

Social support and physical activity for cancer survivors: A qualitative review and meta-study

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Abstract

Purpose: Physical activity (PA) is important for well-being and coping among cancer survivors. Social support (SS) encourages adoption and maintenance of PA behaviour, and PA contexts can provide opportunities for obtaining support for coping with cancer. The qualitative literature examining cancer survivors' experience with SS in and for PA could inform understanding of behaviors experienced as supportive. The purpose of this meta-study was to synthesize the research on adult cancer survivors' experiences with SS related to PA.

Methods: Following meta-study guidelines, we searched nine databases and retrieved 39 articles describing intervention and observation studies, and extracted, analyzed, and synthesized information addressing SS and PA in cancer survivors.

Results: Results emphasized ways that PA contexts facilitate relationships, which are a foundation for obtaining supportive behaviours that enable PA (e.g., providing encouragement and accountability) and assist with coping with cancer (e.g., understanding and talking about cancer). Some themes identified were unique to studies with female breast cancer, advanced cancer, interventions or programs, and that used interviews versus focus groups.

Conclusions: Understanding supportive behaviours could improve PA and coping with cancer in interventions. Future research should focus on identifying supportive behaviours, incorporating theory and methods to address the development of supportive relationships, and recruiting more diverse samples of participants in terms of gender, race/ethnicity, and cancer type.

Implications for cancer survivors: PA can provide opportunities for positive social connections ranging from loose to close social ties, and this research identifies several behaviours in the PA context that may be supportive of PA behavior (e.g., providing actionable information), and coping with cancer (e.g., opportunities but low obligation to talk about cancer).

Keywords

Cancer, oncology, exercise, exercise psychology, physical activity, social networks

Background

Coping with cancer presents challenges that can persist long into survivorship [1,2]. Physical activity (PA) contributes to physical and psychosocial rehabilitation following cancer [3,4], and social support (SS) can facilitate PA motivation, and coping throughout the survivorship trajectory [5-7]. Many PA interventions are thought to facilitate support among cancer survivors by providing opportunities for social interactions [8]. But it is not established what actions taken by other people are experienced as supportive, or how to facilitate effective support in PA programs for cancer survivors [9].

Supportive relationships are essential for well-being [10], and a resource for coping with stress [11] such as the challenges faced through cancer survivorship. SS is a broad, multidimensional concept [12], and has been conceptualized in many ways including perceptions of available support, received support, network size, support quality, functions (e.g., emotional, informational), and providers. SS has been defined as any social interaction that is intended to induce positive outcomes [13], but can also encompass unintentional efforts to assist, such as modeling physical activity behavior [14], and relational elements such as belonging [12]. Support can also be ineffective or unwanted [15].

A diverse literature addresses the role of SS in PA among cancer survivors. The quantitative literature, including both observational cohort studies and quasi-experimental and randomized trials, provides evidence of positive associations between PA and social support [16], and includes evidence using a variety of approaches to conceptualizing and measuring social support including the presence of relationships in one's life (e.g., network size), other people's PA behavior (e.g., modeling), perceptions of being supported (e.g., in general, for PA, by particular people, or aggregate scores of multiple support concepts), and support functions (e.g., informational) and relationship quality [9]. But, most of the quantitative evidence addresses associations between overall perceptions of social support or the number or presence of people in one's social network, and few quantitative studies address what behaviours are experienced as supportive [9]. A better understanding of supportive behaviours and functions they serve is important for understanding how to facilitate support in this context. Because qualitative research can involve detailed examinations of experiences with social support, including accounts of behaviours and the context in which they occurred, a synthesis of this literature may be informative for future intervention research.

Recent theory emphasizes the need to explore supportive behaviours and the functions they serve to identify how to facilitate and improve support [17]. A synthesis of the qualitative literature examining social support in the

context of physical activity interventions and naturally occurring support for physical activity in survivors' lives could provide insights into the supportive behaviours that can enable PA and provide support for coping with cancer through PA. The effectiveness of and receptiveness to supportive behaviours may be best understood within the social contexts people inhabit. Furthermore, synthesis of a body of qualitative research is more persuasive for informing practice than individual studies [18,19]. The purpose of this meta-study was to synthesize the qualitative research on cancer survivors' experiences with SS related to PA.

Methods

Methodology

We followed qualitative meta-study guidelines [19] to analyze and synthesize the methods, theory, and data in the qualitative literature. Meta-study emphasizes interpretation of data to synthesize new knowledge. The protocol for the search was registered with PROSPERO prior to commencing the search (CRD42016052278, www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42016052278). A systematic review of the quantitative studies retrieved from the same original search is reported elsewhere [9], and this manuscript reports on a synthesis of qualitative papers (albeit with a more recent final update to the search). Data sharing is not applicable to this article as no new data were created or analyzed in this study.

Search

We searched the literature investigating (1) PA interventions or programs, or naturally occurring PA (bodily movement produced by skeletal muscles requiring energy expenditure [20], but excluding joint-specific rehabilitation exercises, such as physiotherapy exercises, and excluding behaviour change interventions not including performing PA); and (2) SS, broadly defined to include social interactions intended to help another person, the presence of other people in one's life, social influences such as modeling PA behavior, and relational elements such as belonging [12, 13, 14]; among (3) adult cancer survivors. The search was guided by a librarian with expertise in systematic reviews. Included articles were identified by two reviewers up to July 2019. We did not specify a lower limit for publication date, but included articles ranged from 2004-2019. We searched Medline, Embase, PsycINFO, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, Cinahl, SportDiscus, Social Work Abstracts, and Family and Society Studies Worldwide. The list of Medline search terms are previously published [9]. We also included papers known to the authors.

Screening

The search and selection process is detailed in Figure 1. Two reviewers screened titles and abstracts. When eligibility was unclear, they examined the full text. Both reviewers arrived at consensus regarding inclusion. Disagreements were resolved by the lead author. Articles were included if they (1) were conducted with adults ≥ 18 years of age diagnosed with cancer; (2) involved a PA intervention or program, or inquired about naturally occurring PA; (3) reported on the relationship between SS and PA; and (4) were original primary research published in English in a peer-reviewed journal. This meta-study included studies employing a qualitative methodology. We excluded papers that reported programs or interventions including multiple components or targeting multiple behaviours where it was unclear if results pertained to SS and PA.

Data Collection

One reviewer extracted citation details, participants, program/intervention characteristics, design, methodology, philosophical tenets (i.e., ontology and epistemology) of the qualitative approach used, theory used in conceptualization through data analysis (i.e., excluding references to theory that only discussed its use in other literature in the introduction, or were raised in the discussion), and results related to SS and PA. Data collection was verified by a second reviewer who independently conducted the extraction procedures, results were compared and discrepancies between the reviewers were resolved when possible through consensus discussion between the two reviewers. Any remaining differences were resolved by the lead author.

Data Analysis

The lead author conducted a meta-method analysis, meta-theory analysis, meta-data analysis, and meta-synthesis [19]. NVivo 12 was used to manage data during analysis. The meta-method analysis examined methods used in each study, and their relation to the findings within and across studies. The meta-theory analysis examined conceptual frameworks used in each study, patterns in use of theory across studies, and how theory influenced the findings. We used a matrix to organize data in the meta-theory and meta-method, and to look for patterns across studies in the meta-synthesis. The meta-data analysis involved a thematic analysis, using a constructivist epistemology, of the results pertaining to SS and PA from the primary studies, followed Braun and Clarke's [21] analytic steps (i.e., reviewing all of the extracted data for familiarization, initial coding of data from each study for all ideas related to the research question, organizing codes into groups of similar ideas and generating potential themes, reviewing all of the data within each initial theme and comparing to data across the dataset, defining and naming final themes, and writing a description of each theme with supporting data). At the conclusion of those

analysis with all studies, a meta-synthesis examined connections, interpreted, and integrated results across the three analysis components [19]. The second author, who had collected data, and the seventh and eighth authors, who have extensive knowledge of this research area and theoretical considerations of qualitative methods, reviewed and provided critical feedback on the results, which were incorporated into the final results.

Quality Assessment

Study quality was assessed by two reviewers based on recommendations by Sparkes and Smith [22] and Garside [23] and assessed technical aspects (six items, e.g., clarity of the research question), trustworthiness (six items, e.g., evidence of reflexivity), theoretical considerations (two items, e.g., is there connection to a wider body of knowledge), practical considerations (three items, e.g., potential contribution to policy or practice), and one item assessing whether the researchers identify criteria by which the quality of their study should be judged. Each item was rated as “yes” if fully addressed, “partially” if partially addressed, or “no” if not addressed, and the sums of “yes”, “partially”, and “no” ratings were calculated for each article. Because qualitative studies are undertaken from a variety of philosophical perspectives, to the best of our ability we assessed these elements of trustworthiness with consideration of the philosophical and methodological tenets of each study. Details on the quality assessment are available in a supplemental table. We did not exclude studies based on quality because there is not consensus on rating quality, and studies of lower quality may still contribute to the research objective [24].

Results

Search Results.

5744 records were retrieved, plus two articles were identified by the authors based on searching reference lists of included articles. After removing duplicates, titles and abstracts of 3826 articles were screened, and 39 articles were included (see Figure 1). Two of these articles [25,26] were based on the same study. Most criteria, with the exception of evidence of reflexivity and identifying criteria by which the quality of the study should be judged, were rated as “yes” for the majority of studies. Articles ranged from 9-18 “yes” scores on the 18 total items.

Meta-Method.

Study characteristics are provided in Table 1. Studies were published between 2004-2019, and included $n=28$ studies with one, and $n=10$ studies with more than one time point. Most ($n=26$) studies examined participants in an intervention or program, and $n=9$ of those studies were part of a randomized controlled or quasi-experimental trial. The remaining $n=11$ studies examined naturally occurring PA and did not focus on a specific intervention or

program. 798 cancer survivors participated in the included studies, and sample size ranged from 3-60. Age ranged from 18 to over 90 years. Most participants were women (69%), breast cancer survivors (56%), and of the $n=20$ studies that reported race/ethnicity, 76% were Caucasian. A total of $n=13$ studies included participants who were post-treatment, $n=11$ focused on those in-treatment, $n=9$ included a combination of in and post-treatment, while $n=5$ stated they included participants who were post-diagnosis or post-surgery, but it was not clear whether participants had completed treatment. Most ($n=24$) studies did not report cancer stage, while $n=8$ focused on early stage (stage 0-3), $n=2$ focused on advanced cancer, and $n=4$ included both early stage and advanced cancer.

Of the studies involving an intervention or program, most ($n=23$) involved participating in PA with other survivors in a group, team, partner, or community event setting, leading to a focus on SS from other survivors or instructors. Interventions were 6 weeks to 1 year ($M=14.6$ weeks), with $n=4$ additional studies examining ongoing programs with no specific duration, and $n=1$ study examining a one-day event. Of those reporting location $n=9$ were in medical settings, $n=2$ at survivorship centers, and $n=12$ were community-based.

Most studies ($n=24$, including $n=5$ mixed methods studies) used a general qualitative approach and did not specify a qualitative methodology. Other methodologies included phenomenology ($n=5$), interpretative phenomenological analysis ($n=4$), ethnography ($n=1$), creative analytic practice ($n=1$), grounded theory ($n=2$), interpretive description ($n=1$), community coalition action ($n=1$), and narrative ($n=1$). While there is overlap between methodology and analysis, data analysis techniques included: content, basic qualitative, inductive, or constant comparative ($n=14$); thematic ($n=7$); grounded theory ($n=2$); framework ($n=3$), phenomenology ($n=4$); interpretative phenomenological analysis ($n=3$); interpretive description ($n=1$); narrative ($n=1$); and creative analytic practice ($n=1$). A total of $n=12$ studies did not state a philosophical viewpoint. Stated philosophies included naturalistic ($n=4$), relativist ($n=2$), and realist ($n=1$) ontologies; and hermeneutic or interpretivist ($n=7$), constructionist ($n=3$), constructivist ($n=3$), feminist ($n=2$), contextualist ($n=1$), idiographic ($n=1$), and phenomenological ($n=1$) epistemologies. Most studies used interviews ($n=24$), focus group ($n=10$), or a combination ($n=1$) to collect data. Open-ended questionnaires were used in $n=2$ studies, while $n=1$ involved participant journals, and $n=1$ participant observation.

Meta-Theory

A total of $n=14$ studies used substantive theories to conceptualize the study ($n=4$), to design the intervention ($n=1$), to design interview guides ($n=6$), as a sensitizing framework for data collection and analysis ($n=1$), to guide

interpretation during analysis ($n=5$), or to inform deductive analysis ($n=2$). Theoretical models included theories of explanatory models ($n=1$), treatment adherence ($n=1$), theory of planned behavior ($n=2$), transtheoretical model ($n=1$), social cognitive theory ($n=3$), body image ($n=1$), stress and coping ($n=3$), SS ($n=3$), posttraumatic growth ($n=2$), group cohesion ($n=1$), physical self ($n=1$), embodiment ($n=1$), self-determination theory ($n=1$), common sense model of health and illness ($n=1$), health belief model ($n=1$), and social ecological theory ($n=1$). Most ($n=25$) studies did not explicitly use theory, suggesting there is potential for future studies to adopt theoretical approaches to understand SS processes. Of those studies that did use theory, some theories did not focus on SS processes. For example, several studies employed social ecological models or social cognitive theory, which include SS, but are not theories of support per se because they examine support in terms of barriers and facilitators to PA.

Meta-Data Analysis

Resultant themes are shown in Table 2, and are indicated in italicized font below. Themes were categorized (indicated by bold headings) based whether they addressed underlying relationships and connection in PA, provided support for engaging in PA, or provided support for coping with cancer.

Relationships and connection through PA addressed how relationships were affected by the PA context. Relationships ranging in intimacy from loose social ties to close friendships were a foundation for providing SS. PA provided *opportunity and meaning for building relationships*. PA provided a place and a reason to come together, and to interact regularly, which allowed for relationships to develop, and participants to become closer and more comfortable with each other over time. It also provided a shared experience other than cancer, and a positive focus. Opportunities for physical touch through hugs or contact instrumental to the physical activity [27] also fostered bonds. Initiating contact with an established group was sometimes intimidating, but intentionally introducing or reaching out to new members, or asking how they are doing on a regular basis reduced this barrier. Group PA contexts could also feel alienating when participants felt that they were dissimilar to other participants in terms of their PA ability being poorer, or their cancer experience being less severe, and therefore less deserving of support.

PA contexts typically fostered positive connections in the form of *camaraderie, belonging, and friendship*. The relationships that developed were sometimes loose social ties that participants identified as providing camaraderie through meeting people and making acquaintances, being around other people repeatedly over time, and building a shared sense of trust and sharing. Some of these relationships developed into a deeper sense of belonging to a group, or to close friendships with particular other people with whom they felt close. These

relationships typically developed to be closer over time, although their shared experience with cancer and PA was sometimes seen to accelerate the formation of these connections.

However, relationships could also be challenging, and experiences of *conflict and ostracism* including feeling controlled, being isolated, or experiencing conflict with others or with the priorities of the group (e.g., views about competition) sometimes occurred and affected distress and PA involvement. While positive connections were the prevailing experience, when the expectation for connection and support was not met, it was disappointing and often deeply felt.

Support for PA

Recommendations from medical professionals or other trusted people to become more active or join a particular program were supportive if they provided specific, actionable information, not only general recommendations to be active. Actively recommending participation and providing information about programs helped participants navigate decisions about engaging in PA and identify programs, often at a time when they were managing a lot of other decisions and new information. Personal recommendations from trusted people who knew them helped convince them that they might like a particular program. *Encouraging* PA through intentional, proactive, positive comments pushed survivors to challenge themselves. Encouraging comments reinforced that their decision to engage in PA was a good one, boosted confidence, motivated greater effort, and enhanced positive affect. Comments discouraging PA were detrimental to motivation. Most examples of encouragement involved positive affirmations about their PA behaviour, and reminders were identified as encouraging if not controlling. Exercising with other survivors provided *accountability* for participation and effort. Accountability was described as an intrinsic function of being in a group, of seeing what other people with similar circumstances can do, rather than overt messages pressuring them to engage in PA, so was typically not experienced as controlling in those settings. Participating together created an obligation to show up and work hard, and provided role models who inspired participating and working hard by demonstrating it was possible. Some survivors articulated that they would not have put in as much effort if exercising alone. Doing PA together also provided *companionship* by affording company and connection, and alleviating loneliness. Some activities required others to perform the activity, but companionship was important even in individual activities like walking. Being surrounded by other active people made it easier to join in, and exercising alone was often seen as more difficult. Sometimes, this companionship was described as having someone to talk to during PA, but often simply referred to being with others. Social interactions

also *made PA fun* because being with others can be intrinsically enjoyable, and alleviate boredom. Banter, cheering, talking to others, laughing, being with each other, and participating together made PA fun.

When instructors were highly trained and had expertise and experience guiding cancer survivors in PA, participants trusted their *instruction to help them perform PA safely and effectively*. Survivors felt safe and willing to try PA and push themselves when they trusted their instructors. Expert instructors were also better able to explain the benefits of exercise, and the rationale for things like proper form or a particular workout structure, which was motivating and built confidence. Fostering a *mastery* (individual improvement) *emphasis* in group PA was an important support, and occurred when instructors provided individualized feedback, and other survivors promoted a non-competitive environment. This mastery focus helped participants focus on working toward individual goals and improvement. One study with female survivors identified that if spouses or family helped *do domestic tasks* such as housework or child care, or if they had an equitable division of domestic labour with their spouse, it gave them more time for PA.

Support for coping with cancer

Support in this category was primarily provided by other survivors and/or instructors in group PA programs or interventions. These contexts provided contact with other survivors who *understood the cancer experience* and empathized with them, which reduced feelings of isolation. They had an implicit understanding of what each other had been through and knew how to react to their concerns. Making these connections in a PA context was important because the focus was not on cancer. However, even with cancer de-emphasized, contact with other survivors could be a stressful reminder of cancer. Interacting with other survivors carried risks of feeling overwhelmed by the reminder of their own cancer and mortality, having to cope with the recurrence or death of another participant, and being more visible and approachable by other survivors who may want to discuss cancer at times when they did not welcome such conversations. In some cases, survivors disengaged from PA groups as a result. But some found this stress nurturing aspects of posttraumatic growth such as strengths and gratitude by reminding them of what they had been through. The importance of connections with other survivors was highlighted by experiences of isolation when survivors had to wait for a session to start to begin participation, or programs were suspended for holidays or ended.

Opportunities to *talk about cancer* allowed survivors to process their experiences through expressing thoughts, listening, and developing narratives with people other than family and friends. This theme included sharing information, including facts, suggestions, and opinions about cancer, treatment, and coping. However,

survivors were not expected to talk about cancer in PA programs, which many felt was an important distinction from support groups. Group PA also *normalized cancer* by bringing people together who had been through similar difficulties and had similar physical effects. This commonality made it safe to be vulnerable, and feel at ease with their bodies and emotional struggles. It was important that they were not treated as a patient or a victim. Their involvement in PA also gave them something to talk about with other people that was not cancer. Humor and breaking taboos about cancer was an important method for normalizing cancer. Here, with others who had faced similar fears and challenges, they could share dark humor and tell jokes that could be awkward in other settings. Sharing jokes and laughter with peers who were focused on moving on from cancer was a way to approach the topic of cancer, break down some of the fear, and get on with life.

Many studies referred to the power of seeing and getting to know others who *modeled living well with and after cancer*. These experiences provided hope and tangible evidence that it was possible to thrive after cancer, and were referred to as life affirming, empowering, and demonstrating the possibilities in life after cancer. Several studies described group members providing emotional and tangible support to others during a recurrence or crisis, and provided a vivid demonstration that *support would be available if needed* if they were struggling emotionally or became ill again themselves. That availability of support reduced anxiety related to the uncertainty of cancer recurrence because they knew they had ready access to support, even if they didn't need it right now. These acute situations and everyday interactions with other survivors also provided opportunities to *support others*. Giving to others provided meaning, fostered solidarity, and led to the feeling that being part of the group was not only about meeting their own needs, but also about giving back. Providing support to others was sometimes problematic if that support was unwanted by the receiver. But most descriptions of providing support were positive and were seen as opportunities to give rather than rely on others, feel like they were repaying the support they had received, express gratitude, help others, and take the focus off of themselves.

Meta-Synthesis

Examining the themes from the meta-data analysis in light of the meta-methods and meta-theory results provided insights into how themes are interrelated, and how results may be affected by who is studied, and how. Relationships are the foundation upon which social support was provided. PA can be an important context for support because it can create conditions that facilitate building or strengthening relationships from loose ties to close bonds, which can create relationships that may offer novel opportunities for or forms of support for some survivors.

The two categories of support were distinguished by their focus on providing support for PA or coping with cancer, but their effects were not entirely distinct. For example, the opportunity to obtain support for coping with cancer was often part of the motivation to attend PA programs. Likewise, support for PA can help with coping with cancer, by improving symptom management and mental health, and embodying a way to move on from cancer.

Examining the themes across the populations included in the studies provides insights into variations in support. It was not possible to disambiguate cancer type and gender because all women-only studies were with breast cancer survivors, all men-only studies were with prostate cancer survivors. But several themes were found only in studies with female breast cancer survivors: conflict and ostracism, doing domestic tasks, normalizing cancer, modeling living well after cancer, knowing that support is available if needed, and opportunities for supporting others. Conversely, making PA fun was only addressed in studies that included male prostate cancer survivors exclusively, or were mixed gender samples. There were also notable differences based on cancer stage in that studies including only those with advanced cancer did not identify opportunity and meaning for building relationships, conflict and ostracism, making PA fun, instructing how to be safe and effective, normalizing cancer, modeling living well after cancer, and supporting others as important supportive behaviors and functions.

We also noted differences between studies based on focus on interventions or programs versus naturally occurring PA, and based on data collection methods. Only studies examining interventions or programs identified the themes modeling living well after cancer, supporting others, making PA fun, having a mastery focus, and experiencing conflict and ostracism. These themes may have been more likely in these studies because they are facilitated by the opportunity to be with other survivors, and/or by having formal PA instruction, in the case of mastery focus. These differences did not align with any intentional efforts to foster social support described in the procedures, beyond bringing survivors together, and most forms of support were found across both types of studies. Finally, none of the focus group studies identified conflict or ostracism, modeling living well after cancer, or supporting others, themes that all reference interactions with other people.

Discussion

The purpose of this meta-study was to synthesize the qualitative research on cancer survivors' experiences with SS related to PA. The findings include supportive behaviours and functions that may be useful in enhancing support in PA contexts for cancer survivors. It also highlights the role PA may play in fostering relationships and support. Furthermore, this synthesis identifies areas of future research that could expand our understanding of, and

327 improve, SS in this population.

328 The supportive behaviours and functions identified as supporting PA and coping with cancer are an important
329 contribution, as research in this area has not previously focused on specific supportive behaviours and functions,
330 which are important for identifying ways to improve support for PA [9, 16]. Behaviours that supported PA were
331 well aligned with many models of PA motivation and behavior change, emphasizing support that enhances fun and
332 mastery, as well as enabling forms of support such as encouragement and accountability via being together versus
333 persuasion or pressure which can undermine autonomy and backfire [64]. It was notable that having others who
334 understand the cancer experience and opportunities to talk about cancer were widely discussed across most studies.
335 Many contexts, such as support groups, can provide similar opportunities, but some studies identified that
336 experiencing these forms of support in the PA context was uniquely helpful, as it took the explicit focus off of
337 support and discussion, which some survivors may find less intimidating, or that it better meets their needs [e.g.,
338 34,53].

339 The findings also highlight the role of relationships underpinning support. It is useful to consider the range of
340 intimacy in the relationships experienced in or surrounding the PA context, and the types of support they can
341 engender [65]. Given that most studies spoke to support from fellow participants who were also survivors and part
342 of a group PA program, many of the supportive behaviours were provided by those with whom they had positive
343 relationships described more in terms of camaraderie than close friendship. Close relationships are important, but
344 these looser social ties can also provide support [66]. It was not possible to disentangle what forms of support were
345 provided by what level of closeness of relationship, as the underlying studies were not designed to address that
346 question, but it may be a useful avenue for future research.

347 The results of the meta-synthesis also identify variations in social support themes reported across populations
348 and study conditions. These differences could represent not only population or condition differences, but also
349 differences in how the authors chose to focus these. But they do provide avenues for future examination. In
350 particular, the finding that only studies with female breast cancer survivors identified the importance of obtaining
351 assistance with domestic work is consistent with literature identifying gender imbalances in domestic labour that
352 tend to disadvantage women [67]. Furthermore, that this population discussed the importance of knowing that
353 support is needed even if they do not access it, and having opportunities for supporting others is consistent with
354 theory and research that identifies that people often have a difficult time requesting support, and find doing so easier

in the context of relationships where they also have opportunities to reciprocate [68], and that this phenomenon may be particularly salient for women due to the tendency to be socialized and engaged in caregiving roles [69].

The differences in themes based on cancer stage seems likely to reflect the shift in needs for those with advanced cancer. It is possible that some themes are less relevant to the concerns of those with advanced cancer. For example, developing new relationships may not be a priority as people become more selective about who is included in their social networks when they know time is short [70] and building new relationships with other advanced cancer survivors may heighten anticipated grief if and when those new friends succumb to cancer. Furthermore, support in the form of normalizing or modeling or living well after cancer may not resonate as relevant for this population, and they likely have reduced capacity to focus on supporting others.

In addition to these differences based on who was studied, differences in themes that emerged in studies that examined interventions or programs versus naturally occurring PA, and differences based on how data was collected provide insight for future research. A handful of themes (modeling living well after cancer, supporting others, making PA fun, having a mastery focus, and experiencing conflict and ostracism) were only found in studies examining interventions or programs, and seem to largely reflect support experiences that are more relevant in contexts where survivors come together to engage in facilitated PA. But the types of support identified were largely similar across these types of studies, and forms of support identified only in programs or interventions were not typically aligned with intentional efforts to foster these types of support through intervention design. This finding is consistent with previous observations that most group PA interventions and programs do not tend to focus on intentional means of fostering support, beyond bringing people together [71]. Therefore, there may be room for exploring means to further enhance support through intentional efforts. Furthermore, future studies on this topic should consider that the social dynamics present in focus groups may limit discussion on sensitive topics. Future studies should consider social dynamics such as potential difficulty talking about negative interpersonal experiences (e.g., conflict) or making claims about one's own positive behaviour (e.g., supporting others) in the presence of one's peers. Therefore, an over-reliance on focus group methods may limit what is known about social support.

Study Limitations

Limitations of this review include that we only included peer-reviewed studies published in English, which may have excluded some ideas, and be subject to biases in what ideas are published. Synthesizing literature across philosophical and methodological perspectives is antithetical to some philosophical viewpoints that emphasize a

wholistic view. This set of studies predominantly used generic qualitative and/or interpretive approaches, which aided the synthesis, but studies that adopted more critical or post-structural philosophies were harder to integrate, and the wholistic meaning of individual studies cannot be adequately represented. Limitations of the collective body of literature on which the review was based include that the reliance on single interviews may limit the depth of data and ability to discuss how relationships develop. The trend toward general methodological/analytical approaches may limit the depth of findings and focus on describing participants' explicitly articulated views. Many studies included survivors both during and post-treatment, and results were often not distinguishable across these groups, making it difficult to consider distinctions in support along the survivorship continuum. Furthermore, findings are drawn from data that collectively is disproportionately from Caucasian female survivors of breast cancer. Given that SS is subject to cultural, socioeconomic, and gendered socialization influences, and may be more available to those with more common forms of cancer, these findings may not capture the support needs and experiences of other segments of the population. We posit that while problematic, this synthesis is a useful avenue for identifying practical applications as well as areas in need of further study, and presents a synthesis of what is currently understood from the qualitative literature on SS in PA contexts for adult cancer survivors.

Implications for Cancer Survivors

Implications for cancer survivors include synthesizing evidence that PA can provide opportunities for positive social connections that range from loose to close social ties. It provides evidence of behaviours that may be particularly supportive of PA (e.g., providing specific, actionable information) and coping with cancer (e.g., providing opportunities to talk about cancer in a context where perceived obligation to do so is low) for survivors in PA contexts. These elements may be important targets for developing interventions to improve access to support in PA programs. They may also provide survivors with important information about the types of support they may be able to access through PA programs and opportunities.

Conclusions

This meta-study is useful for understanding behaviours that support PA and coping among cancer survivors in PA contexts. Most survivors experienced PA contexts as facilitating positive relationships and valued support. But the importance of support was sometimes also highlighted by its absence, suggesting a need for developing methods to improve support. Future research is needed examining SS processes in PA contexts, focusing on supportive behaviours and the functions they serve. There are gaps in representation of the diverse population of

411 people who experience cancer, for example, more research is needed with men and people who do not identify with
412 the gender binary, people of colour, and people with cancer types other than breast and prostate cancer. There are
413 also many opportunities to explore SS using a wider array of theories and methodologies.

414 **Compliance with Ethical Standards**

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588 Table 1. Study location, sample, intervention or program, design, methodology, philosophy, methods, and theory for included studies.

Study, Location	Sample	Intervention or Program	Design (Parent Study Design); Methodology (i.e., overall approach to research); Philosophy	Methods (i.e., research tools used)	Theory
Studies of participants involved in a program or intervention					
Backman [28] Sweden	16W, age 36-71, breast cancer, in treatment, stage 1-3	16wk aerobic or aerobic/strength individual supervised, hospital-based, 45-60min 2x/wk	single interview (following conclusion of intervention arm of an RCT); content analysis	interview, or focus group using nominal group technique, post-intervention	
Browning [29] USA	28W 5M (24 in qualitative), 82% Caucasian, $M_{age}=60.4$, mixed cancer types, in or post-treatment	10wk group yoga, tai chi, and Qigong, 60-90min 1x/wk, at cancer center, caregivers can participate	single questionnaire (following participation in a single-group repeated measures study); mixed methods, content analysis	open-ended questionnaire 6mo post-intervention	
Brunet [30] Canada	7W, 6 Caucasian, $M_{age}=55.3$, breast cancer, post-treatment	8wk group aerobic and strength, at cancer foundation, 60min 2x/wk	longitudinal; thematic analysis	two 24-50min interviews 1 st wk and post-intervention	
Bruun [27] Denmark	26M, $M_{age}=67.1$, prostate cancer, in treatment	12wk recreational football, 45-60min 2-3x/wk, community location	longitudinal (from participants in a non-randomized pilot study and an RCT); ethnography, framework analysis	20hrs observation; 45-60min focus group at baseline (one team only) and in wk 9-12 (all teams)	
Burke [31] UK	7W 3M, $M_{age}=58.2$, rectal cancer, in treatment, locally advanced cancer	6wk supervised, high intensity aerobic interval training in pairs, 20-30min 3x/wk, hospital-based	Longitudinal (from non-randomized 2-arm pilot trial); phenomenology; hermeneutic, relativist	3 interviews pre-, mid-, and post-program	
Coon [32] USA	12M 9W, 86% White, $M_{age}=52$, multiple myeloma, in treatment (pre-stem cell transplant)	12wk stretching, resistance, and aerobic, individual, home-based	longitudinal (from intervention arm of an RCT); content analysis, constant comparison; constructionist, naturalistic	22-106min interview, 7-35min follow-up phone interview after recovery from transplant	theory of explanatory models used as sensitizing framework for data collection and analysis
Cormie [33] Australia	12M, $M_{age}=75.3$, prostate cancer, in or post-treatment	3mo group aerobic and resistance exercise, 60min 2x/wk, clinic-based	single interview; interpretive phenomenologic framework, thematic content analysis	37-85min interview ≥ 3 mo after starting program	
Emslie [34] UK	36W, Caucasian, $M_{age}=53$, breast cancer, in treatment, early stage	12wk group PA, 2x/wk	single interview (after intervention arm of an RCT); inductive analysis	70-105min focus group at end, or 6mo post-intervention	

Fox [35] UK	41M, 85% Caucasian, M_{age} =63.63, prostate cancer, in treatment, localized or advanced cancer	10wk individual and group balance, aerobic, and resistance, 8 60min sessions, at a hospital	Single survey/interview; mixed methods, affinity diagram approach, basic qualitative analysis	telephone survey/interview ≤6mo post-program	
Galantino [36] USA	10W, 90% Caucasian, M_{age} =58, breast cancer, post-treatment, stage 1-3	8wk group community-based yoga 90min 2x/wk, home-based yoga 15 min 3x/wk, weekly phone calls	longitudinal; content analysis	journal entries after each session	theory of planned behavior, transtheoretical model, and social cognitive theory informed intervention
Hennessy [37] UK	6W, British, M_{age} =41.6, 67% breast cancer, in or post-treatment	W-only 5km fundraising run/walk	single interview; phenomenology, thematic content analysis; hermeneutic	20-60min interview 6-8wks post-event	
Luoma [38] Finland	25W, M_{age} =54, breast cancer, in or post-treatment	12mo individual aerobic, 1x/wk group, 3x/wk home-based	single focus group (at conclusion of intervention arm of an RCT); phenomenology	55-76min focus group, 4-11 months after beginning the intervention	
McDonough [39] Canada	14W, 93% Caucasian, M_{age} = 54.23, breast cancer, post-treatment	12wk dragon boating, community-based	longitudinal; interpretative phenomenological analysis	Two 45-60min interviews, pre-post season	body image, stress, SS theories informed conceptualizing study, interview design
McDonough [25] & McDonough [26] USA	17W, 94% Caucasian, M_{age} =51.24, breast cancer, post-treatment	ongoing dragon boating, community-based	longitudinal (2011): interpretative phenomenological analysis; phenomenological, hermeneutic, idiographic (2018): thematic analysis; relativist, constructivist	5 30-90min interviews over 19mo	(2011): post-traumatic growth informed interview guide and interpretation (2018): NR
McGrath [40] Australia	6W 3M, age 57-74, mixed cancers, in or post-treatment	ongoing walking and resistance training, 1hr 2x/wk, hospital-based	single interview; qualitative descriptive	30-60min phone interview	
Midtgaard [41] Denmark	35W 20M, age 18-63 mixed cancers, in treatment	6wk group aerobic, resistance, and body awareness exercise, 9hr across 4 sessions/wk (including relaxation and massage)	single focus group (from a single group pre-post study); mixed methods, narrative analysis; constructionist	focus group post-intervention	group cohesion model informed conceptualizing study, focus group design
Missel [42] Denmark	10W 8M, age 36-79, lung cancer, in treatment (2 weeks post-surgery)	12wk group strength and aerobic, 1hr 2x/wk, community-based	longitudinal (from intervention arm of an RCT); phenomenological; hermeneutic	3 25-90min interviews: 1-3d, 7wks, 4mo post-surgery	

Paltiel [43] Norway	2W 3M, age 42-76, mixed cancers, in treatment, palliative	6wk group exercise 2x/wk, at a hospital	single interview (from a single-group pre-post pilot trial); phenomenological-hermeneutic	~45min interview; 7mo post-intervention	
Parry [44] Canada	11W 1M, mid-40s to early-60s, breast cancer, post-treatment	ongoing dragon boating	single interview; active interviews, creative analytic practice; feminist	1-2hr interview	
Sabiston [45] Canada	20W, Caucasian $M_{age}=58.69$, breast cancer, post-treatment	ongoing dragon boating, community-based	single interview; grounded theory; constructivist	45–60min interview	physical self, SS, stress, post-traumatic growth theories informed interpretation
Schmidt [46] Denmark	29M, age 67-74, prostate cancer, in treatment, localized or metastatic	12wk hospital-based group aerobic and resistance, 2x/wk, last 2 sessions community-based	single interview (following a prospective observational study); thematic analysis	60-90min focus group 2-3mo post-program	
Szalai [47] Hungary	51W, $M_{age}=48.51$, 69% breast cancer, post-diagnosis, primary diagnosis or metastatic	1yr group exercise, 90min 1x/wk, community-based	Single interview (from comparative non-randomized study); mixed methods, descriptive qualitative analysis, content analysis	25-42min interview post-program	stress and coping and SS theory informed categories in deductive analysis
Thomas [48] Canada	10W, 90% Caucasian, $M_{age}=52$, breast cancer, in or post-treatment, stage 1-3	6wk group yoga, 1x/wk, community-based	Single open-ended questionnaire (from a longitudinal mixed methods study); feminist, interpretivist	open-ended items in post-program questionnaire	
Unruh [49] Canada	3W, early 50s, breast cancer, post-treatment, no recurrences	ongoing dragon boating, 3x/wk, community-based	longitudinal; thematic analysis, content analysis	1.5-3hr interview, .5-1hr phone interview	
Van Puymbroeck [50] USA	18W, breast cancer, post-treatment	8wk group yoga 75 min 2x/wk hospital-based, and home-based yoga 30 min 3x/wk	single focus group (from non-randomized pilot study); interpretative phenomenological analysis; hermeneutic, interpretive	45-60min focus group 1wk post-intervention	embodiment theory informed interpretation
Weisenbach [51] USA	15W, Caucasian, $M_{age}=54$, breast cancer, in or post-treatment	ongoing dragon boating, community-based	single interview; interpretive description; constructivist	interview	self-determination theory, theory of planned behavior, common sense model informed conceptualizing study, interview guide, analysis

Wurz [52] Canada	7W, 86% Caucasian, $M_{age}=55.3$, breast cancer, post-treatment	8 wk group exercise, 2x/wk at survivorship center	longitudinal; thematic analysis	2 interviews pre-post program	social cognitive theory informed conceptualizing study
Studies not involving a PA program or intervention					
Blaney [53] Ireland	16W 10M, Caucasian, $M_{age}=55$, 46.2% breast cancer, in or post- treatment, stage 1-4 including palliative		Single focus group; descriptive qualitative, constant comparative analysis	$M=76$ min focus group	social cognitive theory informed interview guide
Brunet [54] Canada	9W, Caucasian $M_{age}=55.3$, breast cancer, post-treatment, stage 1-3		single interview; thematic analysis; contextualist epistemology	~75min interview	
Cummins [55] New Zealand	15W 10M, 92% New Zealand European, $M_{age}=58$, mixed cancer, pre-, in, or post-treatment		single interview; qualitative descriptive, thematic analysis; naturalistic	60-90min interview	
Granger [56] Australia	5W 2M, age 60-72, lung cancer, post-treatment		single focus group; content analysis; naturalistic	32-78min focus group	
Loh [57] Malaysia	14W, Asian $M_{age}=55$, breast cancer, in or post- treatment, stage 0-3		single focus group; grounded theory, thematic analysis	focus group	
Mackenzie [58] Australia	36W, 94% Caucasian, age 29-57, breast cancer, post-diagnosis		single interview; framework analysis	1-3hr interview	
Maxwell- Smith [59] Australia	13W 11M, $M_{age}=69.38$, colorectal cancer, post- treatment		single interview; inductive thematic analysis	interview	
Rammant [60] Belgium	22M 8W, age 52-85, bladder cancer, post- surgery, no metastases or second diagnoses		single interview; framework analysis	11-46min interview	WHO treatment adherence model informed interpretation
Sheill [61] Ireland	20M, $M_{age}=71$, prostate cancer, in treatment, advanced cancer		single interview (recruited to a clinical trial); content analysis	15-20min interview	health belief model informed interview questions
Smith [62] UK	11W 8M, White, $M_{age}=59$, 37% breast cancer, post-treatment		single interview; thematic analysis; realist	$M=52$ min face-to- face or phone interview	

Smith [63] USA	60W, African American, $M_{age}=43.73$, breast cancer, post-diagnosis	single focus group; community coalition action, content analysis	1hr focus group	social-ecological framework used to classify barriers
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Note: PA=physical activity, SS=social support, W=women, M=men, min=minute, hr=hour, d=day, wk=week, mo=month, yr=year, NR=not reported,
RCT=randomized controlled trial

592 Table 2. Categories, themes, support provider, and sample quotations from included studies

Theme	Studies	Provider	Quotation
Relationships and connection through PA			
Opportunity and meaning for building relationships	25,26,27,28,31,33,36,37,39,40,41,42,46,51,54,59,61	SU,SP,FA,FR,OT	<i>P: Here, we see each other in action. S: There is so much that becomes easier because of the interaction we have had. P: We have become like a little family [laughter]. S: I would say more like a team.³⁷</i>
Camaraderie, belonging, friendship	25,27,29,31,32,34,35,36,38,39,40,42,43,44,45,46,47,48,49,50,51,52,53,54,56,62	SU,IN,OT	<i>Everybody was really welcoming from the first minute—the girls accepted and integrated me from the first minute even though they did not know me at all.⁴³</i>
Conflict and ostracism	25,26,49	SU	<i>There's just a little clique that all seems to be happier together and, well, I'm just pitiful. I feel like, you know, people stand with their backs to me.³⁴</i>
Support for PA			
Recommend	26,32,51,55,57,60	SU,HCP,OT	<i>When I joined the [medical center's survivor] program, there is a part on exercise and healthy lifestyle and we had a guideline on how to start PA.⁵³</i>
Encourage	25,26,27,28,30,31,32,33,37,41,52,53,54,55,56,57,60,61,62,63	SU,IN,SP,FA,FR,HSP,OT	<i>My husband, he encourages me when I work out. He compliments me, and it makes me feel good and keeps me going.⁵⁰</i>
Accountability	26,27,31,34,35,37,41,43,46,47,54,56,57,60	SU,IN,HCP,OT	<i>If it weren't for this group of people and this type of training then I never would have done that PA of running around and pretending that I could actually play football [laughing].²¹</i>
Companionship	26,32,34,37,46,54,55,56,59,61,62,63	SU,SP,FA,FR,OT	<i>My dear old dad...used to come around and say come on we'll go for a walk...just someone that comes along and says 'come on' and drags you out on a regular basis and makes you do stuff.⁵¹</i>
Make PA fun	27,29,31,33,35,41	SU,IN	<i>But one thing I would say, if you're on your own it's boring whereas I know when me and 'Maureen' have been on the bikes at the same time, we don't shut up ever and then there's the forty minutes gone.²⁵</i>
Instruct how to be safe, effective	27,28,30,31,33,34,35,46,47,52,53,56	IN,HCP	<i>You were on a program where the exercises were set for you by the people who know what they are doing.²⁷</i>
Mastery emphasis	30,31,43,50	SU,IN	<i>They're looking at what you're doing and how you've been previously ... you know, they give you that feedback as well and I think that reinforces what you're doing and helps you to come back next time.²⁵</i>
Do domestic tasks	58	SP,FA	<i>I said to [my husband] 'yes we can go to the pool but you've got the kids, I'm doing laps'. [He] would always say to me 'you do what you want to do, don't worry about everybody else.'⁵⁴</i>

Support for coping with cancer			
Understand cancer experience	25,26,28,29,31,33, 34,37,39,40,42,43, 44,45,46,48,49,50, 51,52,55,56,57,60, 63	SU	<i>You don't have to explain it. You don't have to say a word. They would just know how you are feeling . . . because you don't have to articulate anything, it's already in there.⁴¹</i>
Talk about cancer	25,26,27,28,31,33, 34,35,36,37,38,39, 40,41,42,43,44,45, 46,47,48,49,50,51, 52,56	SU	<i>It's great being able to talk with the others in the group who all have the same illness as me. It binds us together and you don't feel so alone.⁴⁰ It was kind of alongside of what you were doing [exercise], it wasn't the main focus of why you got together.²⁸</i>
Normalize cancer	26,28,30,34,38,39, 40,41,45,47,50,52, 53	SU,IN	<i>If you're doing chemotherapy and you walk in with the headscarf on, here you can take it off, or if you're wearing your wig, you can take it off. And it's a sense of freedom when you can do that.⁴⁸ I also enjoy the dark humor that is a part of the team, humor that people who have not had cancer often can't appreciate.⁴⁰</i>
Model living well after cancer	25,26,37,40,44,45, 48,49,51,52	SU	<i>I was encouraged to see a few people in the group whom I had met briefly in the past, who had had the breast cancer experience. It was good to see them again later, how well they were coping with their challenge.⁴⁴</i>
Support available if needed	25,43,44,45,49,56	SU	<i>The fact that it may come back, you may, it may reoccur, that you have women that you can talk to or will support you or you can be alone if you want to.⁴¹</i>
Supporting others	25,26,28,37,39,40, 44,45,49,51	SU	<i>I can tell they're not feeling so good. So you go over and have a little chat. And they'll say 'You know, I do feel so much better now.'³⁶</i>

Note: PA=physical activity, SU=survivors, IN=instructor, SP=spouse, FA=family, FR=friend, HCP=health care provider, OT=others. Categories are indicated by bold headings. Themes are indicated in normal font in the left column.

Figure 1.

Flow diagram of study selection

