



AHN CANCER INSTITUTE

Exercise Oncology

00 43:15

LIFT LIKE A
CHAMPION
TODAY

EXERCISE ONCOLOGY & BREAST CANCER

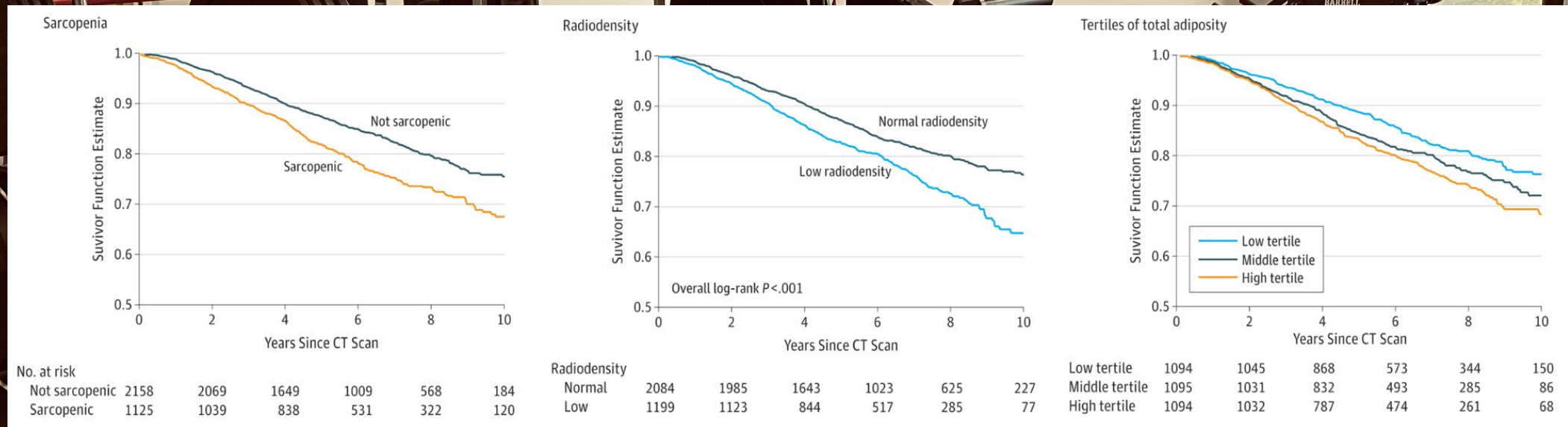
Colin E. Champ, MD, CSCS
Drexel University College of Medicine
AHN CI Exercise Oncology & Resiliency Center

Conflicts

- Scientific Advisory Board
 - Simply Good Foods/Atkins
- Book Sales
- Nutrition/Exercise Presentation Compensation
- Grants
 - Marie McCandless Foundation
 - Pittsburgh Foundation
 - Suburban Foundation
 - Elekta



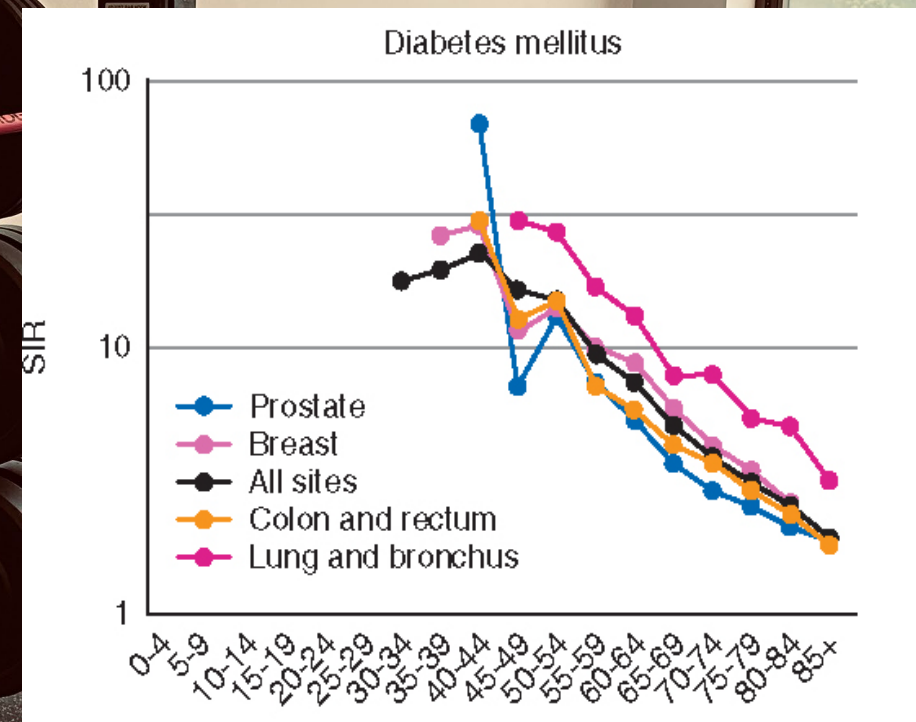
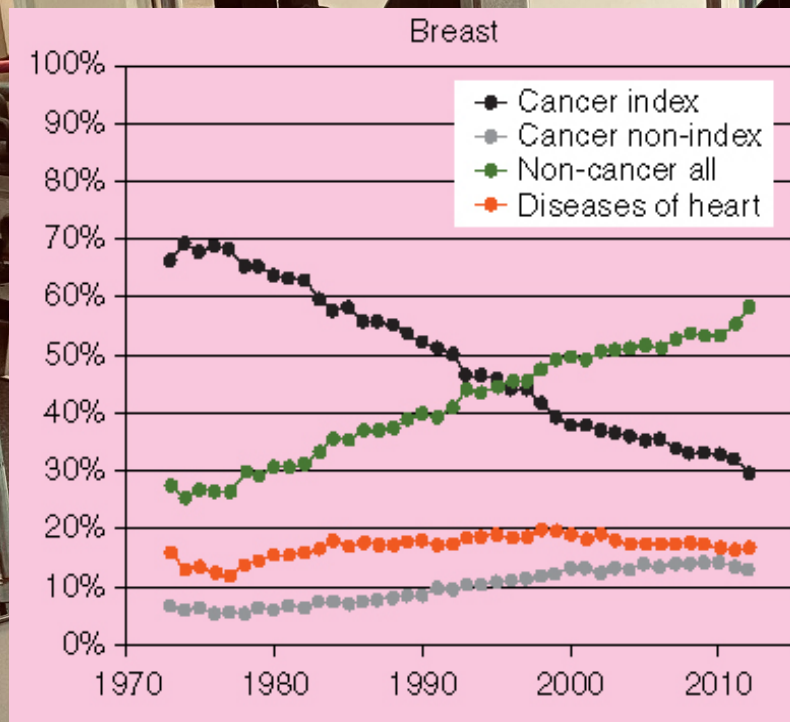
BREAST CANCER OUTCOMES AND BODY COMPOSITION



3241 women stage
II/III breast cancer
(2000-2013)

Caan et. al. Association of Muscle and Adiposity
Measured by Computer Tomography With
Survival in Patients with Nonmetastatic Breast
Cancer. JAMA. 2018

BREAST CANCER AND METABOLIC MORTALITY



BREAST CANCER AND METABOLIC MORTALITY



1340 Women treated for breast cancer

Cannioto et. al Physical Activity Before, During, and After Chemotherapy for High-Risk Breast Cancer: Relationships With Survival. J Natl Cancer Inst. 2021



AHN CANCER INSTITUTE

Exercise Oncology

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LIFT LIKE A
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TODAY

3 Month Program:

- EXERT-C
- EXERT-BCN
- EXERT-BC
- SLED

Yearly Program:

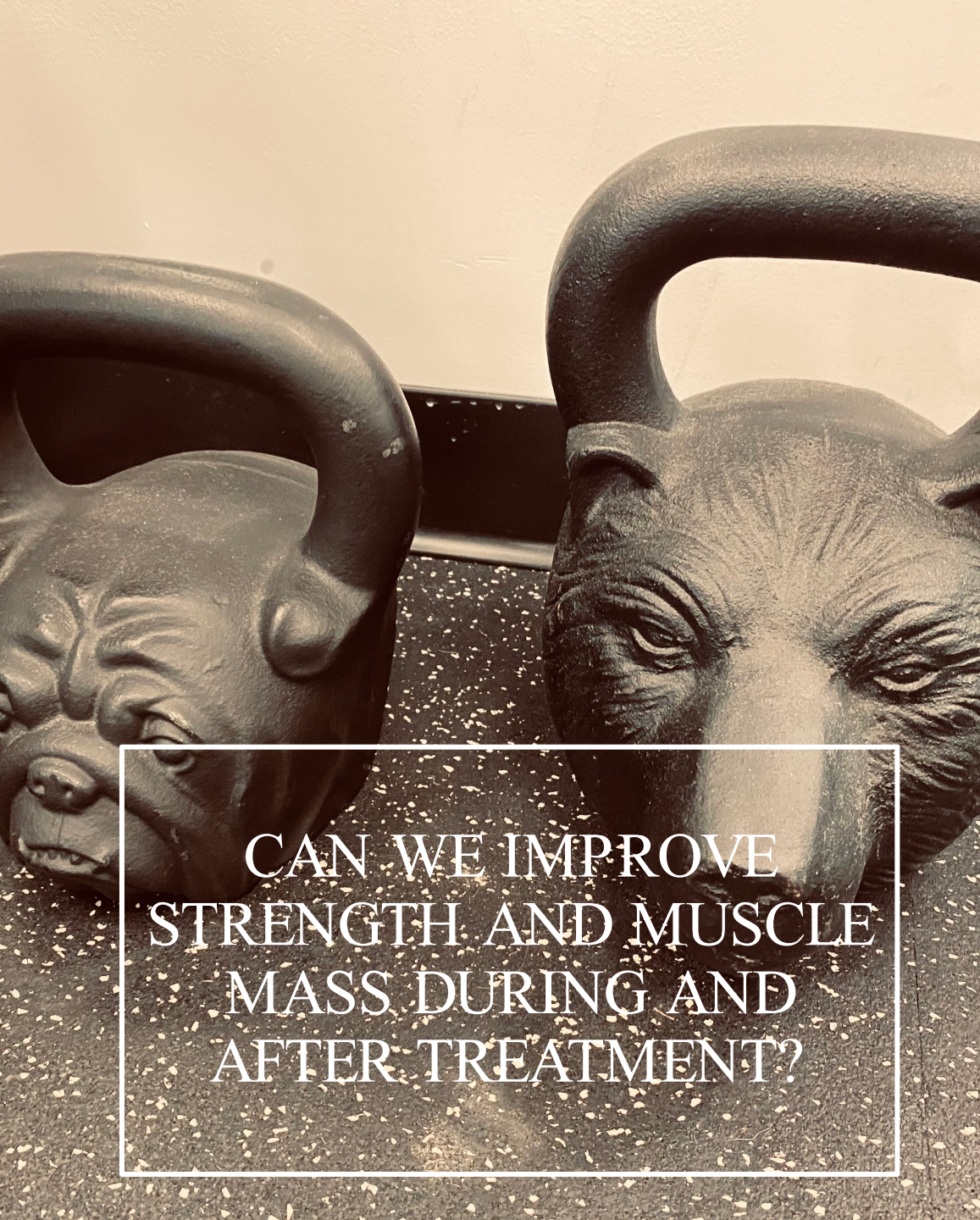
- Monthly oscillations between strength, conditioning, and hypertrophy regimens

- Mobility Sessions
- Sit Down Nutrition and Exercise Discussions

NOT ALL EXERCISE IS THE SAME

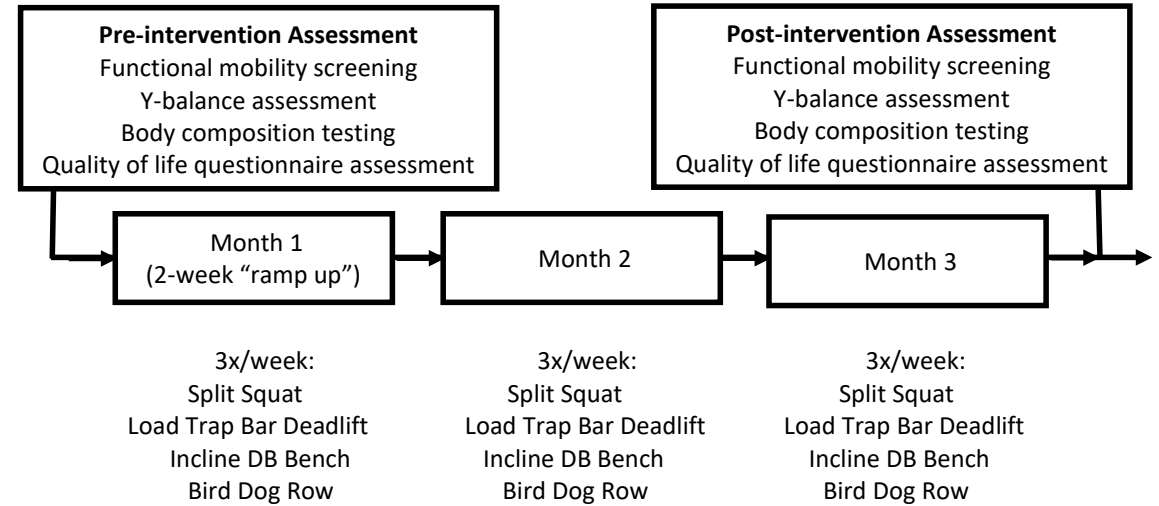
THE PHYSIOLOGIC AND METABOLIC EFFECTS DIFFER DRASTICALLY WITH INTENSITY



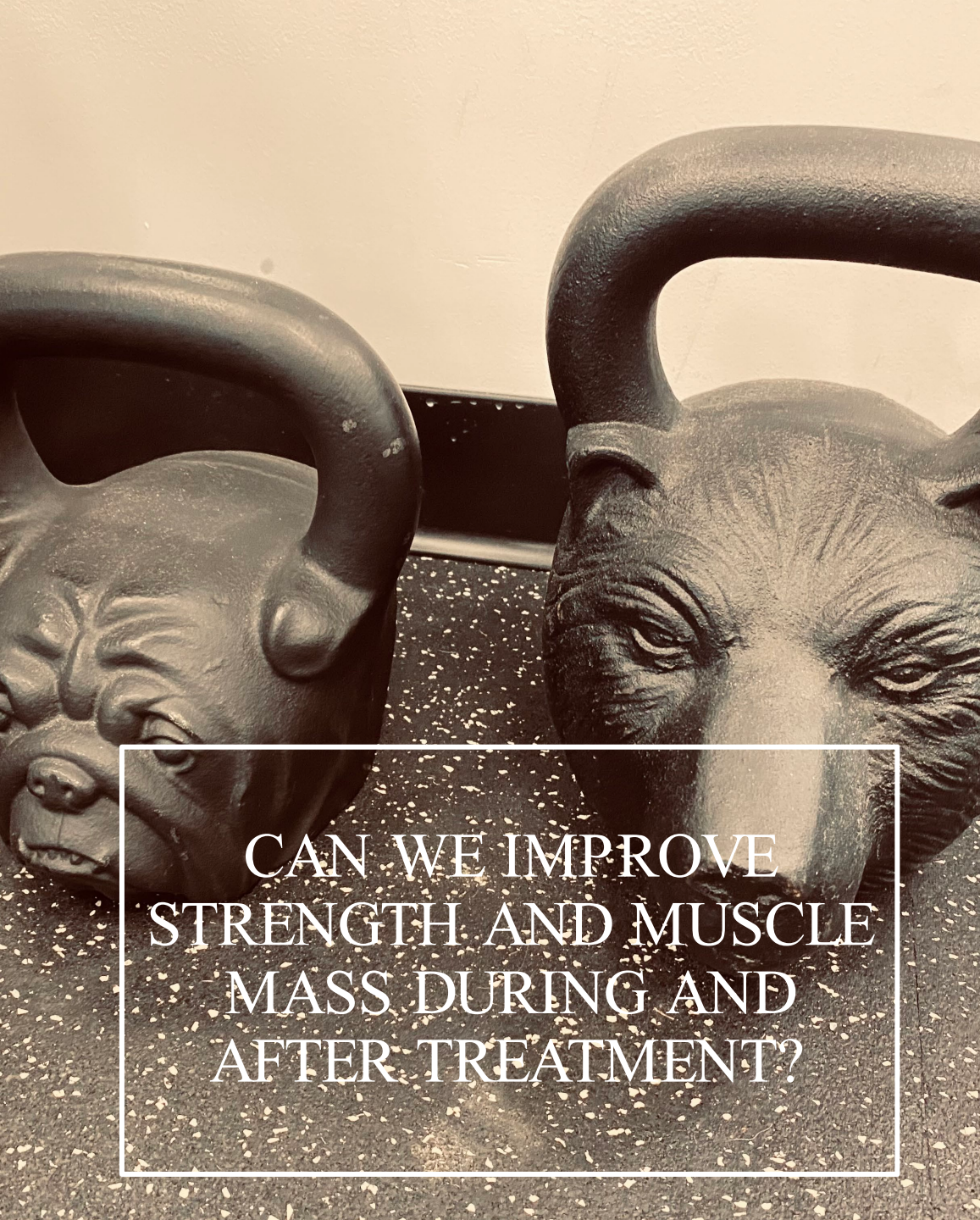


CAN WE IMPROVE STRENGTH AND MUSCLE MASS DURING AND AFTER TREATMENT?

Figure 1: Exercise intervention.



	N	%
Median Age at Enrollment (Interquartile range)	56.5	(51-64)
Prior History of Exercise	9	23
Breast Cancer Stage		
Ductal carcinoma in situ	3	8
Early stage	26	65
Locally advanced	8	20
Locoregional recurrence	2	5
Distant metastases present	1	3
Lymphedema at Time of Enrollment	7	18
Concurrent Receipt of Anti-Estrogen Therapy	32	80
Concurrent Receipt of Non-Hormonal Systemic Therapy	5	12.5
Concurrent Radiotherapy	12	30

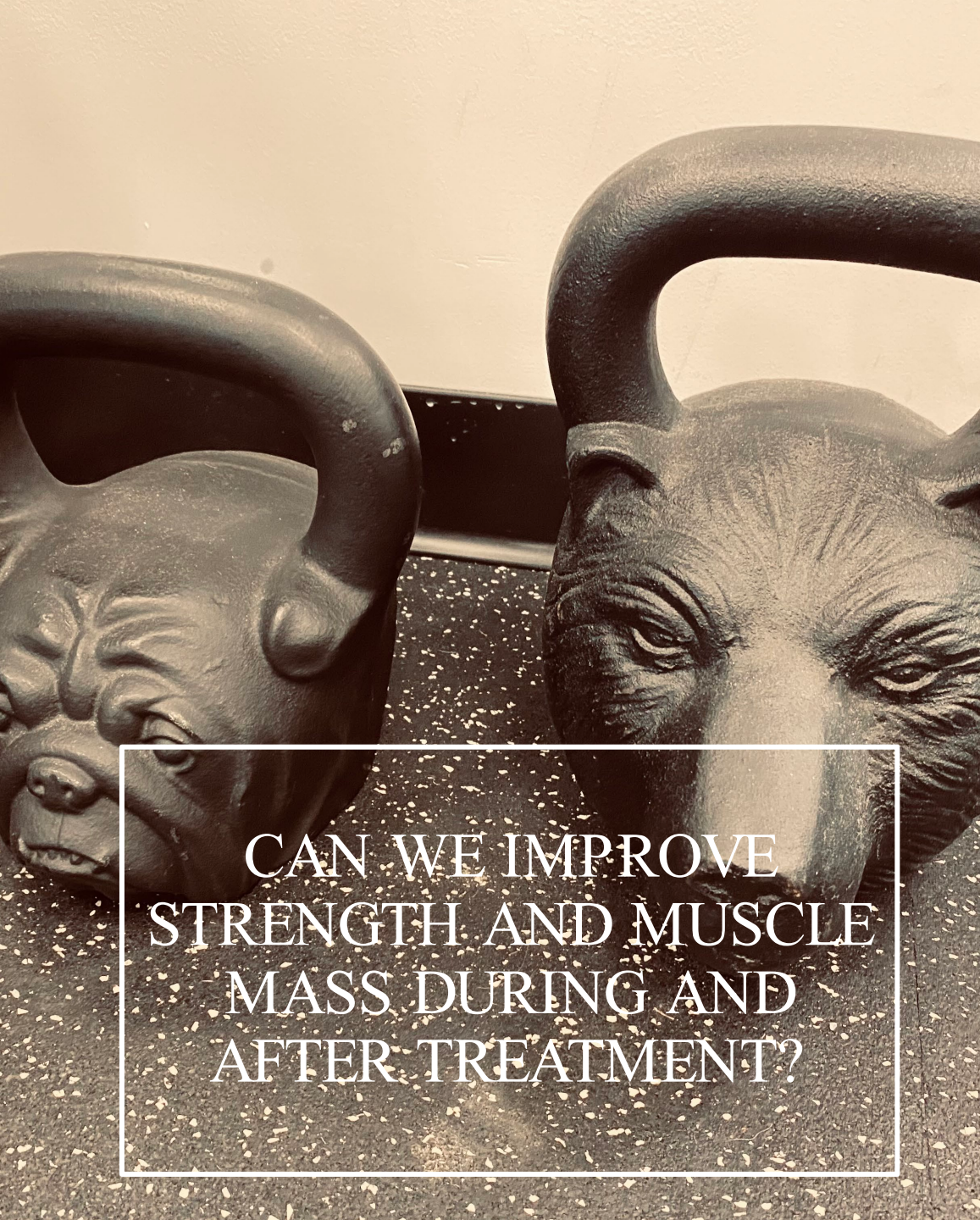


CAN WE IMPROVE STRENGTH AND MUSCLE MASS DURING AND AFTER TREATMENT?

	Baseline (median [IQR])	Post-intervention (median [IQR])	P value
Height (inch)	64.8 (63 - 66)	-	N/A
Weight (initial)	168.7 (148.3 - 192.9)	163.1 (142.9 - 191.2)	0.067
Body Fat (lb)	67.6 (47.1 - 88.1)	62.2 (42.7 - 90.2)	0.548
Body Fat (%)	38.9 (33.4 - 44.1)	36.1 (30.5 - 43.5)	<0.001
US Excess Fat (%)	6.6 (0.0 - 18.9)	2.8 (0.0 - 13.4)	0.002
Muscle mass (lb)	55.1 (51.6 - 61.4)	56.4 (52.1 - 61.8)	0.103
Muscle Mass (%)	33.8 (30.2 - 36.0)	35.8 (31.9 - 40.0)	0.011
Whole Body Phase Angle (degrees)	4.9 (4.6 - 5.2)	5.1 (4.8 - 5.4)	<0.001
Grip Strength, Right (lb)	18 (15 - 22)	24 (20 - 28)	<0.001
Grip Strength, Left (lb)	20 (16.8 - 22.3)	26 (22 - 28.5)	<0.001
Functional Mobility Screen Score	9 (8 - 11)	12 (9.8 - 14)	<0.001
Y-Balance Test Score, Left Side	72.3 (63.9 - 81.2)	83.9 (78.3 - 98.1)	<0.001
Y-Balance Test Score, Right Side	73.0 (62.3 - 80.2)	86.2 (76.5 - 95.0)	<0.001
EQ5D6 Score	73.5 (60 - 86.3)	85 (70 - 95)	<0.001
Godin Questionnaire Score	23.5 (6 - 35.3)	41.5 (32.8 - 55.5)	<0.001

Load (Pounds x Repetitions x Sets)				P value, Month 1 vs 3
Exercise	Month 1, week 4	Month 2, week 4	Month 3, week 4	
Load Split Squat	422.4 (33.5-660)	844.8 (590-1056)	844.8 (720-1290)	<0.001
Load Trap Bar Deadlift	2493 (2010-2862)	2668 (2082-3366)	3120 (2232-3675)	<0.001
Incline Dumbbell Bench	375 (300-450)	575 (450-612.5)	600 (585-775)	<0.001
Bird Dog Row	450 (300-502)	600 (450-682.5)	750 (660-825)	<0.001

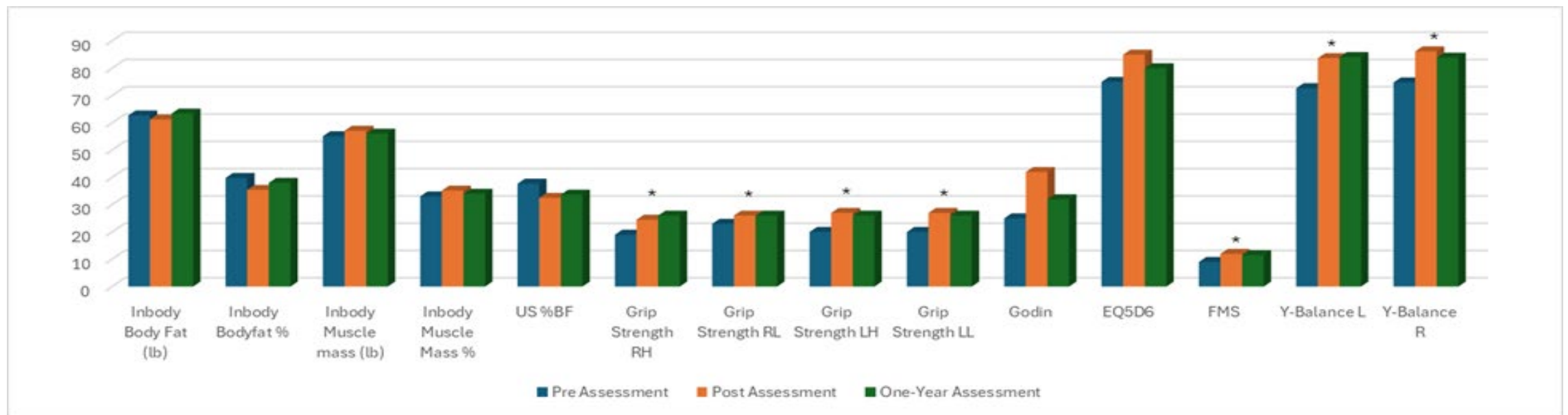
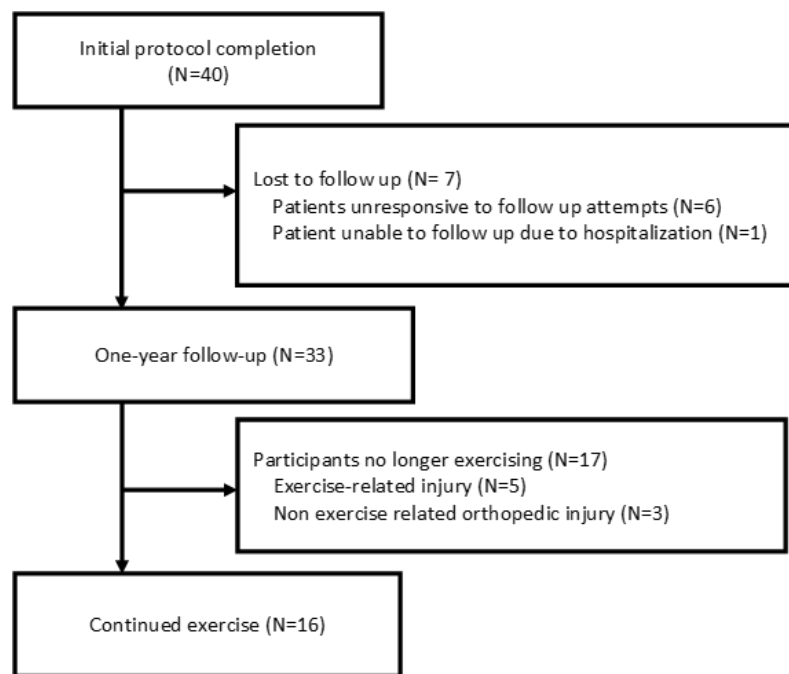
Carpenter et. Al. EXERT-BC: A pilot study of an exercise regimen designed to improve functional mobility, body composition, and strength after the treatment for breast cancer. Cancer Medicine. 2024.



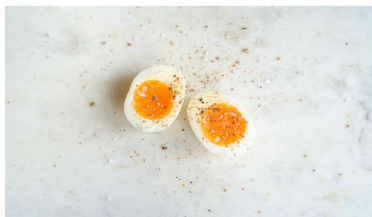
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	N	%
Age, years (median, range)	54	(27 - 72)
Body mass index (median, range)	30.3	18.9 - 48.1
Prior exercise	18	40.9
Breast cancer stage		
DCIS	3	6.8
Stage I-II	22	50
Stage III	18	40.9
Meta static	1	2.3
Premenopausal	11	25.0
Postmenopausal	33	75.0
Cancer-related symptoms present	35	79.5
Upper extremity lymphedema present	8	18.2
Receipt of radiation therapy	37	84.1
Radiation therapy during exercise	17	38.6
Primary breast surgery		
Mastectomy	26	59.1
Lumpectomy	18	40.9
Lymph node management		
Sentinel node biopsy only	35	79.5
Axillary node dissection	9	20.5
Targeted systemic therapy during exercise	6	13.6
Receipt of anti-estrogen therapy	31	70.5



Increase
Protein:
0.6-0.8g/lb
per day



Keep
Carbs
under 100
g/day



01
No calorie
counting, eat
nutrient-
dense foods



02
Limit
processed
foods, sugar,
bread, pasta

03
Cook,
eat with
family,
no snacking



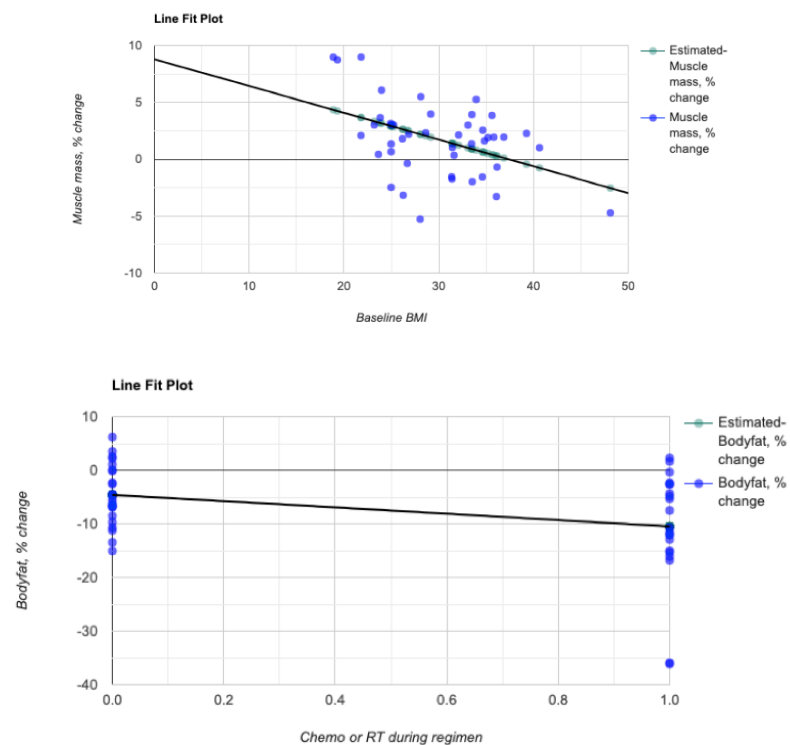
04
Quality>quantity
: whole foods,
grass-fed meat



CAN WE IMPROVE
STRENGTH AND MUSCLE
MASS WHILE REDUCING
FAT MASS DURING AND
AFTER TREATMENT?



Inbody parameter	Pre-regimen, Median (IQR)	Post-regimen, Median (IQR)	%change	Paired p value
Body fat, kg	32.3 (23.2 - 41.9)	30.5 (20.5 - 40.8)	-6.6	<0.001
Muscle mass, kg	25.9 (23.9 - 28.6)	26.4 (24.0 - 28.4)	1.4	0.003
Fat-free mass, kg	47.8 (44.0 - 52.2)	48.2 (44.1 - 52.2)	1.0	0.018
Whole body phase angle, degrees	5.08 (4.80 - 5.37)	5.28 (5.24 - 5.57)	4.0	<0.001
Carbohydrates (grams/day)	141.9 (93.6 - 209.2)	92.8 (47.4 - 147.2)	-34.6	<0.001
Resting metabolic rate, kCal/day	1398.5 (1317.4 - 1494.7)	1408.0 (1321.3 - 1493.8)	0.8	0.018



CAN WE IMPROVE
STRENGTH AND MUSCLE
MASS WHILE REDUCING
FAT MASS DURING AND
AFTER TREATMENT?

Variable	n (%)
Patients	115
Age (years)	54.10 (range 24-71)
Disease site	
Left	57 (49.57%)
Right	54 (46.96%)
Bilateral	4 (3.48%)
Surgery	
Lumpectomy	69 (60.00%)
Mastectomy	46 (40.00%)
Lymph node surgery	
SLN	96 (83.48%)
ALND	14 (12.17%)
Both	5 (4.35%)
Patients with clinical lymphedema	15 (13.04%)

115 women on:

- EXERT- C
- EXERT- BCN
- EXERT- BC

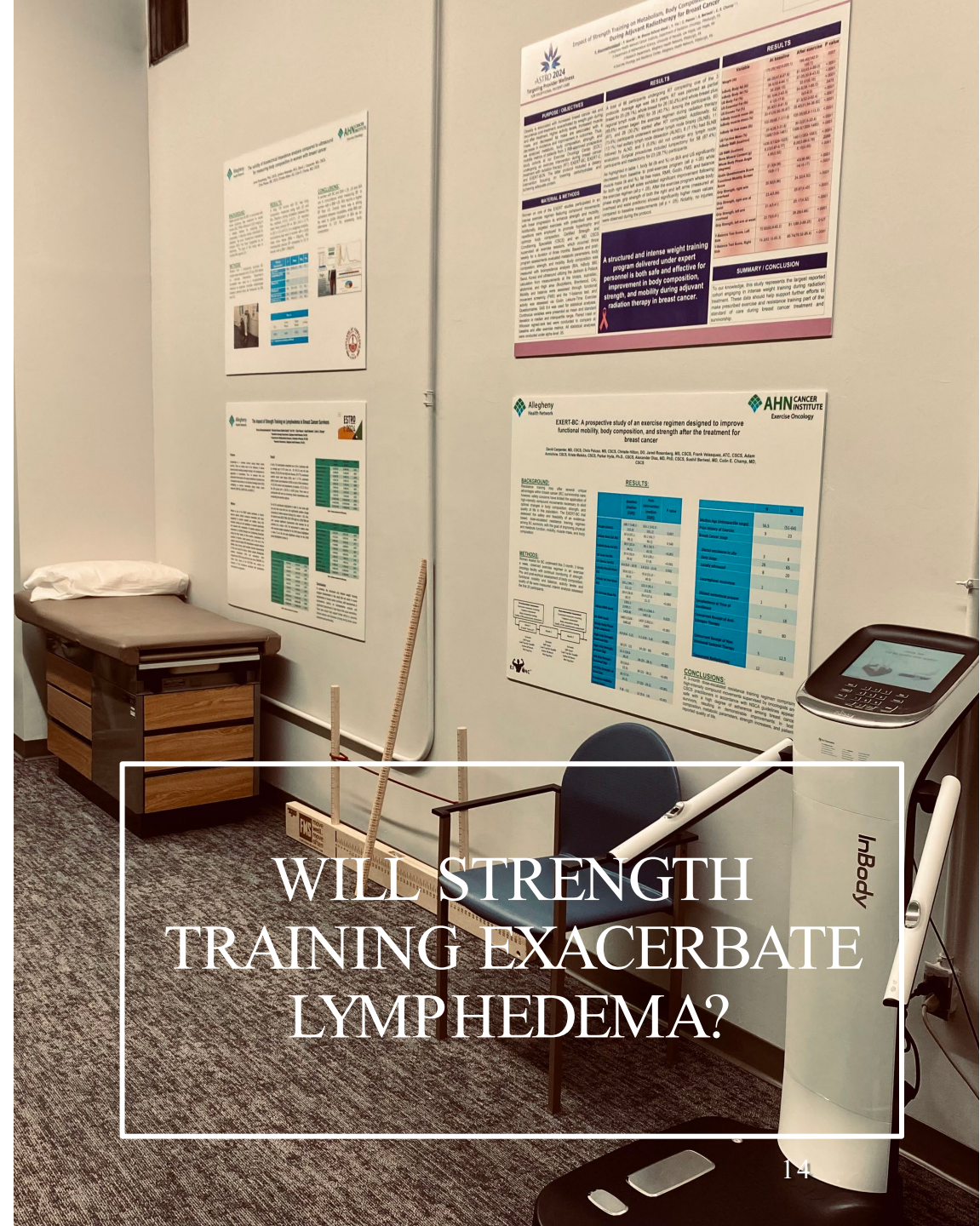
Edema Index:

- Bilateral ECW/TBW

ECF ratio:

- Extracellular water of the affected to unaffected arm

Shamsesfandabadi et. al. Improvement of Lymphedema from Intense Resistance and Strength Training in Breast Cancer Survivors. Under review. *Jama Network*.



WILL STRENGTH
TRAINING EXACERBATE
LYMPHEDEMA?

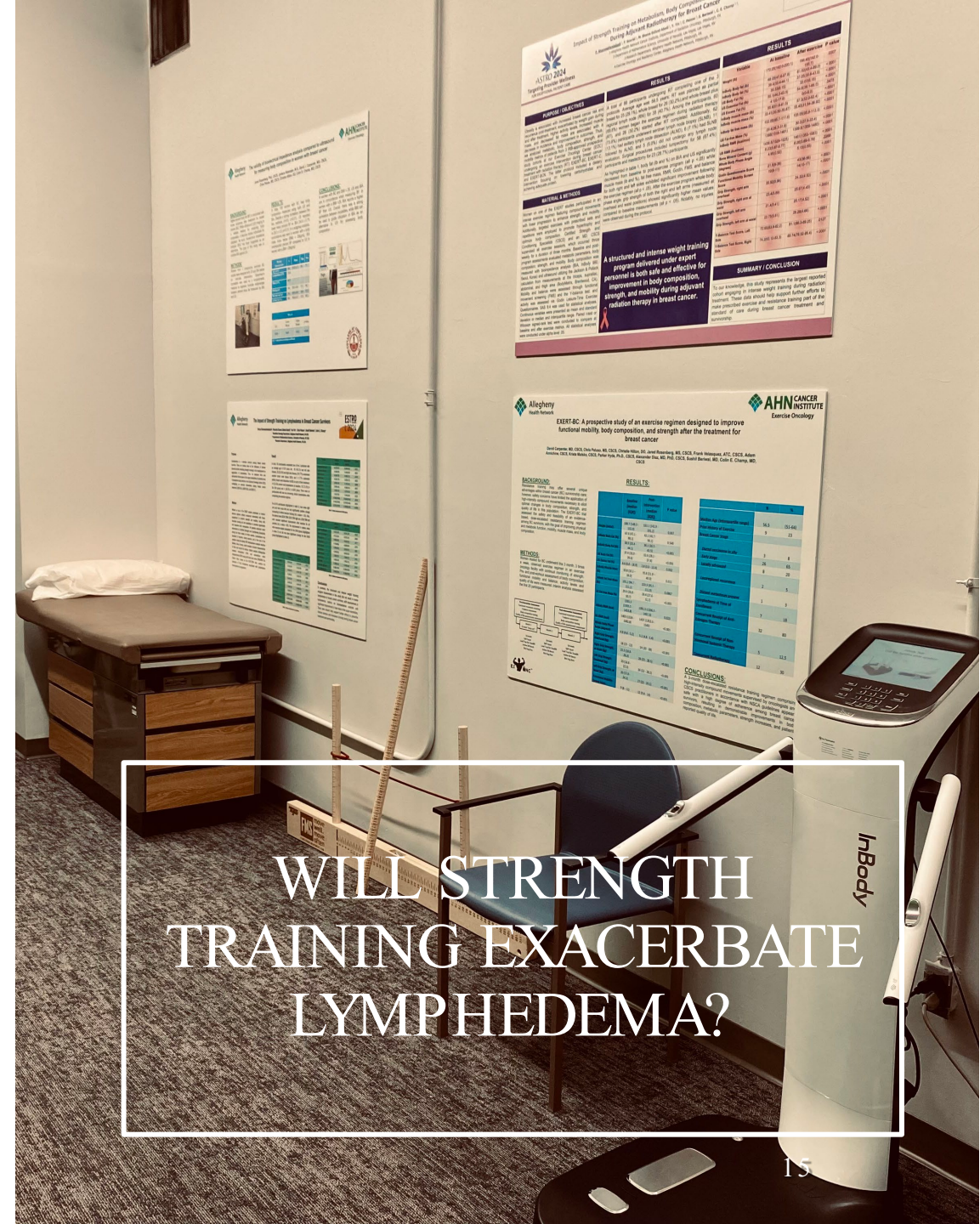
Fluid assessment for all patients (n=111)

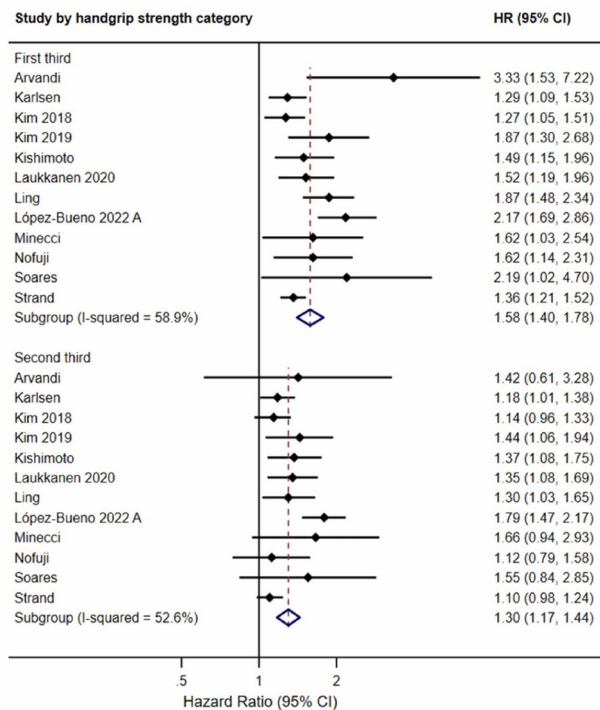
Variable	InBody at baseline	Inbody after exercise	P value
Lean mass affected	5.45(4.92-6.08)	5.64(4.98-6.20)	<.0001
Lean mass unaffected	5.51(4.83-6.06)	5.53(5.05-6.20)	<.0001
TBW affected	4.26(3.81-4.76)	4.39(3.88-4.81)	<.0001
TBW unaffected	4.30(3.77-4.72)	4.30(3.92-4.83)	<.0001
ICW affected	2.62(2.36-2.91)	2.71(2.40-3.00)	<.0001
ICW unaffected	2.67(2.34-2.93)	2.67(2.45-2.98)	<.0001
ECW affected	1.63(1.46-1.81)	1.68(1.48-1.85)	<.0001
ECW unaffected	1.63(1.43-1.83)	1.65(1.48-1.85)	.0022
ECW/TBW	0.385(0.006)	0.383(0.006)	<.0001
ECW/TBW affected	0.381(0.004)	0.380(0.004)	<.0001
ECW/TBW unaffected	0.380(0.378-0.383)	0.378(0.376-0.382)	<.0001

Fluid assessment for ALND group (n = 19)

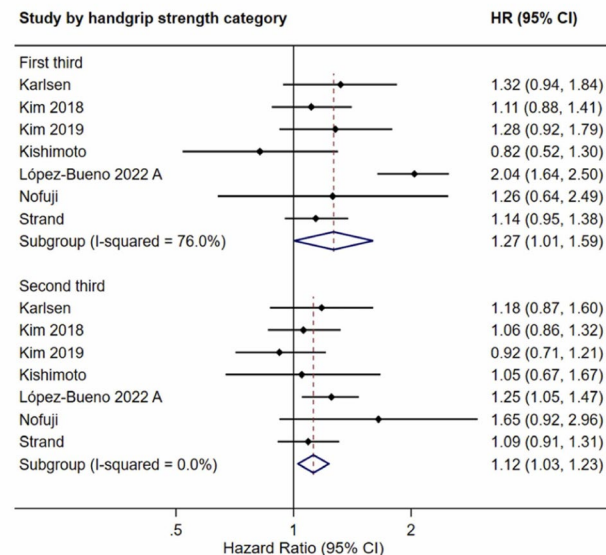
Variable	InBody at baseline	Inbody after exercise	P value
Lean mass affected	5.66(1.20)	5.81(1.05)	.0523
Lean mass unaffected	5.80(4.78-6.55)	5.91(5.16-6.61)	.1362
TBW affected	4.41(0.94)	4.52(0.83)	.0681
TBW unaffected	4.52(3.73-5.11)	4.59(4.03-5.14)	.1475
ICW affected	2.73(0.57)	2.80(0.50)	.0540
ICW unaffected	2.80(2.31-3.15)	2.87(2.49-3.17)	.0892
ECW affected	1.63(1.46-1.98)	1.70(1.54-1.94)	.0519
ECW unaffected	1.72(1.43-1.96)	1.72(1.52-1.96)	.3548
ECW/TBW	0.385(0.007)	0.384(0.008)	.0509
ECW/TBW affected	0.381(0.005)	0.380(0.004)	.0442
ECW/TBW unaffected	0.378(0.378-0.384)	0.377(0.375-0.382)	.0076

Shamsesfandabadi et. al. Improvement of Lymphedema from Intense Resistance and Strength Training in Breast Cancer Survivors. Under review. *Jama Open*.

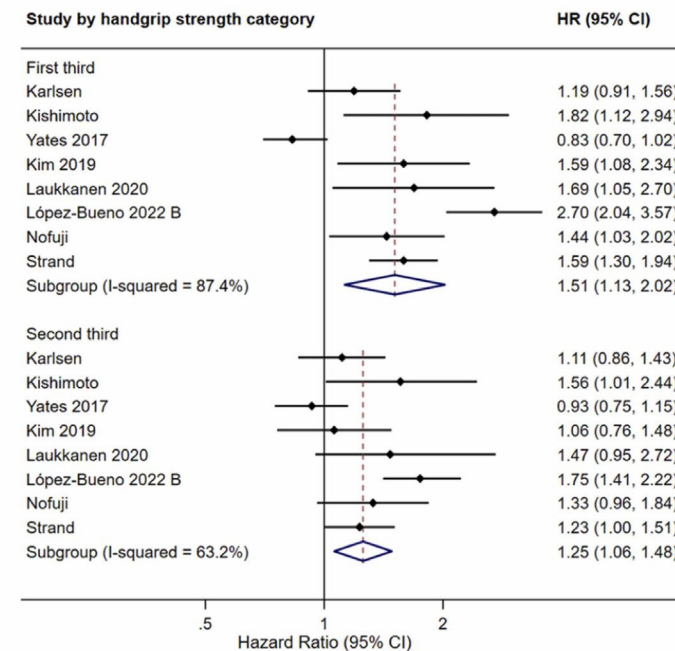




Handgrip strength and cancer mortality



Handgrip strength and cardiovascular mortality



HAND GRIP
STRENGTH

Lopez-Bueno et al. Thresholds of handgrip strength for all-cause, cancer, and cardiovascular mortality: A systematic review with dose-response meta-analysis. Aging Research Reviews. 2022

	Baseline	Post-Intervention	
Grip parameters	Median (IQR)		Paired p value
R/L Maximum	24 (20-28)	27 (24-30)	<0.001
R/L Minimum	20 (16-24)	24 (20-27)	<0.001
R/L Mean	22.5 (17.6-26.0)	26.0 (22.1-28.4)	<0.001
R/L Mismatch, %	13.3 (6.5 - 25.8)	8.7 (3.9 - 15.4)	<0.001
Non-grip parameters			
Ybalance, L/R Mean	77.0 (66.5- 85.0)	86.8 (79.4- 95.8)	<0.001
Ybalance, % Mismatch	3.8 (1.4- 8.1)	3.4 (1.7- 6.0)	0.010
Functional mobility screen score	10 (9-12)	13 (10-15)	<0.001
Composite Load	4129 (3361- 5161)	6162 (4854- 7315)	<0.001

Grip R/L Mean, Baseline	F value	R squared	UVA p value	MVA p value
Baseline bodyfat, %	8.147	0.0565	0.005	-
Baseline muscle mass, %	9.463	0.0651	0.002	0.004
Baseline whole body phase angle, degrees	31.68	0.183	<0.001	<0.001
Baseline Inbody resting metabolic rate	9.211	0.0566	0.003	0.011
Grip, R/L Mismatch Baseline				
Baseline bodyfat, %	1.675	0.0122	0.198	-
Baseline muscle mass, %	0.6206	0.0045	0.432	-
Baseline whole body phase angle, degrees	0.0128	0.00009	0.910	-
Baseline Inbody resting metabolic rate	0.6678	0.0049	0.415	-



HAND GRIP STRENGTH

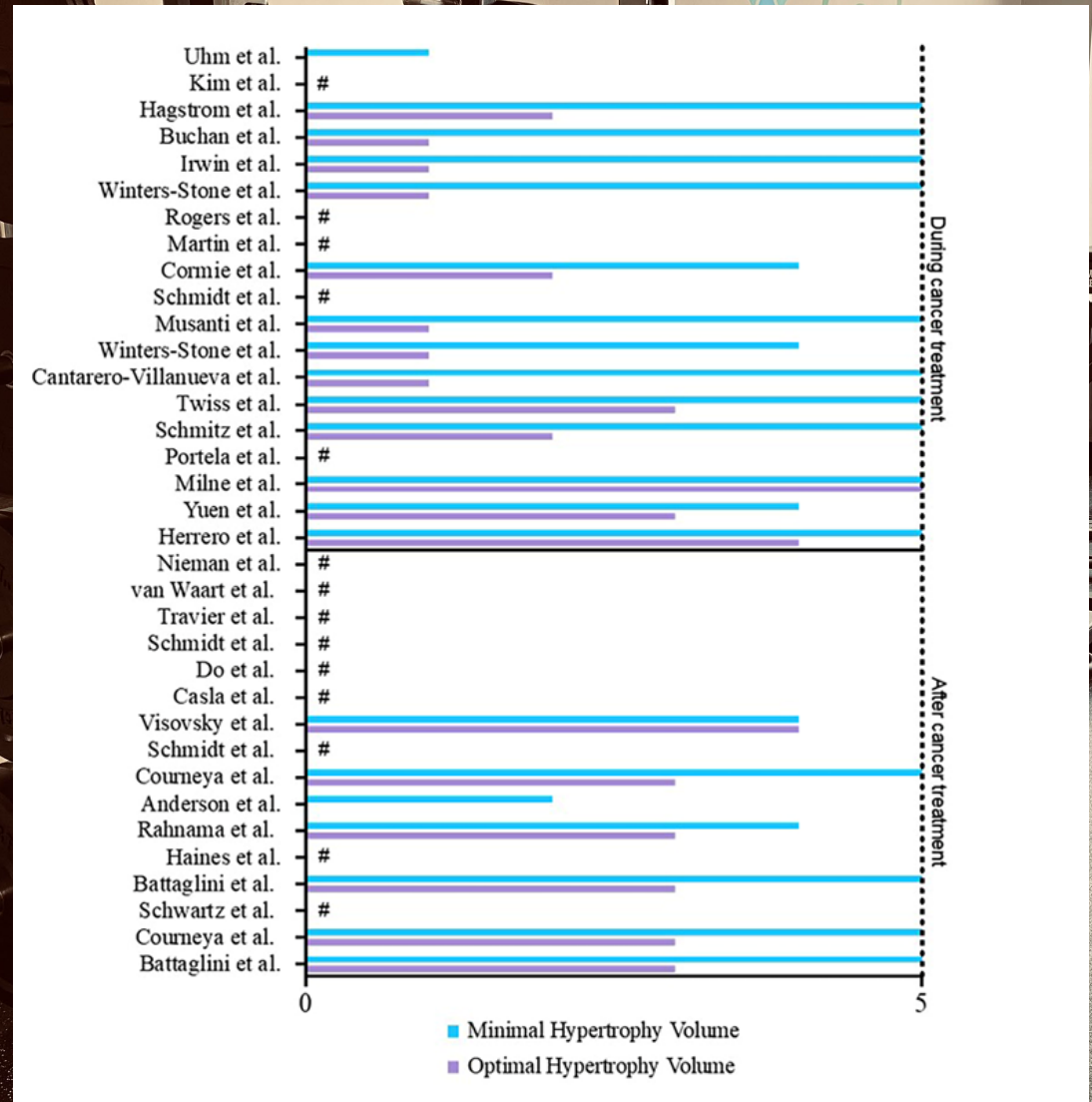
Champ et. al. Grip Strength as a Surrogate Measure of Strength, Functional, and Metabolic Parameter Increases in Breast Cancer Survivors Undergoing an Exercise Regimen. Under review. *Scientific Reviews*.

Hypertrophy & Breast Cancer

Decades of Negative Studies

Minimal Threshold: 5 sets/muscle/week

Optimal Threshold: 10 sets/muscle/week



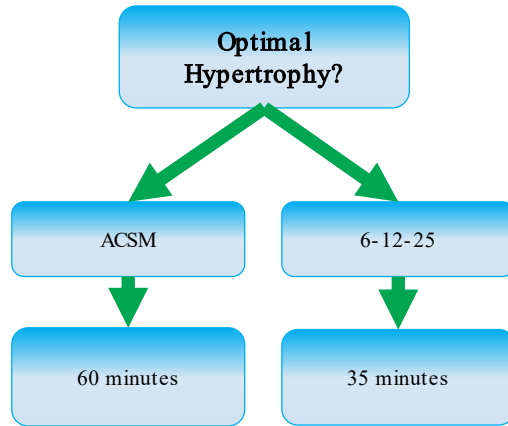
EXERCISE IS NOT MEDICINE

Exercise may improve body composition, strength, VO2max, balance and bone density, or even breast cancer outcomes when:

Exercise is goal oriented with appropriate methods to achieve these goals by promoting a physiologic stress that reaches adequate levels to promote metabolic, cellular, and physiologic adaptation

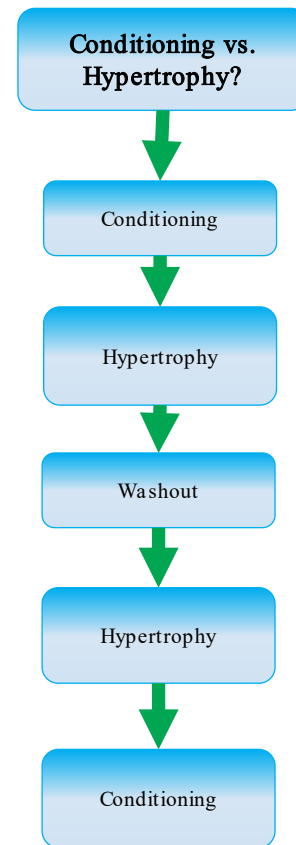
EXERT- BCH

Randomized Comparison of Hypertrophy Regimens in Breast Cancer



EXERT- BCHC

Impact of Hypertrophy & Conditioning Regimens on VO₂max and Body Composition in Breast Cancer



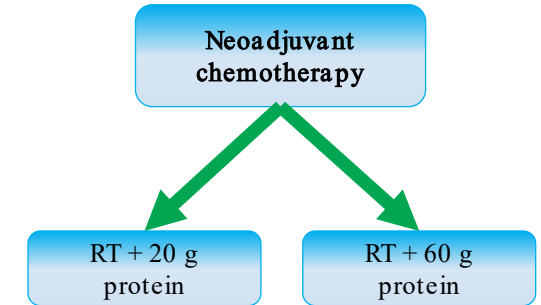
*Monthly VO₂ Max

Ex Onc Sled:



NEOCHEMOPRT

Randomized Comparison of Hypertrophy Regimens in Breast Cancer



“EXERCISE” ONLY WORKS IF YOU HIT THE REQUIRED DOSE



THANK YOU

