

A systematic review of physical activity trials in adolescent cancer patients and survivors: What we know and where we need to go

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Introduction

- Adolescent cancer patients and survivors face a host of negative short- and long-term side effects¹
- Recent systematic reviews and meta-analyses show that physical activity can help mitigate these effects in children and adults with cancer^{2,3}
- There is currently lack of information for adolescents with cancer⁴, which is troubling given the unique developmental changes occurring in this population⁵
- A review focusing on adolescent cancer patients and survivors is necessary to summarize the evidence, determine the effectiveness of physical activity in this population, and establish future directions for practice
- The aim of this project was to systematically explore the effectiveness of physical activity interventions to promote health outcomes in adolescent cancer patients and survivors**

Methods

- Three electronic databases were systematically searched (PubMed, Web of Science, EMBASE) between January 1990 and September 2014 using relevant key words (Table 1)
- Reference lists of identified reviews were also manually screened
- Authors independently searched for and screened the identified studies; in cases of disagreement, discussion occurred until consensus was reached

Table 1. Search Terms.

Category	Search Term
Population	Adolescent OR young adult OR young person OR 13-19 OR teenager AND Cancer OR oncology OR neoplasm OR acute lymphoblastic leukemia OR Hodgkin's lymphoma OR metastatic
Intervention	Physical activity OR fitness OR movement OR yoga OR physical therapy OR exercise OR aerobic exercise OR resistance training OR strength OR flexibility AND Usual care OR standard care OR control group OR comparison group
Comparison	

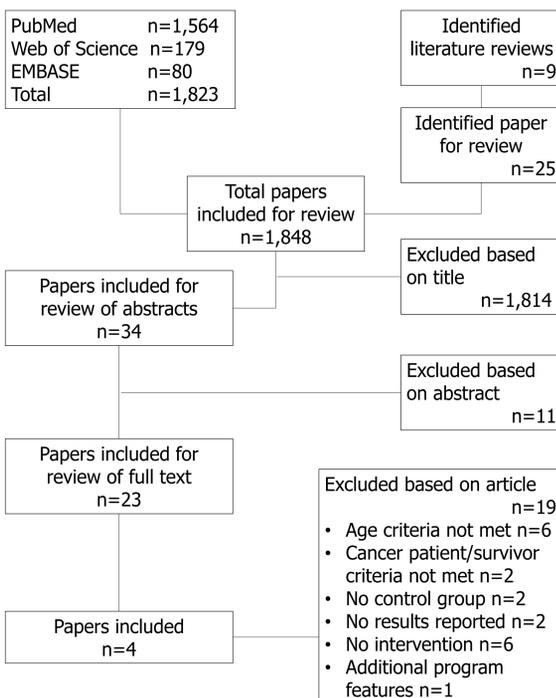


Figure 1. PRISMA Figure outlining inclusion/exclusion criteria for studies.

Results

Authors, Year, Location, Study Design	Sample Characteristics	Intervention Characteristics	Outcomes
Winter et al., 2013 ⁶ Germany Controlled Clinical Trial	Sample • Intervention group n=16 • Control group n=15 • M _{age} =13.7 years±3.2 Diagnosis • Lower extremity bone tumour patients post-surgery	Setting; Supervised (yes/no) • Hospital; Supervised by a trained sports therapist Length of Intervention • During in-patients stays (average 5.3 days ± 1.7) Frequency • 1 time/day for 30-60 min sessions (dependent on individual state of well-being) Intensity • Not reported Activity Type • Warm-up, strength, endurance and relaxation/stretching	Psychological • Not assessed Social • Not assessed Physical • Not assessed Other Adherence • 58.5% Physical Activity Level • Increase in activity in both patient groups (within-subjects results) • No significant difference between intervention and control group (between-subjects results)
Yeh et al., 2011 ⁷ China Controlled Clinical Trial	Sample • Intervention group n=12 • Control group n=10 • M _{age} = 11.7 years (range not reported) Diagnosis • Acute lymphoblastic leukemia patients	Setting; Supervised (yes/no) • Home; Supervised by parents Length of Intervention • 6 weeks Frequency • 3 days/week for 10-30 min sessions (dependent on individual level of physical functioning) Intensity • Warm-up: 10-30% HRR • Aerobic exercise: 40-60% HRR Activity Type • Aerobic exercise following steps in an exercise video • Exercise was individualized following baseline assessment	Psychological Fatigue • No change in general, cognitive, sleep/rest fatigue over time (within- and between-subjects results) Social • Not assessed Physical • Not assessed Other Adherence • 86% (per protocol); 76% (intention to treat)
Rosenhagen et al., 2011 ⁸ Germany Controlled Clinical Trial	Sample • Intervention group n=9 • Control group n=10 • M _{age} = 14.4 years (range not reported) Diagnosis • Mixed cancer patients	Setting • Hospital; Supervised by trained exercise therapists Length of Intervention • 5-7 weeks Frequency • 3 days/week for 50 min sessions (dependent on individual level of physical functioning) Intensity • 0.6 watt/kg on a stationary bike Activity Type • Individualized stationary bicycling and strength training	Psychological Health Related Quality of Life: • No change within or between groups Fatigue • No change within or between groups Social • Not assessed Physical Strength • No change within or between groups Other Study Acceptance • High acceptance for sports therapy
Hinds et al., 2007 ⁹ USA Randomized Controlled Trial	Sample • Intervention group n=14 • Control group n=15 • M _{age} =12.5 years±2.9 (range 7.4-18.2 years) Diagnosis • Mixed cancer patients	Setting • Hospital; Supervised by experienced exercise therapists Length of Intervention • 2-4 days (dependent on length of hospitalization) Frequency • 2 times/day for 30 min sessions Intensity • Not reported Activity Type • Stationary bicycling	Psychological Fatigue • No difference in fatigue scores between* Social • Not assessed Physical Sleep Efficiency • No difference in sleep duration or efficiency between groups* Other Compliance • 85.4% <small>*These results were obtained using mixed model analysis. ANOVA yielded different results: Sleep Efficiency - Significant improvement and difference between-subjects</small>

Based on Human response model (Heitkemper & Shaver, 1989) and Trans-theoretical model of behaviour change (Prochaska & DiClemente, 1983).

Study Inclusion Criteria:

- Used a randomized controlled trial or controlled clinical trial study designs
- Published in peer-reviewed journals in English
- Reported on the outcomes of physical activity
- Included > 50% adolescent (i.e., 13-19 years old) cancer patients or survivors

Study Exclusion Criteria:

- Multicomponent interventions

Discussion

- One RCT and three CCTs were identified that examined physical activity for adolescent cancer patients
- Physical activity appears to be safe; however, the limited number of studies hampers conclusions concerning its effectiveness to improve health-related outcomes in this population
- Given the evidence for the safety and benefits of physical activity in younger² and older³ cancer populations, more studies are urgently required to address the gaps identified (i.e., the dearth of studies), determine the effectiveness of this mode of intervention, and explore the unique benefits it may offer for adolescents with cancer
- There are several avenues for future research, such as:
 - Investigating if there are optimal times (during or after treatment) to intervene
 - Exploring the efficacy of different settings, lengths of interventions, frequencies, intensities and activity types
 - Determining if demographic (e.g., age, gender) and cancer-specific factors (e.g., treatment status) moderate or mediate outcomes

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