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Utilising a Combined Exercise and Counselling Program to Examine the  
Relationship Between Emotional Self-Efficacy and Physiological Improvements in  
Breast Cancer Survivors

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## Results

### Participant recruitment and baseline characteristics

Participant recruitment commenced in October 2008 and concluded in May 2009, with women beginning the program on a rolling basis. Figure 3 presents a summary of how women were transitioned through the program. Out of the 23 women who expressed interest in participating, 21 were eligible for the study. The reason for ineligibility was still undergoing treatment (n=2).

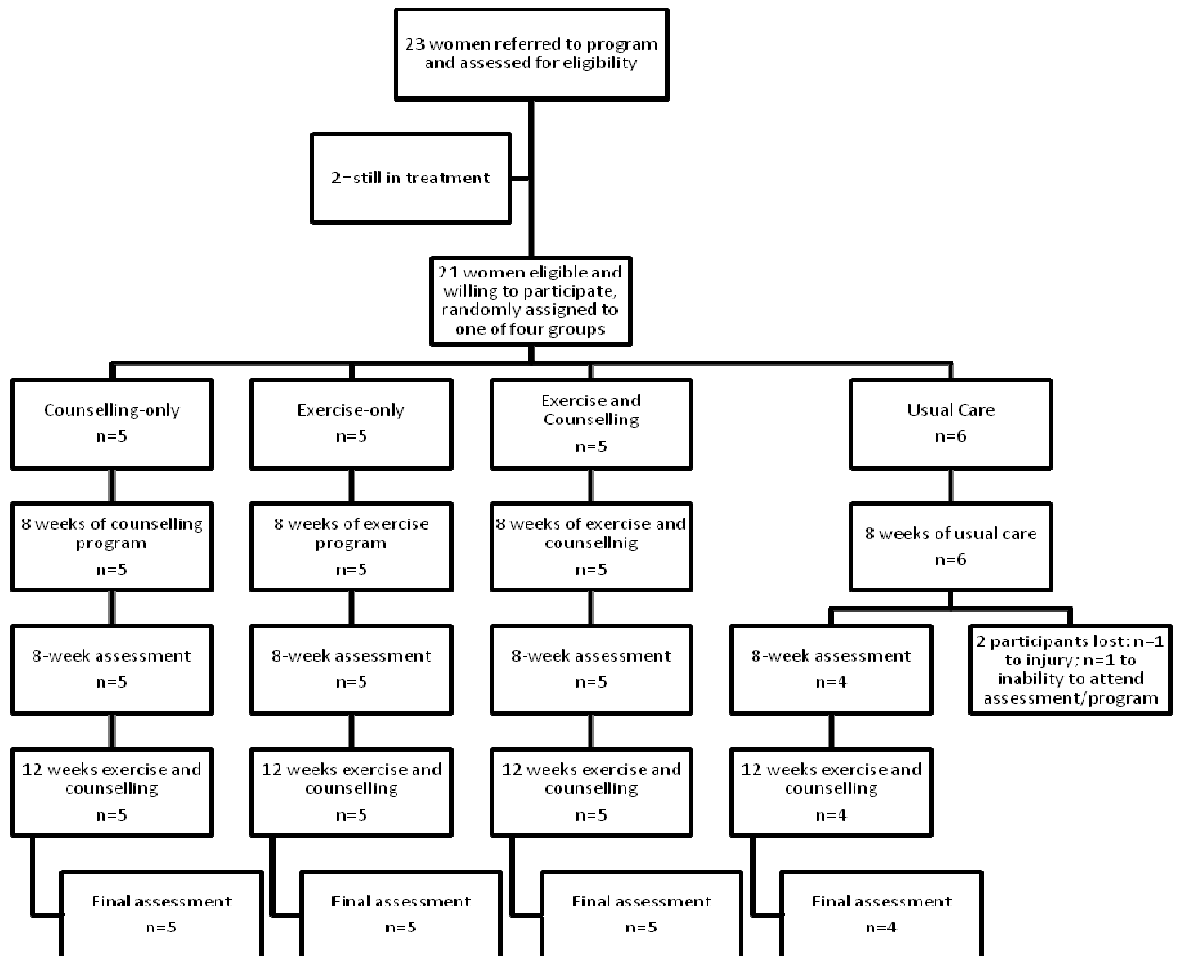


Figure 3. Group allocation and movement of participants through intervention.

Table 6 presents baseline demographic (age, marital status) and medical characteristics (weight, BMI, hypertension, menopausal status, cancer-related statistics) of study participants.

Table 6

*Baseline Demographic and Medical Profile of Participants Overall and by Group*

Variable	Overall n=19		Counselling n=5		Exercise n=5		Exercise & Counselling n=5		Usual Care n=4		p
	# of patients or M	% or range	# of patients or M	% or range	# of patients or M	% or range	# of patients or M	% or range	# of patients or M	% or range	
Age, years	56	37-73	56	53-70	47.4	44-51	49.4	46-53	53.75	37-73	0.026*
Months post	5	1-24	2	1-5	6	1-18	8	2-24	8.5	1-10	0.260
Marital status											0.561
Single	1	5.3	0	0	0	0	1	20	0	0	
Married	17	89.5	5	100	5	100	4	80	3	75	
Widowed	1	5.3	0	0	0	0	0	0	1	25	
Weight, kg	75.2	54.7-104	68.1	54.7-75.2	75.8	60.9-84.9	81.4	67.2-104	68.2	57.9-91.5	0.151
BMI, kg/m <sup>2</sup>	25.5	20.3-38.6	24.1	21.9-25.5	28	20.6-31.6	31.4	24.4-37.7	26.2	20.2-38.6	0.167
Obese	5	26.3	0	0	1	20	3	60	1	25	0.226
Hypertension	8	42	2	40	2	40	2	40	2	50	1.000
Menopausal											0.343
Pre	6	31.6	0	0	3	60	2	40	1	25	
Peri	5	26.3	2	40	1	20	2	40	0	0	
Post	8	42.1	3	60	1	20	1	20	3	75	
Disease stage											0.417
I	4	21.1	0	0	2	40	1	20	1	25	
II	10	52.6	3	60	2	40	4	80	1	25	
III	5	26.3	2	40	1	20	0	0	2	50	
Surgery											0.853
Lump	5	26.3	1	20	1	20	1	20	2	50	
Mast	13	68.4	4	80	4	80	3	60	2	50	
None	1	5.3	0	0	0	0	1	20	0	0	
Chemo protocol											1.000
FEC	2	10.5	1	20	0	0	0	0	1	25	
FEC-T	7	36.8	3	60	2	40	0	0	2	50	
AC-T	3	15.8	0	0	0	0	3	60	0	0	
TC	1	5.3	0	0	1	20	0	0	0	0	
E-CMF	1	5.3	0	0	1	20	0	0	0	0	
None	5	26.3	1	20	1	20	2	40	1	25	
Radiation	12	63.2	1	20	4	80	5	100	2	50	0.039*
HT											0.453
Tam	14	73.7	3	60	4	80	5	100	2	50	
AI	4	21.1	1	20	1	20	0	0	2	50	
None	1	5.3	1	20	0	0	0	0	0	0	

Note. M, median; BMI, body mass index; Lump, lumpectomy; Mast, mastectomy; FEC, fluorouracil, epirubicin, cyclophosphamide; FEC-T, fluorouracil, epirubicin, cyclophosphamide, docetaxel; AC-T, doxorubicin, cyclophosphamide, docetaxel; TC, docetaxel, cyclophosphamide; E-CMF, epirubicin, cyclophosphamide, methotrexate, fluorouracil  
\* p < .05

The median age was 56 years and ranged from 37-73 years, with 89.5% of the women married and 42.1% post-menopausal. In relation to their cancer, women typically had Stage II cancer (52.6%) and a median of 5 months post-treatment (range=1-24 months), which usually involved a mastectomy (68.4%), chemotherapy

(73.7%), radiation (63.2%), and some form of hormone therapy (94.7%). Groups were balanced on all medical variables, with the exception of whether or not they underwent radiation ( $p=0.039$ ). The only significant difference in demographic variables found at baseline was in relation to age ( $p=0.026$ ). Due to the small number of participants in each group and need to use non-parametric tests, no adjustments for the variation in age and radiation treatment were made during analyses. Instead, the potential impact of these differences is explored further in the discussion. Additionally, it is important to point out that clinically significant differences in baseline parameters may have existed between groups. For example, BMI differences of  $\geq 1$  kg/m<sup>2</sup> are typically considered clinically significant, and there was a range of 6.3 units in group BMI values. Relevant implications of such differences are examined in the discussion. Baseline values of the assessed physical and psychological parameters are presented in Table 7.

Table 7

*Baseline Physiological and Psychological Scores of Participants Overall and by Group*

Variable	Overall n=19		Counselling n=5		Exercise n=5		Exercise & Counselling n=5		Usual Care n=4		p
	Med (M)	Range (SE)	Med (M)	Range (SE)	Med (M)	Range (SE)	Med (M)	Range (SE)	Med (M)	Range (SE)	
ESE (SESES-C)	71.33 (76.45)	20.67-173.3 (7.73)	54 (63.47)	37.33-96.67 (12.98)	82 (80.93)	62.67-97.33 (6.341)	54.67 (55.07)	20.67-93.33 (12.85)	90.0 (106.3)	72-173.3 (22.73)	0.266
Body comp (%BF)	33 (31.9)	24.6-45 (2.116)	31 (29.6)	25.1-32.9 (1.402)	33.4 (31.7)	24.6-38.6 (2.459)	37.2 (31.1)	27.3-43.5 (7.627)	33.1 (35.3)	29.8-45 (3.34)	0.295
$\dot{V} O_{2max}$ (Modified Bruce, mL•kg <sup>-1</sup> •min <sup>-1</sup> )	30.22 (30)	17.67-37.53 (1.004)	29.65 (31.1)	28.9-34 (1.027)	30.91 (29.8)	22.81-36.5 (2.275)	30.9 (30.5)	29.08-31.37 (0.401)	29.65 (28.6)	17.67-37.53 (4.103)	0.941
UB strength (YMCA BP, repetitions)	16 (19)	0-44 (3.1)	13 (17)	0-36 (6.8)	15 (13)	2-29 (4.9)	19 (26)	12-44 (6.1)	16.5 (18)	3-34 (7.2)	0.437
LB strength (1RM LP, kg)	70 (70.8)	40-110 (4.251)	60 (66)	40-90 (8.718)	60 (72)	50-110 (12.14)	80 (80)	60-100 (7.071)	65 (65)	60-70 (2.887)	0.563
Flexibility (Sit- and-reach, cm)	2.5 (2.7)	-13-17 (1.917)	2.5 (1)	-13-9.5 (4.053)	1 (0.7)	-5-7 (1.947)	6 (2.7)	-7.5-12 (3.8)	9.25 (6.4)	-10-17 (6.296)	0.731

Note. Med, median; M, mean; SE, standard error; ESE, emotional self-efficacy; SESES-C, Stanford Emotional Self-Efficacy Scale-Cancer; %BF, percent body fat;  $\dot{V} O_{2max}$ , maximal volume of oxygen consumed; UB, upper body; BP, bench press; LB, lower body; LP, leg press; RM, repetition maximum

Important to note from these results is that no significant differences between groups existed at baseline for emotional self-efficacy or any of the physiological variables. There was discrepancy between the median and mean values of C self-efficacy scores (54 versus 63.47), but no one individual baseline score appeared to influence this. The same trend was observed in the UC group (median=90,  $\bar{x}$ =106.3), though

this likely resulted from a potential outlier scoring 173.3 and the group only containing 4 rather than 5 participants. Similar discrepancies between median and mean are seen in ExC upper body strength, Ex lower body strength, and ExC and UsC flexibility, primarily existing due to the impact of a potential outlier on the mean. The impact of such discrepancies is mentioned in the limitations section of the discussion. The potential existence of clinically significant differences between groups at baseline is also examined in the discussion.

### **Adherence**

Two subjects pulled out of the study prior to fully completing the eight-week assessment, with both being from the usual care group. One ceased participation due to injury unrelated to the study, and the other subject was no longer able to commute to the program. These two individuals were therefore considered “dropouts” and all related data was excluded from data analysis. This resulted in 19 subjects overall completing all three assessments (baseline, 8-week, and 20-week), with 5 participants each in the exercise-only, counselling-only, and exercise and counselling group and 4 women in the usual care group.

Attendance to supervised exercise sessions was monitored for each participant once she commenced this component of her program, either at the start or after the eight-week assessment, depending on allocated treatment group. Maximum number of sessions each participant could attend varied based on which group she was in and how much of her program was home- versus gym-based. Participants taking holiday during enrolment in the exercise component were given a home-based program to continue while away. Adherence to this program was self-reported and tracked by the participant utilising an individualised exercise log (Appendix). Overall median exercise adherence was 79% (n=19, range=33-100%). Group-specific adherence rates were: exercise-only group (n=5, median=77%, range=70-100%), counselling-only group (n=5, median=79%, range=72-94%), exercise and counselling group (n=5, median=83%, range=50-89%), usual care (n=4, median=76.5%, range=33-90%). Figure 4 presents the given reasons for missed sessions, with the primary causes for absenteeism being sickness (32%), work (19%), and injury sustained outside the program (19%).

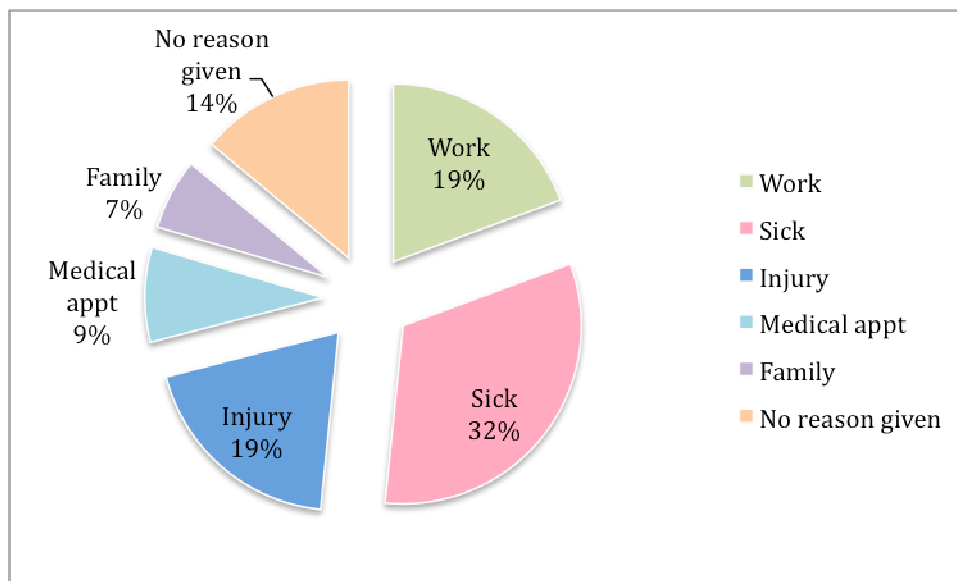


Figure 4. Percentages of sessions missed and corresponding reasons.

Adherence to counselling was not based on number of sessions attended, as these sessions were conducted on a needs-based schedule discussed between the counsellor and participant. Instead, subjects were either classified as “non-compliant” (NC) or “graduated” (G) based on whether they continued long enough to participate in a closing session with the counsellor. The counsellor did not have specific graduation criteria, but based it more on overall progress from initial session and other patient-specific advances that were not disclosed for sake of privacy protection. Due to this method of tracking adherence, no specific data was recorded on number of sessions attended and required for counselling completion. Overall results were 2 classified as NC and 17 deemed G. In relation to group-specific figures, the averages are as follows: exercise-only (NC=1, G=4), counselling-only (NC=0, G=5), exercise and counselling (NC=0, G=5), usual care (NC=1, G=3). The reasons given for non-compliance were belief they did not need counselling (n=1) and unwillingness to schedule time for sessions (n=1). It is not known if these participants held this view prior to program commitment or developed it after enrolment, but follow-up study would be beneficial to examine reasons for these beliefs.

### 8-Week Differences

**Between-group differences.** The Kruskal-Wallis test was utilised to examine differences between groups for eight-week changes ( $\Delta$ ). Table 8 presents

group medians, ranges, means, standard error, and p-values for eight-week changes observed in the psychological and physiological parameters of interest.

Table 8

*8-week Psychological and Physiological Changes of Participants Overall and by Group*

Variable	Overall n=19		Counselling N=5		Exercise n=5		Exercise & Counselling n=5		Usual Care n=4		p
	Med (M)	Range (SE)	Med (M)	Range (SE)	Med (M)	Range (SE)	Med (M)	Range (SE)	Med (M)	Range (SE)	
ESE (SESES-C)	4 (-0.77)	-107-26.7 (6.66)	12 (11.1)	-10-26.7 (6.91)	6 (8.13)	-2.67-20 (3.91)	17.3 (11.1)	-2-21.3 (5.24)	-12 (-33.3)	-107- -2.67 (24.8)	0.052
Weight (kg)	-0.15 (-0.11)	-1.8-2 (0.21)	0.15 (0.02)	-0.75-0.65 (0.28)	0.1 (0.74)	-0.15-2 (0.46)	-0.6 (-0.72)	-1.8- -0.15 (0.29)	-0.35 (-0.46)	-1.45-0.3 (0.37)	0.071
BMI (kg/m <sup>2</sup> )	-0.05 (-0.04)	-0.66-0.7 (0.08)	0.1 (0.03)	-0.29-0.22 (0.01)	0.03 (0.26)	-0.05-0.7 (0.16)	-0.2 (-0.26)	-0.6- -0.08 (0.09)	-0.1 (-0.19)	-0.66-0.1 (0.17)	0.065
Body comp (%BF)	0.4 (0.29)	-2.56-2.8 (0.36)	1 (1.22)	-0.48-2.8 (0.6)	0.4 (-0.35)	-2.56-0.9 (0.7)	-0.5 (-0.56)	-2.4-1.9 (0.75)	0.81 (0.83)	-0.69-2.41 (0.71)	0.213
$\dot{V} O_{2max}$ (Modified Bruce, mL·kg <sup>-1</sup> ·min <sup>-1</sup> )	0.59 (0.54)	-14.8-9.8 (1.23)	0.3 (-4.23)	-14.8-0.8 (3.12)	5.19 (4.84)	-0.9-9.8 (1.91)	1.07 (1.06)	-0.47-3 (0.56)	-0.15 (0.5)	-3.03-5.33 (1.76)	0.139
UB strength (YMCA BP, repetitions)	2 (1.65)	-10-14 (1.68)	-7 (-5.4)	-10-0 (1.75)	9 (8)	2-11 (1.67)	4 (5)	-6-14 (3.52)	1 (-1)	-8-2 (2.35)	0.010*
LB strength (1RM LP, kg)	0 (6.25)	-10-30 (2.56)	0 (0)	-10-10 (3.16)	10 (12)	0-30 (5.83)	10 (8)	-10-20 (5.83)	0 (5)	0-20 (5)	0.419
Flexibility (Sit- and-reach, cm)	2 (1.51)	-3.5-8 (0.71)	1 (0.8)	-3.5-8 (2.12)	1.5 (1.7)	0-3.5 (0.68)	3 (3.8)	2-6.5 (0.78)	-0.5 (-0.25)	-3-3 (1.25)	0.146

Note. Med, median; M, mean; SE, standard error; ESE, emotional self-efficacy; SESES-C, Stanford Emotional Self-Efficacy Scale-Cancer; %BF, percent body fat; CR, cardiorespiratory;  $\dot{V} O_{2max}$ , maximum volume of oxygen consumed; UB, upper body; BP, bench press; LB, lower body; LP, leg press; RM, repetition maximum  
\* p < .05

Changes in emotional self-efficacy (SESES-C scores) approached significance (p=0.052), with mean rank values indicating the three treatment groups, C, Ex, and ExC, all improved compared to UsC (Figure 5).

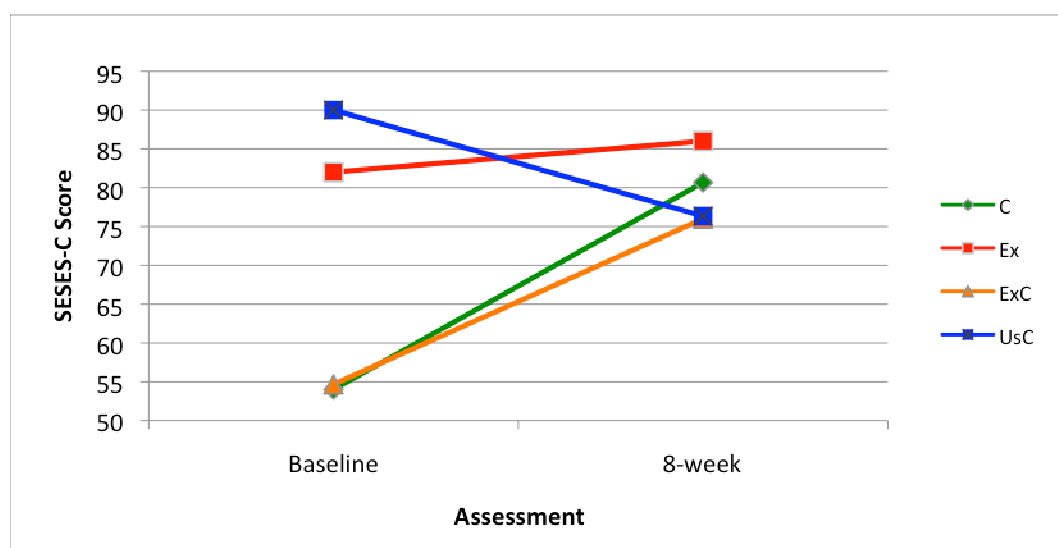


Figure 5. Changes from baseline to 8-week assessment in emotional self-efficacy in each group (C, Ex, ExC, and UsC), as assessed by the Stanford Emotional Self-Efficacy Scale-Cancer (SESES-C).

C and ExC had the highest mean delta 8-week values ( $\bar{x}=11.1$ ), though ExC had a higher median self-efficacy score improvement than C (17.3 versus 12). This finding is important as it suggests the combination of exercise and counselling produced the greatest improvement in self-efficacy levels. Additionally, those women in UsC that received no initial intervention actually experienced a decline in emotional self-efficacy (median=12). One other finding in relation to self-efficacy scores was the discrepancy between median and mean scores in the ExC and UsC groups (17.3 vs 11.1; -12 vs. -33.3, respectively). In the ExC group, this finding did not appear to be due to an outlier but rather a result of the data range. In the UsC group, a participant scoring -107, much lower than the remaining 3, likely caused the observed difference between median and mode.

For physical changes, a significant difference between groups was observed in upper body strength ( $p=0.010$ ), as assessed by the YMCA bench press protocol (Figure 6).

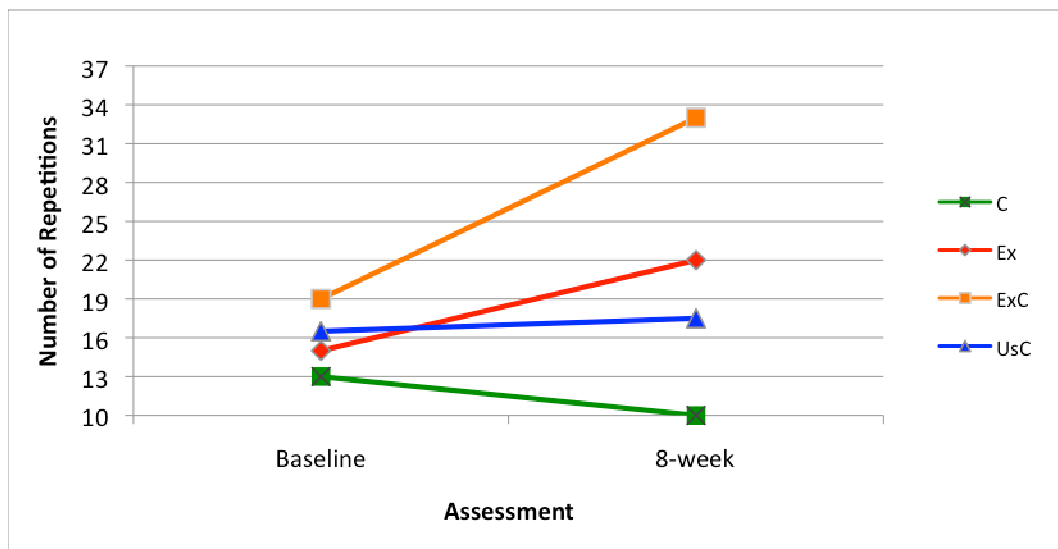


Figure 6. Changes from baseline to 8-week assessment in upper-body strength in each group (C, Ex, ExC, and UsC), as assessed by number of repetitions performed of YMCA bench press.

Both Ex and ExC increased in the number of repetitions completed from baseline to eight weeks, with Ex increasing by a median of 9 repetitions and ExC by a median of 4 repetitions. As expected, little change was seen in the UsC group (median=1) and



a decline was observed in C (median=-7). These differences are important because they support the idea that engaging in exercise is important for rebuilding upper body strength, while no structured exercise participation leads to no gain, or even a loss, in strength.

Eight-week differences between groups in relation to change in weight in kg ( $p=0.071$ ) and BMI in  $\text{kg}/\text{m}^2$  ( $p=0.065$ ) also approached significance. Based on median values, the C group had the greatest increase in these two parameters (weight: median=0.15; BMI: median=0.1), while ExC had the greatest decrease (weight: median= -0.6; BMI: median= -0.2). Results of the Kruskal-Wallis test revealed no significant differences between groups for 8-week changes in percent body fat ( $p=0.213$ ), lower body strength ( $p=0.419$ ), cardiorespiratory endurance ( $p=0.139$ ), or flexibility ( $p=0.146$ ). However, trends suggested Ex and ExC produced improvements in lower body strength, cardiorespiratory endurance, and flexibility, while C and UsC participants remained relatively the same or even decreased, again emphasising the importance of exercise in improving physical well-being (Figures 7-9). One other finding in relation to cardiorespiratory endurance was the difference in C's median and mean values (0.3 vs. -4.23), likely the result of the spread of the data (three slight improvements and two declines) rather than an outlier.

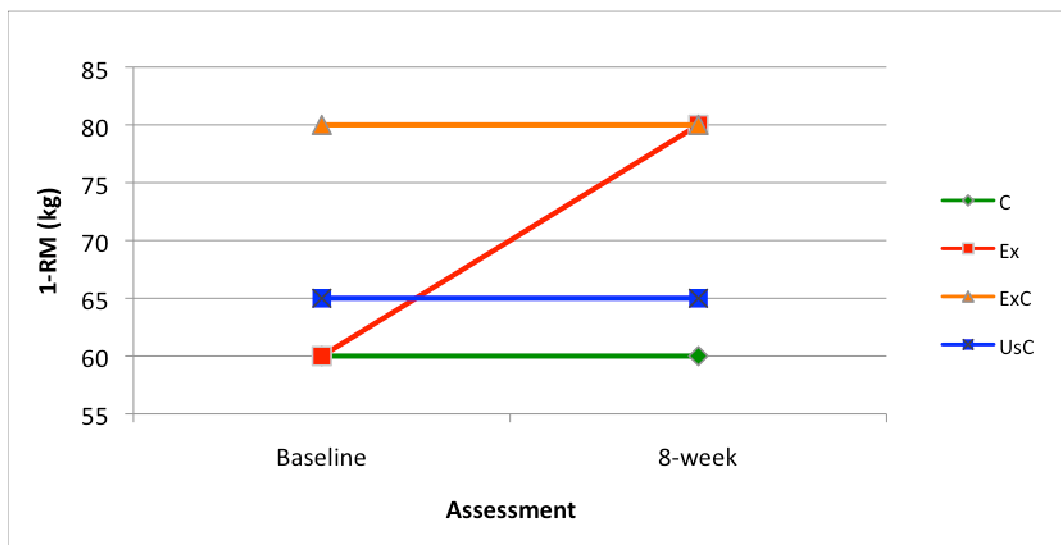


Figure 7. Changes from baseline to 8-week assessment in lower-body strength in each group (C, Ex, ExC, and UsC), as assessed by a 1-RM leg press.

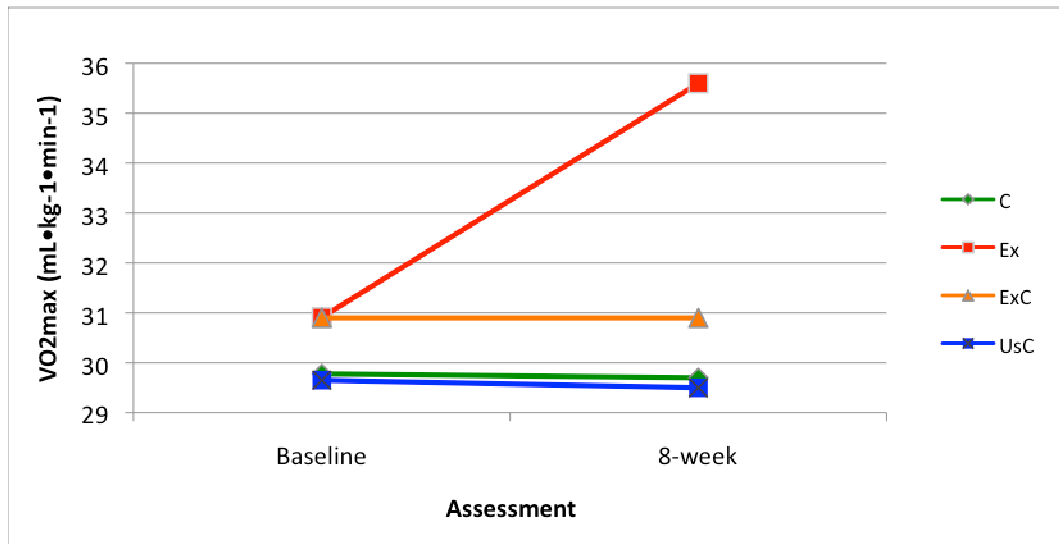


Figure 8. Changes from baseline to 8-week assessment in cardiorespiratory endurance in each group (C, Ex, ExC, and UsC), as assessed by  $\dot{V}O_{2max}$  values obtained utilising the Modified Bruce treadmill protocol.

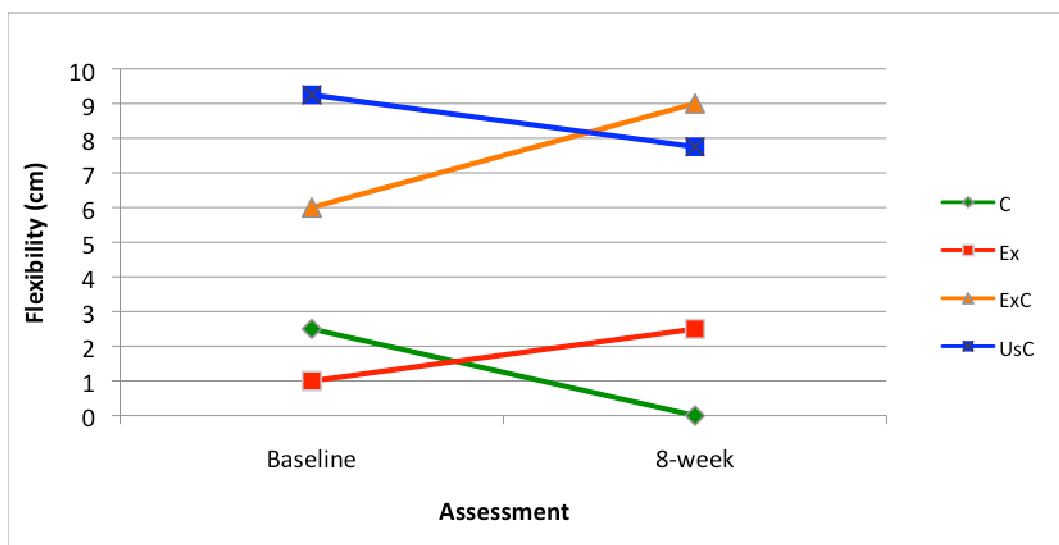


Figure 9. Changes from baseline to 8-week assessment in flexibility in each group (C, Ex, ExC, and UsC), as assessed by the Sit-and-Reach.

**Within-group differences.** The Wilcoxon Signed Ranks test was used to identify any significant changes within groups from baseline to the eight-week assessment. A marginally significant decrease in emotional self-efficacy was observed in the UsC group, with scores decreasing from 106.3 to 73 over the initial 8 weeks ( $\bar{x} \Delta = -33.3$ ;  $p=0.068$ ). The Ex group exhibited a significant increase in upper body strength ( $p=0.042$ ), improving from a mean of 13 repetitions at baseline to 21.2 repetitions after 8 weeks ( $\bar{x} \Delta = 8$ ). ExC had a significant 8-week increase in

flexibility from 2.7 cm to 6.5 cm ( $\bar{x} \Delta=3.8$  cm;  $p=0.042$ ), and significant decreases in weight and BMI ( $p=0.043$ ), which decreased, respectively, from 84.5 kg to 83.81 kg ( $\bar{x} \Delta= -0.72$ ) and from 30.5 kg/m<sup>2</sup> to 30.2 kg/m<sup>2</sup> ( $\bar{x} \Delta= -0.26$  kg/m<sup>2</sup>). In the C group, upper body strength was found to decline over the initial 8 weeks, with YMCA bench press repetitions decreasing from 17 to 12 ( $\bar{x} \Delta= -5.4$ ;  $p=0.066$ ).

## 12-Week Differences

**Between-group differences.** Changes were also compared between groups corresponding to the 12-week period from week 8 to week 20, when all participants partook in exercise and counselling. Results of the Kruskal-Wallis test revealed a significant difference between groups for cardiorespiratory endurance, measured as  $\dot{V} O_{2max}$  in mL·kg<sup>-1</sup>·min<sup>-1</sup> ( $p=0.036$ ) (Figure 10).

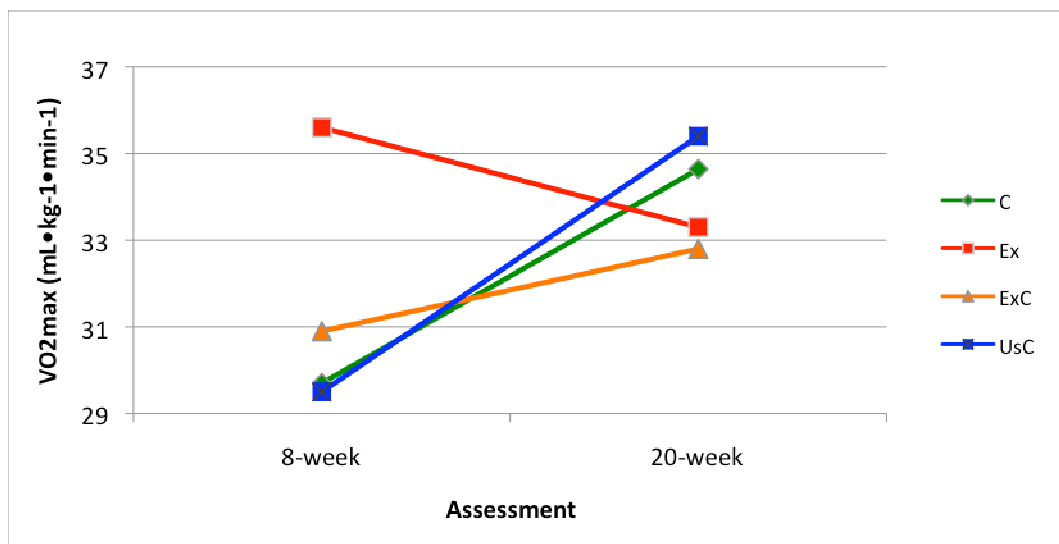


Figure 10. Changes from 8-week to 20-week assessment in cardiorespiratory endurance in each group (C, Ex, ExC, and UsC), as assessed by  $\dot{V} O_{2max}$  values (mL·kg<sup>-1</sup>·min<sup>-1</sup>) obtained utilising the Modified Bruce treadmill protocol.

Median values revealed C (7.8) and UsC (5.78) achieved greater improvements during the 12-week period than Ex (median=0.8) or ExC (median=2), indicating a catch-up effect. The observed increase in cardiovascular fitness in C and UsC participants suggest the addition of exercise to these groups' treatment was beneficial for aerobic fitness. No other significant 12-week changes were found between groups in any other physiological variables (Table 9).

Table 9

*12-week Psychological and Physiological Changes of Participants Overall and by Group*

Variable	Overall n=19		Counselling n=5		Exercise n=5		Exercise & Counselling n=5		Usual Care n=4		<i>p</i>
	Med (M)	Range (SE)	Med (M)	Range (SE)	Med (M)	Range (SE)	Med (M)	Range (SE)	Med (M)	Range (SE)	
<b>ESE (SESES-C)</b>	4 (7.483)	-27.33-48 (4.257)	9.33 (7.333)	-5.33-20.67 (4.487)	-5.33 (-4.4)	-12.67-5.33 (2.986)	4 (16.67)	-3.33-48 (10.7)	16.33 (10.33)	-27.33-36 (13.44)	0.233
<b>Weight (kg)</b>	-0.4 (-0.158)	-3.25-2 (0.348)	-1.35 (-1.57)	-3.25- -0.75 (0.447)	-0.2 (-0.44)	-1.4- 0.7 (0.401)	1.8 (0.79)	-1.8- 2 (0.735)	0.625 (0.587)	-0.9- 2 (0.725)	0.088
<b>BMI (kg/m<sup>2</sup>)</b>	-0.2 (- 0.073)	-1.2-1 (0.132)	-0.6 (-0.62)	-1.2- -0.3 (0.156)	0 (-0.134)	-0.5-0.3 (0.153)	0.58 (0.236)	-0.7-0.7 (0.264)	0.15 (0.225)	-0.4-1 (0.322)	0.085
<b>Body comp (%BF)</b>	-0.5 (-0.78)	-2.8-0.738 (0.224)	-1.671 (-1.53)	-2.8-0 (0.451)	-0.5 (-0.68)	-1.9-0.391 (0.371)	-0.002 (-0.08)	-0.5-0.5 (0.177)	-0.995 (-0.81)	-1.99-0.738 (0.603)	0.200
<b><math>\dot{V} O_{2max}</math> (Modified Bruce, mL·kg<sup>-1</sup>·min<sup>-1</sup>)</b>	2.9 (3.836)	-6.1-17.6 (1.351)	7.8 (8.12)	1.68-17.6 (2.752)	0.8 (-1.06)	-6.1-2.9 (1.672)	2 (2.442)	-4.2-13.26 (2.978)	5.78 (5.84)	4.95-6.85 (0.425)	0.036*
<b>UB strength (YMCA BP, repetitions)</b>	6 (7.063)	-8-24 (1.736)	11 (10.6)	3-21 (2.993)	4 (3)	0-6 (1.095)	4 (5.4)	-8-24 (5.363)	11 (9.25)	2-13 (2.496)	0.218
<b>LB strength (1RM LP, kg)</b>	0 (4.5)	-30-60 (4.211)	10 (14)	-10-60 (12.08)	0 (-6)	-30-0 (6)	0 (0)	-20-10 (5.477)	15 (10)	-10-20 (7.071)	0.275
<b>Flexibility (Sit- and-reach, cm)</b>	1 (1.325)	-4.5-9 (0.813)	4 (3.6)	0.5-8 (1.355)	-1 (-0.2)	-4.5-4.5 (1.57)	1.5 (1.9)	-2.5-9 (2.094)	0.5 (0)	-2-1 (0.707)	0.365

*Note.* Med, median; M, mean; SE, standard error; ESE, emotional self-efficacy; SESES-C, Stanford Emotional Self-Efficacy Scale-Cancer; %BF, percent body fat; CR, cardiorespiratory;  $\dot{V} O_{2max}$ , maximum volume of oxygen consumed; UB, upper body; BP, bench press; LB, lower body; LP, leg press; RM, repetition maximum

\*  $p < .05$

However, trends indicated that both C and UsC improved in upper-body strength, lower body strength, and flexibility from week 8 to week 20, suggesting a positive impact of the addition of exercise to their program (Figures 11-13).

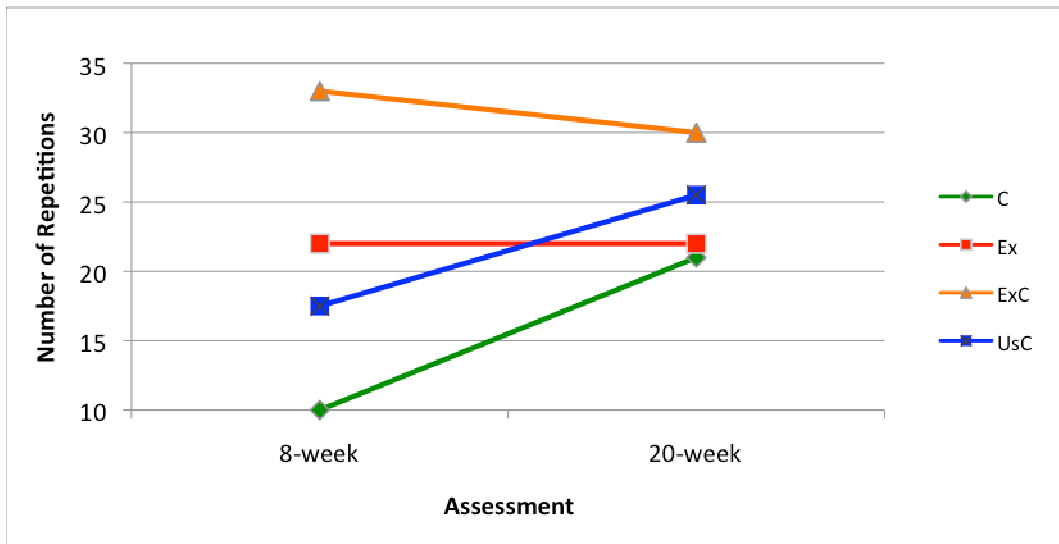


Figure 11. Changes from 8-week to 20-week assessment in upper-body strength in each group (C, Ex, ExC, and UsC), as assessed by number of repetitions performed of YMCA bench press.

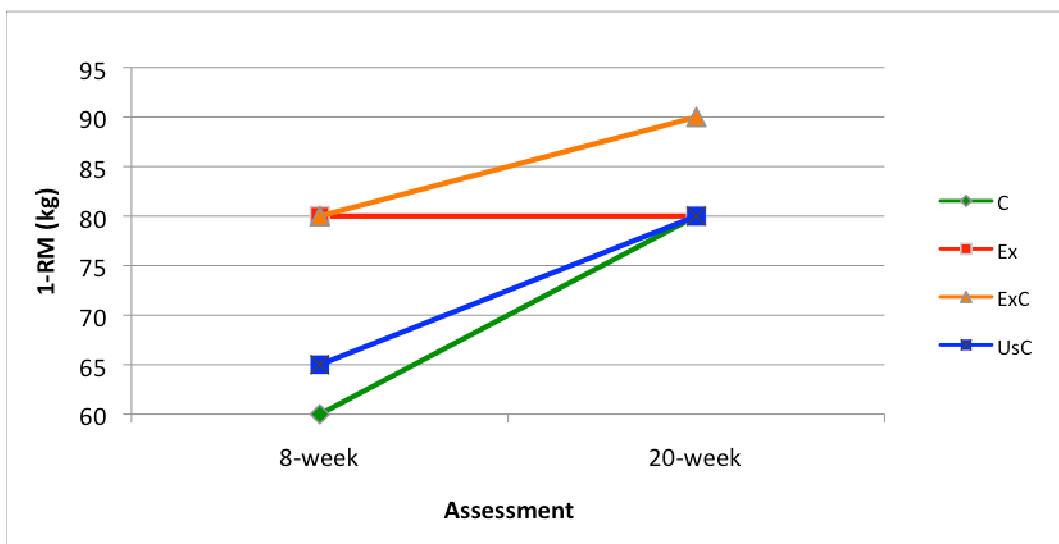


Figure 12. Changes from 8-week to 20-week assessment in lower-body strength in each group (C, Ex, ExC, and UsC), as assessed by a 1-RM leg press.

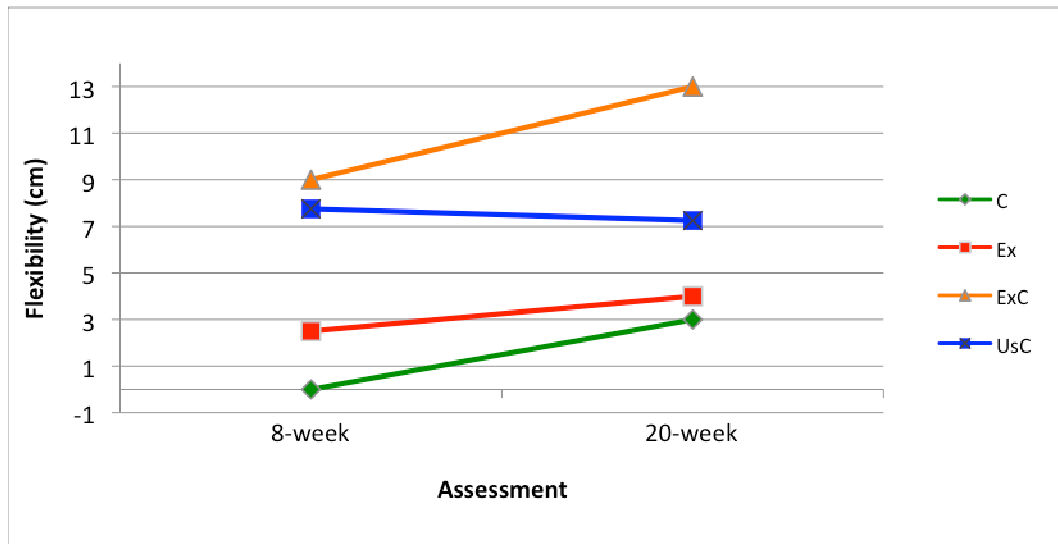


Figure 13. Changes from 8-week to 20-week assessment in flexibility in each group (C, Ex, ExC, and UsC), as assessed by the Sit-and-Reach.

Additionally, C, ExC, and UsC all increased emotional self-efficacy levels from week 8 to week 20 (Figure 14). Though ExC had some difference between the median and mean self-efficacy scores (4 vs. 16.67), this appeared to result more from the range of the data than an outlier.

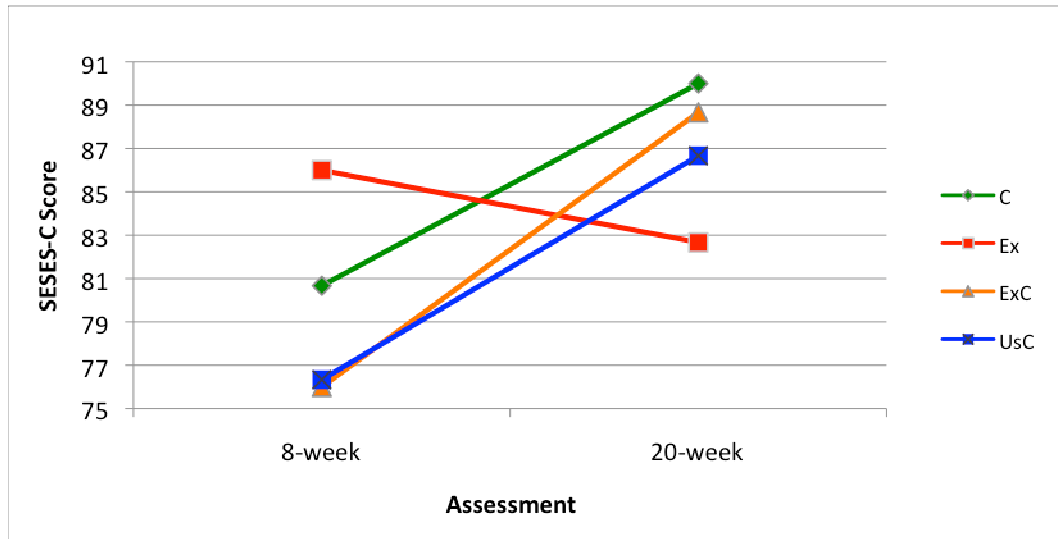


Figure 14. Changes from 8-week to 20-week assessment in emotional self-efficacy in each group (C, Ex, ExC, and UsC), as assessed by the Stanford Emotional Self-Efficacy Scale-Cancer (SESES-C).

**Within-Group Differences.** Wilcoxon Signed Ranks tests revealed a marginally significant difference in exercise adherence during the first 8 weeks compared to the final 12 weeks for both Ex and ExC ( $p=0.062$ ). Participants in the Ex group went from an average session attendance of 92.6% at 8 weeks to 73.6%

during the second half of the intervention, while ExC rates dropped from 88.2% of sessions to 70.2%. As neither the C or UsC group participated in exercise during the first 8 weeks, this comparison was not relevant.

The C group exhibited significant improvements in weight ( $p=0.043$ ), BMI ( $p=0.042$ ), upper body strength ( $p=0.042$ ), cardiorespiratory endurance ( $p=0.043$ ), and flexibility ( $p=0.043$ ). Weight, and as a result BMI, decreased from the 8-week assessment to the conclusion of the program from a mean value, respectively, of 64.63 kg and 23.9 kg/m<sup>2</sup> to 63.1 kg and 23.3 kg/m<sup>2</sup> ( $\bar{x} = -1.57$  kg;  $\bar{x} = -0.62$  kg/m<sup>2</sup>). Cardiorespiratory endurance, as assessed by  $\dot{V} O_{2max}$  values, improved by 8.12 mL·kg<sup>-1</sup>·min<sup>-1</sup>, increasing from 26.86 to 35 mL·kg<sup>-1</sup>·min<sup>-1</sup>. Additionally, upper body strength testing was found to increase, indicated by YMCA bench press repetitions increasing from 12 to 23 ( $\Delta=10.6$ ), and flexibility went from 1.8 cm at week 8 to 5.4 cm at week 20 ( $\Delta=3.6$  cm). These results indicate partaking in exercise for 12 weeks was sufficient to produce physiological improvements. No other significant within-group emotional self-efficacy or physiological changes from the 8-week assessment to the final assessment at 20 weeks were observed in the Ex, ExC, or UsC groups.

## 20-Week Differences

**Between-Group Differences.** Kruskal-Wallis testing revealed no significant differences between groups in delta values over the full 20 weeks of the program for any of the physiological or psychological variables (Table 10).

Table 10

*20-week Psychological and Physiological Changes of Participants Overall and by Group*

Variable	Overall n=19		Counselling n=5		Exercise n=5		Exercise & Counselling n=5		Usual Care n=4		p
	Med (M)	Range (SE)	Med (M)	Range (SE)	Med (M)	Range (SE)	Med (M)	Range (SE)	Med (M)	Range (SE)	
ESE (SESES-C)	11.33 (6.717)	-87.33-68 (7.177)	25.33 (18.4)	-3.33-36 (8.139)	2.67 (3.733)	-8.67-12.67 (3.885)	21.33 (27.73)	-4-68 (178.2)	-10 (-23)	-87.33-15.33 (23.71)	0.137
Weight (kg)	-0.2 (-0.264)	-2.6-2.7 (0.341)	-1.65 (-1.55)	-2.6- -0.2 (0.41)	0.05 (0.3)	-1.45-2.7 (0.672)	0 (0.07)	-2.4-1.7 (0.715)	-0.175 (0.125)	-1.1-1.95 (0.711)	0.106
BMI (kg/m2)	-0.08 (-0.114)	-0.9-1 (0.124)	-0.69 (-0.62)	-1- -0.08 (0.156)	0.03 (-0.134)	-0.52-1 (0.153)	0 (0.236)	-0.9-0.5 (0.264)	-0.03 (0.225)	-0.4-0.6 (0.322)	0.113
Body comp (%BF)	-0.5 (-0.78)	-2.17-1.4 (0.224)	0 (-0.594)	-2.154-1 (0.151)	-1 (0.122)	-2.17-0.4 (0.246)	-0.9 (-0.02)	-1.9-1.4 (0.248)	0.237 (0.035)	-1.5-1.121 (0.257)	0.437

$\dot{V} O_{2max}$ (Modified Bruce, mL·kg <sup>-1</sup> ·min <sup>-1</sup> )	4.2 (4.377)	-3.083-12.8 (0.939)	2.85 (3.892)	1.54-8.6 (1.255)	5.2 (3.776)	-0.91-8.59 (1.822)	2.576 (3.502)	-3.083-12.8 (2.75)	5.748 (6.338)	3.17-10.69 (1.587)	0.569
<b>UB strength (YMCA BP repetitions)</b>	8 (8.713)	-14-26 (2.013)	4 (5.2)	0-11 (1.934)	12 (11)	7-15 (1.517)	15 (10.4)	-14-26 (7.243)	8.5 (8.25)	2-14 (3.065)	0.416
<b>LB strength (IRM LP, kg)</b>	10 (10.75)	-10-60 (3.625)	10 (14)	-10-60 (12.08)	0 (6)	0-20 (4)	10 (8)	-10-30 (6.633)	15 (15)	10-20 (2.887)	0.527
<b>Flexibility (Sit-and-reach, cm)</b>	2.5 (2.838)	-4-12 (1.07)	2.5 (4.4)	0.5-9 (1.097)	2.5 (1.5)	-4-7.5 (2.043)	8 (5.7)	-0.5-12 (2.354)	-1.5 (-0.25)	-2-4 (1.436)	0.194

Note. Med, median; M, mean; SE, standard error; ESE, emotional self-efficacy; SESES-C, Stanford Emotional Self-Efficacy Scale-Cancer; %BF, percent body fat; CR, cardiorespiratory;  $\dot{V}O_{2max}$ , maximum volume of oxygen consumed; UB upper body; BP, bench press; LB, lower body; LP, leg press; RM repetition maximum

Additionally, the groups were once again balanced in all parameters at the end of the study (see Appendix E for related figures). This finding indicates a catch-up effect occurred between groups, with any benefits or declines arising from the initial 8-week group separation balanced out by the second phase of the study when all participants enrolled in exercise and counselling. In relation to discrepancies between median and means, most appear to be a result of the range of results and small subject numbers rather than an outlier. One exception is in relation to UsC self-efficacy scores, where one participant's 20-week change was -87.33, compared to the group's other three participants changing by -30, 10, and 15.33.

**Within-Group Differences.** Results from the Wilcoxon Signed Ranks test indicated the C and Ex groups had significant within-group changes from baseline to 20 weeks, while UsC experienced marginally significant improvements. In the C group, baseline weight and BMI were both higher than values observed at the conclusion of the intervention ( $p=0.043$ ), with weight decreasing from 64.6 kg to 63.1 kg ( $\bar{x} \Delta = -1.55$ ) and BMI going from 23.9 kg/m<sup>2</sup> to 23.3 kg/m<sup>2</sup> ( $\bar{x} \Delta = -0.594$ ). Additionally, cardiorespiratory endurance significantly increased from 31.09 mL·kg<sup>-1</sup>·min<sup>-1</sup> to 35 mL·kg<sup>-1</sup>·min<sup>-1</sup> ( $\bar{x} \Delta = 3.892$ ;  $p=0.043$ ), while bench press repetitions went from 17 to 23 ( $\bar{x} \Delta = 5$ ;  $p=0.068$ ) and flexibility went up from 1 cm to 5.4 cm ( $\bar{x} \Delta = 4.4$ ;  $p=0.042$ ). The Ex group experienced a significant increase in upper-body strength ( $p=0.043$ ), improving the number of YMCA bench press repetitions from 13 to 24 ( $\bar{x} \Delta = 11$ ). Marginally significant physiological improvements were observed in UsC, who improved cardiorespiratory endurance from 28.63 mL·kg<sup>-1</sup>·min<sup>-1</sup> to 35 mL·kg<sup>-1</sup>·min<sup>-1</sup> ( $\bar{x} \Delta = 6.338$ ;  $p=0.068$ ), upper-body strength from 18 to 26 repetitions



( $\bar{x} \Delta=8.25$ ;  $p=0.068$ ), and lower-body 1-RM strength from 65 to 80 kg ( $\bar{x} \Delta=15$ ;  $p=0.063$ ). These positive changes highlight the beneficial impact of exercise. No significant changes were observed in emotional self-efficacy scores, though C, Ex, and ExC all improved in this parameter from baseline to the end of the 20 weeks.

### Emotional Self-Efficacy Correlations

Spearman's correlation coefficient was used to examine potential correlations between baseline emotional self-efficacy levels and both overall adherence and 20-week changes in physiological and psychological parameters. Results from the test are presented in Table 11.

Table 11

#### *Adherence and Physiological Correlates with Baseline Emotional Self-Efficacy*

Variable	$r_s$	$p$
Exercise adherence	-0.181	0.458
$\Delta 20\text{wk \%BF}$	-0.137	0.576
$\Delta 20\text{wk } \dot{V} O_{2\text{max}}$	0.147	0.547
$\Delta 20\text{wk Bench Press}$	-0.391	0.098
$\Delta 20\text{wk 1-RM}$	0.141	0.565
$\Delta 20\text{wk Flexibility}$	-0.573	0.010*
$\Delta 20 \text{ wk SESES-C}$	-0.881	0.000**

*Note.* wk, week; %BF, percent body fat;  $VO_{2\text{max}}$ , maximum volume of oxygen consumed; RM, repetition maximum; SESES-C, Stanford Emotional Self-Efficacy Scale-Cancer

\*  $p < .05$ ; \*\*  $p < .01$

Baseline self-efficacy scores were found to negatively correlate with 20-week changes in both flexibility ( $r= -0.573$ ;  $p=0.010$ ) and emotional self-efficacy scores ( $r= -0.881$ ;  $p=0.000$ ), suggesting participants with lowest baseline self-efficacy improved their flexibility and self-efficacy levels greatest over the 20 weeks, and vice versa, compared to other participants. These findings have important implications, as they suggest participants with the lowest self-efficacy had the most to gain from this program. No other significant correlations were observed between baseline self-efficacy scores and adherence or any of the other physiological

variables of interest. An additional correlation examined was between overall change in emotional self-efficacy levels and exercise program adherence, with no significant relationship observed ( $r=0.175$ ;  $p=0.474$ ).

Correlations between emotional self-efficacy levels and weight and BMI were also examined (Table 12), as previous research has suggested weight gain is associated with decreased self-efficacy (Levine, Raczynski, & Carpenter, 1991).

Table 12

*Correlations Between Emotional Self-Efficacy and Weight and BMI*

Correlation	$r_s$	$p$
Baseline ESE and weight	-0.138	0.572
Baseline ESE and BMI	-0.065	0.792
Final ESE and weight	-0.097	0.691
Final ESE and BMI	-0.104	0.670
Baseline ESE and $\Delta 20$ wk Weight	0.051	0.836
Baseline ESE and $\Delta 20$ wk BMI	0.063	0.797
Final ESE and $\Delta 20$ wk Weight	0.466	0.044*
Final ESE and $\Delta 20$ wk BMI	0.432	0.065

Abbreviations: ESE, emotional self-efficacy; BMI, body mass index

\*  $p < .05$

Unexpectedly, emotional self-efficacy levels at the conclusion of the 20-week program were seen to positively correlate with overall increases in weight ( $r=0.466$ ;  $p=0.044$ ) and BMI ( $r=0.432$ ;  $p=0.065$ ). This finding indicates that higher final emotional self-efficacy levels were seen in those women who had the greatest increases in weight and BMI. No other significant correlations were observed.

### Adverse Effects

No participants experienced any adverse effects from partaking in the program. One participant sprained an ankle, another had Achilles problems, and a third had chronic back problems reagravated during their time in the study, but all incidences occurred outside of the clinic and were unrelated to participation. Additionally, no cases of lymphoedema developed or worsened during exercise participation. Arm circumferences were monitored during the program, and values were recorded as part of the baseline, 8-week, and 20-week assessment. The only significant difference observed was in the right forearm of the C group ( $p=0.042$ ) and indicated a positive impact of exercise, as circumference was observed to decrease from baseline to the end of the program (median=-0.5 cm). Median values indicated all groups either maintained or decreased their forearm and upper arm circumferences over the 20

weeks of the study, with no other significant changes from baseline to 20 weeks observed (Table 13).

Table 13

*20-week Changes in Upper Arm and Forearm Circumferences for Participants by Group*

Group	Right Forearm		Left Forearm		Right Upper Arm		Left Upper Arm	
	M (Range)	P	M (Range)	p	M (Range)	p	M (Range)	p
C	-0.5 (-0.5- -1.5)	0.042*	-0.3 (-1.5-0.5)	0.498	-1 (-5-2)	0.416	-0.5 (-4-3)	0.892
Ex	0 (-0.8-1.5)	0.465	0 (-1.2-1)	0.715	0 (-2.3-2)	1.000	-1.2 (-2-1)	0.144
ExC	-1 (-2-0)	0.068	-0.5 (-1-0)	0.102	0 (-2-0.5)	0.414	0 (-1.5-1.9)	0.581
UsC	-0.75 (-1-0.5)	0.194	-0.75 (-1.5-0.5)	0.197	-0.5 (-4-1.5)	0.593	-0.75 (-4-1.5)	0.465

Note. M, median; C, counselling-only; Ex, exercise-only; ExC, exercise and counselling; UsC, usual care  
\* p < .05

## CHAPTER 5

### Discussion

#### Overview

The aim of this study was to determine if a combined exercise and counselling program could improve emotional self-efficacy and physical well-being, and if a link existed between program adherence and resulting improvements. Overall, the results of this study suggested exercise and counselling were capable of producing psychological and physiological benefits. Exercise appeared to impact physiological domains, as expected, while both exercise and counselling resulted in improvements in emotional self-efficacy, though the combination of the two modalities appeared most beneficial. Additionally, these improvements were attainable without producing adverse effects such as lymphoedema.

In relation to emotional self-efficacy, overall results suggested a combination of exercise and counselling most beneficial for producing improvements in this parameter, supporting the study's first hypothesis. C, Ex, and ExC all improved emotional self-efficacy over the first 8 weeks and full 20 weeks of the study, while