# Relationship of anxiety with joint pain and its management: A population survey

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**Running title**
Anxiety and the management of joint pain


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## Abstract

## Objectives

To examine the associations between severity of pain and anxiety in a community population reporting joint pain, and investigate management of joint pain in the presence of co-morbid anxiety.

## Methods

A population survey of people aged ≥45 years registered with eight general practices in Cheshire, Shropshire, and Staffordshire, UK. Respondents were asked to report pain intensity in their hands, hips, knees and feet (numeric rating scale), anxiety symptoms (GAD-7 scale), and guideline-recommended treatments used to manage pain. Clinical anxiety was defined by a GAD-7 score of 10 or more.

## Results

11,222 respondents with joint pain were included in this analysis. 1,802 (16.1%) reported clinical anxiety. Respondents reporting more severe pain were more likely to report clinical anxiety (severe *vs*. mild pain odds ratio [OR] 5.36, 95% confidence interval [CI] 4.56,6.31). Number of pain sites was also positively associated with clinical anxiety (four *vs.* one site OR 3.64, 95%CI 3.09,4.30). Those with clinical anxiety were less likely to undertake general fitness exercises (OR 0.60, 95%CI 0.52,0.70), but more likely to diet (OR 1.43, 95% CI 1.21,1.69), use walking aids (OR 1.53, 95%CI 1.32,1.77) and assistive devices (OR 1.24, 95%CI 1.04,1.49), and more likely to use opioids (OR 1.34, 95%CI 1.18,1.52).

## Conclusion

Anxiety is common amongst patients presenting to primary care with joint pain. Patients with anxiety are likely to manage their joint pain differently to those without. Case-finding to identify and treat anxiety would be appropriate in this population, with caution about opioid prescribing and consideration of exercise as an intervention.

## Keywords

Analgesia, anxiety, joint pain, osteoarthritis, primary health care, questionnaire survey

## Background

Joint pain due to osteoarthritis (OA) is a common presenting complaint in primary care. In North Staffordshire, United Kingdom, one in seven primary care consultations is estimated to be for a musculoskeletal problem (Jordan et al., 2010) and 10% of the population aged ≥45 years is recorded annually as having a consultation with OA or joint pain (Jordan et al., 2014). The National Institute for Health and Care Excellence (NICE) guidance states that OA can be diagnosed clinically, without further investigations, in people over 45 years old who have activity-related joint pain, no more than thirty minutes of morning stiffness, and no atypical features suggesting an alternative diagnosis (National Institute for Health & Care Excellence, 2014). NICE recommends that patients with OA should have an agreed self-management strategy, with core management including access to appropriate information, physical activity and exercise, and support for weight loss if needed (body mass index (BMI) ≥25 $kgm^{-2}$) (National Institute for Health & Care Excellence, 2014). However, pharmacological treatments that are recommended as an adjunct to core treatments often precede or replace these in management of joint pain (Jinks et al., 2011; Porcheret, Jordan, Jinks, Croft, & Primary Care Rheumatology, 2007). Exercise as a treatment for OA is well-known (Fransen et al., 2015) and has also been found to be effective in anxiety disorders, albeit less so than antidepressants (Jayakody, Gunadasa, & Hosker, 2014).

Chronic pain, such as joint pain, is often associated with co-morbid anxiety disorders (Axford et al., 2010; McWilliams, Cox, & Enns, 2003; McWilliams, Goodwin, & Cox, 2004; Scott et al., 2007). Anxiety disorders are associated with increased frequency of consultation in primary care (Bélanger, Ladouceur, & Morin, 2005), but people often present with pain and seldom with psychological symptoms (Garcia-Campayo, Caballero, Perez, & Lopez, 2012; Wittchen et al., 2002). Recognition of anxiety disorders in primary care has been identified to be suboptimal (Wittchen et al., 2002), and the receipt of a physical diagnosis reduces the likelihood of being diagnosed with anxiety (Ballenger et al., 2001). Many patients suffer clinically significant symptoms without meeting the diagnostic criteria for an anxiety disorder (Beesdo et al., 2009; Haller, Cramer, Lauche, Gass, & Dobos, 2014), and general practitioners (GPs) may be more confident to recognise anxiety symptoms than to make specific anxiety diagnoses (Walters, Rait, Griffin, Buszewicz, & Nazareth, 2012). Anxiety can be diagnosed formally by a structured clinical assessment, such as the Composite International Diagnostic Interview (World Health Organization, 1990), but screening tools have also been used in research to identify what may be termed 'clinical anxiety'. The GAD-7 scale quantifies anxiety symptoms (Spitzer, Kroenke, Williams, & Lowe, 2006) and can be used to screen for generalised anxiety disorder, panic disorder, social anxiety disorder and post-traumatic stress disorder in primary care (Kroenke, Spitzer, Williams, Monahan, & Lowe, 2007) and the general population (Lowe et al., 2008). Although it cannot be used to assign specific anxiety disorder diagnoses, a threshold score of 10 or more may be used to classify people as having 'clinical anxiety' (Bair, Wu, Damush, Sutherland, & Kroenke, 2008) with a sensitivity of 89% and specificity of 82% for generalised anxiety disorder (Kroenke et al., 2007). It is quick to administer (Williams, 2014) and has previously been used to determine the presence of anxiety in people with joint pain (Bair et al., 2008).

There is evidence that anxiety and depression comorbidity is associated with worse pain amongst primary care patients with chronic musculoskeletal pain (Bair et al., 2008; de Heer et al., 2014). A meta-analysis of the prevalence of depression and anxiety in people with OA suggested that over 20% of OA patients have anxiety, with a relative risk estimated at 1.35 amongst people with OA compared to those without, though this did not achieve statistical significance (Stubbs, Hurley, & Smith, 2015). Factors within clinical OA associated with an increased risk of clinical anxiety require further exploration. Any associations between different primary care management processes of care and clinical anxiety are also unknown. The objectives of this analysis were (i) to examine the relationship between pain (severity, location, and number of sites affected) and clinical anxiety in a community population reporting joint pain, and (ii) to investigate the management of joint pain (self-reported processes of care) in the presence of co-morbid clinical anxiety.

## Method

The Management of Osteoarthritis in Consultations Study (MOSAICS) was a programme of research to develop a model primary care consultation for OA, and test its feasibility and acceptability in primary care. A cross-sectional population survey formed a key component of this programme. The full description of the methods, outcome measures, and analysis plan have been reported in the protocol (Dziedzic et al., 2014). In brief, participants were recruited from eight general practices in the North West Midlands and Cheshire. Between May 2011 and February 2012, patients registered with the participating practices who were aged ≥45 years, did not have a diagnosis of inflammatory arthritis or serious co-morbidity, and did not have an inability to attend the surgery or consent to the research, were sent an invitation to complete the MOSAICS population survey.

Respondents were asked to report the intensity of pain in their hands, hips, knees and feet during the previous month on a numeric rating scale from 0 to 10. As supported by the patient and public involvement group for quantifying multi-site pain, a 'worst pain' score was calculated as the greatest value given for any joint (Finney, Dziedzic, M. Lewis, S. Ryan, & Healey, 2015). Pain scores were classified as none (0), mild (1 to 3), moderate (4 to 6), and severe (7 to 10) pain, as described in previous studies of musculoskeletal pain (Salaffi, Ciapetti, & Carotti, 2012) and in primary care (Krebs, Carey, & Weinberger, 2007).

Anxiety symptoms were assessed using the GAD-7 scale. This score is calculated from the frequency of seven anxiety symptoms in the previous two weeks and gives a result from 0 to 21, where higher scores indicate worse anxiety (Spitzer et al., 2006). Where one item was missing, we used the mean of the other six responses for the missing value; if more than one item was missing, no total GAD-7 score was calculated (Kroenke et al., 2007).

Management of joint pain was assessed using the Knee Pain Screening Tool (KNEST) (Jinks, Jordan, Ong, & Croft, 2004) expanded for use in the hands, hips, knees and feet, and included treatments listed in national guidelines for OA management (Box 1) (Conaghan, Dickson, Grant, & Guideline Development, 2008). For each treatment, respondents were asked to state whether they had used it in the previous twelve months, and whether it had been obtained from the National Health Service (NHS), another source, or both.

**Box 1. Treatments for pain included in the modified Knee Pain Screening Tool.**

| |
|---|
| **Consultations** |
| General practitioner |
| Practice nurse |
| Physiotherapy |
| Occupational therapy |
| Podiatry or chiropody |
| Hospital specialist |
| Osteopath or chiropractor |
| Community pharmacy |
| |
| **Core treatments** |
| Muscle-strengthening exercises |
| General fitness exercises |
| Dieting to lose weight |
| Written information about treatments |
| Written information about self-management |
| Written information about osteoarthritis |

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**Relatively safe pharmaceutical options**
Paracetamol
Anti-inflammatory creams or gels

**Adjunctive treatments**
Drugs on prescription
Joint operation
Joint injection
Capsaicin cream
Anti-inflammatory tablets
Stronger painkillers (e.g. opioids)
Transcutaneous electrical nerve stimulation
Warmth, heat or cold
Walking aids (e.g. walking sticks)
Shock-absorbing shoes or insoles
Appliances and supports (e.g. knee brace)
Assistive devices (e.g. kitchen gadgets)

**Treatments that are not recommended**
Acupuncture
Glucosamine or chondroitin sulphate

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The Index of Multiple Deprivation 2010 (IMD) was derived for each respondent from their post code. This ranks neighbourhood deprivation through seven domains: income; employment; health and disability; education, skills and training; housing and services; crime and disorder; and living environment (HM Government Department for Communities and Local Government, 2011). Information about other potential confounding factors were included as questions in the survey (Dziedzic et al., 2014).

## Analysis

This analysis included all respondents who completed sufficient items for a total GAD-7 score to be calculated, and reported a worst pain score of at least 1, indicating that they had at least some joint pain. Respondents were dichotomised to the presence of clinical anxiety at or above a GAD-7 threshold score of 10 (Bair et al., 2008).

The association of anxiety with joint pain intensity, with location of pain, and with number of pain sites were determined first unadjusted, and then adjusted for potential confounding variables (age, sex, marital status, living alone, employment status, IMD, BMI and registered general practice) using binary logistic regression and presented as odds ratios (OR) with 95% confidence intervals (CI). The association of self-reported use of each treatment for joint pain with clinical anxiety was also determined using binary logistic regression analysis, adjusting for worst pain intensity, number of joints with a pain score of at least one, age, sex, marital status, living alone, employment status, IMD, BMI and general practice. Dieting to lose weight was analysed separately for all respondents and for those with a BMI of 25 kgm$^{-2}$ or greater. Analysis was repeated, stratified by source of treatment (NHS *vs.* non-NHS).

## Results

The survey was mailed to 28,443 people, and 15,083 were returned completed (response rate 53.0%). 11,534 (76.5%) respondents reported pain in at least one joint in the previous month. Of these, 11,222 (97.3%) completed sufficient items for a GAD-7 to be calculated. These 11,222 formed

the study population for this analysis (Table 1).

**Table 1. Demographic characteristics of respondents**

| | Respondents n (%) |
|---|---|
| **All respondents** | 11222 |
| **Sex** | |
| Women | 6258 (55.8%) |
| Men | 4964 (44.2%) |
| **Age** | |
| 45-64 | 6023 (53.7%) |
| 65-74 | 3072 (27.4%) |
| 75-84 | 1717 (15.3%) |
| 85+ | 410 (3.7%) |
| **Lives Alone** | |
| No | 8723 (77.7%) |
| Yes | 2237 (19.9%) |
| Missing | 262 (2.3%) |
| **Marital status** | |
| Single | 534 (4.8%) |
| Married or cohabiting | 8205 (73.1%) |
| Separated or divorced | 1026 (9.1%) |
| Widowed | 1395 (12.4%) |
| Missing | 62 (0.6%) |
| **Employment** | |
| Employed | 3776 (33.7%) |
| Unemployed and other[†] | 1533 (13.7%) |
| Retired | 5675 (50.6%) |
| Missing | 238 (2.1%) |
| **Body mass index** | |
| Underweight (<18.5 kg/m$^2$) | 100 (0.9%) |
| Normal range (18.5–25 kg/m$^2$) | 3705 (33.0%) |
| Pre-obese (25–30 kg/m$^2$) | 4372 (39.0%) |
| Obese (≥30 kg/m$^2$) | 2640 (23.5%) |
| Missing | 405 (3.6%) |
| **Index of Multiple Deprivation:** | |
| Most deprived | 2348 (20.9%) |
| 2 | 2149 (19.2%) |
| 3 | 2289 (20.4%) |
| 4 | 2242 (20.0%) |
| Least deprived | 2189 (19.5%) |
| Missing | 5 (<0.1%) |

[†] Includes 'Not working due to ill health', 'Unemployed/seeking work', 'Housewife' and 'Other'

The knee was the most common site of reported joint pain (7,736 respondents [68.9%] reporting at least mild pain). The median GAD-7 score was 3 (inter-quartile range [IQR] 0–7). 3,588 (32.0%) respondents had a GAD-7 score of 0. 1,802 (16.1%) respondents reported a score of 10 or more, and so were classified as having clinical anxiety. Increasing pain intensity was associated with an increased prevalence of clinical anxiety (adjusted OR for severe *vs.* mild worst pain 5.36, 95% CI 4.56,6.31), as was a greater number of joint sites affected by at least mild pain (adjusted OR for four sites *vs.* one site 3.64, 95% CI 3.09,4.30; Table 2).

Compared to the knee, clinical anxiety was more frequent in people with pain at the foot (adjusted OR 1.35, 95% CI 1.14,1.61) or in multiple sites (adjusted OR 1.39, 95% CI 1.19,1.63).

**Table 2**. **Association of severity of joint pain, location and number of painful joints with clinical anxiety.**

| n = 11222 | All respondents; n (column %) | Respondents with clinical anxiety[†]; n (row %) | Odds ratio (95% CI) of having clinical anxiety[†] | |
|---|---|---|---|---|
| | | | Unadjusted | Adjusted[‡] |
| **Worst pain** | | | | |
| Mild | 3925 (35.0%) | 238 (6.1%) | 1[§] | 1[§] |
| Moderate | 3767 (33.6%) | 511 (13.6%) | 2.43 (2.07–2.86) | 2.20 (1.86–2.61) |
| Severe | 3530 (31.5%) | 1053 (29.8%) | 6.59 (5.67–7.65) | 5.36 (4.56–6.31) |
| **Hand pain** | | | | |
| None | 4275 (38.1%) | 460 (10.8%) | 1[§] | 1[§] |
| Mild | 2975 (26.5%) | 309 (10.4%) | 0.96 (0.83–1.12) | 0.88 (0.75–1.04) |
| Moderate | 2078 (18.5%) | 480 (23.1%) | 2.49 (2.16–2.87) | 2.11 (1.81–2.46) |
| Severe | 1213 (10.8%) | 451 (37.2%) | 4.91 (4.22–5.71) | 3.72 (3.15–4.40) |
| Missing | 681 (6.1%) | 102 (15.0%) | - | - |
| **Hip pain** | | | | |
| None | 4905 (43.7%) | 532 (10.8%) | 1[§] | 1[§] |
| Mild | 2419 (21.6%) | 258 (10.7%) | 0.98 (0.84–1.15) | 0.98 (0.83–1.16) |
| Moderate | 1955 (17.4%) | 437 (22.4%) | 2.37 (2.06–2.72) | 2.07 (1.78–2.41) |
| Severe | 1264 (11.3%) | 443 (35.0%) | 4.44 (3.83–5.13) | 3.48 (2.95–4.09) |
| Missing | 679 (6.1%) | 132 (19.4%) | - | - |
| **Knee pain** | | | | |
| None | 2979 (26.6%) | 340 (11.4%) | 1[§] | 1[§] |
| Mild | 3354 (29.9%) | 318 (9.5%) | 0.81 (0.69–0.96) | 0.80 (0.67–0.95) |
| Moderate | 2626 (23.4%) | 452 (17.2%) | 1.61 (1.39–1.88) | 1.42 (1.20–1.67) |
| Severe | 1756 (15.7%) | 613 (34.9%) | 4.16 (3.58–4.83) | 3.45 (2.92–4.07) |
| Missing | 507 (4.5%) | 79 (15.6%) | - | - |
| **Foot pain** | | | | |
| None | 4791 (42.7%) | 477 (10.0%) | 1[§] | 1[§] |
| Mild | 2317 (20.7%) | 269 (11.6%) | 1.19 (1.01–1.39) | 1.11 (0.94–1.32) |
| Moderate | 1979 (17.6%) | 423 (21.4%) | 2.46 (2.13–2.84) | 2.10 (1.80–2.45) |
| Severe | 1505 (13.4%) | 530 (35.2%) | 4.92 (4.27–5.67) | 3.93 (3.36–4.60) |
| Missing | 630 (5.6%) | 103 (16.3%) | - | - |
| **Number of joint sites with at least mild pain** | | | | |
| 1 | 3456 (30.8%) | 305 (8.8%) | 1[§] | 1[§] |
| 2 | 3295 (29.4%) | 434 (13.2%) | 1.57 (1.34–1.83) | 1.45 (1.23–1.72) |
| 3 | 2489 (22.2%) | 442 (17.8%) | 2.33 (1.91–2.61) | 1.93 (1.63–2.29) |
| 4 | 1982 (17.7%) | 621 (31.3%) | 4.71 (4.05–5.48) | 3.64 (3.09–4.30) |
| **Number of joint sites with at least moderate pain** | | | | |
| 0 | 3925 (35.0%) | 238 (6.1%) | 1[§] | 1[§] |
| 1 | 3133 (27.9%) | 405 (12.9%) | 2.30 (1.95–2.72) | 2.14 (1.79–2.56) |
| 2 | 2103 (18.7%) | 420 (20.0%) | 3.87 (3.26–4.58) | 3.36 (2.80–4.03) |
| 3 | 1207 (10.8%) | 372 (30.8%) | 6.90 (5.77–8.26) | 5.75 (4.73–7.00) |
| 4 | 854 (7.6%) | 367 (43.0%) | 11.67 (9.67–14.10) | 8.74 (7.09–10.79) |
| **Number of joint sites with severe pain** | | | | |
| 0 | 7692 (68.5%) | 749 (9.7%) | 1[§] | 1[§] |
| 1 | 2104 (18.8%) | 477 (22.7%) | 2.72 (2.39–3.09) | 2.44 (2.12–2.80) |
| 2 | 865 (7.7%) | 302 (34.9%) | 4.97 (4.24–5.83) | 4.34 (3.64–5.17) |
| 3 | 340 (3.0%) | 140 (41.2%) | 6.49 (5.16–8.16) | 4.71 (3.64–6.10) |
| 4 | 221 (2.0%) | 134 (60.6%) | 14.28 (10.79–18.89) | 10.99 (8.01–15.07) |
| **Sites** | | | | |
| Knee | 2968 (26.5%) | 394 (13.3%) | 1 | 1 |
| Hip | 1773 (15.8%) | 261 (14.5%) | 1.13 (0.95-1.34) | 1.06 (0.88-1.28) |
| Hand | 1807 (16.1%) | 284 (15.8%) | 1.22 (1.03-1.44) | 1.20 (1.00-1.43) |
| Foot | 1926 (17.2%) | 329 (17.1%) | 1.35 (1.15-1.58) | 1.35 (1.14-1.61) |
| Multiple | 2748 (24.5%) | 534 (19.4%) | 1.58 (1.37- 1.82) | 1.39 (1.19-1.63) |

[†] Clinical anxiety defined as GAD-7 score ≥10

[‡] Adjusted for age, sex, marital status, living alone, employment status, body mass index, index of multiple deprivation 2010, and general practice

[§] Reference category

CI=confidence interval

4,449 (39.6%) respondents reported visiting their GP with a joint problem in the year before completing the questionnaire (Table 3). Of these, 1,006 (22.6%) reported clinical anxiety. Respondents with anxiety were significantly more likely to report using each consultation option listed in the KNEST instrument except physiotherapy, podiatry, and osteopathy (Table 3). There was no statistically significant difference between respondents with and without clinical anxiety in reported use of NHS or private physiotherapy services.

**Table 3. Association of type of consultation for joint pain with clinical anxiety**

|  | Frequency of use | | |
| --- | --- | --- | --- |
| *Consultations* | *Respondents with clinical anxiety[†]* *n (%)* | *Respondents without clinical anxiety[†]* *n (%)* | *Odds ratio (95% CI)[‡] of use with clinical anxiety[†]* |
| General practitioner[§] | 1006 (22.6%) | 3443 (77.4%) | 1.13 (1.00–1.28) |
| Practice nurse[§] | 277 (33.4%) | 553 (66.6%) | 1.58 (1.31–1.91) |
| Physiotherapy | 390 (20.3%) | 1533 (79.7%) | 1.07 (0.92–1.23) |
| Occupational therapy | 90 (31.8%) | 193 (68.2%) | 1.52 (1.13–2.06) |
| Podiatry or chiropody | 305 (21.8%) | 1093 (78.2%) | 1.13 (0.96–1.33) |
| Hospital specialist | 452 (24.4%) | 1404 (75.6%) | 1.22 (1.06–1.41) |
| Osteopath or chiropractor | 108 (15.5%) | 591 (84.5%) | 0.83 (0.65–1.06) |
| Community pharmacy | 237 (25.9%) | 677 (74.1%) | 1.44 (1.20–1.72) |

[†] Clinical anxiety defined as GAD-7 score ≥10
[‡] Compared to use by respondents without clinical anxiety, adjusted for worst pain score, number of joint-pain sites, age, sex, marital status, living alone, employment status, body mass index, index of multiple deprivation 2010, and general practice
[§] Not all respondents completed this question so denominator <11 222
CI=confidence interval

The most frequently reported treatments were paracetamol and topical anti-inflammatories. Participants with clinical anxiety were significantly more likely to report using walking aids or strong painkillers such as opioids, and less likely to do general fitness exercises or muscle-strengthening exercises (Table 4). Few respondents reported dieting to lose weight, but this was reported by a greater proportion of those with clinical anxiety than without. This pattern was true for all respondents and for those with a raised BMI. Rates of reporting receipt of written information were low and similar for those with and without clinical anxiety.

**Table 4. Treatments used by respondents who reported joint pain, with and without anxiety.**

| Treatment | Respondents with clinical anxiety[†] n (%) | Respondents without clinical anxiety[†] n (%) | Odds ratio (95% CI) [‡] of use in respondents with clinical anxiety[†] |
|---|---|---|---|
| **Core treatments** | | | |
| Muscle-strengthening exercises | 362 (20.1%) | 1793 (19.0%) | 0.84 (0.72–0.97) |
| General fitness exercises | 287 (15.9%) | 2316 (24.6%) | 0.60 (0.52–0.70) |
| Dieting to lose weight | 301 (16.7%) | 759 (8.1%) | 1.43 (1.21–1.69) |
| Respondents with BMI≥25 kg/m$^2$ | 248 (20.9%) | 562 (9.7%) | 1.51 (1.25–1.82) |
| Written information about: | | | |
| Treatments | 147 (8.2%) | 573 (6.1%) | 0.95 (0.76–1.18) |
| Self-management | 266 (14.8%) | 963 (10.2%) | 0.97 (0.82–1.15) |
| Osteoarthritis | 208 (11.5%) | 578 (6.1%) | 1.18 (0.97–1.43) |
| **Relatively safe pharmaceutical options** | | | |
| Paracetamol | 1130 (62.7%) | 4767 (50.6%) | 1.14 (1.01–1.28) |
| Anti-inflammatory creams or gels | 889 (49.3%) | 3735 (39.6%) | 1.06 (0.94–1.19) |
| **Adjunctive treatments** | | | |
| Drugs on prescription | 982 (54.5%) | 3192 (33.9%) | 1.27 (1.12–1.44) |
| Joint operation | 128 (7.1%) | 437 (4.6%) | 1.02 (0.81–1.30) |
| Joint injection | 178 (9.9%) | 486 (5.2%) | 1.19 (0.97–1.47) |
| Capsaicin cream | 50 (2.8%) | 90 (1.0%) | 1.35 (0.89–2.07) |
| Anti-inflammatory tablets | 703 (39.0%) | 3704 (39.3%) | 0.79 (0.70–0.90) |
| Stronger painkillers (e.g. opioids) | 796 (44.2%) | 2167 (23.0%) | 1.34 (1.18–1.52) |
| TENS | 168 (9.3%) | 492 (5.2%) | 0.96 (0.78–1.20) |
| Warmth, heat or cold | 700 (38.8%) | 2621 (27.8%) | 1.04 (0.92–1.18) |
| Walking aids | 625 (34.7%) | 1457 (15.5%) | 1.53 (1.32–1.77) |
| Shock-absorbing shoes or insoles | 338 (18.8%) | 1314 (13.9%) | 1.03 (0.88–1.20) |
| Appliances and supports | 322 (17.9%) | 1190 (12.6%) | 0.98 (0.83–1.14) |
| Assistive devices | 320 (17.8%) | 699 (7.4%) | 1.24 (1.04–1.49) |
| **Treatments that are not recommended** | | | |
| Acupuncture | 85 (4.7%) | 267 (2.8%) | 1.19 (0.90-1.59) |
| Glucosamine or chondroitin sulphate | 298 (16.5%) | 2002 (21.3%) | 0.66 (0.56–0.77) |

[†] Clinical anxiety defined as GAD-7 score ≥10

[‡] Compared to use by respondents without clinical anxiety, adjusted for worst pain score, number of joint-pain sites, age, sex, marital status, living alone, employment status, body mass index, index of multiple deprivation 2010, and general practice

CI=confidence interval; TENS=Transcutaneous electrical nerve stimulation

Reported used of paracetamol was significantly different between those with and without clinical anxiety (OR 1.14; 95% CI 1.01, 1.28), and those with clinical anxiety were more likely than those without anxiety to have it prescribed as an NHS treatment (558 [31.0%] *vs.* 1,438 [15.3%], adjusted OR 1.43, 95% CI 1.24–1.65) and less likely to obtain it independently (643 [35.7%] *vs.* 3,591 [38.1%], adjusted OR 0.88, 95% CI 0.78–0.99). Despite not being recommended in NICE guidance, glucosamine or chondroitin sulphate were used by one in five respondents, but usage was less common in those with clinical anxiety.

## Discussion

From a community sample of 11,222 people reporting joint pain, we have shown a significant association between joint pain intensity and anxiety severity, which is consistent with previous literature (Bair et al., 2008; de Heer et al., 2014). Whatever level of pain was reported, anxiety was more common with increasing number of pain sites affected. The association of the hand and foot sites with clinical anxiety is a new finding. This may partly reflect the nature of foot OA as a relatively

"neglected" site in terms of evidence for effective treatments (Conaghan, Kloppenburg, Schett, Bijlsma, & committee, 2014). Respondents with clinical anxiety were less likely to report the use of core non-pharmacological joint-pain treatments of muscle-strengthening exercises and general fitness exercises, and less likely to use oral anti-inflammatory medications, but were more likely to use paracetamol and opioids.

At over 16% (*n*=1802), the prevalence of clinical anxiety amongst patients reporting joint pain in this study is similar to the total proportion (16.2%) of people meeting the diagnostic criteria for a common mental disorder in a household survey in 2007 (McManus, Meltzer, Brugha, Bebbington, & Jenkins, 2009); it is greater than the proportion of people identified by the same survey as having mixed anxiety & depression (9.0%) or generalised anxiety disorder (4.4%). It is a little lower than the pooled prevalence of anxiety symptoms in people with OA (21.3%) identified by Stubbs et al. (Stubbs, Aluko, Myint, & Smith, 2016).

The impact of OA on patients' lives is complex and multi-factorial (Creamer, Lethbridge-Cejku, & Hochberg, 2000). Anxiety and pain can perpetuate each other (Gerrits et al., 2012; Teh et al., 2009) and acute anxiety is associated with increased perception of pain (Goffaux et al., 2011; Saracoglu, Unsal, Taskin, Sevincok, & Karaman, 2012). Appropriate management of both anxiety and pain may be required to achieve satisfactory outcomes. Regular physical activity can improve symptoms of joint pain and is associated with a lower prevalence of generalised anxiety disorder (Muhsen, Lipsitz, Garty-Sandalon, Gross, & Green, 2008). However, people with anxiety regarding their pain are known to restrict their activities (Nicolson, Caplan, Williams, & Stern, 2009). A causal relationship between anxiety and pain cannot be inferred from our results, and the association could reflect a combination of both more anxiety amongst those with less regular exercise, and more limited activities in those with more pain.

Opioids may be perceived to be useful by people with anxiety due to their anxiolytic properties (Colasanti, Rabiner, Lingford-Hughes, & Nutt, 2011) but this effect seems to be transient (Howe & Sullivan, 2014). Opioid use has been associated with worse outcomes within an intervention for anxiety (Roy-Byrne et al., 2013). Although self-reported use of opioids in this survey was greater in people identified as having clinical anxiety, we cannot draw firm conclusions about differences in requests for opioid treatment, any associated impact on anxiety severity, or whether the association reflected a difference in management recommended or prescribed by the GP.

NICE guidance on the management of OA emphasises the importance of a self-management strategy (National Institute for Health & Care Excellence, 2014). A randomised controlled trial found that a self-management educational programme for OA in primary care reduced anxiety symptoms, even though that trial did not show a significant effect on pain (Buszewicz et al., 2006). Our results suggest that people with clinical anxiety might be less likely to obtain treatments independently and more likely to use NHS-prescribed treatment. Higher levels of anxiety are also associated with lower income levels (Lejtzén, Sundquist, Sundquist, & Li, 2014). We might expect people with lower income to be less able to pay for private provision, and they are more likely to receive NHS-prescribed medications free of charge (NHS Choices, 2013), which might influence their help-seeking.

There is some evidence that a collaborative care approach including brief, low-intensity psychological therapy in primary care can reduce the severity of depression and anxiety, as well as improve self-management of chronic conditions (diabetes and cardiovascular disease) (Coventry et al., 2015). With suitable case-finding for anxiety symptoms in people with joint pain, provision of or referral for such intervention could usefully be considered, such as that being tested in the ENHANCE study (Healey et al., 2015).

This was a pragmatic study, including a large number of people living in the community with symptoms of joint pain and anxiety. It is the first study to investigate comprehensive management options recommended by national guidance for OA pain in the presence of anxiety. Our questionnaire data were not intended to assign specific OA or anxiety disorder diagnoses. Instead we focussed on the symptoms with which patients are likely to present to their GPs and grouped people into clinical OA or anxiety on the basis of reported symptoms. The majority of this survey population would be expected to meet the NICE criteria for a clinical diagnosis of OA. This survey was not designed to determine the odds of clinical anxiety in people with joint pain relative to the population generally.

The design of a cross-sectional paper-based survey allowed a large number of people from a primary-care population to participate. The response rate of 53% is typical for a population-based postal survey (Hill, Roberts, Ewings, & Gunnell, 1997), although less than previous surveys of patients registered with GPs in this area (Marshall et al., 2013). When response rates are low, respondents may not necessarily be representative of the wider community (Hill et al., 1997), although a systematic review found no effect of response rate on recorded prevalence of anxiety disorders (Baxter, Scott, Vos, & Whiteford, 2013). We consider the results of this survey to be generalizable to UK primary care populations presenting with joint pain due to the sampling frame used, response rate, and clinical anxiety prevalence comparable to previous evidence (Stubbs et al., 2016).

The instruments used in the survey considered different timescales: GAD-7 questions consider the previous two weeks, the numeric pain scales covered the previous month, and the KNEST included treatments over the previous twelve months. Clinical anxiety symptoms tend to be chronic (Spitzer et al., 2006), but joint pain is reported as being variable over days and weeks (Gooberman-Hill et al., 2007). The use of a single cross-sectional questionnaire precludes the drawing of conclusions regarding causal or temporal (direction of association) relationships between joint pain and anxiety symptoms. We were also unable to determine the effects of treatments taken previously. For example, respondents reporting high levels of analgesia use and low levels of pain equally might reflect successful management of pain or inappropriately high levels of analgesia, and respondents using adjunctive treatments for their joint pain may have tried core treatments previously and found them unsuccessful. Information provision was reported as poor, but for those with symptoms of several years' duration, the information may have been provided more than one year ago. There was also a risk of recall bias. For example, treatments that were not successful might be recalled less than more successful interventions. Also, patients expecting a pharmacological intervention might be more likely to recall prescriptions they received than the provision of information.

We performed multiple comparisons in this analysis. Although a number of significant results at the $p$<0.05 level would be expected by chance, the gradient of odds of clinical anxiety seen with increasing pain severity and number of pain sites, means that these observations are likely to be valid and in keeping with previous evidence (de Heer et al., 2014). We have controlled for multiple potential confounding factors, though residual confounding remains a risk. However, we consider that in the primary care setting, the mechanism linking anxiety with joint pain may be less important than recognising that a relationship exists and seeking to improve recognition of anxiety symptoms in OA patients.

NICE guidance for the recognition of mental health problems highlights a need to be alert to the possibility of anxiety disorders (National Institute for Health and Care Excellence, 2011). As one in five patients presenting to their GP with joint pain has clinical anxiety as defined by a raised GAD-7 score, with the anxiety increasing with pain severity and the number of sites affected, we consider

that this constitutes a population in which the routine use of a case-finding instrument for anxiety may be warranted. The GAD-7 scale, and even briefer two-item (Kroenke et al., 2007) and single-item (Donker, van Straten, Marks, & Cuijpers, 2011) scales have similar properties for identifying patients for further assessment, with the two-item version being recommended by NICE (National Institute for Health and Care Excellence, 2011). Although routine use may identify many people with sub-threshold symptoms, as the first step in the treatment of generalised anxiety disorder is the identification and monitoring of symptoms (National Institute for Health and Care Excellence, 2011), we consider that it would be a proportionate and justifiable approach for this population. The Improving Access to Psychological Therapies services use a GAD-7 threshold score of 8 to define cases (Clark et al., 2009), so referral to these services could be offered to patients meeting the clinical anxiety threshold used in our study.

## Conclusions

NICE guidance on the management of OA emphasises the importance of a self-management strategy and use of core treatments (National Institute for Health & Care Excellence, 2014). The majority of respondents with or without anxiety did not report adherence to these recommendations within the previous year. The broader MOSAICS programme is investigating the feasibility of improving access to core treatments (Dziedzic et al., 2014). As discussed, self-management and use of core treatments are particularly beneficial for patients with co-morbid anxiety, yet we have shown that they are least likely to be following this approach. We therefore propose that additional efforts are made by clinicians to encourage and facilitate patients with co-morbid anxiety to self-manage their pain with core non-pharmacological treatments, and that especial attention is paid to the application of guidelines in managing joint pain for those with co-morbid anxiety.

## Declarations

### Ethics approval and consent to participate

Individual patient consent was obtained for every respondent to this survey. This research was approved by the North West 1 Research Ethics Committee, Cheshire, UK (reference number 10/H1017/76).

### Competing interests

Prof. Jordan reports grants from National Institute for Health Research, grants from Arthritis Research UK during the conduct of the study. Prof. Dziedic reports grants from Arthritis Research UK

## Availability of data and material

The Centre has established data sharing arrangements to support joint publications and other research collaborations.  Applications for access to anonymised data from our research databases are reviewed by the Centre's Data Custodian and Academic Proposal (DCAP) Committee and a decision regarding access to the data is made subject to the NRES ethical approval first provided for the study and to new analysis being proposed. Further information on our data sharing procedures can be found on the Centre's website (http://www.keele.ac.uk/pchs/datasharing/) or by emailing the Centre's data manager (primarycare.datasharing@keele.ac.uk).

## Authors' contributions

LAB, MGP, and EKA undertook the analyses and drafted and revised the paper. EA, JJE and KPJ designed the analyses and drafted and revised the paper. ELH, AGF, CC-G, and CDM were involved in the interpretation of the findings, and revised the paper. KSD is CI for the study and led the design of the MOSAICS study, and revised the paper. All authors have approved the final version.

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