

Individualized Exercise in the AYA Cancer Survivor Population

ABSTRACT

Background • Hypotheses
Adolescent and young adult cancer survivors (AYACS; ages 15-30) have an 84.5% five-year survival rate. AYACS have a 10 times greater risk to develop cardiac disease compared to healthy peers.¹ This is in part due to their lower physical activity.² Structured exercise in adult cancer survivors improves strength, fatigue, VO2, and antioxidant levels and decreases markers of cellular damage.³⁻⁵ AYACS could benefit from similar structured long-term exercise. Although evidence suggests exercise is beneficial in older cancer survivors, this has not been demonstrated in AYACS. We hypothesized that a 12-week, one-on-one, multi-modal, community-based exercise program would improve AYACS outcomes compared to baseline or inactive AYACS. The current study hopes to demonstrate the feasibility of an exercise intervention in a community setting within Indianapolis.

Methods
Six individuals were included in a feasibility trial for a larger pilot study of 374 participants. On day 1, baseline assessments were performed for experimental outcomes: body composition, strength, flexibility, VO2peak, balance, plasma biomarkers, plasma biomarkers, PA, psychological health, health-related quality of life, and fatigue. Mini assessments were performed at weeks 5, measuring strength and VO2peak with an isometric leg press and endurance work. Total respectively in the larger pilot study participants will be measured at weeks 12 and 24. Participants train for 60 minutes (20 cardio, 30 weight, 10 stretching) 3 times a week for 12 weeks, one-on-one with a cancer exercise specialist.

Results
The average change in VO2peak was +26.3% and in strength was +15.5% (no statistical analysis). Adherence was 90.5%.

Conclusion • Potential impact
This trial suggests the feasibility of a pilot larger study. The greatest limitation was that the population wanted to prove efficacy, not just feasibility. However, as the goal was to show feasibility rather than to prove efficacy, the sample gave useful information.

BACKGROUND

Adolescent and young adult cancer survivors (AYACS; ages 15-30) have an 84.5% five-year survival rate one year post-diagnosis, which rises to 94% at five years.¹ Currently, AYACS have a 10 times greater risk to develop cardiac disease compared to healthy peers.² This complication and other long-term sequelae are largely side effects of treatment. For example, thoracic radiation increases the risk of ischemic heart disease, cardiomyopathy, and other cardiac pathologies.³ Other common side effects result from therapy or the cancer itself,⁴ such as cancer-related fatigue, likely contributed to the lower physical activity in AYACS compared to the healthy population.⁵ The long-term effects of cancer and its treatment are the greatest burdened aspects of cancer that impact their mortality. In addition to the physical consequences of cancer, the psychosocial aspects of a survivor's health are also affected. Survivors have higher rates of anxiety, depression, and other psychological difficulties compared to their peers.⁶

Due to increases in the expectancy, a multi-disciplinary approach to increase quality of life in the AYACS population after initial treatment is becoming increasingly important. The oncology field has focused interventions mostly on the adult population with very few studies addressing or young adults. For example, structured exercise in adult cancer survivors has been shown to improve strength, fatigue, VO2, and antioxidant levels and decreases markers of cellular damage.³⁻⁵ AYACS could benefit similarly, reducing long-term health effects. An important challenge in the AYACS exercise intervention is the necessary time requirement. Given the responsibilities and life events faced by people from 15-30, ensuring adherence to a structured program presents with inherent difficulty. We hypothesized that a 12-week one-on-one multi-modal, community-based exercise program would improve AYACS outcomes compared to baseline or inactive AYACS. The current study hopes to demonstrate the feasibility of an exercise intervention in a community setting within Indianapolis.

Materials and Methods

Six individuals were included in a feasibility trial for a larger pilot study of 374 participants. On day 1, baseline assessments were performed for experimental outcomes: body composition, strength, flexibility, VO2peak, balance, plasma biomarkers, PA, psychological health, health-related quality of life, and fatigue. The strength assessment included exercises for all major muscle groups: isometric leg press, isometric chest press, chest press, seated row, leg curl, leg extension, leg press. Mini assessments were performed at weeks 5, measuring fatigue, psychological health, strength and VO2peak. These outcomes were measured with the PARISS and the PARISS. Patient-Reported Outcomes Measurement Information System (PROMIS) anxiety and depression scales.⁷⁻⁹ 6-minute Walk Test¹⁰, and estradiol one-rip maximum.¹¹ respectively.

$$VO2peak = \frac{2000 \times (HR_{max} - 181) + 1000 \times (HR_{max} - 181) \times (HR_{max} - 181) \times 0.001}{254} + (26 \times \text{Stature} \times RP \text{ (m} \cdot \text{min}^{-1}) \times 0.001) + 2.45$$

$$FIMR = \text{weight} \times \left(\frac{\text{HR}_{max} - 181}{100} \right)$$

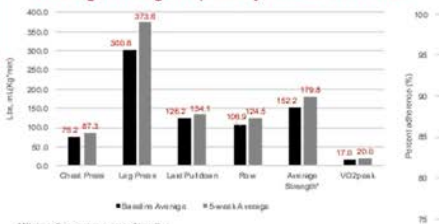
In the larger pilot study, and later in the feasibility trial, participants will be measured at weeks 12 and 24 for all outcomes. The first study will have no 5-week mini assessments. During the trial assessment, range of motion for each exercise is noted to ensure reproducibility of the trial assessment conditions upon re-assessment. Participants train for 60 minutes (20 cardio, 30 weight, 10 stretching) 3 times a week for 12 weeks, one-on-one with a cancer exercise specialist. Training is tailored to each individual; breast cancer survivors may focus on strengthening the sides of their upper body that underwent surgical therapy, while survivors of lung cancer may perform circuit training during the strength session in order to improve cardiorespiratory fitness. Each training session is developed by the trainer of the individual client. Exercise sessions are carried out at the Indianapolis Community Healthplex, which contains a fully-equipped gym. Training is spaced throughout the week as needed by each client to ensure maximal adherence, allowing consecutive days if necessary.

RESULTS

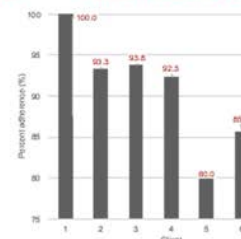
Percent changes in trial fitness outcomes by client

Client	Age	Sex	Cancer Stage	DeltaVO2%	DeltaFCP	DeltaFCP	DeltaStAP	DeltaFlex
1	27	Female	0-1	19.1	21.6	47.1	-11.3	31.9
2	27	Male	2B	-13.8	9.1	14.3	10.0	11.9
3	40	Female	1	31.6	-19.7	24.4	-	-0.7
4	41	Male (2A)	Melanoma, Basal cell carcinoma	118.1	18.1	9.6	4.9	2.3
5	21	Female	2	1.2	7.0	32.6	7.6	16.7
6	20	Female	2	5.0	71.4	8.0	-3.0	30.7
Average				23.3	17.6	28.7	3.4	19.8
Average % strength change								15.5

Average change in primary fitness outcomes



Percent adherence



Psychosocial and Fatigue Outcomes

	Mean change	Mean initial value	p-value
Advanced Paper Fatigue Scale	-1.37	3.58-5.5	0.022
Paper-Attentional Ability	-1.83	3.14-2.9	0.047
Paper-Attentional Making	-3.07	4.06-1.0	0.047
Paper-Serious	-1.93	3.87-1.9	0.024
Paper-Cognitive/Speed	-1.06	2.79-1.7	0.091
PROMIS-Anxiety (4 items)	-0.83	8.17-5.3	0.293
PROMIS-Depression (4 items)	-0.47	3.50-4.0	0.323

RPRS is the general scale including the 4 2-Sub-Category. RPRS showed significant improvement after the intervention despite insignificant improvements in 2 of its sub-categories. The PROMIS scale for depression and anxiety showed no significant improvement but did trend in the positive direction.

STATEWIDE IMPACT

To best serve participants, sites must open across the state so that services are available close to their homes. To keep overhead costs minimal and to capitalize on faculty and students as resources, sites will first open at existing fitness facilities at the IU School of Medicine's eight regional campuses.

Philanthropic support will be key to creating a virtual statewide clinical research laboratory that can engage researchers and participants from all corners of Indiana to evaluate the impact of an integrated wellness approach on the long-term health of cancer survivors.



March 2019
First site opens at Indianapolis Healthplex. This state-of-the-art wellness and fitness center has donated access to its facilities to participants and is providing dedicated space to the Indiana Cancer Wellness Center.

2020
Expansion to IU School of Medicine campuses in Evansville, Fort Wayne and South Bend.

2021-2022
Expansion to IU School of Medicine campuses in Bloomington, Gary, Muncie, Terre Haute and West Lafayette.

SUMMARY and CONCLUSIONS

The greatest limitation of this trial was the participating ages falling above the AYACS age range. As a prominent concern regarding AYACS adherence to the future pilot study is their ability to maintain a regular schedule, the lack of AN-Age-range participants could reduce the study's ability to predict adherence. However, this pilot points toward the best adherence-boosting strategy. Only all participants had work and family life as barriers to exercise session attendance. Both factors were also important limitations in AYACS. Next, flexibility on the part of the trainers allowed coverage of a wide variety of exercise schedules. Thus, the study did not only attempt to suggest feasibility regarding the age of the trial, but also feasibility of the program at the Indianapolis Healthplex. No participants expressed problems with the facility with respect to a location or equipment and activity offering. Overall, we believe this trial to have suggested feasibility of the larger pilot study.

An previous studies have shown that programs of structured exercise can improve health outcomes in adult cancer survivors, proving the way not the goal of the trial. However, the positive changes in physical and psychosocial outcomes demonstrated are important. The improvements suggest that the specific exercise programming and facility used for this trial could reproduce previously recorded improvements in health outcomes of other cancer survivors. This shows that investigation of the AYACS population with the methodology performed in this feasibility study is a worthwhile investment capable of confirming the proposed hypothesis in a randomized control trial.

OUR TEAM



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