Resilience and return-to-work pain interventions: systematic review

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Background
Resilience is a developing concept in relation to pain, but has not yet been reviewed in return-to-work (RTW) contexts.

Aims
To explore the role of resilience enhancement in promoting work participation for chronic pain sufferers, by reviewing the effectiveness of existing interventions.

Methods
Resilience was operationalized as: self-efficacy, active coping, positive affect, positive growth, positive reinforcement, optimism, purpose in life and acceptance. Five databases were searched for randomized controlled trials (RCTs) whose interventions included an element of resilience designed to help RTW/staying at work for chronic pain sufferers. Study appraisal comprised the Cochrane risk of bias (RoB) tool and additional quality assessment. Findings were synthesized narratively and between-group differences of outcomes were reported. Heterogeneous PICO (population, intervention, comparator, outcome) elements precluded meta-analysis.

Results
Thirty-four papers from 24 RCTs were included. Interventions varied; most were multidisciplinary, combining behavioural, physical and psychological pain management and vocational rehabilitation. Four found RTW/staying at work improved with intensive multidisciplinary interventions compared with less intensive, or no, treatment. Of these, one had low RoB; three scored poorly on allocation concealment and selective outcome reporting. Four trials had mixed results, e.g. interventions enabling reduced sick leave for people on short-term not long-term leave; 16 showed no improvement. Five trials reported resilience outcomes were improved by interventions but these were not always trials in which RTW improved.

Conclusions
Effectiveness of resilience interventions for chronic pain sufferers on RTW is uncertain and not as helpful as anticipated. Further agreement on its conceptualization and terminology and that of RTW is needed.

Key words Chronic pain; occupational health; resilience; return to work.

Introduction

There is compelling evidence that safe, appropriate work confers economic, bio–psycho–social benefits for workers and their families [1–3] and strong evidence that worklessness is associated with poorer physical and mental health outcomes for working-age adults [4] including those with chronic pain [5,6].

Chronic pain can be defined as pain that fluctuates, lasting over 3 months, which may be intractable [7,8]. It is estimated that one in five Europeans has chronic pain and it was recently reported that 25–35% of adults report chronic pain [5]. Chronic pain can negatively impact on work [5,10]. An observational study review reported that it has substantial deleterious effects on work absenteeism and presenteeism [11]. It is therefore useful to consider what makes a chronic pain sufferer who wants to (re)enter or sustain working life resilient.

Defining resilience is complex; it is debated whether it is an outcome, process, state or trait [12–14]. Resilience enhancement arises from positive psychology, notably the Broaden-and-Build and Self-Determination Theory [15,16]. There is agreement that resilience can be defined as a dynamic process encompassing positive adaptation in the face of adverse experiences that would otherwise lead to poor outcomes [17–19]. Resilience is a complex, multi-faceted phenomenon, but it may help us understand why some people seem relatively protected from stress compared to others [14,20,21]. It is thought that having a resilient personality (i.e. having emotional flexibility and availability to problem-solve) can protect older adults against adverse effects of chronic pain and may help explain individual differences in pain acceptance if considered a stable trait involving the ability to adapt to adversity [22].

A recent review has conceptualized resilience when one is in pain as being able to recover from disability and depression, and sustaining functioning in the presence of pain [23]. This psychological flexibility model, which includes acceptance, mindfulness and committed action, could be important to consider when conceptualizing resilience in pain [24]. These authors also suggest that acceptance and commitment therapy (ACT), which promotes behaviour change rather than symptom reduction, may be key. There is a growing evidence for the utility of these models in reducing pain-related suffering [25]. The authors argue that promoting resilience mechanisms may be useful for both interventions and prevention strategies. It is methodologically challenging to operationalize and measure the

dynamic characteristics of resilience mechanisms such as psychological flexibility. We need to know more about resilience when one is in pain [23].

Another recent review demonstrated overlap between pain resilience, pain acceptance, psychological flexibility and pain self-efficacy [26] and concluded that pain resilience is a 'dynamic process related to both stable individual characteristics and contextual and state factors, such as goal contexts and affective states'. We have synthesized key factors from the research above, and from communications with leading resilience and pain researchers, to inform our search strategy (Appendix 1, available as Supplementary data at *Occupational Medicine* Online) and to inform our conceptualization of interventions with resilience components as those which aim to improve self-efficacy, active coping, positive affect, positive growth, positive reinforcement, optimism, purpose in life and acceptance, all *per se* and in relation to pain.

Currently, a resilience-enhancing approach means shifting towards the inclusion of positive outcomes (sustainability) in addition to one's ability to recover from negative outcomes (pain and distress). Resilience is a growing area in the pain literature and we wanted to apply its utility to looking at helping pain sufferers return to or stay in work. Although many interventions utilize resilience-enhancing techniques, they are often not referred to as such, and their use can be under-theorized. Our aim is to identify the role of resilience-enhancing techniques in existing interventions to assess their effectiveness, in order to provide the basis for a more focused approach that might assist practising occupational physicians, and others interested in sustainable working lives for pain patients. No one has yet attempted to group interventions according to a clearly operationalized set of criteria arising from a literature review and in-depth conversations with leading experts. This is what we attempt here; to see if resilience, while complex, could be a useful concept, by which to understand how to help people return to work. Our review focuses on interventions that address resilience by changing individual cognitions and practices. Future research might examine the role of workplace factors on promoting resilience.

Our literature search found no other systematic reviews of the role of resilience-enhancing techniques in interventions designed to enable chronic pain sufferers to stay at work or return to work. There are some related studies. A 2012 review examined the effectiveness of community and workplace-managed interventions to manage musculoskeletal-related sickness absence and job loss [27]. It found that most interventions appeared beneficial although effects were smaller in larger and better-quality studies, suggesting publication bias; also, the effort-intensive interventions were less effective than simple ones. Musculoskeletal-related sickness absence is similar to chronic pain sickness absence in terms of how both are measured [28] and the review's inclusion of behaviour change techniques is related to the interventions we map onto resilience training in our review. However, our review covers all chronic pain and any intervention with any element of resilience as conceptualized here and delineated in the primary and secondary outcomes, below.

A recent meta-analysis of cohort studies examined absence from work and return to work (RTW) for back pain sufferers [29]. The pooled estimate suggests a good RTW rate but the 32% not back at 1 month are key to target in preventing long-term absence. This review provides important data regarding ascertaining if interventions designed to bolster resilience do so, and we consider the length of time participants have been off work as part of our study.

Another meta-analysis was conducted on the effectiveness of psychological interventions for chronic pain (excluding headache) on health care use and work absence [30]. Nine of the 18 randomized controlled trials (RCTs) reported work loss as an outcome. No effects of psychological interventions on work loss were found (although the studies were considered heterogeneous). In contrast, in our review, we have broadened the criteria to include any intervention designed to assist RTW or staying at work for chronic pain sufferers (including headache sufferers), which has any element of resilience within it.

Our review objective is to consider if resilience is a useful concept by which to conceptualize RTW interventions for pain patients, examining the effectiveness of RCTs of interventions which include any key element of resilience designed to assist RTW or staying at work for adult chronic pain sufferers.

Methods

This review was planned and conducted in accordance with PRISMA guidelines, following a predetermined protocol registered on PROSPERO (CRD42015023504). Protocol deviations are documented in Appendix 4 (available as Supplementary data at *Occupational Medicine* Online). Eligible papers met the following criteria:

- Participants: aged 18+ with chronic pain (diagnosed or labelled using any recognized criteria) who are either in any kind of employment or attempting to (re)enter employment through any (RTW) scheme.
- Interventions: designed to assist RTW or staying at work for chronic pain sufferers, which have any element of resilience within it (specified below).
- Comparators: a group offered a control such as placebo, no treatment, wait list, usual care/treatment-as-usual (UC/TAU).
- Primary outcome measures:

RTW or staying-at-work measures (via any quantifiable method capable of being validated).
Resilience (as measured by any validated resilience scale plus any validated scales measuring the following aspects of resilience: self-efficacy, active coping, positive affect, positive growth, positive reinforcement, optimism, purpose in life and acceptance, all per se and in relation to pain). Baseline through to last available follow-up (FU) results will be reported. We only report between-group analyses from outcomes that conform to our inclusion criteria.

- Secondary outcome measures (measured using any validated scale):

Pain intensity
Pain interference
Pain disability
Fear of work avoidance beliefs

Completed, published RCTs/clinical trials were included. MEDLINE, Embase, PsycINFO (via Ovid), the Cochrane Library and Web of Science were searched from inception to May 2017, using MeSH and key word terms (see Appendix 1, available as Supplementary data at *Occupational Medicine* Online, for search strategy). The first 20 pages of Google Scholar were searched. No language restrictions were imposed. We are only reporting on RCTs in this paper but searched for all primary study types (systematic reviews, RCTs, observational and qualitative). Findings regarding RCTs are reported here. Observational and qualitative studies were sought to assess harms and consider why people may respond differently to the same objective experiences of interventions at work. These findings will be reported in subsequent papers.

All titles and abstracts of studies were independently screened by two reviewers (EW and RP). Disagreement was resolved via discussion with a third reviewer (DW). The full text of potentially eligible studies was retrieved. Studies were translated into English where necessary. Each study was read in full and independently assessed by two reviewers. Any disagreement was resolved via discussion with a third reviewer. The reference lists of all full-text articles were hand searched for additional studies. Relevant systematic reviews were also screened for potential trials. Authors of any RCT protocols/abstracts were contacted to establish trial status. Details of the selection process are summarized in the inclusion flow-chart (Figure 1). Excluded articles, alongside reasons for exclusion, are available from the lead author on request.

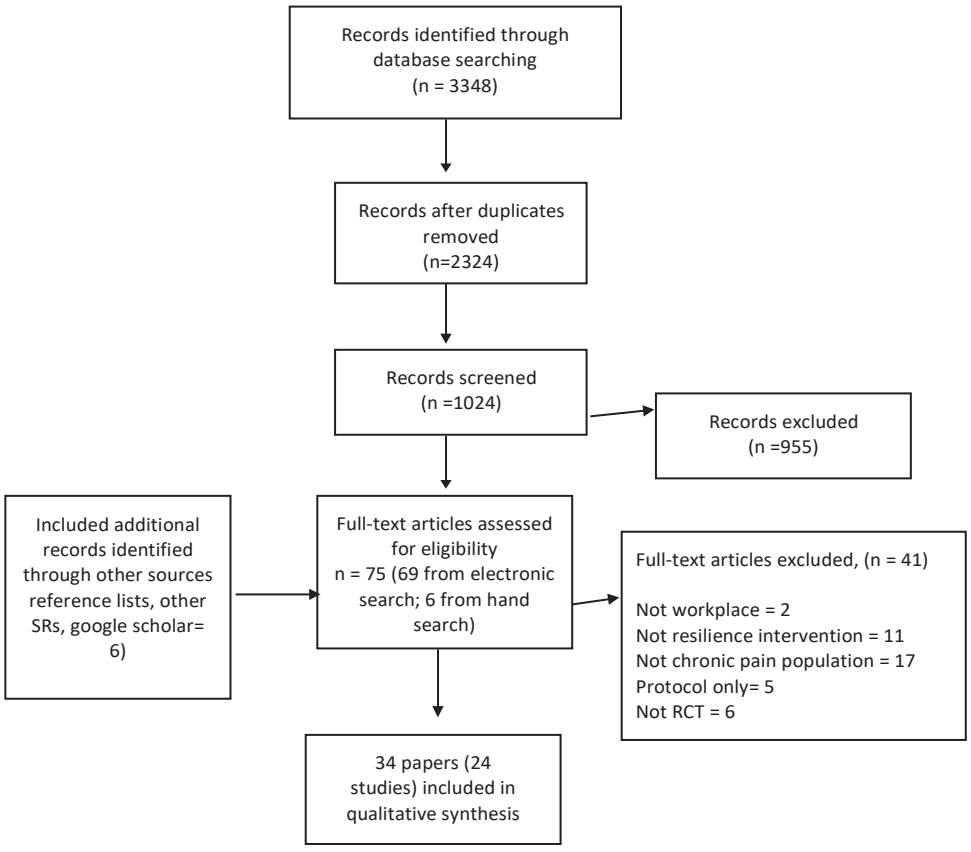

Figure 1. Flow diagram of search.

We collated multiple reports that related to the same study, so that each study rather than each report was the unit of interest in this review. Data were extracted from included studies for assessment of study quality and evidence synthesis using a data extraction form piloted prior to the start of the review and refined to ensure consistency. Study authors were contacted for missing data. Data were extracted independently by one reviewer from the review team (EW, RP, DW, JX and NC) and checked by a second, who then met to agree data extraction, risk of bias (RoB) and methodological quality. Disagreements were resolved via discussion with a third reviewer. Extracted data included: study setting; population/participant demographics and baseline characteristics; details of intervention and comparator; study methodology; recruitment and study completion rates; outcomes and measurement times; suggested mechanisms of intervention action; and information for assessment of RoB and study quality. See Table 1 for characteristics and main results of included studies.

The Cochrane RoB assessment was used [31]. This was supplemented with methodological quality assessment (guided by previous works [32,33]; see Appendix 3, Tables 2 and 4 (Table 4 is available as Supplementary data at *Occupational Medicine* Online) show issues). We conducted a narrative synthesis of findings from included studies structured around the type of intervention, target population characteristics, type of outcome and intervention content. We summarized the intervention effects for each study by reporting between-group differences, only with the primary outcomes. We suggested a *priori* that there would be limited scope for meta-analysis because of the range of different outcomes measured; this was so. We aim to categorize studies according to which resilience concepts interventions use.

Results

The literature search identified 3348 records. Once duplicates were removed, 1024 records were screened and assessed against eligibility criteria (Figure 1). Seventy-five full-text articles were assessed for eligibility from the database search and hand-searching. After further exclusion, we identified 34 papers pertaining to 24 RCTs for inclusion. In total, we excluded 41 records. The most common reason was inability to separate out participants with chronic pain from other conditions or subacute pain (the list and full reasons are available on request). Characteristics and main results of included studies are summarized in Table 1. RoB is summarized in Table 2 (all included study details are in Appendix 2 [Table 3], available as Supplementary data at *Occupational Medicine* Online, and the quality assessment is summarized in Appendix 3 [Table 4], available as Supplementary data at *Occupational Medicine* Online). We contacted 19 authors for clarity regarding eligibility, eight responded. Additional unpublished data were obtained from two included studies [34,35] regarding the percentage of participants on sick leave (SL) and length of pain, respectively.

The 24 included studies were published between 1992 and 2017. Seven trials occurred in Sweden, four in each of Denmark, Norway and the Netherlands, and one in each of England, Finland, Germany, the USA and Hong Kong.

The sample size randomized totalled 6795 (range 45–664, mean 243); inclusion criteria varied between studies. Participants' age ranges were not always stated, although the lowest stated limit was 18 and the highest upper was 65 (see Appendix 2 [Table 3], available as Supplementary data at *Occupational Medicine* Online, for means) [36–39]. It varied between and even within trials whether participants were on SL from work, on benefits or in work. Pain conditions, type of job, whether on SL or not and SL duration, if applicable, varied greatly across studies and was not always stated. There was heterogeneity within trials, e.g. one trial included patients who had a paid job (working full or part-time or on SL) who felt their workability was threatened by disease-related problems [40]. While some studies reported International Classification of Primary Care (ICPC) criteria to describe pain, terminology was often used inconsistently across studies, e.g. it was unclear what the differences may be between chronic widespread pain and musculoskeletal (MS/MSK) pain.

Interventions varied in design and intensity but most were multidisciplinary, combining behavioural, physical and psychological aspects of pain management (see Appendix 2 [Table 3], available as Supplementary data at *Occupational Medicine* Online). Physical elements focused on clinical examination, ergonomics, exercise, stretching and relaxation. Psychological elements focused around cognitive behavioural therapy (CBT); active coping strategies in general and particularly for stress and pain management; goal-setting to enable sustainable behaviour change; and improving self-efficacy and motivation and reducing fear. Some included participant-led rehabilitation planning with specialist case-workers and vocational guidance. A minority included direct workplace visits and interactions with work managers. Some trials' interventions used multiple resilience concepts and some only one. Therefore, we could not effectively group studies conceptually according to resilience concepts.

Comparisons were UC,TAU or different interventions compared against each other instead of UC/TAU. UC varied from no treatment (although participants could seek treatment elsewhere in one trial, see [41]) to quite extensive treatment regimens (e.g. TAU involved individualized education, lifestyle advice by a specialist and sometimes physiotherapy and social support in one trial [42]). Many studies compared different interventions against each other with no TAU group (e.g. [43–46]).

Table 1. Summary of characteristics and main results of included studies

	First author, year, country	*N* = total Intervention (I) CG randomized (analysed)	Intervention	Control/ comparison group	Assessment schedule BL and schedule	Primary outcomes—RTW, SL (return to work, sick leave or staying at work measures) R (resilience concepts)	Main results + or − (sig. diffs)
1	Alaranta (1994) [62] Finland	*N* = 378 (293) IG: 152 CG: 141	3-week prog. of physical training and CBT disability management	3-week in-house rehab. prog.	BL; 3 and 12 months	SL: total no. of sick days in a 12-month period Resilience (MHLC and SAS)	−SL −R
2	Altmaier (1992) [61] USA	*N* = 45 IG = 24 (21): CG = 21 (21)	Psychological prog.	Standard treatment	BL; discharge (at 3 weeks); 6 months	RTW (if pt was working FT or PT training) Resilience: 20-item self-efficacy scale and WHYMPI	−RTW −R
3	Andersen (2015) [51] Denmark	*N* = 141 (*N* = 94) I1: = 47: I2 = 46: CG: = 47	IG1: chronic pain self-management prog. IG2: tailored physical activity	Reference group	BL; end of 3-month interval	Sick-listed status (yes/no); duration of sickness absence period	+RTW (TPA gp not CPSMP)
4	Asenlof (2005) and FU: Asenlof (2009), Emilson (2017) [36–38] Sweden	2005: 122: IG = 57: CG = 65 2009: 122 (97): IG = 65: CG = 57 2016: 43 (44%): IG = 20:CG = 23	Tailored behavioural treatment	Exercise-based physiotherapy treatment	BL; 3-, 12- and 24-month paper; 10 years	Sickness-related absence[c] (Functional) self-efficacy[c] (SES, Swedish V)	+SL (2017 paper only, TBT gp) +R (2005 paper only)
5	Bendix (1995) [43] Denmark	*N* = 132 (106) I1 = 46 (40): 12 = 43 (31): I3 = 43(35)	I1: intensive, multidisciplinary functional restoration	I2: active physical training I3: active + psycho-physical prog.	4 months	RTW defined as work readiness SL (days)	+RTW +SL
6	Bendix (1996) [41] Denmark	*N* = 106 (94) IG = 55 (45), ATW (27%) CG = 51 (49), ATW (16%)	I1: intensive, MD functional restoration: see Bendix (1995) [43]	CG: not treated – could go elsewhere for treatment	4 months	RTW defined as work readiness SL (days)	+RTW +SL
7	Bernaards (2006, 2007, 2011) [52–54] The Netherlands	*N* = 466 I1 = 152: I2 = 156: CG = 158	IG1: work style IG2: work style/ lifestyle PA	UC (Dutch guidelines)	BL; end of 6-month interval (ST pain); 12 months after start (LT pain)	Degree of recovery (self-reported 7-point scale) Disability at work (0–11 scale)	−R
8	Bergbom (2014) [44] Sweden	*N* = 105[a] IG1 = 28 (18[b]): IG2 = 32 (24[b]): IG3 = 45 (37[b])	I1: activity training I2: graded exposure *in vivo* I3: broad CBT	No true CG	BL, PI 9-month PI 1× week through treatment	Measured before and after treatment: SL (self-report of 14 days or more)	−SL
9	Brendbekken (2017) [34] Norway	*N* = 284 IG = 141: CG = 143	MI: ISIVET	BI: active CG	2 weeks, 3 months (MI); 2 weeks (BI); monthly for 24 months (all)	RTW fully and partly (if > 50% of work days/month spent on SL)	−FT RTW +PT RTW
10	De Buck (2005) [40] The Netherlands	*N* = 140 I: *N* = 74: CG = 66	Job retention vocational rehab. prog.	UC	BL; 6, 12, 18 and 24 months	Occurrence of job loss (complete work disability or unemployment) Resilience RAND 36	−Job loss +R
11	Eijk-Hustings (2013) [42] The Netherlands	Total *N* = 203 (134) IG1, MD gp = 108 (67): IG2 = 47(19): UC = 48	I: 2 phases, MD phase 1 also IG1, then AE phase 2, also IG2	UC	12 weeks; 18 months	HR QoL, using EQ-5D SL measured by self-developed questionnaire Impact of FM on functioning (FIQ, workability subscale)	−R −SL
12	Ewert (2009) [39] Germany	Total *N* = 202 (169) I1 = 92 (83): CG = 91 (86)	I: 13-week programme – multimodal secondary prevention	13-week exercise prog.	BL; PI; 3 and 12 months	Resilience: WHYMPI, CSQ, pain-specific self-efficacy, GSE, SF-36 (PCS) and SF-36 (MCS)	−R

Table 1. *Continued*

	First author, year, country	*N* = total Intervention (I) CG randomized (analysed)	Intervention	Control/ comparison group	Assessment schedule BL and schedule	Primary outcomes—RTW, SL (return to work, sick leave or staying at work measures) R (resilience concepts)	Main results + or − (sig. diffs)
13	Haldorsen (1998) [57,58] and 12-month FU (1998) [59] Norway	*N* = 469 IG = 312 (293): CG = 157 (94)	IG: multimodal CBT	TAU GP care	BL; 4 weeks; 2, 6 and 10 months 1-year FU	RTW (Norwegian National Health Insurance Register data)	−RTW
	Haldorsen 1998 [59] Norway (Bergen study)	*N* = 223 IG = 142: CG = 8	I1: multimodal CBT	TAU GP care	BL; 4 weeks; 2, 6 and 10 months 1-year FU	RTW	−RTW
14	Haldorsen (2002) [35], Skouen (2002) [65], Skouen (2006) [66] Norway	Total = 654 (627) as RTW data not available on gov. workers (*n* = 27) IG1 =169 (165), 57, 42 IG2 = 222(214), 52, 81 CG = 263 (249), 86, 85	I1: EMD I2: LMD	TAU GP advice (called OT, ordinary treatment)	BL testing (screening for prognosis) Treatment (1–2 months later) Every month for 14 months	RTW (absence of sick pay per month)	−RTW for medium prognosis participants −RTW for poor prognosis and good prognosis
	Haldorsen (2002) [35], Skouen (2002) [65], Skouen (2006) [66], subgroup analyses of LBP pain [35]	*N* = 664, 211 were pts with LBP I1= 52: I2= 57: CG = 86	As for Haldorsen (2002) [35]	As for Haldorsen (2002) [35]	BL; 26 months; monthly, with *P* values reported at 12-, 18- and 24-month PI	RTW (proportion of pts back at FT work, recorded every month) (men and women analysed separately)	+RTW men LMD gp −RTW for women
14	Haldorsen (2002) [35], Skouen (2002) [65], Skouen (2006) [66], subgroup of CWP only from Haldorsen (2002) [35], comparing RTW in 3 gps during first 54 months after treatment	CWP subgroup (data on the 215 with CWP [208 pts] as RTW data were not available on government employees). Randomized to: TAU *N* = 88 (85) LMD *N* = 83 (81) EMD *N* = 44 (*n* = 42)	As for Haldorsen (2002) [35]	As for Haldorsen (2002) [35]	54-month FU from end of treatment	Proportion of pts who fully RTW for each month in FU period; days absent from work (M and F analysed separately)	+RTW female EMD gp −RTW men LMD gp
15	Hutting (2013, 2015) [48,49] The Netherlands	*N* = 123 IG = 66 (64): CG = 57 (53)	Self-management of CANS programme (SG)	UC + information available	BL; 3, 6 and 12 months	Absenteeism (SPS-6 Dutch V and WLQ)[c] Resilience (SEWS)[c], VBBA[c], GSES[c] Dutch V	−RTW −R
16	Jensen (1997) [60] Sweden	*N* = 63 (54) IG1 = 33 (29): IG2 = 30 (25)	EI	RI	1 week before treatment Last day of treatment 6 months post-treatment 18 months post-treatment	SL (over 14 days) Resilience: CSQ, Swedish V, GSI	−SL −R
17	Jensen (2001, 2005), Bergström (2012) [47,67,68] (2005 paper is 36-month FU; 2012 paper is 10-year FU) Sweden	*N* = 214 IG1 BMR: 63 (49, 47) IG2 PT 2: 54 (48, 50) IG3 CBT: 49 (41) CG: 48 (0, 28) Nos analysed vary over FU and measures.	I1: behavioural medicine rehabilitation I2: behavioural-oriented physiotherapy IG3: CBT	UC	Pre-treatment Post-treatment 6 and 18 months 36 months (2005 paper only)	SL Early retirement Resilience: SF-36	−SL +R (females only)
17	Bergström (2012) [68] (10-year FU of Jensen 2001 [47]) Sweden	Ppts were classified into 1 of 3 subgroups based on the MPI-S *N* = 194 (187) IG1 = (AC 13, ID 15, DYS 22) IG2 = (AC 18, ID 13, DYS 23) IG3 = (AC 18, ID 8, DYS 18) CG = (AC 18, ID 11, DYS 17)	As for Jensen et al. (2001, 2005) [47,67]	UC	10 years	Registered sickness absence after rehab. over a 10-year FU	−SL

Table 1. *Continued*

	First author, year, country	*N* = total Intervention (I) CG randomized (analysed)	Intervention	Control/ comparison group	Assessment schedule BL and schedule	Primary outcomes—RTW, SL (return to work, sick leave or staying at work measures) R (resilience concepts)	Main results + or − (sig. diffs)
18	Jensen (2011) [45] Denmark	*N* = 351 (344) I1 = 176 (176[c], 124[d]): I2 = 175 (175[c], 120[d])	Hospital-based MD intervention	Brief intervention	BL; 12 months	RTW (first 4-week period with no social transfer payments)	−RTW
19	Li (2006) [64] Hong Kong	*N* = 64 IG = 34:CG = 30	3-week prog. of individual vocational counselling and gp-based training	Waiting list	BL; 3 months	RTW conceptualized as readiness to work (C-LASER); resilience (self-report); C-LASER, SF-36	+RTW (readiness to work)
20	Lindell (2008) [55] Sweden	*N* = 147 (125) IG = 63: CG = 62	CBT rehabilitation prog. Phase 1 (2–8 weeks); phase 2 (2–8 months)	Primary care treatment	6, 12 and 18 months	RTW share RTW chance Net days SL	−RTW share, chance or SL
21	Linton (2005) [56] Sweden	*N* = 185 I1 = 69 (14): I2 = 69 (61) CG = 47 (43) at 1 year	I1: CBT + medical treatment (as for UC) I2: CBT + physical therapy (focusing on exercise)	UC: medical treatment	BL; 12 months	Work absenteeism split into SL and risk of being off work in the LT/developing LT sick disability leave SL (no days SL per month during the 6 months prior I and during the previous 6-month period at FU) Risk of developing SL and LT SL (amount of SL taken during past year at pre-test and at 1-year FU)	−SL
22	Macedo (2009) [50] England	*N* = 32 (no drop outs) IG = 16:CG = 16	OT and UC together	UC	BL; 6 months	Resilience: COPM Work productivity via work days missed/month AIMS2, AHI (EQ-5D)	−RTW (work productivity) +R
23	Marhold (2001) [63] Sweden	Total *N* = 72 *N* = 36 (LT SL): *N* = 36 (ST SL) IG = 36: CG = 36/into ST and LT SL	I: CBT RTW prog. (+TAU)	TAU: no CBT, but contact with health professionals	BL; PI; 6 months	No. SL days out of 60 days Resilience (CSQ)	+SL for ST not LT SL +Control and ability to reduce pain only for CSQ
24	Myhre (2014) [46] Norway	Total *N* = 413 IG = 209 (203): CG = 204 (202)	I: work-focused rehabilitation (at Oslo and Trondheim)	CG: MD rehab.	BL; 12 months	RTW (defined as first 5-week period that ppts did not received sickness/workplace benefits)	−RTW

AC, adaptive copers; AE, aerobic exercise; ATW, able to work; BI, brief intervention; BL, baseline; BMR, Behavioural medicine rehabilitation; CANS, Complaints of the arm, neck and shoulder; CBT, cognitive behavioural therapy; CG, control group; CPSMP, Chronic Pain Self-Management Programme; CWP, chronic widespread pain; diffs, difference; DYS, dysfunctional; EI, experimental intervention; EMD, extensive MD treatment; FM, fibromyalgia; FT, full time (work); FU, follow-up; GP, General Practitioner; gp, group; HRQoL, health related quality of life; ID, interpersonally distressed; IG, intervention group; ISIVET, Interdisciplinary Structured Interview and Visual Education Tool; LBP, lower back pain; LMD, light MD treatment; LT, long term; MCS, mental component summary scale; MD, multidisciplinary; MI, multidisciplinary intervention; MPI-S, Multidimensional Pain Inventory–Swedish Language Version; OT, occupational therapy; PA, physical activity; PI, post intervention; ppts, participants; prog., programme; PT, part-time (work); pt/pts, patient/patients; QoL, quality of life; rehab., rehabilitation; RI, regular intervention; RTW, return to work; SES, Self-efficacy scale; SG, Self-management of complaints of the arm, neck and shoulder group; sig., significant; SL, sick leave; ST, short term; TAU, treatment-as-usual; TBT, Tailored Behavioural Treatment; TPA, Tailored Physical Activity; UC, usual care; V, version

Scales: AHI, Arthritis Helplessness Index [83]; AIMS2, Arthritis Impact Measurement Scales II [84]; C-LASER, Chinese Lam Assessment on Stages of Employment Readiness [unpublished, 64]; COPM, Canadian Occupational Performance Measure [90]; CSQ, Coping Strategies Questionnaire [91; 92 Swedish version]; EQ5D, EuroQol [98]; FIQ, Fibromyalgia Impact Questionnaire [102; 103]; GSES, General Self Efficacy Scale [Dutch version, 104]; GSE, General Perceived Self-Efficacy [105]; GSI, Global Self-rating index [60]; MHLC, Multidimensional Health Locus of Control [115]; MPI-S, Multidimensional Pain Inventory–Swedish Language Version [68]; PCS, Pain Catastrophizing Scale [123]; RAND, 36 item Health Survey [129]; SAS, Social Adjustment Scale [133]; SES, Self-Efficacy Scale [134; 135]; SEWS, Self efficacy at work scale [136]; SF36, Short Form Health Survey [138] (MCS, Mental component summary scale; PCS, physical component summary scale; Danish version 139); SPS-6, Stanford Presenteeism Scale [141; 142]; VBBA, Questionnaire on experiencing and assessing stress at work [Dutch version 149]; WHYMPI, West-Haven Yale Multidimensional Pain Inventory [150; 151]; WLQ Work Limitations Questionnaire [152]; References for all scales are available from the lead author on request.

[a]Half ppts assigned to an IG by psychological profile, the rest randomly assigned.

[b]Completed FUs.

[c]Numbers for 1° (primary) outcomes.

[d]Numbers for 2° (secondary) outcomes (interpersonally distressed ID, dysfunctional DYS, adaptive copers AC).

Table 2. Risk of bias of included studies

Study	First author	Random sequence generation	Allocation concealment	Outcome assessors blind	Participants blind	Personnel blind	Incomplete outcome data—ITT	Selective outcome reporting
1	Alaranta (1994) [62]	U	U	H	H	H	U	L
2	Altmaier (1992) [61]	H	U	U	U	H	U	L
3	Andersen (2015) [51]	L	L	L	H	H	L	L
4	Asenlof (2005, 2009) and Emilson (2017) [36–38]	L	L	H	H	H	L	L
5	Bendix (1995) [43]	L	U	H	H	H	U	L
6	Bendix (1996) [41]	L	U	H	H	H	U	L
7	Bernaards (2006, 2007, 2011) [52–54]	L	U[a]	U	H	U	U	L
8	Bergbom (2014) [44]	U	U	U	U	U	U	L
9	Brendbekken (2017) [34]	L	L	U	H	H	L	L
10	De Buck (2005) [40]	L	L	L	L	H	L	L
11	van Eijk-Hustings (2013) [42]	L	L	U	U	U	L	L
12	Ewert (2009) [39]	L	U	U	U	U	H	L
13	Haldorsen (1998) [57–59]	L	U[a]	U[b]	U	U	U	L
14	Haldorsen (2002), Skouen (2002), Skouen (2006) [35,65,66]	L	U	U	U	U	L	L
15	Hutting (2013, 2015) [48,49]	L	L	U	H	H	L	L
16	Jensen (1997) [60]	L	L	L	U	U	L	L
17	Jensen (2001, 2005) [47,67]	L	L	L	U	U	H	L
17	Bergström (2012) [68]—10-year FU of Jensen (2001) [47]	L	L	U	H	H	H	U
18	Jensen (2011) [45]	L	L	H	H	H	L	L
19	Li (2006) [64]	L	H	H	H	H	L	H
20	Lindell (2008) [55]	L	H	U	H	H	L	L
21	Linton (2005) [56]	L	L	U	H	H	U	L
22	Macedo (2009) [50]	L	L	H	H	H	L	L
23	Marhold (2001) [63]	U	U	U	H	H	H	L
24	Myhre (2014) [46]	L	L	H	H	H	H	L

H, high risk; ITT, intention to treat; L, low risk; U, unclear from paper.
[a]Not clear if envelope opaque.
[b]U when physicians are rating; H when participant are self-rating.

Assessment schedules varied (range 3–24-month FU period, mode 12 months), with varying intervals between, usually 3 monthly for shorter trials and 6 monthly for longer. One trial [35] had a 54-month FU; two [36–38,47] had 10-year FU periods.

RTW or staying at work was a primary outcome in all but four [39,42,48–50] included trials. Studies varied greatly in how RTW or staying at work was operationalized. Essentially, there were three strands. Studies either looked at RTW self-report or insurance data; or the same for SL; or measured occupational performance including employment readiness and impact of condition on daily function. Exemplifying the complexity, RTW was operationalized in many different ways, e.g. the first 4-week period within the first year after inclusion during which participants received no social transfer payments [45]; the first 5-week-period people did not receive sickness or workplace benefits [46]; and work readiness, defined as having a job, being in education or seeking work [43].

Four trials found that RTW/staying at work was improved by intensive multidisciplinary interventions compared with less intensive treatment (the total number of sickness-related days' absence was lower in intervention group at 10-year FU [$P < 0.05$] though also at 3 months before treatment [$P < 0.05$] [36–38]; higher work readiness in intervention group [$P = 0.001$] [43]; [$P < 0.01$] [64] or no treatment [increased RTW in intervention group; $P < 0.001$] [41]). Four trials [34,35,51,63,65,66] showed mixed results such as CBT-based RTW interventions being more effective for reducing the number of SL days for those on short-term but not long-term SL. The remaining 16 trials showed that targeted interventions did not improve work outcomes compared with other arms. In some cases, an intervention was better than the reference group at returning people to work or keeping them in work, but this was not the resilience intervention.

Regarding primary outcome 2, resilience measures, studies varied regarding which resilient concepts they measured and how. Concepts identified included active coping ($n = 4$), self-efficacy ($n = 4$) (plus back pain-specific self-efficacy [$n = 1$]), and other affect-related issues such as health locus of control ($n = 2$) and changed ability to

work related to pain (n = 7).

No studies used validated resilience or pain resilience scales. Resilience concepts were a secondary outcome in seven trials [36–39,44,45,48–51]. Six trials had interventions with resilience elements but did not report resilience outcomes [41,43,46,52–56]. Five trials reported positive resilience outcomes finding that: self-efficacy increased initially, although this was not sustained, while improved sickness-related absence was [36–38]; all emotional states improved even though occurrence of job loss did not [40]; work absence and emotional resilience improved for women only [47,67,68]; both coping and work outcomes improved [50]; some coping measures improved and SL was reduced for those on short-term leave [63].

Results for secondary outcomes (pain levels and intensity, interference, disability, fear of work avoidance beliefs) are as follows. Most trials measured pain levels via visual analogue scales (VAS). Seven trials measured pain intensity [39,44,46,52–54,56–60], two measured pain interference [39,61] and 10 measured pain disability [36–38,43–46,56,60–63]. Only three trials measured fear of work avoidance beliefs; two via the Waddell Fear-Avoidance Belief Questionnaire (FABQ) seven-item work subscale [45,46]; one trial used four of these items [44]. Even when RTW did not improve, secondary outcomes often did (e.g. pain-related disability [37], though not at ten-year follow-up, [38]; pain levels [50, 57-9 and 62]; all pain measures but only for some pain locations with long-term pain 52-4); see Appendix 2 (Table 3), available as Supplementary data at *Occupational Medicine* Online.

For RoB, in all cases bar one, FU studies or subgroup analyses papers were assessed as having the same RoB as the original trial so are reported together (e.g. [36] and its two FUs [37,38] are grouped together in Table 2). The only exception to this is for Jensen *et al*. [47] and its 10-year FU study, Bergstrom *et al*. [68], which were given different ratings so are reported separately in Table 2. For the 24 trials, blinding was the main source of bias regarding scoring poorly. RoB due to blinding of participants was rated as high in 15 trials, unclear in eight and low in one. However, it was often impossible to blind participants. Since RTW is a relatively objective outcome, this may not be a key issue. It was unclear if outcome assessors were blinded in 12 trials, eight were rated as high risk and four as low. It was unclear if other study personnel were blinded in eight trials, 16 were rated as high risk and none as low. Trials scored better at review level on these criteria as follows: random sequence generation (20 low, three unclear, one high), allocation of treatment concealment (12 low, 10 unclear, two high), completeness of outcome data (12 low, eight unclear, four high) and selective outcome reporting (23 low, 0 unclear, one high).

For quality assessment, papers not trials, were initially assessed separately since different papers recorded different elements of the quality criteria, particularly on number and reasons for withdrawals (see Table 4, Appendix 3). Papers were grouped together if possible around the same trial, when ratings were the same. This resulted in 28 sets of quality assessment reported in Appendix 3 (Table 4) (available as Supplementary data at *Occupational Medicine* Online) pertaining to the 24 trials. For quality assessment criterion ‘Was the number of withdrawals/ dropouts mentioned?’, 25/28 ratings were positive as this was mentioned. For criterion ‘Were reasons for withdrawals/dropouts given?’, 12/8 ratings were positive. For criterion ‘Was practitioner level training satisfactory?’, 27/28 ratings were positive. For criterion ‘Was therapeutic time between groups equivalent?’, 13/28 ratings were positive. For criterion ‘Was a power calculation conducted?’, 17/28 ratings were positive (although four of these stated they were underpowered). For criterion ‘Were groups similar on prognostic indicators’, 25/28 ratings were positive. Therefore, at review level, studies scored highest on quality assessment with nearly all rated as having satisfactory practitioner level training, mentioning number of withdrawals and groups being similar prognostically. Only around half were rated positively for conducting power calculations, around one third for having equivalent therapeutic time between groups, and giving reasons for dropouts.

Discussion

Four trials found RTW/staying at work was improved with intensive multidisciplinary interventions compared to less intensive, or no, treatment. That is the total number of sickness-related days’ absence was lower in the intervention group at 10-year Fu ($P < 0.05$) though also at three months before treatment ($P < 0.05$) for one trial [36-38]; there was higher work readiness in the intervention group for two trials, ($P = 0.001$) [43] and ($P < 0.01$) [64]; and there was increased RTW in the intervention group compared to no treatment for one trial ($P < 0.001$) [41].

Of the four trials that found improved work outcomes, two [41,43] conceptualized RTW as ‘readiness to work’ among participants with a threatened job situation including being on SL and having no job; in one trial [64], people were already working; and the fourth [36–38] did not specify work status, making cross-trial comparison difficult. Furthermore, apart from blinding issues (viewed as relatively unproblematic as described above), one trial had low RoB [36–38]; three scored poorly on allocation concealment and selective outcome reporting (see Table 2) [41,43,64].

Regarding the four trials which presented mixed RTW results, this may be partly due to the difficulty of returning chronically suffering people to the labour market. For example, one trial [34] found that while there was no difference between groups on full RTW, there was on partial RTW. A CBT-based RTW intervention applying pain coping skills for employed women on SL with musculoskeletal pain found it more effective for reducing the number of SL days for those on short- but not long-term leave [63]. Short-term here was up to 1 year (mean = 3 months). Treated participants

on long-term SL did not reduce their SL more than their controls nor improve on any of the psychological measures but we do not know why. Possibly their sick roles were too established.

One trial showed that participants with a good prognosis did equally well with ordinary treatment; those with medium benefitted more from the two multidisciplinary treatments (MDTs) and those with poor did better with the extensive MDT [35]. FU studies showed different outcomes when stratified by pain condition and gender [65,66]. Appendices 2 and 3 (Tables 3 and 4) (available as Supplementary data at *Occupational Medicine* Online) show issues with bias and quality and we need to know more about use of screening, since only poor prognosis participants did better with extensive MDT which is also expensive, so may not be needed by those with a good and medium prognosis. Later, review authors [69] point out that by subgrouping patients from an original trial [57] into different prognoses for RTW and at the same time, offering different treatment programmes, better results were achieved. These review authors [69] also highlight that subgroup analyses showed that classifying patients with long-term MS pain (according to International Classification of Diseases revision 9 [ICD-9] criteria) revealed treatment effects depending on different types of treatment [65,66]. Men and women responded differently with women faring worse in these set of studies, e.g. in subgroup analyses from an original trial [35] on patients with lower back pain (LBP) only, men with LBP randomized to light MDT returned to work more often than those randomized to extensive MDT or TAU but there was no difference for women [65]. This may be due to psychosocial factors such as women doing more domestic work, negative career orientation and more illness behaviour [65]. Treatment effects decreased with age in women. However, women only reported better quality of life (QoL) in an intervention group which used MDT and also included workplace visits [65]. Another trial [47] also reported better outcomes for women only—suggesting women may do better as they are more open to psychosocial explanations and treatments for pain. The right treatment therefore may depend on prognoses, sex and age, at least. Thus for healthcare providers, it is hard to decide who will do best with what treatment. Much more needs to be known about the effect of these variables.

Sixteen trials reported that their interventions were not better at returning/keeping people in work. Trial authors suggest that the multi-faceted nature of pain means health carers must work hard to enable patient-centred communication [34,70].

Some studies found that while RTW did not differ between groups, QoL and pain-related measures showed improvement discussed as being important for the longer term (notably trial [58]).

Five trials reported positive resilience outcomes [36–38,40,47,50,63,67,68] but these were not always trials which also reported positive work outcomes, and further complexity is provided since emotional resilience improved for women only in one trial [47,67,68].

Blinding was the main source of bias. Participants were not blinded in over half the trials (often blinding was impossible; this may be less important given the relative objectivity of the return-to-work outcome). Sequence generation, allocation of treatment concealment, completeness of outcome data and selection of outcome reporting were the least biased criteria with many trials scoring as low risk. We were less strict with the selective reporting judgement as we did not mark papers down if there was no protocol, rather we simply checked against the methods section.

Quality assessment was very mixed, for example nearly all studies had groups who were similar on prognostic indicators, mentioned withdrawals and had satisfactory practitioner-led training, but only a third gave reasons for drop outs, and only a third had equivalent therapeutic time between groups. About half the trials conducted a power calculation (with four considered underpowered).

The search strategy was comprehensive, but it is possible that some published and unpublished RCTs may have been missed. Publication bias is problematic in clinical research [71]. Almost all RCTs were either poorly blinded or it was impossible to blind. Some of the TAU arms were so extensive that they were similar to actual intervention arms in other trials, making comparison difficult.

Heterogeneous methods of operationalizing not only resilience but RTW, coupled with unclear reporting and RoB in trials conducted to date, means we cannot draw firm conclusions on the effectiveness of interventions designed to assist RTW or staying at work for chronic pain sufferers which address resilience. A recent review also commented on the heterogeneity of cross-country operationalization of RTW [72].

Another recent meta-analysis examined effectiveness of workplace-based RTW interventions and work disability management interventions that assist workers with MSK and pain-related conditions and mental health conditions [73]. It found strong evidence that duration away from work from both MSK or pain-related conditions and mental health conditions were reduced by multi-domain interventions encompassing at least two of the target domains (health-focused, service coordination and work modification interventions). Our review provides limited evidence that RTW and SL rates can be improved by MDT interventions that include resilience and in practice the interventions which did show such improvements cover the health-focused domain, the service coordination domain but not usually the work modification domain.

Resilience may yet be too broadly operationalized to help in thinking about why some RTW interventions for pain sufferers help and some do not. It may have more utility in supporting work participation if there was agreement on the terminology, operationalization and measurement of not only resilience but RTW factors. This is challenging

given the different social insurance systems across countries for RTW and the ongoing debate around what resilience and pain resilience are [23,74,75]. For example, no trials used any resilience or pain resilience measures. The latter is unsurprising as pain resilience measures are new [75] but we had expected the former given the interest in promoting resilience in pain patients in general—it was missing from helping sustainable RTW. The studies we analysed did not explicitly set out to test resilience-building but did include elements of it if one accepts resilience includes raised self-efficacy (and the other concepts from our operationalization). Our results show that only some of the trial interventions were successful, although questions remain regarding the role of resilience and what might be achieved if resilience-building was further, and more consistently, foregrounded.

A new body of research is beginning to consider how ACT may connect with resilience [23]; a recent trial showed that adding telephone FU to an ACT-based occupational rehabilitation programme boosted work participation at 1-year FU for participants on SL (30% of whom had musculoskeletal pain on their sick notes and 75% reported clinically significant chronic pain symptoms [76]). This is promising and extends some of the secondary outcome findings in one trial here which used an ACT-based tailored behavioural treatment to attain a significant reduction in sickness absence at 10 years' FU (although other outcomes' positive effects were not maintained [36–38]).

Notwithstanding the complexities of defining resilience, pain conditions, status of working, type of job and being on SL or not, all varied greatly across studies and was not always stated but needs to be in future studies. Ideally, quality issues such as keeping therapeutic time equivalents and reducing RoB by not reporting outcomes selectively should be addressed. The review studies' participant age ranges are expected in the context of RTW historically; future studies may need to increase the upper age limits as the extending working life agenda gains importance [77].

We need to know more about treatment effects in relation to gender, age, prognoses and type of work. Some authors [66,69] note they did not register work types, so could not categorize participants into more homogenous groups. No trials considered the extent to which participants were under financial obligations to work. Few trials covered direct interactions between workplace and line managers, often seen as key in the RTW literature [78].

In conclusion, there is uncertainty regarding effectiveness of resilience interventions for chronic pain sufferers regarding RTW/staying at work rates. This is due to heterogeneity of resilience as operationalized, but also to how RTW/SL are reported, due to differences in countries' social insurance systems. Grouping interventions according to key resilience concepts is challenging; resilience was not as helpful as anticipated at this formative stage. We need further agreement on the terminology, operationalization and measurement of not only resilience but RTW factors.

Funding

This work was supported by the NIHR Bristol Biomedical Research Centre – Nutrition Theme, providing a financial contribution for RP's time, and by a University Knowledge Exchange account to D.W. (for a small payment to our translator of papers 189–190). We thank our translator who did paper 64 gratis.

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