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Caitlin M. Coviello
Florida State University, cmc11j@my.fsu.edu

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Resistance Training Improves Muscular Strength and Lymphedema in Breast Cancer Survivors

C.M. Covelli1, T.A. Madzima1, M.J. Ormsbee1,2, L.B. Panton1,2
Dept. of Nutrition, Food & Exercise Sciences1, Institute of Sports Sciences and Medicine2 Florida State University, Tallahassee FL

ABSTRACT
Breast cancer survivors (BCS) encounter side effects from cancer treatments that reduce muscular strength. Studies show resistance training (RT) in BCS can improve strength. One concern with RT in BCS is increasing lymphedema, which is swelling of the arms from lymph node removal and is a common side effect in BCS. Studies suggest low to moderate RT may improve or reduce the risk of developing lymphedema. PURPOSE: To evaluate the efficacy of a moderate to high intensity RT intervention to improve muscular strength and lymphedema in BCS over a 12-week period. METHODS: Thirty-three (age: 59±8yrs; BMI: 27.2±5.6kg/m²) BCS were measured pre and post training for muscular strength (chest press and leg extension) via one-repetition maximums (1-RM) and handgrip (HG) strength via a HG dynamometer. Lymphedema was monitored at baseline and weeks 5 and 9 by measuring the percent difference in circumference between the involved and uninvolved arm. A positive percent difference indicates the possibility of edema. RT consisted of two days/wk using ten exercises performed for three sets of 10-12 repetitions at ~65-85% of 1-RM. ANOVAs were used to analyze data. Significance was accepted at p<0.05. RESULTS: BCS significantly increased upper (86±22 to 115±29kg) and lower body (97±25 to 116±31kg) strength and HG strength (51±9 to 54±8kg). The average percent difference in upper extremity volume of BCS significantly decreased from 5.6±11.2% at baseline to 2.0±5.6% in week 9, CONCLUSIONS: Twelve weeks of RT at 65-85% of 1-RM was well tolerated and significantly improved muscular strength and decreased lymphedema in BCS.

BACKGROUND
• Approximately 231,840 new cases of breast cancer are estimated in 2015 (1).
• Despite the improved five-year survival rate, breast cancer survivors (BCS) encounter both physical and psychosocial side effects from cancer treatments that negatively affect body composition and quality of life (QOL) (2,3,4).
• Resistance training (RT) has been shown to elicit improvements in body composition (lean mass and fat mass), muscular strength, and physical function in cancer survivors (5).
• Lymphedema is a common side effect in breast cancer survivors, characterized by swelling of the arms. Despite guidelines discouraging RT given by the National Lymphedema Network, studies have shown that RT does not increase arm swelling or worsen lymphedema symptoms(6).

PURPOSE
To evaluate the efficacy of a moderate to high intensity RT intervention to improve muscular strength and lymphedema in BCS over a 12-week period.

METHODS
• Thirty-three (59±8yrs) female BCS (stages 0-II), ages 40-75 years, having completed cancer treatment (surgery, radiation, chemotherapy, and/or hormone suppressant therapy) and/or who were taking hormone suppressant therapy were recruited for the study.

RESULTS
TABLE 1. Characteristics of Participants (N=33)

| Age (yrs) | 59 ± 8 |
| Months Since Cancer Diagnosis (months) | 74 ± 59 |
| Height (cm) | 162.3 ± 5.8 |
| Weight (kg) | 72.6 ± 14.5 |
| Body Mass Index (kg/m²) | 27.6 ± 5.6 |

Values are means ± standard deviations

TABLE 2. Muscular Strength (N=33)

| Age (yrs) | 59 ± 8 |
| Months Since Cancer Diagnosis (months) | 74 ± 59 |
| Height (cm) | 162.3 ± 5.8 |
| Weight (kg) | 72.6 ± 14.5 |
| Body Mass Index (kg/m²) | 27.6 ± 5.6 |

Values are means ± standard deviations

TABLE 3. Baseline Lymphedema History (N=33)

| Lymph nodes removed from both arms (%) | 10 % 30 % |
| Lymph nodes removed from right arm (%) | 10 % 30 % |
| Lymph nodes removed from left arm (%) | 10 % 30 % |
| No lymph nodes removed (%) | 40 % 10 % |

RT consisted of two days/wk using ten exercises performed for three sets of 10-12 repetitions at ~65-85% of 1-RM. All significance was accepted at p<0.05. Twelve weeks of RT at 65-85% of 1-RM improved muscular strength and decreased lymphedema in a majority of participants. However, among the participants that did not have any lymph nodes removed from either side of their upper body, the percent difference between the arm with the larger volume and the arm with the lesser volume was analyzed. A one-way analysis of variance (ANOVA) was used to analyze pre- and post changes of dependent variables. All significance was accepted at p<0.05. Statistical analyses were completed on SPSS (version 21).

FIGURE 1. Lymphedema Monitoring

Upper Extremity Lymphedema Measurements: % Difference between involved versus Uninvolved Arms (N=33)

CONCLUSIONS
Twelve weeks of RT at 65-85% of 1-RM was well tolerated and significantly improved muscular strength and decreased lymphedema in BCS. RT at higher intensities can help counteract the cancer related changes and significantly improve muscular strength without exacerbating lymphedema or causing any musculoskeletal injuries.

REFERENCES