ROCK CLIMBING TRAINING AND CANCER SURVIVORSHIP – A PILOT STUDY

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Abstract

Introduction. Cancer survivors (CS) have a high probability of experiencing a multitude of psycho-physiological stressors after a cancer diagnosis and in conjunction with cancer therapies. **Purpose.** Therefore, the primary aim of this investigation was to explore the potential mental and physical benefits of incorporating rock climbing training (e.g., adventure-based/non-traditional physical conditioning) into exercise programming during the cancer survivorship process. **Methods.** In this pilot project, four (n=4, female=2) CS, many years after cancer diagnosis and treatment, volunteered to participate. Over the course of an 8-wk, 2 x wk, supervised exercise training intervention, we showcased the benefits of full body circuit training (CircT) for 4-wks followed immediately by 4-wks of full body rock climbing training (RockT). Psychological (e.g., self-efficacy, fatigue) and physiological (e.g., predicted VO_2max, balance) variables were assessed at baseline, 4-wks (i.e., after CircT), and 8-wks (i.e., after RockT) in this non-randomized, cross-over study protocol. **Results.** Psycho-physiological variables, in general, improved the initial 4-wks and remained stable the last 4-wks of training. **Conclusion.** In this small CS group, we observed improvement in physical functioning with very little alteration in their psychological outlook. Importantly, the unique qualities of rock climbing training served to maintain the effectiveness of traditional exercise training sessions.

Keywords: exercise, self-efficacy, balance, muscular fitness, fatigue

Acknowledgements: We wish to thank the cancer survivors who participated and brightened our day two times per week for 8 weeks. Never stop moving!

Abstrait

Introduction. Les survivants du cancer (CS) ont une forte probabilité d'éprouver une multitude de facteurs de stress psychophysiologiques après un diagnostic de cancer et en conjonction avec des thérapies contre le cancer. **Objectif.** Par conséquent, l'objectif principal de cette enquête était d'explorer les avantages physiques et mentaux potentiels de l'intégration de l'entraînement d'escalade (conditionnement physique basé sur l'aventure / non traditionnel) dans la programmation d'exercices durant le processus de survie au cancer. **Méthodes.** Dans ce projet pilote, quatre (n = 4, femmes = 2) CS, plusieurs années après le diagnostic et le traitement du cancer, se sont portés volontaires pour participer. Au cours d'une séance d'entraînement supervisée de 8 semaines, 2 x semaines, nous avons présenté les avantages de l'entraînement en circuit complet (CircT) pendant 4 semaines, suivi immédiatement de 4 semaines d'entraînement à l'escalade complète (RockT). Les variables psychologiques (p. Ex. Auto-efficacité, fatigue) et physiologiques (p. Ex. VO2max prédite, équilibre) ont été évaluées au départ, 4 semaines (c.-à-d. Après CircT) et 8 semaines (c.-à-d. protocole d'étude randomisé et croisé. **Résultats.** Les variables psycho-physiologiques, en général, ont amélioré les 4 semaines initiales et sont restées stables les 4 dernières semaines d'entraînement. **Conclusion.** Dans ce petit groupe CS, nous avons observé une amélioration du fonctionnement physique avec très peu d'altération dans leurs perspectives psychologiques. Fait important, les qualités uniques de l'entraînement d'escalade ont servi à maintenir l'efficacité des séances d'entraînement traditionnelles.

Mots-clés: exercice, auto-efficacité, équilibre, forme musculaire, fatigue

Introduction

Climbing involves continuous episodes of isometric holding (Booth et al., 1999) and both aerobic and anaerobic energy system involvement (Giles, Rhodes & Taunton, 2006). Further, as metabolites accumulate in climbing specific skeletal musculature with overload, such as during bouldering or top rope (TR) ascents, localized muscle vasodilation occurs and blood flow is directed to working areas via increased cardiac output and blood flow redistribution (Watts et al., 2000). Henceforth, this implies specific feedback to the Central Nervous System (CNS) via the metaboreflex (Sheel, 2004), which consequently invokes a rise in sympathetic activation and increased heart rate (HR) (O'Leary et al., 1999; and Sheel, 2004) along with potentially altered perceived effort (PE) and mood states. Some researchers have explored the psycho-physiological impact of rock climbing ascents (Draper et al., 2010). We explored the impact, both physically and mentally, of utilizing rock climbing training and movements in CS, post treatment. Because rock climbing oriented exercise sessions may be novel to CS undergoing fitness programming, it is important to underscore the sympathetic NS and cardiovascular benefits of climbing training. Moreover, with a cancer diagnosis, it is largely a health- and self image-altering event, especially in relation to self-efficacy, possible onset of depression, and unexplained fatigue (ACSM, 2012).

Purpose

The primary purpose of this research was to explore psychophysiology variables related to CS undergoing rock climbing training. We hypothesized that rock climbing training would maintain or increase physical functioning and augment psychological outcomes in our cross-over study design.

Methods

Four (n=4, female=2) cancer survivors, with very little (n=2) or no rock climbing experience (n=2), volunteered to be in our research project, approved by the University Institutional Review Board (IRB) for protection of human participants (IRB# HS16-808). We employed a convenience sample in a non-randomized cross over study design with repeated measures (i.e., at baseline, 4-wks, and 8-wks). All participants committed to the 8-wk, 2 x wk, supervised exercise training program. The initial 4-wks, all participants underwent standardized, full body, circuit weight training (CircT) exercise sessions (e.g., 8-12 full body exercise stations with 30 sec lifting / 30 sec rest x 3 sets + 10-15 min of continuous aerobic exercise). The last 4-wks, all participants were progressed into utilizing continuous rock climbing movement training (RockT), starting on a bouldering wall while maintaining some CircT. Indoor wall climbing (i.e., 9 meter high, artificial indoor wall with harness and rock shoes) was introduced the final 2-wks with circuit, leg exercises introduced after 20-min of climbing x 2 (Figure 3). Data collection occurred at baseline, mid-, and post-training on fitness/physiological and psychological parameters. Fitness tests included bench step-ups for estimated VO_2max (ml/kg/min), sit and reach for flexibility (cm), balance error scoring system (BESS) for balance (total # of errors), and sit-ups and push-ups to failure set to a metronome (20 reps/min) for muscular fitness. Psychological tests included Piper Fatigue Scale (PFS), Beck Depression Inventory (BDI), and General Self Efficacy Scale (GSES). Two-way, repeated measures analysis of variance (ANOVA) tests were utilized for each variable and a Bonferroni adjustment employed for each category of assessment (i.e., physiological and psychological). Significance was set at $p < 0.01$ for

physiological and $p < 0.02$ for psychological data.

Results

Height, weight, and age are reported in Table 1 (mean ± SD). Table 2 provides cancer diagnosis and treatment type(s). No significant differences were found between groups (i.e., CircT vs RockT) or across time (i.e., pre- vs mid- vs post-training) for any variable. Figure 1 depicts physiological outcomes from pre- to mid- (after 4-wks of CircT) to post-training (after 4-wks of RockT), and includes sit-ups (muscular fitness), push-ups (muscular fitness), sit and reach (flexibility), balance (neuromuscular control), and predicted VO_2max (functional capacity). Only sit-ups (reps to failure) and balance (# errors recorded) continued to improve over the 8-week, cross-over design exercise training protocol (i.e., 4-wk CircT followed by 4-wk RockT). Push-ups (muscular fitness) and sit and reach (flexibility of the lower back and upper hamstrings) improved from baseline to 4-wks of CircT and then declined slightly or remained constant after 4-wks of RockT. VO_2max (functional capacity) declined marginally after 4-wks of CircT and improved slightly after 4-wks RockT. With regard to psychological outcomes (Figure 2), GSES started high (33.5 out of top score of 40), increased slightly (to 34) after CircT, and declined marginally (to 33) after RockT. BDI remained steady after 4-wks of CircT and decreased a little after 4-wks of RockT.

Finally, PFS declined after 4-wks of CircT and increased after 4-wks of RocT, although fatigue remained below the baseline value.

Table 1. **Participant Characteristics.**

	Age (yrs)	Ht (cm)	wt (kg)
mean	44.3	170.3	71.7
SD	11.1	10.5	11.5

Table 2. **Cancer Characteristics**

Cancer Diagnosis	Diagnosis Date	Treatment
Small Cell Lung ca. - non squamous cell; stage III;	3/2014	6-wks chemotherpy; no meds
Synovial Sarcoma	4/2008	Surgery + Chemo
Borderline Ovarian Cancer, stage I	3/2010	R. ovary removed/ surgery, no other trt
Testicular	7/1997	Surgery

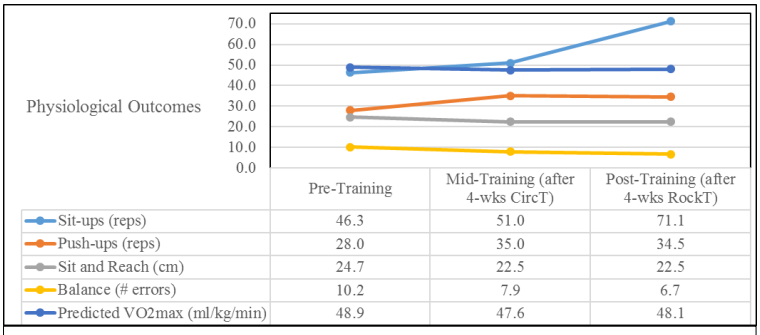

Figure 1. Physiological outcome variables at pre-, mid-, and post-training in cancer survivors. CircT = circuit wt training; RockT = rock climbing training.

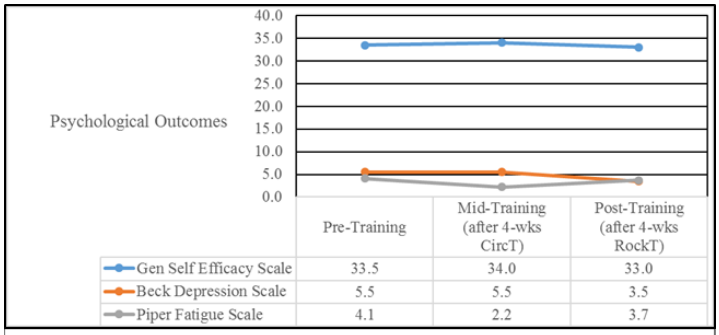

Figure 2. Psychological outcome variables at pre-, mid- (after 4-wks CircT), and post-training (after 4-wks of RockT) in cancer survivors. CircT = circuit wt training ; RockT = rock climbing training.

DISCUSSION

Notably, we observed physiological improvement over the initial 4-wks of CircT and maintenance of this enhancement over 4-wks of RockT. Although not formally measured, participants expressed they felt a sense of camaraderie during both phases of training and that RockT induced a greater sense of accomplishment vs CircT.

From a general psychological perspective, self-efficacy, depression, and fatigue indicators displayed minimal to mild dysfunction. It's well established that exercise training induces positive physiological and psychological changes in diseased and non-diseased exercisers (ACSM, 2017). Less documented are the effects of adventure-based training (i.e., non-traditional exercise conditioning), such as RockT, on the cancer survivorship experience and in particular posttraumatic growth perspective in cancer survivors (Burke and Sabiston, 2012). In fact, according to Burke and Sabiston, a person's encounter with cancer may lead them to "embrace new experiences and lead a more active life". This is especially poignant when one considers the initial thought process of a cancer survivor at diagnosis, which includes pondering "a threat of death and responding with fear, helplessness, and anxiety" (Burke and Sabiston, 2012). With the aforementioned quotes in mind, the current study, a pilot project with a low number of participants, illustrated the psycho-physiological benefits of a CircT program followed by RockT. Despite the small number of exercisers and non-significant findings, we believe that RockT provided a stabilizing boost to the traditional exercise (i.e., CircT) training program and may offer an enhanced sense of accomplishment and camaraderie (Figure 3).

Figure 3. Cancer survivors going through group circuit leg exercises in between 2 x 20-min, tope-rope climbing bouts.

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