Psychometric testing of the British-English perceived workplace support scale, work accommodations, benefits, policies and practices scale, and work transitions index in four rheumatic and musculoskeletal conditions

HAMMOND, Alison, TENNANT, Alan, CHING, Angela, PARKER, Jennifer, PRIOR, Yeliz, GIGNAC, Monique A.M., VERSTAPPEN, Suzanne M.M. and O'BRIEN, Rachel <http://orcid.org/0000-0002-4720-1956>

Received: 14 July 2023 | Revised: 3 August 2023 | Accepted: 3 August 2023

DOI: 10.1002/msc.1807

WILEY

RESEARCH ARTICLE

Psychometric testing of the British-English Perceived Workplace Support Scale, Work Accommodations, Benefits, Policies and Practices Scale, and Work Transitions Index in four rheumatic and musculoskeletal conditions

Alison Hammond[1] | Alan Tennant[2] | Angela Ching[1,3] | Jennifer Parker[1] | Yeliz Prior[1] | Monique A. M. Gignac[4,5] | Suzanne M. M. Verstappen[6,7,8] | Rachel O'Brien[9]

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

[2]Leeds Institute of Rheumatic and Musculoskeletal Medicine, University of Leeds, Leeds, UK

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

[4]Institute of Work and Health, Toronto, Ontario, Canada

[5]Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario, Canada

[6]Centre for Epidemiology Versus Arthritis, Centre for Musculoskeletal Research, Faculty of Biology, Medicine and Health, University of Manchester, Manchester, UK

[7]Manchester Academic Health Science Centre, Manchester, UK

[8]NIHR Manchester Biomedical Research Centre, Manchester University NHS Foundation Trust, Manchester, UK

[9]College of Health, Well Being and Life Sciences, Sheffield Hallam University, Sheffield, UK

Correspondence

Alison Hammond, Centre for Human Movement and Rehabilitation, School of Health and Society, Allerton, University of Salford, Frederick Road, Salford M6 6PU, UK.
Email: a.hammond@salford.ac.uk

Funding information

European League Against Rheumatism, Grant/Award Number: HPR035

Abstract

Objective: The aims were to validate linguistically British-English versions of the Perceived Workplace Support Scale (PWSS), Work Accommodations, Benefits, Policies and Practices Scale (WABPPS), and Work Transitions Index (WTI) in rheumatoid arthritis (RA), axial spondyloarthritis (axSpA), osteoarthritis (OA) and fibromyalgia (FM).

Methods: The three scales were adapted into British-English and reviewed by an expert panel prior to cognitive debriefing interviews. Participants completed postal questionnaires. Construct validity for the PWSS was assessed using Rasch analysis. Concurrent validity included testing between the three scales and work, job strain and work-life balance scales. Two weeks later, participants were mailed a second questionnaire to measure test-retest reliability.

Results: The questionnaire was completed by 831 employed participants: 68% women, 53.50 (SD 8.9) years of age, with condition duration 7.70 (SD 8.00) years. The PWSS satisfied Rasch model requirements. Concurrent validity was mostly as hypothesised, that is, weak to moderate negative correlations for the PWSS (r_s = 0.07 to −0.61), and weak to moderate positive correlations for the WABPPS and WTI (r_s = 0.20–0.52). Some correlations were stronger, mostly in axSpA. Internal consistency (Cronbach's alpha) for all three scales was consistent with group use in all conditions. Test-retest reliability was generally excellent, with intraclass coefficients (2,1) of 0.80–0.93 for the three scales in the four conditions.

Discussion: Reliable, valid versions of the British-English PWSS, WABPPS, and WTI are now available for use in research, organisational level studies and vocational rehabilitation.

KEYWORDS
arthritis, contextual factors, musculoskeletal, patient reported outcomes, work, work rehabilitation

1 | INTRODUCTION

Work ability of people with rheumatic and musculoskeletal diseases (RMDs) can be affected by a wide range of functioning and disability, personal, and work-related personal and environmental contextual factors (Boonen et al., 2023; Heerkens et al., 2017). Work-related environmental factors associated with presenteeism (i.e., reduced productivity at work) include workplace support, work accommodations (i.e., modifications to a job or work environment to enable an employee with a disability to perform their job duties) and organisational policies and practices (Boonen et al., 2021; Brown et al., 2023; Tang et al., 2011). Assessing such factors, the nature of people's work (full or part-time, self-employed, job demands), and job disruptions experienced, is important to gain a better understanding of people with RMD's ability to work (Heerkens et al., 2017; Tang et al., 2011). Patient reported outcome measures (PROM) assessing such factors, tested across a range of RMD, can help to identify how people with RMD's working environment affects work participation, plan work interventions either for individuals or organisation-wide to support ability-inclusive employment practices, and evaluate changes in outcomes following interventions.

Workplace support from managers, co-workers and employers can assist people with RMD to continue working by providing not only practical help and access to work accommodations but also accessibility-focused workplace culture, psychological support and understanding of disability-related work issues. The Perceived Workplace Support Scale (PWSS), styled on a work-family support scale, consists of three sub-scales for manager, co-worker, and organisational support. Each has excellent internal consistency in working people with inflammatory arthritis (IA), rheumatoid arthritis (RA) and osteoarthritis (OA) (Gignac & Cao, 2009; Gignac et al., 2007; Li et al., 2006). Greater manager and co-worker support were weakly, but significantly, associated with lower health-related workplace stress (Gignac & Cao, 2009; Gignac et al., 2007), and greater co-worker support with fewer job disruptions (Gignac & Cao, 2009).

The Workplace Accommodations, Benefits, Policies and Practices Scale (WABPPS) was developed through a literature review and includes work accommodations formally provided by an employer as well as informally accessed by workers (Al Dhanhani et al., 2015; Gignac et al., 2015; Jetha et al., 2021). Those with greater workplace activity limitations, and job stress are more likely to need and use work accommodations (Al Dhanhani et al., 2015; Jetha et al., 2021). The Work Transitions Index (WTI) (Part 2) asks about seven common job disruptions identified from employment literature review (Gignac et al., 2004). Those with greater job disruptions are more likely to have greater disease activity (Jetha, et al., 2015). Both the WABPPS and WTI have face validity, but no information on validity and reliability.

The three scales (PWSS, WABPPS, WTI) were developed in Canada in IA and OA and used in RMD studies in IA (primarily RA) and OA, lupus, systemic sclerosis, and juvenile arthritis (PWSS: Gignac et al., 2007, Gignac & Cao, 2009; Li et al., 2006) (WABPPS: Al Dhanhani et al., 2015; Gignac et al., 2015; Gignac, Ibrahim, Smith, et al., 2018; Gignac, Kristman, Smith, et al., 2018; Jetha, et al., 2021, 2022) (WTI: Gignac, 2005; Gignac & Cao, 2009; Gignac et al., 2008, 2011, 2014, 2015; Gignac, Ibrahim, Smith, et al., 2018; Gignac, Kristman, Smith, et al., 2018; Jetha et al., 2015; Li et al., 2006). The WABPPS included between nine and 14 items and the WTI included seven or 10 disruptions. Definitive versions were therefore requested from the developer.

As these scales were developed in Canadian English, before use in the United Kingdom (UK), they should be validated linguistically (i.e., translated and culturally adapted) into British-English (a different form of the same language) and then tested psychometrically (Acquadro et al., 2004). The aims of this study were therefore to validate linguistically, investigate content validity and evaluate the psychometrics of the British-English PWSS, WABPPS and WTI amongst working people with RA, axial spondyloarthritis (axSpA), lower limb OA and fibromyalgia (FM) in the UK. Testing should include both classical testing and item response theory (e.g., Rasch analysis) to establish psychometric properties (e.g., reliability and validity) (Mokkink et al., 2010).

2 | METHOD

2.1 | Design, participants, and recruitment procedures

The WORK-PROM study design used cross-cultural adaptation (Phase 1), followed by cross-sectional surveys to establish psychometric properties of the PWSS, WABPPS and WTI (Phase 2). The Consensus-based Standards for the selection of health Measurement Instruments (COSMIN) checklist was followed (Gagnier et al., 2021; Mokkink et al., 2010). Phase 1 occurred in 2017 and Phase 2 occurred from March 2018 to March 2020. Approval was granted by the National Research Ethics Service Committee East Midlands—Leicester South (17/EM/0409) and the University of Salford's School of Health & Society Ethics Panel (HSR1617-89). All participants provided informed, written consent.

Participants were recruited from 41 secondary care and six community National Health Service (NHS) Trusts' Rheumatology, Orthopaedic or Therapy out-patient clinics, with some from the

University of Salford's Arthritis Volunteer Register, in the UK. Participants were eligible if at least 18 years old, in paid employment at least 1 day a week, currently working, and had a primary diagnosis of RA; axSpA; lower limb OA (knee and/or hip), or FM. Diagnoses were confirmed by a rheumatologist for RA and axSpA; or a rheumatologist, orthopaedic surgeon, general practitioner, or extended scope physiotherapist for OA and FM. Participants needed to be able to read, write and understand British-English. Patients were ineligible if on long-term sick leave as some of the work outcome measures required responses about recent ability to work.

Patients were identified using these criteria in clinics (acting as Patient Identification Centres (PICs) (Health Research Authority, 2023) by a member of their healthcare team, usually a physiotherapist or occupational therapist. A member of the healthcare team could also refer the patient to an NHS research facilitator. Patients were given a short study explanation by the therapist/research facilitator, shown the study questionnaire, and asked if they would like further details. If yes, they were provided with an information pack. This included a participant information sheet, reply form (including diagnosis, employment status, and sick leave status, to further check eligibility criteria) and a Freepost envelope addressed to the research team. Patients could take this pack home to read and return the reply form to the research team, if interested. If the patient could spend time with the therapist/research facilitator, the participant information sheet was discussed, the reply form completed in the clinic, and signed by the patient to give permission for the therapist/research facilitator to send the form, including their contact details, directly to the research team. Alternately, therapists could also identify eligible patients from therapy records and mail out information packs. Patients could contact the research team if they had any questions about the study. PICs maintained a log of patients. Each month, the research team updated PICs about which of their patients had returned the reply forms. This allowed therapists/research facilitators at PICs to post one reminder letter and an information pack to those not replying after 4 weeks. The research team paid PICs £7.50 per participant, from their location who returned a completed study questionnaire to assist with costs of patient identification. PICs also received research infrastructure support costs from their regional National Institute of Health Research (NIHR) Clinical Research Network (CRN) for these participants. This study was adopted into the NIHR's portfolio of approved studies eligible for such support costs (NIHR, 2023).

2.2 | Data collection

In Phase 1, linguistic validation, and cross-cultural adaptation were conducted to ensure that the scales' wording was comprehensible to participants (Beaton et al., 2007). Content validity (i.e., the degree to which scale content adequately reflects what is being measured) was tested during cognitive-debriefing interviews (De Vet et al., 2011). Previously, the WABPPS was conducted as an interview and thus restructured into a questionnaire. A review of UK employment-law related literature was also undertaken to check whether relevant work accommodations for working people with RMD were included. Full details of the Phase 1 method are in Supplementary File S1.

In Phase 2, for psychometric testing, following receipt of the reply form, the research team mailed a paper questionnaire booklet to the patient to complete at home (Test 1: T1). The front page of the questionnaire included a consent form to complete. Two weeks after T1 return, they were mailed a second questionnaire (Test 2: T2) to assess test-retest reliability. Following each mailing, if required, participants were sent a reminder at 2 weeks (letter) and 4 weeks (letter plus questionnaire booklet).

The T1 booklet included demographic data, such as age, sex, living arrangements, education status, condition duration (of symptoms and from diagnosis), medication regimen, employment status and job title. The latter was coded into job skill-level categories (1 = elementary occupations, e.g., cleaner, refuse collector, shelf filler; 2 = requiring compulsory education/work-related training; 3 = post-compulsory education (sub-degree) or longer work experience; 4 = degree education or equivalent experience (Office for National Statistics, 2016).

The T1 booklet also included the three scales, that is, the British-English versions of the PWSS, WABPPS and WTI: The PWSS includes 19 items each scored 0 = strongly disagree to 4 = strongly agree: Part 1 Manager Support (four items, range 0–16); Part 2 Co-worker Support (eight items, range 0–32); and Part 3 Organisational Support (seven items, range 0–28), with higher scores indicating better perceptions of workplace support. No time frame is specified as questions relate to current employment (Li et al., 2006; Supplementary File S2).

The WABPPS has two parts. Part 1 consists of 16 work accommodations, policies, or benefits, with four related questions about need for, use, availability and, if used, helpfulness. Items can be considered individually, or the total number of items needed, available and used are summed (score range for each question is 0–16). Items can be used to explore whether work needs are met, unmet or exceeded, with those scoring 0–1 having low, 2–4 medium, and 5 or more high need/use. Total scores could also be calculated separately for those items related to work accommodations/policies, and benefits. Part 2 asks whether employers refused to provide work accommodations, and if yes, why (Gignac, Ibrahim, Smith et al., 2018; Supplementary File S3). Part 1 Q1 was psychometrically tested.

The WTI has four parts: Part 1 identifies employment status; Part 2 lists seven common work disruptions related to occasional loss of work time (items 1, 2 and 7) and changes in the nature of work (items 3, 4, 5, and 6), with items answered as yes, no, or not applicable, and summed to identify the number of disruptions experienced; Part 3 requests absenteeism (numbers of days of sick leave) within a fixed time period (modifiable according to the study, in this case 6 months) due to the health condition, and for other reasons; and Part 4 about any changes in job, or to working hours, within a fixed time period (also modifiable according to study) (Gignac et al., 2008, Supplementary File S4). Part 2 was psychometrically

tested. Scoring instructions and handling of missing data for the three scales are explained in Supplementary Files S2–S4.

To test concurrent validity, a lot of work and health scales were included in the T1 questionnaire booklet. For all, a higher score indicates worse status, unless otherwise stated.

2.2.1 | Work scales

Three scales evaluated both the physical and emotional impact of health conditions on work and included the British-English Workplace Activity Limitations Scale (WALS), a measure of presenteeism, with 12 items of: physical work ability (eight items); managing work demands (physically and/or mentally) (three items); and concentration at work (one item), scored 0 = no difficulty to 3 = unable to do (range 0–36) (Hammond et al., 2023b). The Work Limitations Questionnaire-25 (WLQ-25) indicates the percentage of productivity losses in the past 2 weeks (Lerner et al., 2001). Two forms of the Work Instability Scale (WIS) were used: the RA-WIS for RA, OA, or FM (Gilworth et al., 2003; Tang et al., 2010) and ankylosing spondylitis (AS)-WIS for axSpA (Gilworth et al., 2009). Both measure the mismatch between work abilities and job demands.

Additionally, four other personal work-related measures were included: the Long-Term Conditions Job Strain Scale (LTCJSS: range 0–60), measuring health condition-related factors contributing to job strain; the Long Term Conditions Work Spillover Scale (LTCWSS: range 0–24) assessing reciprocal demands of work on managing the health condition and the condition interfering with work; and the Work-Health-Personal Life Perceptions Scale (WHPLPS) evaluating work-life balance for those with chronic conditions. This consists of two parts: Part 1 Condition negatively Affects Work (CAW: range 0–32), and Part 2 Work and personal life affect Condition and its management (WAC: range 0–28) (Hammond et al., 2023a). The fourth scale was work self-efficacy, measured on a 0–10 numeric rating scale (NRS), with higher scores indicating greater self-efficacy.

2.2.2 | Health scales

The following are included in the T1 booklet. As some were condition-specific, four separate T1 questionnaire booklets were used, with participants completing the booklet relevant to their condition.

For RA, the RA Impact of Disease (RAID) scale, consisting of seven 0–10 NRS (e.g., pain, fatigue) scored by summing weighted scores (Gossec et al., 2011); and the Health Assessment Questionnaire (HAQ), consisting of 20 physical function items rated 0 = not at all difficult to 3 = unable to do (Kirwan & Reeback, 1986). The HAQ was scored by summing all items (0–20 = mild; 21–40 = moderate; 41–60 = severe disability) without adjustment for using aids and devices (Tennant et al., 1996). For axSpA, the Bath Ankylosing Spondyloarthritis Disease Activity Index (BASDAI), including items of symptom severity (e.g., pain, fatigue) (Garrett et al., 1994), and the Bath Ankylosing Spondyloarthritis Functional Index (BASFI: score range 0–10) including 10 physical function items (Calin et al., 1994). For OA, two sub-scales of the Western Ontario McMaster Universities Osteoarthritis Index (WOMAC) were included: pain (five items); and physical function (17 items), both scored 0 = none to 4 = extreme, with total scores for each sub-scale calculated (Bellamy et al., 1988). Finally, for FM, two sub-scales of the Revised Fibromyalgia Impact Questionnaire (FIQR) were included, symptoms (10 items: score range 0–50); and physical function (nine items: score range 0–30) (Bennett et al., 2009). For all four conditions, pain, fatigue, and mood 0–10 NRS were included (or extracted from health scales). Additionally, a question about perceived health status was included (Likert scale 1 = very good to 5 = very poor) for discriminant validity testing.

At Test 2, participants completed the three scales again, that is, the PWSS, WABPPS, and WTI plus perceived change in health status for reliability testing: 'Overall, how much is your arthritis/condition troubling you now compared to when you last completed this questionnaire?' (1 = much less; 2 = less 3 = about the same; 4 = more; 5 = much more).

2.3 | Sample size

A minimum of 150 cases was needed within each condition group as Rasch analysis was used to assess construct (structural) validity (Rasch, 1980). Up to 250 were collected to ensure a broad spread of responses. At least 79 sets of repeated responses were needed to demonstrate that a test-retest correlation of 0.70 differs from a background correlation (constant) of 0.45, with 90% power at the 1% significance level. A test-retest reliability correlation of 0.70 is considered a minimum acceptable level (Nunnally, 1978).

2.4 | Statistical analyses

Demographic and Phase 1 item relevance scores and Phase 2 work and health scales were summarised descriptively as appropriate. RUMM 2030+ software was used for Rasch analysis (Andrich et al., 2015). As all Phase 1 items and Phase 2 scales were either ordinal or not normally distributed, non-parametric statistical tests were conducted using the Statistical Package for the Social Sciences (SPSS) v26 (IBM Corp, 2019). The following psychometric properties were assessed:

2.4.1 | Compliance

Compliance (i.e., amount of missing data) was assessed by identifying the number (%) of missing data items in each of, and total number of PWSS, WABPPS and WTI (Part 2) which were not scoreable. Less than 3% of missing data are acceptable and more than 15% unacceptable (De Vet et al., 2011).

2.4.2 | Validity

Construct (structural) validity measures the degree to which scale scores adequately reflect the dimensionality of the construct measured, that is, do all items measure the same construct (unidimensional), and are items independent of one another. The first analytical strategy was testing the fit of the PWSS for each condition to the Rasch Model. This model specifies what should be achieved if the scale can be transformed from an ordinal-to an interval-level scale. Providing a fully integrated analytical solution, it entails tests of unidimensionality; invariance by key contextual factors (i.e., can the three scales be used to assess group differences as scale items are interpreted similarly across groups. e.g., across conditions, age groups, sex) (Teresi et al., 2000); whether or not the scale items form an appropriate probabilistic ordering consistent with the model expectations, and thus allowing the transformation of the scale to interval level measurement. Full details about the Rasch analysis are in Supplementary File S5 and elsewhere (Tennant & Conaghan, 2007). The WABPPS and WTI Part 2 were not tested as both scales sum the frequency of items recorded rather than measuring a trait.

Concurrent validity (i.e., the degree to which scale scores correlate with other relevant scales) was assessed using Spearman's correlations. Correlations of 0.20–0.39 are considered weak; 0.4–0.59 moderate, and ≥0.6 strong (Evans, 1996). Moderate positive correlations were hypothesised between the three PWSS sub-scales' scores, and between the WABPPS Q1 (number needed) and WTI Part 2 (number of job disruptions). For the PWSS, the following were hypothesised: weak to moderate negative correlations with the WALS, WLQ-25, WIS, LTCJSS, LTCWSS, WHPLPS and health scales, that is lower workplace support is correlated with worse work difficulties, greater job strain, work spillover and worse work-life balance, but less so with health; and weak to moderate positive correlations with work self-efficacy.

For the WABPPS and WTI scores, the following were hypothesised: weak to moderate positive correlations with the WALS, WLQ-25, WIS, LTCJSS, LTCWSS, WHPLPS and health scales; and weak to moderate negative correlations with work self-efficacy. Correlations were anticipated as weak or moderate because work socio-cultural, economic, and political factors can also potentially influence PWSS, WABPPS and WTI scores.

Discriminant validity, that is, hypothesis testing that there would be significant score differences in PWSS, WABPPS, and WTI scores between those reporting good, fair, and poor health; and low, moderate, or high work instability on the RA-WIS (RA, OA, FM) or AS-WIS (axSpA). These were assessed using Kruskal-Wallis tests, with $p \leq 0.05$ considered significant. Further tests between groups were conducted using Mann-Whitney tests, as needed.

2.4.3 | Reliability

Internal consistency, that is, the degree of interrelatedness between items within a scale, was assessed using Cronbach's alpha. Results ≥0.80 were deemed good to excellent: ≥0.90 is consistent with individual use; and >0.70 with group-level use (Evans, 1996). The Person Separation Index (PSI) was also calculated for the PWSS, for which scores >0.70 indicate group-level use; and ≥0.85 individual use (Tennant & Conaghan, 2007).

Test-retest reliability is the extent to which scores are the same for repeated measurements over time in those reporting health has not changed (i.e., perceived health is 'the same' at T2). This was assessed using Spearman's correlations and intraclass correlation coefficients (ICC (2,1): two-way random consistency, average measure models). An ICC ≥0.75 is considered excellent and 0.50–0.74 moderate (Cichetti. 1994). The reliability of individual scale items was calculated using weighted kappa, with levels of agreement as 0.41–0.60 = moderate; ≥0.61 = good (Evans, 1996).

2.4.4 | Precision

Precision was assessed by calculating (a) the Standard Error of Measurement (SEM), a function of the reliability of the instrument and the standard deviation; and (b) the Smallest Detectable Difference (SDD), derived from the SEM with the formulae ($SEM \times 1.96 \times \sqrt{2}$). It is a statistical estimate of the smallest detectable difference across groups above measurement error (Donoghue, PROP group & Stokes, 2009).

Floor and ceiling effects were considered present if >15% of participants achieved either the lowest or highest scores (Terwee et al., 2007). If present, these can negatively affect the quality of a scale as responsiveness (i.e., ability to detect change over time) will be limited.

3 | RESULTS

3.1 | Phase 1

Full details of the linguistic validation, cross-cultural adaptation and content validity results are in Supplementary File S1; Tables S1–S6). In cognitive debriefing interviews ($n = 48$; participant characteristics are in Table 1), most items in all three scales were considered very or extremely relevant by participants, with no differences between conditions. Participants in job skill-level groups 1 and 2 (i.e., elementary; and semi-skilled jobs) were significantly more likely to report items in the PWSS and WTI Part 2 as extremely relevant compared to very relevant items in groups 3 and 4 (skilled; semi-professional, professional and managerial jobs). The WABPSS responses were similar across job skill groups except for six items (three about working hours, and three physical wok accommodations) being more relevant for those in groups 1 and 2.

All three scales were considered comprehensive and comprehensible. Changes made by the expert panel were generally minor

TABLE 1 Phases 1 and 2 participant characteristics.

	RA		axSpA		OA		FM	
	Phase 1 ***n*** **= 12**	**Phase 2** ***n*** **= 297**	**Phase 1** ***n*** **= 10**	**Phase 2** ***n*** **= 202**	**Phase 1** ***n*** **= 13**	**Phase 2** ***n*** **= 176**	**Phase 1** ***n*** **= 13**	**Phase 2** ***n*** **= 156**
Sex, M:F *n* (%)	5:7	77 (26.00): 220 (74.00)	4:6	126 (62.40): 76 (37.60)	4:9	54 (30.70): 122 (69.30)	2:11	10 (6.40): 146 (93.60)
Age (year), mean (SD)	57.33 (6.77)	53.52 (8.93)	33.00 (14.62)	46.80 (10.25)	55.92 (6.70)	55.99 (7.52)	39.69 (9.11)	45.71 (10.05)
Job skill level, *n* (%)								
- 1 and 2	3	151 (51.00)	5	66 (32.70)	8	86 (48.90)	7	95 (61.00)
- 3 and 4	9	143 (48.00)	5	136 (67.30)	5	89 (50.60)	6	61 (39.00)
- Missing	-	3 (1.00)	-	-	-	1 (0.60)	-	-
Disease duration (y.), mean (SD)	18.08 (11.93)	7.68 (8.02)	12.70 (9.78)	12.25 (10.35)	12.35 (10.60)	4.87 (6.80)	5.38 (3.55)	2.99 (4.17)
Phase 2 only:								
Symptom duration (y.), mean (SD)	9.34 (8.56)		18.89 (11.69)		7.87 (8.43)		8.36 (7.16)	
Living with spouse/family/significant other, *n* (%)	243 (81.80)		181 (89.60)		146 (83.00)		139 (89.10)	
Children ≤18 years living at home, *n* (%)	69 (23.20)		69 (34.20)		32 (18.40)		56 (35.90)	
Educational level, *n* (%)								
- No formal qualifications	28 (9.40)		14 (6.90)		17 (9.70)		7 (4.50)	
- Secondary/non tertiary	150 (50.50)		100 (49.50)		93 (52.90)		76 (48.70)	
- Tertiary	117 (39.40)		87 (43.10)		62 (35.30)		73 (46.80)	
- Missing	2 (0.70)		1 (0.50)		4 (2.30)		-	
Hours worked, median (IQR)	35.00 (21.25–37.50)		37.50 (32.25–39.00)		35.50 (24.00–37.50)		29.56 (10.17)	
Self-employed, *n* (%)	64 (21.50)		35 (17.30)		22 (12.50)		18 (11.50)	
Organisation size, *n* (%)								
- 1 (myself)	38 (12.80)		3 (11.40)		17 (9.70)		14 (8.80)	
- 2–9	35 (11.80)		27 (13.40)		12 (6.80)		8 (5.00)	
- 10–49	49 (16.50)		23 (11.40)		22 (12.50)		23 (14.40)	
- 50–249	31 (10.40)		24 (11.90)		26 (14.80)		18 (11.30)	
- 250 plus	141 (47.50)		105 (52.00)		98 (55.70)		93 (58.10)	
- Missing	3 (1.00)		-		1 (0.6)		-	

TABLE 1 (Continued)

	RA		axSpA		OA		FM	
	Phase 1 ***n*** **= 12**	**Phase 2** ***n*** **= 297**	**Phase 1** ***n*** **= 10**	**Phase 2** ***n*** **= 202**	**Phase 1** ***n*** **= 13**	**Phase 2** ***n*** **= 176**	**Phase 1** ***n*** **= 13**	**Phase 2** ***n*** **= 156**
Medication regimen, *n* (%)								
- None	2 (0.70)		19 (9.40)		34 (19.30)		0	
- NSAIDS +/− analgesics	11 (3.70)		4 (2.00)		121 (68.80)		14 (9.00)	
- Steroids +/− NSAIDS	6 (2.00)		52 (25.70)		10 (5.70)		6 (3.80)	
- Single DMARD	104 (35.00)		10 (5.00)		-		-	
- Combination DMARD	98 (33.000)		2 (1.00)		-		-	
- Biologic/biosimilar	67 (22.6)		114 (56.40)		-		-	
- FM: Neuropathic analgaesics (e.g., gabapentin)	-		-		-		99 (63.50)	
- FM: Opiate medication	-		-		-		12 (7.70)	
- Missing	9 (3.00)		1 (0.50)		-			
Time between test 1 and test 2: days, median (IQR)	40 (34.00–48.00) (*n* = 221)		38 (29.00–49.25) (*n* = 154)		30 (23.75–37.00) (*n* = 130)		33 (26.50–45.00) (*n* = 117)	

Abbreviations: axSpA, axial spondyloarthritis; DMARD, disease modifying anti-rheumatic drug; FM, fibromyalgia; IQR, inter-quartile range; NSAID, non-steroidal anti-inflammatory drug; OA, osteoarthritis; RA, rheumatoid arthritis; SD, standard deviation.

wording changes and consistency of terminology within scales. Changes made marginal reductions to Flesch-Kincaid Reading Grade-Level scores (i.e., reading age) in the Canadian-to the British-English versions of the: PWSS from 14 to 13 years, and the WTI was similar at 12 years. The British-English WABPPS reading age was 12 years. Reading age was not calculated for the Canadian WABPPS as it was an interview schedule. The British-English versions of the three scales are in Supplementary Files S2–S4.

3.2 | Phase 2

Overall, 1359 people were referred from PICs or volunteered for the study. Of these, 831 (61%) returned T1 and 622 both T1 and T2 booklets (Figure S1). The response rates were secondary care 62% (696/1117), community care 53% (119/224), and volunteers 89% (16/18). Participant characteristics are shown in Table 1 and work and health scales in Table 2. Median time between tests was 36 (IQR 28–47) days.

3.2.1 | Compliance

Missing data in the scales were low. In the PWSS, this ranged from 0% (RA, axSpA, FM) to 1.13% (OA), with only two responses for OA in the Organisational Support sub-scale not scoreable. However, sub-scales were not applicable to those self-employed (Parts 1 and 3) and/or with no co-workers (Part 2), meaning that for the Manager Support subscale 10.89%–18.85%, Co-worker Support sub-scale 8.33%–11.93%, and Organisational Support sub-scale 8.33%–17.17% were not completed. For the WABPPS Q1, between 1.28% (FM) and 2.01% (RA) were not scoreable. For the WTI Part 2, between 0.33% (RA) and 1.10% (OA) were not scoreable (Tables S7–S9).

3.2.2 | Validity

Construct (structural) validity

The fit of the data for the PWSS to the Rasch model is shown in Table 3. Full details of the Rasch analysis results are in Supplementary File S5, Tables S10 and S11.

Part 1 Manager Support was unidimensional with a good fit to the Rasch model in the four conditions. Part 2 Co-worker Support and Part 3 Organisational Support needed adjustment within conditions due to the substantial local dependency, but then achieved fit and were unidimensional. DIF was only identified occasionally for sex and education. For the combined dataset (i.e., all four conditions combined, $n = 831$), the Co-worker Support scale showed adequate fit but not Manager or Organisational Support. Creating total scores for the three parts did not fit the Rasch model. Overall, the three parts are best scored separately and within conditions only.

Concurrent validity

Results are shown in Tables 4 and 5. The three PWSS sub-scales correlated moderately to strongly with each other in the four conditions ($r_s = 0.43–0.79$), except for the RA Co-worker sub-scale which correlated weakly with the Manager sub-scale ($r_s = 0.38$). WABPPS Q1 and WTI Part 2 also correlated moderately with each other ($r_s = 0.44–0.55$).

As hypothesised, for the PWSS correlations with work scales (WALS, WLQ-25, WIS) were generally weakly negative (although still significant at $p < 0.01$ for most) in the four conditions ($r_s = -0.07$ to -0.46 across the three sub-scales), with generally the lowest in OA (with no correlations in the Co-worker sub-scale) and highest in AxSpA. Correlations with work personal factors (LTCJSS, LTCWSS and WHPLPS) were generally weakly to moderately negatively correlated ($r_s = -0.11$ to -0.61), again with correlations highest in axSpA. Organisational Support generally had higher correlations, followed by Manager Support and Co-worker Support. Correlations with work self-efficacy varied from no to moderate positive correlations ($r_s = 0.17–0.42$). There were generally weak negative or no correlations with health scales ($r_s = 0–0.35$).

Correlations for the WABPPS and WTI were also as hypothesised (significant at $p < 0.01$ for most). For the WABPPS Q1, there were weak to moderate positive correlations with work scales ($r_s = 0.20–0.52$) and work personal factors ($r_s = 0.27–0.52$). There were either no or weak negative correlations with work self-efficacy ($r_s = -0.16$ to–0.23), and no or weak positive correlations with health scales ($r_s = 0–0.44$). For the WTI Part 2, there were generally moderate-to-strong positive correlations with work scales ($r_s = 0.40–0.72$) and work personal factors ($r_s = 0.35–0.69$). There were weak to moderate negative correlations with work self-efficacy ($r_s = -0.28–0.48$), and weak to moderate correlations with health scales ($r_s = 0.18–0.53$). For the WABPPS and WTI Part 2, correlations were highest for axSpA and generally lowest in FM.

Discriminant validity

There were significant differences between levels of perceived disease severity across all four conditions for the WABPPS and WTI Part 2, except for the WABPPS in FM. However, there were only significant differences in axSpA for the PWSS sub-scales (Table S12). For low, moderate, and high work instability groups, there were significant differences between groups across all four conditions for the PWSS, WABPPS Q1 and WTI Part 2, except for the PWSS Co-worker scale in OA (Table S13).

3.2.3 | Reliability

Internal consistency

Cronbach's alpha values for the three scales were mostly good to excellent (0.75–0.94), consistent with group-level use, except for the WTI Part 2 for FM ($\alpha = 0.60$) (Table 6). The PSI values for the PWSS were also good (0.80–0.90) (Table 3).

TABLE 2 Participants' work and health scales.

Median (IQR) unless otherwise stated	RA (*n* = 297)	axSpA (*n* = 202)	OA (*n* = 176)	FM (*n* = 156)
Work scales:				
PWSS				
- Part 1: Manager support (0–16)	11.00 (8.00–14.00) (*n* = 241)	11.00 (8.00–14.00) (*n* = 170)	10.00 (8.00–14.00) (*n* = 156)	9.00 (6.00–12.00) (*n* = 140)
- Part 2: Co-worker support (0–32)	24.00 (19.00–27.00) (*n* = 194)	23.00 (18.00–26.00) (*n* = 181)	23.00 (18.00–27.00) (*n* = 155)	22.00 (17.00–27.00) (*n* = 143)
- Part 3: Organisational (0–28)	17.00 (11.00–21.00) (*n* = 246)	16.00 (12.00–21.00) (*n* = 174)	15.00 (11.00–21.00) (*n* = 155)	14.00 (9.00–20.00) (*n* = 143)
WABPBPS: Q1 needed (0–16)	4.00 (1.00–8.00)	4.00 (1.00–7.00)	3.00 (2.00–7.00)	9.00 (6.00–12.00)
WTI: Part 2 (0–7)	1.00 (0–3.00)	1.00 (0–2.00)	1.00 (0–3.00)	3.00 (2.00–5.00)
WALS (0–36)	9.00 (5.00–14.00)	6.00 (3.00–11.00)	10.00 (6.00–14.00)	16.00 (12.00–19.00)
WLQ-25: Productivity loss (%)	6.86 (3.30–11.15)	5.11 (1.72–9.27)	6.56 (3.35–11.04)	13.26 (9.19–16.53)
Work instability scale (RA-WIS: 0–23 RA, OA, FM; AS-WIS 0–20)	13.00 (7.50–18.00)	10.50 (4.00–15.00)	13.00 (8.00–17.00)	18.00 (15.00–20.00)
LTCJSS (0–60)	22.00 (12.00–36.00)	15.00 (8.00–29.00)	24.00 (12.00–36.00)	43.00 (31.00–51.00)
LTCWSS (0–24)	13.00 (8.00–16.75)	11.00 (6.00–15.00)	13.00 (9.00–16.00)	16.00 (13.00–19.00)
WHPLPS: Part 1. CAW: 0–32	20.00 (14.00–25.00)	16.00 (10.00–21.25)	20.00 (14.00–24.00)	26.00 (21.00–29.00)
WHPLPS part 2 WAC (0–28)	14.00 (9.00–19.00)	13.00 (7.75–17.00)	16.00 (10.00–19.00)	21.00 (17.00–24.75)
Self-efficacy to work (0–10)	8.00 (6.00–10.00)	9.00 (7.50–10.00)	8.00 (6.00–10.00)	7.00 (5.00–8.00)
Health scales:				
Perceived severity health last month (1–5)	3.00 (2.00–3.00)	2.00 (2.00–3.00)	3.00 (3.00–3.00)	4.00 (3.00–4.00)
Pain NRS (0–10)	5.00 (3.00–7.00)	4.80 (1.60–6.90)	-	7.00 (6.00–8.00)
Fatigue NRS (0–10)	6.00 (4.00–8.00)	6.00 (2.40–7.50)	6.00 (4.00–8.00)	8.00 (7.00–9.00)
Mood NRS (0–10)	4.00 (2.00–7.00)	4.00 (2.00–6.00)	5.00 (3.00–7.00)	6.50 (5.00–8.00)
RA:				
- RAID (0–10)	4.85 (3.15–6.47)	-	-	-
- HAQ20 (0–60]	9.00 (3.00–18.00)	-	-	-
axSpA:				
- BASDAI (0–10)	-	3.91 (1.95–5.85)	-	-
- BASFI (0–10)	-	2.96 (1.31–5.33)	-	-
OA:				
WOMAC:				
- Physical function (0–68)	-	-	30.50 (21.00–41.00)	-
- Pain (0–20)	-	-	10.00 (7.00–13.00)	-

(Continues)

TABLE 2 (Continued)

Median (IQR) unless otherwise stated	RA (n = 297)	axSpA (n = 202)	OA (n = 176)	FM (n = 156)
FM:				
FIQR (normalised scores):				
- Symptoms (0–50)	-	-	-	34.50 (28.13–39.00)
- Function (0–30)	-	-	-	19.33 (14.67–22.67)

Abbreviations: AS, ankylosing spondylitis; axSpA, axial spondyloarthritis; BASDAI, Bath Ankylosing Spondylitis Disability Index; BASFI, Bath Ankylosing Spondylitis Function Index; Benefits, Policies and Practices Scale; FIQR, Fibromyalgia Impact Questionnaire – Revised; FM, fibromyalgia; HAQ, Health Assessment Questionnaire; LTCJSS, Long-Term Conditions Job Strain Scale; LTCWSS, Long-Term Conditions Work Spillover Scale; NRS, numeric rating scale; OA, osteoarthritis; PWSS, Perceived Workplace Support Scale; RA, rheumatoid arthritis; RAID, RA Impact Disease; WABPPS, Workplace Accommodations, Benefits, Policies and Practices Scale; WALS, Workplace Activity Limitations Scale; WHPLPS, Work-Health-Personal Life Perceptions Scale (Part 1 CAW = Condition negatively Affects Work and personal life; Part, 2 WAC = Work and personal life Affect Condition and its management); WIS, Work Instability Scale; WLQ-25, Work Limitations Questionnaire-25; WOMAC, Western Ontario McMaster Universities Osteoarthritis Index; WTI, Work Transitions Index Part 2.

Test-retest reliability

At T2, 356/622 (57%) reported their condition was 'the same' as at T1 and were included in analyses. For all four conditions, correlations between T1 and T2 scores were strong to very strong for the three scales (r_s = 0.63–0.86), apart from being moderate in FM (r_s = 0.48). ICCs (2,1) were excellent at 0.80–0.93, except for the WTI Part 2 in FM (0.68) (Table 6). Item reliability was generally moderate to good, although more items were weak in the WTI Part 2 for OA and FM (Tables S14–S16).

3.2.4 | Precision

Precision

The SEM and SDD scores for the scales are shown in Table 6.

Floor and ceiling effects

Between 0% and 14.70% of participants scored either the lowest or highest scores on the PWSS sub-scales, that is, within acceptable limits (<15%), apart from a ceiling effect (19.80%) in axSpA for the Manager Support sub-scale (Table S17). Effects were not calculated for the WABPPS or WTI Part 2 scales as these scales report frequencies and many employed participants with RMD may not need work accommodations or experience job disruptions.

4 | DISCUSSION

Linguistically validated British-English versions of the PWSS, WABPPS and WTI are now freely available for use in the UK (Supplementary Files S2–S4). This study provides new evidence that the PWSS, WABPPS and WTI (Part 2) have good psychometric properties in RA, axSpA, OA and FM.

As was clear from participant feedback, the three scales had good content validity as all items were considered very or extremely relevant. Comments on the PWSS included: '*This is very relevant as I had a manager in the past who was a real pain, it makes all the difference to how stressful a job is.*' For the WABPPS, '*Yes, I needed all those things listed and really was not aware if we had any of them until I investigated [at work]. I really should have known having worked there for 9 years, right?*' The WABPPS can therefore play a role in patient activation, prompting identifying the availability of work accommodations, benefits, and policies. The WTI Part 2 was also viewed positively: '*This gets to understanding that you have to adapt, adjust working life…. They all impact on how you do your work.*' Input from patient research partners and the developer helped ensure linguistic and cross-cultural validity. The reading age of the scales was 12–13 years, meaning these should be understandable for most people in the UK, as the average reading age is 11–14 years (Health Education England, undated). However, the WABPPS does require respondents to pay careful attention to the instructions.

TABLE 3 Fit of the perceived workplace support scale to the Rasch model: construct (structural) validity.

	Residuals (SD)		Chi-Square		Reliability		Dimensionality			
Scale/diagnosis	Item	Person	Value (df)	*p*	PSI	*α*	% *t*-tests (LCI)	DIF	ECV	Latent Correlation
PWSS: Part 1 manager support:										
- RA	0.38	1.43	48.50 (36)	0.08	0.82	0.87	6.20 (3.50)	None	-	-
- axSpA	0.19	1.37	40.10 (32)	0.13	0.84	0.87	5.90 (2.60)	None	-	-
- OA	0.60	1.25	25.80 (36)	0.90	0.80	0.83	2.60	None	-	-
- FM	0.83	1.41	25.70 (32)	0.78	0.84	0.89	7.30 (3.60)	Education	-	-
Combined conditions	0.67	1.42	83.00 (36)	0.00	0.82	0.87	4.40	None	-	-
PWSS: Part 2 Co-worker support:										
- RA	0.72	1.19	33.7 (32)	0.38	0.81	0.84	4.31	None	0.93	-
- axSpA	1.86	1.68	75.50 (72)	0.37	0.88	0.91	7.20 (4.00)	Education	-	-
- OA	0.04	0.83	20.00 (18)	0.33	0.86	0.89	3.90	None	0.99	0.99
- FM	0.10	1.03	14.30 (27)	0.98	0.83	0.87	2.10	None	0.94	-
Combined conditions	2.31	1.40	49.10 (45)	0.31	0.82	0.84	5.10 (3.60)	Sex	0.95	-
PWSS: Part 3: Organisational support										
- RA	1.33	1.04	32.10 (18)	0.02	0.90	0.89	8.10 (5.40)	None	0.92	0.95
- axSpA	1.30	1.07	36.30 (19)	0.01	0.85	0.84	4.00	None	0.94	0.91
- OA	2.26	1.45	16.40 (27)	0.95	0.83	0.83	3.20	None	0.73	0.90
- FM	0.89	0.86	31.90 (20)	0.05	0.90	0.90	4.20	None	0.97	0.99
Combined conditions	3.88	1.54	82.20 (36)	0.00	0.89	0.82	6.70 (5.10)	None	0.88	0.87
PWSS: TOTAL score										
- RA	0.97	0.79	53.90 (44)	0.15	0.83	0.81	3.00	None	0.88	0.91
- axSpA	1.41	0.83	47.30 (44)	0.34	0.72	0.74	2.40	None	0.77	0.65
- OA	0.82	1.06	27.40 (27)	0.44	0.76	0.78	5.80 (2.40)	None	0.81	-
- FM	1.06	0.88	58.50 (45)	0.09	0.65	0.69	2.30	None	0.70	0.55
Combined conditions	1.57	1.11	65.00 (60)	0.31	0.69	0.66	2.30	Sex	0.74	-
Ideal values	<1.4	<1.4		>0.01	>0.7	>0.7	<5%		>0.9	>0.9

Abbreviations: *α*, Cronbach's alpha; axSpA, axial spondyloarthritis; DIF, differential item functioning; ECV, explained common variance; FM, fibromyalgia; LCI, lower confidence interval; OA, osteoarthritis; PSI, person separation index; RA, rheumatoid arthritis; SD, standard deviation.

This is the first study examining construct (structural) validity of the PWSS in RA, axSpA, OA and FM, demonstrating fit to the Rasch model. These scales were unidimensional, meaning that raw scores can be summed. Generally, the three parts of the PWSS had moderate-to-strong correlations with each other, indicating that workplace culture can have a similar influence across co-workers, managers, and organisation, either for better or worse. Correlations with work scales and work personal factors were generally weak to moderate, indicating that increasing work difficulties, job strain, work spillover, and work-health-life balance are associated with worse workplace support (and vice versa). Correlations are not indicative of causation. However, this suggests that workplaces perceived by workers with health conditions as being less psychologically and practically supportive could contribute to their work difficulties and increase job stress. A UNISON (a UK trade union) survey of members with disabilities ($n = 2873$) identified that 55% experienced a positive response on disclosing their condition to their employer, but 34% did not find them supportive or became unsupportive as time went on (UNISON, 2020).

At the same time, additional research needs to be conducted related to decisions to disclose or share information with co-workers. Some research points to very different reasons for disclosure to colleagues, differentiating between disclosure related to approach goals and the desire to achieve a positive outcome like improved relationships and sustaining good job performance versus avoidance goals where individuals feel forced to disclose to prevent reputational damage and being seen as a poor worker (Gignac et al., 2021).

TABLE 4 Concurrent validity of the perceived work support scale with work and health measures.

	PWSS (manager) (r_s)				PWSS (co-worker) (r_s)				PWSS (organisation) (r_s)			
	RA	ax SpA	OA	FM	RA	AxSpA	OA	FM	RA	axSpA	OA	FM
PWSS: Manager	-	-	-	-	-	-	-	-	-	-	-	-
PWSS: Co-worker	0.38**	0.57**	0.49**	0.53**	-	-	-	-	-	-	-	-
PWSS: Organisation	0.64**	0.79**	0.68**	0.67**	0.43**	0.60**	0.53**	0.48**	-	-	-	-
Work scales:												
WALS	−0.20**	−0.46**	−0.17*	−0.30**	−0.17**	−0.30**	−0.07	−0.24**	−0.22**	−0.39**	−0.26**	−0.34**
WLQ-25 productivity loss (%)	−0.20**	−0.44**	−0.13	−0.29**	−0.23**	−0.31**	−0.15	−0.21*	−0.26**	−0.40**	−0.23**	−0.33**
WIS	−0.28**	−0.44**	−0.23**	−0.30**	−0.25**	−0.30**	−0.15	−0.21*	−0.33**	−0.38**	−0.40**	−0.38**
LTCJSS	−0.33**	−0.50**	−0.33**	−0.40**	−0.29**	−0.34**	−0.24**	−0.34**	−0.39**	−0.51**	−0.45**	−0.45**
LTCWSS	−0.44**	−0.61**	−0.38**	−0.39**	−0.37**	−0.44**	−0.34**	−0.32**	−0.44**	−0.59**	−0.45**	−0.44**
WHPLPS part 1	−0.26**	−0.49**	−0.29**	−0.21*	−0.27**	−0.36**	−0.16	−0.15	−0.35**	−0.48**	−0.38**	−0.27**
WHPLPS part 2	−0.34**	−0.45**	−0.32**	−0.24**	−0.26**	−0.32**	−0.22*	−0.11	−0.39**	−0.43**	−0.42**	−0.29**
Work self-efficacy	0.27**	0.37**	0.38**	0.42**	0.32**	0.33**	0.17	0.26**	0.38**	0.34**	0.37**	0.37**
Health scales:												
Pain NRS	−0.21**	−0.18*	-	−0.06	−0.12	−0.19*	-	0.00	−0.20**	−0.17*	-	−0.06
Fatigue NRS	−0.23**	−0.28**	−0.11	−0.13	−0.13*	−0.16*	0.00	0.02	−0.22**	−0.23**	−0.18*	−0.11
Mood NRS	−0.26**	−0.23**	−0.28**	−0.15	−0.22**	−0.20**	−0.32**	−0.11	−0.20**	−0.30**	−0.35**	−0.01
RA:												
- RAID	−0.23**	-	-	-	−0.17**	-	-	-	−0.20**	-	-	-
- HAQ20	−0.08	-	-	-	−0.13*	-	-	-	−0.16*	-	-	-
axSpA:												
- BASDAI	-	−0.27**	-	-	-	−0.22**	-	-	-	−0.23**	-	-
- BASFI	-	−0.29**	-	-	-	−0.19*	-	-	-	−0.23**	-	-
OA:												
- WOMAC pain	-	-	−0.10	-	-	-	0.04	-	-	-	−0.13	-
- WOMAC physical function	-	-	0.00		-	-	0.15	-	-	-	−0.05	-
FM:												
- FIQR symptoms	-	-	-	−0.15	-	-	-	−0.03	-	-	-	−0.16
- FIQR function	-	-	-	−0.17*	-	-	-	−0.09	-	-	-	−0.19*

Abbreviations: axSpA, axial spondyloarthritis; BASDAI, Bath Ankylosing Spondylitis Disability Index; BASFI, Bath Ankylosing Spondylitis Function Index; FIQR, Fibromyalgia Impact Questionnaire – Revised; FM, fibromyalgia; HAQ, Health Assessment Questionnaire; LTCJSS, Long-Term Conditions Job Strain Scale; LTCWSS, Long-Term Conditions Work Spillover Scale; NRS, numeric rating scale; OA, osteoarthritis; PWSS, Perceived Workplace Support Scale; RA, rheumatoid arthritis; RAID, Rheumatoid Arthritis Impact of Disease; r_s, Spearman's correlations; WABPPS, Workplace Accommodations, Benefits, Policies and Practices Scale (Q1 need); WALS, Workplace Activity Limitations Scale; WHPLPS, Work-Health-Personal Life Perceptions Scale (Part 1 CAW = Condition negatively Affects Work and personal life; Part, 2 WAC = Work and personal life Affect Condition and its management); WIS, Work Instability Scale; WLQ-25, Work Limitations Questionnaire-25; WOMAC, Western Ontario McMaster Universities Osteoarthritis Index; WTI, Work Transitions Index Part 2.

Correlation significant at $^{**}p \leq 0.01$; $^{*}p \leq 0.05$.

The WABPPS Q1 (i.e., need for work accommodations, benefits, and policies) was weakly to moderately correlated with work scales and work personal factors. Potentially, a stronger correlation might have been anticipated, that is, as work difficulties increase, so does the need for work accommodations. However, people with long-term health conditions may take some time to adjust psychologically to accepting the need for work accommodations, not (yet) perceive the need for these despite work difficulties and find it challenging to identify needs (British Society of Rehabilitation Medicine, 2021; Gignac et al., 2023). Additionally, they simply may not know their

TABLE 5 Concurrent validity of the work accommodations scale (Q1 need for) and work transitions index (part 2: number of job disruptions).

	WABPPS (Q1 need) (r_s)				WTI part 2 (r_s)			
	RA	AxSpA	OA	FM	RA ($n = 297$)	AxSpA ($n = 202$)	OA ($n = 176$)	FM ($n = 156$)
WTI part 2	0.49**	0.55**	0.52**	0.44**	-	-	-	-
Work scales:								
WALS	0.47**	0.52**	0.44**	0.29**	0.61**	0.72**	0.54**	0.49**
WLQ-25 productivity loss (%)	0.43**	0.47**	0.33**	0.20*	0.55**	0.71**	0.49**	0.47**
WIS	0.36**	0.48**	0.39**	0.24**	0.58**	0.66**	0.58**	0.40**
LTCJSS	0.46**	0.52**	0.42**	0.31**	0.56**	0.68**	0.56**	0.47**
LTCWSS	0.34**	0.44**	0.27**	0.35**	0.54**	0.69**	0.43**	0.47**
WHPLPS part 1	0.40**	0.45**	0.38**	0.27**	0.57**	0.62**	0.53**	0.46**
WHPLPS part 2	0.29**	0.38**	0.29**	0.29**	0.39**	0.54**	0.37**	0.35**
Work self-efficacy	−0.22**	−0.16*	−0.23**	−0.22**	−0.41**	−0.48**	−0.43**	−0.28**
Health scales:								
Pain NRS	0.20**	0.32**	-	0.00	0.38**	0.42**	-	0.23**
Fatigue NRS	0.31**	0.41**	0.27**	0.09	0.42**	0.50**	0.36**	0.18*
Mood NRS	0.21**	0.33**	0.30**	0.04	0.31**	0.47**	0.38**	0.26**
RA:								
- RAID	0.28**	-	-	-	0.44**	-	-	-
- HAQ20	0.36**	-	-	-	0.46**	-	-	-
axSpA:								
- BASDAI	-	0.44**	-	-	-	0.53**	-	-
- BASFI	-	0.40**	-	-	-	0.48**	-	-
OA:								
- WOMAC pain	-	-	0.17*	-	-	-	0.26**	-
- WOMAC physical function	-	-	0.23**	-	-	-	0.26**	-
FM:								
- FIQR symptoms	-	-	-	0.12	-	-	-	0.36**
- FIQR function	-	-	-	0.15	-	-	-	0.40**

Abbreviations: axSpA, axial spondyloarthritis; BASDAI, Bath Ankylosing Spondylitis Disability Index; BASFI, Bath Ankylosing Spondylitis Function Index; FIQR, Fibromyalgia Impact Questionnaire – Revised; FM, fibromyalgia; HAQ, Health Assessment Questionnaire; LTCJSS, Long-Term Conditions Job Strain Scale; LTCWSS, Long-Term Conditions Work Spillover Scale; NRS, numeric rating scale; OA, osteoarthritis; PWSS, Perceived Workplace Support Scale; RA, rheumatoid arthritis; RAID, Rheumatoid Arthritis Impact of Disease; r_s, Spearman's correlations; WABPPS, Workplace Accommodations, Benefits, Policies and Practices Scale (Q1 need); WALS, Workplace Activity Limitations Scale; WHPLPS Work-Health-Personal Life Perceptions Scale (Part 1 CAW, Condition negatively Affects Work and personal life; Part, 2 WAC, Work and personal life Affect Condition and its management); WIS, Work Instability Scale; WLQ-25, Work Limitations Questionnaire-25; WOMAC, Western Ontario McMaster Universities Osteoarthritis Index; WTI, Work Transitions Index Part 2.

Correlation significant at $^{**}p \leq 0.01$; $^{*}p \leq 0.05$.

legal rights, or perceive these are unavailable, and not consider their needs.

The WTI part 2 was moderately to strongly correlated with work difficulties and work personal factors, as expected. Correlations for all three scales were better for axSpA, the group with significantly more men, full-time workers, and having level 3–4 jobs, which often provide greater job autonomy. It was notable that correlations were lowest in OA, despite the scales having been developed in OA and IA in Canada. For all three scales, internal constancy was sufficient for group-level use, meaning they are suitable for research, and organisational-level use, which is their main purpose.

TABLE 6 Test-retest reliability and precision of the PWSS, WABPPS Q1, and WTI Part 2 ('the same' at Test 2).

	Cronbach's α	*n* for test-retest[a]	T1 score median (IQR)	T2 score median (IQR)	Correlation T1 T2 (r_s)	ICC (2,1) (95% CI)	SEM	SDD
PWSS: Manager support (0–16)								
RA	0.87 (*n* = 241)	101	12.00 (8.00–14.00)	11.00 (8.00–14.00)	0.72**	0.86 (0.80, 0.91)	1.52	4.29
axSpA	0.87 (*n* = 170)	81	11.00 (8.00–13.50)	11.00 (8.00–14.00)	0.70**	0.85 (0.76, 0.90)	1.46	4.11
OA	0.83 (*n* = 156)	69	11.00 (8.00–13.50)	10.50 (7.00–14.00)	0.79**	0.88 (0.80, 0.92)	1.43	4.04
FM	0.89 (*n* = 138)	49	10.00 (6.00–12.50)	9.00 (5.50–12.00)	0.63**	0.80 (0.65, 0.89)	2.00	5.65
PWSS: Co-worker support (0–32)								
RA	0.90 (*n* = 263)	114	24.00 (20.00–28.00)	23.00 (19.00–26.25)	0.74**	0.87 (0.81, 0.91)	2.28	6.44
axSpA	0.91 (*n* = 181)	89	23.00 (18.00–25.50)	23.00 (20.00–26.00)	0.63**	0.82 (0.73, 0.89)	2.47	6.97
OA	0.89 (*n* = 155)	69	23.00 (17.00–27.50)	22.00 (16.00–26.00)	0.83**	0.90 (0.83, 0.94)	2.07	5.85
FM	0.92 (*n* = 143)	51	22.00 (16.00–28.00)	23.00 (17.00–28.00)	0.76**	0.88 (0.80, 0.93)	2.95	8.35
PWSS: Organisational support (0–28)								
RA	0.94 (*n* = 246)	101	17.00 (13.00–21.00)	15.00 (12.00–21.00)	0.81**	0.90 (0.85, 0.93)	1.78	5.01
axSpA	0.92 (*n* = 174)	85	17.00 (14.00–21.00)	16.00 (13.00–21.00)	0.76**	0.89 (0.83, 0.93)	1.94	5.46
OA	0.93 (*n* = 156)	68	16.00 (10.75–21.00)	15.00 (9.25–21.00)	0.86**	0.93 (0.88, 0.96)	1.77	5.07
FM	0.94 (*n* = 143)	50	14.50 (10.00–21.00)	14.00 (10.50–19.25)	0.72**	0.85 (0.74, 0.92)	2.63	7.41
WABPPS: Q1 need (0–16)								
RA	0.87	117	4.00 (2.00–7.00)	3.00 (1.00–7.00)	0.77**	0.88 (0.83, 0.92)	1.31	3.71
axSpA	0.87	99	3.00 (1.00–6.00)	3.00 (1.00–5.00)	0.68**	0.88 (0.82, 0.92)	1.18	3.34
OA	0.83	79	3.00 (1.00–5.00)	3.00 (1.00–5.00)	0.75**	0.83 (0.73, 0.89)	1.42	4.01
FM	0.82	54	9.00 (6.00–12.00)	9.50 (6.00–12.00)	0.74**	0.85 (0.75, 0.92)	1.49	4.22
WTI: Part 2 (0–7)								
RA	0.78	133	1.00 (0.00–3.00)	1.00 (0.00–2.00)	0.68**	0.81 (0.73, 0.87)	0.77	2.17
axSpA	0.75	99	0.00 (0.00–2.00)	0.00 (0.00–1.00)	0.77**	0.91 (0.86, 0.94)	0.46	1.29
OA	0.75	79	1.00 (0.00–2.00)	1.00 (0.00–2.00)	0.75**	0.85 (0.77, 0.91)	0.68	1.92
FM	0.60	53	3.00 (2.00–5.00)	3.00 (2.00–4.00)	0.48**	0.68 (0.45, 0.82)	1.04	2.93

Abbreviations: axSpA, axial spondyloarthritis; FM, fibromyalgia; ICC, intra-class correlation coefficient; IQR, inter-quartile range; OA, osteoarthritis; PWSS, Perceived Workplace Support Scale; RA, rheumatoid arthritis; SDD, Smallest Detectable Difference; SEM, Standard Error of Measurement; WABBPS, Work Accommodations, Benefits, Policies and Practices Scale; WTI, Work Transitions Index Part 2.

[a]Participants indicating perceived health 'about the same' at T1 and T2, who had scores available at both time points.

**Correlation significant at $p \leq 0.01$.

4.1 | Strengths, limitations and future research

Relatively large samples of working people with RA, axSpA, OA and FM were recruited from across the UK, meaning that results are more likely to be representative. In general, participants had longer symptoms or disease durations, meaning they may represent those managing to stay in employment. However, it also means that they were more likely to have a realistic view of workplace support, have had time to consider work accommodation needs, and how their work has been disrupted. In FM, very few men were recruited, and the test-retest sample was smaller than required. Further research is needed to develop measures appropriate for the workplace needs of the self-employed. Phase 1 participants highlighted the relevance of the company size they work for in interpreting their responses, emphasising the need to consider this in future research.

4.2 | Conclusion

Overall, there is good validity and reliability of the British-English PWSS, WABPPS Q1 and WTI part 2. The three scales meet most recommendations of the COSMIN checklist for methodological quality and reporting (Gagnier et al., 2021; Mokkink et al., 2010). Accordingly, the scales can be used in the UK in these four RMDs in

research, organisational-level studies and potentially in specialist vocational rehabilitation practice. To our knowledge, there are no other scales measuring workplace support, work accommodations and job disruptions for use in RMD.

AUTHOR CONTRIBUTIONS

Alison Hammond, Alan Tennant, and Yeliz Prior contributed to the study conception and design. Phase 1: Alison Hammond and Yeliz Prior conducted data collection and analysis. Alison Hammond, Alan Tennant, Monique A. M. Gignac, Yeliz Prior, Suzanne M. M. Verstappen and Rachel O'Brien were members of the Expert Panel. Phase 2: Material preparation and data collection were performed by Angela Ching, Jennifer Parker, and Alison Hammond. Analyses were performed by Alan Tennant (Rasch analysis) and Alison Hammond (classical testing). The first draft of the manuscript was prepared by Alison Hammond and Alan Tennant. All authors contributed to previous versions of the manuscript. All authors have read and approved the final manuscript.

ACKNOWLEDGEMENTS

This work was part-funded 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.

The authors wish to thank: all the study participants for their time in completing the questionnaires. In Phase 1, the expert panel members for their time in supporting the linguistic validation process: John Grogan (JG: translator); Anita Prince (AP) and Stephen Kay (SK): patient research partners; Tracy White (TW: Senior Occupational Therapist, Wrightington Hospital); and Yvonne Hough (YH: Senior Occupational Therapist, St Helens Hospital), clinical advisors. In Phase 2: all the Local Collaborators (LC), rheumatology consultants, research facilitators, rheumatology nurses, occupational therapists and physiotherapists assisting with participant identification at the contributing NHS Trusts:

ENGLAND: Yvonne Hough (LC), St Helens and Knowsley Teaching Hospitals NHS Trust; Tracy White (LC), Wrightington, Wigan and Leigh NHS Foundation Trust; Karen Crosby (LC), JoAnn Nicholson, Susannah Glasgow, Manchester University NHS Foundation Trust; Nicky Walker (LC), Mid Cheshire Hospitals NHS Foundation Trust; Sarah Wilson (LC), Sheffield Teaching Hospitals NHS Foundation Trust; Carol Graham (LC), Midlands Partnership NHS Foundation Trust; Anne Boulton (LC), Northumbria Healthcare NHS Foundation Trust; Clare Webb (LC), University Hospitals of Derby and Burton NHS Foundation Trust; Anne Bontoft (LC), Northern Lincolnshire and Goole NHS Foundation Trust; Deborah Wilson (LC), Phil Buckley, Sherwood Forest Hospitals NHS Foundation; Dr Roshan Amarasena (LC), Jayne Edwards, Theresa Grant, Lisa Burgess, The Robert Jones and Agnes Hunt Orthopaedic Hospital NHS Foundation Trust; Sandi Derham (LC), Royal United Hospitals Bath NHS Foundation Trust; Sarah Small (LC), James Paget University Hospitals NHS Foundation Trust; Christina MacLeod (LC), Kevin Spear, Emily Porter, Hampshire Hospitals NHS Foundation Trust; Dr Shweta Bhagat (LC), Julie Blundell, Nyssa Muskett, West Suffolk NHS Foundation Trust; Sathish Govindarajalu (LC), Matthew Pearson, Samantha Nunn, Cambridgeshire Community Services NHS Trust; Dr David Coady (LC), Rona Ymballa, City Hospitals Sunderland NHS Foundation Trust; Susan Ellis (LC), East Lancashire Hospitals NHS Trust; Peter Swan (LC), Stephanie Howard, Wendy Neale, Norfolk Community Health and Care NHS Trust; Helen Jeffrey (LC), Jude Prince, Countess of Chester Hospital NHS Foundation Trust; Mr Kishore Mamidi (LC), Dr Marwan Bukhari (LC), Kathryn Allison, Jackie Toomey, Lynda Fothergill, University Hospitals of Morecambe Bay NHS Foundation Trust; Dr Karl Gaffney (LC), James Kennedy, Celia Woodhouse, Norfolk and Norwich University Hospitals NHS Foundation Trust; Dr Pamela Peterson (LC), Susan Pugmire, Gateshead Health NHS Foundation Trust; Dr Hanadi Sari-Kouzel (LC), Marina Oprea, Greta Van Duyvenvoorde, Allison Clarke, Blackpool Teaching Hospitals NHS Foundation Trust; Dr Suzanne Lane (LC), Cathleen Chabo, Sue Brixey, Ipswich Hospital NHS Trust; Dr Imran Riaz (LC), Ellie Gilham, Jayne Brown, The Queen Elizabeth Hospital King's Lynn NHS Foundation Trust; Suzannah Pegler (LC), Great Western Hospitals NHS Foundation Trust; Louise Hollister (LC), Dawn Simmons, Weston Area Health NHS Trust; Sue Smolen (LC), Mid Essex Hospital Services NHS Trust; David Sweeting (LC), East Coast Community Healthcare; Emma McLoughlin (LC), Anna Thornhill, Charlotte Dando, Solent NHS Trust; Dr Sophia Naz (LC), Lorraine Lock, Northern Care Alliance; Jonathan Price (LC), Joanne Holt, Birmingham Community Healthcare NHS Foundation Trust; Alison Bradshaw (LC), The Walton Centre NHS Foundation Trust; Dr Dobrina Hull and Dr Prahbu Gandhimani (LC), Kingston Hospital NHS Foundation Trust; Fiona Wright (LC), North Bristol NHS Trust; Dr Michael Green (LC), Samantha Roche, Holly Hancock, York Teaching Hospitals NHS Foundation Trust; Dr Cathy Lawson (LC), Pauline Fitzgerald, Lynsey Hall, Harrogate & District NHS Foundation Trust; Liz Lowe (LC), Jacqueline McCormick, Tameside and Glossop Integrated Care NHS Foundation Trust; Lee Hawthorn (LC), Bridgewater Community Healthcare NHS Foundation Trust; Dr Jill Firth (LC), Katherine Kinsey, Helen Light, Pennine MSK Partnership Ltd; Sharon Kerrison, Lara Smith, Jayne Budd (LCs), Stockport NHS Foundation Trust.

WALES: Laura Ingham (LC), Christine Samuel, Susan Pearson, Hayley Radford, Emma Williams, Shari Parker, Swansea Bay University Health Board.

SCOTLAND: Janet Harkess (LC), NHS Fife; Justine Griffin (LC), NHS Greater Glasgow and Clyde.

NORTHERN IRELAND: Una McKenna (LC), Northern Health and Social Care Trust.

CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to report.

DATA AVAILABILITY STATEMENT

The data underlying this article will be shared on reasonable request to Yeliz Prior. 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 & Society Ethics Panel (HSR1617-89: date 22/02/2017). All participants provided informed, written consent.

ORCID

Alison Hammond https://orcid.org/0000-0002-5266-9991
Alan Tennant https://orcid.org/0000-0002-0728-2130
Angela Ching https://orcid.org/0000-0002-3765-2534
Jennifer Parker https://orcid.org/0000-0002-2235-5748
Yeliz Prior https://orcid.org/0000-0001-9831-6254
Monique A. M. Gignac https://orcid.org/0000-0003-4445-3274
Suzanne M. M. Verstappen https://orcid.org/0000-0001-6181-0646
Rachel O'Brien https://orcid.org/0000-0002-4720-1956

REFERENCES

Acquadro, C., Joyce, C. R. B., Patrick, D. L., Ware, J. E., & Wu, A. W. (2004). *Linguistic validation manual for patient-reported outcomes (PRO) instruments*. Mapi Research Trust.

Al Dhanhani, A. M., Gignac, M. A. M., Beaton, D. E., Su, J., & Fortin, P. R. (2015). Job accommodations availability and utilization among people with lupus: An examination of workplace activity limitations and work context factors. *Arthritis Care & Research*, *67*(11), 1536–1544. https://doi.org/10.1002/art.22662

Andrich, D., Sheridan, B. S., & Luo, G. (2015). *RUMM2030: An MS windows computer program for the analysis of data according to Rasch unidimensional models for measurement*. RUMM Laboratory.

Beaton, D. E., Bombardier, C., Guillemin, F., & Ferraz, M. B. (2007). *Recommendations for the cross-cultural adaptation of the DASH & Quick-DASH outcome measures*. Institute of Work and Health. https://dash.iwh.on.ca/sites/dash/files/downloads/cross_cultural_adaptation_2007.pdf

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*, 1833–1840.

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

Boonen, A., Putrik, P., Marques, M. L., Alunno, A., Abasolos, L., Beaton, D., Betteridge, N., Bjørk, M., Boers, M., Boteva, B., Fautrel, B., Guillemin, F., Mateus, E. F., Nikiphorou, E., Péntek, 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., Brzezińska, O., Chauhan, L., Copsey, S., Guimarães, 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 supporting 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

British Society of Rehabilitation Medicine (2021). Vocational rehabilitation: BSRM brief guidance. https://www.bsrm.org.uk/downloads/bsrmvocrehab-finaldraftv6-7-9-21.pdf

Brown, T., Hammond, A., Ching, A., & Parker, J. (2023). Work limitations and associated factors in working people with rheumatoid arthritis, axial spondyloarthritis, osteoarthritis or fibromyalgia. *Musculoskeletal Care*. online first. https://doi.org/10.1002/msc.1760

Calin, A., Garrett, S., Whitelock, H., Kennedy, L. G., O'Hea, J., Mallorie, 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.

Cichetti, D. V. (1994). Guidelines, criteria, and rules of thumb for evaluating normed and standardised assessment instruments in psychology. *Psychological Assessment*, *6*(4), 284–290. https://doi.org/10.1037/1040-3590.6.4.284

De Vet, H. C. W., Terwee, C. B., Mokkink, L. B., & Knol, D. L. (2011). *Measurement in medicine: A practical guide*. Cambridge University Press.

Donoghue, D., Stokes, E., & Stokes, E. (2009). How much change is true change? The minimum detectable change of the berg balance scale in elderly people. *Journal of Rehabilitation Medicine*, *41*(5), 343–346. https://doi.org/10.2340/16501977-0337

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

Gagnier, J. J., Lai, J., Mokkink, L. B., & Terwee, C. B. (2021). COSMIN reporting guidelines for studies on measurement properties of patient reported outcome measures. https://www.cosmin.nl/wp-content/uploads/COSMIN-reporting-guideline_1.pdf

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 behavioural coping efforts to manage work activity limitations. *Arthritis Care & Research*, *53*(3), 328–336. https://doi.org/10.1002/art.21169

Gignac, M. A. M., Badley, E. M., Lacaille, D., Cott, C., Adam, P., & Anis, A. H. (2004). Managing arthritis and employment: Making arthritis-related work changes as a means of adaptation. *Arthrits Care & Research*, *51*(6), 909–916. https://doi.org/10.1002/art.20822

Gignac, M. A. M., Bowring, J., Tonima, S., Franche, R.-L., Thompson, A., Jetha, A., Smith, P. M., Macdermid, J. C., Shaw, W. S., Van Eerd, D., Beaton, D. E., Irvin, E., Tompa, E., & Saunders, R. (2023). A sensibility assessment of the job demands and accommodation planning tool (JDAPT): A tool to help workers with an episodic disability plan workplace support. *Journal of Occupational Rehabilitation*, *33*(1), 145–159. https://doi.org/10.1007/s10926-022-10057-4

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., Cao, X., Lacaille, D., Anis, A. H., & Badley, E. M. (2008). Arthritis-related work transitions: A prospective analysis of reported productivity losses, work changes, and leaving the labour force. *Arthritis Care & Research*, *59*(12), 1805–1813. https://doi.org/10.1002/art.24085

Gignac, M. A. M., Cao, X., & McAlpine, J. (2015). Availability, need for and use of work accommodations and benefits: Are they related to employment outcomes in people with arthritis? *Arthritis Care & Research*, *67*(6), 855–864. https://doi.org/10.1002/acr.22508

Gignac, M. A. 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 outcomes. *Arthritis Care & Research*, *63*(7), 953–962. https://doi.org/10.1002/art.20456

Gignac, M. A. M., Ibrahim, S., Smith, P. M., Kristman, V., Beaton, D. E., & Mustard, C. A. (2018a). 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., Jetha, A., Martin Ginis, K. A., & Ibrahim, S. (2021). Does it matter what your reasons are when deciding to disclose (or not disclose) a disability at work? The association of workers' approach and avoidance goals with perceived positive and negative workplace outcomes. *Journal of Occupational Rehabilitation*, *31*, 638–651. https://doi.org/10.1007/s10926-020-09956-1

Gignac, M. A. M., Kristman, V., Smith, P. M., Beaton, D. E., Badley, E. M., Ibrahim, S., & Mustard, C. A. (2018b). Are there differences in workplace accommodation needs, use and unmet needs among older workers with arthritis, diabetes, and no chronic conditions? Examining the role of health and work context. *Work, Ageing and Retirement*, *4*, 381–398. https://doi.org/10.1093/worker/way004

Gignac, M. A. M., Lacaille, D., Beaton, D. E., Backman, C. L., Cao, X., & Badley, E. M. (2014). Striking a balance: Work-health- personal life 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

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

Gilworth, G., Emery, P., Barkham, N., Smyth, N. G., Helliwell, P., & Tennant, A. (2009). Reducing work disability in Ankylosing Spondylitis – development of a work instability scale for AS. *BMC Musculoskeletal Disorders*, *10*(1), 68. https://doi.org/10.1186/1471-2474-10-68

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

Hammond, A., Tennant, A., Ching, A., Parker, J., Prior, Y., Gignac, M. A. M., Verstappen, S., & O'Brien, R. (2023a). Psychometric testing of the British-English long term conditions job strain scale, long-term conditions work spillover scale and work-health-personal life perceptions scale in four rheumatic and musculoskeletal conditions. *Musculoskeletal Care*, 1–16. https://doi.org/10.1002/msc.1774

Hammond, A., Tennant, A., Ching, A., Parker, J., Prior, Y., Gignac, M. A. M., Verstappen, S., & O'Brien, R. (2023b). Psychometric testing of the British-English workplace activity limitations scale in four rheumatic and musculoskeletal conditions. *Rheumatology Advances in Practice*, *7*(1), rkad028. https://doi.org/10.1093/rap/rkad028

Health Education England Health literacy "how to" guide. Health education England. https://library.nhs.uk/wp-content/uploads/sites/4/2020/08/Health-literacy-how-to-guide.pdf

Health Research Authority. (2023). Integrated research application system: Patient identification Centres. https://www.myresearchproject.org.uk/help/hlpsitespecific.aspx#PIC

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

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

Jetha, A., Badley, E. M., Beaton, D., Fortin, P. R., Shiff, N. J., & Gignac, M. A. M. (2015). Unpacking early work experiences of young adults with rheumatic disease: An examination of absenteeism, job disruptions, and productivity loss. *Arthritis Care & Research*, *67*(9), 1246–1254. https://doi.org/10.1002/acr.22602

Jetha, A., Johnson, S. R., & Gignac, M. A. M. (2021). Unmet workplace support needs and lost productivity of workers with systemic sclerosis: A path analysis study. *Arthritis Care & Research*, *73*(3), 423–431. https://doi.org/10.1002/acr.24123

Jetha, A., Tucker, L., Backman, C., Kristman, L., Bowring, J., Hazel, E. M., Perlin, L., Proulx, L., Chen, C., & Gignac, M. A. M. (2022). Rheumatic disease disclosure at the early career phase and its impact on the relationship between workplace supports and presenteeism. *Arthritis Care & Research*, *74*(10), 1751–1760. https://doi.org/10.1002/acr.24620

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

Li, X., Gignac, M. A. M., & Anis, A. H. (2006). Workplace, psychosocial factors, and depressive symptoms among working people with arthritis: A longitudinal study. *Journal of Rheumatology*, *33*, 1849–1855.

Mokkink, L. B., Terwee, C. B., Patrick, D. L., Alonso, J., Stratford, P. W., Knol, D. L., Bouter, L. M., & de Vet, H. C. W. (2010). The COSMIN checklist for assessing the methodological quality of studies on measurement properties of health status measurement instruments: An international Delphi study. *Quality of Life Research*, *19*(4), 539–549. https://doi.org/10.1007/s11136-010-9606-8

National Institute of Health Research. (2023). https://www.nihr.ac.uk/documents/nihr-crn-recruitment-policy-document/11347

Nunnally, J. C. (1978). *Psychometric theory*. McGraw-Hill.

Office for National Statistics (2016). Standard occupational classification SOC 2010. https://www.ons.gov.uk/methodology/classificationsandstandards/standardoccupationalclassificationsoc/soc2010

Rasch, G. (1980). *Probabilistic models for some intelligence and attainment tests*. The University of Chicago Press.

Tang, K., Beaton, D. E., Lacaille, D., Gignac, M. A. M., Zhang, W., Anis, A. H., & Bombardier, C. (2010). The work instability scale for rheumatoid arthritis (RA-WIS): Does it work in osteoarthritis? *Quality of Life Research*, *19*(7), 1057–1068. https://doi.org/10.1007/s11136-010-9656-y

Tang, K., Escorpizo, R., Beaton, D. E., Bombardier, C., Lacaille, D., Zhang, W., Anis, A. H., Boonen, A., Verstappen, S. M., Buchbinder, R., Osborne, R. H., Fautrel, B., Gignac, M. A., & Tugwell, P. S. (2011). Measuring the impact of arthritis on worker productivity: Perspectives, methodological issues, and contextual factors. *Journal of Rheumatology*, *38*(8), 1776–1790. https://doi.org/10.3899/jrheum.110405

Tennant, A., & Conaghan, P. G. (2007). The Rasch measurement model in rheumatology: What is it and why use it? When should it be applied, and what should one look for in a Rasch paper? *Arthritis & Rheumatism*, *57*(8), 1358–1362. https://doi.org/10.1002/art.23108

Tennant, A., Hillman, M., Fear, J., Pickering, A., & Chamberlain, M. A. (1996). Are we making the most of the stanford health assessment questionnaire? *British Journal of Rheumatology*, *35*(6), 574–578. https://doi.org/10.1093/rheumatology/35.6.574

Teresi, J. A., Kleinman, M., & Ocepek-Welikson, K. (2000). Modern psychometric methods for detection of differential item functioning: Application to cognitive assessment measures. *Statistics in Medicine*, *19*(11–12), 1651–1683. https://doi.org/10.1002/(sici)1097-0258(20000615/30)19:11/12<1651::aid-sim453>3.0.co;2-h

Terwee, C. B., Bot, S. D. M., de Boer, M. R., van der Windt, D. A. W. M., Knol, D. L., Dekker, J., Bouter, L. M., & de Vet, H. C. (2007). Quality criteria were prosed for measurement properties of health status questionnaires. *Journal of Clinical Epidemiology*, *60*(1), 34–42. https://doi.org/10.1016/j.jclinepi.2006.03.012

UNISON. (2020). Let's be reasonable: Disability equality in the workplace: A report by UNISON. https://www.unison.org.uk/content/uploads/2020/12/26261.pdf

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: Hammond, A., Tennant, A., Ching, A., Parker, J., Prior, Y., Gignac, M. A. M., Verstappen, S. M. M., & O'Brien, R. (2023). Psychometric testing of the British-English Perceived Workplace Support Scale, Work Accommodations, Benefits, Policies and Practices Scale, and Work Transitions Index in four rheumatic and musculoskeletal conditions. *Musculoskeletal Care*, 1–18. https://doi.org/10.1002/msc.1807