Musculoskeletal Science and Practice 39 (2019) 150–156

Contents lists available at ScienceDirect

Musculoskeletal Science and Practice

journal homepage: www.elsevier.com/locate/msksp

Original article

Correlates and predictors of pain intensity and physical function among individuals with chronic knee osteoarthritis in Nigeria

Adesola Odole[a], Ezinne Ekediegwu[a,b,*], E.N.D. Ekechukwu[c], Chigozie Uchenwoke[d]

[a] Department of Physiotherapy, Faculty of Clinical Sciences, College of Medicine, University of Ibadan, Ibadan, Nigeria
[b] Astella Physiotherapy Clinics, Enugu, Nigeria
[c] Department of Medical Rehabilitation, Faculty of Health Sciences and Technology, College of Medicine, University of Nigeria, Enugu, Nigeria
[d] Department of Medical Rehabilitation, Faculty of Health Sciences and Technology, College of Medicine, Nnamdi Azikiwe University, Anambra, Nigeria

ARTICLE INFO

Keywords:
Kinesiophobia
Pain catastrophizing
Self-efficacy
Knee osteoarthritis

ABSTRACT

Background: Little is known about the correlates between pain intensity (PI) and physical function (PF) and psychosocial factors {kinesiophobia (K), Pain Catastrophizing (PC) and Self-efficacy (SE)} among patients diagnosed with knee osteoarthritis in developing countries like Nigeria.

Objective: To investigate the correlates of PI and PF and psychosocial factors in patients with knee osteoarthritis in Nigeria.

Design: Eighty-nine consecutively sampled patients diagnosed with knee osteoarthritis from three selected public hospitals in Enugu, South-East Nigeria, participated in this cross-sectional survey.

Method: Brief Fear of Movement Scale for Osteoarthritis, Pain Catastrophizing Scale and Arthritis Self-Efficacy Scale-8 item were used to assess kinesiophobia, pain catastrophizing and Self-efficacy respectively. Visual Analogue Scale and Ibadan Knee or Hip Osteoarthritis Measure were used to assess PI and PF respectively. Data were analysed using Pearson's correlation coefficient and multiple regression at $p = 0.05$.

Results/findings: Participants were aged 59.11 ± 12.46years involving male (17.9%) and female (82.1%) participants. There were no significant gender differences in the scores of kinesiophobia, PI, PF, PC and self-efficacy. Pain intensity was significantly proportional to kinesiophobia ($r = 0.38$), and PC($r = 0.39$). Better physical function was associated with high self-efficacy ($r = 0.35$), low kinesiophobia ($r = -0.43$) and low PC($r = -0.28$). Significant predictive markers of PI included kinesiophobia ($\beta = 0.24$) and PC($\beta = 0.11$) while that of PF, included kinesiophobia ($\beta = -0.41$) and SE($\beta = 2.39$).

Conclusions: Kinesiophobia and pain catastrophizing correlate and predict PI significantly. Kinesiophobia and SE are significant correlates and predictors of PF among patients with knee osteoarthritis in Nigeria.

1. Introduction

Osteoarthritis (OA) is a common debilitating degenerative joint disease with physical and psychological sequelae, associated with large societal and economic burden (Anna et al., 2013). It is characterized by slow progressive articular cartilage destruction, ultimately leading to disabling pain perception and joint dysfunction (Crawford et al., 2013; Anna et al., 2013). The commonest form of osteoarthritis among Africans is knee OA owing to limited access to proper healthcare (Anna et al., 2013; Bija et al., 2015). Knee osteoarthritis causes the greatest burden to Africans seemingly due to joint pain and stiffness which invariably leads to a persistent reduction in physical function (Anna et al., 2013). This eventually results to a reduction in performance of activities of daily living as significant disability emanates, therefore, requiring surgical intervention (Anna et al., 2013), especially total knee replacement (DeFrances and Podgornik, 2006). Primary symptoms of knee OA include joint pain perception, stiffness and physical functional limitation. Other symptoms include crepitus, knee instability, elevated sensitivity to cold and/or damp (Joern et al., 2010). However, of all these, pain perception remains a key feature of knee OA both as a criterion for diagnosis and as a major driver of health care decisions (Zhang et al., 2010). Asides pain perception, joint stiffness affects the ability to perform activities of daily living among patients with knee OA (Aghdam et al., 2013). As a result, pain perception and physical functional limitation which have an indirect relationship, are the two primary concerns of patients with OA (Thumboo et al., 2002; Reneman et al., 2007). These factors impact the health status of patients with knee OA (Huang et al., 2015). Pain perception associated with knee OA

* Corresponding author. Physiotherapy Department, Faculty of Clinical Sciences, College of Medicine, University of Ibadan, Ibadan, Nigeria.
E-mail address: tshantec@yahoo.com (E. Ekediegwu).

https://doi.org/10.1016/j.msksp.2018.11.014
Received 13 April 2017; Received in revised form 2 November 2018; Accepted 22 November 2018

is likely a heterogeneous, multi-factorial phenomenon that involves not only the disease process but also elements specific to patient psychosocial make-up and pain neurophysiology (Andrew et al., 2013).

Several psychosocial factors (self-efficacy, anxiety, social support, kinesiophobia, helplessness, pain catastrophizing, depression) have been reported to influence pain perception and physical function in patients with knee OA (mostly cross-sectional studies) (Weinberger et al., 1990; Hadler, 1992, Vlaeyen and Linton, 2000; Thumboo et al., 2002, Houben et al., 2005; Shelby et al., 2008; Dekker et al., 2009; Scopaz et al., 2009; Singh et al., 2011; Sánchez-Herán et al., 2016; Sharma et al., 2016). In a cross-sectional study involving individuals with knee/hip OA, physical function was found to be inversely proportional to learned helplessness and Chinese ethnicity was related to less pain perception (Thumboo et al., 2002). Anxiety and depression increase pain intensity and lower physical function in patients with OA (Scopaz et al., 2009; Sharma et al., 2016). Social support, on its own, impacts directly on the functional status of patients with knee OA (Weinberger et al., 1990). Sensations of buckling and knee instability associated with knee OA suggest relationships with kinesiophobia and pain catastrophizing which could affect knee confidence as well as one's ability to perform activities of daily living (Sánchez-Herán et al., 2016). More so, high kinesiophobia relates to increased pain perception and its transition from acute to chronic in knee pain, poorer physical function and activities of daily living (ADL) (Vlaeyen and Linton, 2000; Houben et al., 2005; Scopaz et al., 2009). Pain catastrophizing relates to pain outcomes especially after surgical interventions in patients with knee OA (Singh et al., 2011). Higher pain catastrophizing contributes to greater pain perception and disability and was found to relate with lower self-efficacy as well (Shelby et al., 2008). Poor self-efficacy which describes low ability to cope and manage around a pain experience is one of the risk factors for functional decline (Lorig et al., 1989; Dekker et al., 2009). Therefore, kinesiophobia can lead to a reduction of various activities thought to generate pain perception with progressive limitation of physical function in some individuals. The resultant disuse and deconditioning generate a further loss of muscle tone, decreased physical function and invariably leads to disability (Houben et al., 2005). On the other hand, higher pain catastrophizing contributes not just to greater pain perception but also to the limitation of physical function and has been found to relate with lower self-efficacy as well (Shelby et al., 2012).

These psychosocial factors (kinesiophobia, pain catastrophizing, self-efficacy) are sometimes referred to as health-related beliefs which modulate individual perception and response to the illness and seem to affect functional level following musculoskeletal injury (Riddle et al., 2010; Tichonova et al., 2016). With the inclusion of ethnic background, they have been found to relate with pain intensity, physical function and disability among patients with knee OA in developed countries (Thumboo et al., 2002; Backman, 2006; Somers et al., 2009a,b). Literature appears silent on the relationships between these psychosocial factors and pain intensity and physical function among patients diagnosed with knee OA in the African population given that there are cultural variations in pain perception and experience (Shipton, 2013). Invariably, this suggests that these psychosocial factors influence treatment outcome in patients with knee OA. This study was, therefore, designed to investigate the relationships between pain intensity and physical function and selected psychosocial factors (kinesiophobia, pain catastrophizing and self-efficacy) among patients diagnosed of OA of the knee in Nigeria – the most populous African nation.

2. Method

Ethical approval was sought and obtained from the University of Ibadan/University College Hospital Health Research Ethics Committee as well as the selected hospitals (University of Nigeria Teaching Hospital, Parklane and National Orthopaedic hospitals) for data collection before the commencement of the study.

2.1. Participants

The sample size for the survey was 99 and it was calculated using the formula by Sullivan (2012) {with prevalence of knee OA from a hospital-based study in Nigeria at 6.9% (Akinpelu et al., 2007)}. Consecutive sampling technique was used to recruit participants for the study. After recruitment, those who consented to participate in the study completed demographic/clinical data forms and the selected instruments (outcome measures) which were administered by the physiotherapists (one of the authors and research assistants trained on the administration of the outcome measures). Participants were free to drop out of the study at any point without providing a reason.

Participants eligible for the study were patients with (i) the ability to read and write Igbo or English (ii) having chronic clinical features of only knee OA according to the American College of Rheumatology (ACR) Clinical Classification Criteria for OA of the knee. Participants were excluded according to the following criteria; (i) prior knee surgery (ii) acute knee trauma (iii) any other form of arthritis (iv) intra-articular corticosteroid injection to the knee(s) 3 weeks prior recruitment for the study (v) previous knee arthroscopic or arthroplasty. Each participant carried out each of the physical performance tests on IKHOAM while the researcher or a trained research assistant (physiotherapists) rated the performance. Scoring of each outcome measure was done by one of the authors in accordance with the scoring instructions outlined for each outcome measure.

2.2. Outcome measures

- **Pain**

Pain was assessed using an 11-point **Pain Visual Analogue Scale (**PVAS), anchored 0 cm (no pain), 50 cm (moderate pain) and 100 cm (worst imaginable pain) with higher scores representing greater pain intensity (Jensen et al., 1986; Huskisson et al., 1974; Ferraz et al., 1990; Burckhardt and Jones, 2003). The PVAS possesses adequate reliability and validity, with the test–retest reliability higher among literate than illiterate patients (Ferraz et al., 1990; Jensen and Karoly, 1992). In patients with pain associated with knee OA, the scale has demonstrated sensitivity to changes in pain assessed hourly for a maximum of 4 h and weekly for up to 4 weeks following analgesic therapy (Joyce et al., 1975).

- **Physical function**

The **Ibadan Knee or Hip Osteoarthritis Measure (IKHOAM)**, a 33-item instrument with domains consisting of activity limitations, participation restrictions and physical performance tests was used to assess physical function. It is a Nigerian culture and environment-friendly clinical instrument for individuals with knee OA (Akinkpelu et al., 2011; Odole et al., 2013). The maximum obtainable score on IKHOAM is 232, calculated in percentage as subject's score/total possible score x 100 with low scores implying a low level of physical functioning ability (Odole et al., 2013). The Ibadan Knee or Hip Osteoarthritis Measure has good validity, responsiveness and reliability as well as Minimal Clinical Important Difference (MCID) of 12.89 (Akinpelu et al., 2007 & 2011).

- **Kinesiophobia**

The **Brief Fear of Movement Scale for Osteoarthritis (BFMSO)** is an adapted version of Tampa Scale of Kinesiophobia (TSK) for patients with OA which consists of six items. Possible scores range from 6 to 24, with higher scores ($\geq$15) representing a high degree of kinesiophobia (Shelby et al., 2012). The scale has sound psychometric properties including convergent validity (Shelby et al., 2012).

- **Pain Catastrophizing**

The **Pain Catastrophizing Scale (PCS)** was used as a measure of pain catastrophizing. The PCS is a 13-item self-report measure with three subscales of magnification, rumination and helplessness (van Damme et al., 2002). The PCS has excellent psychometric properties, including adequate to excellent internal consistency (Sullivan et al., 1995; Osman et al., 2000; 2000), test-retest reliability, good convergent validity and construct validity (Sullivan et al., 2009). Total score ranges from 0 to 52 with scores 30 and above representing a clinically relevant level of catastrophizing (Sullivan et al., 1995).

- **Self-efficacy**

Self-efficacy was assessed with **Arthritis Self-efficacy Scale-8 Item (ASES-8)**, the shortened form of the original ASES 20-item which consists of 8 items with no subscales. The total score is the mean of the eight items with higher scores denoting greater self-efficacy (Sara et al., 2014). The scale demonstrates high internal consistency (Sara et al., 2014) and positively correlates with other measures of self-rated health status and physical performance but negatively correlates with arthritis symptoms (pain, fatigue, and stiffness) (Sara et al., 2014).

2.3. Data analysis

Pearson's correlation coefficient was used to determine the correlation between the scores of each selected psychosocial and each selected clinical variables. The closer the coefficient is to zero (from either + or -), the less strong the relationship and vice versa (Pallant, 2011). From this study, the correlation coefficient values for most of the variables were either weak (very close to zero: 0.20–0.39) or moderate (quite close to zero: 0.40–0.59). The relationships would have been stronger if the correlation coefficient were closer to one. Multiple linear regression analysis was used to determine the effect of each of the independent/predictor variables (selected psychosocial factors: kinesiophobia, pain catastrophizing and self-efficacy) on each of the dependent (outcome) variables (pain intensity and physical function). The level of significance was set at 0.05.

3. Results

3.1. Summary of Participant's characteristics

Eighty-nine patients (16 males, 73 females) out of ninety-nine consecutively sampled patients with knee OA ranging between 20 and 84 years (mean age: 59.11 ± 12.46years) participated fully in this study (see Table 1). Participants with bilateral knee joint affectation (45.3%) were more in distribution than those with unilateral affectation. There were no significant variations of gender in the scores of PI, PF, PC, K and self-efficacy. Participants with bilateral knee OA affectation (45.3%) reported the highest scores on only PI (6.05 ± 2.72) as shown in Table 1. The total mean scores of PI, PF, K, PC and SE of all the participants were 5.26 ± 2.88, 68.33 ± 17.89, 14.43 ± 3.61, 17.03 ± 9.97 and 7.22 ± 2.12 respectively. The mean scores for PI of the right knee only, left knee only and bilateral knee were 4.90 ± 2.83, 3.44 ± 2.96, 6.05 ± 2.72 respectively. The mean scores for PF with regards to the affectation of the right knee only, left knee only and both knees were 72.77 ± 14.21%, 69.01 ± 27.80% and 63.46 ± 17.34% respectively as shown in Table 1.

3.2. Relationship between pain intensity, physical function, kinesiophobia, pain catastrophizing and self-efficacy

There were positive but weak correlations between kinesiophobia and each of pain intensity ($r = 0.38$, $p = 0.00$), pain catastrophizing and pain intensity ($r = 0.39$, $p = 0.00$) as well as between self-efficacy and physical function ($r = 0.35$, $p = 0.00$). There was, however, a negative but moderate correlation between kinesiophobia and physical function ($r = -0.43$, $p = 0.00$). Physical function had a weak negative correlation with each of pain catastrophizing ($r = -0.28$, $p = 0.01$) as shown in Table 2.

3.3. Predictive markers of pain intensity and physical functioning

In the regression models, kinesiophobia, pain catastrophizing, self-efficacy and age explained a significant proportion of variance in measures of pain intensity (0.30) and physical function score (0.41) at $p < 0.05$. Significant positive predictive markers of pain intensity were kinesiophobia ($\beta = 0.24$, $p < 0.0001$) and pain catastrophizing ($\beta = 0.11$, $p < 0.0001$). Also, kinesiophobia ($\beta = -1.86$, $p = 0.00$) and age ($\beta = -0.41$, $p = 0.00$) were significant negative predictors of physical function as shown in Table 3.

4. Discussion

The mean age (59.11 ± 12.46 years) of the participants from this study supports the definition of OA by the American College of Rheumatology as a disease that most often affects middle-aged to elderly people (American College of Rheumatology, 2012). Participants were predominantly females (82.1%) with a mean age of 60.30 ± 10.63 years and this seemingly suggests that females had a significantly greater risk OA in the knee, particularly after menopausal age due to loss of oestrogen associated with lower cartilage turnover (Mahajan et al., 2005; Srinkanth et al., 2005; Linn et al., 2012). Other possible contributory factors to high proportion of females with knee OA may include molecular changes and lifestyle adaptations (reduced physical activity, diet, obesity etc.) in addition to possible higher health-seeking behaviour (de Klerk et al., 2009). All the selected variables did not vary significantly between male and female. Lack of significant differences in the mean scores of all the variables between male and female may be due to the fact that a non-probability sampling technique was used for this study. This implies that there was no equal representation of both sexes. Apart from this, the scores of the variables appeared not to be high enough to produce any statistically significant

Table 1
Characteristics of participants and mean scores of pain intensity, physical function, kinesiophobia, pain catastrophizing and self-efficacy across descriptive variables.

Variables	Categories	%	Mean scores				
			PI	PF	K	PC	SE
Sex	M(**mA**:54.78 ± 18.02, **Bm**:26.83 ± 3.01)	17.9	3.94 ± 2.29	78.66 ± 17.31	13.12 ± 3.77	13.63 ± 12.45	7.40 ± 1.90
	F(**mA**:60.30 ± 10.63, **Bm**:31.23 ± 6.69)	82.1	5.55 ± 2.93	65.90 ± 17.89	14.73 ± 3.53	17.74 ± 9.32	7.19 ± 2.18
JA	Right knee only	43.2	4.90 ± 2.83	72.77 ± 14.21	13.63 ± 3.90	17.95 ± 10.55	7.63 ± 2.14
	Left knee only	11.6	3.44 ± 2.96	69.01 ± 27.80	15.60 ± 3.03	13.46 ± 8.98	7.43 ± 2.20
	Both knee	45.3	6.05 ± 2.72	63.46 ± 17.34	14.95 ± 3.34	17.10 ± 9.66	6.80 ± 2.06
SD	Acute	1.1	9.00	44.40 ± 00.00	14.00 ± 0.00	29.00 ± 0.00	5.88 ± 0.00
	Chronic	98.9	5.22 ± 2.87	68.62 ± 17.80	14.43 ± 3.63	16.90 ± 9.95	7.24 ± 2.13
TOTAL	N/A	100	5.26 ± 2.88	68.33 ± 17.89	14.43 ± 3.61	17.03 ± 9.97	7.22 ± 2.12

M: Male, F: Female, mA: Mean Age, Bm: Mean Body mass index, JA: Joint Affected, PI: Pain Intensity.
PF: Physical Function, K: Kinesiophobia, PC: Pain Catastrophizing, SE: Self-Efficacy.

Table 2
Relationship among pain intensity, physical function and kinesophobia, pain catastrophizing, self-efficacy: Pearson's correlation matrix.

Variables		Pain intensity	Physical function	Kinesiophobia	Pain cat.	Self-efficacy
Pain intensity	**r**	1	−0.30*	0.38*	0.39*	−0.02
	p		0.01	0.00	0.00	0.84
Physical function	**r**	−0.30*	1	−0.43*	−0.28*	0.35*
	p	0.01		0.00	0.01	0.00
Kinesiophobia	**r**	0.38*	−0.43*	1	0.28*	−0.01
	p	0.00	0.00		0.01	0.92
Pain catastrophizing	**r**	0.39*	−0.28*	0.28*	1	−0.28*
	p	0.00	0.01	0.01		0.01
Self-efficacy	**r**	−0.02	0.35*	−0.01	−0.28*	1
	p	0.84	0.00	0.92	0.01	

r = Correlation coefficient, p = Probability of error, * = Significant Correlation at $p < 0.05$, pain cat. = pain catastrophizing.

difference.

Knee OA is characterized by progressive articular cartilage destruction, ultimately leading to disabling chronic symptoms (Crawford et al., 2013) of which this study appears to support as most of the participants had chronic OA. The mechanism by which acute pain becomes chronic has been explained by alterations of the pain pathway (which could lead to hypersensitivity, allodynia or hyperalgesia) and the cognitive-behavioural, fear-avoidance model (Vlaeyen and Linton, 2000; Basbaum et al., 2009; Woolf, 2011). This model is one of the most influential psychological models of chronic musculoskeletal pain and was postulated to explain psychological factors in the experience of musculoskeletal pain. The model was advanced to explain how patients with an acute or sub-acute musculoskeletal pain condition might transit over time to a chronic pain, reduced physical function and then, increased disability (Linton and Shaw, 2011). Furthermore, it describes the method by which pain is catastrophically misinterpreted cognitively as a threat (pain catastrophizing), therefore giving rise to fear of pain, kinesiophobia, avoidance behaviour and hyper-vigilance which affects the attention process (Vlaeyen and Linton, 2002; Leeuw et al., 2007). Kinesiophobia and pain catastrophizing influence one's ability to perform activities of daily living, thus impact on self-efficacy (Sánchez-Herán et al., 2016). Vlaeyen and Linton (2000) added that this behaviour invariably perpetuates a vicious cycle in which chronic pain develops with a decrease in physical function and increase in long-term disability. The resulting disability has been proposed to lower the threshold for pain and activity tolerance, which then continues the cycle (Vlaeyen and Linton, 2000).

4.1. Relationships among selected study variables

There was a weak, but significant relationship between kinesiophobia and pain intensity. This may imply that OA patients with higher pain intensity tend to report greater kinesiophobia. Results of earlier studies (Reneman et al., 2007; Somers et al., 2009b; Helminen et al., 2013; Perry and Francis, 2013) revealed a weak or non-existent correlation between kinesiophobia and pain intensity in patients with chronic heterogeneous pain, chronic musculoskeletal pain and knee OA.

There was a significant, negative yet moderate correlation between kinesiophobia and physical function. However, kinesiophobia and physical function have been reported to be strongly and consistently associated in patients with OA of the knee (Somers et al., 2009b; Helminen et al., 2013). The discrepancy in the strength of the correlation may be due to cultural variations between Asian and African participants in the studies. The relationship between kinesiophobia and physical function appeared closer to one in the Asian population but farther from one in the African population. This suggests that among Africans higher kinesiophobia does not ultimately result in poorer physical function in the same population. The Igbo cultural ideology emphasizes change, individualism, competitiveness and doggedness (Achebe, 2012) which may have been culpable in the relationship.

Also, there was a significant positive but weak correlation between pain catastrophizing and pain intensity. Pain catastrophizing is an important variable in understanding pain and disability in knee OA patients and has been identified as a positive correlate to pain intensity (Sullivan et al., 2009; Somers et al., 2009b; Domenech et al., 2014; Perry and Francis, 2013; Helminen et al., 2013). In line with findings from previous studies (Somers et al., 2009b; Helminen et al., 2013; Domenech et al., 2014) that identified pain catastrophizing to be strongly and consistently associated with decreased physical function in patients with anterior knee pain and knee OA, pain catastrophizing and physical function were found to have a weak but significant negative correlation from this study.

Self-efficacy (as the belief in one's capabilities to organize and execute the courses of action required to produce given attainments) has been an important theoretical construct underlying research in arthritis and other sources of chronic pain (Lorig et al., 1989; Bandura, 1997; Allegrante and Marks, 2003). The results from this present study showed a significant positive but weak correlation between self-efficacy and physical function which appears to have been impacted upon by the Igbo culture; being individualistic, highly competitive and characterized by self-confidence (Achebe, 2012).

Table 3
Predictor variables of pain intensity and physical function: Standard multiple regression models.

Outcome variables	Predictor variables	B	Standard error	t	P	F	R^2
Pain intensity							
	Kinesiophobia	0.25*	0.08	3.08	0.001	9.69 ($p < 0.05$)	0.27
	Pain cat.	0.10*	0.03	3.57	0.001		
	Self-efficacy	0.07	0.14	0.52	0.61		
Physical function							
	Kinesiophobia	−1.97*	0.51	−3.86	0.001	11.79 ($p < 0.05$)	0.32
	Pain cat.	−0.23	0.19	−1.26	0.21		
	Self-efficacy	2.81*	0.92	3.07	0.001		

β = Contribution of each variable (Unstandardized coefficient for applied studies), R^2 = Quality of the fitness of the models; coefficient of determination, F = Joint significance of all the variables in the model, Pain cat. = Pain catastrophizing, p = Probability of error, * = Significant predictor variables at $p < 0.05$.

4.2. Predictive markers of pain intensity and physical function

To explore the relative contribution of each independent variable (selected psychosocial factors: kinesiophobia, pain catastrophizing, self-efficacy) as well as their predictive ability as a set, on each of the dependent variables (pain intensity and physical function) and to test their overall fitness to the data, the standard multiple regression analysis was used. Hence, there are two models; for predicting pain intensity and physical function. These models are weak though they predicted their desired outcome significantly. In the model for predicting pain intensity, the extent to which kinesiophobia, pain catastrophizing and self-efficacy could predict pain intensity (R^2) is 0.27 indicating that the model for pain intensity fits the data quite well (Pallant, 2011). In other words, the model explains 27 percent of the variance in pain intensity. More so, with the F-value for pain intensity being 9.69 and its p-value smaller than alpha (Spring, 2000), the model is, therefore, statistically significant.

From the same model, kinesophobia and pain catastrophizing were significant positive predictors of pain intensity; however, kinesiophobia was a stronger predictor ($\beta = 0.25$, $p = 0.00$) in explaining pain intensity, when the variance explained by all other variables in the model is controlled for. The Beta value for pain catastrophizing was slightly lower ($\beta = 0.10$, $p = 0.00$) than that of kinesiophobia, indicating that it made less of a unique contribution. This implies that kinesophobia, most importantly, and pain catastrophizing are significant factors to be considered in the management of patients with knee OA especially with pain control being borne in mind. Prediction of pain intensity by pain catastrophizing has been reported by some authors (Severeijns et al., 2001; Granot and Ferber, 2005; Beneciuk et al., 2010; Sommer et al., 2010; Parr et al., 2012; Moore et al., 2016). In addition to this, reduction in pain catastrophizing {through active physical treatment and/or cognitive-behavioural therapy (CBT) including both multi-disciplinary intervention and specific catastrophizing intervention such as "From Catastrophizing to Recovery" (FCR)} results to decrease in pain intensity (Jensen et al., 2001; Burns et al., 2003; Smeets et al., 2005; Darnall et al., 2014). However, Parr et al. (2012) reported that kinesiophobia predicts disability more than pain intensity.

With the exception of pain catastrophizing, kinesiophobia (negative predictor) and self-efficacy (positive predictor) were found to be significant predictors of physical function from the regression model for physical function with 0.32 total contributory level. This model explains 27 percent of the variance in physical function and it reaches statistical significance ($F = 11.79$, ($p < 0.05$). The R square value also, indicates that the quality of the fitness of the model appears fair; better than that of pain intensity (Pallant, 2011). Comparing the two models, it could be concluded that the selected psychosocial variables could significantly predict physical function ($R^2 = 0.32$) better than pain intensity ($R^2 = 0.27$), even though, there appear to be some other factors that could be used to predict each of the clinical variables which are beyond the scope of this study. There is a strong evidence that kinesiophobia and physical function are strongly and consistently associated in patients with knee OA (Helminen et al., 2015). Kinesiophobia affects physical activity and is, therefore, a determinant of disability in patients with musculoskeletal pain (Swinkels-Meewisse et al., 2003; Roelofs et al., 2004; Elfving et al., 2007). Impaired knee confidence has been identified with greater kinesiophobia and poorer physical function (Hart et al., 2015). In the same vein, self-efficacy has been found to be positively associated with physical function, hence it is a significant predictor of physical function (Li et al., 2001; Creamer et al., 2000; Benyon et al., 2010). The model, therefore, implies that a decrease in kinesiophobia and improvement in self-efficacy among patients with knee OA could have strong positive effects on their physical function. Functional exercise regimen decreases kinesiophobia which invariably enhances physical function (Monticone et al., 2013). It has been documented that a causal factor in phobia is self-belief, thus, self-efficacy judgements have been found to be the best predictors of therapeutic change.

Kinesophobia appears to be central to both models: a positive predictor of pain intensity and a negative predictor of physical function. The negative linear relationship between kinesiophobia and physical function observed in this study shows that kinesiophobia is a possible predictor of physical function in individuals with knee OA and vice versa. Furthermore, self-efficacy was found to be a significant positive predictor of physical function. Pain catastrophizing was found to have a significant negative but small correlation with physical function yet not significant enough in predicting physical function. Conclusively, these models have shown that all the selected psychosocial variables (kinesiophobia, pain catastrophizing and self-efficacy) appear to influence the selected clinical variables (pain intensity and physical function) in accordance with findings from the study conducted by Thumboo et al. (2002).

4.3. Study limitations

A major limitation was the absence of data on the use, dosage and the number of analgesics and anti-inflammatory drugs taken by the participants since these drugs might have interfered with the quality and intensity of pain felt by them. A replication study on equal-number of gender would be needful. More so, the causality of the associations could not be established in this study due to its cross-sectional design, as other potential risk factors for the selected psychosocial variables (heredity, family traditions, prior pain experience, socio-demographic factors, environment, literacy level, personal differences/individuals temperament and situational factors) at the time of recruitment for the study which could have contributed to the findings were not controlled for. Other potential psychosocial factors that could be predictive markers of the selected clinical factors were also not controlled for.

5. Conclusion

Kinesiophobia, pain catastrophizing and self-efficacy relate to pain intensity and physical function in Nigerians with knee OA. There is the existence of significant positive correlations between pain intensity and each of kinesiophobia and pain catastrophizing. On the other hand, while physical function has a significant positive correlation with self-efficacy, it has a significant negative correlation with kinesophobia. Kinesophobia and pain catastrophizing are significant predictors of pain intensity while kinesophobia, pain catastrophizing and self-efficacy are significant predictors of physical function among individuals with knee OA in Nigeria.

Recommendation

Further studies are needed to determine the contributory factors to a moderate correlation between kinesiophobia and physical function. Relationships between pain intensity and physical function and selected psychosocial factors in other Nigerian tribes (apart from Igbo) and specific interventions for each of these among Nigerians is recommended.

Ethical approval

University of Ibadan/University College Hospital Health Research Ethics Committee (UI/EC/15/0059).

Funding

The study was not funded.

Conflicts of interest

None declared.

Acknowledgement

The authors wish to thank the study participants, research assistants (physiotherapists), orthopaedic surgeons and nurses for their co-operation with the recruitment.

References

Achebe, C., 2012. There Was a Country, first ed. United States of America: Penguin press, Allen Lane, Great Britain.
Aghdam, A.R.M., Kolahi, S., Hasankhani, H., Behshid, M., Varmaziar, Z., 2013. The relationship between pain and physical function in adults with knee osteoarthritis. Int. Res. J. Appl. Basic Sci. 4 (5), 1102–1106.
Akinkpelu, A.O., Maduagwu, S.M., Odole, A.C., Alonge, T.O., 2011. Prevalence, pattern of knee osteoarthritis in a north eastern nigerian rural community. East Afr. Orthop. J. 8, 48–54 March.
Akinpelu, A.O., Alonge, O.O., Adekanla, B.A., Odole, A.C., 2007. Patterns of osteoarthritis seen in physiotherapy facilities in Ibadan, Lagos, Nigeria. Afr. J. Biomed. Res. 10, 111–115.
Allegrante, J., Marks, R., 2003. Self-efficacy in management of osteoarthritis. Rheum. Dis. Clin. N. Am. 29, 747–768.
American College of Rheumatology, 2012. Osteoarthritis. Retrieved April 21, 2014, from, http://www.rheumatology.org/practice/clinical/patients/diseases_,_conditions/osteoarthritis.asp.
Andrew, J.K., Steven, Z.G., Katrina, S.M., Jennifer, E.S.-L., 2013. Future directions in painful knee osteoarthritis: harnessing complexity in a heterogeneous population. Phys. Ther. 94, 422–432.
Anna, L., Mark, E., Elaine, D., Cyrus, C., 2013. Epidemiology, burden of osteoarthritis. Br. Med. Bull. 105, 185–199.
Backman, C.L., 2006. Arthritis, pain. Psychosocial aspects in the management of arthritis pain. Arthritis Res. Ther. 8, 221. https://doi.org/10.1186/ar2083.
Bandura, A., 1997. Self-efficacy: the Exercise of Control. WH Freeman, New York, NY.
Basbaum, A.I., Bautista, D.M., Scherrer, G., Julius, D., 2009. Cellular and molecular mechanisms of pain. Cell 139 (2), 267–284.
Beneciuk, J.M., Bishop, M.D., George, S.Z., 2010. Pain catastrophizing predicts pain intensity during a neurodynamic test for the median nerve in healthy participants. Man. Ther. 15 (4), 370–375 doi: 10/j.math.2010.02.008.
Benyon, K., Hill, S., Zadurian, N., Mallen, C., 2010. Coping strategies, self-efficacy as predictors of outcome in osteoarthritis: a systematic review. Muscoskel. Care 8, 224–236. https://doi.org/10.1002/msc.187.
Bija, M.D., Luma, H.N., Temfack, E., Gueleko, E.T., Kemta, F., Ngandeu, M., 2015. Patterns of knee osteoarthritis in a hospital in sub-Saharan Africa. Clin. Rheumatol. 34 (11), 1949–1953.
Burckhardt, C.S., Jones, K.D., 2003. Adult measures of pain: the McGill pain questionnaire (MPQ), rheumatoid arthritis pain scale (RAPS), short form McGill pain questionnaire (SF-MPQ), verbal descriptive scale (VDS), visual analog scale (VAS), west haven-yale multidisciplinary pain inventory (WHYMPI). Arthritis Rheumatol. 49, 96–104.
Burns, J.W., Kubilus, A., Bruehl, S., Harden, R.N., Lofland, K., 2003. Do changes in cognitive factors influence outcome following multidisciplinary treatment for chronic pain? A cross-lagged panel analysis. J. Consult. Clin. Psychol. 71 (1), 81.
Crawford, C. Dennis, Larry, E. Miller, John, E. Bloc, 2013. Conservative management of symptomatic knee osteoarthritis: a flawed strategy? Orthop. Rev. 5 (1).
Creamer, P., Lethbridge-Cejku, M., Hochberg, M.C., 2000. Factors associated with functional impairment in symptomatic knee osteoarthritis. Rheumatol. (Oxf.) 39 (5), 490–496.
Darnall, B.D., Sturgeon, J.A., Kao, M.C., Hah, J.M., Mackey, S.C., 2014. From catastrophizing to recovery: a pilot study of a single-session treatment for pain catastrophizing. J. Pain Res. 7, 219.
de Klerk, B.M., Schiphof, D., Groeneveld, F.P., Koes, B.W., van Osch, G.J.M., van Meurs, J.B., Bierma-Zeinstra, S.M., 2009. No clear association between female hormonal aspects and osteoarthritis of the hand, hip and knee: a systematic review. Rheumatology 48 (9), 1160–1165.
DeFrances, C.J., Podgornik, M.N., 2006. 2004 national hospital discharge survey. Adv. Data 371, 1–19.
Dekker, J., Dijk, G.M. van, Veenhof, C., 2009. Risk factors for functional decline in osteoarthritis of the hip or knee. Curr. Opin. Rheumatol. 21 (5), 520–524.
Domenech, J., Sanchis-Alfonso, V., Lopez, L., Espejo, B., 2014. Influence of kinesiophobia, catastrophizing on pain, disability in anterior knee pain patients. Knee Surg. Sports Traumatol. Arthrosc. 21, 1562–1568.
Elfving, B., Andersson, T., Grooten, W.J., 2007. Low levels of physical activity in back pain patients are associated with high levels of fear-avoidance beliefs and pain catastrophizing. Physiother. Res. Int. 12 (1), 14–24.
Ferraz, M.B., Quaresma, M.R., Aquino, L.R., Atra, E., Tugwell, P., Goldsmith, C.H., 1990. Reliability of pain scales in the assessment of literate, illiterate patients with rheumatoid arthritis. J. Rheumatol. 17, 1022–1024.
Granot, M., Ferber, S.G., 2005. The roles of pain catastrophizing and anxiety in the prediction of post-operative pain intensity: a prospective study. Clin. J. Pain 21 (5), 439–445.
Hadler, N.M., 1992. Knee pain is the malady—not osteoarthritis. Ann. Intern. Med. 116, 598–599.
Hart, H.F., Collins, N.J., Ackland, D.C., Crossley, K.M., 2015. Is impaired knee confidence related to worse kinesiophobia, symptoms and physical function in people with knee osteoarthritis after anterior cruciate ligament reconstruction? J. Sci. Med. Sport 18 (5), 512–517. https://doi.org/10.1016/j.sams.2014.09.011.
Helminen, E.-E., Sinikallio, S.H., Valjakka, A.L., Väisänen-Rouvali, R.H., Arokoski, J.P., 2013. Effectiveness of a cognitive-behavioural group intervention for knee osteoarthritis pain: protocol of a randomized controlled trial. BioMed. Central Musculoskelet. Disord. 14, 46. http://www.biomedcentral.com/1471-2474/14/46.
Helminen, E.E., Sinikallio, S.H., Valjakka, A.L., Väisänen-Rouvali, R.H., Arokoski, J.P., 2015. Effectiveness of a cognitive–behavioural group intervention for knee osteoarthritis pain: a randomized controlled trial. Clin. Rehabil. 29 (9), 868–881.
Houben, R.M.A., Leeuw, M., Vlaeyen, J.W.S., Goubert, L., Picavet, H.S.J., 2005. Fear of movement/injury in the general population: factor structure, psychometric properties of an adapted version of the Tampa Scale for Kinesiophobia. J. Behav. Med. 28 (5), 415–424.
Huang, Z., Chen, J., Ma, J., Shen, B., Pei, F., Kraus, V.B., 2015. Effectiveness of low-level laser therapy in patients with knee osteoarthritis: a systematic review and meta-analysis. Osteoarthritis Cartilage 23 (9), 1437–1444.
Huskisson, E.C., Wojtulewski, J.A., Berry, H., Scott, J., Hart, F.D., Balme, H.W., 1974. Treatment of rheumatoid arthritis with fenoprofen: comparison with aspirin. Br. Med. J. 1, 176–180.
Jensen, M.P., Karoly, P., 1992. Self-report scale, procedures for assessing pain in adults. In: Turk, D.C., Melzack, R. (Eds.), The Handbook of Pain Assessment. Guilford press, New York, NY, pp. 135–141.
Jensen, M.P., Karoly, P., Braver, S., 1986. The measurement of clinical pain intensity: a comparison of six methods. Pain 27, 117–126.
Jensen, M.P., Turner, J.A., Romano, J.M., 2001. Changes in beliefs, catastrophizing, and coping are associated with improvement in multi-disciplinary pain treatment. J. Consult. Clin. Psychol. 69 (4), 655–662.
Joern, W.-P.M., Klaus, U.S.-B., Peer, E., 2010. The epidemiology, etiology, diagnosis, and treatment of osteoarthritis of the knee. Deutsch Arztebl Int. 107 (9), 152–162 Mar.
Joyce, C.R., Zutshi, D.W., Hrubes, V.F., Mason, R.,M., 1975. Comparison of fixed interval, visual analogue scales for rating chronic pain. Eur. J. Clin. Pharmacol. 8, 415–420.
Leeuw, M., Goossens, M.E., Linton, S.J., Crombez, G., Boersma, K., Vlaeyen, J.W., 2007. The fear-avoidance model of musculoskeletal pain: current state of scientific evidence. J. Behav. Med. 30, 77–94.
Li, F., Harmed, P., McAuley, E., Fisher, K.J., Duncan, T.E., Duncan, Status, C., 2001. Taiwan Chi, self-efficacy and physical function in the elderly. Present. Sci. 2 (4), 229–239.
Linn, S., Murtaugh, B., Casey, E., 2012. Role of sex hormones in the development of osteoarthritis. Phys. Med. Rehabil. 4, 169–173. https://doi.org/10.1016/j.pmrj.2012.01.013.
Linton, S.J., Shaw, W.S., 2011. Impact of Psychological Factors in the Experience of Pain30 March 2011. Phys. Ther. 91 (5), 700–711. https://doi.org/10.2522/ptj.20100330.
Lorig, K., Chastain, R.L., Ung, E., Shoor, S., Holman, H.R., 1989. Development, evaluation of a scale to measure perceived self-efficacy in people with arthritis. Arthritis Rheum. 32, 37–44.
Mahajan, A., Vishal, T., Sourabh, V., Sudhaa, S., 2005. Osteoarthritis and menopause. J. Indian Rheumatol. Assoc. 13, 21–25.
Monticone, M., Ferrante, S., Salvaderi, S., Florentini, R., Restelli, M., Foti, C., 2013. Home-based functional exercises aimed at managing kinesiophobia contribute to improving disability and quality of life of patients undergoing total knee arthroplasty: a randomised controlled trial. Arch. Phys. Med. Rehabil. 94 (2), 231–239.
Moore, E., Thibault, P., Adams, H., Sullivan, M.J.L., 2016. Catastrophizing and pain-related fear predict failure to maintain treatment gains following participation in a pain rehabilitation program. Pain Rep. 1 (2), 567. https://doi.org/10.1097:/PR9.0000000000000567.
Odole, A.C., Odunaiya, N.A., Akinpelu, A.O., 2013. Ibadan knee/hip osteoarthritis outcome measure: process of development. Ann. Ib. Postgrad. Med. 11 (2), 71–76 Dec 2013.
Osman, A., Barrios, F.X., Gutierrez, P.M., Kopper, B.A., Merrifield, T., Grittmann, L., 2000. The pain catastrophizing scale: further psychometric evaluation with adult samples. J. Behav. Med. 23, 351–365.
Pallant, J., 2011. A Step by Step Guide to Data Analysis Using SPSS, fourth ed. Allen & Unwin, Australia.
Parr, J.A., Borsa, P.A., Fillingim, R.B., Tillman, M.D., Manini, T.D., Gregory, C.M., George, S.Z., 2012. Pain-related fear, and catastrophizing predict pain intensity and disability independently using an induced muscle injury model. J. Pain 13 (4), 370–378. https://doi.org/10.1016/j.jpain.2011.12.011.
Perry, E.V., Francis, A.J.P., 2013. Self-efficacy, pain-related fear, disability in a heterogeneous pain sample. Pain Manag. Nurs. 14. https://doi.org/10.1016/j.pmn.2011.09.001.
Reneman, M.F., Schiphorts Preuper, H.R., Kleen, M., Geertzen, J.H.B., Dijkstra, P.U., 2007. Are pain intensity and pain related fear related to functional capacity evaluation performances of patients with chronic low back pain? J. Occup. Rehabil. 17, 247–258. https://doi.org/10.1007/s10926-007-9078-z.
Riddle, D.L., Wade, J.B., Jiranek, W.A., Kong, X., 2010. Preoperative pain catastrophizing predicts pain outcome after knee arthroplasty. Clin. Orthop. Relat. Res. 468 (3), 798–806.
Roelofs, J., Goubert, L., Peters, M.L., Vlaeyen, J.W., Crombez, G., 2004. The Tampa scale for kinesiophobia: further examination of psychometric properties in patients with chronic low back pain and fibromyalgia. Eur. J. Pain 8 (5), 495–502.
Sánchez-Herán, Á., Agudo-Carmona, D., Ferrer-Peña, R., López-de-Uralde-Villanueva, I., Gil-Martínez, A., Paris-Alemany, A., La Touche, R., 2016. Postural stability in osteoarthritis of the knee and hip: analysis of association with pain catastrophizing and fear-avoidance beliefs. PM&R 8 (7), 618–628.
Sara, W., Danielle, E.S., Marsha, D., Patricia, A.S., 2014. Psychometric properties of the 8-

item English arthritis self-efficacy scale in a diverse sample. Arthritis 8.
Scopaz, K.A., Piva, S.R., Wisniewski, S., Fitzgerald, G., 2009. Relationships of fear, anxiety, and depression with physical function in patients with knee osteoarthritis. Arch. Phys. Med. Rehabil. 90 (11), 1866–1873.
Severeijns, R., Vlaeyen, J.W., van den Hout, M.A., Weber, W.E., 2001. Pain catastrophizing predicts pain intensity, disability and psychological distress independent of the level of physical impairment. 17 (2), 165–172.
Sharma, A., Kudesia, P., Shi, Q., Gandhi, R., 2016. Anxiety and depression in patients with osteoarthritis: impact and management challenges. Open Access Rheumatol. Res. Rev. 8, 103.
Shelby, R.A., Somers, T.J., Keefe, F.J., Pells, J.J., Dixon, K.E., Blumenthal, J.A., 2008. Domain specific self-efficacy mediates the impact of pain catastrophizing on pain, disability in overweight, obese osteoarthritis patients. J. Pain 9 (10), 912–919.
Shelby, R.A., Somers, T.J., Keefe, F.J., DeVellis, B.M., Patterson, C., Renner, J.B., Jordan, J.M., 2012. Brief fear of movement scale for osteoarthritis. Arthr. Care Res. (Hoboken) 64 (6), 862–871 June.
Shipton, E.A., 2013. The pain experience and sociocultural factors. N. Z. Med. J. 126, 1370.
Singh, J.A., Lewis, C.E., Wang, K., Felson, D.T., Nevitt, M.C., Torner, J., Bradley, L.A., 2011. Pain catastrophizing, but not widespread pain, is associated with poor pain outcomes after knee replacement: an analysis from the multicenter osteoarthritis study (MOST). Arthritis Rheum. 63 Retrieved from, http://www.embase.com/search/results?subaction=viewrecord&from=export&id=L70786318\nhttp://www.blackwellpublishing.com/acrmeeting/abstractindex.asp?l=B&MeetingID=781\nhttp://sfx.unimi.it:9003/unimi?sid=EMBASE&issn=00043591&id=doi:&atitle=Pain+catastrophiz.
Smeets, R.J.E.M., Vlaeyen, J.W.S., Kester, A.D.M., Knottnerus, J.A., 2005. Reduction of pain catastrophizing mediates the outcome of both physical and cognitive=behavioural treatment in chronic low back pain. J. Pain 7 (4), 261–271. https://doi.org/10.1016/j.jpain.2005.10.011.
Somers, T.J., Keefe, F.J., Godiwala, N., Hoyler, G.H., 2009a. Psychosocial factors, the pain experience of osteoarthritis patients: new findings, new directions. Curr. Opin. Rheumatol. 21, 501–506.
Somers, T.J., Keefe, F.J., Pells, J.J., Dixon, K.E., Waters, S.J., Riordan, P.A., Blumenthal, J.A., McKee, D.C., LaCaille, L., Tucker, J.M., Schmitt, D., Caldwell, D.S., Kraus, V.B., Sims, E.L., Shelby, R.A., Rice, J.R., 2009b. Pain catastrophizing, pain-related fear in osteoarthritis patients: relationships to pain, disability. J. Pain Symptom Manag. 37, 863–872.
Sommer, M., de Rijke, J.M., van Kleef, M., Kessels, A.G., Peters, M.L., Geutrs, J.W., Patjin, J., Gramke, H.F., Marcus, M.A., 2010. Predictors of acute post-operative pain after elective surgery. Clin. J. Pain 26 (2), 87–94. https://doi.org/10.1097/AJP.0b013e3181b43d68.
Srinkanth, V.K., Fryer, J.L., Zhai, G., Winzenberg, T.M., Hosmer, D., Jones, G., 2005. A meta-analysis of sex differences in prevalence, incidence, severity of osteoarthritis. Osteoarthritis Cartilage 13, 769–781.
Sullivan, L.M., 2012. In: Martside, G. (Ed.), Essentials of Biostatistics in Public health, second ed. Micheal Brown.Jones and Barlett learning, LLC, USA, 978-1-4496-2394-4, pp. 170–187.
Sullivan, M.J.L., Bishop, S.R., Pivik, J., 1995. The pain catastrophizing scale: development, validation. Psychol. Assess. 7 (4), 524–532.
Sullivan, M., Tanzer, M., Stanish, W., Fallaha, M., Keefe, F.J., Simmonds, M., Dunbar, M., 2009. Psychological determinants of problematic outcomes following total knee arthroplasty. Pain 143, 123–129. https://doi.org/10.1016/j.pain.2009.02.011.
Swinkels-Meewisse, I.E., Roelofs, J., Verbeek, A.L., Oostendorp, R.A., Vlaeyen, J.W., 2003. Fear of movement/(re)injury, disability and participation in acute low back pain. Pain 105 (1–2), 371–379.
Thumboo, J., Chew, L.-H., Lewin-Koh, S.-C., 2002. Socioeconomic, psychosocial factors influence pain or physical function in Asian patients with knee or hip osteoarthritis. Ann. Rheum. Dis. 61, 1017–1020.
Tichonova, A., Rimdeikienė, I., Petruševičienė, D., Lendraitienė, E., 2016. The relationship between pain catastrophizing, kinesiophobia and subjective knee function during rehabilitation following anterior cruciate ligament reconstruction and meniscectomy: a pilot study. Medicine 52 (4), 229–237.
van Damme, S., Crombez, G., Bijttebier, P., Goubert, L., van Houdenhove, B., 2002. A confirmatory factor analysis of the Pain Catastrophizing Scale: invariant factor structure across clinical, non-clinical populations. Pain 96, 319–324.
Vlaeyen, J.W.S., Linton, S.J., 2000. Fear-avoidance, its consequences in chronic musculoskeletal pain: a state of the art. Pain 85 (3), 317–332 April.
Vlaeyen, J.W.S., Linton, S.J., 2002. Pain-related fear, its consequences in chronic musculoskeletal pain. In: Linton, S.J. (Ed.), New Avenues for the Prevention of Chronic Musculoskeletal Pain, Disability. Elsevier Science, Amsterdam, the Netherlands, pp. 81–103.
Woolf, C.J., 2011. Central sensitization: implications for the diagnosis and treatment of pain. Pain 152 (3), S2–S15.
Zhang, W., Doherty, M., Peat, G., 2010. EULAR evidence-based recommendations for the diagnosis of knee osteoarthritis. Ann. Rheum. Dis. 69, 483–489.