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Community-Based Multidimensional Rehabilitation for Cancer Survivors: A Scoping Review

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ABSTRACT

Objective: To map existing research on community-based multidimensional cancer rehabilitation, specifically relating to characteristics of studies, participants, intervention formats, outcomes, and outcome measures.

Data Sources: Searches were performed in MEDLINE, Embase, CINAHL, and Web of Science databases in May 2022 and updated in February/March 2024.

Review Methods: The review followed the methodological guidance for scoping reviews developed by the Joanna Briggs Institute. We considered evidence from primary research, knowledge syntheses, and research protocols, and imposed no limits on study design. All authors screened independently for eligibility, using a standardized template for data extraction. We used descriptive statistics and presented the results in tables and narrative summaries.

Results: The search retrieved 6424 records, of which 104 were selected for full-text screening. Twelve publications were included in the review, representing nine unique rehabilitation interventions. The included studies comprised 594 participants with a mean age of 59.6 years. The cancer types were mixed with an overrepresentation of breast and prostate cancer. Seven of the publications were feasibility, pilot, protocol, or intervention development studies, and only two were randomized controlled trials. Physical activity/exercise was the most common component within physical functioning, and social support/peer support was most common within psychosocial functioning. Sixty-five tools were used to measure a range of outcomes, the most frequent being health-related quality of life.

Conclusion: The findings demonstrate that this field of research is in its infancy in Europe. Improving homogeneity in outcomes and outcome measures would enhance comparisons and pooling of results in future research.

1 | Introduction

Advances in cancer detection and treatment have significantly improved survival rates; however, many cancer survivors experience long-term late effects that impact their health and quality of life. Commonly reported late effects are fatigue, neuropathy, lymphedema, urinary and gastrointestinal issues, and mental and psychosocial challenges [1–3]. Compared to the general population, there is also an increased risk of developing life-threatening and chronic diseases, new cancers, and cancer recurrence in people who have received toxic cancer treatments [4].

There is evidence that rehabilitation can mitigate the severity and impact of these issues on the individual, and thus, is an important

component of comprehensive cancer care [5–7]. The World Health Organization (WHO) defines rehabilitation as "a set of interventions designed to optimize functioning and reduce disability in individuals with health conditions in interaction with their environment" [8]. Rehabilitation interventions can be unidimensional (addressing only physical dimensions or only psychosocial dimensions) or multidimensional (addressing both physical and psychosocial dimensions) [9]. There is substantial evidence about the positive effects of physical rehabilitation interventions such as exercise for cancer survivors [10–13], with guidelines for recommendations on types and dosages of exercise [14–16].

Although psychosocial challenges faced by cancer survivors are well documented [17, 18], the evidence base for psychosocial rehabilitation interventions remains less robust compared to that for physical rehabilitation. Nevertheless, a growing body of research supports the effectiveness of psychosocial interventions incorporating elements such as psychoeducation, cognitive behavioral therapy, emotional support, relaxation techniques, and acceptance and commitment therapy (ACT). These approaches have demonstrated positive outcomes in enhancing coping capacity, reducing psychological distress, improving quality of life, and alleviating symptoms such as fatigue, depression, anxiety, and fear of recurrence [19–27].

Acknowledging the evidence, psychosocial interventions, alongside physical exercise (PE) interventions, are now incorporated in the European Society for Medical Oncology's Clinical Practice Guidelines for diagnosing and treating cancer-related fatigue [28]. Mind–body interventions such as mindfulness-based stress reduction and yoga interventions are categorized in the guidelines as psychosocial interventions, though they combine psychoeducational elements with meditation exercises and breathing techniques. As evidence on physical activity (PA) and exercise is strong and evidence on psychosocial components is promising, there is a growing body of research on combining these components to provide multidimensional rehabilitation to cancer survivors [9, 29, 30].

A Cochrane review by Scott et al. [9] examined the effectiveness of multidimensional rehabilitation programs in supporting cancer survivors' physical and psychosocial well-being. They found that the most effective interventions were those delivered face-to-face, comprising participants with mixed diagnoses, not lasting longer than 6 months, and being provided by multidisciplinary healthcare professionals. Similarly, a systematic review by Mewes et al. [30] found benefits for multidimensional rehabilitation programs over usual care, most notably for fatigue and physical functioning.

The main rationale for multidimensional cancer rehabilitation interventions lies in their holistic approach to address cancer survivors' multidimensional needs. However, the strength of a multidimensional rehabilitation intervention is not merely the benefit of separate approaches working in parallel targeting their separate domains. Evidence has also demonstrated that there can be a synergy between physical and psychosocial components. This is exemplified in research showing how PE in groups of cancer survivors facilitates supportive behaviors through peer support, providing encouragement and accountability, where this in turn can improve adherence to the PA components in rehabilitation interventions [31].

Existing research has often been conducted on rehabilitation programs within medical institutions such as hospitals or residential rehabilitation centers, requiring patients to be away from home [32]. However, there is a patient preference for local rehabilitation services taking place within community settings [33–36], and community-based exercise programs for cancer survivors have escalated, with evidence in this area rapidly increasing [12, 37–42].

Previous reviews reveal that most research in this field has been conducted outside Europe, with the largest amount published from the United States of America [9, 30, 43]. The focus of this scoping review is restricted to European countries. The rationale for this is partly due to the dominance of non-European studies. Another consideration relates to health system relevance. Though European countries do not have identical healthcare systems, they generally share key structural and policy features, such as universal health coverage, public funding models, and similar approaches to cancer care and rehabilitation. This makes findings more transferable and relevant to the Norwegian context, which was a key consideration in our review. Furthermore, European countries are often guided by shared frameworks and recommendations from bodies such as the European Union and WHO Europe, which influence the design and implementation of community-based health interventions. These regional alignments help focus the review.

To summarize, previous reviews were limited to RCTs and quasiexperimental studies examining mainly physical outcomes; they did not differentiate between hospital and community-based settings and only included studies published up to 2012. There remains a gap in evidence syntheses published after 2012 on cancer rehabilitation in Europe that is both multidimensional and community-based. This scoping review aims to attain an overview of research published after 2012 on community-based multidimensional rehabilitation interventions for cancer survivors in Europe. Specifically, the review seeks to address the following review questions: (1) What types of studies are conducted in the field of community-based multidimensional cancer rehabilitation, and what are the characteristics of participants in included studies? (2) What are the components, format, and setting of community-based multidimensional cancer rehabilitation interventions? (3) Which outcomes are assessed in these studies, and what are the outcome measures and assessment time points?

2 | Methods

A scoping review was selected as the most appropriate knowledge synthesis based on the exploratory nature of the review questions. The aim was broad in scope to identify all types of research within this field, identifying key issues and knowledge gaps in research on community-based multidimensional rehabilitation for cancer survivors. The objectives, eligibility criteria, and methods for this scoping review were specified in advance in a protocol, though not registered a priori. The protocol and conduct of the review followed the methodological guidance developed by the international research organization Joanna Briggs Institute (JBI) [44, 45], based on the scoping review framework initially proposed by Arksey and O'Malley [46]. Furthermore, we applied the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping

Reviews (PRISMA-ScR) checklist both during the development of the protocol and throughout the reporting process to ensure methodological transparency and completeness [47].

2.1 | Eligibility Criteria

Eligibility criteria are detailed according to the population, concept, and context (PCC) framework for scoping reviews [45]. Studies were eligible if they met the inclusion criteria as described in Table 1. For feasibility reasons, only studies reported in English, Norwegian, Swedish, or Danish were eligible. We further limited the search by location (Europe only) and years (from 2012 inclusive to the date of search).

2.2 | Information Sources and Search Strategy

We only included sources of evidence published in peer-reviewed journals and considered evidence from primary research studies, systematic reviews, other types of knowledge synthesis, and research protocols. We imposed no limits on study design and included studies that applied quantitative, qualitative, and mixed methods. Before developing the final search strategy, we searched the Cochrane Library, MEDLINE, and EPISTEMONIKOS databases to identify any existing reviews in this field. Search terms were determined from the key concepts "cancer," "multidimensional rehabilitation," and "community-based." We developed a search matrix combining Medical Subject Headings (MeSH) and all identified search terms and conducted a pilot search in the MEDLINE database. Retrieved records were inspected to identify further relevant terms, and the search was modified accordingly. The final search strategy was developed in consultation with a librarian information specialist. It was developed for MEDLINE and adapted for searches in Embase, CINAHL and Web of Science databases. The initial search was conducted on 4th-5th May 2022, with updated searches in MEDLINE and Embase on 7th March, 2023, and 12th February, 2024, and in Web of Science on 19th March, 2024. A supporting search was performed by handsearching the reference lists of all included studies and previous reviews of relevance to this field of research. A detailed search strategy for MEDLINE can be found in Supporting File 1.

2.3 | Screening and Selection

Retrieved articles from the search were exported to EndNote [48] for duplicate removal before being imported into Rayyan, a web-based tool for organizing and managing sources for literature reviews [49]. First-level screening of titles and abstracts was performed independently by the six authors, split into three pairs (HHA, LMO, MSP, GBS, TES, and MAH), and reasons for exclusion were noted. Interrater discrepancies were resolved by consensus or by consulting a third reviewer. The same process was employed for 2nd level full-text review of articles deemed potentially relevant for inclusion in the review.

2.4 | Data Charting Process and Data Items

A data extraction form was developed by adapting the template provided in the JBI's methodological guidance [44, 45] to fit the current scoping review questions. It was piloted with three of the authors on a random sample of 6 articles and subsequently refined. Data extraction from all included studies was performed by one author (HHA), and 50% were verified by a second author (LMO or MSP) to ensure accuracy. Extracted data items are listed in Table 2. Data were extracted on types of study design; however, in line with the guidance on scoping reviews [44, 45], we did not appraise the methodological quality of the included sources of evidence, as the review questions did not warrant such an appraisal.

2.5 | Data Analysis and Synthesis of Results

Data underwent descriptive analyses and were summarized in the text and tables to describe the characteristics of included studies, populations, interventions, outcomes, and outcome measures corresponding to the review questions.

3 | Results

3.1 | Selection of Sources of Evidence

The database searches retrieved 6424 records after the removal of 1400 duplicates. Seven additional studies were identified through hand-searching reference lists. Hence, titles and abstracts for 6431 records were screened for eligibility, of which 104 were selected for full-text review. Ninety-two records did not meet the eligibility criteria and were excluded, resulting in 12 publications [34, 50–60] included in the review. Figure 1 depicts the selection process flow chart with reasons for exclusion at the full-text review stage.

3.2 | Characteristics of Sources of Evidence

Of the 12 included sources of evidence, nine were published within the last five years [34, 50, 52–57, 59]. The distribution of countries of origin was Ireland ($n = 3$) [52–54], Norway ($n = 3$) [34, 50, 59], and one each from the Netherlands [51], Portugal [55], the United Kingdom [56], Spain [57], Lithuania [58], and Germany [60]. Addressing Review question 1, four were feasibility/pilot studies [50, 51, 57, 59], two were study protocols for randomized controlled trials [53, 55], two were randomized controlled trials [56, 58], two were nonrandomized trials [54, 60], one was a qualitative intervention evaluation study [34], and one described an intervention development [52]. Three of the 12 publications reported on the same rehabilitation intervention [52–54], and one other intervention was reported in 2 of the 12 included studies [34, 50]. Hence, the 12 included sources of evidence report on nine unique multidimensional community–based rehabilitation interventions for cancer survivors. Sample sizes for the nine studies that recruited participants, i.e., all except the two protocol articles [53, 55] and the intervention development publication [52], ranged between 9 and 191, totaling 594 study participants with a mean age of 59.6 years. Most studies included both males and females diagnosed with mixed cancer diagnoses, while one study was conducted exclusively on women with breast cancer [58] and two on men with prostate cancer [56, 60]. These were also the most frequent cancer types in the mixed diagnosis studies, with 40% breast cancer and 34% prostate cancer. Data on socioeconomic status were reported in six [34, 50, 54, 56, 59, 60] studies, mainly through participants' educational level. Data on population ethnicity were only reported in one study [57]. Further details on the study and population characteristics for all 12 included studies addressing Review question 1 are presented in Table 3. Unless specifically

TABLE 1 | Inclusion and exclusion criteria.

	Inclusion criteria	Exclusion criteria
Population	Adults aged 19 years and above cancer diagnosis (any type) Completed primary cancer treatment	Children aged 0–18 years Adult survivors of childhood cancers. Undergoing primary cancer treatment.
Concept	Multidimensional* cancer rehabilitation Comprising at least one physical and one psychosocial component.	Single component rehabilitation or not comprising both a physical and a psychosocial component (incl. mind–body interventions) Speech therapy as only physical component. Smoking cessation and mass-screening programs
Context	Community-based** (i.e., delivered in participants' local community) in Europe	Hospital-based services (including outpatient services). Residential rehabilitation services. Interventions that were solely/mainly home-based or internet-based. Interventions delivered outside Europe.

*Interventions comprising a minimum of one physical component (e.g., physical exercise) and one psychosocial component (e.g., social support).
**Considered community-based if explicitly stated as such by the authors, and/or it was clear from the publication that the intervention was delivered from a facility in the local community.

TABLE 2 | Data items extracted.

Review questions	Items for data extraction
1. What types of studies are conducted in the field of community-based multidimensional cancer rehabilitation, and what are the characteristics of participants in identified studies?	First author, article title, publication year, name of the journal, country where the study was conducted, study design, study aims, sample size, sample mean age, gender, socioeconomic status, ethnicity, type of cancer, and treatment status
2. What are the components, format, and setting of community-based multidimensional cancer rehabilitation?	Intervention's theoretical foundation, intervention components, intervention frequency, format of delivery, duration, professions delivering the intervention, and intervention setting
3. Which outcomes are assessed in these studies, and what are the outcome measures and assessment time points?	Outcomes assessed, outcome instruments employed/data collection methods, and data collection time points

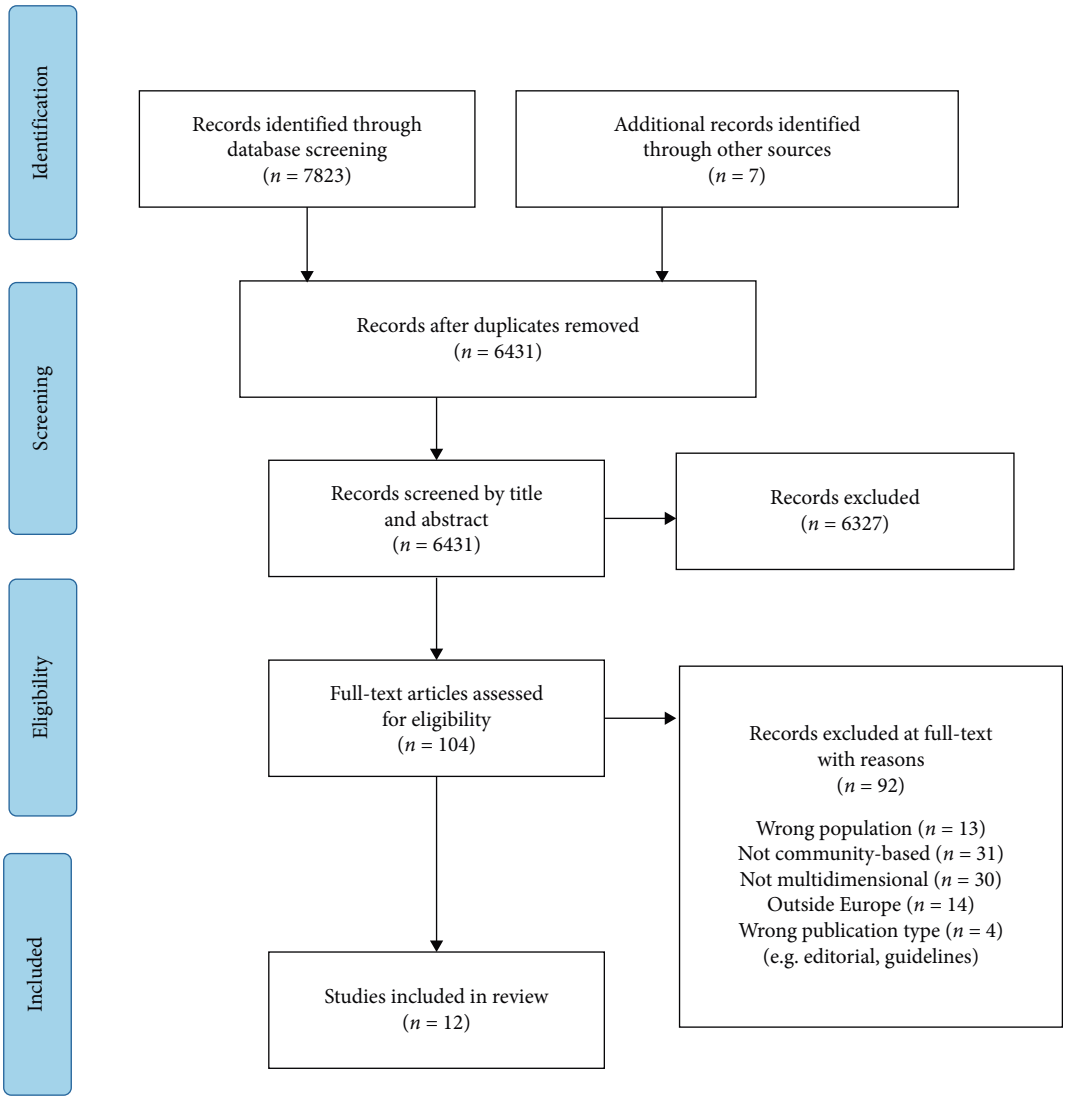

FIGURE 1 | PRISMA flow diagram for the sources of evidence selection.

referring to study and population characteristics, the subsequent results will be reported from the nine unique interventions.

3.3 | Results of Individual Sources of Evidence

3.3.1 | Theoretical Frameworks

Of the nine distinct interventions described in the 12 included publications, five were reported to have a theoretical foundation [34, 50, 52–54, 56, 58]. The theories underpinning the development of the interventions were the theory of health promotion [34, 50], behavior change theory [52–54], self-determination theory [55], self-efficacy theory [56], and engagement in meaningful activities [58]. The remaining four interventions were not reported to be based on a specific theoretical framework [51, 57, 59, 61].

3.3.2 | Intervention Characteristics

Only two [54, 57] of the included publications applied the recommended Template for Intervention Description and Replication (TIDieR) checklist and guide [62] in reporting the rehabilitation interventions, resulting in varied details for data extraction. Overall, the interventions were sufficiently described to answer the specific review questions for the current scoping review.

Addressing Review question 2, Table 4 details the characteristics of the nine unique rehabilitation interventions identified in the included publications. In accordance with the inclusion criteria for the scoping review, all interventions included at least one component relating to physical functioning and one component relating to psychosocial functioning. PE and PA were the most common components targeting physical functioning. In five interventions, the authors reported that the PE component comprised both aerobic and resistant exercise [50, 54, 55, 57, 59]. One lifestyle intervention focused on diet consultations in addition to PA [51], another involved pelvic floor muscle exercises for men who had been treated for prostate cancer [56], and one intervention offered community-based occupational therapy to women who had been treated for breast cancer, targeting common late effects such as arm swelling and reduced arm mobility [58]. Rath et al. [60] compared existing rehabilitation services and did not describe intervention characteristics in any detail beyond what they stated was standard for German rehabilitation services, i.e., treatments such as physical therapy,

TABLE 3 | Characteristics of the included studies and sample characteristics (Review question 1).

First author, year, country	Study type/design	Purpose	Sample size	Sample characteristics	Socioeconomic status (SES) of the sample/educational level	Sample ethnicity
Ahmedzai (2022) [50], Norway	Feasibility study, Mixed methods	Assess the feasibility and acceptability of a newly developed community-based multidimensional cancer rehabilitation program in Norway	$N = 60$	Mean age 55.7 years; 80% females; cancer types: breast (42%), gynecological (13%), gastrointestinal (12%), lymphoma (12%), lung (7%), other (15%)	43% University/higher education	NR
Beumeler (2018) [51], The Netherlands	One-armed pilot study	Describe a lifestyle intervention program, assess feasibility, and present preliminary results from a pilot study, examining the program's effects on physical and mental health and quality of life.	$N = 9$	Aged 34–74; 44% females; cancer types: lung, breast, colon, non-Hodgkin lymphoma	NR	NR
Cantwell (2020) [52], Ireland	Intervention development	Systematically describe the development process of the MedEx IMPACT intervention	$N = 41$	Mean age 57.7 years; 56% female; cancer types: breast (41%), prostate (27%), colorectal (20%), other (12%)	NR	NR
Cantwell (2022) [53], Ireland	Study protocol for a two-arm nonrandomized comparison trial	Describe the study protocol for a two-arm nonrandomized comparison trial conducted within a community-based setting, aiming to investigate the clinical effectiveness of a cancer-specific physical activity behavior change intervention, namely, MedEx IMprove Physical Activity after Cancer Treatment (IMPACT), compared to a general exercise rehabilitation program, among survivors of cancer	Aim: minimum 120 participants (60 in each group)	Adults ≥ 18 years: any diagnosis of cancer	NR	NR
Cantwell (2024) [54], Ireland	Two-arm nonrandomized trial	Examine the short- and long-term effects of a usual care (UC) community-based exercise program (MedEx Move On [MMO]), and UC combined with a physical activity (PA) behavior change (BC) intervention (MedEx improved PA after cancer treatment [MedEx IMPACT]) on PA levels, cardiorespiratory fitness (CRF), and quality of life (QoL) among survivors of cancer	$N = 191$	Mean age 56 years; 73% female; cancer types: breast (60%), colorectal (16%), prostate (13%), other (11%).	70% Diploma/certificate or higher education	NR

(Continues)

TABLE 3 | (Continued)

First author, year, country	Study type/design	Purpose	Sample size	Sample characteristics	Socioeconomic status (SES) of the sample/educational level	Sample ethnicity
Carraça (2023) [55], Portugal	Study protocol for a 3-arm pragmatic randomized controlled trial	Describe the protocol of a pragmatic (RCT) PAC-WOMAN, targeting Portuguese postmenopausal women diagnosed with hormone receptor–positive breast cancer, currently on aromatase inhibitors. The primary aim of the trial is to develop and test the long-term (16-month) effectiveness and cost-effectiveness of two 4-month group-based interventions, compared to a control waiting list, on promoting sustained changes in PA, sedentary behavior, QoL, and healthcare services' use	Aim: 122 participants	Adults < 70 years; all females; all breast cancer	NR	NR
Faithfull (2022) [56], UK	Two-armed, parallel-group randomized controlled trial	Evaluate the effectiveness of the symptom management after radiotherapy (SMaRT) group intervention to improve urinary symptoms in men with prostate cancer	$N = 63$	Mean age 71.1 years; all males; all prostate cancer	The English Index of Multiple Deprivation (EIMD) Quintiles (1 [*most deprived*] to 5 [*least deprived*]): 84% ≥ 4	NR
Herrero (2022) [57], Spain	Single-group implementation feasibility study	Evaluate the safety, feasibility, and preliminary effectiveness of implementing a supervised exercise program into the clinical care of individuals with advanced cancer	$N = 84$	Mean age 56.4 years; 87% female; cancer types: breast (46%), lung (17%), ovarian (12%), colorectal (8%), prostate 5%), stomach (4%), lymphoma (4%), other (5%)	NR	Caucasian (93%), Latinos (7%)
Løken (2022) [34], Norway	Qualitative study	Explore cancer survivors' experienced outcomes of a multidimensional rehabilitation program in primary healthcare	$N = 56$	Mean age 55.8 years; 79% female; cancer types: breast (44%), gastrointestinal (16%), lymphoma (11%), gynecological (9%), lung (7%), other (13%)	43% University/higher education	NR
Petruseviciene (2018) [58], Lithuania	Open label randomized controlled trial	Evaluate the short-term effects of community-based occupational therapy on health-related quality of life and engagement in meaningful activities among women with breast cancer	$N = 22$	Ages: 50% between 18% and 59%, and 50% between 60 and 80 years; all females; all breast cancer	NR	NR
Ranes (2022) [59], Norway	Feasibility study qualitative	Explore how cancer survivors experienced a novel 4-month community-based group exercise program after completing rehabilitation in specialist healthcare	$N = 14$	Mean age 64.9; females (43%); cancer types: breast (29%), prostate (57%), rectal (7%), fallopian tube (7%)	36% Higher education (≤ 3 years of college/university)	NR
Rath (2016) [60], Germany	Prospective quasiexperimental study design	Analyze the impact of inpatient and outpatient rehabilitation on psychosocial and physical outcomes in patients after surgery	$N = 95$ (this refers to the outpatient sample)	Mean age 57.4; all males; all prostate cancer	48% Higher education (12-13 years of education)	NR

Abbreviation: NR, not reported.

TABLE 4 | Intervention characteristics (Review question 2).

Study (first author, intervention name)	Physical components	Psychosocial components	Delivery format	Intervention frequency	Intervention duration	Intervention provider	Intervention setting	Goal-oriented
Ahmedzai 2022 Løken 2022 Multidimensional cancer rehabilitation	RE + AE 60 min × 2 weekly	Psychoeducation × 7 h Group discussions/ peer support	Group-based and 1:1 exercise consultations	Weekly × 2 + home exercise	12 weeks	OT, PT, cancer, CNS, SW	Municipal Healthy Life Center	Yes
Beumeler 2018 Lifestyle intervention	PA Dietitian consultation 1–4 appointments + 1 group meeting	Group discussions/ peer support MBT	Group-based and individual	Weeks 1–12: weekly × 2 Weeks 13–26: weekly × 1 + home exercise Weeks 27–52: home exercise weekly × 1	12 months	PT, dietitian, GP	Primary care facility	Yes
Cantwell 2020 Cantwell 2022 Cantwell 2024 MedEx IMPACT	PE 60 min × 2 weekly (RE + AE) PA information sessions	Group discussions/ peer support	Group-based and 1:1 exercise consultation	Weekly × 2 + home exercise Four 30-min PA information sessions	12 weeks	Trained researchers with expertise in exercise prescription and oncology rehabilitation	Community-based setting at a gym of a university	Yes
Carraça 2023 PAC program Physical activity counseling (PAC)	Arm 1: PA counseling (PAC) (for home exercise) Arm 2: RE + AE 90 min × 2 weekly	Arm 1: psychoeducation Group discussions/ peer support	Arm 1: group-based and individual Arm 2: group-based	Arm 1: 8 sessions × 120 min every 15 days + home exercise Arm 2: weekly × 2	4 months	Certified cancer exercise professionals	Urban centers/local gyms	Arm 1: yes SMaRT goals Arm 2: NR
Faithfull 2022 Symptom management after radiotherapy (SMaRT)	Pelvic floor muscle exercises	Group discussions/ peer support	Group-based and individual	Group sessions × 4 1:1 individual session × 1, telephone sessions × 2 4 months at-home self-management	10 weeks	CNS	Groups at the community leisure facility 1:1 sessions at a clinical center	NR
Herrero 2022 "Cancer exercise intervention"	RE + AE 60 min × 2 weekly	Psychoeducation Peer support	Group-based	Weekly × 2 + home exercise from Week 6	12 weeks	Cancer-trained clinical exercise physiologists	Exercise Oncology Unit of the Spanish Cancer Association (a community-based facility)	NR
Petruseviciene 2018 Occupational therapy program	Occupational therapy 90 min × 1 weekly for 4 weeks	Psychoeducation Peer support	Group-based 1:1 if needed	Weekly × 1	6 weeks	OT	Community-based (exact locality NR)	NR
Ranes 2022 "Rehabilitation: Physical activity and Coping"	RE + AE 60 min × 2 weekly	Peer support	Group-based	Weekly × 2	4 months	PT	Municipal physiotherapy and training clinics	NR
Rath 2016 Standard cancer rehabilitation	Physical therapy	Psychoeducation Peer support	Group-based and individual rehabilitation plan	NR	NR, but stated 3 weeks to be the German standard	NR	Community-based rehabilitation clinics	NR

Abbreviations: AE, aerobic exercise; CNS, clinical nurse specialist; GP, general practitioner; MBT, mind–body therapy; NR, not reported; OT, occupational therapist; PA, physical activity; PE, physical exercise; PT, physiotherapist; RE, resistance exercise; SW, social worker.

psycho-oncological treatment, patient education, medical treatment, and group sessions [60] (page 2718).

Regarding psychosocial intervention components, social support, specifically peer support, was reported in all nine rehabilitation interventions. Psychoeducation was reported as a component in five of the interventions [50, 55, 57, 58, 60] and mind–body therapy was reported in one [51]. Six of the interventions were delivered in both group and one-to-one sessions [50, 51, 54–56, 60], two were solely group-based [57, 59], and one was mainly group-based, though one-to-one sessions were offered if needed [58]. The frequency of rehabilitation sessions was typically twice weekly [50, 51, 54, 55, 57, 59], though this varied (Table 4). Intervention duration ranged from 6 weeks [58] to 12 months [51], with 12 weeks being the most common [50, 51, 54, 57]. Professionals delivering the interventions included occupational therapists [50, 58], physiotherapists [50, 51, 59], clinical nurse specialists [50, 56], certified cancer exercise professionals [55], cancer-trained clinical exercise physiologists [57], and researchers with exercise and cancer rehabilitation expertise [54]. Other professionals, including general practitioners, social workers, and dietitians, were involved in psychoeducation and individual consultation sessions. One study did not report on the type of professionals delivering the intervention [60].

As per the inclusion criteria, all interventions were delivered within local community settings. This included gyms [54, 55], municipal facilities [50, 51, 59], a community-based cancer association facility [57], a leisure facility [56], and a rehabilitation clinic in the community [60]. The latter study included participants from both in-patient and community settings, with subgroup data analyzed separately [60]. One did not specify the setting beyond stating that it was community-based [58]. In four of the interventions [50, 51, 54, 55], they used a goal-oriented approach for rehabilitation. For the remaining five [56–60], the authors did not state whether goal setting was a component of the interventions.

4 | Outcomes and Outcome Measures

Addressing Review question 3, Table 5 presents outcomes identified in the included publications with corresponding outcome measures used for the assessment. Primary study outcomes were stated as such in four studies and included PA levels [54, 55], urinary symptoms [56], quality of life and healthcare use [55], and feasibility implementation [57]. Secondary outcomes were explicitly stated in three studies [54–56].

Overall, quality of life was the most frequently assessed outcome and was assessed in eight of the included studies [51, 53–58, 60]. Hence, all studies measuring patient-reported outcomes (PROs) assessed quality of life. The most commonly assessed outcomes relating to physical health and well-being were PA levels [51, 53, 55, 57], fatigue [51, 53, 57, 59], and muscular strength [51, 53, 55, 57], which were assessed in four studies. Cardiorespiratory fitness was assessed in three of the studies [54, 55, 57]. Self-efficacy [51, 53, 55, 56, 58] was the outcome most frequently assessed within psychosocial health and well-being, followed by emotional distress [51, 53, 55, 60], measured in four studies. Perceived social support was only assessed in one study [53]. Other outcomes included intervention feasibility [50, 51, 53, 57] and intervention evaluation [34, 50, 51, 53, 55, 59].

As detailed in Table 5, the included studies employed 65 distinct tools to measure outcomes within physical and psychological health and well-being and quality of life. Most of these ($n = 44$) were PRO measures (PROMs), whereas 21 were objective outcome measures. A wide range of measures were employed, even when assessing the same outcome. For instance, five different PROMs were used to assess quality of life (European Organization for Research and Treatment of Cancer Core Quality of Life Questionnaire [EORTC QLQ-C30], RAND-36, FACT-G, EQ-5D, and SWLS), in addition to disease-specific scales and modules. Fatigue was measured using four fatigue-specific PROMs (FQ, VAS-F, FACIT-F, and FACT-F). The most commonly used PROM was the EORTC QLQ-C30 [63], employed in four studies [55, 56, 58, 60], and the most frequently used objective outcome measure was the handgrip test, assessing muscle strength in three studies [51, 53, 55].

4.1 | Assessment Time Points

All studies, except one [34], assessed outcomes at baseline, and all conducted outcome assessments at the end of the intervention. Only two studies included assessment time points during the intervention [50, 51]. Four of the studies [54–56, 60] included follow-up time points: two at 6 months [54, 56], one at 10 months [55], two at 12 months [54, 60], and one included follow-up assessments at 16 months [55].

5 | Discussion

5.1 | Study and Sample Characteristics

This scoping review sought to map existing research on community-based multidimensional rehabilitation interventions for adult cancer survivors. Identifying merely 12 publications demonstrates that such rehabilitation programs may be few within the European countries and/or that this area of research is in its infancy. The fact that we identified only two RCTs, and four of the twelve publications were feasibility/pilot studies, suggests that this is indeed the case. This is strengthened by the finding that the publications included two study protocols and one intervention development, and that the 12 publications only represented nine distinct rehabilitation interventions. Our results reflect findings from the Cochrane review by Scott et al. in 2013 [9]. They had initially identified 26 relevant articles but excluded 14 of these as they were supplementary papers on pilot work, design, subgroup analyses, and follow-up. Of the 12 papers included in their review, only two were European studies, and none of the reported interventions were delivered in a community-based setting [64, 65]. The lack of cancer rehabilitation interventions in Europe that are community-based, including during the time period of our review, is supported by findings from a systematic review of community-based health behavior interventions for cancer survivors, published in 2022, where only 4 of included 43 studies were European [43].

Sample characteristics from our sources of evidence align with existing research, showing a greater representation of prostate and breast cancer survivors in both site-specific and mixed rehabilitation programs compared to other diagnoses [9, 30]. In

TABLE 5 | Outcomes and outcome measures employed in the included sources (Review question 3).

Outcome domain	Subdomains	Specific dimensions	Outcome measures used in the studies
Physical health and well-being	Physical fitness, function, and capacity	Cardiorespiratory fitness	Submaximal treadmill test [55, 57]
			6 min walk test/6-min time trial [54]
		Perceived effort	Borg Scale of Perceived Exertion [57]
		Endurance	Steep ramp test [51]
		Physical activity	Accelerometer [54, 55]
			Physical activity logbook [53]
			International Physical Activity Questionnaire (IPAQ) [53, 55, 57]
			Activity Choice Index (ACI) [55]
		Muscular strength	Handgrip test [51, 53, 55]
			Biceps curl [51]
			Functional squat [51]
			Sit-to-stand test [53, 55]
			Chest and leg press [55, 57]
			Timed up and go test [55]
			Stand on one foot test [55]
		Flexibility	Sit and reach test [53]
		Other	Blood pressure [51]
			Shoulder mobility measures [55]
	Body structure and composition		Body mass index (BMI) [51, 54, 55]
			Inbody 770 [57]
			Waist circumference [51, 55]
			Body height [53, 55]
			Body weight [53, 55]
			Waist-to-hip ratio [54]
			Upper limb perimeters [55]
	Symptom experience	Fatigue	Chalder Fatigue Questionnaire (FQ) [59]
			Visual Analog Scale–Fatigue (VAS-F) [51]
			Functional Assessment of Chronic Illness Therapy–Fatigue Scale (FACIT-F) [53]
		Pain	Numeric Pain Rating Scale (NPRS) [51]
			Brief Pain Inventory (BPI) [55]
			Five items from EORTC QLQ-BR45 related to joint, bone, and muscle pain/discomfort [55]
			Pain disability impact (PDI) [55]
		Sleep	Pittsburgh Sleep Quality Index [55]
		Urinary symptoms	International Prostate Symptom Score (IPSS) [56]
			International Continence Society Male Short-Form questionnaire (ICSmaleSF) [56]

(Continues)

TABLE 5 | (Continued)

Outcome domain	Subdomains	Specific dimensions	Outcome measures used in the studies
Psychosocial health and well-being	Emotional/mental domains	Mental well-being	Hospital Anxiety and Depression Scale (HADS) [55, 60]
			Distress thermometer and problem list [51]
			Depression Anxiety and Stress Scale (DASS-21) [51]
			The Patient Health Questionnaire Depression Scale (PHQ-8) [53]
			Short Warwick–Edinburgh Mental Well-being Scale (SWEMWBS) [53]
		Self-efficacy	Self-efficacy Scale (SES) [51]
			Modified Bandura's Exercise Self-Efficacy Scale [55]
			Self-Efficacy for Symptom Control Inventory (SESCI) [56]
			13-Item validated scale measuring barrier-specific self-efficacy for exercise [53]
			Engagement in Meaningful Activities Survey [58]
			Modified 11-item validated scale measuring self-regulatory self-efficacy for exercise [53]
	Psychological adjustment		Action Planning and Coping Planning Scales [55]
			Behavioral Regulation in Exercise Questionnaire-3 (BREQ-3) [55]
		Social optimism and autonomy	Positive outcome list (POL) [51]
		Other	Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS) [55]
			The Feeling Scale (FS) [55]
			4 Items on satisfaction with life, optimism, purpose of life, and daily activities [55]
			Body Image Scale (BIS) [55]
	Social support		Social support from family and friends (10-item validated tool) [53]

(Continues)

TABLE 5 | (Continued)

Outcome domain	Subdomains	Specific dimensions	Outcome measures used in the studies
Health-related quality of life (measuring physical, social, functional, and emotional well-being)			The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core 30 (EORTC QLQ-C30) [55, 56, 58, 60] The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Breast Cancer module (EORTC QLQ-BR23) [55, 58] European Organization for Research and Treatment of Cancer Quality of Life Scale (EORTC QLQ-PR25) [56, 60] RAND-36 item Health Survey (SF-36) [51] Functional Assessment of Cancer Therapy–General (FACT-G) [54] Functional Assessment of Cancer Therapy–Breast (FACT-B) [53] Functional Assessment of Cancer Therapy–Prostate (FACT-P) [53] Functional Assessment of Cancer Therapy–Colorectal (FACT-C) [53] Functional Assessment of Cancer Therapy–Fatigue (FACT-F) (general and fatigue subscale) [57] Euro–Quality of Life-5 (EQ-5D) [57] Satisfaction With Life Scale (SWLS) [53]
Other study outcomes	Feasibility, intervention evaluation		Study retention and intervention adherence [50, 51, 53, 57] Focus groups [34, 50, 53, 55, 59] Custom intervention evaluation questionnaire [50, 51, 53] Interpersonal Behaviors Questionnaire (IBQ) [55]
	Healthcare use		Number and type of consultations, drugs, medical tests and exams, in-patient stays, day care [55]

terms of the participants' age at inclusion, the findings also concur with previous research, showing that samples in rehabilitation survivorship research tend to comprise lower age groups than the mean age of people diagnosed with cancer. In our review, the mean age for all studies combined was 59.6 years, whereas people aged 65 and above account for the majority of all new cancer diagnoses, with increasing incidences in the older age groups, including 75 and older [66]. This demonstrates that rehabilitation programs for cancer survivors may not reach the largest groups of cancer survivors who are generally older than those included in rehabilitation intervention research. Furthermore, regarding reach and equity, the socioeconomic status in six of the included studies indicated that study participants were recruited from groups with relatively high educational levels. Ethnicity was only reported in one study, where 93% of the participants were Caucasian, and 3% were of Latin origin. The lack of reporting on ethnicity and the disproportionate representation of higher-educated survivors corresponds with the literature on who takes part in cancer rehabilitation research [41–43, 67].

5.2 | Intervention Characteristics

Not surprisingly, the most common intervention component within the physical domain was PE/PA. This reflects the prominence of exercise in rehabilitation interventions for cancer survivors [10, 11], including in community-based programs [41]. In terms of psychosocial intervention components, social support in the form of peer support was included in all interventions, both through facilitated and informal group discussions. In this review, we conceptualize social support to cover cancer survivors' perceptions of available and received support in terms of informational and emotional functions. Social support, being the most frequent psychosocial component, is in contrast to the systematic review by Mewes et al. in 2012 [30], where psychoeducation was the most frequent psychosocial component in multidimensional cancer survivor rehabilitation interventions. Scott et al. reported cognitive behavior therapy as the most common psychosocial component [9]. It is interesting to note the difference between the European studies in our review and earlier USA-dominated reviews, though we cannot conclude whether this represents an actual geographical difference in selected psychosocial intervention components.

Considering the range of psychosocial components available, it was surprising that the studies combined only included three different components, i.e. psychoeducation, peer support and mind–body therapy. Gaining social support through peer support is increasingly recognized as an important benefit of participating in cancer rehabilitation programs, also in unidimensional exercise interventions where peer support may not be an intended component but transpires through exercise classes delivered in group settings [68, 69]. Several of the studies in the review stressed the importance of exercising with others in similar situations as opposed to joining a fitness center, facilitating peer fellowship and mutual understanding. Participants in a dedicated cancer rehabilitation program often perceive the group dynamics to focus more on health promotion rather than the cancer illness [50, 59]. This may seem counterintuitive considering they all have/have had a diagnosis of cancer; however, this may be explained by the very fact of all being in a similar situation. Hence, they do not have the focus and label of being "the cancer patient" amongst a group of noncancer individuals, which could be the case if they attended a generic fitness center.

The most common intervention duration in the included studies was 12 weeks. This aligns with other community-based exercise rehabilitation programs for cancer survivors [37, 42], though there is substantial variance in program duration, with some lasting up to 1 year [43]. There is also a wide variety of professionals delivering cancer rehabilitation interventions, for both exercise-based [41, 42] and multidimensional interventions, most commonly delivered by physiotherapists followed by nurses [9]. Findings from our review did, however, demonstrate more diversity, including intervention providers such as occupational therapists, social workers, general practitioners, dietitians, and exercise physiologists. This shows that community-based cancer rehabilitation can be delivered by a range of professionals, not limited to specialists who may not be attainable within local communities.

5.3 | Outcomes and Outcome Measures

Four of the included studies stated the study's primary outcome, including PA levels, urinary symptoms, quality of life, healthcare use, and feasibility implementation. A wide range of outcomes were assessed, with health-related quality of life being the most frequently assessed outcome. This mirrors findings from a review of functional outcomes in cancer rehabilitation research, where quality of life was assessed nearly twice as frequently as the second most frequent outcome, which was functions related to activities of daily living [32]. PA levels, followed by fatigue and muscular strength, were the most common outcomes within physical health and well-being, again reflecting existing literature [30, 32, 43]. It was interesting to note that since the Cochrane review of multidimensional rehabilitation programs by Scott et al. in 2013 [9], our review showed a higher proportion of objective outcome measures used for testing changes in the domains of physical health and well-being. Scott et al. reported that the majority of studies measuring changes in PA were based on self-report measures, and they recommended that greater use of objective measures, such as accelerometers and the six-minute walk test, should be explored in future research. Our findings showed that five out of the seven publications that examined changes within the physical domain employed objective measures in assessing changes, demonstrating a possible change in the direction of the recommendation from Scott et al. in 2013.

Within psychosocial health and well-being, of particular interest in our findings is that social support was a component in the interventions of all included studies. However, the assessment of perceived social support was only included in one study. For such a frequently included and seemingly important intervention component, it was surprising that only one of the studies included social support as an outcome and assessed participants' perceived level of social support pre- and postintervention.

Health-related quality of life spans both physical and psychosocial domains, and in line with existing cancer rehabilitation literature [70], a variety of measures, both cancer-specific and generic, were used in the studies to assess this outcome (EORTC QLQ-C30, RAND SF-36, FACT-G, EQ-5D, and SWLS), in addition to disease- and symptom-specific scales and modules. The

three most common PROMs (EORTC QLQ-C30, RAND SF-36, and FACT-G) are consistent with what is found in the cancer rehabilitation literature in general [67] and specifically in studies of multidimensional cancer survivor rehabilitation [9, 30] and community-based cancer rehabilitation research [42, 43].

Existing evidence recognizes a synergy between PE/PA and social support through peer support by not only aiding intervention adherence but also helping cancer survivors in coping with cancer and its effects [31]. Outcome measures employed in the included studies mostly assessed specific physical or psychosocial domains. None of the studies included outcome measures to evaluate any potential synergistic effect from the interventions' physical and psychosocial intervention components.

The inclusion of high numbers and wide diversity in outcomes assessed in cancer survivorship research can be a challenge regarding research consistency and pooling of results. Researchers have addressed this by developing core sets of outcome domains to be assessed in this field of research [71, 72]. A questionnaire that intends to capture the full range of health-related quality of life issues specifically applicable to cancer survivors is under development from the EORTC Quality of Life group. This is provisionally named QLQ-SURV 100 and has the potential to become a unifying outcome measure for research in this population [73].

The framework for developing and evaluating complex interventions recommends that the program theory be identified or developed at the start of a research project [74]. Theoretical frameworks are important as they can offer understanding about how and under what circumstances interventions may bring about changes [74]. Our findings revealed that though five of the interventions were based on a theoretical framework, the outcomes that were assessed did not generally reflect this, though some of them included outcome measures assessing various aspects of self-efficacy. The identification of theory in rehabilitation interventions without discussion of its application in the study resonates with the literature in cancer rehabilitation research [75]. However, we did find descriptions of how behavior change theories can underpin the development and components of rehabilitation interventions without explicitly testing their application in relation to outcomes [52].

The included studies assessed outcomes at different time points and over varying follow-up periods, though baseline and end-of-study assessments were performed in most studies. This variety in outcome assessment time points has the same challenges as the heterogeneity of outcomes and outcome measures. This was not only the case in our findings but is reflected in the body of research in this field [30, 37, 43]. Only three studies included follow-up assessment of outcomes at 12 months or later. This reflects existing research in cancer rehabilitation studies where long-term follow-up data are generally lacking [30, 76], weakening the evidence base for long-term effects of cancer rehabilitation programs.

6 | Limitations

Limitations of this scoping review include restricting the search to publications in English and Scandinavian languages. In line with scoping review guidelines, we also restricted our search to selected databases, acknowledging the risk of missing potentially relevant publications. For example, PsycINFO was not included in our search strategy, and its exclusion may have limited the identification of some psychosocial-focused studies. However, as we wanted to identify interventions that included both physical as well as psychosocial components, we deemed the selected databases sufficient to capture the relevant literature within this topic. We also relied exclusively on scientific publications that had undergone peer review, and though this was intentional, we may have missed data from interventions in an early developmental phase. We further restricted publications to interventions set in Europe, which left out a potentially large body of rehabilitation literature from the rest of the world, particularly the USA. However, this was again intentional as we wanted to capture research conducted in countries with comparable healthcare systems to Norway. Some unidimensional exercise interventions may also provide peer support without explicitly stating so, for instance, if participants exercise in groups and interact within and outside scheduled exercise sessions. These would not have been identified in the search as multidimensional, unless the paper explicitly stated that peer support was an intervention component. Furthermore, studies do not consistently report a detailed description of the settings for rehabilitation interventions, and we may have missed studies that were not identified through our search terms intended to capture "community-based" context.

Finally, the scoping review is strengthened by adhering to the methodological guidance developed at the Joanna Brigg's Institute and reporting the review following the PRISMA-ScR checklist.

7 | Conclusions and Implications of the Findings for Research

Adhering to the standard remit of a scoping review, it is not appropriate to include implications for clinical practice but rather focus on future direction for research. The limited number of studies identified in this scoping review, including only two randomized controlled trials, demonstrates that this field of research is in its infancy within Europe. Hence, it is currently premature to conduct a systematic review of the effects of community-based multidimensional cancer rehabilitation interventions in Europe. The inclusion in the review of several feasibility and pilot studies and a protocol for an RCT suggests that the body of evidence in this field of research is likely to increase in the near future.

First and foremost, there is a general need for more research on community-based multidimensional rehabilitation programs for cancer survivors. There is a particular need for controlled trials examining the effects of the various intervention components to determine what works for which groups of cancer survivors. Our findings have further identified a need for better consistency on which outcomes to investigate and which outcome measures to use for assessments, particularly relating to quality of life, which was the most frequent outcome in the studies. This would improve comparisons across studies and pooling of results. Considering the implied importance of social support/peer support in this population, this warrants further investigation in larger studies where perceived social support should be measured. The inclusion of variables describing socioeconomic status and

ethnicity should also be given more focus in this area of research to obtain more knowledge on reach and equity in community-based multidimensional rehabilitation services for cancer survivors.

Furthermore, comparisons across studies on intervention characteristics could be significantly improved by the authors describing rehabilitation interventions according to the TIDieR checklist.

Considering the stated importance in guidelines for the use of theory in developing new interventions [74], future rehabilitation intervention development and research should take this into account and consistently include the use of theories in intervention research [77].

Author Contributions

May Aasebø Hauken, Line Merethe Oldervoll, and Hilde Hjelmeland Ahmedzai designed and planned the study. Tabita Elise Slettvoll conducted the literature searches in close collaboration with Hilde Hjelmeland Ahmedzai. May Aasebø Hauken, Line Merethe Oldervoll, Guro Birgitte Stene, Tabita Elise Slettvoll, Marc Sampedro Pilegaard, and Hilde Hjelmeland Ahmedzai screened and selected studies for inclusion. Hilde Hjelmeland Ahmedzai extracted the data, verified by one of the co-authors, May Aasebø Hauken, Line Merethe Oldervoll, Guro Birgitte Stene, and Marc Sampedro Pilegaard. Hilde Hjelmeland Ahmedzai synthesized the results and drafted the manuscript.

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Ethics Statement

The research was conducted on published data from peer-reviewed publications and required no separate consent or ethical approval.

Consent

Please see the Ethics Statement.

Conflicts of Interest

The authors declare no conflicts of interest.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section. *(Supporting Information)*