Supplementary Material 2: Study and Sample Characteristics for Included Articles (*N*=97)

Study Characteristics				Total Sample Characteristics					
First Author, Year	**Country**	**Aim(s)**	**Study Design**	***Analyzed* Sample Size (n)**	**Age at Baseline (Mean ± SD; Range)**	**Sex (% Female/ Women)[a]**	**Cancer Type (%)**	**Cancer Stage (%)**	**Treatment Status at Baseline**
Observational Studies (n=26)									
Barlow-Krelina (2020)	Canada/ United States	1) Examine whether PA is associated with neurocognitive problems and improvements in these problems over time in adult survivors of childhood cancer, using cross-sectional and longitudinal methods, with consideration of PA quantity, intensity, and consistency. 2) Examine mediating effects of body mass index and chronic health conditions.	Prospective longitudinal (case-control)	4571	24.8±7.6; NR/ 28.6±7.6; NR[b,c]	51.6%	Mixed (Hematological, CNS malignancy, kidney, neuroblastoma, soft tissue sarcoma, bone)	NR	Post-active treatment
Bedillion (2019)	United States	1) Examine the role of depression in mediating the effects of cancer treatment on cognitive function (PCA and PCI) in breast cancer survivors. 2) Examine the role of PA in moderating these effects.	Cross-sectional	317	59.1±7.9; 40-75	100%	Breast	0-III	Post-active treatment
Bender (2021)	United States	Explore the relationship between cognitive function, PA, and cardiorespiratory fitness in postmenopausal women with early-stage breast cancer before they begin systemic adjuvant therapy, aromatase inhibitors with or without chemotherapy.	Cross-sectional	73	63.7±5.3; NR	100%	Breast	0-II	Awaiting active treatment
Cooke (2016)	United States	1) Determine whether breast cancer survivors and non-cancer age-matched controls differed in memory recall, white matter lesion volume, and PA. 2) Examine the relations among these measures and the extent to which PA mediated the relations between white matter lesion volume and memory recall.	Cross-sectional	58	55.8±1.7; NR/ 55.4±1.8; NR[b]	100%	Breast	0-III	Post-active treatment
Crowgey (2014)	United States	Examine the relationships between self-reported exercise behaviour, cardiorespiratory fitness, and cognitive function in early breast cancer survivors.	Cross-sectional	51	52±12; NR/ 58±5; NR[b]	100%	Breast	I-III	Post-active treatment
Ehlers (2017)	United States	Examine the relationships among PA, fatigue symptoms, and cognitive function (i.e., executive functioning and working memory) in a national sample of breast cancer survivors using objective measures of PA (i.e., accelerometry) and cognitive functioning.	Cross-sectional	299	57.5±9.5; 28-79	100%	Breast	0-IV	Post-active treatment
Ehlers (2018)	United States	Examine the estimated cognitive effects of substituting daily sedentary time with light-intensity PA, MVPA, or sleep in breast cancer survivors.	Cross-sectional	286	57.8±9.5; 28-79	100%	Breast	0-IV	Post-active treatment

Fitzpatrick (2012)	Canada	Examine the relationships between physical fitness activities, cognitive health, and QoL among older adults on chemotherapy and older adults who have completed chemotherapy.	Prospective longitudinal pilot	15	66±NR; 55-85	NR	Mixed (Breast, colorectal)	I-II	Mixed (On/post-active treatment)
Gendron (2020)	Canada	Examine the associations between cardiorespiratory fitness and PA on various cognitive function parameters in childhood acute lymphoblastic leukemia survivors	Cross-sectional	219	21.8±6.3; NR	47.9%	Hematological	NR	Post-active treatment
Hartman (2015)	United States	Assess the relationships between obesity, PA, and sleep with cognitive functioning among breast cancer survivors.	Cross-sectional	136	62.6±6.6; 49.7-81.1	100%	Breast	I-III	Mixed (On/post-active treatment)
Hocking (2013)	United States	1) Compare young adult survivors of childhood cancer and healthy controls on PA levels 2) Examine psychological predictors of PA in young adult survivors of childhood cancer over a 2-month period.	Prospective longitudinal (case-control)	265	21.9±2.8; 18-30	53.2%	Mixed **(**Hematological, solid tumors)	NR	Post-active treatment
Hooke (2018)	United States	Examine the longitudinal mediation effects of PA on cognition via a symptom cluster during the first year of treatment for acute lymphoblastic leukemia in children and adolescents.	Prospective longitudinal	327	NR; 3-18	48%	Hematological	NR	On active treatment
Huang (2017)	China	Longitudinally investigate the associations of age and energy balance-related factors, including body mass index, waist-to-hip ratio, and PA with post-therapy cognitive recovery in a large cohort of breast cancer survivors.	Prospective longitudinal	1286	54.9±9.7; 20-75	100%	Breast	I-III	Post-active treatment
Knowlton (2020)	United States	1) Evaluate the self-reported symptoms and exercise habits among both cancer survivors and patients living with advanced disease. 2) Assess change in exercise habits before and after cancer diagnosis and interest in increasing exercise and self-reported barriers.	Cross-sectional	570	NR	60.2%	Mixed **(**Breast, gynecologic, neurologic, gastrointestinal, genitourinary, thoracic, head and neck, melanoma, sarcoma, hematological, unknown/unspecified, multiple primaries)	NR	Mixed (On/post-active treatment)
Mackenzie (2016)	United States	Examine the effects of cardiorespiratory fitness, heart rate recovery, and PA on working memory in breast cancer survivors and age-matched controls.	Cross-sectional (case control)	62	55.1±5.2; NR/ 56.1±9.8; NR/ 55.2±10.6; NR[d]	100%	Breast	0-III	Post-active treatment
Marin-Chollom (2022)	United States	Examine the relationships of PA, diet, body mass index and waist-to-hip ratio with cognitive functioning among Hispanic/Latina breast cancer survivors who previously received at least one form of adjuvant cancer treatment.	Cross-sectional	54	55.7±9.4; NR	100%	Breast	0-III	Post-active treatment

Marinac (2015)	United States	1) Investigate the relationships between objectively measured PA and cognitive functioning in a sample of free-living breast cancer survivors with a broad range of body mass indices. 2) Examine whether the association between PA and cognitive functioning varies by body mass index.	Cross-sectional	135	62.6±6.6; NR	100%	Breast	I-III	Post-active treatment
Mohammadi (2013)	Iran	Assess eating practices, level of PA and QoL among Iranian breast cancer survivors.	Cross-sectional	100	47.9±6.71; 32-61	100%	Breast	NR	Post-active treatment
Myers (2015)	United States	1) Explore the potential factors associated with PCI in breast cancer survivors compared to controls. 2) Gain insight into perceived levels of severity for cognitive complaints.	Cross-sectional	363	52±11.8; NR/ 53.1±8.6; NR/ 52.8±11.3; NR/ 53.6±9.6; NR/ 54±8.8; NR/ 62.3±10; NR/ 49.4±9.8; NR[e]	100%	Breast	I-IV	Mixed (Awaiting/ on/ post-active treatment)
Myers (2017)	United States	1) Explore relationships between select single nucleotide polymorphisms for interleukin 1 receptor type 1, interleukin 6, and tumor necrosis factor genes, and perceived cognitive function. 2) Explore whether body mass index and exercise frequency moderate these relationships.	Cross-sectional	101	54.9±10.8; 34-89	100%	Breast	I-IV	Mixed (Awaiting/ on/ post-active treatment)
Peng (2021)	Hong Kong	1) Evaluate the prevalence of neurocognitive and behavioural deficits 2) Identify clinical and socioenvironmental factors associated with these outcomes in a cohort of young Chinese survivors of childhood acute lymphoblastic leukemia. 3) Examine the mediating effects of socio-environmental factors on neurocognitive and behavioural outcomes in this population.	Cross-sectional	152	23.5±7.2; NR	48%	Hematological	NR	Post-active treatment
Phillips (2017)	United States	1) Examine the relationship between PA, psychological factor (i.e., stress, depression, anxiety, fear of cancer recurrence), exercise self-efficacy, and subjective memory impairment in a sample of breast cancer survivors at baseline. 2) Examine the relationships between potential changes in these variables over a 6-month period when controlling for baseline associations and stability in measures across time.	Prospective longitudinal	1477	56.3±9.3; NR	100%	Breast	0-IV	Post-active treatment

Salerno (2021)	United States	1) Investigate patterns and trajectories of PA before, during, and after chemotherapy in patients with breast cancer compared with age-matched, cancer-free controls. 2) Investigate the association between prechemotherapy PA and changes in cognitive function in patients and controls. 3) Investigate how change in PA from prechemotherapy to post-chemotherapy was associated with cognitive trajectories in patients only.	Prospective longitudinal (case control)	943	53.1±10.5; NR	100%	Breast	I-III	Awaiting active treatment
Tonorezos (2019)	Canada/ United States	Investigate the associations between vigorous exercise and subsequent psychological symptoms, health-related QoL, cancer pain, and cognitive impairment among adult survivors of childhood cancer from the *Childhood Cancer Survivor Study*.	Prospective longitudinal (case-control)	6199	34±NR; 22-54	48.8%	Mixed (Hematological, CNS malignancy, kidney, neuroblastoma, soft tissue sarcoma, bone)	NR	Post-active treatment
vanVeen (2019)	Nether-lands	Investigate the associations between adherence to the WCRF/AICR recommendations and health-related QoL for all recommendations together and for PA, body composition and diet separately in a large cohort of colorectal cancer survivors.	Cross-sectional	1096	70.8±9.2; NR	42%	Colorectal	I-IV	Post-active treatment
Williams (2022)	United States	1) Characterize neurocognitive, emotional distress, QoL, and social attainment impairments in a well-characterized cohort of Hodgkin's lymphoma survivors relative to their sibling peers. 2) Identify demographic, clinical, treatment, behavioural, and chronic health factors associated with these impairments.	Cross-sectional	4940	37.5±6; 21-54/ 33.2±8.5; 18-58[b]	53.6%	Hematological	NR	Post-active treatment
(Quasi-)Experimental Studies (n=71)									
Arneil (2019)	Australia	1) Determine if subjectively reported cognitive function changed over time in younger women previously treated for breast cancer and who took part in the *Younger Women's Wellness after Cancer Program*. 2) Determine if PA is associated with subjectively reported cognitive function, and if time had an impact on this.	RCT (intervention and control group data were pooled for outcomes of interest)	41	37.9±NR; NR	100%	Breast	NR	Post-active treatment
Backman (2014)	Sweden	1) Investigate the feasibility and adherence of a PA intervention among patients with breast cancer and colorectal cancer during adjuvant chemotherapy treatment. 2) Investigate the effects of PA on health aspects, including QoL and symptoms, and measure surrogate markers for cardiovascular disease.	RCT	67	54±NR; NR	89.6%	Mixed (Breast, colorectal)	NR	On active treatment

Bade (2021)	United States	1) Determine interest in participating in a home-based walking regimen in patients with stage III-IV non-small cell lung cancer. 2) Examine the effects of the intervention on PA, dyspnea, QoL, depression scores, and biomarkers.	Pilot RCT	40	64.9±8.7; 42-79	75%	Lung	III-IV	Mixed (On/post-active treatment)
Baumann (2010)	Germany	Evaluate the effects of supervised exercise therapy in patients undergoing hematopoietic stem cell transplantation.	Pilot RCT	64	44.9±12.4; NR/ 44.1±14.2; NR[f]	45.3%	Hematological	NR	On active treatment
Benzing (2020)	Switzer-land	1) Investigate the effects of a computerized training program specifically targeting working memory and exergaming (including physical and cognitive challenges targeting executive functions more broadly) on core executive functions (working memory, inhibition, switching), as compared to a waitlist group. 2) Investigate potential for transfer effects (i.e., effects on less trained or untrained domains) of the training on further cognitive functions (nonverbal IQ, planning, memory, attention, and processing speed) and parent ratings on their children's executive functions in real-world context.	RCT	69	11.4±3.5; 7-16	NR	Mixed (Hematological, CNS tumors & neuroblastomas, other)	NR	Post-active treatment
Bryant (2017)	United States	1) Test the effects of a 4-week in-hospital/in-treatment progressive exercise mixed-modality program on fatigue, health-related QoL, and physical function in adults with acute leukemia undergoing induction therapy. 2) Evaluate the effects of the exercise program on cognition, anxiety, depression, and sleep disturbance. 3) Evaluate the effect of intervention on adherence to exercise.	Pilot RCT	17	52±13; 34-67/ 49±15; 28-69[f]	29.4%	Hematological	NR	On active treatment
Buffart (2015)	Australia & New Zealand	1) Examine the effects of a 12-month resistance and endurance exercise program on cancer-specific health-related QoL in physically inactive, older long-term survivors of prostate cancer. 2) Explore which demographic and clinical variables moderated the effects of the program on health-related QoL. 3) Study which physical and psychological factors mediated the intervention effect on health-related QoL.	RCT	100	71.7±6.4; NR	0%	Prostate	T2-T4	Post-active treatment
Campbell (2018)	Canada	Test the effect of a 24-week aerobic exercise intervention compared to usual lifestyle control on measures of cancer-associated cognitive impairment in early-stage breast cancer survivors reporting persistent cognitive concerns.	Proof-of-concept RCT	19	52.4±6.2; NR	100%	Breast	II-III	Post-active treatment

Cantarero-Villanueva (2013)	Spain	Analyze the effects of an 8-week aquatic exercise program in a deep-water pool and 6 months after finishing the program on fatigue, psychological outcomes, muscular strength, and endurance in breast cancer survivors.	RCT	68	49±7; NR/ 47±8; NR[f]	100%	Breast	I-III	Post-active treatment
Cox (2020)	Canada	Determine whether aerobic exercise training produces improvements in controlled attention and information processing speed during increasing task load using paired visual-motor Go and Go/No-Go tasks in pediatric brain tumor survivors treated with cranial radiation.	Crossover RCT	25	12.5±2.9; 9.7-16.9/ 11.1±3.2; 7.4-16.9[g]	44%	Brain	NR	Post-active treatment
Culos-Reed (2006)	Canada	Examine the physical and psychological benefits afforded by a 7-week yoga program for cancer survivors in comparison to usual care.	RCT	38	51.2±10.3; NR	95%	Mixed (Breast, NR)	NR	Post-active treatment
Derry (2015)	United States	Examine whether yoga affects self-reported cognitive complaints in breast cancer survivors.	RCT	186	51.6±9.2; 27-76	100%	Breast	0-III	Post-active treatment
Dimeo (2004)	Germany	Compare the effect of two interventions (i.e., aerobic exercise and progressive relaxation training) on the fatigue, QoL and physical performance of cancer patients recovering from surgical treatment of solid tumours.	RCT	69	55.1±10; 32-74/ 60±9.5; 36-78[f]	27.5%	Mixed (Lung, stomach, colon, sigmoid, rectum)	I-IV	Post-active treatment
Fazzino (2017)	United States	1) Examine whether common late cancer treatment-related symptoms (musculoskeletal pain, vasomotor symptoms, and cognitive problems) impact post-menopausal breast cancer survivors' PA adoption (0-6 months) and maintenance (6-18 months) during a weight management intervention. 2) Investigate the degree to which these late symptoms influence PA adoption and maintenance when accounting for overall physical and mental functioning.	RCT	176	58.2±8.1; NR	100%	Breast	0-III	Post-active treatment
Fontana (2021)	Switzer-land	1) Assess the feasibility of weekly sessions of pure physical training and physical plus attentional training over a period of 10 months in children on- or off-cancer therapy. 2) Explore if the type of PA had an impact on mood, behavioural and cognitive outcomes, particularly attention, executive functions, and working memory.	Crossover RCT	20	10.9±3.1; 6-18	35%	Mixed (Hematological, CNS tumours, non-CNS solid tumours)	NR	Mixed (On/post-active treatment)
Galantino (2008)	United States	Determine the feasibility and initial efficacy of an Iyengar yoga-based program on cognitive, physical, and QoL measure in breast cancer survivors post-chemotherapy.	Case series	3	59.7±NR; 55-67	100%	Breast	I-II	Post-active treatment
Galantino (2012)	United States	Determine the impact of yoga on measures of cognition, functional outcomes, and QoL in breast cancer survivors.	Case series	4	54.8±NR; 44-65	100%	Breast	II	Post-active treatment
Galiano-Castillo (2016)	Spain	Investigate the effectiveness of a telehealth system for improving adverse effects after an 8-week intervention and its maintenance after 6 months of follow-up in breast cancer survivors.	RCT	76	48.3±8.8; NR	100%	Breast	I-III	Post-active treatment

Galiano-Castillo (2017)	Spain	Determine if an Internet-based tailored exercise program would lead to greater improvements in functional capacity and cognition than usual care in breast cancer survivors.	RCT	76	48.3±8.8; NR	100%	Breast	I-III	Post-active treatment
Galveo (2010)	Australia	Compare the effects of a combined resistance and low volume aerobic exercise program versus usual care in patients with hypogonadal prostate cancer.	RCT	57	69.5±7.3; NR/ 70.1±7.3; NR[f]	0%	Prostate	NR	On active treatment
Gehring (2020)	Nether-lands	Evaluate indications of effects of an exercise intervention (specifically aimed at the improvement (or maintenance) of cognitive functions) at the group and individual level on cognitive performance scores of attention, memory, and executive functioning, and at the group level on patient-reported outcomes (cognitive symptoms, fatigue, sleep, mood, and QoL).	Pilot RCT	32	49.2±8.9; NR/ 48±11.9; NR[f]	56.3%	Glioma	II-III	Post-active treatment
Gokal (2016)	United Kingdom	Investigate the effectiveness of a 12-week self-managed, home-based walking intervention on the psychosocial well-being (self-esteem, mood, PA, anxiety, depression, fatigue) in comparison to the control group in breast cancer survivors receiving chemotherapy.	RCT	50	52.1±11.7; 27-74/ 52.4±8.9; 29-66[f]	100%	Breast	I-III	On active treatment
Gokal (2018)	United Kingdom	Investigate the effects of a home-based, self-managed, moderate intensity walking intervention on subjective and objective cognitive functioning in breast cancer survivors undergoing chemotherapy.	RCT	50	52.1±11.7; 27-74/ 52.4±8.9; 29-66[f]	100%	Breast	I-III	On active treatment
Hacker (2011)	United States	1) Test the effects of strength training compared to usual activity on PA, muscle strength, fatigue, health status perceptions, and QoL following hematopoietic stem cell transplantation. 2) Further evaluate the feasibility of the revised strength training intervention by determining the week-to-week strength training frequency of study participants.	Pilot RCT	19	46.3±16.2; 20-67	26.3%	Hematological	NR	Post-active treatment
Hartman (2018)	United States	Examine the effects of a 12-week PA intervention, compared with a contact control condition, on objective and self-reported measures of cognition among breast cancer survivors.	RCT	87	57±10.4; NR	100%	Breast	I-III	Post-active treatment
Hartman (2019)	United States	Examine physical and psychological function and biological mechanisms potentially linking PA with changes in objective and self-reported cognition among breast cancer survivors enrolled in a 12-week RCT.	RCT	87	57±10.4; NR	100%	Breast	I-III	Post-active treatment
Henke (2014)	Germany	Examine the feasibility and effects of a specially designed treatment protocol for advanced lung cancer patients (>18 years) on the patient's QoL and their ability to be independent in activities of daily living during palliative chemotherapy.	RCT	29	NR	NR	Lung	III-IV	On active treatment

Howell (2018)	United States	Evaluate the initial efficacy of a web-delivered, interactive, rewards-based PA intervention among adolescent cancer survivors to increase MVPA and improve fitness and neurocognitive and health-related QoL outcomes over 24 weeks.	RCT	78	12.7±1.1; 11-15	55.1%	Mixed (Hematological, CNS tumors, Ewing sarcoma, germ cell tumour, neuroblastoma, retinoblastoma, rhabdomyosarcoma, soft tissue sarcoma, Wilms tumour, other)	NR	Post-active treatment
Janelsins (2016)	United States	1) Assess the effects of *Yoga for Cancer Survivors* on memory difficulty in cancer survivors post-treatment. 2) Explore moderating effects of memory difficulty on post-intervention sleep quality and vice versa. 3) Explore possible mediating effects of changes in memory on changes in sleep quality and vice versa.	RCT	328	54±NR; 26-72	95.7%	Mixed (Breast, hematological, gastrointestinal, gynecological, head and neck, lung, genitourinary, melanoma)	NR	Post-active treatment
Knoerl (2022)	United States	Explore the impact of exercise and mind–body prehabilitation interventions on changes in QoL and cancer treatment-related symptoms between the time of enrollment and 1-month post-surgery in women with newly-diagnosed breast cancer.	RCT	47	52.8±8.8; NR	100%	Breast	I-III	Awaiting active treatment
Knols (2011)	Germany	Evaluate the effects of a 12-week outpatient physical exercise program incorporating aerobic and strength exercises, as compared with a usual care control condition, on physical performance, body composition, quantified walking activity, self-reported PA, fatigue, and self-reported health-related QoL, as assess both immediately following the training program and at 3-month follow-up.	RCT	131	46.7±12.8; 18-75	41.2%	Hematological	NR	Post-active treatment
Korstjens (2011)	Nether-lands	Test the effects a 12-week group-based self-management cancer rehabilitation combining comprehensive physical training and cognitive-behavioural problem-solving training on problem-solving, anxiety and depression as compared to PT alone.	RCT	147	48.8±10.9; NR	83.7%	Mixed (Breast, hematological, gynecological, urologic, lung, colon, other)	NR	Post-active treatment
Lambert (2021)	Canada	Assess the effects of a 12-week PA intervention on fractional anisotropy (as measured by diffusion tensor imaging) and resting functional connectivity (as measured by resting-state functional magnetic resonance imaging) in adolescent and young adult cancer survivors post-treatment.	Proof-of-concept single group pre-post study (from a pilot RCT)	5	37.7±2; 35-40	100%	Mixed (Breast, ovarian, soft tissue sarcoma)	III/Unknown	Post-active treatment

Larkey (2016)	Not reported	1) Explore if breast cancer survivors completing a 12-week Qigong/Tai Chi Easy intervention will improve in QoL (including mental and physical components), cognitive function/performance, and overall level of PA than those in the sham Qigong control group. 2) Explore if breast cancer survivors completing a 12-week Qigong/Tai Chi Easy intervention reduce weight more than those in the sham Qigong control group.	Pilot RCT	87	58.8±8.9; NR	100%	Breast	I-III	Post-active treatment
Leach (2015)	Canada	Evaluate the feasibility of the initial 12 weeks of the *Breast cancer patients Engaging in Activity while Undergoing Treatment* (BEAUTY) program based on: 1) Effectiveness of the program in maintaining physical and psychosocial outcomes, and 2) Adherence to group glasses, safety, and participant enjoyment of the program.	Single-group pre-post study	96	50.3±9; 24-73	100%	Breast	I-IV	Mixed (On/post-active treatment)
Leach (2016)	Canada	Compare physiological and psychosocial outcomes at 12 versus 24 weeks for a community exercise program for breast cancer patients who were currently undergoing or within 3 months of completing chemotherapy and radiation treatment.	Single-group pre-post study	63	50.5±8.7; NR	100%	Breast	I-IV	Mixed (On/post-active treatment)
Livingston (2015)	Australia	1) Assess the efficacy of a clinician-referred 12-week exercise program in comparison with usual care in increasing self-reported PA levels for men who had completed active treatment for prostate cancer. 2) Examine the effect of the exercise program on psychological well-being, QoL, and objectively assessed PA.	Cluster RCT	147	65.6±8.5; 39-84	0%	Prostate	I-III	Post-active treatment
Mijwel (2018)	Sweden	Compare the effects of two training interventions, namely (1) resistance and high-intensity interval training and (2) moderate-intensity aerobic and high-intensity interval training, to a control group receiving usual care on cancer-related fatigue, health-related QoL, and symptoms in women with breast cancer undergoing chemotherapy.	RCT	206	52.7±10.3; NR/ 54.4±10.3; NR/ 52.6±10.2; NR[h]	100%	Breast	NR	On active treatment
Miki (2014)	Japan	Assess the efficacy of speed-feedback therapy with a bicycle ergometer as a rehabilitation approach aimed at improving the cognitive function of elderly cancer patients.	RCT	78	73±4.6; NR/ 75.5±6.6; NR[f]	55.1%	Mixed (Breast, prostate)	I-IV	Post-active treatment
Morielli (2021)	Canada	Assess the effects of supervised exercise during neoadjuvant chemoradiation for rectal cancer and unsupervised exercise after neoadjuvant chemoradiation for rectal cancer on secondary patient-reported outcomes including symptom burden and QoL.	RCT	32	57±12; NR	33%	Rectal	NR	On active treatment)

Myers (2019)	United States	1) Evaluate the feasibility of conducting a three-arm, randomized, single-blind, controlled intervention trial to improve objectively and subjectively assessed cognitive function in BCS who were 2 months to 8 years post completion of chemotherapy and radiation therapy. 2) Compare changes in: (1) objective or subjective cognitive function; (2) other cancer and cancer treatment-related symptoms (fatigue, sleep disturbance, and distress); and (3) QoL between the three groups following the 8-week intervention period.	Pilot RCT	50	53.7±11.2; 29-76	100%	Breast	I-III	Post-active treatment
Northey (2019)	Australia	1) Investigate the effects of a 12-week aerobic exercise intervention of either high-intensity interval training or moderate-intensity continuous exercise on cognitive performance in breast cancer survivors in comparison to a waitlist control. 2) Examine the effects of these interventions on aerobic fitness and cerebrovascular function as a potential mechanism to explain exercise-induced changes in cognitive performance.	Pilot RCT	17	62.9±7.8; NR	100%	Breast	I-III	Post-active treatment
Nusca (2021)	Italy	1) Explore the effects of a 2-month-long post-operative combined and supervised exercise training on the QoL of patients that underwent laparoscopic colorectal surgery after the exercise program (T1) was completed, compared to usual care alone. 2) Investigate whether any differences in QoL observed at T1 are maintained in the longer term, in particular at 2 (T2) and 4 (T3) months from the end of the exercise program. 3) Explore sleep quality, anxiety and depression, functional capacity, physical performance, muscle strength, body mass index, muscle mass, and nutritional status between intervention and control group at T1, T2, and T3. 4) Explore all clinical outcomes within the intervention group and control group from baseline (T0) to the end of the exercise program (T1) and at 2 (T2) and 4 (T3) months from the end of the intervention.	Pilot non-randomized trial	11	63.5±NR; 43-80/ 73±NR; 51-80[f,i]	36.4%	Mixed (Colon, rectal)	II-III	Post-active treatment
Oechsle (2014)	Germany	Evaluate the effects of a supervised multimodal exercise program on physical performance, immune function, treatment-related side effects, and QoL during myeloablative chemotherapy in patients with hematologic malignancies or solid tumors.	Pilot RCT	48	51.7±13.3; NR/ 52.9±15.4; NR[f]	31%	Hematological	NR	On active treatment

Oh (2010)	Australia	1) Investigate the hypothesis that the medical Qigong group would experience significant improvements in QoL compared with the control group in cancer patients. 2) Investigate the hypothesis that the medical Qigong group would show greater reductions in fatigue and moor, and decreased levels of inflammation by 10 weeks of follow-up.	RCT	162	60±12; 31-86	NR	Mixed (Breast, lung, prostate, colorectal, other)	NR	Mixed (On/post-active treatment)
Oh (2012)	Australia	1) Investigate the hypothesis that medical Qigong can improve cognitive function of cancer patients. 2) Explore the effect of medical Qigong on inflammation.	RCT	81	62±12; 34-86	50%	Mixed **(**Breast, lung, prostate, colorectal, gastric, other)	NR	Mixed (On/Post-active treatment)
Park (2021)	South Korea	Provide initial experimental data on the feasibility and safety of an exercise intervention for patients with metastatic cancer during palliative chemotherapy.	Pilot single-group pre-post study	19	60±NR; 30-74[i]	47.4%	Mixed (Lung, gynecologic, soft tissue sarcoma, gastric, mesothelioma)	IV	On active treatment
Pasyar (2019)	Iran	Evaluate the effect of an 8-week yoga intervention on QoL and upper extremity edema volume in women with breast cancer-related lymphedema.	Pilot RCT	27	51.6±10.5; NR/ 51.8±11.4; NR[f]	100%	Breast	NR	Post-active treatment
Peterson (2018)	United States	Determine if the combination of aerobic exercise and cognitive exercise could improve cognitive function when compared to either intervention alone in patients undergoing cancer treatment.	Pilot quasi-randomized trial	28	57.9±8; NR	78.6%	Mixed (Breast, ovarian, throat/tongue, hematological, lung, supraglottic/laryngeal, colon, anaplastic oligodendroglioma, prostate)	NR	On active treatment
Peterson (2020)	United States	Measure the effects of aerobic and flexibility training on physiological, psychosocial, and cognitive functioning in a patient with anaplastic oligodendroglioma.	Case report	1	44±N/A; N/A	100%	Anaplastic oligodendroglioma	III	Post-active treatment
Poier (2018)	Germany	Explore whether multimodal therapy (i.e., psychoeducation, eurythmy therapy, painting therapy, and sleep education/restriction) or a combination therapy (i.e., multimodal therapy plus aerobic training) is superior to aerobic training alone after 10 weeks of intervention and 6 months later in on health-related QoL in breast cancer survivors with chronic cancer-related fatigue.	Pragmatic quasi-randomized trial	126	58.6±10; NR/ 58±10.6; NR/ 56.4±7.7; NR[j]	100%	Breast	I-III	Post-active treatment
Reid-Arndt (2012)	United States	Examine the potential benefits Tai Chi to neuropsychological functioning in women with a history of cancer.	Pilot single-group pre-post study	23	62.3±10.8; NR	100%	Mixed **(**Breast, ovarian, endometrial, hematopoietic)	NR	Post-active treatment

Riggs (2017)	Canada	1) Test whether exercise training leads to changes in brain structure in survivors of pediatric brain tumors treated with cranial radiation. 2) Test whether exercise leads to improvements across tests of attention, processing speed, and short-term memory.	Crossover quasi-randomized trial	28	12±3; 8.1-16.9/ 11.2±3; 7.7-16.9[g]	42.9%	Brain	NR	Post-active treatment
Rogers (2009)	United States	Determine the effects of a PA behaviour change intervention on objectively-measured PA, motivational readiness for PA, fitness, muscle strength, body composition, QoL, fatigue, endocrine symptoms, cognitive function, sleep quality, and joint symptoms 3 months after intervention completion.	RCT	41	53±9; NR	100%	Breast	I-III	Post-active treatment
Rosero (2020)	Spain	Examine the effects of a 10-week structured and individualized multicomponent exercise program on physical/cognitive functioning and mental wellness in elderly patients with non-small-cell lunger cancer under adjuvant therapy or palliative treatment.	Pragmatic non-randomized trial	26	74.5±3.6; NR/ 79±3; NR[f]	23.1%	Lung	I-IV	On active treatment
Saarto (2012)	Finland	1) Investigate the effects of exercise intervention on QoL, fatigue, depression, and menopausal symptoms in breast cancer survivors. 2) Record the effects on physical fitness.	RCT	500	52.3±NR; 36-68/ 52.4±35-68; NR[f]	100%	Breast	NR	Post-active treatment
Sabel (2017)	Sweden	Evaluate the effects of active video gaming versus a waiting list on cognitive, motor, and activities of daily living performance in children treated with radiotherapy for brain tumors.	Crossover pilot RCT	13	12.5±2.9; 7.2-16.4	54%	Brain	NR	Post-active treatment
Salerno (2019)	United States	1) Examine the effects of a 30-min moderate-intensity aerobic exercise session on processing speed and spatial working memory compared with 30 mins of quiet, seated rest in breast cancer survivors. 2) Examine how regular PA may have influenced the relationship between acute exercise and cognitive function.	Crossover RCT	27	49.1±8.1; NR	100%	Breast	0-III	Post-active treatment
Salerno (2020)	United States	Examine the effects of varying durations of exercise (e.g., 10, 20, and 30 min) on cognitive function in patients with breast cancer to identify the optimal length of acute exercise.	Crossover RCT	48	56±11; NR	100%	Breast	0-III	Post-active treatment
Schmidtt, M (2015)	Germany	Investigate whether progressive resistance training in breast cancer patients during chemotherapy provides beneficial effects on fatigue and QoL beyond the potential psychosocial effects of a supervised, group-based training.	RCT	95	52.7±10; NR	100%	Breast	I-IV	On active treatment
Schmidtt, T (2015)	Germany	Compare the effects of moderate endurance and moderate resistance training with usual care on physical fitness, fatigue, concentration and QoL in women with primary breast cancer during adjuvant chemotherapy.	RCT	67	53±12.6; NR/ 56±10; NR/ 54±11.2; NR[k]	100%	Breast	NR	On active treatment

Schwartz (2002)	United States	1) Examine tolerance for treatment, fatigue, functional ability, and cognitive function in patients with melanoma receiving at least five million IU/m^2 of IFN-a three times/week over the first 4 months of treatment. 2) Determine the percentage of patients who adhered to IFN-a treatment, methylphenidate, and the exercise regimen.	Pilot non-randomized trial (case-control)	28	44±NR; 20-64	NR	Melanoma	II-III	On active treatment
Spreafico (2021)	Italy	Assess the effect of an in-hospital training program on the physical vitality and fatigue of children during or after treatment for cancer.	Non-randomized trial	44	15.5±NR; 5-21[i]	45.5%	Mixed (Nasopharyngeal carcinoma, thyroid carcinoma, hematological, brain, neuroblastoma, osteosarcoma, soft tissue sarcoma, Ewing sarcoma, abdominal desmoplastic tumour, Wilms tumour)	NR	Mixed (On/post-active treatment)
Steindorf (2014)	Germany	Evaluate the efficacy of resistance training beyond the psychosocial benefits associated with a group-based non-exercise intervention on fatigue and QoL in 160 breast cancer patients receiving adjuvant radiotherapy.	RCT	155	55.8±9.1; NR	100%	Breast	0-III	On active treatment
Trinh (2021)	United States	1) Evaluate the feasibility of delivering a supervised PA program plus standard exercise counselling versus a supervised PA plus motivationally-enhanced behavioural counselling in prostate cancer survivors. 2) Examine the effects of the intervention on objectively assessed PA, QoL, body composition, cardiorespiratory fitness, objectively-assessed cognitive functioning, and physical function.	Pilot RCT	26	65.6±6.8; NR	0%	Prostate	NR	Post-active treatment
Vadiraja (2009)	India	Compare the effects of a 6-week integrated yoga program with brief supportive therapy as a control intervention in early operable breast cancer patients undergoing adjuvant radiotherapy.	RCT	75	46.7±9.3; NR/ 48.5±10.2; NR[f]	100%	Breast	I-III	On active treatment
Van Weert (2010)	Nether-lands	Determine the effect of a combined rehabilitation program (physical training and cognitive-behavioural training) and of physical training alone on CRF in comparison with no intervention in cancer survivors.	RCT	209	49.9±11.3; NR/ 47.8±10.5; NR/ 51.3±8.8; NR[l]	85.6%	Mixed (Breast, hematological, gynecologic, other)	NR	Post-active treatment

Vaquero (2020)	Spain	1) Study the structural characteristics and potential plasticity effects of a 3-month PA program on the bilateral hippocampus of lung cancer patients, as well as on their cognitive and neuropsychological performance and their QoL. 2) Explore whether some differences may be present in this structure, at baseline, or due to the effects of PA, depending on the cancer cellular type, so small-cell lung cancer and non-small-cell lung cancer patients were compared, along with a matched healthy control group.	Non-randomized trial (case-control)	36	59.2±3.3; NR/ 57.8±1.5; NR/ 56±6.3; NR/ 62.3±6.9; NR/ 60.7±6.9; NR[m]	22.2%	Lung	II-IV	Post-active treatment
Wiskemann (2011)	Germany	1) Examine the effects of a partly self-administered exercise intervention starting before allogeneic hematopoietic stem cell transplantation and ending 6 to 8 weeks after discharge on fatigue. 2) Examine the effects of a partly self-administered exercise intervention starting before allogeneic HSCT and ending 6 to 8 weeks after discharge on endurance performance, isometric muscle strength, functional performance status, PA levels, health-related QoL, psychologic well-being, and distress.	RCT	105	48.8±NR; 18-71	32.4%	Hematological	NR	Awaiting treatment
Wurz (2021)	Canada	1) Evaluate the feasibility of using neuroimaging with executive functioning tasks to assess neural activity changes following a PA intervention (as assessed via enrollment into the proof-of-concept sub-study, adherence to scheduled fMRI scans, outliers, missing data, and performance on executive functioning tasks). 2) Assess if a 12- week PA intervention enhances neural activity among AYAs after cancer treatment.	Proof-of-concept single group pre-post study (from a pilot RCT)	5	37.7±2; 35-40	100%	Mixed (Breast, ovarian, soft tissue sarcoma)	III/Unknown	Post-active treatment
Zimmer (2018)	Germany	1) Investigate the influence of personalized exercise recommendations (which were given during stationary rehabilitation) on long-term effects on patients' objectively measured PA, fatigue, and cancer-related cognitive impairment as well as on fatigue- and cognitive impairment-related biomarkers. 2) Explore the potential relationships between biomarkers and fatigue.	Single-group pre-post study	60	54.3±8.5; NR	100%	Breast	NR	Post-active treatment

Notes. CNS=central nervous system; fMRI=functional magnetic resonance imaging; MVPA=moderate-to-vigorous physical activity; NR=not reported (or could not be computed based on available data); PA=physical activity; PCA=perceived cognitive ability; PCI=perceived cognitive impairment; QoL=quality of life; RCT=randomized controlled trial; WCRD/AICR=World Cancer Research Fund/American Institute for Cancer Research.

Cross-sectional study: information was collected at a particular point in time for a group of people. Longitudinal study: a defined group of people (or cohort) was followed over time (i.e., observations occurred at multiple time points on the same individuals). Retrospective study: participants were identified (usually from past records) and information was collected from them (past or present) and current outcomes. Prospective study: people were recruited and followed into the future. Case-control study: people with cancer ('cases') with compared with people from the same source populations with without cancer ('controls'). (Quasi-)experimental study: researchers introduced an intervention and studied the effects. Experimental study (or RCT): eligible people were randomly assigned to one of two or more groups. Quasi-experimental: people were allocated to different groups using methods that were not random (i.e., non-randomized trial) or observations were made before and after the implementation of an intervention only in a group that received an intervention (i.e., single-group pre-post study or case series). Crossover trial: all participants received all interventions but the order in

which they received them (i.e., the sequence) was determined using methods that were random or not random. Pragmatic trial: interventions were tested using flexible protocols and local customization. Cluster trial: involved random or non-random allocation of groups or clusters of individuals to receive an intervention. Quasi-randomized trial: involved methods that were random and not random (e.g., by preference) to groups. Case report: involved a single individual or specific group.

[a]Sex and gender were not differentiated as they were often used interchangeably in articles.

[b]Total not provided; reported separately for cancer survivors and the non-cancer comparator group, respectively.

[c]Baseline data, but neurocognitive data was only collected at the two follow-up points.

[d]Total not provided; reported separately for breast cancer survivors who received radiation only, those who underwent chemotherapy, and the non-cancer comparator group, respectively.

[e]Total not provided; reported separately for those pre-chemotherapy, on current chemotherapy, <1 year, >1-2 years, >2-5 years, and >5 years post-chemotherapy, and the non-cancer comparator group, respectively.

[f]Total not provided; reported separately for the intervention and comparator groups, respectively.

[g]Total not provided; reported separately for crossover sequence groups 1 and 2, respectively.

[h]Total not provided; reported separately for the resistance training plus high-intensity interval training (HIIT), aerobic training plus HIIT, and comparator group, respectively.

[i]Median age.

[j]Total not provided; reported separately for the aerobic training, multimodal therapy, and combination therapy groups, respectively.

[k]Total not provided; reported separately for the resistance training, endurance training, and comparator group, respectively.

[l]Total not provided; reported separately for the physical training, physical training plus Cognitive Behavioural Therapy, and comparator groups, respectively.

[m]Total not provided; reported separately for the small-cell lung cancer (PA intervention and non-PA control groups), non-small-cell lung cancer (PA intervention and non-PA control groups), and non-cancer control groups, respectively.

Article Title: A scoping review of studies exploring physical activity and cognition among persons with cancer

Journal Name: Journal of Cancer Survivorship

Authors: Jennifer Brunet, PhD[1,2,3*] & Sitara Sharma, MA[1]

***Correspondence should be addressed to:**

Jennifer Brunet, Full Professor

[1] School of Human Kinetics, University of Ottawa

125 University (MNT 339), Ottawa, ON Canada K1N 6N5

[2] Institut du savoir Montfort, l'Hôpital Montfort, Ottawa, ON Canada

[3] Cancer Therapeutic Program, Ottawa Hospital Research Institute, Ottawa, ON Canada

Email: jennifer.brunet@uottawa.ca

Tel.: 613-562-5800 (3068)