Received: 2 March 2023 | Accepted: 5 March 2023

DOI: 10.1002/msc.1760

WILEY

RESEARCH ARTICLE

Work limitations and associated factors in rheumatoid arthritis, axial spondyloarthritis, osteoarthritis and fibromyalgia

Tamara Brown[1] | Alison Hammond[1] | Angela Ching[1,2] | Jennifer Parker[1]

[1]Centre for Human Movement and Rehabilitation Research, School of Health and Society, University of Salford, Salford, Greater Manchester, UK

[2]King's Clinical Trials Unit, Institute of Psychiatry, Kings College London, London, UK

Correspondence
Alison Hammond, Centre for Human Movement and Rehabilitation Research, Allerton Building, Frederick Road, Salford M6 6PU, UK.
Email: a.hammond@salford.ac.uk

Funding information
European League Against Rheumatism

Abstract

Introduction: Rheumatic and musculoskeletal diseases (RMD) impact on work participation. The aims of this study were to: examine work limitations of working people with: rheumatoid arthritis, axial spondyloarthritis (axSpA), osteoarthritis, or fibromyalgia using the Workplace Activity Limitations Scale (WALS, a measure of presenteeism); and identify personal, functioning and disability, and work contextual factors associated with presenteeism.

Methods: Secondary analysis was conducted of a cross-sectional survey including work outcome measures (WORK-PROM study). A literature review identified variables (coded to ICF) to include in multivariable regressions examining factors associated with presenteeism.

Results: Moderate to high WALS scores were identified in: 93.60% with FM; 69.90% OA; 65.20% RA; and 46.80% axSpA (n = 822). Similarities in work limitations were noted across conditions, although some more problematic in specific RMD. Participants received help with about a quarter of activities (27%RA; 25%FM; 23%OA; 17%axSpA) and work adaptations for less than a fifth causing difficulty (18%FM; 14%RA; 14%OA; 9%axSpA). Literature review identified 33 variables in the WORK-PROM dataset to include in multivariable regressions. Factors associated with higher WALS scores were worse: functional limitations, job strain, pain, difficulties with mental-interpersonal job demands, perceived health status, work-life balance, greater need for work accommodations and lack of perceived work support.

Discussion: This study extends understanding of work limitations of working people with these four RMD, the extent of help and adaptations received, need for more work accommodation support, and focus on work support, work rehabilitation, and healthy workplace practices to help keep people working.

KEYWORDS
arthritis, ICF, occupational health, presenteeism, vocational rehabilitation, work accommodations, work contextual factors

1 | BACKGROUND

Rheumatic and musculoskeletal diseases (RMD) cause pain, fatigue, and functional limitations. For working people with RMD these can impact on paid work participation, increasing the risk of work instability (a mismatch between abilities and work demands) (Gilworth et al., 2003), presenteeism (reduced at-work productivity due to work limitations), absenteeism (working days lost due to ill-health), and work disability (stopping work prematurely due to ill-health) (Versus Arthritis, 2021). Rheumatic and musculoskeletal diseases include inflammatory conditions for example, rheumatoid arthritis (RA) and axial spondyloarthritis (axSpA); and musculoskeletal pain conditions, for example, osteoarthritis (OA) and fibromyalgia (FM). Global estimates of prevalence for these conditions are: up to 0.46% in RA (Almutairi et al., 2021); 0.2%–1.6% in axSpA (Stolwijk et al., 2016); 6.35% in OA (Long et al., 2022); and 0.2%–6.6% in FM (Heidari et al., 2017). Onset is typically during working age, meaning many could be working for decades with their condition.

Rheumatic and musculoskeletal diseases impact on global work disability burden, with financial costs societally, organisationally, and individually (Versus Arthritis, 2021). Worldwide, RMD are the first or second cause of work disability (Bevan et al., 2013). Costs of presenteeism and absenteeism in the United Kingdom (UK) for OA and RA alone are estimated as £3.43 billion by 2030 (Versus Arthritis, 2021). In many countries the State Pension Age is rising. In the UK, it will be 67 by 2028 and 68 from 2037, with no mandatory retirement age (Department of Work and Pensions (DWP), 2017), meaning many must work longer. A third of all working people in the UK are now over 50, but disability-free life expectancy is, on average, 61 for women and 62 for men (Centre for Ageing Better, 2022). For those with RMD, risk of presenteeism, absenteeism and work disability increase. The economic consequences are extensive to the economy and individual's ability to support themselves in later life. The UK Government strategy 'Improving Lives: The Future of Work, Health and Disability' (DWP & Department of Health (DH), 2017) identified the importance of enabling people with disabilities or ill-health to stay in work, aiming for a million more disabled people in work by 2027.

Increasing presenteeism, absenteeism and work disability are influenced by factors such as symptoms and functional limitations caused by RMD, psychological factors, workplace environment, and societal factors (Gignac et al., 2011). Investigating presenteeism, by identifying the nature and frequency of work limitations, and factors contributing to these, can further assist health and occupational health professionals in planning work rehabilitation and work accommodations to help working people with RMD stay working for longer. The aims of this study were to: examine work limitations experienced by working people with either RA, axSpA, knee and/or hip OA, or FM; and to investigate what functioning and disability, personal and work contextual factors are associated with work limitations (presenteeism).

2 | METHODS

2.1 | Study design and participants

Secondary analysis was conducted of a cross-sectional mailed survey evaluating the psychometric properties of seven work patient reported outcome measures in RA, axSpA, OA and FM (the WORK-PROM study). Participants were recruited from Rheumatology, Orthopaedic or Therapy departments at 41 secondary care and six community National Health Service (NHS) Trusts across all four countries in the UK; and from a University Arthritis Volunteer Register (see Supplementary Figure S1). Participants were eligible if: at least 18 years of age; in paid work at least 1 day a week (including self-employed); currently at work; and a primary diagnosis of: RA or early inflammatory arthritis; axSpA (i.e., including ankylosing spondylitis (AS)); knee and/or hip OA; or FM. Diagnosis was by a rheumatology consultant (any condition) or consultant orthopaedic surgeon, general practitioner of extended role physiotherapy practitioner (OA, FM). Exclusion criteria were on long-term sick leave and inability to read English or provide informed consent. Those on short-term sick leave could participate on return to work. Research nurses and therapy staff identified patients meeting criteria, provided an information sheet and reply form (including eligibility checklist). Eligible patients were mailed the survey, with a consent form on the front. Two weeks later, a reminder letter and further survey were mailed, if necessary. The Strengthening the Reporting of Observational Studies in Epidemiology Guidelines were followed (Von Elm et al., 2007). Ethical approval was obtained from the National Research Ethics Service Committee East Midlands – Leicester South (17/EM/0409), including for secondary analysis. Data collection occurred between March 2018 and March 2020.

2.2 | Literature search and overview review

Firstly, a literature search and an overview review were conducted of factors identified as associated with presenteeism, absenteeism and work participation in these four RMD, in order to provide a theoretical basis for selecting which variables, from those available in the WORK-PROM dataset, to include in analyses. The review method and results are summarized in Supplementary File 1. Factors were linked to the International Classification of Functioning, Disability and Health (World Health Organization, 2001) using linking rules (Cieza et al., 2005) and classified into the ICF-Occupational Health Care (ICF-OHC) model (Heerkens et al., 2017) (Supplementary Table S1). Overall, 78 factors were identified of which 33 could be linked to variables available in the WORK-PROM dataset. Of these, for RA 26 factors were identified, for axSpA 21, for OA 19 and for FM 25 factors (Supplementary Table S2).

2.3 | Data collection

2.3.1 | The Workplace Activity Limitations Scale

The British English Workplace Activity Limitations Scale (WALS) was used to identify work limitations (Hammond, Tennant, Chig, et.al., 2023). It is a measure of presenteeism (Verstappen et al., 2019), including 12 items scored as 0 = no difficulty to 3 = unable to do. Respondents are asked to report degree of difficulties without the use of help or special equipment. Workplace Activity Limitations Scale scores of 0–6 indicate low; 7–13 moderate; and 14–36 high work instability/risk of work disability (Gignac et al., 2011; Hammond, Tennant, Ching, et al., 2023). Two options were added about: receiving help from others (yes/no); and if adapted (i.e., special equipment or work modifications) (yes/no) to explore availability of work adaptations and accommodations. Scores for each option can be summed from 0 to 12 (Gignac et al., 2005; Hammond, Tennant, Prior, & Gignac, 2023). Internal consistency (Cronbach's α) for the Help subscale is RA = 0.84, axSpA = 0.85, OA = 0.86, FM = 0.83; and Modifications sub-scale: RA = 0.77; axSpA = 0.77; OA = 0.83; FM = 0.80, that is, all values are consistent with group use (Evans, 1996). The WALS has also been linked to the ICF (Hammond, Tennant, Ching, et al., 2023).

The following variables were matched to ICF-OHC factors identified in the literature review. For all measures, unless otherwise stated, a higher score indicates worse status. Missing data in any measures were handled according to the measure's scoring instructions.

2.3.2 | Personal factors, health, and work characteristics

Personal contextual factors included: age, sex, living arrangement (alone; with others), education level and comorbidities (the Rheumatic Disease Comorbidity Index (England et al., 2015). Additional characteristics were included to describe participants: for health, disease and symptom duration, and medication regimen; and if working full- (≥35 h/week) or part-time (<35 h/week); or self-employed.

2.3.3 | Functioning and disability factors (body function and structures; and activities and participation)

A mix of general and condition-specific variables were included. For all conditions, perceived health status was measured on a Likert (1 = very good; 5 = very poor) scale. Pain, hand pain, mood and fatigue were measured using 0–10 numeric rating scales (NRS). For OA, a condition-specific pain scale was used (see below). Poorer mental health/job-related stress was measured using the British-English Long-Term Conditions Job Strain Scale (LTCJSS), of stress associated with for example, working with symptoms, work scheduling, work relationships (Gignac et al., 2007; Hammond, Tennant, Prior, & Gignac, 2023). The Mental-Interpersonal Demands (Work Limitations Questionnaire-25: MID-WLQ-25) subscale measures the degree of difficulty with mental (e.g., concentration) and social activities at work (Lerner et al., 2001). The number of body parts affected by the participants' RMD was assessed using a 16-item checklist.

Participants also completed condition-specific measures. For RA, these were: the RA Impact of Disease (RAID), measuring for example, sleep, coping (Gossec et al., 2011); the Health Assessment Questionnaire (HAQ) measuring physical function (Kirwan & Reeback, 2001), scored using the HAQ20 method, that is, summing all items without adjusting for using aids and devices (Wolfe, 2001); and the Measure of Activity Performance of the Hand (Prior et al., 2018). For axSpA, measures were: the Bath Ankylosing Spondyloarthritis Disease Activity Index (BASDAI) of symptom severity (Garrett et al., 1994); and the Bath Ankylosing Spondyloarthritis Functional Index (Calin et al., 1994). For OA, the Western Ontario McMaster Universities Osteoarthritis Index sub-scales of pain and physical function were included (Bellamy et al., 1988). For FM, the Revised Fibromyalgia Impact Questionnaire (FIQR) sub-scales of symptoms and function were included (Bennett et al., 2009). For condition-specific function measures, scores were divided into tertiles to give an indication of comparative levels of function between the four RMD, although measures are not directly comparable as activities in each are condition specific.

2.3.4 | Work-related personal contextual factors

Four items about attitudes to work were included, measured on 0–10 NRS (not at all to very): confidence to work (work self-efficacy); work motivation; importance of work; and job satisfaction. Self-disclosure of heath condition(s) at work was measured by asking: 'Does your employer/supervisor know about your arthritis?' (yes/no) and 'How many, if any, of your co-workers know about your arthritis?' (0 = none; 4 = all) (Gignac et al., 2009). Work-life balance was measured using two sub-scales of the British -English Work-Health-Personal Life Perceptions Scale (WHPLPS): (a) health condition affecting work; and (b) work/personal life affecting health condition and its management (Gignac et al., 2014; Hammond, Tennant, Prior, & Gignac, 2023).

2.3.5 | Work-related environmental contextual factors

These included: hours worked; organization size; and job skill level (Office of National Statistics, 2010). Other measures were physical job demands (i.e., extent of physically active work and movement required in their job (Gignac et al., 2011); extent of control over work (Gignac et al., 2007); and the British-English Perceived Workplace

Support Scale with three subscales of support from: managers; co-workers; and their company/organization (Gignac et al., 2007; Hammond, Tennant, Prior, & Gignac, 2023). Lastly, the British-English Work Accommodations, Benefits, Policies and Practices Scale was used to identify need for work adjustments and policies at work (16 yes/no items), for example, flexible hours, working from home part of the week, modified work duties (Gignac et al., 2018; Hammond, Tennant, Prior, & Gignac, 2023).

2.4 | Sample size

The sample size was determined by responses available in the WORK-PROM dataset.

2.5 | Statistical analysis

Descriptive data were used to summarize variables using the mean (standard deviation), median (inter-quartile range) and number (percentage), as appropriate. Differences between conditions were tested using one-way analysis of variance (ANOVA, with Tukey post-hoc tests) for continuous variables; Kruskal-Wallis for ordinal data; and Chi-square for categorical data. Statistical significance was set at $p \leq 0.05$.

Multivariable regression was used to examine independent variables associated with the WALS (controlling for age and/or sex if relevant). Analyses were conducted for conditions separately as datasets included condition-specific measures of symptoms and function. Firstly, for each condition, bivariate regression analyses of independent variables with the WALS were conducted. Variables were selected for inclusion in the multivariable regression analyses if: significantly associated ($p \leq 0.05$) with WALS scores in bivariate regressions; and correlated with the WALS at $r \geq 0.3$ (except for categorical variables). Pearson's correlations were conducted to examine multicollinearity, with items omitted based on theoretical grounds if correlations were ≥0.8. For example, in axSpA, the BASDAI correlated ≥0.8 with each of pain, fatigue, and perceived health and the BASDAI therefore omitted. Collinearity diagnostic tests were examined (e.g., variance inflation factor and tolerance) and variables omitted if not meeting test requirements (Field, 2013).

Two multivariable regression analyses were conducted for each condition. For both, the independent variables entered met the selection criteria described above: (a) linked to factors based on the relevant condition-specific literature review and (b) linked to the 33 factors identified in the cross-condition literature review (Supplementary Table S2). The second analysis was conducted as the literature review (restricted to 2012–2022) may have missed some condition-specific factors. The forced entry method was used, with best fit obtained by sequentially dropping variables according to descending p values (Field, 2013). Variables with a p-value ≤0.05 were retained. Data were analysed using the Statistical Package for the Social Sciences v26 (IBM, 2019).

3 | RESULTS

Of the 1359 patients referred to the WORK-PROMS study, 879 (64.7%) returned the study questionnaire, with 822 (60.5% overall) included, as 4.2% overall of respondents were ineligible (Supplementary Figure S1).

3.1 | Personal factors, health, and job characteristics

Table 1 shows participant characteristics. There were: more women with RA, OA and FM, and men with axSpA (reflecting these conditions' sex distributions), with very few men with FM ($n = 10$). Participants with OA or RA were significantly older than those with axSpA or FM. Most were living with others but those with RA and OA significantly less likely to have children living at home, reflecting their older age. There were no differences in educational level between groups. Those with axSpA had been diagnosed for significantly longer than those with RA, OA, or FM. In FM, symptom duration was similar to RA and OA, but it had taken significantly longer to be diagnosed. Significantly more of those with axSpA were working full-time than those with RA, OA, or FM.

3.2 | Work limitations experienced by participants with rheumatoid arthritis, axial spondyloarthritis, osteoarthritis or fibromyalgia

Participants with FM had significantly higher WALS scores, more activities causing difficulty, and more activities with which they had help and/or adaptations, than those with RA, OA and axSpA. Those with RA and OA had comparable, and those with axSpA significantly lower WALS scores/fewer activities with difficulties (Table 2). There were moderate to high WALS scores (i.e., indicating moderate to high work instability and need for work support) in: 93.60% with FM (most having high instability); 69.90% in OA; 65.20% in RA; and 46.80% in axSpA. Participants generally had more help and adaptations as the number of activities with difficulties increased.

Frequencies of specific work limitations are shown in Table 3. On average, participants had difficulties with half or more of activities (54% RA; 48% axSpA; 61% OA; 76% FM). The three most common difficulties were: in RA, 80% working with hands, lifting/carrying and crouching/bending/kneeling; in axSpA, 60%–73% and in OA 75%–91% crouching/bending/kneeling, lifting/carrying, and standing for long periods; and in FM, concentration (94%), working with hands (87%) and lifting/carrying (86%). In general, for each activity, significantly more with FM had difficulties, RA and OA similar, and fewer with axSpA. Exceptions were those with OA having more problems than RA for mobility issues of crouching, standing, sitting, and getting around at work; and fewer hand problems than RA, reflecting their primary diagnosis was knee and/or hip OA. On average, participants received help with about a quarter of those activities they had

TABLE 1 Participants' personal, health and job characteristics.

	RA (n = 294)	axSpA (n = 199)	OA (n = 173)	FM (n = 156)	Differences between conditions (df = 3)
Personal factors:					
Age (years): Mean (SD)	53.47 (8.97)	46.96 (10.24)	56.49 (7.21)	45.71 (10.05)	$F = 57.82$; $p < 0.001$
Sex: M: F, n (%)	76 (26.00):218 (74.00)	124 (62.30):75 (37.70)	54 (31.00):119 (69.00)	10 (6.00):146 (94.00)	$X^2 = 135.86$; $p < 0.001$
Living situation: n (%)					
- With spouse/family/significant other	241 (82.00)	179 (89.90)	143 (83.00)	139 (89.00)	$X^2 = 8.12$; $p = 0.04$
Educational level: n (%)					
- No formal qualifications	27 (9.20)	14 (7.00)	17 (10.00)	7 (4.00)	H = 4.67; $p = 0.20$
- Secondary/non tertiary	148 (50.30)	100 (50.30)	91 (53.00)	76 (49.00)	
- Tertiary	117 (39.80)	84 (42.20)	61 (35.00)	73 (47.00)	
- Missing	2 (0.70)	1 (0.50)	4 (2.00)	-	
Co-morbidities (RDCI):					
mean (SD)	1.07 (1.18)	1.03 (1.20)	1.31 (1.26)	1.79 (1.54)	$F = 13.59$; $p < 0.001$
Health characteristics:					
Disease duration (years): Mean (SD)	7.66 (7.97)	12.33 (10.40)	4.87 (6.80)	2.99 (4.17)	$F = 47.79$; $p < 0.001$
Symptom duration (years): Mean (SD)	9.33 (8.52)	18.97 (11.75)	7.87 (8.43)	8.36 (7.16)	$F = 62.01$; $p < 0.001$
Medication regimen: n (%)					
- None	2 (0.70)	19 (9.50)	33 (19.00)	23 (15.00)	
- NSAIDS +/− analgesics only	11 (3.70)	4 (2.00)	118 (69.00)	14 (9.00)	
- Steroids +/- NSAIDS only	6 (2.00)	51 (25.60)	10 (6.00)	6 (4.00)	
- Single DMARD	103 (35.00)	10 (5.00)	-	-	
- Combination DMARD	97 (33.00)	2 (1.00)	-	-	
- Biologic/biosimilar	66 (22.40)	112 (56.30)	-	-	
- Neuropathic analgesics (e.g., gabapentin)	-			99 (64.00)	
- FM: Opiate medication				12 (8.00)	
Job characteristics:					
Full-: Part-time work: n (%)	160 (54.40):134 (45.60)	150 (75.40):49 (24.60)	106 (61.30):67 (38.70)	70 (45.00):86 (55.00)	$X^2 = 37.88$; $p < 0.001$
Self-employed: n (%)	63 (21.40)	34 (17.10)	21 (12.10)	18 (11.50)	$X^2 = 10.51$; $p = 0.02$

Abbreviations: axSpA, axial spondyloarthritis; DMARD, disease modifying anti-rheumatic drugs; FM, fibromyalgia; NSAID, non-steroidal anti-inflammatory drugs; OA, osteoarthritis; RA, rheumatoid arthritis; RDCI, Rheumatic Disease Comorbidity Index; SD, standard deviation.

TABLE 2 Work Activity Limitations Scale scores, including those for low, moderate, and high work instability groups.

Mean (SD)	RA (*n* = 294)	axSpA (*n* = 199)	OA (*n* = 173)	FM (*n* = 156)	Differences between conditions (df = 3)
All:					
WALS (0–36):	9.56 (6.03)	7.41 (5.76)	10.23 (5.72)	15.26 (5.47)	$F = 56.10$; $p < 0.001$
- No. activities with difficulty (0–12)	7.12 (3.34)	5.72 (3.72)	7.27 (2.12)	9.92 (2.27)	$F = 50.69$; $p < 0.001$
- No. activities receiving help (0–12)	2.07 (2.57)	1.02 (1.98)	1.78 (2.54)	2.53 (2.82)	$F = 11.93$; $p < 0.001$
- No. activities with adaptations (0–12)	1.05 (1.77)	0.53 (1.28)	1.01 (1.96)	1.80 (2.34)	$F = 13.78$; $p < 0.001$
Low work instability (score 0–6); n (%):	*n* = 102 (34.70)	*n* = 106 (53.30)	*n* = 52 (30.10)	*n* = 10 (6.40)	
WALS:	3.39 (1.85)	2.94 (2.00)	3.81 (1.88)	4.40 (1.78)	
- No. activities with difficulty (0–12)	3.26 (1.79)	2.74 (1.88)	3.46 (1.13)	4.40 (1.73)	$F = 3.41$; $p = 0.02$
- No. activities receiving help (0–12)	0.79 (1.37)	0.44 (0.95)	0.84 (1.13)	0.70 (1.34)	$F = 2.07$; $p = 0.11$
- No. activities with adaptations (0–12)	0.47 (0.92)	0.33 (0.78)	0.24 (0.69)	0.60 (1.08)	$F = 1.16$; $p = 0.32$
Moderate work instability (score 7–13); n (%):	*n* = 118 (40.10)	*n* = 61 (30.70)	*n* = 68 (39.30)	*n* = 41 (26.30)	
WALS:	9.86 (1.89)	10.08 (1.92)	9.90 (1.87)	10.10 (1.99)	
- No. activities with difficulty (0–12)	8.23 (1.45)	8.28 (1.69)	7.91 (1.63)	8.51 (1.61)	$F = 1.37$; $p = 0.25$
- No. activities receiving help (0–12)	2.40 (2.36)	1.70 (2.45)	1.59 (2.25)	1.98 (2.55)	$F = 1.99$; $p = 0.12$
- No. activities with adaptations (0–12)	1.22 (1.73)	0.57 (0.97)	0.98 (1.96)	1.61 (1.83)	$F = 3.55$; $p = 0.02$
High work instability (score 14–36); n (%):	*n* = 74 (25.20)	*n* = 32 (16.10)	*n* = 53 (30.60)	*n* = 105 (67.30)	
WALS:	17.59 (4.09)	17.09 (3.50)	16.96 (3.55)	18.30 (3.41)	
- No. activities with difficulty (0–12)	10.66 (1.23)	10.75 (1.08)	10.19 (1.47)	11.03 (1.07)	$F = 5.79$; $p < 0.001$
- No. activities receiving help (0–12)	3.33 (3.32)	1.69 (2.87)	2.92 (3.34)	2.92 (2.93)	$F = 1.90$; $p = 0.13$
- No. activities with (0–12)	1.58 (2.41)	1.13 (2.50)	1.80 (2.46)	2.00 (2.57)	$F = 1.09$; $p = 0.35$

Abbreviations: axSpA, axial spondyloarthritis; FM, fibromyalgia, OA, osteoarthritis; RA, rheumatoid arthritis; SD, standard deviation; WALS, Work Activity Limitations Scale; Work instability, low work instability, WALS scores of 0–6; moderate work instability, scores of 7–13, high work instability, scores of 14–36.

difficulties with (27% RA; 25% FM; 23% OA; 17% axSpA). Participants most often had help with lifting (62% RA; 50% axSpA; 51% OA; 52% FM); and reaching (40% RA; 22% axSpA; 43% OA; 39% FM). On average, participants had work adaptations for less than a fifth of activities they had difficulties with (18% FM; 14% RA; 14% OA; 9% axSpA). They most often had adaptations for: working with hands (30% RA; 25% axSpA; 24% OA; 31% FM) and sitting for long periods (24% RA; 24% axSpA; 23% OA; 34% FM).

3.3 | Functioning and disability factors

There were significant differences between groups, with FM being significantly worse for all generic measures; RA and OA generally similar, and axSpA either similar to (pain, fatigue, mood, mental-interpersonal demands) or significantly better than RA and OA (perceived health, hand pain, job strain) (Table 4). Amongst the OA group, whilst participants had to have either knee and/or hip OA to be included, 98 (56%) also reported having one or both hands/wrists affected by arthritis, and also experienced hand pain. Participants with FM had significantly more body parts affected than those with RA, who also had more affected than axSpA or OA. Condition-specific function measures meant direct comparisons were not possible between groups. However, classifying scores into tertiles (mild, moderate, severe difficulties) indicated more participants with FM (88%) and OA (69%) reported they had moderate or severe difficulties, compared to those with axSpA (43%) or RA (21%) reporting moderate or severe difficulties.

3.4 | Work-related personal contextual factors

On average, participants with axSpA had significantly higher work self-efficacy and work-health-personal life balance, RA and OA similar, and FM least (although still moderate on average) (Table 4). Those with axSpA also had significantly higher motivation to continue working than RA, OA and FM. Participants across conditions considered it important to continue working and had moderate job satisfaction. Over 80% in each group had disclosed their condition to their employer, with significantly more with FM doing so than axSpA.

TABLE 3 Frequency of work activity difficulties, help received, and adaptations made.

WALS item	RA $n = 294$ n (%)	axSpA $n = 199$ n (%)	OA $n = 173$ n (%)	FM $n = 156$ (%)	Differences between conditions (df = 3)
Work with hands:					
- Difficulty with	237 (80.60)[1=]	64 (32.20)	79 (45.70)	135 (86.50)[2]	$X^2 = 178.970$ $p = 0.001$
- Help received	54 (22.80)	9 (14.10)	19 (24.10)	20 (14.80)	$X^2 = 21.97$; $p = 0.001$
- Adaptations made	72 (30.40)[1]	16 (25.00)[3]	19 (24.10)[1]	42 (31.10)[2]	$X^2 = 36.82$; $p = 0.001$
Lift, carry, move objects:					
- Difficulty with	237 (80.60)[1=]	132 (66.30)[2]	140 (80.90)[2]	134 (85.90)[3]	$X^2 = 23.64$; $p = 0.001$
- Help received	146 (61.60)[1]	66 (50.00)[1]	72 (51.40)[1]	70 (52.20)[1]	$X^2 = 15.58$; $p = 0.001$
- Adaptations made	40 (16.90)	17 (12.90)	20 (14.30)	30 (22.40)[3]	$X^2 = 9.56$; $p = 0.02$
Crouch, bend, kneel, work awkward positions:					
- Difficulty with	236 (80.30)[3]	145 (72.90)[1]	157 (90.80)[1]	133 (85.30)	$X^2 = 21.53$; $p = 0.001$
- Help received	68 (28.80)	26 (17.90)	40 (25.50)[3]	42 (31.60)[3]	$X^2 = 12.19$; $p = 0.007$
- Adaptations made	14 (5.90)	6 (4.00)	12 (7.60)	15 (11.30)	$X^2 = 7.87$; $p = 0.05$
Stand for long periods:					
- Difficulty with	175 (59.50)	120 (60.30)[3]	130 (75.10)[3]	129 (82.70)	$X^2 = 34.19$; $p = 0.001$
- Help received	28 (16.00)	7 (5.80)	22 (16.90)	20 (15.50)	$X^2 = 12.40$; $p = 0.006$
- Adaptations made	26 (14.90)	6 (5.00)	20 (15.40)[2]	22 (17.10)	$X^2 = 15.27$; $p = 0.002$
Reach:					
- Difficulty with	168 (57.10)	94 (47.20)	98 (56.60)	125 (80.10)	$X^2 = 40.99$; $p = 0.001$
- Help received	67 (39.90)[2]	21 (22.30)[2]	42 (42.90)[2]	49 (39.20)[2]	$X^2 = 24.18$; $p = 0.001$
- Adaptations made	20 (11.90)	4 (4.30)	9 (9.20)	20 (16.00)	$X^2 = 17.47$; $p = 0.001$
Manage pace of work:					
- Difficulty with	166 (56.50)	77 (38.70)	97 (56.10)	128 (82.10)	$X^2 = 67.22$; $p = 0.001$
- Help received	56 (33.70)[3]	16 (20.80)[3]	18 (18.60)	39 (30.50)	$X^2 = 25.18$; $p = 0.001$
- Adaptations made	12 (7.20)	3 (3.90)	9 (9.30)	15 (11.70)	$X^2 = 12.95$; $p = 0.005$
Meeting job demands:					
- Difficulty with	162 (55.10)	74 (37.20)	90 (52.00)	133 (85.30)	$X^2 = 83.91$; $p = 0.001$
- Help received	52 (32.10)	14 (18.90)	24 (26.60)	38 (28.60)	$X^2 = 21.70$; $p = 0.001$
- Adaptations made	18 (11.10)	5 (6.80)	10 (11.10)	12 (9.20)	$X^2 = 5.21$; $p = 0.16$
Sit for long periods:					
- Difficulty with	157 (53.40)	116 (58.30)	113 (65.30)	128 (82.10)	$X^2 = 37.93$; $p = 0.001$
- Help received	17 (10.80)	8 (6.90)	16 (14.20)	15 (11.70)	$X^2 = 6.35$; $p = 0.01$
- Adaptations made	37 (23.60)[2]	28 (24.10)[1]	26 (23.00)[3]	44 (34.40)[1]	$X^2 = 20.29$; $p = 0.001$
Concentrating at work:					
- Difficulty with	155 (52.70)	93 (46.70)	83 (48.00)	146 (93.60)[1]	$X^2 = 102.01$; $p = 0.001$
- Help received	15 (9.70)	8 (8.60)	8 (9.60)	22 (15.10)	$X^2 = 18.50$; $p = 0.001$
- Adaptations made	7 (4.50)	3 (3.20)	4 (4.80)	14 (9.60)	$X^2 = 18.07$; $p = 0.001$

(Continues)

TABLE 3 (Continued)

WALS item	RA $n = 294$ n (%)	axSpA $n = 199$ n (%)	OA $n = 173$ n (%)	FM $n = 156$ (%)	Differences between conditions (df = 3)
Get around at work:					
- Difficulty with	148 (50.30)	80 (40.20)	121 (69.90)	119 (76.30)	$X^2 = 63.69$; $p = 0.001$
- Help received	29 (19.60)	13 (16.30)	14 (11.60)	23 (19.30)	$X^2 = 7.33$; $p = 0.06$
- Adaptations made	28 (18.90)	9 (11.30)	16 (13.20)	30 (25.20)	$X^2 = 21.80$; $p = 0.001$
Manage shifts/hours of work:					
- Difficulty with	133 (45.20)	80 (40.20)	74 (42.80)	128 (82.10)	$X^2 = 77.76$; $p = 0.001$
- Help received	38 (28.60)	16 (20.00)	17 (23.00)	33 (25.80)	$X^2 = 15.24$; $p = 0.002$
- Adaptations made	12 (9.00)	4 (5.00)	7 (9.50)	18 (14.10)	$X^2 = 18.55$; $p = 0.001$
Get to/from work:					
- Difficulty with	117 (39.80)	64 (32.20)	76 (43.90)	110 (70.50)	$X^2 = 57.62$; $p = 0.001$
- Help received	29 (24.80)	7 (10.90)	11 (14.10)	22 (20.01)	$X^2 = 14.60$; $p = 0.002$
- Adaptations made	23 (19.70)[3]	4 (6.30)	18 (23.70)[2]	15 (13.60)	$X^2 = 12.14$; $p = 0.007$

Note: percentages of those receiving help/having adaptations based on numbers of participants experiencing that activity difficulty.
Abbreviations: RA, rheumatoid arthritis; axSpA, axial spondyloarthritis; OA, osteoarthritis; FM, fibromyalgia.
[1,2,3] = first, second, third most common work activity: with difficulty; help received; and adaptations made.

Those with RA, OA, or FM had also disclosed their condition to more co-workers, than in axSpA.

3.5 | Work-related environmental contextual factors

Significantly more with axSpA were working longer hours than participants with RA, OA, or FM, but with no difference between groups when controlled for sex, as differences were due to more men working full-time in axSpA, and women working part-time in RA, OA and FM. More with RA and axSpA worked in small enterprises, reflecting that more were self-employed (Table 4). There was no difference in levels of physical job demands between groups. Participants with RA had most control over their work, and FM least. Participants with FM reported significantly less managerial and organisational support at work, compared to RA, axSpA and OA; whilst those with RA perceived significantly less support from co-workers, compared to other groups. Significantly more work accommodations were needed in FM than RA, axSpA or OA.

3.6 | Factors associated with work limitations

In the bivariate regression analyses, numbers of factors associated with work limitations at $p \leq 0.05$ were RA = 22; axSpA = 23; OA = 22; and FM = 18 (Table 5). Those meeting criteria for inclusion in multivariable regressions were (for all four conditions, unless stated): (a) personal factors of age (OA) and female sex (OA, axSpA); (b) functioning and disability factors: perceived health status, pain, fatigue, mood, job strain (LTCJSS), mental interpersonal demands (MID-WLQ-25), and disease symptoms (except for RA and axSpA due to multicollinearity), functional limitations, and number of body parts affected (RA, axSpA); (c) work-related personal factors: work self-efficacy, work life balance, motivation to continue to work (RA, axSpA, OA), and job satisfaction (OA); (d) work-related environmental factors: number of work accommodations needed; and perceived work support from employers (axSpA, FM), co-workers (axSpA) and organization (axSpA, FM).

In RA and axSpA, the two multivariable regression analyses led to the same results. For FM only one analysis was required, as no additional variables were identified from the cross-condition review. For OA, the two analyses led to partially different results, therefore both are presented. For the OA condition-specific review multivariable regression, physical function was identified as a significant factor but not pain. In the cross-condition review analysis, pain was significant and function almost significant. Pain and function almost met the criteria for multicollinearity ($r = 0.79$), potentially accounting for this difference, suggesting both are important factors (Table 6).

Across conditions, no personal factors were significantly associated with work limitations. Associated functioning and disability factors were: functional limitations (all four conditions), job strain (RA, axSpA and OA), pain (OA and FM), difficulties with mental-interpersonal job demands (RA and OA) and perceived health status (axSpA). For work-related personal factors, these were work-life balance (condition negatively affecting work (WHPLPS part 1) (RA, OA, FM) and work self-efficacy (OA). For work-related environmental factors, these were need for work accommodations (RA, axSpA, OA, and almost significant for FM) and lack of perceived work

TABLE 4 Participants' functioning and disability, work-related personal and work-related environmental contextual factors measures.

Mean (SD) unless otherwise stated	RA (n = 294)	axSpA (n = 199)	OA (n = 173)	FM (n = 156)	Differences between conditions (df = 3)
Functioning and disability factors:					
Self-reported health in last month (1–5) (median, IQR: n (%):	3 (2–3)	2 (2–3)	3 (3 - 3)	4 (3–4)	H = 138.42; $p < 0.001$
- Poor/very poor	45 (15.30)	21 (10.60)	37 (21.40)	83 (53.00)	
- Fair	133 (45.20)	78 (39.20)	95 (54.90)	63 (41.00)	
- Good/very good	116 (39.50)	100 (50.30)	41 (23.70)	10 (6.00)	
Pain NRS (0–10)	4.85 (2.50)	4.46 (2.90)	4.96 (1.98)	6.98 (1.94)	$F = 37.27$; $p < 0.001$
Hand pain NRS (0–10)	4.59 (2.78)	1.90 (2.64)	3.53 (3.27)	6.46 (2.38)	$F = 83.40$; $p < 0.001$
Fatigue NRS (0–10)	5.79 (2.70)	5.19 (2.92)	5.76 (2.84)	7.49 (1.98)	$F = 23.37$; $p < 0.001$
No. Body parts affected (0–16): Median (IQR)	8.00 (5.00–11.00)	5.00 (3.00–8.00)	5.00 (2.50–9.00)	12.00 (10.00–14.75)	H = 220.53; $p < 0.001$
Mood NRS (0–10)	4.36 (2.70)	4.02 (2.50)	4.86 (2.89)	6.27 (2.44)	$F = 24.45$; $p < 0.001$
Job strain (LTCJSS: 0–60)	24.40 (15.41)	19.22 (15.49)	25.28 (14.92)	40.24 (13.68)	$F = 61.33$; $p < 0.001$
Mental-interpersonal demands (WLQ-25: 0–100)	23.52 (21.60)	19.00 (18.37)	22.07 (21.48)	44.48 (21.87)	$F = 51.16$; $p < 0.001$
Work- health- personal life perceptions scale:					
- Condition negatively affects work (part 1: 0–32)	19.41 (7.20)	15.70 (7.95)	19.03 (7.12)	24.83 (4.97)	$F = 49.90$; $p < 0.001$
- Work/personal life negatively affects condition (part 2: 0–28)	13.76 (6.84)	12.65 (6.44)	14.68 (7.02)	20.33 (5.53)	$F = 46{,}58$; $p < 0.001$
Condition specific measures:					
RA:					
RAID (0–10)	4.71 (2.26)	-	-	-	
HAQ20 (0–60) (n = 291) †	11.59 (10.41)	-	-	-	
- Mild difficulties: n (%)	231 (79.40)				
- Moderate: n (%)	56 (19.20)				
- Severe: n (%)	4 (1.40)				
MAPHAND (0–54)	14.02 (9.96)	-	-	-	
axSpA:					
BASDAI (0–10)		3.96 (2.36)			
BASFI (0–10) (n = 194)†	-	3.42 (2.46)	-	-	
- Mild difficulties: n (%)		106 (54.60)			
- Moderate: n (%)		61 (30.70)			
- Severe: n (%)		27 (13.60)			
OA:					
WOMAC	-	-			
- Pain (0–20)			9.89 (3.94)		
- Physical function (0–68) †			31.66 (13.68)		
- Mild difficulties: n (%)			51 (29.50)		
- Moderate: n (%)			93 (53.80)		
- Severe: n (%)			29 (16.80)		

(Continues)

TABLE 4 (Continued)

Mean (SD) unless otherwise stated	RA (*n* = 294)	axSpA (*n* = 199)	OA (*n* = 173)	FM (*n* = 156)	Differences between conditions (df = 3)
FM:					
FIQR:					
- Symptoms (0–50)	-	-	-	33.24 (7.77)	
- Function (0–30)†	-	-	-	18.43 (6.52)	
- Mild difficulties: *n* (%)	-	-	-	17 (11.40)	
- Moderate: *n* (%)				73 (49.00)	
- Severe: *n* (%)	-			59 (39.61)	
Work-related personal factors					
Work self-efficacy (0–10):	7.57 (2.18)	8.29 (2.03)	7.73 (2.15)	6.35 (2.24)	$F = 24.44$; $p < 0.001$
Motivation continuing to work (0–10)	7.87 (2.73)	8.06 (2.44)	7.47 (2.69)	7.27 (2.79)	$F = 3.32$; $p = 0.02$
Importance continuing to work (0–10)	8.68 (2.16)	8.97 (1.72)	8.71 (1.90)	8.73 (1.76)	$F = 1.01$; $p = 0.39$
Job satisfaction (0–10)	6.92 (2.67)	6.95 (2.57)	6.85 (2.57)	6.46 (2.68)	$F = 0.83$; $p = 0.48$
Disclosure:					
- Employer (yes: *n* (%)	257 (87.40)	164 (82.40)	152 (87.90)	141 (90.40)	$X^2 = 8.72$; $p = 0.03$
- Co-workers (0–4: Median, IQR)	3 (1–3)	1 (1–3)	3 (1–3)	3 (1–3)	H = 17.33; $p < 0.001$
Work-related environmental factors:					
Hours worked	33.24 (12.47)	37.77 (10.44)[a]	34.16 (11.66)	31.50 (10.56)	$F = 1.50$; $p = 0.21$
Organization size: *n* (%)					
- 1	37 (12.60)	22 (11.10)	17 (9.90)	14 (9.00)	$F = 3.04$; $p = 0.03$
- 2–9	34 (11.60)	27 (13.60)	12 (6.90)	8 (5.10)	
- 10–49	49 (16.70)	23 (11.60)	22 (12.70)	23 (14.70)	
- 50–249	31 (10.50)	23 (11.60)	26 (15.00)	18 (11.50)	
- 250 plus	140 (47.60)	104 (52.30)	95 (54.90)	93 (59.60)	
Job skill level: *n* (%)					
- 1 and 2	149 (51.00)	66 (33.10)	84 (48.60)	95 (61.00)	$F = 10.03$; $p < 0.001$
- 3 and 4	142 (48.00)	133 (66.90)	88 (50.80)	61 (39.00)	
- Missing	4 (1.00)	-	1 (0.70)	-	
Physical job demands: Median (IQR) (0–4)	3 (1–4)	2 (1–4)	3 (1–4)	3 (1–4)	H = 2.84; $p = 0.42$
- None/a little *n* (%)	101 (34.40)	83 (41.70)	53 (30.70)	61 (39.10)	
- Noticeable *n* (%)	37 (12.60)	175 (8.90)	22 (12.70)	14 (9.00)	
- A lot/great deal	156 (53.00)	99 (49.80)	98 (56.60)	81 (51.90)	
Control over work: Median (IQR):0–4	2 (1–4)	2 (0–3)	2 (1–3)	2 (0–3)	H = 15.63; $p < 0.001$
Perceived workplace support: ‡					
- Manager (0–16)	10.36 (3.97) (*n* = 239)	10.40 (4.18) (*n* = 168)	10.34 (3.95) (*n* = 153)	9.17 (4.41) (*n* = 138)	$F = 3.13$; $p = 0.03$
- Co-workers (0–32)	19.05 (5.74) (*n* = 260)	22.14 (6.52) (*n* = 179)	22.13 (6.45) (*n* = 152)	21.52 (7.28) (*n* = 143)	$F = 11.81$; $p < 0.001$
- Organization (0–28)	16.34 (6.47) (*n* = 245)	16.51 (6.42) (*n* = 172)	15.62 (6.44) (*n* = 153)	14.42 (6.68) (*n* = 143)	$F = 3.44$; $p = 0.02$

TABLE 4 (Continued)

Mean (SD) unless otherwise stated	RA (n = 294)	axSpA (n = 199)	OA (n = 173)	FM (n = 156)	Differences between conditions (df = 3)
Work accommodations (WABPPS):					
- No. accommodations **needed** (0–16)	5.01 (4.17)	4.64 (4.04)	4.46 (3.77)	8.55 (3.94)	$F = 37.76$; $p < 0.001$

Abbreviations: axSpA, axial spondyloarthritis; BASDAI, Bath Ankylosing Spondylitis Disability Index; BASFI, Bath Ankylosing Spondylitis Function Index; FM, fibromyalgia; FIQR, Revised Fibromyalgia Impact Questionnaire; HAQ, Health Assessment Questionnaire; LTCIJSS, Long Term Conditions Job Strain Scale; NRS, numeric rating scale; OA, osteoarthritis; RA, rheumatoid arthritis; RAID, Rheumatoid Arthritis Impact of Disease; WABBPS, Work Accommodations; Benefits, Policies and Practices Scale; WOMAC, Western Ontario McMaster Universities Osteoarthritis Index.

SD = standard deviation; IQR = inter-quartile range; F = ANOVA; H = Kruskal-Wallis test; X^2 = Chi-square test; † = mild/moderate/severe difficulties categorized by tertiles for each measure. ‡ = Perceived Workplace Support Scale: reduced numbers in all subscales as those self-employed (including independent contractors/freelance/consultancy) and/or working alone may be unable to complete one or more sub-scales. a = analysis controled for sex.

support from the manager (axSpA) or organization (FM) (Table 6). Associations are summarized in Supplementary Table 4.

4 | DISCUSSION

This study investigated workplace activity limitations experienced by working people with RA, axSpA, OA and FM, using the WALS, identified as one of the two best presenteeism measures for RMD by the Outcome Measures in Rheumatology Worker Productivity Group (OWPG) (Beaton et al., 2016). Work limitations were also compared between conditions, highlighting those with FM had the highest. Previous presenteeism studies compared RA and OA (Gignac et al., 2011), or RA and axSpA (Druce et al., 2018). None compared all three or included FM. Whilst previous studies have investigated contextual factors associated with presenteeism, only a few in RA and OA used a theoretical approach to select which to include. The literature review, using the ICF-OHC (Heerkens et al., 2017) as a structure, supported a wider range of functioning and disability, personal, and work contextual factors to be included in analyses of factors associated with presenteeism, compared to previous studies in RA, axSpA and OA. No studies were identified about presenteeism and contextual factors in FM.

Notably more participants with FM had worse function, pain, fatigue, job strain, work self-efficacy and work-life balance than those with the other three conditions, RA and OA were generally similar (apart from RA having better function scores), and axSpA either similar to, or better than RA and OA. Those with FM also perceived they had least control over their work, less support at work and needed more work accommodations than the other conditions. More were also in unskilled and semi-skilled jobs compared to the other conditions. Fibromyalgia diagnosis can be delayed, which was apparent in this study, meaning working people may have problems explaining reasons for work difficulties to employers, potentially resulting in greater work difficulties than if diagnosed sooner, with workplace support instigated later (Guymer et al., 2016). It can also take longer to be referred to community or secondary care NHS Trusts (where recruitment occurred) for condition management and rehabilitation.

Workplace Activity Limitations Scale scores indicating moderate to high work instability were identified for two-thirds or more of participants with OA, FM, and RA and just under half of those with AxSpA. This may reflect better disease control in axSpA as biologics use is associated with improved presenteeism (Boonen et al., 2021), and over half were on biologic drugs. In RA, it was notable that whilst most had WALS moderate to high work instability scores, most also had relatively low HAQ function scores. Health professionals should ask all working patients about work issues, even if having few daily activity difficulties. Similarities in workplace tasks causing difficulty were noted in all four RMDs, although some tasks were more problematic for specific conditions, for example, concentration in FM, and working with hands in RA. Health care professionals should consider preventative adaptations for tasks commonly causing difficulty, depending on condition.

Although participants reported difficulties with around a half to three-quarters of work activities, on average they received help or adaptations with a quarter or less of these, apart from help with lifting and reaching. Those with moderate and high work instability need workplace adaptations (Gilworth et al., 2003) and health care professionals should support working people with RMD by providing such advice (Boonen et al., 2021). Participants also reported that concentration at work, managing pace of work and meeting job demands were problematic, emphasizing that adaptations for both physical and cognitive difficulties, such as flexible working hours and modified work duties, are important for working people with RMDs. Most participants across conditions had disclosed their condition to their employer yet still identified needs for work accommodations. Despite disclosing, workers with RMD can find some employers lack understanding, sympathy, and support to assist with accommodations (Agaliotis et al., 2018), even though legally required to. They may also be reluctant to request accommodations from employers because of concerns about being stigmatised, or instead prefer to make changes within their control, for example, modifying task performance, getting help from co-workers and self-managing their condition at work, such as pacing (Agaliotis et al., 2018).

There was overlap across conditions for which factors in multivariable analyses were significantly associated with greater presenteeism. Worse function was common across all conditions and has

TABLE 5 Bivariate regression analyses with Workplace Activity Limitations Scale (WALS) scores.

	RA (n = 294)		axSpA (n = 199)		OA (n = 173)		FM (n = 156)	
	B	p	B	p	B	p	B	p
Contextual factors: Personal factors:								
Age	−0.04[a]	0.33	0.005[a]	0.91	−0.25[a]	<0.001[c]	−0.17[a]	0.70
Sex (female)	1.10[a]	0.17	2.03[a]	0.02[c]	2.81[a]	0.002[c]	1.77[a]	0.32
Living situation (alone)	0.88[a]	0.34	−0.80[a]	0.55	0.07[a]	0.96	−0.31	0.83
Education level	0.09[a]	0.72	−0.30[a]	0.32	0.09[a]	0.76	−0.09[a]	0.79
Comorbidities (RDCI)	1.06	<0.001	1.00	0.003	0.86[a]	0.01	0.59[a]	0.04
Functioning and disability factors:								
Perceived health status	4.49	<0.001[c]	4.67[a]	<0.001[c]	4.06[a]	<0.001[c]	3.35[a]	<0.001[c]
Pain	1.32[a]	<0.001[c]	1.05[a]	<0.001[c]	1.63[a]	<0.001[c]	1.35[a]	<0.001[c]
Fatigue	1.30[a]	<0.001[c]	1.19[a]	<0.001[c]	1.16[a]	<0.001[c]	0.84[a]	<0.001[c]
No. Joints affected	0.61	<0.001[d]	0.71	<0.001[d]	0.39[a]	<0.001	0.22	0.10
Mood	1.07[a]	<0.001[c]	1.31[a]	<0.001[c]	1.08[a]	<0.001[c]	0.73[a]	<0.001[c]
Anxiety/Job strain (LTCJSS)	0.28[a]	<0.001[c]	0.29[a]	<0.001[c]	0.27[a]	<0.001[c]	0.26[a]	<0.001[c]
Mental-interpersonal demands (WLQ-25)	0.19[a]	<0.001[c]	0.22	<0.001[d]	0.16[a]	<0.001[c]	0.15[a]	<0.001[c]
Work-health- personal life perceptions scale:								
- Condition negatively affects work (part 1)	0.58[a]	<0.001[c]	0.55	<0.001[d]	0.55	<0.001[d]	0.74[a]	<0.001[c]
- Work/personal life negatively affects condition (part 2)	0.41[a]	<0.001[c]	0.54	<0.001[d]	0.39	<0.001[d]	0.44[a]	<0.001[c]
RA/IA measures:								
RAID	1.77[a]	<0.001[b]	-		-		-	
HAQ20	0.44[a]	<0.001[c]	-		-		-	
MAPHAND	0.42[a]	<0.001[b]	-		-		-	
axSpA measures:								
BASDAI	-		1.57[a]	<0.001[b]	-		-	
BASFI	-		1.80[a]	<0.001[c]	-		-	
OA measures:								
WOMAC pain					0.81[a]	<0.001[c]		
WOMAC physical function	-		-		0.25[a]	<0.001[c]	-	
FM measures:								
FIQR symptoms	-		-		-		0.39[a]	<0.001[c]
FIQR function	-		-		-		0.50[a]	<0.001[c]
Contextual factors: Work-related personal factors:								
Work self-efficacy	−1.48[a]	<0.001[c]	−1.46[a]	<0.001[c]	−1.47	<0.001[d]	−0.97[a]	<0.001[c]
Motivation to continue to work	0.70	<0.001[d]	−0.80	<0.001[d]	−0.85	<0.001[d]	−0.47[a]	0.003
Importance of continuing to work	−0.27[a]	0.10	−0.47[a]	0.05	−0.69	0.002	−0.43	0.09
Job satisfaction	−0.48[a]	<0.001	−0.05	0.38	−0.69	<0.001[d]	−0.49	0.003
Disclosure:								
- Employer	2.35[a]	0.09	0.03	0.93	−0.07[a]	0.86	2.34[a]	0.25
- Co-workers	0.76[a]	0.005	−0.03	0.005	0.81[a]	0.004	0.67[a]	0.06

TABLE 5 (Continued)

	RA (n = 294)		axSpA (n = 199)		OA (n = 173)		FM (n = 156)	
	B	p	B	p	B	p	B	p
Work-related environmental factors:								
Hours worked	−0.01[a]	0.66	−0.07[a]	0.10	−0.07	0.07	−0.02[a]	0.95
Organization size	0.20	0.41	0.18[a]	0.53	−0.001	0.99	−0.19	0.57
Job skill level	0.34	0.35	−0.69	0.13	0.51	0.29	−0.13	0.79
Physical job demands	0.61[a]	0.02	1.04[a]	0.001	0.97[a]	0.003	0.45[a]	0.16
Control over work	−0.73[a]	0.002	−0.81[a]	0.003	−1.04	<0.001	−0.49[a]	0.12
Perceived workplace support:								
- Manager	−0.32[a]	0.001	−0.68[a]	<0.001[c]	−0.25[a]	0.03	−0.40[a]	<0.001[c]
- Co-workers	−0.21[a]	0.001	−0.32[a]	<0.001[c]	−0.12[a]	0.10	−0.21[a]	0.001
- Organization	−0.17	0.005	−0.37	<0.001[d]	−0.23	0.001	−0.26[a]	<0.001[c]
WABPPS:								
- no. job accommodations needed	0.69[a]	<0.001[c]	0.81[a]	<0.001[c]	0.75[a]	<0.001[c]	0.42[a]	<0.001[c]

Abbreviations: axSpA, axial spondyloarthritis; BASDAI, Bath Ankylosing Spondylitis Disease Activity Index; BASFI, Bath Ankylosing Spondylitis Function Index; FM, fibromyalgia; FIQR, Revised Fibromyalgia Impact Questionnaire; HAQ20, Health Assessment Questionnaire (score includes all 20 items); LTCJSS, Long Term Conditions Job Strain Scale; MAPHAND, Measure of Activity Performance of the Hand; OA, osteoarthritis; RA, rheumatoid arthritis; RAID, RA Impact of Disease; RDCI, Rheumatic Diseases Comorbidity Index; WOMAC, Western Ontario McMaster Arthritis Index; WABBPS, Work Accommodations, Benefits, Policies and Practices Scale; WLQ-25, Work Limitations Questionnaire-25.

[a]variable identified in literature review, for specified condition, as associated with work participation

[b]variable not meeting selection criteria for multivariable regression analyses due to multicollinearity

[c]variable meeting selection criteria for first multivariable regression model (i.e., from condition-specific literature review: RA = 10; axSp = 11; OA = 10; FM = 14 variables).

[d]variable additionally meeting selection criteria for second multivariable regression model (i.e., from the 33 factors identified from the cross-condition literature review: RA = 3; axSpA = 6; OA = 5; FM = 0).

been identified previously as the strongest disease-related predictor of adverse work outcomes (Boonen et al., 2023). Other factors significantly associated varied between conditions: greater job strain and need for work accommodations (RA, axSpA, OA); poorer work – life balance (RA, OA, FM); greater pain (OA, FM); greater mental-interpersonal job demands (RA, OA); lower perceived work support (axSpA, FM); worse perceived health (axSpA) and poorer work self-efficacy (OA). These factors are all modifiable by non-pharmacological (physical, psychological, and social) work-related interventions, supported by active engagement of employers (if willing to do so) alongside effective medication regimens. As well as function, some presenteeism studies, in the UK, South America and Italy, have identified different associated factors to this study: in RA and axSpA/AS, older age, being female, greater fatigue, and worse disease activity (Druce et al., 2018; Gwinnutt et al., 2020; McFarlane et al., 2019; Xavier et al., 2019); and in FM, worse FIQR symptom score (Salaffi et al., 2011). In these studies, work contextual factors were not included, yet these are essential to consider (Boonen et al., 2023), as without these important factors can be missed. Most of these studies analysed data derived from drug registries or trials, limiting the factors available to include.

Other studies conducted in the Netherlands, Belgium, and Australia have included work contextual factors in multivariable analyses. Some did not use a model to guide factor selection (RA: van Vilsteren et al., 2015; Boot et al., 2018), whilst others have (axSpA/AS: Boonen et al., 2015; Boonen et al., 2018; OA, Agaliotis et al., 2017; Hermans et al., 2012). Amongst these studies, factors associated with greater presenteeism were: in RA, worse function and health, poorer mental health, poor job satisfaction, having used a biologic, and greater work instability (Boot et al., 2018; van Vilsteren et al., 2015); in AS, worse function and health, being female, poorer job control, less co-worker support and manual work (Boonen et al., 2015, 2018). For OA, this was greater pain, higher number of joints affected by OA, physically demanding work, and job insecurity (Agaliotis et al., 2017; Hermans et al., 2012). To our knowledge, no presenteeism studies in FM have included work contextual factors. In this study, a wider range of contextual factors were included, compared to previous presenteeism in RMD studies, likely explaining differences in findings. Research in general working populations have similarly identified that greater job strain, poorer work-life balance and poor workplace support are significantly associated with presenteeism (Bevan & Cooper, 2022; McGregor et al., 2018; Pit & Hansen, 2016; Rainbow et al., 2021). This study highlights that factors associated with presenteeism in RMDs have similarities to factors affecting the general working population, as well as condition-specific factors. Accordingly, as well as condition-specific vocational

TABLE 6 Multivariable regression analyses for factors associated with workplace activity limitations.

	B (95% CI)	SE B	β	*p*
RA (n = 294)				
Constant	0.49 (−0.70, 1.69)	0.61		0.42
Physical function (HAQ20)	0.25 (0.20, 0.29)	0.02	0.43	<0.001
Mental-interpersonal demands: (WLQ-25)	0.06 (0.03, 0.08)	0.01	0.20	<0.001
Job strain (LTCJSS)	0.07 (0.02, 0.11)	0.02	0.17	0.003
Work-life balance: (WHPLPS (1): Condition negatively affects work)	0.14 (0.05, 0.23)	0.05	0.17	0.002
No. Work accommodations needed (WABPPS)	0.13 (0.02, 0.23)	0.06	0.09	0.02
$R^2 = 0.72$; $F = 132.36$; df = 5; $p < 0.001$				
axSpA (n = 199)				
Constant	0.34 (−1.82, 2.49)	1.09		0.76
Physical function (BASFI)	0.86 (0.58, 1.13)	0.14	0.37	<0.001
Job strain (LTCJSS)	0.13 (0.08. 0.18)	0.02	0.33	<0.001
No. Work accommodations needed (WABPPS)	0.24 (0.10, 0.39)	0.07	0.17	<0 0.001
Perceived workplace support- manager	−0.17 (−0.30, −0.04)	0.07	−0.12	0.01
Perceived health status	0.87 (0.11, 1.62)	0.38	0.13	0.03
$R^2 = 0.78$; $F = 106.38$; df = 5; $p < 0.001$				
OA (n = 173): Condition-specific review factors				
Constant	0.22 (−1.36, 1.81)	0.80		0.78
Physical function (WOMAC)	0.41 (0.25, 0.58)	0.08	0.28	<0.001
Job strain (LTCJSS)	0.14 (0.09, 0.19)	0.03	0.36	<0.001
Mental-interpersonal demands: WLQ-25	0.05 (0.02,0.09)	0.02	0.20	0.002
No. Work accommodations needed (WABPPS)	0.26 (0.09,0.43)	0.09	0.17	0.003
$R^2 = 0.62$; $F = 64.20$; df = 4; $p < 0.001$				
OA (n = 173): Cross-condition review factors				
Constant	3.78 (0.35, 7.22)	1.74		0.31
Pain	0.73 (0.43, 1.04)	0.15	0.25	<0.001
Work self-efficacy	−0.52 (−0.81, −0.24)	0.14	−0.20	<0.001
Job strain (LTCJSS)	0.10 (0.04, 0.17)	0.03	0.27	0.002
No. Work accommodations needed (WABPPS)	0.26 (0.11, 0.42)	0.08	0.17	0.001
Work-life balance: (WHPLPS (1): Condition negatively affects work)	0.16 (0.04, 0.28)	0.06	0.20	0.01
$R^2 = 0.67$; $F = 65.08$; df = 5; $p < 0.001$				
FM (n = 156)				
Constant	−3.41 (−7.53, 0.71)	2.08		0.10
Work-life balance: (WHPLPS (1): Condition negatively affects work)	0.47 (0.33, 0.61)	0.07	0.44	<0.001
Pain	0.51 (0.13, 0.88)	0.19	0.18	0.01
Physical function (FIQR)	0.21 (0.09. 0.34)	0.06	0.25	0.001
Perceived workplace support- organization	−0.10 (−0.20, −0.01)	0.05	−0.13	0.03
$R^2 = 0.57$; $F = 46.05$; df = 4; $p < 0.001$				

Abbreviations: axSpA = axial spondyloarthritis; BASFI = Bath Ankylosing Spondylitis Function Index; FM = fibromyalgia.; FIQR = Revised Fibromyalgia Impact Questionnaire; HAQ20 = Health Assessment Questionnaire (score includes all 20 items); LTCJSS = Long Term Conditions Job Strain Scale; OA = osteoarthritis; RA = rheumatoid arthritis; WABBPS = Work Accommodations, Benefits, Policies and Practices Scale; WHPLPS = Work Health Personal Life Perceptions Scale; WLQ-25 = Work Limitations Questionnaire-25; WOMAC = Western Ontario McMaster Arthritis Index.

rehabilitation and support, working people with RMD of course benefit from healthy workplace practices, for example, flexible working, home or hybrid working, shorter working weeks, effective line management practices, which reduce presenteeism in the general working population (Bevan & Cooper, 2022).

4.1 | Limitations

This was a cross-sectional study and so limits examining causality, for which longitudinal studies are needed. Participants were identified in community and hospital out-patient clinics so cannot be considered representative of all with these conditions. Additionally, consecutive sampling was not used, as recruitment was dependent on research nurse/facilitator and therapy staff availability. Study information emphasized those with no or few work problems were eligible, but potentially this group may have self-selected out of the study. Very few men with FM could be recruited. The WORK-PROM study was primarily designed to evaluate measures' psychometrics, not to comprehensively evaluate factors affecting presenteeism. The literature review identified a number of potentially important variables were not included. Further work by the OWPG has identified important contextual factors to include in studies, such as compensation for absence, income needs and family support (Boonen et al., 2021)).

4.2 | Conclusion

This study extends understanding of the work limitations experienced by working people with RA, axSpA, OA and FM, as previously these had only been investigated using the WALS in RA and OA in Canada and South America (Gignac et al., 2011; Xavier et al., 2019). It also provides insight into the limited extent of help and adaptations being received, and the need for more work accommodation support for specific limitations. In this study, half to two-thirds of participants had moderate to high work instability, emphasizing the need for health professionals to routinely ask about work and actively screen employed patients, even if they have 'mild' functional difficulties. This was not a community-based study, meaning generalisability to all with these four conditions is unclear. However, as recruitment was from therapy and out-patient clinics, findings are more likely generalisable to working people with RA, axSpA, OA and FM that health professionals are treating. Early identification of people with RMD experiencing work difficulties is essential, and should be followed by tailored work support, using a biopsychosocial approach, focussing on improving function, symptom self-management at work (physical and cognitive), work accommodations, job stress, work-life balance, and employer liaison. Health professionals need to play an active role in initiating such support (Boonen et al., 2023). In particular, the high levels of work limitations found in FM suggest most working people with FM being treated in out-patient clinics and therapy departments are likely to need work support.

This study identified personal, functioning and disability, and work-personal and environmental contextual factors associated with presenteeism, with similarities and differences between conditions. The inclusion of a wider range of work contextual factors than previous studies has extended understanding of influences on work limitations. Presenteeism is known to be a precursor to future work disability (Boonen et al., 2023; McFarlane et al., 2019). Accordingly, identifying work limitations and factors associated with presenteeism can assist identifying the focus of work interventions to help keep people with RMD in work, as well as the need for employers to adopt and extend healthy workplace practices for all.

AUTHOR CONTRIBUTIONS

Alison Hammond, Tamara Brown, Angela Ching, and Jennifer Parker conceived the study. Alison Hammond and Tamara Brown led the study. Angela Ching, Jennifer Parker, and Alison Hammond conducted the original data collection. Tamara Brown, Angela Ching and Alison Hammond conducted the literature search, data extraction and all authors contributed to the literature review. Alison Hammond conducted analyses and all authors interpreted results. Tamara Brown and Alison Hammond completed the first draft of the manuscript. All authors contributed to, read, and approved the final manuscript.

ACKNOWLEDGEMENTS

We would like to thank Dr Alex Clarke-Cornwell (University of Salford) for commenting on the statistical analysis and results sections of the article.

Data used in this article were collected during the WORK PROM study, part-supported by the European Alliance of Associations for Rheumatology (EULAR) grant number HPR035; with NHS service support costs secured from the NIHR Comprehensive Local Research Network.

CONFLICT OF INTEREST

The authors have no conflicts of interest to report.

DATA AVAILABILITY STATEMENT

The data underlying this article will be shared on reasonable request to AH. All data relevant to the study are included in the article.

ETHICS STATEMENT

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the National Research Ethics Service Committee East Midlands – Leicester South (17/EM/0409: date 16/11/2017) and the University of Salford's School of Health Sciences Ethics Panel (HSR1617-89: date 22/02/2017), including for secondary analysis. All participants provided informed, written consent for the WORK PROM study.

ORCID

Tamara Brown https://orcid.org/0000-0003-1069-4627
Alison Hammond https://orcid.org/0000-0002-5266-9991

Angela Ching https://orcid.org/0000-0002-3765-2534
Jennifer Parker https://orcid.org/0000-0002-2235-5748

REFERENCES

Agaliotis, M., Mackey, M. G., Heard, R., Jan, S., & Fransen, M. (2017). Personal and workplace environmental factors associated with reduced worker productivity among older workers with chronic knee pain: A cross-sectional survey. *Journal of Occupational and Environmental Medicine*, *59*(4), e24–e34. https://doi.org/10.1097/JOM.0000000000001000

Agaliotis, M., Mackey, M. G., Jan, S., & Fransen, M. (2018). Perceptions of working with chronic knee pain: A qualitative study. *Work*, *61*(3), 379–390. https://doi.org/10.3233/WOR-182817

Almutairi, K., Nossent, J., Preen, D., Keen, H., & Inderjeeth, C. (2021). The global prevalence of rheumatoid arthritis: A meta-analysis based on a systematic review. *Rheumatology International*, *41*(5), 863–877. https://doi.org/10.1007/s00296-020-04731-0

Beaton, D. E., Dyer, S., Boonen, A., Verstappen, S. M. M., Escorpizo, R., Lacaille, D. V., Bosworth, A., Gignac, M. A., Leong, A., Purcaru, O., Leggett, S., Hofstetter, C., Peterson, I. F., Tang, K., Fautrel, B., Bombardier, C., & Tugwell, P. S. (2016). OMERACT filter evidence supporting the measurement of at-work productivity loss as an outcome measure in rheumatology research. *Journal of Rheumatology*, *43*(1), 214–222. https://doi.org/10.3899/jrheum.141077

Bellamy, N., Buchanan, W. W., Goldsmith, C. H., Campbell, J., & Stitt, L. W. (1988). 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. *Journal of Rheumatology*, *15*, 833–840.

Bennett, R. M., Friend, R., Jones, K. D., Ward, R., Han, B. K., & Ross, R. L. (2009). The revised fibromyalgia impact questionnaire (FIQR): Validation and psychometric properties. *Arthritis Research and Therapy*, *11*(4), R120. https://doi.org/10.1186/ar2783

Bevan, S., & Cooper, C. L. (2022). *The healthy workforce: Enhancing wellbeing and productivity in the workers of the future*. Emerald Publishing Company.

Bevan, S., Quadrello, T., & McGee, R. (2013). *Reducing temporary work absence through early intervention: The case of MSDs in the EU*. The Work Foundation.

Boonen, A., Boone, C., Albert, A., & Mielants, H. (2015). Understanding limitations in at-work productivity in patients with active ankylosing spondylitis: The role of work-related contextual factors. *Journal of Rheumatology*, *42*(1), 93–100. https://doi.org/10.3899/jrheum.131287

Boonen, A., Boone, C., Albert, A., & Mielants, H. (2018). Contextual factors influence work outcomes in employed patients with ankylosing spondylitis starting etanercept: 2-year results from AS@work. *Rheumatology*, *57*(5), 791–797. https://doi.org/10.1093/rheumatology/kex476

Boonen, A., Putrik, P., Marques, M. L., Alunno, A., Abasolos, L., Beaton, D., Betteridge, N., Bjork, M., Boers, M., Boteva, B., Fautrel, B., Guillemin, F., Mateus, E. F., Nikiphorou, E., Pentek, M., Pimentel Santos, F., Severens, J. L., Verstappen, S. M. M., Walker-Bone, K., & Ramiro, S. (2021). EULAR Points to Consider (PtC) for designing, analysing, and reporting of studies with work participation as an outcome domain in patients with inflammatory arthritis. *Annals of the Rheumatic Diseases*, *80*(9), 1116–1123. https://doi.org/10.1136/annrheumdis-2020-219523

Boonen, A., Webers, C., Butink, M., Barten, B., Betteridge, N., Black, C., Bremander, A., Boteva, B., Brzezinska, O., Chauhan, L., Copsey, S., Guimaraes, V., Gignac, M., Glaysher, J., Green, F., Hoving, J. L., Marques, M. L., Smucrova, H., Stamm, T. A., & Verstappen, S. M. M. (2023). EULAR points to consider to support people with rheumatic and musculoskeletal diseases to participate in healthy and sustainable paid work. *Annals of the Rheumatic Diseases*, *82*(1), 57–64. https://doi.org/10.1136/ard-2022-222678

Boot, C. R. L., de Wind, A., van Vilsteren, M., van der Beek, A. J., van Schaardenburg, D., & Anema, J. R. ((2018). One-year predictors of presenteeism in workers with rheumatoid arthritis: Disease-related factors and characteristics of general health and work. *Journal of Rheumatology*, *45*(6), 766–770. https://doi.org/10.3899/jrheum.170586

Calin, A., Garrett, S., Whitelock, H., Kennedy, L. G., O'Hea, J., Mallory, P., & Jenkinson, T. (1994). A new approach to defining functional ability in ankylosing spondylitis: The development of the Bath Ankylosing Spondylitis Functional Index (BASFI). *Journal of Rheumatology*, *21*, 2281–2285.

Centre for Ageing Better. (2022). The state of ageing 2022: Summary. Retrieved from https://ageing-better.org.uk/sites/default/files/2022-04/The-State-of-Ageing-2022-online.pdf

Cieza, A., Geyh, S., Chatterji, S., Kostansjeck, N., Ustun, B., & Stucki, G. (2005). ICF linking rules: An update based on lessons learnt. *Journal of Rehabilitation Medicine*, *37*(4), 212–218. https://doi.org/10.1080/16501970510040263

Department of Work & Pensions (2017). State pension age timetable. Retrieved from https://www.gov.uk/government/news/proposed-new-timetable-for-state-pension-age-increases

Department of Work and Pensions, Department of Health & Social Care. (2017). Improving lives: The future of health, work and disability. Retrieved from https://www.gov.uk/government/publications/improving-lives-the-future-of-work-health-and-disability

Druce, K. L., Aikman, L., Dilleen, M., Burden, A., Szczypa, P., & Basu, N. (2018). Fatigue independently predicts different work disability dimensions in etanercept treated rheumatoid arthritis and ankylosing spondylitis patients. *Arthritis Research and Therapy*, *20*(1), 96. https://doi.org/10.1186/s13075-018-1598-8

England, B. R., Sayles, H., Mikuls, T. R., Johnson, D. S., & Michaud, K. (2015). Validation of the rheumatic disease comorbidity Index. *Arthritis Care & Research*, *67*(6), 865–872. https://doi.org/10.1002/acr.22456

Evans, J. D. (1996). *Straightforward statistics for the behavioural sciences*. Brooks/Cole Publishing.

Field, A. (2013). Ch. 8: Regression. In *Discovering Statistics using IBM SPSS Statistics* (4th ed., pp. 293–356). Sage.

Garrett, S., Jenkinson, T., Kennedy, L. J., Whitelock, H., Gaisford, P., & Calin, A. (1994). A new approach to defining disease status in ankylosing spondylitis: The Bath ankylosing spondylitis disease activity Index (BASDAI). *Journal of Rheumatology*, *21*, 2286–2291.

Gignac, M. A. M. (2005). Arthritis and employment: An examination of behavioral coping efforts to manage workplace activity limitations. *Arthritis Care & Research*, *53*(3), 328–336. https://doi.org/10.1002/art.21169

Gignac, M. A. M., & Cao, X. (2009). Should I tell my employer and Co-workers I have arthritis?" A longitudinal examination of self-disclosure in the workplace. *Arthritis Care & Research*, *61*(12), 1753–1761. https://doi.org/10.1002/art.24889

Gignac, M. A. M., Ibrahim, S., Smith, P. M., Kristman, V., Beaton, D. E., & Mustard, C. A. (2018). The role of sex, gender, health factors and job context in workplace accommodations use among men and women with arthritis. *Annals of Work Exposure and Health*, *62*(4), 490–504. https://doi.org/10.1093/annweh/wxx115

Gignac, M. A. M., Lacaille, D., Beaton, D. E., Backman, C. L., Cao, X., & Badley, E. M. (2014). Striking a balance: Work- life- personal health conflict in women and men with arthritis and its association with work outcomes. *Journal of Occupational Rehabilitation*, *24*(3), 573–584. https://doi.org/10.1007/s10926-013-9490-5

Gignac, M. A. M., Sutton, D., & Badley, E. M. (2007). Arthritis symptoms, the work environment, and the future: Measuring perceived job strain among employed persons with arthritis. *Arthritis Care & Research*, *57*(5), 738–747. https://doi.org/10.1002/art.22788

Gignac, M., Cao, X., Tang, K., & Beaton, D. E. (2011). Examination of arthritis-related workplace activity limitations and intermittent disability over four-and-a-half years and its relationship to job modifications and outcome. *Arthritis Care & Research*, *63*(7), 953–962. https://doi.org/10.1002/acr.20456

Gilworth, G., Chamberlain, A., Harvey, A., Woodhouse, A., Smith, J., Smith, G., & Tennant, A. (2003). A. Development of a work instability scale for rheumatoid arthritis. *Arthritis & Rheumatism*, *49*(3), 349–354. https://doi.org/10.1002/art.11114

Gossec, L., Paternotte, S., Aanerud, G. J., Balanescu, A., Boumpas, D. T., Carmona, L., de Wit, M., Dijkmans, B. A. C., Dougados, M., Englbrecht, M., Gogus, F., Heiberg, T., Hernandez, C., Kirwan, J. R., Mola, E. M., Cerinic, M. M., Otsa, K., Schett, G., Scholte-Voshaar, M., & Kvien, T. K. (2011). Finalisation and validation of the rheumatoid arthritis impact of disease score, a patient derived composite measure of impact of rheumatoid arthritis: A EULAR initiative. *Annals of the Rheumatic Diseases*, *70*(6), 935–942. https://doi.org/10.1136/ard.2010.142901

Guymer, E. K., Littlejohn, G. O., Brand, C. K., & Kwiatek, R. A. (2016). Fibromyalgia onset has a high impact on work ability in Australians. *Internal Medicine Journal*, *46*(9), 997–1119. https://doi.org/10.1111/imj.13135

Gwinnutt, J. M., Leggett, S., Lunt, M., Barton, A., Hyrich, K. L., Walker-Bone, K., & Verstappen, S. M. M., & RAMS and BRAGGSS co-investigators. (2020). Predictors of presenteeism, absenteeism and job loss in patients commencing methotrexate or biologic therapy for rheumatoid arthritis. *Rheumatology*, *59*(10), 2908–2919. https://doi.org/10.1093/rheumatology/keaa027

Hammond, A., Tennant, A., Ching, A., Parker, J., Prior, Y., Gignac, M., Verstappen, S., & O'Brien, R. (2023). Psychometric testing of the British-English Workplace Activity Limitations Scale in four rheumatic and musculoskeletal conditions. *Rheumatology Advances in Practice*. (in press). https://doi.org/10.1093/rap/rkad028

Hammond, A., Tennant, A., Prior, Y., & Gignac, M. A. M. (2023). *Work – PROM manual: British English versions of the: Workplace activity limitations scale (options 1 and 2); long term conditions job strain scale; work-health-personal life Perceptions scale; arthritis work spillover scale; perceived work support scale; work accommodations, benefits, policies and practices scale; and work transitions Index (v.1). Salford*. University of Salford. Retrieved from: https://usir.salford.ac.uk/view/authors/10108. (search Monographs).

Heerkens, J. F., de Brouwer, C. P. M., Engels, J. A., van der Gulden, J. W. J., & Kant, I. (2017). Elaboration of the contextual factors of the ICF for occupational health care. *Work*, *57*(2), 187–204. https://doi.org/10.3233/WOR-172546

Heidari, F., Afshari, M., & Moosazadeh, M. (2017). Prevalence of fibromyalgia in general population and patients, a systematic review and meta-analysis. *Rheumatology International*, *37*(9), 1527–1539. https://doi.org/10.1007/s00296-017-3725-2

Hermans, J., Koopmanschap, M. A., Bierma-Zeinstra, S. M. A., van Linge, J. H., Verhaar, J. A. N., Reijman, M., & Burdorf, A. (2012). Productivity costs and medical costs among working patients with knee osteoarthritis. *Arthritis Care & Research*, *64*(6), 853–861. https://doi.org/10.1002/acr.21617

IBM Corp. (2019). *IBM SPSS statistics for windows, version 26.0*. IBM Corp

Kirwan, J. R., & Reeback, J. S. (1986). Stanford Health Assessment Questionnaire modified to assess disability in British patients with rheumatoid arthritis. *British Journal of Rheumatology*, *25*(2), 26–29. https://doi.org/10.1093/rheumatology/25.2.206

Lerner, D., Amick, B. C., Rogers, W. H., Malspeis, S., Bungay, K., & Cynn, D. (2001). The work limitations questionnaire. *Medical Care*, *39*(1), 72–85. https://doi.org/10.1097/00005650-200101000-00009

Long, H., Liu, Q., Yin, H., Wang, K., Diao, N., Zhang, Y., Lin, J., & Guo, A. (2022). Prevalence trends of site-specific osteoarthritis from 1990 to 2019: Findings from the global burden of disease study 2019. *Arthritis & Rheumatology*, *74*(7), 1172–1183. https://doi.org/10.1002/art.42089

Macfarlane, G. J., Shim, J., Jones, G. T., Walker-Bone, K., Pathan, E., & Dean, L. E. (2019). Identifying persons with axial spondyloarthritis at risk of poor work outcome: Results from the British society for rheumatology biologics register. *Journal of Rheumatology*, *46*(2), 145–152. https://doi.org/10.3899/jrheum.180477

McGregor, A., Ashbury, F., Caputi, P., & Iverson, D. (2018). A preliminary investigation of health and work-environment factors on presenteeism in the workplace. *Journal of Occupational and Environmental Medicine*, *60*(12), e671–e678. https://doi.org/10.1097/JOM.0000000000001480

Office for National Statistics. (2010). Standard occupational classification. Retrieved from: https://www.ons.gov.uk/methodology/classificationsandstandards/standardoccupationalclassificationsoc/soc2010

Pit, S. W., & Hansen, V. (2016). The relationship between lifestyle, occupational health, and work-related factors with presenteeism amongst general practitioners. *Archives of Environmental & Occupational Health*, *71*(1), 49–56. https://doi.org/10.1080/19338244.2014.998329

Prior, Y., Tennant, A., Tyson, S., Kjeken, I., & Hammond, A. (2018). Measure of Activity Performance in the Hand (MAP-Hand) questionnaire: Linguistic validation, cultural adaptation and psychometric testing in people with Rheumatoid Arthritis in the UK. *BMC Musculoskeletal Disorders*, *19*(1), 275. https://doi.org/10.1186/s12891-018-2177-5

Rainbow, J. G., Gilbreath, B., & Steege, L. (2021). Risky business: A mediated model of antecedents and consequences of presenteeism in nursing. *Nursing Research*, *70*(2), 85–94. https://doi.org/10.1097/NNR.0000000000000484

Salaffi, F., Di Carlo, M., Farah, S., Mariani, C., Fulginei, S., Martino, G. P., & Sarzi-Puttini, P. (2022).A cross-sectional research on female workers examining the loss of productivity caused by mild, moderate, and severe fibromyalgia. *Clinical & Experimental Rheumatology*, *40*, 1151–1158. https://doi.org/10.55563/clinexprheumatol/hut4ft

Stolwijk, C., van Onna, M., Boonen, A., & Tubergen, A. ((2016). Global prevalence of spondyloarthritis; A systematic review and meta-regression analysis. *Arthritis Care & Research*, *68*(9), 1320–1331. https://doi.org/10.1002/acr.22831

van Vilsteren, M., Boot, C. L. R., Knol, D. L., van Schaardenburg, D., Voskuyl, A. E., Steenbeek, R., & Anema, J. R. (2015). Productivity at work and quality of life in patients with rheumatoid arthritis. *BMC Musculoskeletal Disorders*, *16*(1), 107. https://doi.org/10.1186/s12891-015-0562-x

Verstappen, S. M. M., Lacaille, D., Boonen, A., Escorpizo, R., Hofstetter, C., Bosworth, A., Leong, A., Leggett, S., Gignac, M. A., Wallman, J. K., Ter Wee, M. M., Berghea, F., Agaliotis, M., Tugwell, P., & Beaton, D. (2019). Considerations for evaluating and recommending worker productivity outcome measures: An update from the OMERACT worker productivity group. *Journal of Rheumatology*, *46*(10), 1401–1405. https://doi.org/10.3899/jrheum.181201

Versus Arthritis. (2021). The State of Musculoskeletal Health 2021 Arthritis and other musculoskeletal conditions in numbers. Retrieved from https://www.versusarthritis.org/about-arthritis/data-and-statistics/the-state-of-musculoskeletal-health/

Von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., Gøtzsche, P. C., & Vandenbroucke, J. P. (2007). The strengthening the reporting of observational studies in Epidemiology (STROBE) statement: Guidelines for reporting observational studies. *British Medical Journal*, *335*, 806–808. https://doi.org/10.1136/bmj.39335.541782

Wolfe, F. (2001). Which HAQ is best? A comparison of the HAQ, mhaq and RA-HAQ, a difficult 8 item HAQ (DHAQ), and a rescored 20 item HAQ (HAQ20): Analyses in 2491 rheumatoid arthritis patients following leflunomide initiation. *Journal of Rheumatology*, *28*, 982–989.

World Health Organization. (2001). *International classification of functioning, disability and health: ICF*. World Health Organization. Retrieved from: https://apps.who.int/iris/handle/10665/42407

Xavier, R. M., Zerbini, C. A. F., Pollak, D. F., Morales-Torres, J. L. A., Chalem, P., Restrepo, J. F. M., Duhau, J. A., Amado, J. R., Abello, M., de la Vega, M. C., Davila, A. P., Biegun, P. M., Arruda, M. S., & Ramos-Remus, C. (2019). Burden of rheumatoid arthritis on patients' work productivity and quality of life. *Advances in Rheumatology*, *59*(1), 47. https://doi.org/10.1186/s42358-019-0090-8

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Brown, T., Hammond, A., Ching, A., & Parker, J. (2023). Work limitations and associated factors in rheumatoid arthritis, axial spondyloarthritis, osteoarthritis and fibromyalgia. *Musculoskeletal Care*, 1–18. https://doi.org/10.1002/msc.1760