Obesity Reduction in Older Adults: Does Exercise Modality Matter?

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Faculty/Presenter Disclosure

• Faculty: Robert Ross

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  – Consulting Fees: University of Copenhagen
Bias declaration is that:

Body weight is **not a good primary outcome for strategies designed to manage obesity and related health risks.**
Adults

Body Mass Index (BMI)

23-25
High

Health Risk

Increase risk
Decrease risk

Public interpretation for obesity management?
- Weight Loss is required
- No weight loss is a failure
Optimal Weight Loss Recommendations

Clinically significant weight loss = greater than 5%

Less than 3% = weight maintenance

Body Mass Index

Health Risk

Increase risk

Decrease risk

23 - 25

High

Adults

Appropriate Physical Activity Intervention Strategies for Weight Loss and Prevention of Weight Regain for Adults

This pronouncement was written for the American College of Sports Medicine by Joseph E. Donnelly, Ed.D. (Chair); Steven N. Blair, Ph.D.; John M. Jakicic, Ph.D.; Malinda M. Manore, Ph.D., R.D.; Janet W. Ranker, Ph.D.; and Bryan K. Smith, Ph.D.
Does Successful Obesity Management Require Weight Loss?

Obesity Management – Desired Outcomes

- Decrease total adiposity
- Decrease abdominal adiposity
- Maintain/increase lean mass
- Decrease functional limitation
- Improve Cardiorespiratory Fitness
- Decrease cardiometabolic risk factors
Obese Elderly: *The Merging of Two Epidemic Trends*

- **Abdominal / Visceral Fat**
- **Skeletal Muscle**
- **Subcutaneous Fat**

**Health Risk**

- **Upper Body**
- **Lower Body**
Issues with aging

62 year old

- Abdominal Fat: 3.3 kg
- Subcutaneous Fat: 3.3 kg
- Visceral Fat: 3.8 kg
- Leg Muscle: 17.5 kg

80 year old

- Abdominal Fat: 2.9 kg
- Subcutaneous Fat: 2.9 kg
- Visceral Fat: 6.8 kg
- Leg Muscle: 10.3 kg

Insulin Sensitivity

- 62 year old: 7.5 mg/kg/min
- 80 year old: 3.4 mg/kg/min (30% less)

Functional Fitness
Issues with aging

- Abdominal obesity
- Insulin resistance
- Metabolic Risk

Aging population

Issue #1

Issue #2

Muscle mass

Mobility and function
Preventing and Treating Skeletal Muscle Loss

Exercise Modality

Skeletal Muscle in Athletes and Sedentary Controls by Age

H. Klitgard et al., *Acta Physiol Scand* 1990;140:41-54
Preventing and Treating Sarcopenia

Muscle Hypertrophy in Response to a Laboratory-Based Strength Training Program

- Resistance: Nautilus
- 8 exercises
- To volitional fatigue

W.R. Frontera et al., J Appl Physiol 1988;64:1308-44
Which modality of exercise is optimal?

- **Aerobic Exercise**
  - ↓ Abd fat
  - ↔ Muscle

- **Resistance Exercise**
  - ↔ Abd fat
  - ↑ Muscle

- **AE + RE**
  - ↓ Abd fat
  - ↑ Muscle

Which modality is optimal for decreasing abdominal obesity, insulin resistance and increasing functional capacity?
Effects of Exercise Modality on Insulin Resistance and Functional Limitation in Older Adults

A Randomized Controlled Trial

Lance E. Davidson, PhD; Robert Hudson, MD, PhD; Katherine Kilpatrick, MD; Jennifer L. Kuk, PhD; Kathleen McMillan, MSc; Peter M. Janiszewski, MSc; SoJung Lee, PhD; Miu Lam, PhD; Robert Ross, PhD
Effects of Exercise Modality on Insulin Resistance and Functional Capacity in Aging: A Randomized Controlled Trial

Treatment Groups

1. Control (N=28)
2. Resistance Exercise (N=36)
3. Aerobic Exercise (N=37)
4. Resistance and Aerobic (N=35)

Abdominally Obese Men and Women (Age ~68yrs) : 6 month exercise intervention, without caloric restriction.

Testing Protocol

- **Recruit**
- **Dietary run-in** period (3-4 wks)
- **Consent**
- VO$_{2}\text{max}$ FFT
- MRI Clamp
- VO$_{2}\text{max}$ FFT
- FFT
- VO$_{2}\text{max}$ FFT
- MRI Clamp

6-month intervention

**C:** Normal lifestyle

**RE:** Weights 3x/wk

**AE:** Treadmill 5x/wk

**RAE:** Weights 3x/wk + Treadmill 3x/wk
Visceral Fat, Skeletal Muscle, and Insulin Resistance

Hyperinsulinemic Euglycemic Clamp
Anthropometrics

- Height
- Weight
- Skinfolds
  - 7-site
- Circumferences
  - Abdominal
  - Appendicular
Cardiorespiratory and functional fitness

Maximal graded exercise test (VO2max)

Functional fitness tests
- Chair stands
- Arm curls
- 2-minute step
- 8-foot up and go
**Effects of Exercise Modality on Cardiorespiratory Fitness in Older Men and Women**

- **Control**
- **Resistance Exercise**
- **Aerobic Exercise**
- **Aerobic and Resistance Exercise**

**Percent Change (%)**

- **150 Minutes walking / wk**
  - *Significant change*

- **90 Minutes walking / wk**
  - *Significant change*
Effect of Fatness (BMI) and Fitness on Cardiovascular Disease (CVD) Mortality

Wei M et al. JAMA 1999; 282:1547-53

“Fit” – top 80 percent – 30 minutes per day of physical activity
Metabolic Syndrome, Fitness, and Mortality


CVD Mortality Among 19,223 Men from the Aerobics Center Longitudinal Study: 10 Years of Follow-up

“Fit” – top 80 percent ~ 30 minutes per day of physical activity
Effects of Exercise Modality on Body Weight and Waist Circumference in Older Men and Women

- Control
- Resistance Exercise
- Aerobic Exercise
- Aerobic and Resistance Exercise

Percent Change

Body Weight
Waist Circumference
Effects of Exercise Modality on Visceral Fat, Total Fat and Skeletal Muscle in Older Men and Women

- Skeletal Muscle
- Visceral Fat
- Abdominal Fat
- Total Fat

Control  | Resistance Exercise  | Aerobic Exercise  | Aerobic and Resistance Exercise
Exercise Modality on Skeletal Muscle Mass in Older Adults

Change in Skeletal Muscle (kg)

-2 -1 0 1 2

Control  RE  AE  RE + AE

* Diff from Control (p<0.05)
+ Diff from AE (p<0.05)

Effects of Exercise Modality on Insulin Sensitivity in Older Men and Women

Percent Change in Insulin Sensitivity (%)

Control
Resistance Exercise
Aerobic Exercise
Resistance and Aerobic Exercise

* p < 0.05
† p < 0.01
Effects of Exercise Modality on Functional Limitation in Older Men and Women

Percent Change (%)

- Control
- Resistance Exercise
- Aerobic Exercise
- Resistance and Aerobic Exercise

* and ‡ indicate statistical significance.
Effects of Exercise Modality on Insulin Resistance and Functional Capacity in Aging: A Randomized Controlled Trial

Figure 4. Percentage of improvement in functional limitation by tertiles of fat loss and muscle gain. Percentage improvement in functional limitation according to tertiles of skeletal muscle and total fat loss (A) and abdominal fat loss (B). Tertiles of fat loss (total and abdominal) and skeletal muscle gain were independent predictors of improvement in functional limitation ($P = .001$ for trend).

Decrease Abdominal Fat and Increase Skeletal Muscle Associated with Improvement in Functional Capacity

Abdominal Fat Loss (kg) vs. % Improvement in Functional Capacity

- High muscle gain: 60% improvement in functional capacity
- Mid muscle gain: 50% improvement in functional capacity
- Low muscle gain: 40% improvement in functional capacity

Muscle Gain (kg)

High
Mid
Low

% Improvement in Functional Capacity

0 10 20 30 40 50 60
Principal Finding

150 minutes of weekly exercise

Reduction of abdominal and visceral fat
Increase in skeletal muscle mass
Improvement in insulin resistance
Improvement in cardiorespiratory fitness

Balanced diet, exercise, no weight loss

SUMMARY
AHA and ACSM advocate that regular physical activity is essential for healthy aging. That older adults engage in both exercise modalities to reduce the risk factors for chronic disease and disability.

Canada’s Physical Activity Guides

Canadian Physical Activity Guidelines

FOR OLDER ADULTS - 65 YEARS & OLDER

Guidelines

To achieve health benefits, and improve functional abilities, adults aged 65 years and older should accumulate at least 150 minutes of moderate- to vigorous-intensity aerobic physical activity per week, in bouts of 10 minutes or more.

It is also beneficial to add muscle and bone strengthening activities using major muscle groups, at least 2 days per week.

Those with poor mobility should perform physical activities to enhance balance and prevent falls.

More physical activity provides greater health benefits.

Let’s Talk Intensity!

Moderate-intensity physical activities will cause older adults to sweat a little and to breathe harder. Activities like:

- Brisk walking
- Bicycling

Vigorous-intensity physical activities will cause older adults to sweat and be “out of breath”. Activities like:

- Cross-country skiing
- Swimming

Being active for at least 150 minutes per week can help reduce the risk of:

- Chronic disease (such as high blood pressure and heart disease) and
- Premature death
And also help to:

- Maintain functional independence
- Maintain mobility
- Improve fitness
- Improve or maintain body weight
- Maintain bone health
- Maintain mental health and feel better

Pick a time. Pick a place. Make a plan and move more!

- Join a community urban poling or mall walking group.
- Go for a brisk walk around the block after lunch.
- Take a dance class in the afternoon.
- Train for and participate in a run or walk for charity!
- Take up a favourite sport again.
- Be active with the family! Plan to have "active reunions”.
- Go for a nature hike on the weekend.
- Take the dog for a walk after dinner.

Now is the time.
Walk, run, or wheel, and embrace life.

www.csep.ca/guidelines

Canadian Society for Exercise Physiology; www.csep.ca
Rethink your Treatment Targets

For management of obesity and related health risk, we must look beyond weight loss as the only indicator of therapeutic/treatment success.
For Reducing Obesity and Related Health Risk, Exercise Without (minimal) Weight Loss is Not a Failure


**BENEFITS**
- Decrease in abdominal and visceral Fat
- Decrease waist circumference
- Increase in skeletal muscle mass
- Increase cardiorespiratory fitness
- Decrease blood pressure

**Obese Men and Women**

<table>
<thead>
<tr>
<th>Waist Circumference Reduction</th>
<th>Control</th>
<th>Weight Loss</th>
<th>No Weight Loss</th>
<th>Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Winner!</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Graph:**
- **Control:** No Change in BMI
- **Weight Loss:** Decrease in BMI
- **No Weight Loss:** Decrease in BMI
- **Exercise:** Decrease in BMI

**Legend:**
- **Red Bar:** Decrease in BMI
- **Green Bar:** Decrease in BMI
- **Blue Bar:** No Change in BMI

**Compared Groups:**
- Control
- Weight Loss
- No Weight Loss
- Exercise

**Conclusion:**
- No Weight Loss is not a failure.
- Exercise without weight loss can still yield significant health benefits.
- Benefits include decreased waist circumference, improved cardiorespiratory fitness, and reduced blood pressure.
Importance of Self-Monitoring – Role for Pedometers

Accumulate 15-30 minutes per day

2000 extra steps / day
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Thank You