

## Review Article

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# A scoping review of studies exploring leisure-time physical activity in adults diagnosed with advanced cancer

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## Abstract

**Objectives.** Despite improving survival rates, people with advanced cancer face several physical and psychosocial concerns. Leisure-time physical activity (LPA) has been found to be beneficial after cancer diagnosis, but little is known about the current state of research exploring LPA in advanced cancer. Our objectives were to (a) map the literature examining LPA in people with advanced cancer, (b) report on the terms used to describe the advanced cancer population within the literature, and (c) examine how the concept of LPA is operationalized within the literature.

**Method.** Our scoping review followed Arksey and O'Malley's methodological framework. We performed a search of 11 electronic databases and supplementary sources (February 2018; database search updated January 2020). Two reviewers independently reviewed and selected articles according to the inclusion criteria: English-language journal articles on original primary research studies exploring LPA in adults diagnosed with advanced cancer. Descriptive and thematic analyses were performed.

**Results.** Ninety-two articles met our criteria. Most included studies were published in the last decade (80%) and used quantitative methods (77%). Many study populations included mixed (40%), breast (21%), or lung (17%) cancers. Stages 3–4 or metastatic disease were frequently indicated to describe study populations (77%). Several studies (68%) described LPA programs or interventions. Of these, 78% involved structured aerobic/resistance exercise, while 16% explored other LPA types.

**Significance of results.** This review demonstrates a recent surge in research exploring LPA in advanced cancer, particularly studies examining exercise interventions with traditional quantitative methods. There remains insufficient knowledge about patient experiences and perceptions toward LPA. Moreover, little is known about other leisure activities (e.g., Tai Chi, dance, and sports) for this population. To optimize the benefits of LPA in people with advanced cancer, research is needed to address the gaps in the current literature and to develop personalized, evidence-based supportive care strategies in cancer care.

## Introduction

### Living with advanced cancer

In Canada, it is estimated that over 200,000 people were diagnosed with cancer in 2019 and the lifetime probability of developing cancer is almost 50% (National Cancer Institute, 2017; Canadian Cancer Society, 2019). Advanced cancer has been previously defined by the National Cancer Institute (NCI) as “cancer that has spread to other places in the body and usually cannot be cured or controlled with treatment” (National Cancer Institute, 2007). In this review, we are using the NCI definition for advanced cancer as it has been widely used in the literature (Beaton et al., 2009; Levit et al., 2013; Lowe, 2010) and provides a basis upon which the concept of advanced cancer can be operationalized within research and clinical contexts.

Generally, cancers that have spread regionally (stage 3) or metastasized to distant sites (stage 4) are associated with lower survival rates (National Cancer Institute, 2017; Canadian Cancer Society, 2018). There are vast differences in stage distribution according to cancer type with cancers, such as lung, pancreatic, and stomach, being more likely to present at a later stage at diagnosis than cancers such as breast, prostate, and thyroid. In a recent special report on cancer incidence by stage, the Canadian Cancer Society (2018) estimated more than 10,000 cases annually of lung, colorectal, prostate, and breast cancers that have already

metastasized at diagnosis (Canadian Cancer Society, 2018). Given these figures do not consider individuals with other cancer diagnoses, those with early stage cancer who have disease progression, and those diagnosed in previous years and presently living with the disease (Mariotto *et al.*, 2017; National Cancer Institute, 2017), these findings suggest a higher prevalence of Canadians currently impacted by advanced cancer.

Progress in cancer detection and treatment options has resulted in declined mortality rates for the general cancer population, including advanced cancer. However, increased survival rates have had an impact on quality of life which remains underexplored, particularly in people diagnosed with advanced cancer (Peppercorn *et al.*, 2011; Canadian Cancer Society, 2019). Despite improved cancer control and palliative therapies, individuals with this health condition face several physical and psychosocial concerns. Some challenges include declined aerobic fitness and muscle strength, high symptom burden (including fatigue and dyspnea), concerns of worry and anxiety, impaired physical and social functioning, financial distress, and affected quality of life (Cheville *et al.*, 2008; Hummler *et al.*, 2014; Liao *et al.*, 2014; Yee *et al.*, 2014; Mayrbaur *et al.*, 2016; Shallwani *et al.*, 2016; Dunn *et al.*, 2017; Teo *et al.*, 2019). In recent studies of people with advanced cancer, issues with daily activities, such as self-care, household tasks, and leisure activities, have also been reported (Cheville *et al.*, 2009; Yee *et al.*, 2014; LeBlanc *et al.*, 2015; Cardoso *et al.*, 2016; Di Lascio and Pagani, 2017). Moreover, unmet needs related to information, communication, emotional support, and supportive care have been frequently described in this population (Houldin and Lewis, 2006; Pollak *et al.*, 2007; Cheville *et al.*, 2008; Lam *et al.*, 2014; Cardoso *et al.*, 2016; Dunn *et al.*, 2017; Kemp *et al.*, 2018).

### **Leisure-time physical activity and advanced cancer**

As the recognition of supportive care priorities in oncology is increasing, leisure-time physical activity (LPA), including exercise, is becoming a growing focus of interest within the cancer population. LPA is considered one domain of physical activity (PA; Pettee Gabriel *et al.*, 2012) and has been described as “the activities one participates in during free time, based on personal interests and needs. These activities include formal exercise programs as well as walking, hiking, gardening, sport, dance, etc.” (Howley, 2001). Exercise is considered LPA that is “planned, structured, repetitive” and purposeful (Caspersen *et al.*, 1985; Dasso, 2019). The benefits associated with PA after general cancer diagnosis have been well established and include reduced fatigue symptoms, improved physical functioning and psychosocial well-being, better treatment outcomes, enhanced quality of life, and decreased mortality (Speck *et al.*, 2010; Ballard-Barbash *et al.*, 2012; Fong *et al.*, 2012; Segal *et al.*, 2017; Campbell *et al.*, 2019). However, the majority of research in this area has focused on patients with common cancer types (e.g., breast, prostate, lung, and colorectal), within early stage disease and within post-treatment phases (Campbell *et al.*, 2019; Shallwani *et al.*, 2019b).

In advanced cancer specifically, earlier reviews examining LPA have focused primarily on intervention studies exploring traditional structured exercise programs with aerobic and resistance components (Lowe *et al.*, 2008; Beaton *et al.*, 2009; Albrecht and Taylor, 2012; Salakari *et al.*, 2015; Dittus *et al.*, 2017; Heywood *et al.*, 2017, 2018). Despite the lack of research previously reported in this area, recent reviews have confirmed the safety and feasibility of exercise interventions in people with

advanced cancer and have reported benefits with exercise for several clinical outcomes, including physical function and quality of life (Lowe *et al.*, 2008; Dittus *et al.*, 2017; Heywood *et al.*, 2017, 2018).

Nonetheless, several limitations exist in the current body of literature exploring LPA for people with advanced cancer. Previous reviews have been limited to intervention study designs and have not considered topics of potential relevance to this population, such as personal experiences and perceptions related to engaging in LPA, reported facilitators and barriers or preferred activities. Within intervention studies, further research is needed to establish optimal exercise dosage parameters for different subgroups of the advanced cancer population (Heywood *et al.*, 2017). Moreover, leisure activities beyond structured aerobic and resistance exercise programs, such as mind-body exercise (e.g., yoga), dance, gardening, or sports, may be meaningful for patients and potentially beneficial for various clinical outcomes. However, these types of activities have not been well researched in the general and advanced cancer literature alike (Bradt *et al.*, 2015; Buffart *et al.*, 2012; Campbell *et al.*, 2019).

As the evidence on PA in cancer is rapidly expanding, it is necessary to update and broaden our understanding of the scope of research on this topic and to identify particular research gaps in the current body of literature. Moreover, challenges in this area of research exist with standardizing the definition of advanced cancer (Lowe, 2010; Lowe *et al.*, 2016) and understanding how key concepts, such as LPA, have been examined in the literature. While systematic reviews have been the most common approach to synthesize the literature, other approaches have been recently considered to address questions that are broader in nature and more inclusive of different evidence types (Grimshaw, 2010). Scoping reviews can provide an extensive review of relevant literature (literature mapping) and help clarify terms (concept mapping), and this approach may be particularly useful to adopt in research areas that are not well understood (Arksey and O'Malley, 2005; Anderson *et al.*, 2008; Rumrill *et al.*, 2009; Levac *et al.*, 2010). The objectives of our scoping review were to map the current research and understand key concepts from the literature about LPA in people with advanced cancer. Specifically, our research questions were the following:

1. What is the extent, nature, and range of the existing literature examining LPA in people with advanced cancer?
2. What terms are used to describe the advanced cancer population within the studies included in the scoping review?
3. How is the concept of LPA operationalized within the studies included in the scoping review?

### **Methods**

The methods for our scoping review have been previously described (Shallwani *et al.*, 2019a). Briefly, our review followed the steps of the methodological framework established by Arksey and O'Malley (2005), with the consideration of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist (Tricco *et al.*, 2018) and additional recommendations on scoping methodology (Arksey and O'Malley, 2005; Davis *et al.*, 2009; Rumrill *et al.*, 2009; Levac *et al.*, 2010; Daudt *et al.*, 2013; Pham *et al.*, 2014; Peters *et al.*, 2017).

### Literature search

The literature search strategy was established and modified in consultation with an interdisciplinary group of researchers (Levac et al., 2010; Daudt et al., 2013; Shallwani et al., 2019a). The search strategy was pilot tested in February 2018 by running the search in one electronic database, scanning 114 abstracts, and reviewing 31 full texts. This exercise permitted the researchers to determine the feasibility of the scoping review and refine the article selection criteria. Following this pilot testing, the search strategy was finalized, and the following steps were completed:

1. *Initial search of 11 electronic databases (performed Feb 20, 2018)*: Cumulative Index to Nursing and Allied Health Literature (CINAHL; 1940–current); Cochrane Database of Systematic Reviews (CDSR; 2005–current); Database of Abstracts of Reviews of Effects (DARE; first quarter of 2016); Cochrane Central Register of Controlled Trials (CENTRAL; 2018); Excerpta Medica Database (EMBASE; 1947–current); Medical Literature Analysis and Retrieval System Online (MEDLINE; 1946–current); Physiotherapy Evidence Database (PEDro; 1999–current); Psychological Abstracts (PsycINFO; 1806–current); US National Library of Medicine Database (PubMed; 1966–current); National Rehabilitation Information Center Database (REHABDATA; 2002–current); and Sports Medicine Database (SPORTDiscus; –current) (Supplementary Appendix A),
2. *Supplementary search of references lists\**: 15 relevant literature reviews, editorials, and commentaries identified during the electronic database search (Supplementary Appendix B),
3. *Grey literature search of selected organizational websites (performed Nov 26, 2018)*: Canadian Cancer Society (Canada), NCI, American Cancer Society (USA), National Cancer Research Institute (UK), European CanCer Organisation, European Society of Medical Oncology (ESMO) (Europe), and Cancer Australia (Australia),
4. *Updated search of electronic databases (performed Jan 24, 2020)*: see initial search, and
5. *Citation analysis using the Scopus database\**: six relevant literature reviews from initial search and one from updated search (Supplementary Appendix B).

\*Due to the high number of articles, we did not scan the references lists and perform citation analyses of all included articles, as originally indicated in the review protocol (Shallwani et al., 2019a).

All retrieved articles from the literature search were exported into the EndNote X7.8 software (Clarivate Analytics, PA). Upon automatic and manual removal of duplicates, citations were exported into the online Covidence program (Veritas Health Innovation Ltd ACN 600 366 274). Two reviewers (SMS and MCR) independently scanned articles at the title/abstract level in blocks of 500–1,000 articles and at the full-text level in blocks of 50–100 articles. Conducting the article selection process in blocks permitted ongoing discussions between the reviewers to further refine the selection criteria, resolve conflicts, and consult senior researchers (JK and RT), as needed (Levac et al., 2010; Pham et al., 2014; Shallwani et al., 2019a). Thus, the selection of articles for inclusion was based on criteria established *a priori* that were refined *post hoc* (Table 1). As per the scoping review approach, we did not apply any quality cutoff criteria in order

to identify all published literature of relevance (Arksey and O'Malley, 2005; Pham et al., 2014).

### Data extraction

Upon completion of the selection process, articles included in the review were exported into the Microsoft Excel software (version 14.7.7, Redmond, WA). The draft data extraction forms (Shallwani et al., 2019a) were pilot tested independently by two reviewers (SMS and MCR) using Excel for over 10% of the included studies from the initial search ( $n = 8$ ), and the extracted information was compared between the reviewers (Levac et al., 2010; Daudt et al., 2013; Pham et al., 2014). This step permitted the researchers to test the usability and clarity of the data forms and headings, to make adjustments to the forms and to create drop-down categories further enhancing their ease of use. Data for the remaining studies were extracted by the primary researcher (SMS) and subsequently verified by the second researcher (MCR). These data included study characteristics (e.g., publication year, location, and methodology) and population characteristics (e.g., diagnosis, gender, and age). To address the secondary objectives, key terms to describe the advanced cancer population were searched based on the article selection criteria (e.g., stage 3–4, palliative, hospice, terminal, and life expectancy). To locate and document these terms, the study population criteria and descriptions were reviewed within the abstract, the methods, and/or the results section of the included articles. In addition, the relevance of LPA within each study (e.g., study outcome, theme, or intervention) and the specific components of LPA explored were recorded for each included article.

### Data analysis

A narrative, descriptive review was performed of the search results, the study characteristics, and the population characteristics. General trends according to publication year were demonstrated through the use of linear graphs. Thematic content analyses were conducted related to descriptions of the advanced cancer population and the specific relevance of LPA within the studies as a main outcome (quantitative research), as a focus of inquiry or as an emerging theme (qualitative research) or as a component of a study intervention or program. Similar studies of particular relevance (i.e., qualitative studies and other types of LPA programs) were described in detail. Due to the volume and heterogeneity of the included studies, there was no formal quality appraisal or data synthesis performed for this review.

## Results

### Search results

The initial database search in February 2018 resulted in 63 articles included in the scoping review, while the supplementary search of relevant review articles and grey literature yielded an additional two included articles. The grey literature search also identified three patient education booklets targeted to patients with advanced cancer (ESMO Palliative Care Working Group, 2011; National Cancer Institute, 2014; Canadian Cancer Society, 2017). These were not included in the review but were referred to for guidance on practical implications. The updated search in January 2020 yielded an

**Table 1.** Refined article selection criteria

Inclusion criteria	Exclusion criteria
<p><i>Study population</i></p> <p>1) Adults aged <math>\geq 18</math> years</p> <p>2) Diagnosis of advanced cancer, specifically indicated as at least one of the following<sup>a</sup>:</p> <p>a) Stage<sup>b</sup> 3 and/or 4 and/or metastatic;</p> <p>b) "Terminal," "end of life," "until death," "incurable," "untreatable" or "inoperable";</p> <p>c) "Palliative" disease/status or receiving "palliative" or "hospice" care, therapies or treatment;</p> <p>d) Limited life expectancies or survival rates;</p> <p>e) "Recurrent" or "relapsed" disease, only if meeting any previously mentioned criteria for advanced cancer</p>	<p>1) Children or adolescents, animals</p> <p>2) Non-cancer diagnoses (e.g., other health conditions and cancer prevention)</p> <p>3) Diagnosis of non-advanced cancer, indicated as<sup>a</sup>:</p> <p>a) Stage 1–2;</p> <p>b) "Locally advanced" or "nonlocalized" cancer and not meeting any other mentioned criteria for advanced cancer</p> <p>4) Mixed populations including cancer and non-cancer or advanced and non-advanced cancer<sup>a</sup></p> <p>5) Caregivers, family members, health care professionals</p>
<p><i>Concept</i></p> <p>1) Post-cancer diagnosis LPA</p> <p>2) Leisure-time domain of PA, such as structured aerobic and resistance exercise (including leisure walking), mind-body exercise (yoga, Tai Chi, Qigong), sports, gardening, hiking, bowling, and dance</p> <p>3) LPA examined as:</p> <p>a) A main study outcome (quantitative research);</p> <p>b) A focus of inquiry or an emerging theme (qualitative research);</p> <p>c) A main component of a study intervention or program</p>	<p>1) Pre-cancer diagnosis LPA</p> <p>2) Other domains of PA (e.g., self-care, occupation, transport, and total) (Petee Gabriel <i>et al.</i>, 2012)</p> <p>3) LPA:</p> <p>a) Not examined as a separate outcome (quantitative research; e.g., questionnaire with 1 item or subscale on LPA, objective or self-reported measures of total PA or daily step count, functional tests of exercise capacity or aerobic fitness);</p> <p>b) Not explored as a main qualitative focus (qualitative research);</p> <p>c) Not considered LPA (e.g., therapeutic-focused/rehabilitation programs or exercises, such as breathing, swallowing, passive, range of motion, and coordination exercises; e.g., mindfulness-based or meditation programs, muscle relaxation techniques not clearly involving major physical movement);</p> <p>d) Not a main component of a multidimensional program/intervention</p>
<p><i>Context</i></p> <p>1) Any phase of the disease trajectory post-diagnosis of advanced cancer (e.g., newly diagnosed, during treatment, or end of life)</p> <p>2) Within any clinical setting (e.g., home-based, community-based, hospital-based, or hospice care)</p>	
<p><i>Types of studies</i></p> <p>1) Original primary research studies</p> <p>2) Any study design and any methodology</p> <p>3) English-language articles</p> <p>4) Full texts available</p>	<p>1) Literature reviews, practice guidelines, position documents, editorials, commentaries, letters, research protocols, conference abstracts, dissertations, book chapters, books, and magazine articles<sup>a</sup></p> <p>2) Program descriptions with no primary data collection</p> <p>3) Non-English language articles</p>

LPA, leisure-time physical activity; PA, physical activity.

<sup>a</sup>Modifications or clarifications to selection criteria indicated in original protocol (Shallwani *et al.*, 2019a).

<sup>b</sup>Studies using other diagnostic criteria without overall staging information were not included.

additional 27 articles for inclusion. Upon completion of the entire literature search, there were 92 articles included in our scoping review (Figure 1). A list of included articles is provided (Supplementary Appendix C).

### Study characteristics

Most studies were published in the last decade (2010–2019/2020: 80%,  $n = 74$ ) (Table 2) and occurred within Europe (43%,  $n = 40$ )

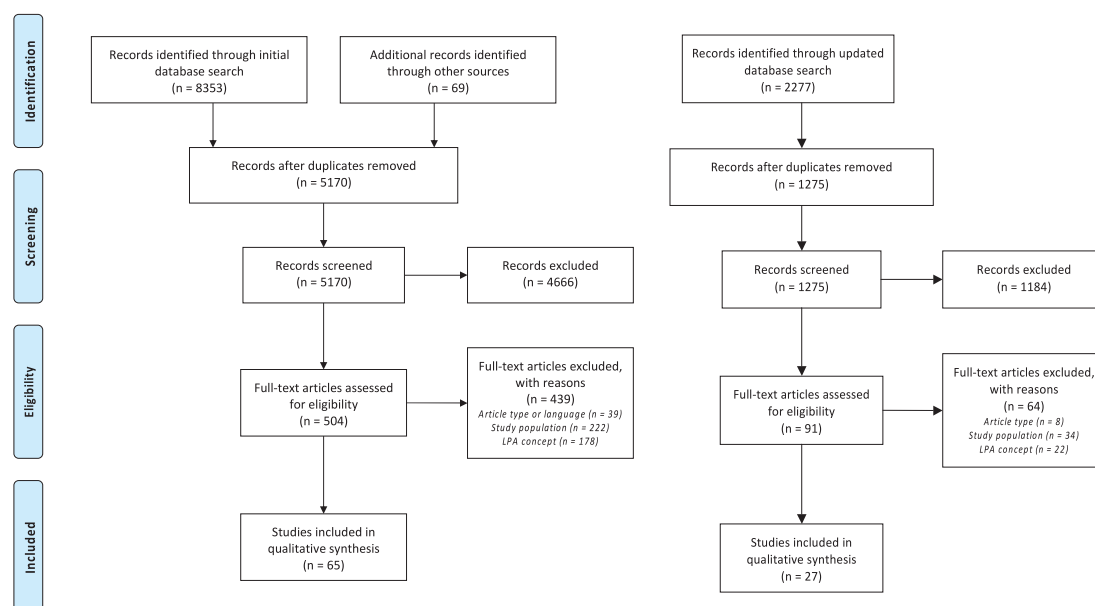


Fig. 1. PRISMA flow diagram (Moher et al., 2009).

or North America (37%,  $n = 34$ ), followed by Australia (14%,  $n = 13$ ) and Asia (5%,  $n = 5$ ). The majority of studies used quantitative methods (77%,  $n = 71$ ), while 14% ( $n = 13$ ) and 9% ( $n = 8$ ) described qualitative and mixed methods, respectively.

Methodological characteristics of the studies including a quantitative approach are described in Table 3. Most studies involved evaluating a controlled intervention ( $n = 57$ ) and followed one or two groups over time. Six quantitative studies and one mixed-methods study adopted a case-study design.

An overview of the 13 studies following an exclusively qualitative approach is provided (Table 4). Few articles clearly stated the qualitative methodological approaches, such as phenomenology ( $n = 3$ ) or grounded theory ( $n = 2$ ). All included studies used semi-structured or unstructured interviews as a primary method of data collection.

Of eight studies describing quantitative and qualitative methods of data collection, three explicitly identified as “mixed-methods” (Tsianakas et al., 2017; Poletti et al., 2019; Ten Tusscher et al., 2019). The study designs are indicated within Table 3. Regarding the qualitative components of these studies, three studies specified a qualitative analytic approach, including social validity, interpretive phenomenology, and the framework approach. Half of the mixed-methods studies described interviews for the qualitative data collection ( $n = 4$ ), while the remaining used focus groups ( $n = 2$ ) or surveys ( $n = 2$ ).

### Population characteristics

Of 92 studies in our review, 24% ( $n = 22$ , including two case studies) included only females and 11% ( $n = 10$ , including five case studies) included only males. Over half of the studies (55%,  $n = 51$ ) provided enough information to determine an average participant age of or above 60 years and over a third (36%,  $n = 33$ ) under 60 years of age. Three studies indicated average ages for different study groups, where one group was  $\geq 60$  years and the other was  $< 60$ . Half of the eight studies with ages under 50 years were case studies (50%,  $n = 4$ ). The remaining studies either did

not include age information ( $n = 1$ ) or provided age ranges only ( $n = 4$ ). Population characteristics with respect to cancer diagnosis are provided (Table 2). Most articles described study groups with mixed types of advanced cancer (40%,  $n = 37$ ) or focused exclusively on patients with advanced breast or lung cancers (38%,  $n = 35$ ). Cancer type by publication year is demonstrated in Figure 2.

Although studies focusing on caregivers and health care professionals were not included in the review, one study examined a yoga intervention in patients with lung cancer with their family caregivers (dyads; Milbury et al., 2015). Masel et al. (2018) also interviewed palliative care team members about their perspectives regarding a horticultural therapy intervention, while Payne et al. (2018) included health care professionals in their qualitative exploration of palliative rehabilitation for advanced lung cancer.

### Description of advanced cancer population

The terms used to describe the advanced cancer population varied between studies, with the majority indicating stages 3–4 or metastatic disease (76%,  $n = 70$ ). Of these, 53% ( $n = 37$ ) focused on stage 4 or metastatic cancer only, while 9% ( $n = 6$ ) included only stage 3 cancer and 39% ( $n = 27$ ) included both stages 3 and 4. In addition, 22 studies (24%) indicated “palliative” or “hospice” to describe the patient population, treatment intent, or care approach, while 18 studies (20%) used terms, such as “terminal,” “incurable,” “untreatable,” “inoperable,” or “until death.” Some studies (10%,  $n = 9$ ) specified life expectancies or survival rates; more precisely, seven studies indicated estimated life expectancies between 3 and 12 months ( $n = 5$ ), between 3 months and 2 years ( $n = 1$ ), and between 6 months and 5 years ( $n = 1$ ), while two studies indicated expected 5-year survival rates of  $\leq 50\%$ . Descriptive terms used in the included studies by publication year are demonstrated in Figure 3. With respect to cancer diagnosis, studies focusing on specific cancer types used staging more frequently in their population descriptions compared with the mixed cancer groups. Within the breast cancer and lung cancer studies ( $n = 35$ ), 100% mentioned staging, 6% ( $n = 2$ )

**Table 2.** Descriptive characteristics of included studies ( $n = 92$ )

Publication year	$n$ (%)
2000–2003	5 (5.4)
2004–2007	8 (8.7)
2008–2011	11 (12.0)
2012–2015	22 (23.9)
2016–2019/2020 <sup>a</sup>	46 (50.0)
Cancer diagnosis	$n$ (%)
Breast	19 (20.7)
Colorectal	4 (4.3)
Gastro-intestinal	3 (3.3)
Lung	16 (17.4)
Prostate	5 (5.4)
Mixed	37 (40.2)
Other <sup>b</sup>	8 (8.7)
<b>Total</b>	<b>92 (100)</b>

<sup>a</sup>The search was performed in January 2020 and yielded four included articles published in 2020 (included in the 2016–2019/2020 category).

<sup>b</sup>Examples of other cancer types include melanoma, ovarian, and pancreatic.

indicated “palliative,” and 11% ( $n = 4$ ) used terms such as “untreatable” and “inoperable.” Meanwhile, within the mixed cancer studies ( $n = 37$ ), 46% ( $n = 17$ ) used staging, 49% ( $n = 18$ ) reported “palliative” or “hospice,” 35% ( $n = 13$ ) indicated terms such as “terminal” and “incurable,” and 22% ( $n = 8$ ) specified life expectancies or survival rates.

### Operationalization of LPA

In over half of the included studies (60%,  $n = 55$ ), LPA was examined quantitatively as a study outcome. The majority of these assessed outcomes related to adherence and acceptability. The outcome measurement tool used most frequently to assess LPA within these studies was the patient-reported Godin Leisure-Time Exercise Questionnaire ( $n = 9$ ).

Twenty-one studies (23%) included in the review explored LPA qualitatively. In most studies, the researchers sought to examine experiences and perceptions related to LPA (focus of inquiry). Two studies reported emerging themes related to LPA; that is, LPA was not the focus of these studies but was part of a theme identified during data analysis (Mackey and Sparling, 2000; Chui et al., 2005).

Many studies (68%,  $n = 63$ ) described an intervention or a program focused on LPA. Most of these (78%,  $n = 49$ ) involved structured exercise programs with components of aerobic and resistance training. Specifically, 35 studies described programs focused on both aerobic and resistance training, while the remaining focused on aerobic ( $n = 10$ ) or resistance ( $n = 4$ ) components only. Besides these, 16% ( $n = 10$ ) explored other types of LPA, including mind-body exercise (e.g., yoga, Qigong, and gardening), while four studies (6%) described combined LPA programs (Table 5). Of these, half ( $n = 7$ ) included only women with breast cancer ( $n = 6$ ) or mixed types of cancer ( $n = 1$ ).

### Discussion

To our knowledge, this is the first scoping review examining the published literature on LPA in people with advanced cancer. In

**Table 3.** Methodological characteristics of included studies with quantitative approach ( $n = 79$ )

	Quantitative studies ( $n = 71$ )	Mixed-methods studies ( $n = 8$ )
Study design, $n$ (%)		
Observational	19 (26.7)	3 (37.5)
<i>Cross-sectional</i>	12 (16.9)	3 (37.5)
<i>Longitudinal</i>	7* (9.9)	0 (0.0)
Intervention	52 (73.2)	5 (62.5)
<i>2-group CCT or RCT</i>	27 (38.0)	2 (25.0)
<i>&gt;2-group RCT</i>	3 (4.2)	0 (0.0)
<i>Single group</i>	15 (21.1)	2 (25.0)
<i>Case series</i>	2 (2.8)	0 (0.0)
<i>Case study</i>	5 (7.0)	1 (12.5)

CCT, controlled clinical trial; RCT, randomized controlled trial.

Within the seven longitudinal observational studies, one study adopted a case-study design.

the last decade, there has been a surge of research exploring LPA in people with advanced cancer, particularly in Europe and North America. These findings support the recent focus in advanced cancer care on developing and implementing tailored supportive and palliative care strategies throughout the care continuum in order to address patients’ individual needs and to enhance their quality of life (Peppercorn et al., 2011; Ferrell et al., 2017).

While significant progress has been made to advance the knowledge on LPA in people with advanced cancer, there remain important limitations and gaps in the current evidence base. Methodological limitations of the current research base include small sample sizes in quantitative research and a lack of sufficient studies and well-defined methodological approaches in qualitative research. As many published articles on this topic used quantitative study methods examining controlled exercise interventions, these research findings are limited in their applicability to real-life settings and to different clinical populations. Moreover, few studies utilized qualitative methods and even fewer implemented mixed-method approaches in this area of research, resulting in limited knowledge on the experiences, perceptions, and preferences of people living with advanced cancer related to engaging in LPA. Of the studies using qualitative methods that were included in our review, including the mixed-methods studies, several did not explicitly indicate the qualitative methodology (e.g., phenomenology and grounded theory), highlighting a need for better designed studies in this area.

### Advanced cancer population

The term “advanced cancer” can represent a particularly heterogeneous group of people with cancer, and there are several challenges with establishing a clear definition for this term (Haun et al., 2017). In our review, there was considerable variability within the population characteristics of the included studies, and many studies involved mixed groups of people with different types of advanced cancer. Several recent articles focused primarily on individuals with one cancer type, a specific treatment approach

**Table 4.** Overview of qualitative studies included in review ( $n = 13$ )

Objective (study)	Study population	Qualitative approach	Data collection
To explore the feasibility and the experienced health benefits and barriers of participation in an exercise and relaxation intervention from the patients' perspective (Adamsen et al., 2012)	Patients with advanced-stage lung cancer (stage III–IV NSCLC and extensive disease SCLC) undergoing chemotherapy	Explorative, feasibility study; thematic analysis	Individual semi-structured interviews ( $n = 15$ ) and one semi-structured focus group ( $n = 8$ )
To explore participants' perceptions to rehabilitation palliative care; specifically perceptions of symptoms, perceptions of rehabilitation services received and attitudes and beliefs about rehabilitation received (Belchamber, 2009)	Older patients post-palliative treatment experiencing one of three distressing cancer symptoms: pain, dyspnea, and fatigue	Phenomenological orientated psychological approach	Semi-structured interviews ( $n = 8$ )
To develop an understanding of the potential physical and psychosocial impact of yoga on the well-being of advanced cancer patients; and to create a foundation for the development of a yoga program for patients at the end of life (Carr et al., 2016)	Women with advanced (stage 4) cancer	Pilot study with descriptive qualitative approach; qualitative content analysis	Individual semi-structured interviews ( $n = 3$ )
To explore the beliefs of patients with late-stage lung cancer regarding exercise, its relationship to their symptoms, and their clinicians' roles in providing counseling (Cheville et al., 2012)	Patients with stage 3B/4 NSCLC	Qualitative study; content analysis	Individual semi-structured interviews ( $n = 20$ )
To identify the impact of key aspects of Chinese culture on the responses of mid-aged Chinese Australians to their advanced cancer (Chui et al., 2005)	Mid-aged Chinese Australians with advanced cancer followed from recruitment until death	Glaserian grounded-theory approach	Face-to-face interviews, telephone contacts, observation, and research field notes ( $n = 11$ )
To explore how palliative cancer patients with poor performance status experience participation in physical activity (Guide et al., 2011)	Palliative cancer patients from different palliative home care units	Qualitative design; qualitative content analysis	Semi-structured interviews ( $n = 11$ )
To gain knowledge on experiences of older women with cancer receiving hospice care [that can be used by physical therapists (Mackey and Sparling, 2000)]	Older women with cancer receiving hospice care	Qualitative single-case study with replication; analysis by grounded-theory techniques	Unstructured interviews ( $n = 3$ ) and research field notes (including information from family members and hospice nurses)
To investigate how patients and palliative care team members perceive the option of horticultural therapy in a hospital-based palliative care ward (Masel et al., 2018)	Advanced cancer patients on a palliative care ward	Qualitative methodology; thematic analysis (applied as a theoretically flexible method)	Semi-structured interviews ( $n = 15$ patients and $n = 5$ palliative care team members)
To explore attitudes toward and experiences with PA and exercise among older patients with advanced cancer during palliative oncological treatment (Mikkelsen et al., 2019)	Patients aged $\geq 65$ years with advanced cancer receiving first-line palliative treatment	Qualitative interview study; thematic analysis	Semi-structured interviews ( $n = 23$ )
To gain a comprehensive understanding of palliative cancer patients' perceptions and experiences of taking part in a group exercise program and to explore the meaning of such an intervention for the individual patient (Paltiel et al., 2009)	Palliative cancer patients' with 2–12 months life expectancy	Qualitative interviews; phenomenological-hermeneutical perspective for analysis	Semi-structured interviews ( $n = 5$ )

(Continued)

**Table 4.** (Continued.)

Objective (study)	Study population	Qualitative approach	Data collection
To explore the experiences and perceptions of patients and healthcare professionals regarding the feasibility, acceptability, benefits, and burdens of palliative rehabilitation as a component of advanced lung cancer management (Payne <i>et al.</i> , 2018)	Adults with advanced (stage 3b–4) NSCLC receiving systemic therapy with palliative intent	Qualitative exploration; thematic analysis	Individual semi-structured interviews ( <i>n</i> = 8 patients and 6 health care professionals)
To examine the views of men diagnosed with metastatic prostate cancer toward physical activity (Sheill 2018b)	Men with metastatic prostate cancer	Qualitative exploration; content analysis	Semi-structured interviews ( <i>n</i> = 20)
To gain insight into the experiences of patients living with incurable advanced cancer receiving hospice care taking part in exercise classes, the meaning they attached to participation and to understand how they perceived participation to have affected their lives (Turner <i>et al.</i> , 2016)	Patients living with incurable advanced cancer receiving hospice care	Heideggerian (hermeneutic/interpretive) phenomenological approach	Individual semi-structured interviews ( <i>n</i> = 9)

NSCLC, non-small cell lung cancer; SCLC, small cell lung cancer.

or a particular demographic (e.g., elderly) to address some of these challenges of heterogeneity. Many of these focused exclusively on advanced breast or lung cancer populations, limiting the applicability of these findings to other cancer types. The inclusion of patient groups with only lung cancer or other cancer types was fairly recent, despite the poor prognosis and relatively low survival rate associated with lung cancer (Canadian Cancer Society, 2018, 2019). Our findings emphasize the need to continue extending research efforts examining LPA in advanced cancer patient groups, including those with diagnoses besides breast cancer.

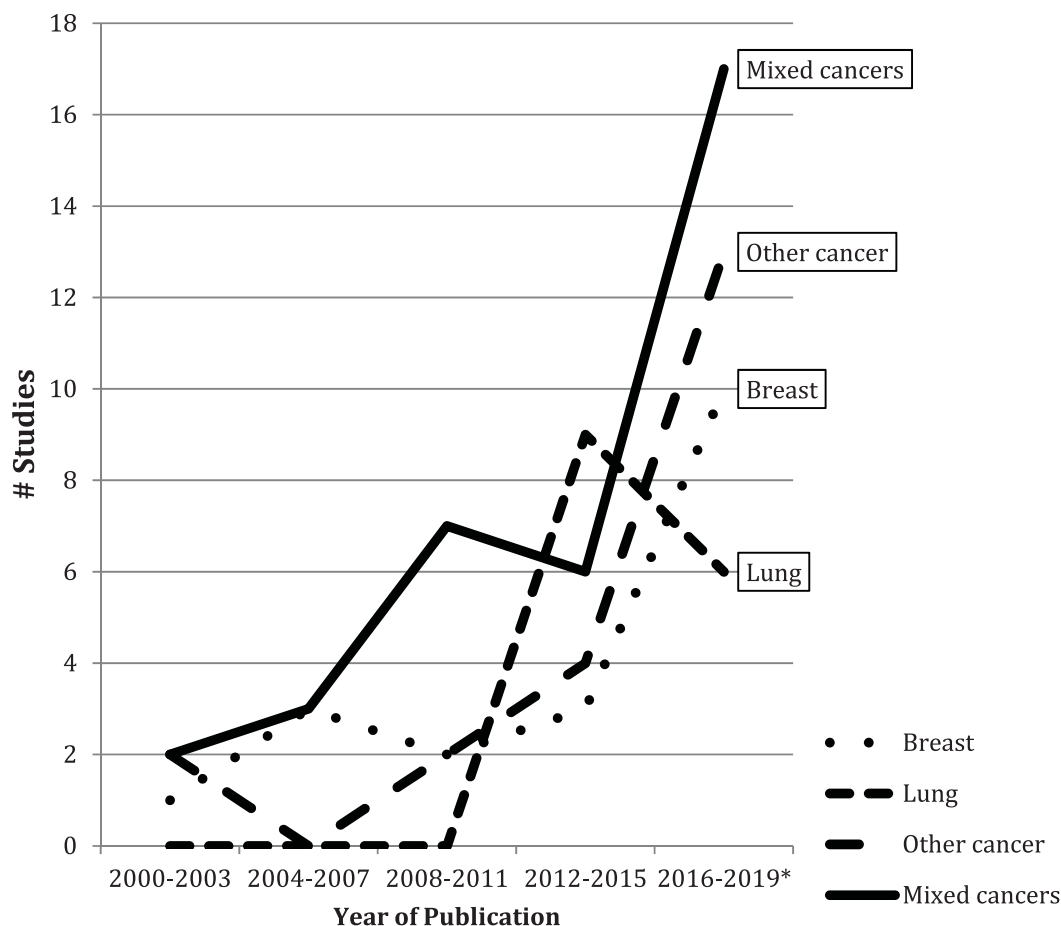
To characterize people living with advanced cancer, cancer staging (stages 3–4) or the presence of metastatic disease were commonly indicated in the studies included in our review, particularly for studies focusing on one cancer type. The increasing use of staging and decreasing relative use of other criteria (e.g., life expectancy) to describe advanced cancer is likely related to the advancements of disease staging criteria, improvements in cancer control therapies, and increases in cancer survival rates (Canadian Cancer Society, 2018, 2019). The evolving definition of advanced cancer, which currently highlights the unlikelihood of cure and the potential presence of disease spread, demonstrates the ongoing challenges with standardizing this definition (National Cancer Institute, 2007, 2020). There remains tremendous heterogeneity within the advanced cancer population and, as noted, a shift toward focusing on specific disease, treatment, or demographic characteristics (e.g., cancer type and presence of metastases) has been adopted to address this concern. The continued identification of specific patient-related characteristics is valuable in order to enhance the transferability of research findings to real-life clinical situations and to recognize apparent population-related gaps.

The characteristics of the studies in our review also demonstrate that more research efforts related to LPA in advanced cancer are focused in older adults (over 60 years) and in women, particularly with breast cancer. Fewer studies in advanced cancer have been conducted with men or young adults. The underrepresentation of these subgroups in cancer rehabilitation

research has been previously highlighted (Johansen, 2007; Høybye *et al.*, 2008). In particular, young adults with cancer face unique needs and challenges, such as psychosocial difficulties, physical symptoms, and health-related concerns, and the need to develop tailored care approaches for this population has been emphasized (Zebrack, 2011; Trevino *et al.*, 2013; Brunet *et al.*, 2018; Avery *et al.*, 2020). As supportive care research in cancer evolves, deliberate efforts are warranted to include underrepresented subgroups, in general cancer studies and advanced cancer studies alike.

Although we did not formally search the literature for studies on the perspectives or involvement of family caregivers or health care providers and only included studies of patients with advanced cancer, one study in our review included patient–caregiver dyads participating in a yoga intervention and two others examined the views of patients and professionals (Milbury *et al.*, 2015; Masel *et al.*, 2018; Payne *et al.*, 2018). Previous research examining the external perspectives of family caregivers, physicians, and physiotherapists has demonstrated these groups believe promoting PA in people with advanced cancer is important and beneficial (Rhudy *et al.*, 2015; Sheill *et al.*, 2017, 2018a). However, in these studies, the presence of specific concerns related to activity recommendations, particularly for patients with bone metastases, and the need for formal education and professional training have been highlighted. Other research within the cancer population also emphasizes the roles of socio-environmental influences, such as social support, perceived environment, and accessibility, in facilitating or impeding PA behavior (Fleury and Lee, 2006; Yen and Li, 2019; Burke *et al.*, 2020). These findings support ecological models, which consider multiple, interactive factors at the individual, interpersonal, and environmental levels that directly impact health behaviors (Glanz and Rimer, 2005). As health professionals and family members can play a critical role in providing support, guidance, and resources for patients with advanced cancer over the care continuum, these areas may benefit from further exploration in the literature.





**Fig. 2.** Cancer diagnosis in included studies by publication year ( $n = 92$ ). Note: \*The search was performed in January 2020 and yielded four included articles published in 2020 (included in the 2016-2019 category).

### LPA programs

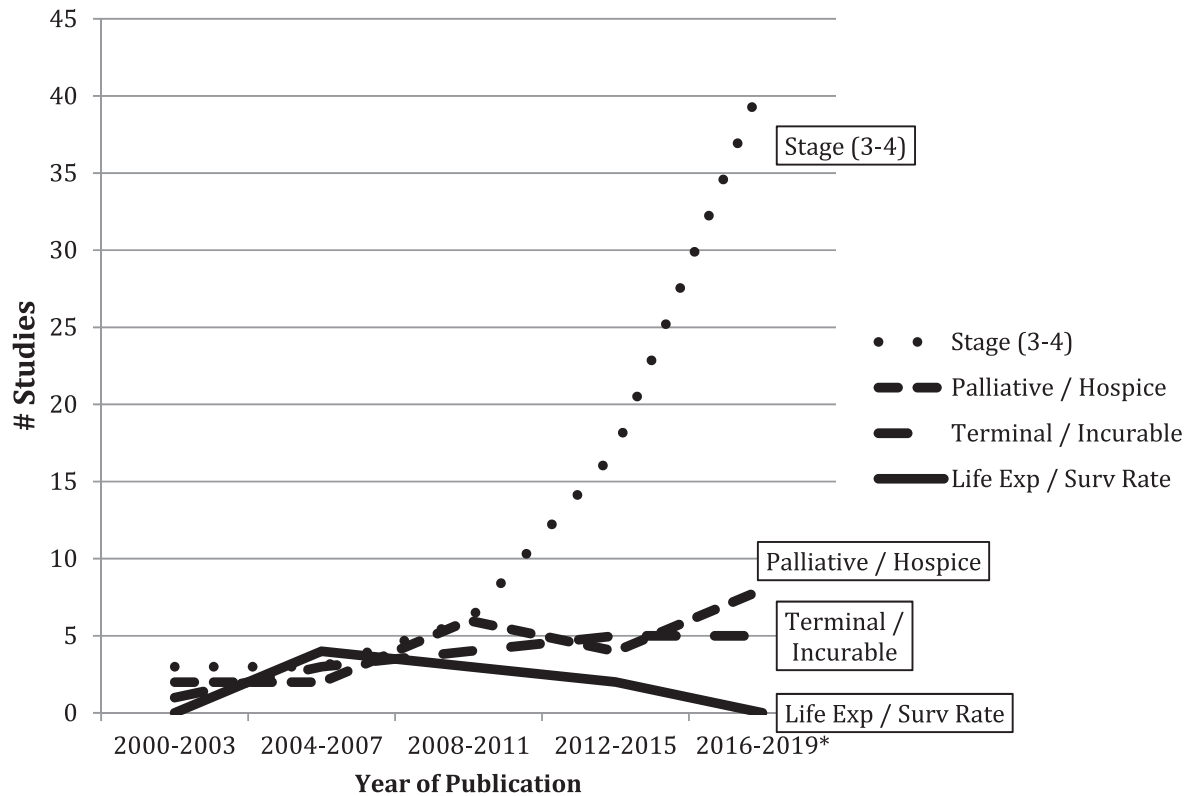
Consistent with other research findings, most studies included in our review explored a program or an intervention with a component of LPA. The majority of these included structured exercise programs of aerobic and resistance training. Findings from these research studies have contributed to an earlier review by Heywood et al. (2017), confirming the safety and feasibility of such types of LPA programs in the advanced cancer population. Recent systematic reviews, including two meta-analyses, have also identified benefits with exercise in people with advanced cancer for certain clinical outcomes, including physical function and quality of life (Lowe et al., 2008; Dittus et al., 2017; Heywood et al., 2018; Nadler et al., 2019; Chen et al., 2020). Other outcomes that may improve with exercise in this population include fatigue, sleep quality, psychosocial function, as well as body composition (Heywood et al., 2018; Chen et al., 2020).

Leisure activities besides structured aerobic and resistance exercise programs, such as mind-body exercises (e.g., yoga, Tai Chi, and Qigong), gardening, dance, or low-impact sports have not been well studied in this population. These activities may be meaningful, enjoyable, and beneficial for patients with advanced cancer and may address some of the barriers experienced by patients toward LPA, such as lack of motivation, lack of enjoyment or familiarity, and challenges with accessibility (Clark et al., 2007; Tsianakas et al., 2017; Sheill et al., 2018b; Hyatt et al., 2019; Mikkelsen et al., 2019). Moreover, mind-body activities, such as yoga and Tai Chi,

may be particularly helpful in managing some of the psychosocial impacts experienced by people with advanced cancer. As noted in our review findings, several of the studies exploring these types of programs have been limited to women with metastatic breast cancer. Research efforts are needed to understand the diverse interests and preferences of patients with different types of advanced cancer and to develop LPA programs that are tailored, meaningful, and accessible for this population.

### LPA outcomes

Many studies with quantitative approaches also examined LPA as a study outcome. Most of these studies assessed adherence to LPA programs or collected information on patient-reported levels of LPA without the use of validated questionnaires. Of those that used questionnaires, the most commonly used one was the Godin Leisure-Time Exercise Questionnaire (Shephard, 1997; Godin, 2011). This patient-reported questionnaire has demonstrated reliability and validity and has been extensively used in different patient populations, including cancer survivors (Amireault et al., 2015). As advanced cancer is frequently characterized by high resting energy expenditure (Bosaeus et al., 2002; Dev et al., 2015), PA assessment tools that are based on estimates of energy expenditure may not be accurate or applicable for this population. Objective measures of PA and other aspects of physical functioning may be feasible and informative (Jones et al., 2007; Gresham



**Fig. 3.** Terms used to describe advanced cancer population in included studies by publication year ( $n = 92$ ); life exp, life expectancy; surv rate, survival rate.

*et al.*, 2018), but these may be limited in distinguishing different domains of PA without the supplementary use of patient-reported measures. Wearable technology is becoming a growing area of interest to facilitate the accurate assessment of PA and energy expenditure and to support the delivery of interventions targeting PA (Freedson *et al.*, 2012; McClung *et al.*, 2018). In recent studies with cancer survivors, the use of digital activity tracking monitors has demonstrated potential value in promoting PA and improving clinical outcomes (Maxwell-Smith *et al.*, 2019; Nguyen *et al.*, 2020). Further exploration of patient-reported and objective PA assessment tools specifically in the advanced cancer population is warranted.

Overall, there were few studies qualitatively exploring LPA in this population and within these studies, several were focused on patients receiving palliative or hospice care and frequently close to the end of life. Women or patients with lung cancer were the subgroups most often included in qualitative reports. Moreover, few studies have specifically explored perceptions related to other leisure activities, such as Tai Chi, Qigong, yoga, dance, and sports. Findings from this scoping review suggest there is limited knowledge on the actual experiences, perceptions, and preferences of people living with different types of advanced cancer related to engaging in LPA.

### Review limitations

Despite our efforts to maintain a broad definition of advanced cancer, it was necessary to refine our inclusion criteria through the selection of specific terms to describe the study population in the research articles reviewed. Using the earlier NCI definition of advanced cancer as our overarching framework (National Cancer Institute, 2007), we limited our selection criteria to include study

population descriptions that indicated stage 3–4 cancers or specified other key terms (e.g., palliative, incurable, and limited life expectancy). Moreover, during the review process, we decided to exclude articles that involved mixed study populations (i.e., studies including patients with advanced cancer as a subgroup).

Another limitation of our review was based on the decision to focus on the leisure-time domain of PA. Several studies excluded from our review examined and targeted other aspects of PA beyond leisure alone, such as total PA, which also considers activities involving physical movement related to occupation, transport and domestic and self-care (Petee Gabriel *et al.*, 2012). These types of activities may be of importance to patients with advanced cancer and, as highlighted within recent qualitative studies, maintaining responsibility and routine through daily life activities is particularly meaningful in this population and may help explain the disconnect between intentions and actual participation in LPA (Cheville *et al.*, 2012; Peoples *et al.*, 2017; Lowe *et al.*, 2020). Finally, we excluded non-English texts during the article screening process. While these limitations may have resulted in missing valuable information on pertinent topics, we have identified through this review an extensive volume and a wide range of studies focusing on LPA in advanced cancer, which provide a global understanding of the scope of published literature and help highlight major gaps in the literature to shape future research inquiries.

### Practical implications

In addition to gaps in the current published literature, the translation of research knowledge to practice has not been well examined in this area. Despite the recent emergence of research supporting exercise interventions, patient education materials targeted to the advanced cancer population are lacking pertinent,

**Table 5.** Studies exploring other (non-structured exercise) LPA programs ( $n = 14$ )

Study population (study)	LPA program description	Main study findings ( <i>from abstract</i> )
<i>Other LPA programs (n = 10)</i>		
3 women with advanced (stage 4) cancer (mixed types; Carr et al., 2016)	Kripaulu and restorative yoga:  Three 45-min personalized home-based yoga sessions	Descriptive qualitative study:  <ul style="list-style-type: none"> <li>Physical, mental, and emotional benefits</li> <li>Alleviation of illness impacts</li> <li>Enhancement of mind-body and body-spirit connections</li> </ul>
21 women with metastatic breast cancer (Carson et al., 2007)	Yoga of awareness:  Eight 120-min weekly group yoga sessions	Pilot/feasibility study:  <ul style="list-style-type: none"> <li>13 women completed intervention</li> <li>Significant pre-post increases in invigoration and acceptance</li> <li>Improved fatigue, pain, invigoration, acceptance, and relaxation on days after increased yoga practice</li> </ul>
15 advanced cancer (mixed types) patients on a palliative care ward (Masel et al., 2018)	Horticultural therapy:  One to three group sessions on palliative care ward	Qualitative study:  <ul style="list-style-type: none"> <li>Themes of well-being, variation of clinical routine, creation and building relationships</li> <li>Positive perception of intervention, but high dropout</li> </ul>
15 dyads of advanced (stage 3) lung cancer patients undergoing radiotherapy and caregivers (Milbury et al., 2015)	Vivekananda yoga:  15 (2–3×/wk ×5–6 wks) 60-min yoga sessions	Single-arm feasibility trial:  <ul style="list-style-type: none"> <li>9 dyads completed intervention</li> <li>No adverse events</li> <li>Mean 10 sessions completed</li> <li>95.5% rated as very useful</li> <li>Improved mental health (patients) and sleep disturbances (caregivers)</li> </ul>
27 women with metastatic breast cancer (Oh et al., 2014)	Medical Qi Gong:  15 60-min weekly group sessions ( <i>vs. meditation control intervention</i> )	Phase II randomized controlled trial (feasibility):  <ul style="list-style-type: none"> <li>9/14 completed Medical Qi Gong intervention</li> <li>No adverse events</li> <li>Medical Qi Gong vs. meditation: no differences in QOL, fatigue, stress, and sexual function; significant difference in neuropathic symptoms</li> </ul>
20 patients with metastatic cancer (Poletti et al., 2019)	Mindfulness-based stress reduction <sup>a</sup> :  Eight 2.5-hr weekly meetings and one 4.5-hr session	Mixed-method study:  <ul style="list-style-type: none"> <li>75% meeting attendance and adherence to home practice</li> <li>Promoted accepting attitude to metastatic cancer disease</li> <li>Improved self-regulation of mood state</li> </ul>
63 women with metastatic breast cancer (Porter et al., 2019)	Mindful yoga:  Eight 120-min weekly group sessions ( <i>vs. support group control</i> )	Randomized pilot study:  <ul style="list-style-type: none"> <li>65% attended <math>\geq 4</math> yoga sessions</li> <li>80% highly satisfied with yoga</li> <li>Yoga vs. support: modest improvements in some outcomes with yoga</li> </ul>

(Continued)

**Table 5.** (Continued.)

Study population (study)	LPA program description	Main study findings ( <i>from abstract</i> )
91 women with metastatic breast cancer (Rao <i>et al.</i> , 2017)	Integrated yoga based stress reduction: 24 (2×/wk ×12 wks) 60-min sessions ( <i>vs. education and supportive therapy</i> )	Two-arm prospective RCT: <ul style="list-style-type: none"> <li>• Significant improvements in symptom distress, sleep quality post-intervention</li> <li>• Decreased morning waking cortisol post-intervention (yoga only)</li> <li>• Yoga <i>vs.</i> control: improved NK cell percent post-intervention</li> </ul>
91 women with metastatic breast cancer (Vadiraja <i>et al.</i> , 2017)	Integrated yoga based stress reduction: 24 (2×/wk ×12 wks) 60-min sessions ( <i>vs. education and supportive therapy</i> )	Two-arm prospective RCT: <ul style="list-style-type: none"> <li>• Yoga <i>vs.</i> control: improved perceived stress, fatigue, and diurnal variation</li> <li>• Positive correlation between change in fatigue severity and 9 a.m. salivary cortisol</li> </ul>
24 patients with advanced (stage 3–4) NSCLC or GI cancer receiving chemotherapy (Vanderbyl <i>et al.</i> , 2017)	Medical Qigong: 12 (2×/wk ×6 wks) ×45-min group sessions ( <i>vs. SET</i> )	Two-arm randomized cross-over study: <ul style="list-style-type: none"> <li>• 19 patients completed both interventions</li> <li>• No differences between groups in anxiety, depression, or QOL changes</li> <li>• Qigong <i>vs.</i> SET: SET better at improving strength and walking distance; greater benefits with SET for symptoms and walking distance when offered as first intervention</li> </ul>
<i>Combined LPA programs (n = 4)</i>		
55 women with stage III breast cancer during radiotherapy (Arun <i>et al.</i> , 2017)	Comprehensive lifestyle intervention ×4–6 wks followed by video-conference sessions over 12 months including behavioral counseling/social support, exercise (aerobic and resistance), nutritional counseling, and mind-body practice (meditation and yoga)	RCT (in progress): <ul style="list-style-type: none"> <li>• High accrual and low dropout rates</li> <li>• High attendance to in-person session and video counseling</li> <li>• Qualitative findings: importance of comprehensive nature, especially mind-body/mindfulness component and social support, and meaningful lifestyle transformations</li> </ul>
90 women with metastatic breast cancer (Block <i>et al.</i> , 2009)	Comprehensive integrative cancer care program combining conventional treatments with nutrition and supplementation, fitness (including interval/endurance training, strengthening, adapted yoga/Pilates/qi gong) and mind-spirit instruction (psychosocial education)	Consecutive case series: <ul style="list-style-type: none"> <li>• 5-year survival rate 27% (<i>vs.</i> 17% for comparison patients)</li> </ul>
28 patients with metastatic melanoma treated with immunotherapy (Lacey <i>et al.</i> , 2019)	Tailored supportive care intervention ×8 wks including exercise, dietary advice, noninvasive complementary therapies (massage, reflexology yoga, qigong, mindfulness meditation, or acupuncture), and psychology consultation	Pre-post-test feasibility cohort study (supportive care and usual care <i>vs.</i> usual care): <ul style="list-style-type: none"> <li>• Intervention group: 50% completed all prescribed exercise sessions and overall 85% exercise adherence; integrative therapies accessed by 85% participants</li> </ul>

(Continued)

Table 5. (Continued.)

Study population (study)	LPA program description	Main study findings (from abstract)
9 patients with advanced cancer (mixed types) from home hospice care (Porock et al., 2000)	Duke energizing exercise plan ×28 days consisting of home-based individualized exercise program/ physical activities (e.g., walking, marching, dancing, and gardening)	Pilot pre-test post-test study with case analysis approach: <ul style="list-style-type: none"> <li>• Increased activity levels with no increase in reported fatigue</li> <li>• Trend toward increased QOL and decreased anxiety</li> </ul>

hr, hour; min, minute; wk, week.

GI, gastro-intestinal; LPA, leisure-time physical activity; NSCLC, non-small cell lung cancer; QOL, quality of life; RCT, randomized controlled trial; SET, standard endurance and strength training.

<sup>a</sup>Including training and practical meditation, body scan, light yoga, simple walking meditation, and Aikido exercises.

updated information on this topic (ESMO Palliative Care Working Group, 2011; National Cancer Institute, 2014; Canadian Cancer Society, 2017). Novel knowledge translation strategies are needed to transfer and implement research information to practice and to facilitate access to appropriate, evidence-based knowledge in patients and health professionals.

As the importance of LPA is increasingly recognized for people with advanced cancer, clinicians specialized in oncology and rehabilitation may wish to further consider their role in optimizing leisure activities that are meaningful to patients and guiding effective LPA programs to improve clinical outcomes, such as physical function and fatigue. With access to updated relevant literature, health professionals and researchers in these areas can establish and deliver evidence-based supportive care strategies and programs for this patient population. Further efforts are needed to translate and personalize research findings in cancer rehabilitation practice through the development and implementation of tailored clinical programs and educational materials.

## Conclusion

To our knowledge, this is the first scoping review of published research exploring LPA in people with advanced cancer. Research on this topic is rapidly expanding, with a focus on studies examining structured aerobic and resistance exercise interventions using traditional quantitative methods. There is insufficient knowledge on the experiences and perceptions of patients with advanced cancer toward engaging in LPA. Moreover, little is known about leisure activities, such as yoga, dance, and sports, particularly in patients with non-breast cancer diagnoses. To optimize the potential benefits of LPA on physical function and quality of life in individuals with advanced cancer, more research is needed to address the gaps in the current body of literature and to develop personalized evidence-based supportive care strategies for this population.

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