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REVIEW ARTICLE

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Effectiveness of fitness for work interventions for workers with low back pain: A systematic review

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Abstract

Objectives: Safety at work is important for workers with low back pain (LBP). This requires good job design that considers both worker capacities and work requirements, a concept called "Fitness for Work." This systematic review aimed to evaluate the effects of fitness for work interventions on workers with LBP.

Methods: We searched PubMed, the Cochrane Library, and Scopus from 2000 through 2020, using relevant terms.

Results: We reviewed nine randomized controlled trials (RCTs) out of 3052 unique references. All studies were RCTs conducted in Western countries. Some RCTs reported positive findings that fitness for work interventions were effective for LBP in facilitating shorter return to work time and reducing short-term sick leave. However, the results of the reviewed studies were inconsistent; therefore, there is insufficient evidence to draw firm conclusions about the effectiveness of fitness for work interventions. Furthermore, the interventions were not effective in reducing long-term sick leave over a 24-month period. There were consistent findings that fitness for work interventions were no more effective than control interventions on pain intensity, disability, and work ability of workers with LBP.

Conclusions: These results suggest that fitness for work interventions may be somewhat effective in facilitating return to work and preventing short-term recurrence in workers with LBP. However, workers need to carefully manage their condition to prevent long-term recurrence.

KEYWORDS

fitness for work, low back pain, return to work, sick leave, workplace

1 | INTRODUCTION

Low back pain (LBP) is a common occupational problem worldwide.[1] In Japan, the lifetime LBP prevalence is 83%,[2] and the annual incidence of new-onset disabling LBP is 6.1%.[3] LBP is often chronic or recurrent and is associated with sick leave and reduced performance at work.[4] The medical cost for work-related LBP (estimated at approximately 82 billion yen) is increasing owing to the aging population in Japan.[5] Therefore, occupational support to reduce symptoms,

prevent recurrence, and maintain the ability to work is important for workers with LBP.

Occupational physicians (or relevant experts) advise both employers and employees with disabilities on modifications to the workplace environment to enable workers to do their jobs safely; this concept is called Fitness for Work.[6] A common fitness for work strategy is to address occupational risk factors, such as lifting, physically heavy work, frequent bending and twisting, repetitive tasks, static postures, and exposure to vibration.[7] There is a general consensus that fitness for work interventions improve organizational culture and increase stakeholder commitment to early return to work and safe work.[8] Although the effectiveness of workplace ergonomic interventions have been previously evaluated in a systematic review,[9] the evidence regarding fitness for work interventions for workers with LBP is scarce.

In recent years, several randomized controlled trials (RCTs) have been conducted on the effects of fitness for work interventions on LBP, and a systematic review is needed. The aim of this systematic review was to evaluate the effects of fitness for work interventions among workers with LBP. These effects included shorter return to work time, less sick leave, symptom reduction, and improved ability to work.

2 | METHODS

2.1 | Search strategy

A systematic literature review on the effectiveness of fitness for work interventions on workers with LBP was conducted. Fitness for work was defined as expert interventions targeted at an individual's capacity to work, workplace conditions, and subsequent work arrangements to implement the expert advice.[6] Specifically, fitness for work interventions consist of ergonomic assessments using interviews and worksite visits from experts. They also include the provision of expert advice to employers or supervisors about workplace conditions, such as improving workplace ergonomic problems and modification of working conditions (eg, workplace environment, tasks, and working hours) for workers with LBP. Because of the differences in occupational health systems between countries,[10] we did not restrict the definition of fitness for work to actions based on national regulations.

We used the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement in developing the review protocol.[11] Literature searches were conducted using PubMed, the Cochrane Library, and Scopus for articles published between November 2000 and November 2020. No restrictions on type of study or language were applied during the search. The search was performed on December 2, 2020, by the authors with support of a research librarian (see Acknowledgments) to validate the search terms. The search was performed using the following terms: (occupational health [Mesh] OR occupational medicine [Mesh] OR occupational disease [Mesh] OR occupational exposure [Mesh] OR occupational injuries [Mesh] OR occupations [Mesh] OR work [Mesh] OR work performance [Mesh] OR workers [Mesh] OR workplace [Mesh] OR workload [Mesh]) AND (low back pain [Mesh] OR back pain [Mesh]). The study protocol was developed before the review survey was conducted, but was not registered.

Two authors (TI and CO) independently reviewed each title and abstract against the inclusion criteria. If the eligibility of a study could not be determined by reading the title and abstract, the study was treated as potentially eligible for inclusion. In assessing articles against the exclusion criteria, the full text of the article was obtained and checked. In case of disagreement between the two reviewers, a third reviewer (YF) was consulted and determined inclusion or exclusion. In addition, we reviewed the reference lists of eligible studies and identified relevant citations. The inclusion and exclusion criteria were as follows.

2.2 | Inclusion criteria

- The study design was an RCT or non-RCT (NRCT).
- The article was written in English.
- The intervention focused on work-related issues in people with LBP.

2.3 | Exclusion criteria

- Lack of expert assessment or advice for fitness for work.
- The outcome was not identified as LBP (eg, spinal pain or musculoskeletal disorder).
- The study only reported economic costs or psychological outcomes.
- The study used qualitative methodology.

2.4 | Risk of bias assessment

Two reviewers (TI and CO) independently assessed the risk of bias in the included studies using the Cochrane Collaboration tool.[12] We assessed the risk of bias in the following areas: (i) random sequence generation; (ii) allocation concealment; (iii) blinding of participants and personnel; (iv) blinding of outcome assessment; (v) incomplete outcome data; (vi) selective outcome reporting; and (vii) other biases. The criteria were rated as "yes," "no," or "don't know". Disagreements between the two reviewers were resolved by discussion. Studies were assessed as having a "low risk of bias" if 50% (four) or more of the seven criteria were met; otherwise, they were assessed as having a "high risk of bias."

2.5 | Data management

A standardized data extraction form was used to extract the data. Information on study design, study site, occupation, follow-up time, LBP at baseline, sample size, age, sex, interventions, outcomes, and results was extracted. We identified the primary and non-primary outcome variables. We summarized the effectiveness of fitness for work interventions according to the following outcome measures: (i) return to work; (ii) sick leave; (iii) pain intensity; (iv) disability; and (v) work ability. When evaluated according to each outcome, the number of included studies was relatively small and the definitions, timing of measurement, and type of statistical analysis differed considerably across studies. Therefore, statistical pooling using a formal meta-analysis was not possible, so we systematically and qualitatively summarized the available evidence. The evidence was synthesized by stratifying the concordance of the findings for each outcome.

3 | RESULTS

3.1 | Study selection

A total of 6987 references were retrieved from PubMed (2798 references), the Cochrane Library (473 references), and Scopus (3716 references). After removing 3935 duplicates, 3052 unique references remained. After evaluation by title and abstract, 114 references met the inclusion criteria. After full text examination, 105 references were excluded. A manual search of the reference list for relevant articles did not reveal any additional papers. Finally, nine studies[13-21] were included in the systematic review (Figure 1).

3.2 | Study characteristics

Table 1 shows the characteristics of the included studies. Three studies were conducted in Denmark,[16,17,21] two each in Finland[13,14] and Sweden,[19,20] and one each in the Netherlands[15] and Norway.[18] All studies were RCTs. One study focused on healthcare and social care workers,[14] and the other studies examined a variety of occupations. Follow-up times ranged from 3 months[16] to 24 months.[13-15,17] Five studies[13,15-18] recruited participants on sick leave, three studies[14,19,21] recruited those not on sick leave, and one study[20] recruited participants of both types. In one study,[20] LBP was assessed with neck pain in an integrated way. LBP was defined as sick leave owing to LBP in five studies,[13,15-18] experiencing LBP symptoms in three studies,[14,19,21] and consulting a physiotherapist for LBP in one study.[20] Most studies focused on nonspecific LBP and did not include cases with

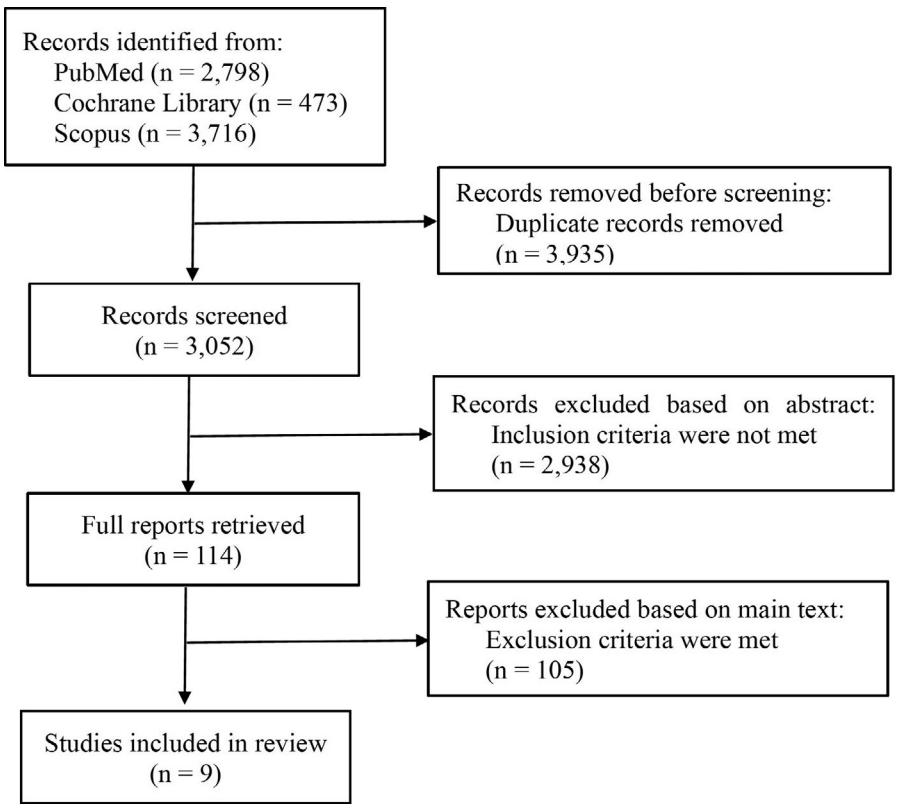

FIGURE 1 Flow chart of the selection process

TABLE 1 Characteristics of the included studies

First author (reference), year	Country	Design	Study site	Occupation	Follow-up time (months)	LBP at baseline	Sample size			Age range at baseline (years) Intervention versus control	Sex (female) Intervention versus control
							Intervention	Control	Total		
Karjalainen,[13] 2003	Finland	RCT	Primary healthcare centers	Various	24	Sick leave for 4-12 weeks owing to LBP	51	57	108	44 (25-60) vs. 43 (25-59), mean age (range)	57% vs. 60%
Kaapa,[14] 2005	Finland	RCT	Occupational health centers	Healthcare and social care	24	Daily or nearly daily LBP during the preceding year	59	61	120	22-57, age range; 46.0 (7.9) vs. 46.5 (7.0), mean age (SD)	98% in total
Anema,[15] 2007	the Netherlands	RCT	Occupational health services	Various	24	Sick leave for 2-6 weeks owing to nonspecific LBP	96	100	196	18-65, age range; 41.2 (10.7) vs. 44.0 (8.6), mean age (SD)	47% vs. 67%
Jensen LD,[16] 2012	Denmark	RCT	Rheumatology outpatient clinics	Various	3	A current episode of sick leave owing to LBP	150	150	300	17-63, age range; 46.2 (9.5) vs. 44.6 (10.3), mean age (SD)	50.9% vs. 58.8%
Jensen C,[17] 2012	Denmark	RCT	Spine center	Various	24	Sick leave for 3-16 weeks owing to LBP	176	175	351	16-60, age range; 42.1 (10.5) vs. 41.9 (10.4), mean age (SD)	50.3% vs. 54.0%
Myhre,[18] 2014	Norway	RCT	Neck and back outpatient clinics	Various	12	Sick leave for 4-52 weeks owing to LBP	203	202	405	18-60, age range; 40.2 (9.7) vs. 41.0 (10.0), mean age (SD)	44.3% vs. 48.5%
Linton,[19] 2015	Sweden	RCT	Occupational healthcare service	Various	6	Experiencing LBP	82	58	140	27-65, age range; 49.7 (10.0) vs. 49.9 (10.4), mean age (SD)	95.1% vs. 93.1%
Sennehed,[20] 2018	Sweden	RCT	Primary care centers	Various	12	Seeking physiotherapy owing to acute or subacute LBP and/or neck pain (<12 weeks); AND No sick leave or sick leave ≤60 days	146	206	352	18-67, age range	63% vs. 67%
Hansen,[21] 2019	Denmark	RCT	Hospital department of rheumatology	Various	6	A current episode of 2-4 weeks of LBP	153	152	305	18-65, age range; 45.3 (10.1) vs. 45.7 (10.5), mean age (SD)	32.0% vs. 32.9%

Note: LBP, low back pain; OP: occupational physician; RCT, randomized controlled trial; SD: standard deviation.

red flags (eg, tumors) or spine surgery. Sample sizes ranged from 108 to 405,[13,18] and age ranged from 16 to 67 years.[17,20]

Fitness for work interventions were performed by a range of experts, including occupational physicians,[13,16,21] physiotherapists,[14,20] ergonomists,[15] psychologists,[19] and case workers[17,18] (Table 2). Three studies provided exercise programs and/or stress management as well as fitness for work interventions.[14,19,21] Karjalainen et al compared three types of intervention[13]: Occupational intervention including fitness for work, clinical intervention (mini-intervention), and usual care; therefore, we compared only the data for the occupational intervention and control.

3.3 | Risk of bias assessment

Table 3 summarizes the risk of bias assessment for each included study. The assessment was based on the Cochrane criteria.[12] Eight studies[13-15,17-21] were classified as having low risk of bias and one study[16] as having high risk of bias. Because of the RCT designs, the risk of bias for random sequence generation was scored as low for all studies. Blinding of participants and personnel is always a potential risk of bias because blinding in fitness for work interventions is not possible. No study blinded the outcome assessment owing to the use of self-report outcome measurements during follow-up.

4 | RETURN TO WORK

Three studies[15,17,18] assessed the effect of fitness for work interventions on early return to work for people currently on sick leave. All studies obtained the information from administrative data and defined early return to work as work resumption within 4 weeks[15,17] or 5 weeks[18] without any sick leave benefits. One study[15] with low risk of bias showed that fitness for work interventions were significantly associated with a shorter return to work time (median of 104 days for controls vs. 77 days for intervention group). In contrast, two studies[17,18] reported no association between fitness for work interventions and return to work. In summary, studies focused on return to work showed conflicting results, with one showing an association between fitness for work interventions and shorter return to work time, and two showing no association among people currently on sick leave for LBP.

5 | SICK LEAVE

Seven studies[13,14,16,17,19-21] examined the association between fitness for work interventions and sick leave for workers with LBP. Sick leave was assessed by cumulated days[13,16,21] or using binary data.[14,17,19,20] For the latter, cutoff values (eg, 30 days, 4 weeks of sick leave) or status in points (eg, 3 months, 24 months) were used, and most were self-reported.[14,19,20] Three papers[16,19,20] with a follow-up of 3, 6, and 12 months found a reduction in sick leave risk in the fitness for work intervention group. Jensen LD et al reported that a 3-month intervention reduced self-rated sick days by less than half, but there was no association with registration-based sick days.[16] Four studies[13,14,17,21] (three of which had a 24-month follow-up) found no evidence of an association. In summary, of the seven studies that examined the association between fitness for work interventions and sick leave, three with relatively short follow-ups showed that fitness for work was associated with fewer recurrences of sick leave, whereas four with relatively long follow-ups found no association.

6 | PAIN INTENSITY

Six studies[13-16,19,21] investigated how much fitness for work interventions reduced LBP pain intensity. Five studies[13,14,16,19,21] used numeric rating scales and one study[15] used a visual analog scale for measurement. All studies reported no effect.

7 | DISABILITY

Five studies[13-16,21] assessed the effect of fitness for work interventions on the prevention of occupational disability owing to LBP. Three studies[13,14,21] used the Roland-Morris Disability Questionnaire and two studies[15,16] used the Oswestry Disability Index for measurement. All studies reported no effect.

8 | WORK ABILITY

Two studies[14,21] investigated the relationship between fitness for work interventions and work ability using a self-developed questionnaire. Neither study found a relationship.

9 | DISCUSSION

This review investigated the effectiveness of fitness for work interventions among workers with LBP. Some RCTs reported positive findings indicating that fitness for work interventions reduced return to work time and short-term sick leave. However, findings were inconsistent. Therefore, currently insufficient evidence to draw any firm conclusions about the effectiveness of fitness for work interventions is available. Furthermore, fitness for work interventions were not effective in reducing long-term sick leave over a 24-month period.

TABLE 2 Interventions, outcomes, and results of the included studies

First author (reference), year	Intervention(s)		Follow-up time (months)	Outcome	Results
	Intervention arm	Control arm			Intervention versus control
Karjalainen,[13] 2003	Worksite visit from a physiotherapist for practical instruction of back-friendly working techniques with the patients' supervisor, the company nurse, and an OP Sending of a recommendation form to the patient's company physicians and treating physicians after the worksite visit from the physician and physiotherapist A 3-month follow-up by the company physician	Usual care with a leaflet	24	Sick leave[a] (days) Pain intensity (NRS) Disability[a] (ODI) Work ability[a] (self-assessed interference with work, yes or no)	Mean 45 days (range, 0-615) vs. 62 days (range, 0-630); NS Mean NRS score 3.2 (range, 0-9) vs. 3.4 (range, 0-9); NS Mean ODI score 18 (range, 0-60) vs. 18 (range, 0-60); NS 20% vs. 29%; NS
Kaapa,[14] 2005	Back school education: work ergonomics instruction by an occupational healthcare physiotherapist with a workplace visit and ergonomic adjustments Cognitive–behavioral stress management and applied relaxation sessions from a psychologist Physical exercise program by a physiotherapist	Individual physiotherapy (passive pain treatment, light active exercise, general advice, and home-exercise program)	24	Sick leave[a] (>30 days) Pain intensity[a] (NRS) Disability[a] (ODI) Work ability[a] (self-assessed work capacity, range 0-10)	12.0% vs. 10.6%; NS Mean NRS score 3.5 (SD 2.6) vs. 4.0 (SD 2.9); NS Mean ODI score 19.7 (SD 14.3) vs. 19.3 (13.1); NS Mean 2.9 (SD 2.8) vs. 3.5 (SD 2.8); NS
Anema,[15] 2007	Worksite assessment and work adjustments based on methods used in participatory ergonomics by an ergonomist A short communication form written by an OP	Usual care (education, coping, and advice about returning to work)	24	Return to work[a] (>4 weeks) Pain intensity (VAS) Disability (RMDQ)	HR 1.7 (95% CI 1.2, 2.3); P =.003. HR was adjusted for graded activity, disability, and job control Mean VAS score 2.9 (SD 2.6) vs. 3.3 (SD 2.6); NS Mean RMDQ score 8.3 (SD 7.9) vs. 8.7 (6.0); NS
Jensen LD,[16] 2012	An initial counseling session from an OP A workplace visit if required A 6-week status interview focused on compliance and adherence to the plan developed with the OP A 3-month follow-up concluding counseling session with the OP	Usual care (a brief instruction in exercises, or readmission to a general practitioner/ chiropractic treatment)	3	Sick leave[a] (self-report) Sick leave[a] (registered) Pain intensity[a] (NRS) Disability[a] (RMDQ)	HR 2.6 (95% CI 1.5, 4.4); P <.05. Unadjusted HR 1.7 (95% CI 0.9, 3.0); NS. Unadjusted Mean NRS 2.6 (SD 2.8) vs. 1.9 (SD 3.0); NS Mean RMDQ score 3.2 (SD 4.8) vs. 2.2 (SD 5.1); NS

(Continues)

TABLE 2 (Continued)

First author (reference), year	Intervention(s)		Follow-up time (months)	Outcome	Results
	Intervention arm	Control arm			Intervention versus control
Jensen C,[17] 2012	Development of a rehabilitation plan by the case manager in collaboration with the patient and a multidisciplinary team Discussion and coordination-relevant initiatives with the workplace and municipal job center by a case manager	Brief intervention (clinical examination and advice offered by a rehabilitation physician and a physiotherapist)	24	Return to work[a] (>4 weeks) Sick leave (status at 24 months)	HR 0.9 (95% CI 0.7, 1.1); NS. HR was adjusted for age and sex 18.8% vs. 16.6%; NS
Myhre,[18] 2014	Worksite assessment and request for temporary work modification to employers by a case worker Creation of a return to work schedule with a multidisciplinary team	Usual care (self-care and coping)	12	Return to work[a] (>5 weeks)	HR 0.9 (95% CI 0.8, 1.2); NS. HR was adjusted for age, sex, and education
Linton,[19] 2015	Worker intervention: education for self-management from a clinical psychologist Supervisor intervention: education about problem-solving techniques and follow-up from a clinical psychologist	Usual care (guided physical activity, physical therapy, participation in self-help, or educational courses)	6	Sick leave during the 3 months[a] (yes or no) Pain intensity[a] (NRS)	20.7% vs. 39.6%; $P < .05$ Mean NRS 4.7 (SD 2.5) vs. 5.2 (SD 2.3); NS
Sennehed,[20] 2018	Conversations with the patient and the employer about workplace adjustments and developing an action plan by a treating physiotherapist 3-, 6-, and 12-month follow-ups by the treating physiotherapist Structured physiotherapy care	Structured physiotherapy care	12	Sick leave[a] (>4 weeks)	OR 1.8 (95% CI 1.0, 3.4); $P = .046$. OR was adjusted for EQ-5D score
Hansen,[21] 2019	Development of a workplace intervention plan by an OP with an optional workplace visit Follow-up consultations after 6 weeks and 3 months with an OP A 45-minute self-administrated physical activity program three times weekly by a physical therapist	Usual care (advice about returning to work)	6	Sick leave[a] (days) Pain intensity (NRS) Disability (RMDQ) Work ability (ability to continue in work, range 0-10)	Mean 17.7 days (SD 32.3) vs. 15.2 days (SD 37.3); NS Mean change NRS −1.0 (95% CI −1.9, −0.1) vs. −1.1 (95% CI −1.5, −0.6); NS Mean change RMDQ −13.4 (95% CI −23.5, −3.3) vs. −11.5 (95% CI −17.0, −6.0); NS Mean change 0.7 (95% CI −0.2, 1.7) vs. −0.7 (95% CI 0.2, 1.1); NS

Note: CI, confidence interval; EQ-5D, EuroQOL five-dimension questionnaire; HR, hazard ratio; NRS, numeric rating scale; NS, not significant; ODI, Oswestry Disability Index; OP, occupational physician; OR, odds ratio; RMDQ, Roland-Morris Disability Questionnaire; SD, standard deviation; VAS, visual analog scale.

[a]Primary outcome.

TABLE 3 Risk of bias assessment scores

First author (reference), year	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective outcome reporting	Other biases	Total score
Karjalainen,[13] 2003	1	1	0	0	1	1	1	5
Kaapa,[14] 2005	1	1	0	0	0	1	1	4
Anema,[15] 2007	1	1	0	0	1	1	1	5
Jensen LD,[16] 2012	1	1	0	0	0	1	0	4
Jensen C,[17] 2012	1	0	0	0	0	1	1	3
Myhre,[18] 2014	1	1	0	0	0	1	1	4
Linton,[19] 2015	1	?	0	0	1	1	1	4
Sennehed,[20] 2018	1	1	0	0	1	1	1	5
Hansen,[21] 2019	1	1	0	0	1	1	1	5

?, Unknown.

There were consistent findings that fitness for work interventions were no more effective than control interventions for pain intensity, disability, and work ability for workers with LBP. These results suggest that fitness for work interventions may be somewhat effective in facilitating return to work and preventing short-term recurrence in workers with LBP. However, such workers need to carefully manage their condition to prevent long-term recurrence. It should also be noted that the results of this study do not limit the value of work arrangement, but only look at one aspect. For example, fitness for work interventions improve organizational culture as well as help create a safety and healthy workplace for other employees.[8]

There are several possible reasons for the limited positive findings for the effectiveness of fitness for work interventions. First, most studies included in this review had relatively small sample sizes and may have lacked the power to detect positive effects. Second, fitness for work interventions may not address important risk factors for LBP. The risk factors for LBP are still not well understood. In particular, it is unclear which risk factors are more or less likely to benefit from fitness for work interventions. In addition, it is difficult to design interventions that can address risk factors outside the workplace, such as those related to home life. Finally, employees with LBP or their employers may not comply with fitness for work interventions. Even if interventions are perfectly designed, high compliance is critical to their effectiveness.[22] For these reasons, the present review concluded that there is insufficient evidence for the effectiveness of fitness for work interventions on LBP, despite the importance of supporting return to work and symptom management for workers with chronic diseases.[23]

A strength of the present review is its systematic search of the literature over the past two decades. The study design, bias, outcome measures, analysis methods, and reporting were evaluated using a rigorous systematic approach. In addition, we only included RCTs or NRCTs, which are less susceptible to bias. However, this review has several limitations. First, we reviewed only RCTs or NRCTs and peer-reviewed studies published in English; therefore, there is a possibility of selection bias. For example, the review excluded studies with different designs that reported relevant findings and studies written in other languages. The results of the publication bias assessment of the included studies were mixed; many studies showed no effect, suggesting a low risk of publication bias. Additionally, the fitness for work interventions in the reviewed studies differed. For example, the types of experts who conducted the interventions varied. Finally, some studies provided exercise programs and/or stress management as well as fitness for work interventions. This difference may have affected the results of the reviewed studies.

10 | CONCLUSION

Safety at work is important for workers with LBP. This requires good job design that considers both the capacities of workers and the requirements of the work; that is, fitness for work. This review indicated that fitness for work interventions have a limited effect on reduction of return to work times and reduction of short-term sick leave, and no effect on pain intensity, disability, work capacity, or long-term sick leave. These findings require confirmation by high quality research studies with well-designed interventions, focused particularly on compliance with fitness for work interventions. Maintenance of work ability (ie, prevention of pain and disability) is important, and further research is needed to identify which aspects of interventions are effective in achieving this goal.

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DISCLOSURE

Approval of the research protocol: N/A. *Informed Consent*: N/A. *Registry and the Registration No. of the study/trial*: N/A. *Animal Studies*: N/A. *Conflict of Interest*: N/A.

AUTHOR CONTRIBUTIONS

TI conceived the ideas. TI and CO collected the data with YF. TI analyzed the data and led the writing with YF and SA. All the authors read and approved the final manuscript.

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