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Non-pharmacological interventions for self-management of fatigue in adults: An umbrella review of potential interventions to support patients recovering from critical illness

Sophie Eleanor Brown [a], Akshay Shah [b], Wladyslawa Czuber-Dochan [c], Suzanne Bench [d,e], Louise Stayt [a,*]

[a] School of Health and Social Care, Oxford Brookes University, Oxford, UK
[b] Radcliffe Department of Medicine, University of Oxford, Oxford, UK
[c] Florence Nightingale School of Nursing, Midwifery and Palliative Care, King's College London, London, UK
[d] Institute of Health and Social Care, London South Bank University, London, UK
[e] Guys & St Thomas' NHS Foundation Trust, London, UK

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ABSTRACT

Purpose: Fatigue is a common symptom after critical illness. However, evidence-based interventions for fatigue after critical illness are lacking. We aimed to identify interventions to support self-management of fatigue caused by physical conditions and assess their effectiveness and suitability for adaptation for those with fatigue after critical illness.
Materials and methods: We conducted an umbrella review of systematic reviews. Databases included CINAHL, PubMed, Medline, PsycINFO, British Nursing Index (BNI), Web of Science, Cochrane Database of Systematic Reviews (CDSR), JBI Evidence Synthesis Database, and PROSPERO register. Included reviews were appraised using the JBI Checklist for Systematic Reviews and Research Syntheses. Results were summarised narratively.
Results: Of the 672 abstracts identified, 10 met the inclusion criteria. Reviews focused on cancer ($n = 8$), post-viral fatigue ($n = 1$), and Systemic Lupus Erythematosus (SLE) (n = 1). Primary studies often did not address core elements of self-management. Positive outcomes were reported across all reviews, and interventions involving facilitator support appeared to be most effective.
Conclusions: Self-management can be effective at reducing fatigue symptoms and improving quality of life for physical conditions and has clear potential for supporting people with fatigue after critical illness, but more conclusive data on effectiveness and clearer definitions of self-management are required.

1. Introduction

Survivors of critical illness commonly report long-lasting cognitive, physical, and social complications that impact on their quality of life [1,2]. This collection of problems is frequently termed post intensive care syndrome [3,4]. Among the numerous challenges associated with post intensive care syndrome, including cognitive impairment, memory loss, pain, muscle weakness, insomnia, anxiety, depression, and symptoms of post-traumatic stress, fatigue is a commonly reported symptom [1a].

Fatigue is defined as an overwhelming exhaustion, unrelieved by sleep, with decreased capacity for physical and mental work at a usual level [5]. Fatigue after critical illness has a prevalence of 14–81% and can persist for many years after hospital discharge [1]. Fatigue after critical illness creates complex and overlapping physical, emotional, social, and cognitive challenges [6]. Fatigue after critical illness may also impact on patients' health and social care resources and personal finances [7]. Survivors of critical illness also report feeling a loss of self-worth and sense of identity due to being unable to perform their usual social roles or care for themselves. Fatigue not only affects survivors' ability to engage in rehabilitation and return to work or usual roles but also impacts on the costs to health and social care services [1,6,7].

Rehabilitation after critical illness is now recognised as a research priority [8,9]. The importance of this has been further highlighted by the

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* Corresponding author at: Oxford Brookes University, Headington Campus, Oxford OX3 0BP, UK.
E-mail address: lstayt@brookes.ac.uk (L. Stayt).

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challenges of the COVID-19 pandemic. Self-management is increasingly being recognised as an invaluable rehabilitation tool for patients managing chronic illnesses or conditions with extended recovery periods and has been shown to improve health outcomes [10-12]. Self-management involves a patient taking an active role in managing their condition and its symptoms, typically with support from health professionals, and includes activities such as symptom monitoring, patient education, goal setting, and reviewing progress [11,13,14]. Self-management can also be delivered partially or fully online, a convenient and increasingly important option since the onset of the COVID-19 pandemic [15]. Non-pharmacological self-management interventions therefore have the potential to improve recovery outcomes for survivors of critical illness with fatigue in a cost-effective manner.

A systematic review by Bench et al. [1a] was unable to identify any interventions designed specifically to support those recovering from critical illness. This highlights the need for evidence-based development of interventions to manage fatigue as part of a wider strategy to improve recovery after critical illness. Fatigue after critical illness shares similarities with fatigue due to other physical conditions, such as cancer [16] and inflammatory bowel disease [17,18]. While there are differences in the nature and progression of fatigue after critical illness [1,6], similar management strategies could be effectively utilised across conditions with appropriate tailoring [14], as the fatigue itself is similar across conditions, and patients typically deal with multiple other related symptoms.

This umbrella review aimed to examine the effectiveness of non-pharmacological self-management interventions for fatigue caused by any physical acute or chronic condition in adults, excluding mental health conditions and cerebral pathologies, to assess the suitability of interventions for adaptation for people with fatigue after critical illness.

2. Methods

Our umbrella review addressed the following question: *What non-pharmacological self-management interventions have been used to manage fatigue caused by physical conditions in adults, and how effective, acceptable, and feasible are they?* Results are reported via narrative synthesis and in accordance with JBI umbrella review guidance [19] and the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) [20]. The review is registered with the International Prospective Register of Systematic Reviews (PROSPERO, registration number 348894).

2.1. Search methods

We performed a comprehensive literature search in July 2022 on the following databases: CINAHL, PubMed, Medline, PsycINFO, British Nursing Index (BNI), Web of Science, Cochrane Database of Systematic Reviews (CDSR), JBI Evidence Synthesis Database, and PROSPERO register using keywords (Supplementary file 1). Reference lists of all included articles were also screened for additional relevant reviews, and forward citations searches were conducted.

2.2. Inclusion criteria

Inclusion criteria were: (1) secondary research data (systematic reviews); (2) reviews reporting studies conducted with adult patients (over 18 years of age); (3) reviews reporting studies examining any non-pharmacological self-management intervention for fatigue caused by any physical condition, excluding mental health and cerebral pathologies; (4) fatigue reported as a primary outcome; (5) written in English; (6) published between January 2000 and July 2022.

In accordance with similar reviews and to ensure inclusion of relevant findings, only reviews published after January 2000 were included. Reviews focused on fatigue caused by mental health conditions, traumatic brain injury, and other neurological pathologies such as stroke were excluded as these conditions can mimic or mask physical fatigue. Eligible reviews were required to have fatigue or a synonym of fatigue reported as a primary outcome and include at least one self-management intervention. Reviews could also report data on any aspect of acceptability or feasibility as primary or secondary outcomes, such as quality of life, satisfaction, engagement, self-efficacy, and cost-effectiveness. Where reviews included non-self-management interventions or addressed non-fatigue outcomes, only relevant summary data were extracted.

2.3. Study selection, data extraction and quality appraisal

Two reviewers (LS and EB) independently screened all titles and abstracts against the inclusion criteria and read all full texts to determine inclusion eligibility. All screening was performed using the Covidence platform (Covidence, Melbourne, Australia). Disagreements were resolved by a third reviewer (AS). The methodological quality of included reviews was assessed using the JBI Critical Appraisal Tool for Systematic Reviews and Research Syntheses [21]. To enable ranking of included reviews, each response category of the JBI appraisal tool was assigned a numerical score: 3 = yes; 2 = unclear; 1 = no; 0 = N/A. Each review was independently reviewed by LS and EB. Final decisions were based on consensus among the research team.

LS and EB independently extracted data from included studies, with each reviewer responsible for half of the total papers. A third reviewer (AS) checked completed extraction for 20% of included reviews. Extracted data were collated on a predesigned template based on the JBI Data Extraction Form for Review of Systematic Reviews and Research Syntheses and included: authors, year of publication, country, objectives, population under study, description of interventions, sources searched, range (years) of included studies, number of studies included, types of studies included, country of origin of included studies, appraisal (instruments used and rating), method of analysis, outcome(s) assessed, results, significance/direction, and heterogeneity.

Detailed individual intervention data were extracted only for interventions meeting at least one of the self-management core elements defined by Howell et al. [22]. This self-management definition includes interventions with active patient involvement (e.g. goal setting and monitoring) but excludes psychological, support group, and information-only interventions and those targeting only diet, exercise, or insomnia [22]. Core elements of self-management include: (1) tailoring to individual patient needs, characteristics, and circumstances; (2) facilitating confidence/self-efficacy; (3) supporting development of skills to communicate with health professionals; (4) facilitating patients' confidence in managing in their own care; (5) coaching by a trained instructor; (6) involving collaboration and guidance from a healthcare team; (7) facilitating health behaviours via goal setting and action planning; (8) supporting development of problem-solving skills to handle barriers. These criteria were used to screen reviews, as they were determined to be sufficiently specific to elucidate the most relevant interventions with clear potential application to fatigue after critical illness. Findings are presented via narrative synthesis.

3. Results

3.1. Study selection

A total of 672 abstracts were identified. After removal of duplicates, 420 reviews were screened against inclusion criteria. Of these 368 were excluded and 43 included for full-text screening. A total of 10 systematic reviews including 228 primary studies met the inclusion criteria. Full details are provided in the PRISMA flow diagram (Fig. 1). The predominant reasons for exclusion were wrong intervention (i.e. not self-management; $n = 14$) and relevant studies being duplicated in another larger or more recent included review ($n = 9$). Thirty-three primary studies were cited in more than one review.

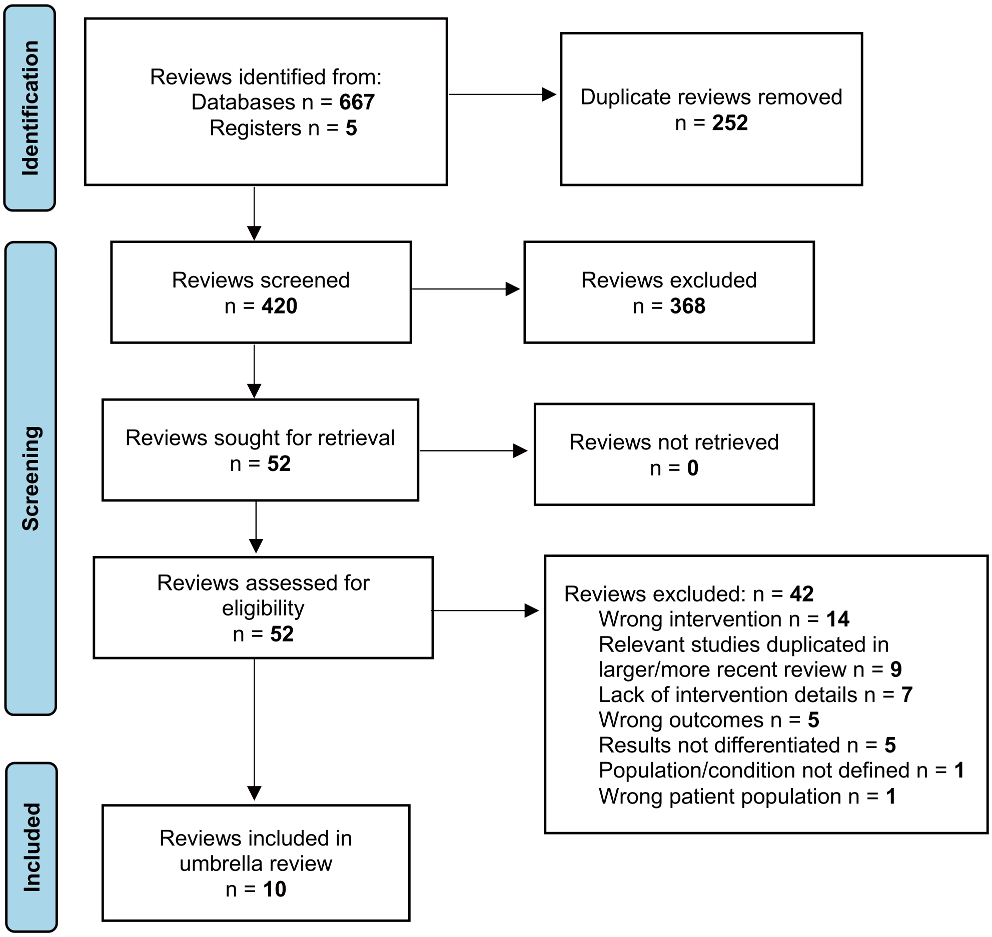


Fig. 1. PRISMA flow diagram of included reviews.

3.2. Study characteristics summary

A summary of the characteristics of included reviews is provided in Table 1. All included reviews were quantitative. A total of 38,658 participants were included across all primary studies. Participants in reviewed primary studies were mostly female and ranged in age from 19 to 69. Ethnicity and cultural background were not reported, but the majority of primary studies were conducted in western countries such as the US, UK, Australia, and European countries. Table 2 includes an overview of the quality scores based on the JBI Critical Appraisal tool for Umbrella Reviews. Consensus was achieved for all scores.

3.3. Results overview

Reviews were published between 2016 and 2022 and included a wide range of interventions targeting fatigue, often alongside other outcomes such as physical activity, quality of life, and anxiety. None of the articles screened or included in this review included patients recovering from critical illness, confirming the lack of available self-management evidence specific to this group. Most reviews focused on cancer-related fatigue ($n = 8$), with the remaining reviews addressing post-viral fatigue ($n = 1$) and Systemic Lupus Erythematosus (SLE) ($n = 1$). Four reviews focused exclusively on fatigue [23-26] and six on a range of symptoms including fatigue [22,27-31]. A wide range of interventions were included in the reviews, including lifestyle (e.g. diet and exercise), physiological (e.g. physical therapies), psychological (e.g. CBT, counselling), and self-management. Only self-management summary data were extracted. Half of included reviews ($n = 4$) focused exclusively on self-management [22-24,27]. Across the primary studies, a total of 31 different outcome measures were used to measure fatigue as a primary outcome (Supplementary File 2).

3.4. Definitions of self-management

The majority of reviews (7/10) did not specifically define self-management. The descriptions provided in the three reviews that did define self-management shared common elements such as goal setting, monitoring or assessment, and feedback, and all included involvement from health professionals. However, two of these did not report using the definition to inform inclusion criteria, resulting in a wide range of interventions classed as ‘self-management’ across all reviews. Agbejule et al. [23] described self-management as patient-led, with the patient engaging in self-monitoring, lifestyle behaviour changes, contact with health professionals, and family and peer support. While Bennett et al. (2016) targeted what they described as ‘patient education’, the definition used also encompassed aspects of self-management such as goal setting, coaching, feedback, and helping patients to understand fatigue and develop strategies. In their inclusion criteria, Hernandez Silva et al. [27] defined self-management as consisting of education, goal setting, progress assessment, and problem-solving with the support of a health professional [27].

3.5. Effectiveness of interventions

All reviews reported improvement in fatigue from self-management interventions, though high heterogeneity prevented conclusions about effectiveness. The three reviews that conducted meta-analyses and included effect sizes reported small-moderate positive effects on fatigue

Table 1
Characteristics of included reviews.

Review	Conditions	Outcomes	No. primary studies (participants)	Intervention type	Intervention delivery
Agbejule 2022	Any cancer type at any stage	- Fatigue severity - Behavioural outcomes (e.g. diet, physical activity, exercise, self-efficacy)	50 (7383)	- Education or psychoeducation (*n* = 16) - Physical activity or exercise (*n* = 12) - Cognitive behavioural therapy (CBT) and stress management (*n* = 4) - Energy conservation (*n* = 2) - Mindfulness-based therapy (*n* = 4) - Imagery-based behaviour therapy (n = 1) - Symptom monitoring system (n = 1) - Self-care education and self-hypnosis (*n* = 1) - Education and acupuncture (n = 1) - Exercise and diet education (n = 1) - Exercise and mind-body therapy (*n* = 1) - Exercise/physical activity and cognitive behavioural therapy (*n* = 2) - Fatigue education through motivational interviewing and counselling (n = 2)	- Web-based (n = 9) - Face to face (*n* = 20) - Home-based (n = 2) - Telephone-based (*n* = 7) - Mixed/hybrid approaches (*n* = 12) - Supervised by health professionals (*n* = 33) - Fully self-directed (*n* = 6) - Facilitated by research staff or lay survivors (*n* = 2) - Facilitator type not recorded or unclear (*n* = 8)
Bennett 2016	Adults with any cancer diagnosis	- Fatigue (general, intensity, distress, interference) - Fatigue knowledge acquisition - Self-reported use of strategies taught in intervention - Coping with fatigue - Self-efficacy for fatigue management - Capacity to perform activities of daily living or physical functioning - Anxiety, depression - Global quality of life	14 (2213)	- Information-giving interventions (n = 4) - Information-giving with counselling or behavioural techniques, e.g. problem solving and reinforcement or support strategies (*n* = 10)	- Web-based or videodisc-based interactive (n = 3) - Telephone-based (*n* = 1) - Telephone or at-home with information, diary (*n* = 3) - Face-to-face with follow-up telephone sessions (*n* = 2) - Face-to-face with audio-visual and computer materials (*n* = 1) - Face-to-face group education sessions (n = 2) - Face-to-face with written information, home tasks, diary, and review (*n* = 2)
Fowler-Davis 2021	Post-viral fatigue syndromes	- Physical and mental fatigue	37 (4871)	- Physiological therapies (n = 20) - Psychological or psycho-spiritual therapies (n = 6) - Multi-modal interventions (n = 8) - Behavioural self-management (n = 3)	- Community setting (n = 9) - Home-based self-management with primary or outpatient care (*n* = 9) - Combined primary and secondary care (*n* = 10) - Laboratory based (*n* = 5) - Not stated (n = 4)
Hernandez Silva 2019	Any cancer type/stage, including receiving treatment, in remission, considered cured, and terminal	- Pain - Psychological distress - Fatigue - Sleep	7 (949)	- Self-management information (n = 3) - Exercise programme with reminder, care plan, and networking with other users (n = 1) - Exercise with video demonstration (*n* = 1) - Exercise with self-management information, progress tracking, video demonstration, and reminders (n = 1) - Information, progress tracking, and mind-body exercises (n = 1)	- All mobile apps designed to be used daily - 5/7 involving health professional
Howell 2017	Any form of cancer at any stage of treatment	- Physical symptoms (including fatigue) - Change in function - Physical/emotional distress - Quality of life - Long-term harmful effects	42 (8048)	- Health behaviour action plans (*n* = 32) - Assessing patients' understanding and confidence for managing their care (*n* = 21) - Coaching by specially trained instructor (*n* = 17) - Problem-solving skills (n = 16)	- One-to-one (*n* = 26) - Group-based (n = 14) - Internet-based (*n* = 2)
Hwang 2020	Breast, endometrial, prostate, haematological, mixed cancer	- Physical, cognitive, psychosocial factors (e.g. fatigue) - Symptom burden - Quality of life - Emotional factors affecting resilience, confidence, self-control - Activity and participation	15 (2688)	- Tele-education (*n* = 11) - Tele-monitoring (n = 2) - Tele-counselling (n = 2)	- Web-based (n = 10) - Telephone-based (n = 3) - Mobile applications (n = 2)

(*continued on next page*)

Table 1 (*continued*)

Review	Conditions	Outcomes	No. primary studies (participants)	Intervention type	Intervention delivery
Poole 2019	Systemic Lupus **Erythematosus (SLE)**	- Occupational performance - Pain - Fatigue - Depression - Cognitive impairment	20 (893)	- Supervised aerobic training (n = 9) - Home-based exercise programme (n = 1) - Education and problem-solving session with monthly telephone counselling (n = 1) - Arthritis Foundation Self-Management Programme (n = 2) - Education self-management (n = 1) - Occupational therapy cognitive strategy education with psychosocial support (n = 1) - Fatigue management intervention (n = 1) - Standard cognitive behavioural therapy intervention (n = 2) - Biofeedback-assisted cognitive behavioural therapy (n = 1) - Mindfulness-based cognitive behavioural therapy (n = 1)	- Electronic (n = 1) - Face-to-face (n = 14) - Hybrid approaches (n = 5)
Ream 2020	Cancer	- Anxiety and depression - Emotional distress - Uncertainty - Pain and fatigue - Nausea and vomiting - Sexually related symptoms - Cancer symptoms	33 (6250)	- All self-management interventions targeted at coping with symptoms	- Telephone only (n = 10) - Telephone with online or printed materials (n = 16) - Phone, face-to-face (n = 3) - Telephone, digital/print materials, face-to-face (*n* = 3) - Telephone and automated symptom monitoring (n = 1)
Seiler 2017	Cancers	- Fatigue - Health-related quality of life - Depression	9 (176)	- Educational programme (n = 1) - Behaviour change (n = 4) - Mindfulness-based cognitive behavioural therapy (n = 1) - Imagery-based behavioural (n = 1) - Web-based exercise (n = 2)	- All web-based
Singleton 2022	Breast cancer	- Quality of Life - Self-efficacy - Symptoms (e.g.fatigue)	32 (4790)	- Cognitive behavioural therapy (n = 3) - Psychoeducation (n = 6) - Education and peer support (n = 6) - Workbook and discussion board (n = 1) - Care plan app (n = 1) - Lifestyle education with discussion board, blogs, and reminders (n = 2) - Symptom management app (n = 2) - Counselling with phone calls (n = 1) - Exercise programme (n = 1) - Information about cancer management and symptom tracking (n = 5) - Mindfulness app (n = 1) - Smartwatch and coaching (n = 1) - Information about cancer care (n = 1)	- Web-based (*n* = 23) - Mobile apps (*n* = 7) - App, smart watch (n = 2)

[24,26,31]. Of these, two [24,31] reported small-moderate effects on quality of life.

3.6. *Cancer-related fatigue self-management*

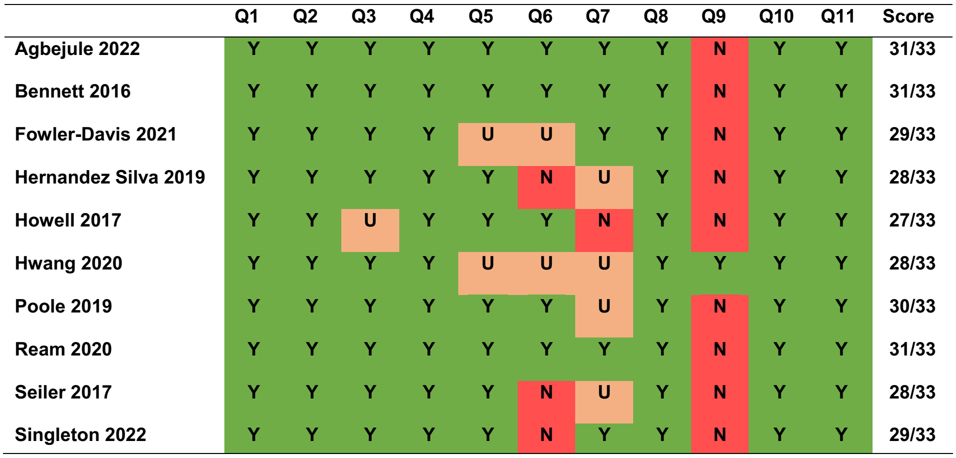
Agbejule et al. [23] conducted a review of 50 fatigue self-management interventions for cancer patients (7383 participants). All included interventions were mapped against a taxonomy of 14 key self-management features [32], including, for example, information provision, goal setting, positive feedback, and counselling. This mapping demonstrated a wide range of what was labelled 'self-management', with an average of 6.1 out of 14 components used across primary studies. Information provision was most common (32/50) and motivational interviewing least used (3/50).

Agbejule et al. [23] reported no negative intervention effects on fatigue. A positive intervention effect on fatigue was observed in 29/50 studies post-intervention, most of which were delivered after cancer treatment, supported by health professionals, included a face-to-face component, tailored to individuals, and guided by behaviour change theory. Of 29 studies that included a follow-up fatigue assessment, 10 observed positive effects and included physical activity programmes (3/29), education programmes (2/29), mindfulness-based stress reduction (1/29), exercise (1/29), mindfulness-based cognitive therapy, cognitive behavioural stress management (1/29), and combined exercise and CBT (1/29). Of the two studies assessing self-efficacy for fatigue self-management, one reported a positive effect post-intervention, and the other reported no intervention effects. The quality of primary studies varied; using the Cochrane Risk of Bias Tool, 22 were deemed to have a high risk of bias, and 28 had some concerns [23]. The primary sources of bias included measurement of the outcome, missing outcome data, and deviations from intended interventions. Abgejule et al. [23] concluded that interventions with tailored, comprehensive support and positive clinician-patient interaction can facilitate self-management of cancer-related fatigue.

Bennett et al.'s [24] systematic review included 14 education interventions for cancer-related fatigue and 2213 participants. Most

Table 2

JBI critical appraisal tool summary.



	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Score
Agbejule 2022	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	31/33
Bennett 2016	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	31/33
Fowler-Davis 2021	Y	Y	Y	Y	U	U	Y	Y	N	Y	Y	29/33
Hernandez Silva 2019	Y	Y	Y	Y	Y	N	U	Y	N	Y	Y	28/33
Howell 2017	Y	Y	U	Y	Y	Y	N	Y	N	Y	Y	27/33
Hwang 2020	Y	Y	Y	Y	U	U	U	Y	Y	Y	Y	28/33
Poole 2019	Y	Y	Y	Y	Y	Y	U	Y	N	Y	Y	30/33
Ream 2020	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	31/33
Seiler 2017	Y	Y	Y	Y	Y	N	U	Y	N	Y	Y	28/33
Singleton 2022	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y	29/33

Y = Yes; U = Unclear; N = No.
Scoring: Yes = 3; Unclear = 2; No = 1; N/A = 0.
Q1. Is the review question clearly and explicitly stated?
Q2. Were the inclusion criteria appropriate for the review question?
Q3. Was the search strategy appropriate?
Q4. Were the sources and resources used to search for studies adequate?
Q5. Were the criteria for appraising studies appropriate?
Q6. Was critical appraisal conducted by two or more reviewers independently?
Q7. Were there methods to minimise errors in data extraction?
Q8. Were the methods used to combine studies appropriate?
Q9. Was the likelihood of publication bias assessed?
Q10. Were recommendations for policy and/or practice supported by the reported data?
Q11. Were the specific directives for new research appropriate?

studies showed significant improvements in at least one area of fatigue measured. Bennett et al. [24] calculated effect sizes for general fatigue (SMD -0.27, 95% CI -0.51 to −0.04), fatigue intensity (SMD -0.28, 95% CI: −0.51 to −0.04), fatigue distress (SMD -0.57, 95% CI: 1.09 to 0.05), fatigue interference (SMD 0.35, 95% CI: −0.54 to −0.16), self-efficacy for managing fatigue (no significant difference), and use of fatigue management strategies (SMD 0.23, 95% CI: 0.04 to 0.41). Findings showed a trend towards a small-moderate effect of reducing fatigue and its impacts. Risk of bias was moderate for most studies as assessed using the Cochrane Risk of Bias Tool, and GRADE quality ranged from very low to moderate. Bennett et al. [24] propose that educational interventions may produce a small reduction in cancer-related fatigue and a moderate reduction in fatigue distress, but they also suggest that education alone is unlikely to have optimal impact.

Seiler et al. [26] reviewed nine studies (176 participants) examining eHealth interventions for cancer-related fatigue, with eHealth defined as health support delivered via information technology (e.g. internet, virtual reality, gaming). Interventions covered a range of content, including education, behaviour change, psychoeducational modules, exercise, and mindfulness-based cognitive therapy, four of which targeted fatigue. A meta-analysis revealed a statistically significant beneficial effect of eHealth interventions for fatigue. Therapist-guided eHealth interventions were found to be more efficacious than self-guided interventions ($r = 0.58$, 95% CI: 0.3136 to 0.5985, $p < 0.001$). Quality appraisal using the Cochrane Risk of Bias tool indicated that four primary studies were of low quality, and five had unclear risk of bias. The authors conclude that there is potential for eHealth interventions to have a positive impact on cancer-related fatigue, but there remains insufficient evidence for their effectiveness, particularly over longer periods.

Hernandez Silva et al. [27] evaluated seven studies (949 participants) of mHealth (mobile phone) self-management interventions for cancer-related fatigue, sleep, psychological distress, and pain in patients with any type of cancer at any stage. Fatigue outcomes improved in all four studies evaluating fatigue, and this was statistically significant in two studies ($p = 0.04$, $p = 0.047$), though confidence intervals were not reported. Quality appraisal using the Cochrane Risk of Bias Tool indicated that most studies were high risk in 2/4 areas, most commonly related to problems with random sequence generation and allocation concealment, and two studies were considered high risk as they reported incomplete outcome data. Hernandez Silva et al. [27] suggest that mHealth could have utility for fatigue self-management, but it is unclear which features could be most beneficial and which populations would most benefit.

Howell et al. [22] assessed 42 studies (8048 participants) of self-management interventions for cancer symptoms, 18 of which targeted fatigue. Of these, 10 reported significant decreases in fatigue post-intervention, including psychoeducational self-management and supportive care interventions, and the remainder found no effect. Howell et al. [22] found that inclusion of what they determined as eight core components of self-management in chronic illness was highly varied. For example, 57% (24/42) involved tailoring to individual needs, and 26% (11/42) included collaboration and guidance from healthcare team experts. Most studies were rated as having a low risk of bias with the Cochrane Risk of Bias Tool. Howell et al. [22] note that the high variability in what was labelled ‘self-management’ made it difficult to draw conclusions about the effectiveness of specific aspects of self-management interventions for cancer-related fatigue.

Hwang et al. [28] reviewed 15 studies of technology-based telehealth occupational therapy interventions for cancer survivors, with 2688 participants. Primary studies were assessed using the PEDro scale, and 10/12 were deemed high quality. The authors reported that symptom self-management showed positive effects on symptom burden and cancer-related fatigue and distress, but detailed results data were lacking in this review. Ream et al. [30] evaluated 33 telephone interventions for cancer symptom management (6250 participants).

Overall effect sizes were not calculated due to data heterogeneity. Of the nine fatigue self-management studies, five reported significant improvements in fatigue either post-intervention or after follow-up (follow-up time points, *p* values, and CI not reported), and four found no significant effects. Ream et al. [30] concluded that the evidence supported the use of telephone interventions for symptoms such as fatigue, but it was not possible to determine whether telephone only or telephone combined with face-to-face was more effective.

Singleton et al. [31] reviewed 32 electronic health interventions for patients with breast cancer (4790 participants). Of the two self-management interventions targeting fatigue, both showed significant improvements after follow-up (follow-up time points not reported; SMD -0.37, 95% CI: 0.61 to 0.13). Appraisal using the Cochrane Risk of Bias tool indicated that most studies were of low quality. The authors suggest that based on patient preferences elucidated in some studies, interventions may benefit from video and written material on practical health management, optional communication with health professionals, and opportunities for social support [31].

3.7. *Post-viral fatigue and SLE*

Fowler-Davis et al. [25] evaluated 37 post-viral fatigue interventions (4871 participants). Significant effects were seen in several types of interventions, including group- and individual-based CBT, complementary therapies, and self-management. Small significant positive effects on fatigue were observed in the two self-management interventions by Friedberg et al. [33] MD -7.0, SMD 0.514, 95% CI 1.8 to −2.2) and Marques et al. [34,35] (MD -9.9, 95% CI -16.3 to −3.4, SMD 0.513), including sustained decrease in fatigue after follow-up in Marques et al. [34,35] (MD -13.69, 95% CI -20.05 to −7.32, SMD 0.720). The self-management interventions were rated as high and moderate quality using the Mixed Methods Appraisal Tool. Poole et al. [29] examined 20 occupational therapy interventions for Systemic Lupus Erythematosus (SLE; 893 participants) and found evidence to support patient education and self-management interventions for pain, depression, anxiety, perceived stress, quality of life, and function. Studies were rated as low-to-moderate quality. The single self-management intervention that targeted fatigue produced a significant improvement in fatigue after follow-up [29], but specific values and follow-up time points were not reported.

3.8. *Quality of life*

Quality of life was reported as an outcome in three reviews [22,24,31]. Bennett et al. [24] reported a small-moderate positive effect of educational interventions on combined global quality of life and health status outcomes ($n = 2$) (MD 11.47, 95% CI 1.29 to 21.65). Howell et al. reported that 10 of the 16 included studies assessing quality of life showed significant improvement but did not provide synthesised effect sizes or significant levels. A significant improvement in quality of life was also reported in Singleton et al.'s review ($n = 8$) [31], with a positive pooled effect size (SMD -0.37, 95% CI 0.61–0.13).

3.9. *Acceptability and feasibility*

Acceptability of interventions was reported by a small number of studies in three reviews [26,28,31], and only two reviews reported on feasibility [26,31]. Where acceptability and feasibility were addressed, they were reported to be high. Singleton et al. [31] reported satisfaction across interventions as 71–100% ($n = 5$), usefulness as 71–95% ($n = 6$), and ease of use as 73–92% ($n = 3$).

3.10. *Self-management interventions relevant to critical illness*

3.10.1. *Overview*

A total of 28 interventions reported in 29 studies met the criteria for self-management and were relevant to fatigue after critical illness (Supplementary File 3). Of these, 17 produced statistically significant or near-significant improvements in fatigue and are summarised in Table 3. An overview of the materials and content of the interventions with positive effects is provided in Fig. 2. Acceptability and feasibility were reported for only one intervention; the RESTORE web-based programme for cancer-related fatigue [36] was reported as feasible and acceptable, though specific details of outcome measures were lacking.

3.10.2. *Modality*

Effective interventions of relevance to fatigue after critical illness, were delivered in a range of modalities, including face-to-face only ($n = 3$), face-to-face with a telephone component ($n = 2$), telephone only ($n = 5$), web-based ($n = 4$), mobile app (n = 2), and combined web-based, app, and telephone support ($n = 1$). All interventions with a face-to-face component took place prior to 2010, signalling a shift to web-based programmes and apps more recently. Eleven interventions included involvement from a health professional, researcher, or trained facilitator.

3.10.3. *Content and materials*

All effective interventions provided strategies for managing fatigue, and one offered no other content [37]. Information about fatigue or the underlying condition was included in two interventions [38,39], and one quarter (4/17) involved goal setting [40-43], counselling [34,35,38,44,45], and regular assessment of fatigue using either a standardised fatigue outcome measure or a scale developed for the intervention [33,42,46-48]. Goal setting and progress monitoring were varied. Of the interventions that conducted regular assessment of fatigue [33,42,46-48], only one also included goal setting and action planning [42], and none of the same interventions included progress tracking.

The most common supporting material was a handbook or written resource, but this was included in fewer than half (7/17) of the interventions [34,35,40,44-47,49]. Links to other resources and supports were provided in only two interventions [36,49]. Only one of the three interventions utilising a diary included progress tracking [45]. Active review of progress with patients was also lacking in interventions that used devices to measure activity [33-35,42], with the data used only to measure effectiveness.

4. Discussion

This umbrella review describes the available evidence for the effectiveness of fatigue self-management interventions for physical conditions and their potential application to fatigue after critical illness. The review elucidated three key findings: (1) self-management interventions varied widely and often lacked core elements of self-management, such as goal setting, tailoring to individual needs, and guidance and collaboration from a healthcare team; (2) telephone and web-based interventions were more common than face-to-face, and evidence suggested that therapist-guided interventions may be more effective than fully self-guided interventions; (3) there was some evidence of a positive effect of fatigue self-management interventions on self-reported fatigue outcomes such as severity and distress, though data were highly heterogeneous.

4.1. *Self-management features*

Most reviews did not specify how, if at all, they defined self-management, and interventions were often included that did not have core elements of self-management as defined by Howell et al. [22]. Lorig and Holman [13] similarly propose that self-management should include problem solving, education about resources, decision-making, and a supportive patient and health professional relationship. While the interventions with positive effects that were deemed suitable for adaptation for fatigue after critical illness included at least one of the

Table 3
Effective interventions relevant to fatigue after critical illness.

Study	Population	Duration	Content	Mode of delivery
Armes 2007 (in Abgejule 2022, Howell 2017)	- 55 adult cancer patients undergoing active chemotherapy	6–9 weeks	- Physical and cognitive strategies to manage cancer-related fatigue - 3 × 60-min sessions every 3–4 weeks	- Face-to-face with trained researcher
Badger 2005 (in Ream 2020)	- 48 adults with breast cancer	6 weeks	- 30-min weekly phone calls including education, support for self-management	- Telephone
Badger 2013 (in Ream 2020)	- 90 adults with breast cancer	8 weeks	- Telephone interpersonal counselling - Telephone health education to manage fatigue	- Telephone
Barsevick 2004 (in Abgejule 2022, Bennett 2016, Ream 2020)	- 396 adult cancer survivors initiating chemotherapy, radiotherapy or other active treatment	3 weeks	- Energy Conservation and Activity Management (ECAM) - 3 x nurse-led telephone sessions - Session 1: complete fatigue journal and assess activity patterns - Session 2: journal used to create energy conservation plan - Session 3: plan evaluated and revised	- Telephone with trained oncology nurse (counselling and case supervision)
Foster 2016 (in Abgejule 2022, Bennett 2016, Seiler 2017)	- 163 adult cancer patients experiencing fatigue, completed primary treatment at least 5 years before	6 weeks	- Self-management support web programme - 5 weekly 30-min sessions (introduction; goal setting; exercise, diet, sleep, work, home; thoughts & feelings; talking to others) - Extra activities: patient stories (text and video) to give examples of cancer-related fatigue management; links to mindfulness and relaxation training; information on financial support	- Self-directed web-based programme
Friedberg 2016 (in Fowler-Davis 2021)	- 124 adults with chronic fatigue	3 months	- Behavioural self-management with web-based diary - Pedometer use - Daily questions assessing increases in activity or exercise - Activity pacing - Increasing exposure to pleasant activities - Coping practices	- Web-based and home-based (not stated if facilitated by health professional)
Kearney 2009, Maguire 2015 (in Hernandez Silva 2019)	- 112 adults with lung, breast, or colorectal cancer (Kearney 2008) - 16 adults with lung cancer (Maguire 2015)	1–4 × 2-week tx cycles (Kearney); 5 weeks (Maguire)	- Self-management information - Symptom questionnaire - Involvement from oncology health professionals	- Mobile app
Marques 2015, 2017 (in Fowler-Davis 2021)	- 91 adults with chronic fatigue	12 weeks, follow-up at 12 weeks	- 2 x motivational interviewing sessions - Information booklet - Self-regulation-based workbook divided into 4 steps focusing on self-regulation cognitions and skills - Pedometer use of 12 weeks	- Telephone and home-based
Molassiotis 2009 (in Ream 2020)	- 164 adults with colorectal or breast cancer undergoing treatment	18 weeks	- Home care nursing programme - Symptoms assessment - Patient self-management education - 1, or more if toxicity experienced, home visit - Weekly phone call - Access to 24-h specialist nursing service	- Face-to-face - Telephone
Ream 2006 (in Abgejule 2022, Howell 2017, Bennett 2016)	- 103 adults with non-Hodgkin's lymphoma or gastrointestinal, non-small cell lung, colorectal, breast, or unknown primary cancer, receiving chemotherapy	3 months (first 3 tx cycles)	- Before chemotherapy: information pack providing information on exercising, balancing activity and rest, dietary supplements, prioritising/delegating activities, relaxation, diversion, sleep-enhancement techniques - During treatment: experienced counselling-trained cancer nurse and knowledge of cancer-related fatigue visited at home once per treatment cycle to review fatigue diary and use of strategies from information pack	- Face to face, home visits supported by nurses
Ream 2015 (in Abgejule 2022, Ream 2020)	- 44 adult cancer survivors scheduled for first course chemotherapy	3 tx cycles	- 3 calls over 3 treatment cycles (40 mins, 20 mins, 20 mins) - Resource pack: Coping with Fatigue booklet, handbook and diary - Motivational interviewing via telephone	- Telephone with cancer nurse trained in motivational interviewing
Sohng 2003 (in Poole 2019)	- 41 adults with Systemic Lupus Erythematosus	6 weeks	- Self-management course - 1 × 2-h group session weekly for 6 weeks focusing on symptom management, exercise, interpersonal relationships, coping with flares, healthy lifestyles	- Face-to-face
Sundberg 2017 (in Hernandez Silva 2019)	- 130 adults with prostate cancer	17–20 weeks	- Self-management information - Progress tracking - Links to online resources - Reminder alerts symptom questionnaire - Involvement from oncology nurse	- Mobile app
Vallance 2020 (in Singleton 2022)	- 83 adults with breast cancer	3 months	- Smartwatch and coaching - Smartwatch measures steps, distance, calories, sleep/rest time, alerts to move	- Web-based/ app with telephone support

(*continued on next page*)

Table 3 (*continued*)

Study	Population	Duration	Content	Mode of delivery
			- Affiliated with app and website - Participants monitor physical activity - Initial session on goal setting, reducing sedentary behaviour and downloading app - 5 phone calls on behaviour change strategies, goal setting and revision, and technical difficulties	
Van Den Berg 2015 (in Singleton 2022)	- 150 adults with breast cancer	4 months	- BREATH website - Cognitive behavioural therapy techniques for self-management - Psychological adjustment after primary breast cancer treatment - Text, assessments, videos on personal and social issues and empowerment - Recommended usage 1 h/week (16 h total) - Weekly email reminder about new website content	- Web-based
Yates 2005 (in Abgejule 2022, Bennett 2016, Howell 2017, Ream 2020)	- 110 adult female breast cancer survivors beginning chemotherapy	3 weeks	- Fatigue psychoeducational support programme - 3 x weekly 10–20-min sessions (1 face to face; 2 + 3 telephone) - Identifying patient needs, providing suitable coping strategies - Creating fatigue management plan - Sessions supplemented by patient booklet (published by Oncology Nursing Society)	- Face-to-face and telephone with nurses
Yun 2012 (in Abgejule 2022, Bennett 2016, Seiler 2017)	- 273 cancer survivors aged 20 to 65 years, completed primary treatment within previous 24 months	12 weeks	- Internet-based education cancer-related fatigue program based on National Comprehensive Cancer Network programme guidelines covering general introduction to cancer-related fatigue, energy conservation, physical activity, nutrition, sleep hygiene, pain control, distress management	- Web-based, self-directed

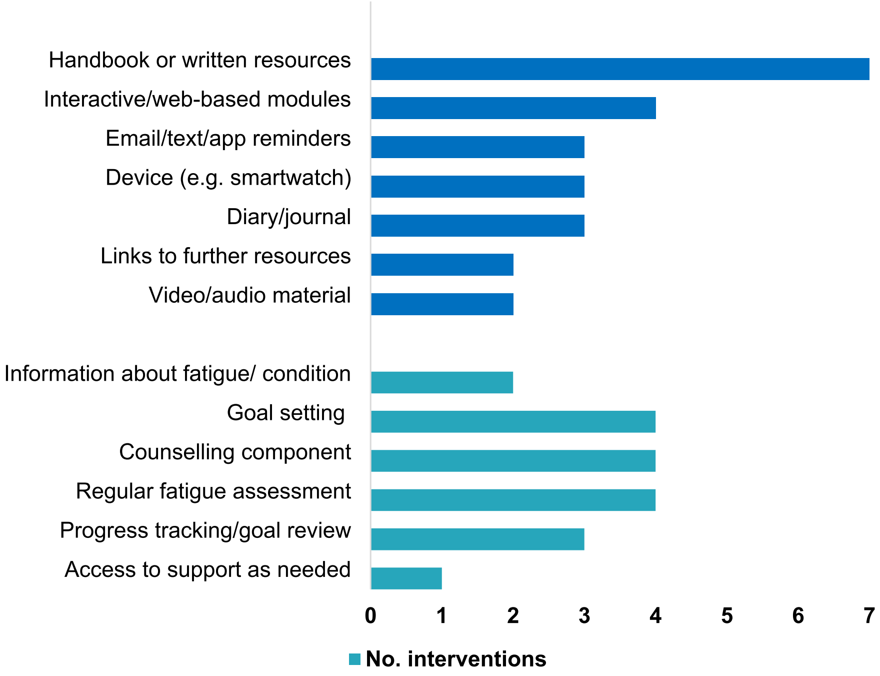


Fig. 2. Features of effective interventions relevant to fatigue after critical illness.

elements defined by Howell et al. [22], none included all. For example, only one quarter addressed goal setting, recognised as an essential rehabilitation activity both in therapist-guided interventions and self-management for promoting self-efficacy [13,50,51]. Although all these interventions had some positive impact on fatigue symptoms, many studies lacked follow-up data, and it is possible that acceptability could be affected by the inclusion or exclusion of certain core aspects of self-management.

In stroke rehabilitation, the self-management described by Howell et al. [22], Cravo et al. [11], and Lorig and Holman [13] has been termed 'supported self-management' to differentiate it from more basic approaches such as symptom tracking and lifestyle changes alone [52]. This is a useful delineation, as the difference in time and resource requirements and activities involved is substantial. While basic and supported self-management both have value, it is arguably not appropriate for interventions exclusively involving symptom reporting (e.g. with a smart device) to be compared alongside comprehensive supported programmes involving information provision, goal setting, and facilitator or health professional support.

The lack of definitions among reviews and primary studies and varied inclusion of proposed key self-management characteristics has significant implications not only for the ability to effectively synthesise data but also the clinical relevance of the interventions. For clinicians to make informed judgements about suitable fatigue self-management interventions for a patient group, there needs to be clarity on what self-management should involve and which characteristics are effective in different contexts.

4.2. Intervention modalities

The majority of effective interventions relevant to fatigue after critical illness used what is typically termed a 'telehealth' or 'eHealth' approach, involving the use of telephone/audio, video, and web- or app-based delivery rather than face-to-face [53]. Almost half of the effective interventions relevant to fatigue after critical illness involved a telephone component or were delivered entirely over the phone, but it is unclear whether patients would have preferred face-to-face due to the lack of acceptability data. Although none of the interventions utilised videoconferencing to support delivery, this modality appears to have advantages compared to telephone in the context of primary care telehealth, such as improved identification of problems and patient perceptions of being understood [54]. Video-conferencing modalities also became more common during the COVID-19 pandemic, forcing healthcare providers and patients to rapidly adapt and become more competent users [55]. For self-management, videoconferencing could allow for more comprehensive support for fatigue symptoms and feedback on progress by facilitating more 'total' communication than telephone calls.

Telehealth or eHealth self-management benefits from being cost-effective and easily integrated into daily life, and web- or app-based programmes are arguably the most convenient format, as patients can engage in their own time rather than adhering to appointments [56]. This could have benefits for people with fatigue after critical illness, as fatigue can make interaction and engaging with 'live' appointments challenging [1,6]. However, it is important to consider that total reliance on technology-based modalities could also be limiting for people who struggle to access or confidently use technology [57,58]. A combination of web- or app-based and telephone/videoconference or face-to-face contact with built-in flexibility may therefore be more appropriate for the self-management of fatigue after critical illness.

Most (14/17) relevant interventions with positive effects included involvement from a health professional, researcher, or trained facilitator, and Agbejule et al. [23] found that interventions facilitated by health professionals with at least one face-to-face session were most likely to have positive effects. Shared decision-making activities and partnership between patient and facilitator are considered central to self-management [11,13]. Dineen-Griffin et al. [59] also identified that a structured provider-patient exchange in self-management should involve a one-to-one session, provision of self-management support materials, and ongoing follow-up. However, some web-based interventions across the reviews, such as RESTORE [41] and BREATH [60], were fully self-directed.

It could be argued that the interactive features possible with current web-based technology fulfil the role of 'live' support from a facilitator. However, relationships or connections with health professionals and peers are still considered central to successful telehealth interventions [53]. In a review of acceptability and feasibility of web-based interventions for quality of life in cancer patients, Corbett et al. [61] found that satisfaction with self-directed web programmes varied. For some individuals, purely online material can feel too impersonal, and people may struggle with the technology without support [61]. Any adaptations of web-based programmes for fatigue after critical illness should therefore consider including some form of optional live interaction, such as webchat or phone/videoconference calls with a health professional or trained facilitator, to provide more comprehensive support.

4.3. Effectiveness of fatigue self-management

It is not possible to make conclusive recommendations for the use of self-management for fatigue after critical illness due to the generally low quality of primary studies and the wide range of intervention characteristics. However, the available evidence indicates that self-management interventions can have a positive effect on fatigue for people with cancer-related fatigue, post-viral fatigue, and SLE, suggesting that self-management could have similar utility for fatigue after critical illness. The majority of reviews focused on cancer, and several interventions were designed to be delivered during cancer treatment cycles, with attention given to chemotherapy and radiotherapy side effects. Therefore, while the experience of fatigue and strategies required are sufficiently similar to make the core intervention components transferable, adaptations would need to be made to ensure content would be optimally relevant for survivors of critical illness.

Feasibility is a core component of the Medical Research Council (MRC) Framework for the Development of Complex Interventions [62,63], ensuring that interventions can reasonably be delivered within real clinical settings. However, only two reviews reported on feasibility from a small number of primary studies. This limits any conclusions about the clinical utility of the interventions deemed relevant to fatigue after critical illness (Table 3). The general lack of acceptability reporting further limits the ability to determine which interventions would be most suitable for fatigue after critical illness. Acceptability has important implications for the success and feasibility of an intervention, as patients may be less inclined to actively engage with an intervention that they do not find acceptable. Only one relevant intervention with positive effects (RESTORE) [41] was reported to be feasible and acceptable, though specific outcome measures and scores were not provided.

It is known that fatigue profoundly impacts on overall quality of life for critical illness survivors [1], and the reviews that included quality of life reported significant improvements from self-management interventions [22,24,31]. However, while quality of life is an important indicator, fatigue and quality of life are different and should be treated as such. Some studies included within the reviews assessed fatigue as part of broader quality of life outcome measures rather than using dedicated fatigue assessment tools. This could risk missing important details about a person's experience of fatigue and how it changes over time with an intervention.

4.4. Implications for future research and practice

The findings of this review have several implications for the development of future interventions and adaptation of interventions for people with fatigue after critical illness.

Limited evidence suggests that self-management interventions can be effective for fatigue caused by physical conditions such as cancer and SLE. However, while the fatigue arising from critical illness shares similarities with these conditions, tailoring would be required to make interventions suitable for people with fatigue after critical illness. For example, most included reviews addressed cancer and primarily dealt with fatigue caused by treatment, in contrast to fatigue after critical illness, which has a different recovery trajectory and may persist long term. Unlike post intensive care syndrome, there is also more awareness of cancer among the general public, so survivors of critical illness may need a different level of support to understand their fatigue and explain it to others. It is also unknown to what extent specific facets of fatigue, such as cognitive fatigue or 'brain fog', differ in critical illness recovery compared to other conditions. The specific needs and preferences of survivors of critical illness must therefore be considered in developing new interventions. Future research should also include acceptability and feasibility measures to allow clinicians to make more informed decisions about the suitability of specific interventions.

Interventions should consider including health professional or facilitator support and a 'live' or face-to-face component, as evidence suggests this may improve effectiveness. While it is not possible to make recommendations regarding modality, evidence from eHealth or telehealth research suggests that web- and app-based interventions should still include supportive exchanges with a facilitator. It is also important to consider that digital interventions may be more suitable for people with fatigue after critical illness due to the energy limitations experienced. For example, 'brain fog' could affect a person's ability to engage with online learning content and navigate implementing strategies independently. Further studies should assess the benefits of different modalities and the preferences of people with fatigue after critical illness.

Many of the reviews included interventions that addressed fatigue as part of a programme targeting the whole condition, such as cancer, and quality of life. In developing future interventions for fatigue after critical illness, it will therefore be important to consider whether such interventions should specifically target fatigue or be built into broader, more holistic intervention packages addressing the full impact of post intensive care syndrome. It may be necessary to provide both options, allowing survivors to either carry out a full post intensive care syndrome intervention programme or only undertake the fatigue component if that is their primary concern.

While the quality of included reviews was generally high, the quality of primary studies varied widely, and data were highly heterogeneous due to the range of outcome measures used to assess fatigue, making it challenging to draw conclusions about effectiveness and suitability for people with fatigue after critical illness. Findings highlight a need for greater consistency in fatigue assessment to ensure adequate comparison of interventions, improve the quality of evidence, and allow for more straightforward adaptation of interventions for different patient groups. Future research should focus on reaching consensus on core fatigue outcomes and standard measures.

4.5. Limitations

This review had a number of limitations. Although we attempted to use a comprehensive range of search terms, the diversity of self-management interventions and how they are labelled means that some relevant reviews may have been missed. As this was an umbrella review, there may also be relevant primary studies in other cohorts that were not reviewed. In addition, reviews were not excluded on the basis of methodological quality, and this quality was varied. Several reviews lacked detail in reporting or had methodological weaknesses, such as extraction or appraisal being conducted by only one author. While most reviews scored highly, the JBI Checklist for Systematic Reviews and Research Syntheses does not have thresholds for high, moderate, or low quality or account for the quality of included primary studies. It is therefore not possible to give definitive conclusions about review quality.

The lack of a precise and clearly stated definition of self-management in inclusion criteria in most reviews resulted in highly heterogenous studies. A wide range of interventions in primary studies were labelled as self-management but often did not fulfil basic self-management characteristics. For example, some reviews included self-management interventions that were primarily psychological therapies, involved information provision or symptom tracking only, or were exclusively exercise and diet-based therapeutic interventions. Most reviews also did not categorise results by intervention characteristics, either due to too few studies or highly heterogeneous data, limiting clinical relevance. It was therefore not possible to definitively determine which types of self-management interventions or modalities are most effective and which would be most suitable for adaptation for fatigue after critical illness.

Among primary studies, fatigue was often included as part of general symptoms rather than as a primary target of an intervention, and this must be considered when interpreting reviews' pooled effectiveness data. A wide range of outcome measures were also used for different aspects of fatigue, such as fatigue intensity, severity, and distress, and not all measures used were specific to fatigue. For example, some studies used proxy measures such as sleep or physical activity or assessed fatigue as part of quality of life. This diversity of outcomes contributed to the limited ability of reviews to aggregate data and calculate effect sizes. Future research would benefit from consensus on standard fatigue outcomes and measures relevant to self-management for specific conditions to better support meta-analysis.

As this was conducted as an umbrella review, the risk of bias is high, in part due to the high heterogeneity of primary studies and limited reporting of follow-up data. The lack of detail in the reporting of intervention characteristics in some reviews also limited understanding of how interventions were conducted. Finally, only English-language reviews were included, leading to potential selection bias.

5. Conclusions

There is some evidence of a positive effect on self-reported fatigue outcomes such as fatigue severity and distress, suggesting that self-management could be of benefit to people with fatigue after critical illness. Health professional-guided interventions may be more effective than fully self-guided interventions, but acceptability and feasibility must be considered. Self-management interventions varied widely and often lacked core elements of self-management, such as goal setting, tailoring to individual needs, and guidance and collaboration from a healthcare team. There is a need for consensus on a definition of self-management for the development of interventions and standard fatigue outcome measures to enable comparison of interventions. This would help researchers and clinicians to make more informed decisions about the suitability of fatigue self-management interventions for different populations and how best to adapt them.

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CRediT authorship contribution statement

Sophie Eleanor Brown: Methodology, Investigation, Formal analysis, Validation, Writing – original draft, Writing – review & editing. **Akshay Shah:** Conceptualization, Funding acquisition, Methodology, Validation, Writing – review & editing. **Wladyslawa Czuber-Dochan:** Conceptualization, Funding acquisition, Methodology, Writing – review & editing. **Suzanne Bench:** Conceptualization, Funding acquisition, Methodology, Writing – review & editing. **Louise Stayt:** Conceptualization, Funding acquisition, Methodology, Investigation, Formal analysis, Writing – review & editing.

Declaration of Competing Interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jcrc.2023.154279.

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