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Review article

Exploring The Fidelity of Resistance Training Interventions in Regional, Rural, And Remote Cancer Care: A Systematic Scoping Review

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Abstract

Resistance-based exercise interventions are an integral part of supportive cancer care, though their high quality and high-fidelity implementation with people with cancer living in non-metropolitan locations is challenging. This systematic scoping review aimed to identify how exercise prescription principles and measures of fidelity are reported in resistance-based exercise interventions delivered to people with cancer living in regional, rural and remote areas. A systematic scoping review was conducted in accordance with the PRISMA-ScR guidelines. Five electronic databases were searched (MEDLINE/PubMed, Embase, CINAHL, SCOPUS and SportDiscus) for peer-reviewed studies published in English, that delivered a resistance-based exercise intervention to adult cancer survivors in regional, rural, or remote areas. Data relating to principles of exercise prescription (specificity, overload, progression, initial values, diminished returns, reversibility), FITT (frequency, intensity, time, time) principles, and fidelity (adherence, dose, quality of delivery, client responsiveness, differentiation) were extracted and summarised descriptively. Of 2490 screened studies, 12 were eligible and retained for analysis. Of the six core principles of exercise prescription, specificity was the most reported (83.3%), and diminished returns and reversibility were least reported (8.3%), with only two studies reporting on more than two principles in total. Similarly, no study reported all four FITT principles. Frequency was the most reported (66.7%), followed by intensity and time (50%). Differentiation (aspects of the intervention that distinguished it from other interventions and contributed to the success) was the most reported aspect of fidelity (100%), with dose (i.e., adherence to prescribed plan) not reported in any study. Exercise prescription principles, FITT principles, and measures of fidelity were poorly reported across included studies. Future research needs to prioritise the quality of reporting of resistance-based exercise interventions to support the replication and translation of clinical research into real world practice within regional, rural, and remote communities.

Key words: Cancer survivorship, exercise, resistance training, rural, regional.

Introduction

Approximately one in five people develop cancer in their lifetime, with around one in nine men and one in twelve women dying from the disease (Bray et al., 2024). While advances in cancer screening and treatment have increased survival rates, the incidence of cancer will continue to grow, with an estimated 33 million new cases and 18.2 million deaths annually by 2050 (Bizuayehu et al., 2024). Cancer incidence and outcomes vary across populations (Minas et al., 2021), with rural-dwellers experiencing higher mortality following a cancer diagnosis in comparison to urban-dwellers (Australian Institute of Health and Welfare, 2024; Carriere et al., 2018; Marshall et al., 2025). This disparity is attributed to factors including reduced access to healthcare services (such as limited workforce and longer wait-times), larger distances to treatment, higher rates of unhealthy behaviours such as smoking and alcohol consumption (as Group 1 carcinogens), lower participation in cancer screening, lower physical activity levels, and reduced access to (and utilisation of) evidence-based non-pharmacological interventions such as exercise and diet (Carriere et al., 2018; McPhee et al., 2024). However, as people continue to live longer with and beyond cancer, non-pharmacological interventions will continue to play an important role in supportive cancer care. Exercise is one of the most widely supported and utilised non-pharmacological interventions to improve physical function and health-related quality of life; reduce cancer recurrence; manage comorbidities; and prevent, reduce, or reverse treatment related side-effects in people with cancer at all stages along the cancer continuum (Campbell et al., 2019).

Resistance training, a specific type of exercise, has also been shown to support improvements in muscular strength, physical function, and body composition (increased muscle and reduced fat), contributing to improved quality of life in cancer survivors (Cheung et al., 2023). Importantly, the effectiveness of resistance-based exercise interventions is dependent on the precision with which this type of exercise is prescribed (Fairman, 2024). Precision in the prescription of resistance training refers to tailoring each exercise to an individuals' needs and capacity, whilst aligning this prescription as closely as possible to recommended guidelines and evidence. It considers the frequency, intensity, time, and type of resistance exercise

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(i.e., FITT principles of exercise prescription), core exercise training principles (i.e., specificity, overload, progression, initial values, diminished returns, and reversibility) (Hoffman, 2002), and fidelity (adherence, dose, quality of delivery, participant responsiveness, differentiation) (Carroll et al., 2007), all of which improve effectiveness, safety, and long-term adherence (Ruiz et al., 2024). Precision in the prescription of resistance training allows for targeting the symptoms and side-effects of cancer and treatment through structured exercise medicine, while providing valuable information into dose/response relationships and individual adaptations to exercise (Fairman, 2024). However, given the challenges faced by people with cancer living in regional, rural, and remote areas, such as access to healthcare services, including exercise professionals and clinic infrastructure, receiving and accessing appropriately prescribed and high-quality resistance training is not always possible.

Whilst applying core principles of exercise training, FITT principles, and measures of program fidelity are vital to achieve desired clinical outcomes when delivering a resistance training intervention that follows best-practice recommendations for people with cancer, it is also essential that these aspects are rigorously reported in published literature (Fairman et al., 2020). This allows resistance training interventions to be accurately replicated, and dose-response relationships scrutinised, supporting future clinical trial design and clinical implementation. For example, detailing how a resistance training intervention is progressively overloaded ensures a future intervention promotes adequate stimulus over time, while remaining safe (Ruiz et al., 2024). Similarly, reporting the FITT principles adopted allows ease of replication in real-world clinical settings, while reporting on measures of program fidelity allows readers to understand if the intervention was delivered and implemented as designed, allowing the true effectiveness of an intervention to be determined, and establish if poor outcomes are due to the intervention itself, or flaws in its implementation (An et al., 2020). Research conducted in urban settings has shown exercise parameters (frequency, intensity, type, time) and consideration of exercise principles (e.g. specificity, progression, overload) are not well reported in published exercise oncology trials, making it difficult to determine if the interventions were delivered as intended and to determine the dose of exercise that participants received (Campbell et al., 2012; Neil-Sztramko et al., 2019a; 2019b; Winters-Stone et al., 2014).

Previous research in people with cancer has also explored adherence to exercise principles during resistance training interventions, however, this is limited to interventions conducted in urban areas (Neil-Sztramko et al., 2019a). Similarly, there has been little-to-no focus on resistance-based exercise interventions with rural cancer survivors (Mama et al., 2021), nor on the fidelity and adherence of interventions to established guidelines and exercise principles. Given the importance of exercise prescription principles and intervention fidelity in resistance training to achieve effective outcomes (Fairman, 2024; Neil-Sztramko et al., 2019b), this presents a challenge to future researchers and clinicians looking to replicate and implement resistance-based exercise interventions with people with cancer living in regional, rural and remote areas.

Therefore, this study aimed to describe how exercise prescription principles and measures of program fidelity are reported in resistance-based exercise interventions implemented for people with cancer living in regional, rural and remote areas, to inform the design of future resistance-based exercise interventions in this setting.

Methods

A systematic scoping review was conducted in accordance with the PRISMA-ScR guidelines (Tricco et al., 2018). A systematic scoping review was appropriate given the aims of this work were to scope the body of published literature relating to a given topic (i.e., resistance exercise principles and practices among cancer survivors in regional, rural and remote areas), identify and synthesise knowledge gaps, and investigate reporting standards (Munn et al., 2018).

Literature search

A systematic literature search was conducted to identify published research that investigated resistance-based exercise interventions or muscle strengthening activities delivered to people with cancer in regional, rural, and remote areas. Electronic databases (MEDLINE/Pubmed, Embase, CINAHL, SCOPUS, SportDiscus) were searched from inception to April 2025, using a search strategy developed in consultation with a university health sciences librarian. The search included subject headings or keywords for "cancer", "rural and regional populations", "exercise interventions" and "adults". The full search strategy can be viewed in Supplementary Material 1. Reference lists of eligible papers were pearled for additional articles meeting the inclusion criteria.

Eligibility criteria

Studies consisting of adult cancer survivors (defined as individuals aged 18 years and older with a cancer diagnosis) residing in regional, rural and remote areas (classified as locations outside of metropolitan or urban settings), with at least one intervention arm receiving a structured resistance exercise program of two weeks or longer were eligible for inclusion. Eligible studies were required to report at least one health or physical performance outcome (e.g., muscle strength, hypertrophy, or functional capacity) or validated self-reported physical function outcome (e.g., SF-36 Physical Function subscale). Interventions could be delivered in person or remotely (e.g., via telehealth), provided the participants were based in regional, rural and remote areas. Studies reporting outcomes for both rural and urban participants were included only if data for rural participants were presented separately. Eligible study designs included randomised controlled trials (RCTs), cohort studies, feasibility studies, and implementation studies. To capture a comprehensive scope of literature, studies published since the inception of each database through to April 2025 were considered. Studies were excluded if they were conducted solely in urban populations or did not separately report regional, rural or remote area data. Articles that did not involve resistance training (e.g., focusing exclusively on yoga or aerobic exercise), or those examining only a single, acute resistance exercise session, were also excluded. Abstracts, editorials, conference posters, systematic reviews, and meta-analyses were not included. Studies in a language other than English were excluded unless a translated version was available.

Study selection and data extraction

Covidence reference management software (Veritas Health Innovation, Melbourne, Australia) was used to compile results obtained from each electronic database and to remove duplicates. Results of the systematic search were independently reviewed through an assessment of title and abstract by two authors (CR, JM). Full text reports were obtained for potentially relevant articles, with eligibility assessed against the inclusion and exclusion criteria. Discrepancies and disagreement between reviewers (CR, JM) at full text stage were adjudicated by a third independent reviewer (NHH).

All relevant data from the included reviews were extracted using a custom data extraction template (Microsoft Excel Version 2503) prior to analysis. Data were extracted across the following domains: (a) publication demographics: title, publication date and author/s, location, outcome measures; (b) study design and population characteristics; (c) exercise intervention characteristics: frequency, intensity time and type (FITT) as well as duration of intervention and exercise performed; (d); reporting of core exercise training principles: specificity, overload, progression, initial values, reversibility, diminished returns; (e) measures of program fidelity: adherence, completion, withdrawal, uptake, dose (i.e., adherence to exercise prescription), differentiation, and training provider. Data were extracted by two authors (CR, JC), with data cross-checked by a third author (JM).

Data management

Data referring to population and intervention characteristics (age, sex, stage along cancer continuum status, sample size, publication year, rurality, exercise intervention, and outcomes) were tabulated and summarised descriptively. The reporting of core exercise training principles (i.e., specificity, progression, overload, initial values, reversibility, and diminishing returns) was informed by Hoffman (2002). Specificity refers to the alignment of exercise interventions to a specific population or outcome. Progression and overload refer to the way in which load and volume of an intervention is gradually increased over time to promote adaptation, while ensuring the safety of participants. Consideration of initial values refers to the consideration of differences in physical activity, physical outcomes, and cancer status at baseline. Diminished returns acknowledges that each individual has an upper limit of possible adaptation to an exercise stimulus (and hence will plateau over time without progressive overload i.e., variability), and reversibility accounts for changes in outcomes of interest if exercise is discontinued (Ruiz et al., 2024). Each principle was defined in relation to exercise oncology, with interpretations and illustrative examples derived from prior research (Campbell et al., 2012; Neil-Sztramko et al., 2019a; 2019b; Winters-Stone et al., 2014). FITT principles of exercise programs were presented exactly as they were reported in the methodology of each included study. Frequency refers to the number of resistance-based exercise sessions per week (or total number of exercise sessions where resistance frequency wasn't reported). Intensity refers to the difficulty of the exercise, and was reported as either low, medium, or high, in line with information provided in each study. Time refers to the duration of each exercise session, or number of sets and repetitions for each resistance-based exercise if reported. Type refers to the exercise modality performed, which included resistance-based exercise either alone or in combination with aerobic exercise, balance training, or flexibility. If reported, type also included information regarding the type of resistance training performed (i.e., bands, free weights, body weight, and machines). All aspects of fidelity were predefined according to work by Carroll et al. (2007) and included adherence (total number of sessions attended), dose (completion of exercise program as prescribed), quality of delivery (training provider, guidelines referred to), participant responsiveness (compliance, withdrawal, uptake) and differentiation (aspects of the intervention that distinguished it from other interventions and contributed to the success).

Results

Selection process

The article screening and selection process is summarised in Figure 1. The systematic search identified 2490 relevant articles after the removal of duplicates. A total of 2444 articles were excluded after title and abstract screening, with a further 34 articles excluded after full text screening. Finally, 12 articles were eligible and included within this systematic scoping review.

Study characteristics

Characteristics of included studies are presented in Table 1. Studies were conducted in rural settings across the United States of America (8/12 [66.7%]), Australia (2/12 [16.7%]), and Canada (2/12 [16.7%]). Rurality of samples varied, with 6/12 (50%) studies including regional, rural, or remote participants only, and 6/12 (50%) including both rural and urban participants (where rural participants ranged from 32% to 84% of the sample). Participant samples ranged from 19 to 849, with participant age ranging from 31 to 86 years old. All included studies had a higher percentage of female than male participants.

Study designs were diverse across included studies, comprising RCTs (4/12 [33.3%]), hybrid effectiveness-implementation (2/12 [16.7%]), quasi-experimental studies (2/12 [16.7%]), retrospective cohort studies (1/12 [8.3%]), and single-arm, non-RCTs (3/12 [25%].

Eleven of the 12 studies included people with cancer only (91.7%), with one study including participants with and without cancer, although the resistance-based intervention in this study was only prescribed to breast cancer survivors (with 15.8% of all participants having breast cancer) (Gallant et al., 2013). Cancer types varied across included studies, with 8/12 (66.7%) involving participants with mixed cancers, and 4/12 (33.3%) including participants with breast cancer only. Similarly, the stage of cancer and phase of cancer continuum varied, with participants ranging from stage I-IV cancer, and from pre-treatment to survivorship (Table 1).

Outcomes

Core exercise prescription principles

Reporting of the core exercise prescription principles varied across included studies (Table 2). No individual study reported all six core exercise principles. Specificity was the most frequently applied and reported principle (10/12 [83.3%]) (Coletta et al., 2021; Eakin et al., 2012; Gallant et al., 2013; Gell et al., 2024; Gray et al., 2019; Hirko et al., 2021; Marker et al., 2025; Modesitt et al., 2021; Wagoner et al., 2024; Wagoner et al., 2023), with these studies including resistance exercise as a component of their intervention to increase functional capacity, muscle strength, or health-related quality of life. Progression and overload were reported in 4/12 (33.3%) (Coletta et al., 2021; Gallant et al., 2013; Hirko et al., 2021; Wagoner et al., 2024) and 2/12 (16.7%) (Coletta et al., 2021; Hirko et al., 2021) studies respectively, although detail on the parameters of progression or rationalisation of how this was achieved was not reported. Baseline measures and initial values were both reported in 4/12 (33.3%) studies (Gell et al., 2024; Marker et al., 2025; Modesitt et al., 2021; Wagoner et al., 2024), and included measures related to each study's primary outcome. Reversibility was reported in one study (Marker et al., 2025), by performing follow-up objective measures related to primary outcomes at completion of the intervention, with diminished returns similarly reported in only one study (Marker et al., 2025), whereby a comparison of differences between exercisers and non-exercisers was performed at baseline and post-intervention.

FITT Principles

Reporting of FITT principles varied between studies. Frequency was the most widely reported principle, followed by duration and intensity of exercise (Table 3). Only one study (Hirko et al., 2021) reported on all four FITT principles and included information on the muscle groups that were targeted by each exercise performed. The remaining 11 studies reported on some, but not all FITT principles. Only one study provided detail on the exact exercises prescribed, with all others either reporting the muscle groups targeted, or the duration of time spent completing resistance-based exercise.

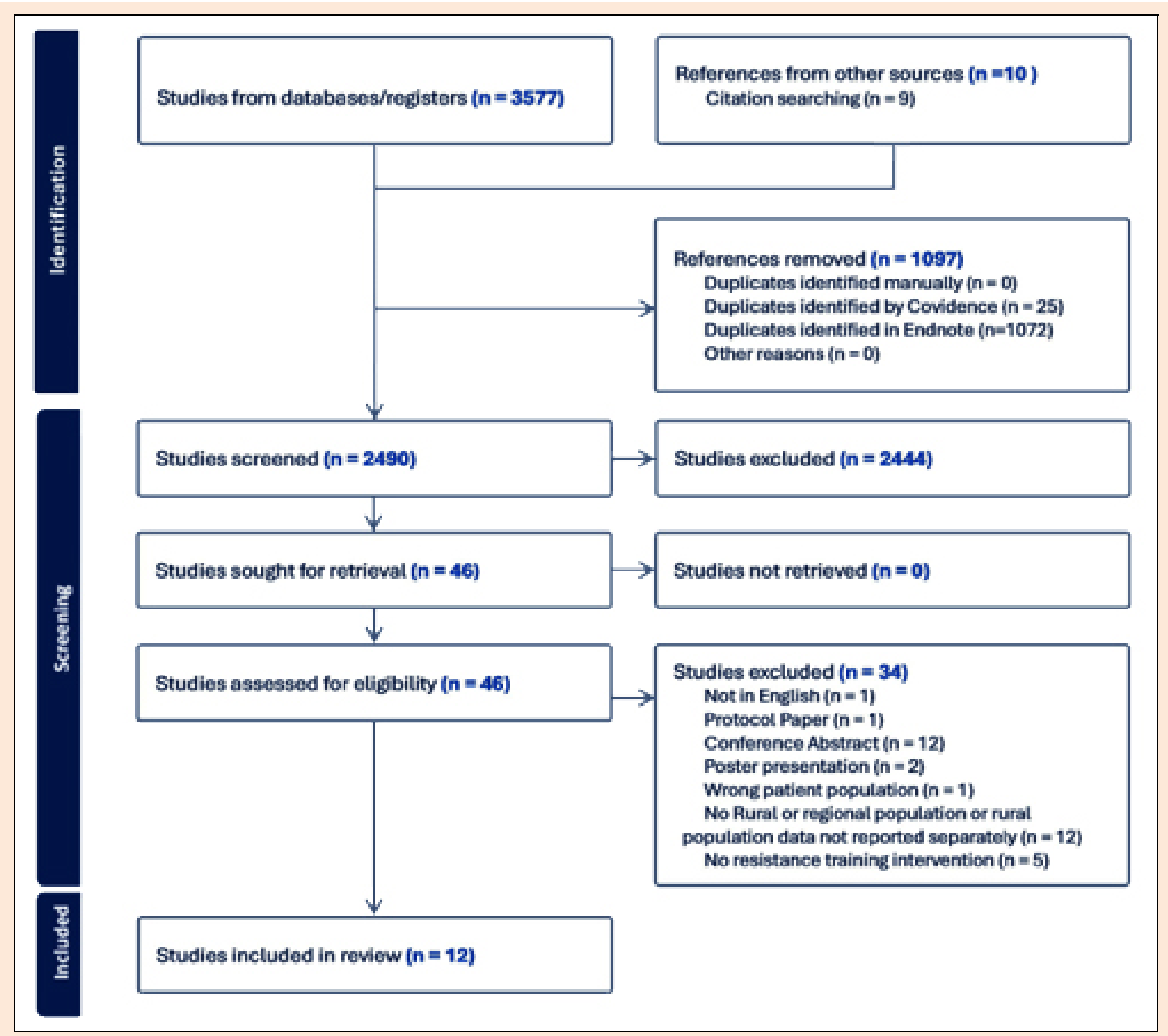

Figure 1. **PRISMA Flowchart – Study identification and selection process.**

Table 1. **Characteristics of included studies.**

Author	Location	Rurality	Study design	Sample size (n)	Cancer type	Treatment Phase	Males n (% of sample)	Females n (% of sample)	Age (years: mean ± SD)	Intervention details	Outcomes	Adverse events
Befort et al. (2012)	USA - Kansas	50% large rural, 50% small/ isolated rural	One-arm treatment study (non-randomised clinical trial)	31	Breast Cancer n = 31 (100%)	Breast Cancer within past 10 years, completed treatment ≥3 months prior (except endocrine therapy)	0 (0%)	31 (100%)	58.9 ± 7.8	Conference calls targeting Behaviour Change, Aerobic, OPTIONAL – light Resistance Training	↓Weight, ↓BMI ↓Waist circumference, ↑Energy expenditure, ↓Insulin, ↓Leptin, ↑Joint pain, ↓Depression, ↑Strength and Health improved significantly, $P < 0.001$ ↓Social Barriers, ↑Appearance and Sexuality	NR
Coletta et al. (2021)	USA - Utah	75% of full sample (n=638), 78% of follow-up sample	Retrospective cohort study	849	Mixed Bladder n = 4 (0%), Brain n = 24 (3%), Breast n = 288 (34%), Cervical n = 4 (0%), Colorectal n = 34 (4%), Endometrial n = 30 (4%), Fallopian tube n = 3 (0%), Gastrointestinal n = 13 (2%), Kidney n = 13 (2%), Leukemia n = 39 (5%), Liver n = 3 (0%), Lung n = 31 (4%), Lymphoma n = 43 (5%), Melanoma n = 22 (3%), MGUS n = 4 (0%), Multiple myeloma n = 70 (8%), Oral n = 9 (1%), Other n =23 (3%), Ovarian n = 27 (3%), Pancreas n = 18 (2%), Peritoneum n = 4 (0%), Polycythemia vera n = 3 (0%)	Cancer survivors (any type, any stage) – Most participants undergoing active treatment	322 (38%)	527 (62%)	61.3 ± 13.5	In-Person, Home Exercise Programs or Hybrid. Aerobic, Resistance Training, Balance, Flexibility	↑GS, ↑CP, ↑LPD, ↑LP, ↑CS, ↑TUG, ↑VO_2max, ↑METs, ↑Fatigue, ↑ QoL	NR
Hirko et al. (2021)	USA - Michigan	100 %	Quasi-experimental study	24	Mixed Breast n = 8 (33.3%), Gastrointestinal n = 3 (12.5%), Gynaecological n = 3 12.5%), Prostate = 3 (12.5%), Lung n = 1 (4.2%), Kidney n = 1 (4.2%), Skin n = 2 (8.3%), Multiple myeloma n = 1 (4.2%), Sarcoma n=1 (4.2%), Missing n=1 (3.0%)	All stages of treatment and survivorship	6	18	Median 66 (IQR 12.5), Range 31-72	Small group sessions – Aerobic + Resistance Training	↓Fatigue, ↓constipation, ↓ pain, ↑sleep quality	NR

Table 1. Continue …

Author	Location	Rurality	Study design	Sample size (n)	Cancer type	Treatment Phase	Males n (% of sample)	Females n (% of sample)	Age (years: mean± SD)	Intervention details	Outcomes	Adverse events
Marker et al. (2025)	USA – Colorado and surrounding states	100%	Single-arm clinical trial	15	Mixed Breast n = 6 (40%) Colorectal n = 1 (7%), Kidney n = 1 (7%), Lung n = 1 (7%), Multiple myeloma n = 2 (13%), non-Hodgkin lymphoma n = 1 (7%), Ovarian n = 1 (7%), Prostate n = 1 (7%), Thyroid n = 1 (7%)	Completed treatment with curative intent in the past 12 months or had no planned changes in treatment for the duration of the study	4	11	60.7± 6.7	Home Exercise program – Video conferencing – Aerobic and Resistance Training	↑FACIT-Fatigue ↑FACT-G (QoL) ↓HADS-Anxiety ↓HADS-Depression ↑GLTEQ-MVPA ↑GLTEQ-Resistance ↑30STS	7 in 6 participants
Modesitt et al. (2021)	USA – Virginia	100%	Prospective trial (non-randomized, single-arm feasibility)	99	Mixed Endometrial n = 58 (58.6%), Breast n = 17 (17.2%), Ovarian n = 23 (23.2%)	Post treatment (No current treatment with Chemotherapy or Radiation)	0	99	59.9± 9.4	Aerobic, Resistance Training, Behaviour Change (Home Exercise Program + mailed workbook + exercise bands + telephone motivational coaching)	higher baseline mental QOL improved completion and exercise outcomes	NR
Wagoner et al. (2023)	Canada Alberta, Nova Scotia, Ontario (British Columbia Saskatchewan Northwest Territories - through outreach from the Alberta hub)	84.3%	Hybrid effectiveness–implementation study	236	Breast: n = 126 (53.4%), Lung: n = 20 (8.5%), Haematological: n = 19 (8.1%), Gynaecological: n = 16 (6.8%), Prostate: n = 16 (6.8%), Skin: n = 6 (2.5%), Brain: n = 6 (2.5%), Colon: n = 6 (2.5%), Head and Neck: n = 5 (2.1%), Other ‡: n = 16 (6.8%)	Pre, during, or up to 3 years post-treatment; 54.2% receiving active treatment	42	192	57.3± 12.5	Online group sessions Aerobic, Resistance Training, Balance	Reach - 84.3% rural/remote; Enrol 85.8% (290/338); Female - 82.1%; Breast Cancer 53.4%; On Tx 54.7% Adoption - 163 HCPs; 45 QEPs → 22 classes; 32 fitness partners (19 organsisations, 13 individuals) Implementation - Ret 81.4%; Adh 78.2%; Assess >85%; Fit: BL 98.3% → 12 weeks 89.8%; PRO: BL 96.6% → 12 weeks 87.7%	1 mild.

Table 1. **Continue …**

Author	Location	Rurality	Study design	Sample size (n)	Cancer type	Treatment Phase	Males n (% of sample)	Females n (% of sample)	Age (years: mean ± SD)	Intervention details	Outcomes	Adverse events
Wagoner et al. (2024)	Canada British Columbia Alberta Saskatchewan Manitoba Ontario Quebec New Brunswick Nova Scotia Prince Edward Island Newfoundland and Labrador Yukon Northwest Territories	71.2%	Hybrid effective-ness–implemen-tation study	498 (rural) 201 (ur-ban)	Mixed Breast: n = 347 (49.6%) Lung: n = 56 (8.0%) Haematological: n = 56 (8.0%) Gynaecological: n = 47 (6.7%) Prostate: n = 43 (6.2%) Skin: n = 21 (3.0%) Brain: n = 11 (1.6%) Colon: n = 20 (2.9%) Head and Neck: n = 7 (1.0%) Multiple Diagnoses: n = 6 (0.9%) Other: n = 65 (9.3%) No information provided: n = 20 (2.9%)	Pre-, during, or post-treatment (up to 3 years); 54.8% receiving active treatment	109	585	57.9± 11.7	Aerobic, Resistance Training, Balance, Flexibility-Small group sessions online and in-person	↑30STS, ↑2MST, ↑6MWT, ↑SL, Balance, ↑Shoulder ROM, ↑Lower Body Flexibility. ↑Fatigue, ↑Wellbeing, ↑Exercise self-effi-cacy	NR

2MST – 2-Minute Step Test, 30STS – 30-Second Sit-to-Stand, 5xSTS – Five-Times Sit-to-Stand Test, 6MWT – Six-Minute Walk Test, AC – Arm Curl, Adh – Adherence, ATPW – Aerobic Training per Week, BL – Baseline, BS – Back Scratch, CP – Chest Press, CS – Chair Stand, DFS – Disease-Free Survival, FACIT-Fatigue – Functional Assessment of Chronic Illness Therapy: Fatigue, FACT-G – Functional Assessment of Cancer Therapy – General (Quality of Life), FIT – Fitness Assessment, GLTEQ-MVPA – Godin Leisure-Time Exercise Questionnaire: Moderate-to-Vigorous Physical Activity, GLTEQ-Resistance – Godin Leisure-Time Exercise Questionnaire: Resistance Training, GS – Grip Strength, HADS-Anxiety – Hospital Anxiety and Depression Scale: Anxiety, HADS-Depression – Hospital Anxiety and Depression Scale: Depression, HCP – Health Care Professional, HCPs – Health-Care Providers, HRQOL – Health-Related Quality of Life, LBD Flexibility – Lower-Body Flexibility, LIPA – Light-Intensity Physical Activity, LP – Leg Press, LPD – Lat Pulldown, METs – Metabolic Equivalents, MVPA – Moderate-to-Vigorous Physical Activity, OS – Overall Survival, PRO – Patient-Reported Outcome, PROMIS-Physical Function – Patient-Reported Outcomes Measurement Information System: Physical Function, QEPs – Qualified Exercise Professionals, QoL – Quality of Life, Ret – Retention, RTPW – Resistance Training per Week, SAR – Sit and Reach, SL Balance – Single-Leg Balance, STS – Sit-to-Stand Test, TUG – Timed Up and Go, Tx – Treatment, VO_2max – Maximal Oxygen Uptake.

Frequency (number of sessions per week) was reported in 9/12 (66.7 %) studies (Coletta et al., 2021; Eakin et al., 2012; Gell et al., 2024; Gray et al., 2019; Hirko et al., 2021; Marker et al., 2025; Modesitt et al., 2021; Wagoner et al., 2024; Wagoner et al., 2023). Intensity of resistance exercise was reported in 6/12 (50%) studies, although none of these six studies explained how this intensity was determined (i.e., as a percentage of one repetition maximum (1RM), or ratings of perceived exertion (RPE)). Of these six studies, four completed resistance training at a

moderate intensity or higher (Coletta et al., 2021; Hayes et al., 2018; Hirko et al., 2021; Marker et al., 2025), one at a light intensity (Befort et al., 2012), and one reported prescribing an 'individualised' intensity for each participant (Wagoner et al., 2024). Six of the 12 (50%) studies reported the time principle (Gallant et al., 2013; Gell et al., 2024; Gray et al., 2019; Hirko et al., 2021; Wagoner et al., 2024; Wagoner et al., 2023), while 6/12 (50%) either included resistance exercise as part of a multimodal exercise intervention or did not provide details regarding the session duration (Befort et al., 2012; Coletta et al., 2021; Eakin et al., 2012; Hayes et al., 2018; Marker et al., 2025; Modesitt et al., 2021). All studies prescribed resistance-based exercise, with 6/12 studies (50%) including information on the type of resistance exercise performed (i.e., bands, free weights, or body weight) (Coletta et al., 2021; Gallant et al., 2013; Hirko et al., 2021; Modesitt et al., 2021; Wagoner et al., 2024; Wagoner et al., 2023). Two of the 12 studies (16.7%) prescribed optional resistance training (Befort et al., 2012; Hayes et al., 2018), with no information provided on the adherence to the 'optional' FITT principles recommended.

Table 2. Core exercise prescription principles.

Author	Specificity	Progression	Overload	Initial Vailes	Reversibility	Diminished Returns
Befort et al. (2012)	NR	NR	NR	NR	NR	NR
Coletta et al. (2021)	+	+(*)	+(*)	NR	NR	NR
Eakin et al. (2012)	+	NR	NR	NR	NR	NR
Gallant et al. (2013)	+	+(*)	?	NR	NR	NR
Gell et al. (2024)	+	NR	NR	+	NR	NR
Gray et al. (2019)	+	NR	NR	NR	NR	NR
Hayes et al. (2018)	NR	NR	NR	NR	NR	NR
Hirko et al. (2021)	+	+ (*)	+ (*)	NR	NR	NR
Marker et al. (2025)	+	NR	NR	+	+	+
Modesitt et al. (2021)	+	NR	NR	+	NR	NR
Wagoner et al. (2023)	+	NR	NR	NR	NR	NR
Wagoner et al. (2024)	+	+ (*)	NR	+	NR	NR

'+' - Reported '+ (*)' – Reported but not rationalised, 'NR' – Not reported, '?' – Inconclusive or unclear.

Table 3. Reporting of FITT principles.

Author	Frequency (sessions per week)	Intensity	Time	Type	Intervention Duration (weeks)	Description
Befort et al. (2012)	NR	Light	NR	?	24	AER, Optional Light RT based on Strength and courage DVD
Coletta et al. (2021)	2	Moderate to vigorous	NR	AER, BT, Flex, RT (free weights, weight machines, and resistance bands)	~25	AER, RT, BT, Flex -Individualised - 12 resistance exercises total, focusing on all major muscle groups including upper and lower body, core, and whole body
Eakin et al. (2012)	2	NR	?	?	32	AER, RT, BT, Flex – Session's duration at least 45 mins. No details of Strength exercise provided. starting parameters and rate of progression were individualised according to baseline functional capacity,
Gallant et al. (2013)	NR	NR	40 min	BT, Flex, ST (Body weight, Hand/ankle weights, chairs)	12	ST, Flex, BT - 40 minutes of strength training
Gell et al. (2024)	2	NR	20 min	?	16	AER, ST, BT 20 min of progressive strengthening exercise using weights
Gray et al. (2019)	3-4	NR for RT	15 min	?	52	AER – minutes of MVPA per week, RT - Exercise workbook -15 min of strength training every other day consisting of six lower extremity strength exercises – Minutes of Resistance Training per week
Hayes et al. (2018)	?	Moderate	NR	NR	32	AER, RT - Weekly exercise prescription by EP – Not all participants did RT
Hirko et al. (2021)	1	Moderate to vigorous	2–3 sets of 8–12 reps	AER, RT- Free weights	Not Fixed	AER, RT, 2–3 sets of 8–12 reps) focused on muscles of the chest, back, shoulders, quadriceps, hamstrings, gluteal, biceps and triceps.
Marker et al. (2025)	2	Moderate	NR	? AER, RT (Individualised)	12	AER, RT with Individualised RT targeted large upper and lower extremity muscle groups based on BFittWell Program
Modesitt et al. (2021)	3	NR	NR	AER, RT (Band)	24	AER, RT with band on every other day with six exercises (squat, forward leg raises, side leg raises, backward leg raises, hip flexion, and knee flexion)
Wagoner et al. (2023)	2	Mild to moderate	45-50 min	AER, BT, RT (Bodyweight)	12	Multi-modal exercise training consisting of AER, RT and BT (45–50 min)
Wagoner et al. (2024)	2	Individualised	45-50 min	AER, BT, RT (Bodyweight & Resisted Exercise)	10-12	Circuit exercise training with AER, RT and BT (45–50 min)

'?' the description was unclear and would not allow for intervention replication, AER – Aerobic Exercise, BT – Balance Training, EP – Exercise Professional, Flex – Flexibility, MVPA – Moderate to Vigorous Physical Activity, NR – Not Reported, RT – Resistance Training, ST – Strength Training

Fidelity

Measures of program fidelity, including adherence, participant responsiveness (completion, uptake, and withdrawal), dose, differentiation, and quality of delivery (intervention provider and use of guidelines), are summarised in Table 4.

Adherence to exercise interventions were reported in 7/12 (58.3%) studies (Gell et al., 2024; Hayes et al., 2018; Hirko et al., 2021; Marker et al., 2025; Modesitt et al., 2021; Wagoner et al., 2024; Wagoner et al., 2023), although this often referred to the entire intervention, with adherence to the resistance training component not directly reported. Reporting and outcomes of participant responsiveness varied between studies, with uptake reported in 8/12 (66.7%) studies (Befort et al., 2012; Eakin et al., 2012; Gallant et al., 2013; Gell et al., 2024; Hirko et al., 2021; Marker et al., 2025; Wagoner et al., 2024; Wagoner et al., 2023), ranging from 0.6% to 85.8%. Completion rates were reported in 11/12 (91.7%) studies and ranged from 28.0% to 98.6% (Coletta et al., 2021; Eakin et al., 2012; Gallant et al., 2013; Gray et al., 2019; Hayes et al., 2018; Hirko et al., 2021; Marker et al., 2025; Modesitt et al., 2021; Wagoner et al., 2024; Wagoner et al., 2023). Withdrawal was reported in 11/12 (91.7%) studies (Coletta et al., 2021; Eakin et al., 2012; Gallant et al., 2013; Gray et al., 2019; Hayes et al., 2018; Hirko et al., 2021; Marker et al., 2025; Modesitt et al., 2021; Wagoner et al., 2024; Wagoner et al., 2023). No included study provided information on the prescribed dose of exercise, or on any deviations from the intended prescription.

Table 4. Aspects of Fidelity.

Author	Adherence	Completion	Withdrawal	Uptake	Dose	Differentiation	Intervention Provider	Guidelines
Befort et al. (2012)	NR	NR	NR	83%	NR	DVD for optional Resistance Training	Dietician, Psychiatrist	American College of Sports Medicine
Coletta et al. (2021)	NR	28%	72%	NR	NR	Exercise prescription based on baseline assessments and medical history	Physiatrists, Exercise Physiologist	American College of Sports Medicine
Eakin et al. (2012)	NR	96%	4%	61%	NR	Behavioural Coaching	Exercise Physiologist	NR
Gallant et al. (2013)	NR	68.2%	31.8%	15.8%	NR	Community exercise program using local resources	Certified site leaders + Certified Cancer Exercise Trainers	American College of Sports Medicine
Gell et al. (2024)	86.9%	95%	5%	64%	NR	RCT via telehealth	Enhance Fitness-certified instructors with ACE credentials	NR
Gray et al. (2019)	NR	76%	24%	NR	NR	Rural Vs Urban	NR	- American Cancer Society Guideline for Diet and Physical Activity
Hayes et al. (2018)	69%	98.6%	1.4%	NR	NR	Exercise prescription vs Usual Care Rural vs Urban	Exercise Physiologist	NR
Hirko et al. (2021)	72.7%	72.7%	27.3%	0.59%	NR	Clinic Exercise Program tailored for Rural Cancer Survivors	Oncology certified Physical Trainer	American College of Sports Medicine
Marker et al. (2025)	97%	79%	21%	37%	NR	Telehealth + App which tracked attendance	American College of Sports Medicine Certified Exercise Physiologists / Certified Cancer Exercise Trainers	American College of Sports Medicine
Modesitt et al. (2021)	36.4%	55.6%	44.4%	NR	NR	Home exercise program with equipment + support	Graduate Students in Exercise Physiology	NR
Wagoner et al. (2023)	78.2%	81.4%	18.6%	85.8%	NR	Exercise prescription with Behavioural Education	Qualified Exercise Professionals	NR
Wagoner et al. (2024)	80.1%	86.9%	13.1%	77.8%	NR	Exercise prescription with Behavioural Education	Qualified Exercise Professionals	American College of Sports Medicine, American Cancer Society, American Society of Clinical Oncology

NR – Not Reported

All studies (100%) provided information on how the intervention was differentiated from existing approaches. Quality of delivery was reported in 11/12 studies (91.7%), with interventions most frequently delivered by exercise physiologists or oncology-trained fitness professionals (e.g., Certified Cancer Exercise Trainers (CETs)) who had undertaken additional training in exercise and cancer (Coletta et al., 2021; Eakin et al., 2012; Gallant et al., 2013; Gell et al., 2024; Hayes et al., 2018; Hirko et al., 2021; Marker et al., 2025; Modesitt et al., 2021; Wagoner et al., 2024; Wagoner et al., 2023). Reference to exercise oncology guidelines in the design of exercise interventions was reported in 7/12 (58.3%) studies (Befort et al., 2012; Coletta et al., 2021; Gallant et al., 2013; Gray et al., 2019; Hayes et al., 2018; Hirko et al., 2021; Marker et al., 2025; Wagoner et al., 2024), with the most referred to guidelines including American College of Sports Medicine (ASCM) (Campbell et al., 2019) and American Cancer Society (ACS) (American Cancer Society, 2022). The other five studies (41.7%) did not refer to an exercise oncology guideline in the design of their intervention (Eakin et al., 2012; Gell et al., 2024; Hayes et al., 2018; Modesitt et al., 2021; Wagoner et al., 2023).

Discussion

This scoping review provides detailed insight into the reporting of resistance-based exercise interventions delivered to people with cancer living in regional, rural and remote areas, specific to core principles of exercise prescription, FITT principles, and fidelity. Included studies were heterogenous, with a vast range of sample sizes, cancer types and stages, phases along the cancer care continuum, and resistance-based exercise intervention designs. Results demonstrated that while core exercise principles, FITT principles, and measures of program fidelity were considered, the frequency of reporting these principles varied within the included studies. This inconsistency in the consideration and reporting of exercise principles and measures of program fidelity poses significant challenges to replicability, establishment of dose-response relationships, and ability to translate study protocols and outcomes into new clinical trials or real-world clinical practice (Bland et al., 2021; Neil-Sztramko et al., 2019a). These implementation challenges are particularly pronounced in regional, rural and remote settings, in comparison to urban settings, where access to services, infrastructure, and supervised exercise programs are limited (Carriere et al., 2018; McPhee et al., 2024).

When compared to exercise oncology research conducted in metropolitan settings, resistance-based exercise interventions delivered to people with cancer living in regional, rural, and remote areas remain limited. Further, given the reduced access to adequate facilities, equipment, and oncology-trained exercise professionals in comparison to metropolitan settings, accurate delivery and monitoring of exercise interventions is challenging, and is often reliant on self-reported measures – likely impacting the quality of reporting of exercise prescription principles and fidelity in research outputs. An understanding of how resistance-based exercise interventions can be successfully and effectively delivered and implemented in these settings is therefore vital to promote optimal cancer care and improve supportive care outcomes for cancer survivors living in regional, rural and remote areas.

Reporting of core exercise principles

In line with previous research, core exercise principles were poorly reported across included studies (Campbell et al., 2012; Neil-Sztramko et al., 2019a; Winters-Stone et al., 2014). No individual study reported or considered all six core exercise principles, with only two studies clearly reporting more than two variables (Table 2).

Specificity was the most applied exercise principle, with most studies prescribing resistance exercise with a view to increase functional capacity, muscle strength, or quality of life. The two studies that did not address the specificity principle (Befort et al., 2012; Hayes et al., 2018), included resistance training as optional in their exercise program, with no outcome measures relevant to resistance-based exercise. While this optional addition may have been taken up by some participants, this prescription does not align with exercise oncology guidelines for cancer survivors, where structured resistance training is considered an essential component of exercise programming recommendations (Campbell et al., 2019; Hayes et al., 2019).

Although four and two studies reported on the principles of progression and overload respectively, these aspects were insufficiently justified. Moreover, the absence of initial values in these studies limits the ability to determine whether the resistance-based interventions were prescribed at an appropriate load and volume. Whilst limited reporting of initial values in non-urban studies could be contributed to reduced access to equipment and staff (both of which are more readily available in urban settings), this does not warrant its exclusion from exercise interventions. In addition to considering the characteristics of a persons' cancer (i.e., stage, type, and treatment), resistance-based interventions need to be of sufficient load or volume and intensity relative to baseline measures (initial values) to elicit adaptation. The omission of these training principles reduces the extent to which physiological adaptation can be explained (Hoffman, 2002) and makes it difficult to determine if outcomes are a result of the exercise intervention or other factors, undermining validity and translation. For people with cancer living in regional, rural, and remote areas, who face known barriers and obstacles to exercise participation (Carriere et al., 2018; McPhee et al., 2024), clear application and reporting of these exercise principles is critical to ensure interventions are safe, effective, and can be appropriately tailored to an individual's initial capacity (Campbell et al., 2019).

Only one included study provided information on reversibility and diminished returns, although, it is acknowledged these are difficult principles to both consider and report in resistance-based exercise interventions (Hecksteden et al., 2018). While challenging in research environments, and even more so in regional, rural, and remote contexts given lack of service availability, understanding the long-term effects of an exercise intervention (i.e., by performing follow-up measures) is important to determine intervention suitability prior to translating into clinical practice (Schloemer and Schröder-Bäck, 2018). Similarly, diminishing returns implies that the magnitude and rate of adaptation to resistance exercise will reduce or plateau, and as such, performing repeated testing, and applying progressive overload can provide insight into a point at which diminishing returns occurs, and therefore the minimum effective dose required to maintain adaptations to resistance training (Hecksteden et al., 2018). In metropolitan areas, access to specialist services and oncology-trained exercise professionals may help to mitigate limitations in reporting of these measures, as repeated testing may be more accessible for example. However, in regional, rural, and remote settings, where access to services and exercise professionals is limited, this is not always feasible, which reduces the replicability and translation of resistance-based exercise interventions into real world clinical practice.

Reporting of FITT principles

While certain studies included in this review provided sufficient detail regarding FITT exercise principles, that would support the replication of their intervention in principle, the absence of precise information about the exact exercises, repetitions, and sets performed, observed in 11 of 12 studies, significantly limits the extent to which these interventions can be reproduced or critically evaluated. These findings are aligned with previous research by Bland et al. (2021), who highlighted insufficient detail in reporting undermines the reliability and replicability of exercise oncology interventions. This lack of detailed reporting specific to resistance exercise performed carries additional significance for people with cancer living in non-metropolitan areas, as they may have limited access to exercise professionals with the skills to individualise resistance-based exercise interventions and thus may rely on non-exercise professionals' ability to interpret the literature, which currently lacks considerable detail and precision.

Although adherence to established exercise oncology guidelines (i.e., American College of Sports Medicine (ACSM) or Exercise and Sports Science Australia (ESSA)) (Campbell et al., 2019; Hayes et al., 2019) enables readers to infer the general nature of progressive resistance training employed, these guidelines leave substantial scope for interpretation by allied health practitioners, limiting prescriptive specificity through ambiguity. Furthermore, the individualisation of prescriptions within studies introduces considerable heterogeneity, making it difficult to draw conclusions regarding dose-response relationships. While the reporting of intensity as "low," "moderate," or "high" provides some indication of alignment with guidelines, without clarification of how intensity is specifically determined (i.e., %1RM, RPE) – which was omitted from all included studies – effectiveness of an intervention cannot be fully assessed.

Six studies reported on the duration of resistance-based exercise sessions (i.e., 40 minutes), with one providing information on the number of sets and repetitions performed for each exercise. Reporting of resistance-based exercise in minutes limits the ability to calculate the volume of resistance training performed within each study, which is particularly pronounced in studies that delivered resistance-based exercise as part of a circuit, where the actual time spent on muscle-strengthening activities is unclear. In shorter-duration interventions (i.e., 20-minutes), it also becomes questionable whether sufficient resistance-based exercise can be delivered in accordance with current recommendations (Campbell et al., 2019). Similarly, information on the type of resistance training and equipment used was insufficiently described across included studies, further constraining the potential for replication. As previous research has shown, transparent and comprehensive reporting of exercise prescription parameters is essential if future research is to establish meaningful dose-response relationships, and to enhance translation of protocols into real-world practice (Fairman, 2024; Fairman et al., 2020).

The generally poor reporting of FITT components across included studies limits replication and prevents comparison and analysis across the prescribed resistance-based exercise interventions (Bland et al., 2021). This lack of transparency restricts the ability to identify minimum effective doses or optimal training regimens; essential for tailoring interventions to diverse cancer populations (Campbell et al., 2019; Neil-Sztramko et al., 2019b). In regional, rural, and remote contexts, where practitioners often adapt published protocols to the facilities and equipment that they have available, insufficient reporting of FITT principles risks inappropriate and low-quality exercise prescription, diminishing the efficacy of resistance-based exercise interventions.

Reporting of fidelity

Aside from adherence, measures of program fidelity are often not well considered or reported in resistance-based exercise interventions, which can impact the effectiveness, repeatability, and translation of such interventions into real world settings (Ginsburg et al., 2021; Page et al., 2017). While consideration of exercise and FITT principles are integral in delivering high quality resistance-based exercise interventions to clinical populations, including people with cancer, measures of program fidelity provide valuable insights into how well an intervention has been delivered. Reporting on measures of program fidelity varied considerably between included studies. Quality of delivery, which refers to resistance exercise interventions delivered by qualified professionals, was the most common aspect of fidelity reported (11/12 [91.7%]), with no study reporting information on the dose of their resistance-based interventions, which refers to the actual volume performed (and any deviations from the initial plan) (Table 4).

Adherence to prescribed interventions was reported by 58.3% of included studies. However, as many interventions consisted of multi-modal exercise, or were complimented with counselling programs, adherence to the resistance training portion of these interventions was not clearly isolated and reported. Exercise oncology guidelines support (and recommend) multi-modal exercise for people with cancer. However, our findings demonstrate the importance of reporting adherence to specific components of a multi-modal exercise program (i.e., to the established resistance exercise protocol), which not only provides information on the dose of resistance exercise performed but also allows for accountability and translation of findings into clinical practice. Reporting of modifications to the prescribed program (i.e., dose reductions or dose increments) within resistance-based exercise interventions also provides valuable insight into the tolerability of specific exercises and volumes, and autoregulation of exercise programs, which when combined with cancer type, stage of treatment, degree of illness, or level of dysfunction, provide necessary detail into the dose-response relationships of specific exercise prescriptions (Fairman et al., 2020). In addition, under reporting of dose, as seen in included studies, makes it difficult to determine exercise parameters, such as total exercise volume, which can limit the validity of outcomes (Fairman et al., 2020). Examining client satisfaction as an aspect of fidelity provides valuable insights into the applicability of a prescribed exercise intervention for people with cancer residing outside of metropolitan areas. In this review (and in line with previous literature), client satisfaction was determined by considering completion, uptake and withdrawal (Carroll et al., 2007). Completion, uptake, and withdrawal were all well-reported across included studies, with 91.7%, 66.7%, and 91.7% of studies reporting these measures of fidelity, respectively. Most studies (11/12) had a completion rate above 50%, half of the studies (6/12) had withdrawal rates below 30%, whilst uptake varied significantly across included studies (0.6% - 85.8%). An uptake of <20% observed across two included studies (Gallant et al., 2013; Hirko et al., 2021) may suggest the method of delivery or suitability of the intervention was not appropriate for the target population. On the contrary, it is also important to note that low health literacy, logistical barriers (e.g. transport), lack of referral or conflicting information provided by medical professionals, and fears and uncertainty can also contribute to reduced uptake of exercise interventions as part of cancer care in rural settings (Hirko et al., 2021; Murray et al., 2022).

Quality of delivery and differentiation were aspects of fidelity that were well reported across included studies. Quality of delivery (reported in 91.7% of studies) was high, with most interventions delivered by oncology-trained fitness professionals (e.g., Certified Cancer Exercise Trainers (CETs)) or clinical exercise physiologists. The delivery of resistance-based exercise interventions by trained professionals ensures that participants received an appropriately tailored and safe exercise program, which can improve participant engagement and outcomes (Carroll et al., 2007). However, as seen in included studies, the level of oncology specific exercise prescription knowledge and training differs between different exercise professionals, and whilst this cannot always be overcome in regional, rural, and remote settings, it may impact the quality of delivery. Differentiation was reported in all studies (100%), highlighting distinct features of each intervention that differed to standard care and contributed to the program's success.

A failure to consider and report measures of program fidelity makes it considerably challenging for researchers and clinicians alike to determine if observed outcomes are attributable to the prescribed intervention, or due to the presence of uncontrolled variability (Bellg et al., 2004; Breitenstein et al., 2010; Carroll et al., 2007). This is particularly problematic in resistance exercise interventions, where a lack of precision or deviations in intensity or volume can alter outcomes (Fairman et al., 2020). Consideration and reporting of fidelity is also particularly important in regional, rural, and remote areas, where intervention delivery can be impacted by workforce limitations, reduced supervision, and logistical and geographical barriers, which are not as prevalent in metropolitan based interventions. In the context of rurally delivered resistance-based exercise as part of cancer care, detailed reporting of fidelity provides critical insights into whether protocols can realistically be implemented outside of controlled research environments, where equipment or expertise may be limited.

Implications for research and practice

This research highlights the lack of detailed and consistent reporting of exercise prescription principles and measures of program fidelity for resistance-based exercise interventions delivered to people with cancer living in regional, rural, and remote areas, presenting challenges for the translation of research-based resistance training interventions into clinical practice in these settings. Although it is recognised that reporting resistance training parameters within research can be challenging, the absence of this detail and the rationale behind decisions made is an area that needs to be addressed in future research in this setting. While journal word limits may partly account for the omission of this detail, the use of supplementary materials provides a feasible means of overcoming such restrictions. In the present review, the exclusion of reporting on exercise dose, and explanation as to how resistance training intensity was determined across all included studies highlights the difficulties faced by clinicians, particularly in rural contexts, when attempting to translate research findings into clinical practice. Even though reporting of exercise prescription principles is improving within exercise oncology interventions conducted in metropolitan settings (Bland et al., 2021; Neil-Sztramko et al., 2019b), the small number of included studies, and poor reporting quality observed in this scoping review has significant implications for rural exercise oncology, given health professionals working outside of metropolitan areas often have fewer resources, less supervision, and a greater reliance on clear, replicable protocols.

Findings from this work provide a template for reporting exercise principles and fidelity in future resistance-based exercise interventions, in rural oncology settings, and general populations. In addition, improvements in overall study design and reporting could be achieved by referring to established frameworks, such as the TIDieR checklist (Hoffmann et al., 2014), CONSORT statement (Hopewell et al., 2025) or CERT template (Slade et al., 2016). These resources serve as valuable starting points for clinicians and researchers when designing, describing, and documenting resistance exercise interventions in rural supportive cancer care. Further refinement may be achieved through reference to other published literature, such as Fairman et al. (2020), who have demonstrated how both exercise prescription principles and measures of fidelity can be transparently reported following resistance-based exercise interventions.

Strengths and Limitations

This study employed an extensive search strategy developed with a health sciences librarian, aligned with previous systematic reviews (Mama et al., 2021), while encompassing electronic databases with robust methodological approaches, providing confidence in the identification of all relevant articles. Independent screening, study selection, and data extraction, in-line with PRISMA-ScR guidelines, is an additional strength of this review. Further, benchmarking our reporting expectations to established protocols for reporting of exercise principles (Hoffman, 2002), FITT principles, and program fidelity (Carroll et al., 2007) contribute to the validity and transparency of this review.

The exclusion of non-English manuscripts may explain why all included studies were performed in high income, western countries only, and therefore, may not provide a true reflection of the delivery and reporting of resistance-based exercise interventions in regional, rural, and remote areas globally. Studies that included both rural and urban participants, but did not report data on rural participants separately, were also excluded, even where rural participants were included in the intervention, which may indicate there are a small portion of interventions delivered to people with cancer living in regional, rural, and remote areas that were not considered in this review. Whilst not the aim of this review, it is not clear if reporting quality impacted the outcomes and effectiveness of the interventions prescribed, which may be investigated in future research.

This review provides novel insight into the reporting of resistance-based exercise interventions delivered to rural cancer survivors. It highlights the limited (few studies, all produced in high-resource countries) and heterogenous nature of research in this space, with a clear need for additional focus to be placed on the consistent and detailed reporting of exercise prescription principles and program fidelity in resistance-based exercise interventions delivered to people with cancer living in regional, rural and remote areas.

Conclusion

Reporting of exercise principles and measures of program fidelity in resistance-based exercise interventions delivered as part of rural cancer care is inconsistent and of poor quality. This lack of detail poses significant challenges for researchers and clinicians looking to replicate these resistance-based interventions in research and clinical practice and looking to perform critical analysis of the dose-response relationships and program adherence in these settings. While most interventions were delivered by certified cancer exercise trainers, or by clinical exercise physiologists, experience and qualifications varied between studies. Adherence to recommended guidelines and reporting of dose would greatly improve resistance-based exercise interventions delivered as part of rural cancer care. Future research needs to prioritise transparency and detail in the reporting of exercise prescription principles and fidelity when prescribing resistance-based exercise interventions to people with cancer living in regional, rural, and remote areas.

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Key points

- Reporting of core exercise prescription principles (e.g., specificity, overload, progression), FITT principles (frequency, intensity, time, type), and measures of fidelity (adherence, dose, quality of delivery) in resistance-based exercise interventions delivered to people with cancer living in regional, rural, and remote areas is inconsistent and of poor quality.
- No individual study included in this review reported on all core exercise prescription principles, FITT principles, or measures of fidelity.
- Transparency and detail in the reporting of core exercise prescription principles, FITT principles, and measures of fidelity is required in future resistance-based interventions delivered to people with cancer in regional, rural, and remote areas, to support the translation of research-based resistance training interventions into clinical practice in these settings.

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