Osteoarthritis and Cartilage Open 8 (2026) 100732

Contents lists available at ScienceDirect

Osteoarthritis and Cartilage Open

journal homepage: www.elsevier.com/journals/osteoarthritis-and-cartilage-open/2665-9131

Determinants of six-minute walk test performance in individuals with knee osteoarthritis

Sivakami Mylvaganam [1], Philippa Nicolson [2], Ian Stanaitis [3], Gillian Hawker [1,3], Lauren K. King [1,4,*]

[1] Department of Medicine, University of Toronto, Toronto, Ontario, Canada
[2] Nuffield Department of Orthopaedics, Rheumatology & Musculoskeletal Sciences (NDORMS), University of Oxford, UK
[3] Research and Innovation Institute, Women's College Hospital, Toronto, Ontario, Canada
[4] Li Ka Shing Research Institute, St. Michael's Hospital, Unity Health Toronto, Toronto, Ontario, Canada

ARTICLE INFO

Handling Editor: Professor H Madry

Keywords:
Six-minute walk test
Knee osteoarthritis
Performance-based measure

ABSTRACT

Objective: The 6-minute walk test (6MWT), an Osteoarthritis Research Society International (OARSI)-recommended measure of physical function in knee osteoarthritis (OA), was originally developed to assess submaximal aerobic fitness in people with cardiovascular disease. The degree to which 6MWT performance reflects knee OA severity versus other patient factors remains unclear. Our objective was to assess the contributions of OA-related and non-OA-related patient characteristics to 6MWT performance in individuals with symptomatic knee OA.
Design: In this cross-sectional study, participants scheduled for total knee arthroplasty completed the 6MWT and standardized questionnaires. Participant characteristics were compared by tertiles of 6MWT distance. Multivariable linear regression modelling was used to assess associations between patient factors and 6MWT distance.
Results: Among 278 participants (mean age 67.1 years, 65.5% female, mean WOMAC pain 57.0, and mean 6MWT distance 323.1m), older age (adjusted beta coefficient -4.0 per year, 95% confidence interval [CI] −5.4, −2.5), female sex (adjusted beta [95% CI] −43.0 [−67.3, −18.7]), presence of obesity (adjusted beta [95% CI] -44.4 [−68.2, −20.5]), greater knee pain (adjusted beta [95% CI] per unit increase in WOMAC pain −1.12 [−2.1, −0.2]), worse knee-OA related function (adjusted beta [95% CI] per unit increase in KOOS-PS −1.1 [−2.0, −0.1]) were associated with shorter 6MWT distance. Greater arthritis coping efficacy (adjusted beta [95% CI] 5.2 [1.4, 9.0]) was associated with longer 6MWT distance.
Conclusions: While 6MWT distance declines with greater knee OA symptom severity, other demographic, biomedical and psychosocial factors also significantly influence 6MWT performance. These should be considered when interpreting the 6MWT in this population.

1. Introduction

Knee osteoarthritis (OA) is a leading cause of pain and disability worldwide [1,2] and contributes to more walking difficulty than any other condition [3,4]. Walking difficulty is a primary reason people with knee OA seek care, including joint replacement [5]. Walking difficulty also represents a strong independent risk factor for adverse chronic disease outcomes in people with knee OA, including increased risk for all-cause mortality [6,7]. Being able to robustly measure walking ability in people with knee OA is therefore important for both clinical decision-making and research applications [8].

The Six-Minute Walk Test (6MWT), which assesses functional walking capacity, is an Osteoarthritis Research Society International (OARSI)-recommended performance-based measure of physical function [9,10]. In the 6MWT, participants walk as far as possible on a flat, hard surface over 6 minutes, with rests and gait aids permitted as needed [11]. The 6MWT was originally developed as an alternative to laboratory-based methods for assessing cardiovascular fitness [12] and was first applied in populations with cardiovascular and respiratory disease [13,14]. Its use in knee OA research began in the 1990s, first appearing in a study evaluating improvements in walking ability following a structured exercise program [15]. There has been

* Corresponding author. St. Michael's Hospital 30 Bond Street, Room 3-057, Toronto Ontario M5B 1W8 Canada.
E-mail addresses: s.mylvaganam@mail.utoronto.ca (S. Mylvaganam), philippa.nicolson@ndorms.ox.ac.uk (P. Nicolson), ian.stanaitis@wchospital.ca (I. Stanaitis), g.hawker@utoronto.ca (G. Hawker), l.king@utoronto.ca (L.K. King).

https://doi.org/10.1016/j.ocarto.2025.100732
Received 9 December 2025; Accepted 10 December 2025

subsequent rapid expansion of use of the 6MWT within the OA field [9,16–18]. Despite this, there remains a limited understanding of what exactly the 6MWT measures in people with knee OA [16,19–23], given that walking ability is shaped by a wide range of physical, psychological, and social factors [24,25]. The extent to which OA severity contributes to 6MWT performance relative to other influences remains unclear, limiting the interpretation of the 6MWT as a measure of OA-related physical function.

To address this gap, we assessed the association between knee OA-related symptom severity and other patient-level biomedical, psychological and social factors with 6MWT distance in a cohort of individuals with symptomatic knee OA awaiting total knee arthroplasty (TKA). We hypothesized that, given the multidimensional nature of walking behaviour, 6MWT performance would be similarly influenced by both knee OA-related symptom severity and non-OA related patient-level factors.

2. Methods

2.1. Design and study participants

This cross-sectional study was nested within the BEST-Knee prospective cohort study [19,26]. The BEST-Knee study recruited adults aged 30 years and older with primary knee OA (confirmed by the surgeon based on history, physical examination and imaging) who were awaiting elective unilateral TKA at two provincial hip and knee clinics in Alberta, Canada. Participants with a diagnosis of inflammatory arthritis and those undergoing revision or bilateral TKA were excluded. All participants were required to have sufficient comprehension of English to provide written informed consent and to follow verbal instructions for the 6MWT.

At the Edmonton site, study participants scheduled for TKA were invited to complete the 6MWT as a secondary objective to enable comparison of patient-reported and performance-based TKA outcomes, aiming for a target of >200 participants based on study funding. Data for participants who completed the 6MWT were included in the current study.

The study was approved by the Research Ethics Boards of the Universities of Alberta (PRO-00051108) and Calgary (REB 14–1294), and from Women's College Hospital (REB 2014–0092) at the University of Toronto. All participants provided informed written consent. The reporting of this study was guided by the Strengthening the reporting of observational studies in epidemiology checklist [27].

2.2. Assessments

Participants completed standardized questionnaires one month prior to TKA, which assessed all exposure variables except for participant age, sex, height and weight (to calculate body mass index [BMI]) which were abstracted from clinical records. Participants also completed the 6MWT one month prior to TKA.

2.3. Exposures

Our study hypothesis was underpinned by a biopsychosocial model of walking ability [24,25] where, in addition to knee OA symptoms, other demographic, biomedical, psychological and social factors may contribute. Exposures of interest included:

Patient-reported knee OA symptom severity: Knee OA pain, assessed using the Western Ontario and McMaster Universities OA Index (WOMAC) pain subscale (higher score indicates worse pain [28,29]) and knee OA-related functional impairment, assessed using the Knee injury and OA Outcome Score physical function short form (KOOS-PS; scores were reverse coded such that higher scores indicated worse disability [3,30,31]).

Other biomedical factors: Obesity (defined as BMI $\geq$30 kg/m^2) [32,33], number of physician-diagnosed medical comorbidities (yes/no from list of: cardiovascular disease, hypertension, diabetes, respiratory disease, stomach disease, liver disease, kidney disease, anemia and cancer) [34], total number of troublesome lower extremity joints (number of painful, aching, swollen or stiff lower extremity joints on a lower extremity joint homunculus, including the index knee) [34–36], and presence of lower back pain (yes/no) [37].

Psychological factors: Depressive symptoms, assessed using the eight-item Patient Health Questionnaire Depression Scale (PHQ-8) (higher scores indicate more severe symptoms) [31,34,38], arthritis coping efficacy, using the 4-item Perceived Arthritis Coping Efficacy scale, which evaluates an individual's perceived ability to manage arthritis-related challenges across physical, emotional and role functioning domains (higher scores indicate greater efficacy) [25,39], and pain catastrophizing using the 13-item pain catastrophizing scale (higher scores suggest more catastrophizing) [25,40].

Social factors: Level of education (post-secondary education, yes/no) and social support using the Lubben Social Network Scale (Lubben SNS) (lower scores suggest social isolation) [25,41].

Demographic factors: Age (years) [33] and sex assigned at birth [32,42].

2.4. Outcome

Our outcome of interest was 6MWT distance. The 6MWT was administered approximately one month prior to TKA. It was performed with or without gait aids on a 45-m indoor flat loop with bright orange cones to mark turning points [11]. Participants were instructed to walk as quickly as possible to cover as much ground as possible in 6 min [11]. Test administrators provided encouragement to participants in 1-min intervals. At the end of 6 min, the distance was measured by noting the number of laps completed and adding partial lap distances measured using a measuring wheel. Normative values for 6MWT distance reported for healthy adults of a similar age typically exceed 480m [42,43].

2.5. Analysis

Participant characteristics were described using frequencies, means and standard deviations, overall and by tertile of 6MWT distance to allow for comparison across functional levels. Differences in characteristics between tertiles were analyzed using one-way ANOVA. Number of troublesome joints was categorized as 0–1, 2, and 3 or more, and number of non-musculoskeletal comorbidities was categorized as 0, 1, 2, and 3 or more conditions. WOMAC pain and KOOS-PS scores were normalized 0 to 100 (higher score representing worse symptoms).

We used multivariable linear regression to assess the association between knee OA symptom severity and other factors (biomedical, psychological, social and demographic) with 6MWT distance. We first modelled the association between knee OA symptom severity alone with 6MWT distance. In a second model, we included all exposures of interest. Adjusted R^2 was calculated for each model to quantify the proportion of variance in 6MWT distance explained by the included exposures. Exposures were assessed for multicollinearity using variance inflation factor (where >4 indicated presence of multicollinearity).

Analysis was performed using R version 4.4.3 (R Foundation for Statistical Computing, Vienna, Austria) and SAS Studio Version 3.1 (SAS Institute Inc., Cary, NC). A p-value of <0.05 was considered statistically significant.

3. Results

3.1. Characteristics of study participants

A total of 278 participants were included. Characteristics of participants are shown in Table 1. Their mean age was 67.1 years (standard

Table 1
Participant characteristics.

Characteristic	Overall (N = 278)	Tertile of 6MWT Distance			p-value
		Lowest (N = 92)	Middle (N = 93)	Highest (N = 93)	
Demographics					
Age - years, mean (SD)	67.1 (8.5)	69.1 (9.8)	67.3 (7.7)	64.9 (7.5)	0.003
Female, n (%).	182 (65.5)	68 (73.9)	62 (66.7)	52 (55.9)	0.026
Biomedical comorbidities					
Body Mass index - kg/m^2, mean (SD)	32.2 (6.1)	32.9 (6.6)	33.0 (5.7)	30.7 (5.7)	0.012
Number of troublesome lower extremity joints, n (%)					0.054
0-1	81 (29.1)	19 (20.7)	30 (32.3)	32 (34.4)	
2	88 (31.7)	28 (30.4)	27 (29.0)	33 (35.5)	
3+	109 (39.2)	45 (48.9)	36 (38.7)	28 (30.1)	
Presence of lower back pain, n (%)	148/272 (54.4)	57/88 (64.8)	48/91 (52.7)	43 (46.2)	0.04
Number of non-musculoskeletal comorbidities, n (%)					0.09
0	73/276 (26.4)	17/90 (18.9)	21 (22.6)	35 (37.6)	
1	103 (37.3)	32 (35.6)	37 (39.8)	34 (36.6)	
2	67 (24.3)	27 (30.0)	24 (25.8)	16 (17.2)	
3+	33 (12.0)	14 (15.6)	11 (11.8)	8 (8.6)	
Psychosocial factors					
Post-secondary education, n (%).	155/274 (56.6)	49/92 (53.3)	54/91 (59.3)	52/91 (57.1)	0.7
PHQ-8 depressive symptoms (0–24), mean (SD)	6.8 (5.7)/276	8.7 (6.4)/91	6.5 (5.6)	5.1 (4.5)/92	<0.001
Lubben social networking score (0–30), mean (SD)	17.8 (5.2)/270	17.4 (5.0)/90	18.6 (4.5)/90	17.5 (5.9)/90	0.29
Gignac arthritis coping score (0–20), mean (SD)	13.1 (3.9)/242	11.6 (4.0)/77	13.3 (3.5)/85	14.7 (3.4)/80	<0.001
Pain catastrophizing score (0-52), mean (SD)	18.0 (13.1)/276	21.8 (13.7)/92	17.6 (12.8)/92	14.6 (11.9)/92	<0.001
Knee OA symptom severity					
WOMAC pain (0–100), mean (SD)	57.0 (16.5)	62.0 (14.5)	56.5 (17.5)	53.0 (16.0)	0.0009
KOOS physical function short form (0–100), mean (SD)	52.9 (16.2)/270	58.3 (15.0)/90	52.2 (17.4)	48.1 (14.65)/87	<0.0001
Six-minute walk test					
Six minute walk distance (m), mean (SD)	323.1 (104.7)	205.5 (60.1)	331.5 (26.3)	431.0 (55.0)	<0.0001

WOMAC Western Ontario and McMaster Universities OA Index (higher score indicates worse pain; *KOOS-PS* Knee injury and OA Outcome Score physical function short form (higher score indicates worse disability); *PHQ-8* Eight-item Patient Health Questionnaire Depression Scale.
Sample size provided at top of each column with denominators included when <100 % response.
P-value as indicated, calculated using Chi-square or Wilcoxon rank sum tests, as appropriate.

deviation 8.5) and 182 (65.5%) were female. Mean BMI was 32.2 kg/m^2 (SD 6.1). Mean WOMAC pain was 57.0/100 (SD 16.5) and mean KOOS-PS was 52.9/100 (SD 16.2). Most participants had both musculoskeletal and non-musculoskeletal comorbidities. Mean 6MWT distance was 323.1 (SD 104.7) meters.

3.2. Participant characteristics by tertile of six-minute walk test distance

When examined by tertile of 6MWT distance, participants in the lowest tertile (shortest distance) were more likely to be older ($p = 0.003$), more likely to be female ($p = 0.03$), have higher BMI ($p = 0.01$), more depressive symptoms ($p < 0.001$), lower (worse) scores for perceived arthritis coping efficacy ($p < 0.001$), higher (worse) pain catastrophizing scores ($p < 0.001$), have lower back pain ($p = 0.04$), and higher (worse) scores for WOMAC pain ($p < 0.001$) and KOOS-PS ($p < 0.0001$) than those in the middle and uppermost tertiles (Table 1).

3.3. Association between knee OA-related symptoms and other patient-level factors with 6MWT distance

The results of multivariable linear regression modeling (adjusted beta coefficients with 95 % confidence intervals [CI]) are shown in Tables 2 and 3. In model 1, which included only knee OA symptom severity, greater knee pain (ß −1.3 per unit increase in WOMAC, 95 % CI -2.3, −0.3) and greater functional impairment (ß −1.5 per unit increase in KOOS-PS, 95 % CI -2.5, −0.5) were associated with shorter 6MWT distance. R^2 of this model was 0.14 (Table 2). In model 2 which included all exposures of interest, greater knee pain (ß −1.2 per unit increase in WOMAC pain, 95 % CI −2.1, −0.2), greater functional impairment (ß −1.1 per unit increase in KOOS-PS, 95 % CI −2.0, −0.1), older age (ß −4.0, 95 % CI −5.4, −2.5), female sex (ß −43.0, 95 % CI −67.3, −18.7), and presence of obesity (ß −44.4, 95 % CI −68.2, −20.5) were associated with shorter 6MWT distance. Greater arthritis coping efficacy (ß 5.2 per unit increase in score, 95 % CI 1.4, 9.0) was associated with longer 6MWT distance. No statistically significant associations were found for number of troublesome joints, presence of low back pain, depressive symptoms, pain catastrophizing or post-secondary education with 6MWT distance. The model R^2 was 0.37. (Table 3).

Table 2
Multivariable linear regression analysis of the association between knee OA-specific patient factors and six-minute walk test distance.

Independent Variables	Dependent Variable: Six-Minute Walk Test Distance			
	Adjusted Beta-Estimate	95 % Confidence Interval		P value
WOMAC pain (0–100), per unit	−1.3	−2.3	−0.3	0.009
KOOS-PS (0–100), per unit	−1.5	−2.5	−0.5	0.003
	Model $R^2 = 0.14$			

WOMAC: Western Ontario and McMaster Universities OA Index (higher score indicates worse pain; *KOOS-PS:* Knee injury and OA Outcome Score physical function short form (higher score indicates worse disability).

4. Discussion

In this cross-sectional study of individuals with symptomatic knee OA awaiting TKA, we evaluated the associations between knee OA symptom severity and other patient factors that could affect walking ability with 6MWT distance. We found that while 6MWT distance declines with greater OA symptom severity, it is also influenced by age, sex, BMI, non-musculoskeletal comorbidity burden and perceived arthritis coping efficacy. This study underscores that additional biomedical and psychosocial factors beyond OA symptom severity influence 6MWT performance in individuals with knee OA, helping clinicians and researchers who use 6MWT to evaluate walking ability in people with knee OA to interpret test results.

Table 3
Multivariable linear regression analysis of the association between patient factors and six-minute walk distance.

Independent Variables	Dependent Variable: Six-Minute Walk Distance			
	Adjusted Beta-Estimate	95 % Confidence Interval		P value
Age, per year	−4.0	−5.4	−2.5	<0.0001
Female sex (ref = male)	−43.0	−67.3	−18.7	0.0006
Post-secondary education (ref = no)	19.9	−3.4	43.1	0.09
WOMAC pain (0–100), per unit	−1.2	−2.1	−0.2	0.02
KOOS-PS (0–100), per unit	−1.1	−2.0	−0.1	0.03
Number of troublesome joints, per category increase[a]	1.6	−7.6	10.7	0.74
Presence of lower back pain (ref = no)	−6.6	−30.2	17.0	0.58
Obesity (ref = no)[b]	−44.4	−68.2	−20.5	0.0003
Non-musculoskeletal comorbidities, per category increase[c]	−12.6	−22.1	−3.2	0.009
PHQ-8 (depressive symptoms), per unit increase	−2.3	−5.4	0.7	0.14
Gignac arthritis coping efficacy, per unit increase	5.2	1.4	9.0	0.007
	Model $R^2 = 0.37$			

WOMAC: Western Ontario and McMaster Universities OA Index (higher score indicates worse pain; *KOOS-PS:* Knee injury and OA Outcome Score physical function short form (higher score indicates worse disability); *PHQ-8* Eight-item Patient Health Questionnaire Depression Scale.

[a] Number of lower extremity troublesome joints was categorized as 0–1, 2, and 3 or more joints and did not include the lower back.

[b] Obesity was defined as a BMI≥30 kg/m.^{2}.

[c] Number of non-musculoskeletal comorbidities was categorized as 0, 1, 2, and 3 or more conditions.

The model including only OA-related pain and patient-reported functional impairment had an R^2 of 0.14 which increased to 0.37 when additional biomedical and psychosocial factors were included. The modest association between our patient-reported outcome measures (WOMAC and KOOS) and our outcome is consistent with our understanding of PROMs as providing information on an individual's perceived ability to perform activities while performance-based measures like the 6MWT objectively assess capacity to perform specific activities [16,19–23]. The improvement in the R^2 after inclusion of additional biopsychosocial factors supports the notion that walking is multidimensional behaviour. Collectively, this highlights the need for clinicians and researchers to consider the broader patient context when using the 6MWT to evaluate walking ability in people with knee OA.

Neither the presence of low back pain nor the number of troublesome lower-extremity joints demonstrated independent associations with 6MWT performance, despite the high prevalence of multisite joint involvement and lower back pain in this sample (Table 1). Previous studies have shown that involvement of additional lower extremity joints adds to the burden of OA symptoms [35,36]. The lack of association in our study may reflect the greater influence of factors beyond musculoskeletal symptoms alone. 6MWT may also not fully reflect the impact of musculoskeletal-related mobility limitations; given that the 6MWT is administered on a flat, unobstructed surface [2], it likely does not entirely represent the agility, balance, and coordination required for walking in the community. Negotiating uneven terrain, stairs, inclines, and crowded environments are common sources of mobility restriction not represented in the 6MWT and better assessments of real-world mobility restrictions would be useful in this population [16].

The associations we observed between 6MWT performance and age, sex and obesity align with prior literature and could be attributed to differences in body composition or muscle mass and aerobic capacity between age groups, sexes and those with differing BMI [11,43]. Similarly, our finding that the number of non-musculoskeletal comorbidities was associated with 6MWT distance is in keeping with prior research establishing the 6MWT as a reflection of cardiorespiratory fitness [2,44–46]. Notably however, we found no difference in the prevalence of specific cardiorespiratory comorbidities across tertiles of 6MWT distance, which might have been expected [2,44–46]. It is possible that since participants had been scheduled for surgery, individuals with significant non-musculoskeletal comorbidities, such as advanced cardiorespiratory disease, diabetic neuropathy, or prior stroke, were excluded and as a result, we may have underestimated the contribution of these comorbidities to 6MWT performance and, conversely, overestimated the influence of OA. Our study has also demonstrated the additive influences of psychosocial factors such as OA coping on 6MWT performance. These are known to compound OA symptoms by affecting motivation, pain perception and engagement with physical activity in general [47,48]. Given that the R^2 for our multivariable model was only 0.37, unmeasured factors account for additional unexplained variability in 6MWT distance beyond what our model captured. These may include additional psychosocial factors such as motivation, sleep and fatigue [49]. The relationship between additional psychosocial constructs and how they relate to walking limitation in people with knee OA merits further study.

This study has several notable strengths. First, the study leveraged a well-characterized cohort from the BEST-Knee prospective study [19,26], which included comprehensive biomedical, psychological, and functional data. This cohort was also clinically relevant as the mean 6MWT distance was substantially lower than values reported for healthy adults of a similar age [42,43], fitting with a symptomatic knee OA population. Thus, the study participants may be representative of those enrolled into OA clinical trials. Importantly, we included under-studied psychological variables such as arthritis coping efficacy in our analyses, contributing novel insights into how psychological resilience may influence performance-based measures like the 6MWT.

Our study also has some limitations. Participants were scheduled for TKA and thus presumably had more advanced knee OA. This may have introduced spectrum bias, limiting the generalizability of our findings to populations with earlier or less severe knee OA. However, participants represented the full range of WOMAC pain and KOOS-PS scores, which suggests variability in perceived symptoms and function even within this pre-surgical cohort. Participation in the 6MWT was voluntary which may have introduced selection bias. Additionally, test-day factors are difficult to account for as the assessment was only administered once prior to TKA in contrast to other similar studies where participants performed it multiple times and a best-test was selected for analyses [11,50].

In conclusion, multiple factors influence 6MWT distance beyond OA symptoms in people with knee OA. Clinicians using the 6MWT to assess physical function in people with knee OA should consider the broader health and psychosocial profile of each individual, and how these factors may be contributing to an observed change or lack thereof in 6MWT performance.

Author contributions

Conception and design: SM, GH, LK. Analysis and interpretation of the data: SM, GH, LK. Drafting of the article: SM, GH, LK. Critical revision of the article: SM, PN, IS, GH, LK. Final approval of the article: SM, PN, IS, GH, LK.

Role of the funding source

The BEST-Knee study was funded by an operating grant from the Canadian Institutes of Health Research (CIHR) grant #MOP-312807. The funder had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; or the decision to submit the manuscript for publication.

Declaration of interest statement

LKK is supported by an Arthritis Society Canada Stars Career Development Award (Star-24-0095). All other authors report no competing interests.

Acknowledgements

We would like to thank the study participants and Alberta site co-ordinators, Anne-Marie Adachi and Shakib Rahman.

References

[1] Collaborators, G.B.D.O., Global, regional, and national burden of osteoarthritis, 1990-2020 and projections to 2050: a systematic analysis for the global burden of disease study 2021, Lancet Rheumatol 5 (9) (2023) e508–e522.
[2] P. Agarwala, S.H. Salzman, Six-minute walk test: clinical role, technique, coding, and reimbursement, Chest 157 (3) (2020) 603–611.
[3] L.K. King, et al., Impact of osteoarthritis on difficulty walking: a population-based study, Arthritis Care Res. 70 (1) (2018) 71–79.
[4] K.D. Allen, L.M. Thoma, Y.M. Golightly, Epidemiology of osteoarthritis, Osteoarthr. Cartil. 30 (2) (2022) 184–195.
[5] D. A, et al., The role of pain and walking difficulties in shaping willingness to undergo joint surgery for osteoarthritis: data from the Swedish BOA register, Osteoarthr Cartil Open 3 (2) (2021) 100157.
[6] G.A. Hawker, et al., All-cause mortality and serious cardiovascular events in people with hip and knee osteoarthritis: a population based cohort study, PLoS One 9 (3) (2014) e91286.
[7] S.E. Hardy, et al., Ability to walk 1/4 mile predicts subsequent disability, mortality, and health care costs, J. Gen. Intern. Med. 26 (2) (2011) 130–135.
[8] T.O. Smith, et al., The OMERACT-OARSI core domain set for measurement in clinical trials of hip And/or knee osteoarthritis, J. Rheumatol. 46 (8) (2019) 981–989.
[9] F. Dobson, et al., OARSI recommended performance-based tests to assess physical function in people diagnosed with hip or knee osteoarthritis, Osteoarthr. Cartil. 21 (8) (2013) 1042–1052.
[10] D.M. Kennedy, et al., Assessing recovery and establishing prognosis following total knee arthroplasty, Phys. Ther. 88 (1) (2008) 22–32.
[11] Laboratories, A.T.S.C.o.P.S.f.C.P.F., ATS statement: guidelines for the six-minute walk test, Am. J. Respir. Crit. Care Med. 166 (1) (2002) 111–117.
[12] K.H. Cooper, A means of assessing maximal oxygen intake. Correlation between field and treadmill testing, JAMA 203 (3) (1968) 201–204.
[13] C.R. McGavin, S.P. Gupta, G.J. McHardy, Twelve-minute walking test for assessing disability in chronic bronchitis, Br. Med. J. 1 (6013) (1976) 822–823.
[14] R.J. Butland, et al., Two-, six-, and 12-minute walking tests in respiratory disease, Br. Med. J. (Clin. Res. Ed.) 284 (6329) (1982) 1607–1608.
[15] M.G. Peterson, et al., Effect of a walking program on gait characteristics in patients with osteoarthritis, Arthritis Care Res. 6 (1) (1993) 11–16.
[16] G. Coleman, et al., Measures of physical performance, Arthritis Care Res. 72 (Suppl 10) (2020) 452–485.
[17] S.L. Kroman, et al., Measurement properties of performance-based outcome measures to assess physical function in young and middle-aged people known to be at high risk of hip and/or knee osteoarthritis: a systematic review, Osteoarthr. Cartil. 22 (1) (2014) 26–39.
[18] M. Ateef, S. Kulandaivelan, S. Tahseen, Test–retest reliability and correlates of 6-minute walk test in patients with primary osteoarthritis of knees, Indian J. Rheumatol. 11 (4) (2016) 192–196.
[19] L.K. King, et al., Minimal clinically important difference for improvement in six-minute walk test in persons with knee osteoarthritis after total knee arthroplasty, BMC Muscoskelet. Disord. 23 (1) (2022) 307.
[20] S.H. Lee, et al., Validity of the osteoarthritis research society international (OARSI) recommended performance-based tests of physical function in individuals with symptomatic kellgren and lawrence grade 0-2 knee osteoarthritis, BMC Muscoskelet. Disord. 23 (1) (2022) 1040.
[21] M.R. Maly, P.A. Costigan, S.J. Olney, Determinants of self-report outcome measures in people with knee osteoarthritis, Arch. Phys. Med. Rehabil. 87 (1) (2006) 96–104.
[22] E. Parent, H. Moffet, Preoperative predictors of locomotor ability two months after total knee arthroplasty for severe osteoarthritis, Arthritis Rheum. 49 (1) (2003) 36–50.
[23] E. Collins, et al., Evaluation of psychometric properties of walking impairment questionnaire in overweight patients with osteoarthritis of knee, J. Rehabil. Res. Dev. 45 (4) (2008) 559–566.
[24] A. Bootsma-van der Wiel, et al., Common chronic diseases and general impairments as determinants of walking disability in the oldest-old population, J. Am. Geriatr. Soc. 50 (8) (2002) 1405–1410.
[25] J.R. Olsen, et al., Individual, social and area level factors associated with older people's walking: analysis of an UK household panel study (Understanding society), Soc. Sci. Med. 358 (2024) 117083.
[26] L.K. King, et al., Use of recommended non-surgical knee osteoarthritis management in patients prior to total knee arthroplasty: a cross-sectional study, J. Rheumatol. 47 (8) (2020) 1253–1260.
[27] E. von Elm, et al., The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies, Lancet 370 (9596) (2007) 1453–1457.
[28] N. Bellamy, Pain assessment in osteoarthritis: experience with the WOMAC osteoarthritis index, Semin. Arthritis Rheum. 18 (4 Suppl 2) (1989) 14–17.
[29] N. Bellamy, et al., Validation study of WOMAC: a health status instrument for measuring clinically important patient relevant outcomes to antirheumatic drug therapy in patients with osteoarthritis of the hip or knee, J. Rheumatol. 15 (12) (1988) 1833–1840.
[30] A.V. Perruccio, et al., The development of a short measure of physical function for knee OA KOOS-physical function shortform (KOOS-PS) - an OARSI/OMERACT initiative, Osteoarthr. Cartil. 16 (5) (2008) 542–550.
[31] G.A. Hawker, et al., A longitudinal study to explain the pain-depression link in older adults with osteoarthritis, Arthritis Care Res. 63 (10) (2011) 1382–1390.
[32] E. Gimeno-Santos, et al., Development and comparison of reference equations for the six-minute walk test in Spanish healthy adults aged 45-85 years, Arch. Bronconeumol. 61 (8) (2025).
[33] S.J. Jay, Reference equations for the six-minute walk in healthy adults, Am. J. Respir. Crit. Care Med. 161 (4 Pt 1) (2000) 1396.
[34] L.K. King, et al., Are medical comorbidities contributing to the use of opioid analgesics in patients with knee osteoarthritis? Osteoarthr. Cartil. 28 (8) (2020) 1030–1037.
[35] A.L. Dore, et al., Lower-extremity osteoarthritis and the risk of falls in a community-based longitudinal study of adults with and without osteoarthritis, Arthritis Care Res. 67 (5) (2015) 633–639.
[36] J.A. Singh, D.G. Lewallen, Ipsilateral lower extremity joint involvement increases the risk of poor pain and function outcomes after hip or knee arthroplasty, BMC Med. 11 (2013) 144.
[37] L.K. King, et al., GLA:D to be walking better: change in self-reported difficulty walking after exercise therapy and education in persons with knee osteoarthritis, J. Rheumatol. 51 (10) (2024) 1033–1038.
[38] K. Kroenke, et al., The PHQ-8 as a measure of current depression in the general population, J. Affect. Disord. 114 (1–3) (2009) 163–173.
[39] M.A. Gignac, C. Cott, E.M. Badley, Adaptation to disability: applying selective optimization with compensation to the behaviors of older adults with osteoarthritis, Psychol. Aging 17 (3) (2002) 520–524.
[40] A. Osman, et al., Factor structure, reliability, and validity of the pain catastrophizing scale, J. Behav. Med. 20 (6) (1997) 589–605.
[41] J. Lubben, et al., Performance of an abbreviated version of the lubben social network scale among three European community-dwelling older adult populations, Gerontol. 46 (4) (2006) 503–513.
[42] T. Troosters, R. Gosselink, M. Decramer, Six minute walking distance in healthy elderly subjects, Eur. Respir. J. 14 (2) (1999) 270–274.
[43] P.L. Enright, D.L. Sherrill, Reference equations for the six-minute walk in healthy adults, Am. J. Respir. Crit. Care Med. 158 (5 Pt 1) (1998) 1384–1387.
[44] R.M. Ross, et al., The six minute walk test accurately estimates mean peak oxygen uptake, BMC Pulm. Med. 10 (2010) 31.
[45] L. Cahalin, et al., The relationship of the 6-min walk test to maximal oxygen consumption in transplant candidates with end-stage lung disease, Chest 108 (2) (1995) 452–459.
[46] V. Bittner, et al., Prediction of mortality and morbidity with a 6-minute walk test in patients with left ventricular dysfunction, SOLVD Investigators. JAMA 270 (14) (1993) 1702–1707.
[47] P.W. Stratford, D.M. Kennedy, Performance measures were necessary to obtain a complete picture of osteoarthritic patients, J. Clin. Epidemiol. 59 (2) (2006) 160–167.
[48] J.J. Tolk, et al., The OARSI core set of performance-based measures for knee osteoarthritis is reliable but not valid and responsive, Knee Surg. Sports Traumatol. Arthrosc. 27 (9) (2019) 2898–2909.
[49] J. Feda, et al., Measures of sleep are not routinely captured in trials assessing treatment outcomes in knee osteoarthritis - a scoping systematic review and call to action, Osteoarthr Cartil Open 5 (4) (2023) 100400.
[50] M.B. Agrawal, N.T. Awad, Correlation between six minute walk test and spirometry in chronic pulmonary disease, J. Clin. Diagn. Res. 9 (8) (2015) OC01–OC04.