The Role of Exercise in Weight Loss and Maintenance

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Disclosures

Consultant for Mio Global for their Personalized Activity Intelligence (PAI) applications based on our Am J Med PAI paper published on-line October 2016;

Also, he is the author of The Obesity Paradox

Obesity and Cardiovascular Disease

Risk Factor, Paradox, and Impact of Weight Loss

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New Orleans, Louisiana

The Role of Exercise and Physical Activity in Weight Loss and Maintenance

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The Role of Exercise and Physical Activity in Weight Loss and Maintenance

ARTICLE INFO

Abstract

This review explores the role of physical activity (PA) and exercise training (ET) in the prevention of weight gain, in initial weight loss, weight maintenance, and the obesity paradox. In particular, we will focus the discussion on the expected initial weight loss from different ET programs, and explore intensity/volume relationships. Based on the present literature, unless the overall volume of aerobic ET is very high, clinically significant weight loss is unlikely to occur. Also, ET also has an important role in weight regain after initial weight loss. Overall, aerobic ET programs consistent with public health recommendations may promote up to modest weight loss (~2 kg), however the weight loss on an individual level is highly heterogeneous. Clinicians should educate their patients on reasonable expectations of weight loss based on their physical activity program and emphasize that numerous health benefits occur from PA programs in the absence of weight loss.

Keywords: Weight loss, Exercise training, Physical activity, Weight regain
Occupational METs over 5 Decades

Occupational EE and Obesity
Meta-Analysis of BMI and Survival

• 97 studies, 2.88 million individuals, >270,000 deaths
• Relative to normal weight, obesity (all grades combined) and grades 2 and 3 obesity were associated with higher all-cause mortality
• Grade 1 obesity was associated with a trend for lower mortality (HR 0.95, CI 0.88-1.01), and overweight had significantly lower mortality (HR 0.94, CI 0.91-0.96)
• In those 65 years and older, there was only a non-significant trend of 10% higher mortality, even in those with BMI 35 and higher

Flegal KM et al. JAMA 2013;309(1):71-82

Scientific Decision Making, Policy Decisions, and the Obesity Pandemic

James R. Hebert, PhD; David B. Allison, PhD; Edward Archer, PhD; Carl J. Lavie, MD; and Steven N. Blair, PhD

Abstract

Rising and epidemic rates of obesity in many parts of the world are leading to increased suffering and economic costs from treating obesity and the chronic diseases associated with it. Although obesity is clearly associated with a number of health problems, the increased size of the obesity epidemic—especially in the United States—has raised questions about its true nature and implications. This article provides an overview of the current status of the obesity epidemic and its causes, and considers ways in which scientific decision making can help improve patients' health outcomes and reduce the burden of obesity on society.


Weight Loss in CV Diseases

• Obesity increases most CV risk factors and CV diseases
• However, an “obesity paradox” is present
• Weight loss improves risk factors
• Impact of weight loss on CV events remains controversial

Potential Adverse Effects of Weight Loss

- Obesity Paradox
- Prolonged QTc and increased ventricular dysrhythmias (starvation, very low calorie, liquid protein diets, and obesity surgeries)
- Pharmacologic agents have limited efficacy and considerable toxicity

Lavie CJ et al. JACC 2009;53:1925-1932

Weight Loss and Lifestyle Modifications

- Calorie restriction and exercise training is safe and is associated with 60% reduction in development of T2DM
  - Knowler WL et al. NEJM 2002;346:393-403
  - Tuomilehto J et al. NEJM 2001;344:1343-1350
- CRET reduces MS by 37%
  - Maiorini L, Lavie CJ. AJC 2003;92:50-54
- In 1,500 CHD patients, 6 month weight loss programs associated with lower CHD events in 4 years
- In 377 patients at Mayo Clinic, weight loss, even in those with BMI < 25 kg/m², was associated with reduced mortality/CV events

Weight Loss in CV Diseases

- In HTN, weight loss reduces BP and LVH
- In HF, weight loss improves LVM, systolic and diastolic LV function, and functional class
- Obesity surgery improves CHD risk factors, T2DM, and short- and long-term mortality
- Obesity surgery in small studies is safe in CHD and HF

Lavie CJ et al. JACC 2009;53:1925-1932
Therapeutic Lifestyle Changes

- Dietary restriction of calories, simple carbohydrates, and saturated fat
- Regular aerobic exercise
- Weight control
- Therapeutic lifestyle changes should *always* be reinforced

Relationship Between MS and Levels of hs-CRP With TLC

![Graph showing the relationship between Metabolic Risk Factors and hs-CRP levels before and after TLC.](image1)

Milani RV, Lavie CJ. *Am J Cardiol.* 2003;92:50-54

Median Levels of hs-CRP With TLC in Patients With and Without Metabolic Syndrome

![Graph showing the median levels of hs-CRP before and after TLC for patients with and without MS.](image2)

Milani RV, Lavie CJ. *Am J Cardiol.* 2003;92:50-54
### Cardiac Rehabilitation in Obesity

- Compared baseline and post-rehabilitation results in 235 obese patients (BMI ≥ 27.3 kg/m² in women and ≥ 27.8 kg/m² in men) and 353 non-obese
- Assessed the benefits of weight loss in 45 obese with ≥ 5% weight reduction

Lavie CJ, Milani RV. Am J Cardiol 1997;79:397-401

### Baseline Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Obese (n=235)</th>
<th>Non-Obese (n=353)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>59 ± 10</td>
<td>63 ± 11</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>HBP, %</td>
<td>74%</td>
<td>58%</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>DM, %</td>
<td>29%</td>
<td>21%</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>% Fat</td>
<td>27.3 ± 7.2</td>
<td>23.4 ± 6.2</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>BMI, kg/m²</td>
<td>31.2 ± 3.3</td>
<td>24.4 ± 2.2</td>
<td>&lt;0.0001</td>
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</tbody>
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Lavie CJ, Milani RV. Am J Cardiol 1997;79:397-401
Baseline Characteristics

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<th>Obese (n=235)</th>
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</tr>
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<tbody>
<tr>
<td>FBS, mg/dl</td>
<td>124 ± 45</td>
<td>110 ± 31</td>
<td>0.04</td>
</tr>
<tr>
<td>TC, mg/dl</td>
<td>210 ± 43</td>
<td>199 ± 37</td>
<td>0.02</td>
</tr>
<tr>
<td>TG, mg/dl</td>
<td>194 ± 111</td>
<td>158 ± 85</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>LDL/HDL</td>
<td>3.86 ± 1.4</td>
<td>3.45 ± 1.2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>HDL, mg/dl</td>
<td>36.9 ± 10.2</td>
<td>39.7 ± 11.4</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Lavie CJ, Milani RV. Am J Cardiol 1997;79:397-401

Improvements after Rehabilitation (Obese = 235)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Baseline</th>
<th>Post Rehab</th>
<th>% Δ</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight, lbs</td>
<td>206 ± 31</td>
<td>203 ± 31</td>
<td>-2%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>BMI, kg/m²</td>
<td>31.2 ± 3.3</td>
<td>30.5 ± 3.3</td>
<td>-2%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>% Fat</td>
<td>27.3 ± 7.2</td>
<td>25.9 ± 6.8</td>
<td>-5%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Exercise Cap.</td>
<td>6.6 ± 2.7</td>
<td>8.4 ± 3.5</td>
<td>+27%</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
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Improvements after Rehabilitation (Obese = 235)

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<tbody>
<tr>
<td>TC, mg/dl</td>
<td>210 ± 43</td>
<td>206 ± 43</td>
<td>-2%</td>
<td>0.07</td>
</tr>
<tr>
<td>TG, mg/dl</td>
<td>194 ± 111</td>
<td>181 ± 131</td>
<td>-7%</td>
<td>0.11</td>
</tr>
<tr>
<td>HDL, mg/dl</td>
<td>36.9 ± 10.2</td>
<td>38.5 ± 10.4</td>
<td>+4%</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>LDL, mg/dl</td>
<td>134 ± 38</td>
<td>132 ± 35</td>
<td>-1.5%</td>
<td>0.31</td>
</tr>
<tr>
<td>LDL/HDL</td>
<td>3.86 ± 1.4</td>
<td>3.61 ± 1.2</td>
<td>-6%</td>
<td>&lt;0.01</td>
</tr>
</tbody>
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Cardiac Rehabilitation in Obesity

Relative Improvements in Obese vs. Non-Obese

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Obese (n=215)</th>
<th>Non-Obese (n=353)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>-2%</td>
<td>0%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>BMI</td>
<td>-2%</td>
<td>0%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Estimated METs</td>
<td>+27%</td>
<td>+ 39%</td>
<td>&lt;0.001</td>
</tr>
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Cardiac Rehabilitation in Obesity

Benefits of Weight Loss

<table>
<thead>
<tr>
<th>Parameter</th>
<th>% Improvements After Rehab</th>
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<tbody>
<tr>
<td></td>
<td>Success (n=45)</td>
</tr>
<tr>
<td>Weight, lbs</td>
<td>-10 ± 4</td>
</tr>
<tr>
<td>BMI, kg/m²</td>
<td>-9 ± 3</td>
</tr>
<tr>
<td>% Fat</td>
<td>-7 ± 5</td>
</tr>
<tr>
<td>Estimated METs</td>
<td>+34 ± 13</td>
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Benefits of Weight Loss

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<td>TC, mg/dl</td>
<td>-7 ± 15</td>
</tr>
<tr>
<td>TG, mg/dl</td>
<td>-20 ± 40</td>
</tr>
<tr>
<td>HDL, mg/dl</td>
<td>+11 ± 29</td>
</tr>
<tr>
<td>LDL, mg/dl</td>
<td>-7 ± 21</td>
</tr>
<tr>
<td>LDL/HDL</td>
<td>-16 ± 26</td>
</tr>
<tr>
<td>FBS, mg/dl</td>
<td>-6 ± 19</td>
</tr>
</tbody>
</table>

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ARTICLE INFO

Abstract

The role of exercise and physical activity in weight loss and maintenance

Damon L. Swift a, b, Neil M. Johannsen c, e, Carl J. Lavie c, f, Conrad P. Earnest d, Timothy S. Church c a Department of Kinesiology, East Carolina University, Greenville, NC 27858 b Center for Health Disparities, East Carolina University, Greenville, NC 27858 c Department of Preventive Medicine, Pennington Biomedical Research Center, Baton Rouge, LA 70808 d Department of Health, University of Bath, Bath, UK e School of Kinesiology, Louisiana State University, Baton Rouge, LA 70803 f Department of Cardiovascular Disease, John Ochsner Heart and Vascular Institute, Ochsner Clinical School-The University of Queensland School of Medicine, New Orleans, LA 70121

A R T I C L E A B S T R A C T

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Keywords: Weight loss, Exercise training, Physical activity, Weight regain
Potential Benefits of Weight Loss in Coronary Heart Disease

Philip A. Ades, Patrick D. Savage, MS
Division of Cardiology, University of Vermont College of Medicine, Burlington, VT 05403

ABSTRACT

The prevalence of overweight, obesity, and insulin resistance in patients with coronary heart disease (CHD) exceeds that of the general population. Obesity is associated with a constellation of coronary risk factors that predispose to the development and progression of CHD. Intentional weight loss, accomplished through behavioral and physical interventions, improves metabolic dysfunctions associated with obesity. The weight loss interventions should be designed to be sustainable and result in long-term maintenance of weight loss. The weight loss interventions should also provide improvement in lipid profiles, blood pressure, and measures of inflammation and vascular function in both healthy individuals and patients with CHD. Additionally, intentional weight loss also has beneficial effects on glucose control in patients with diabetes mellitus. In a recent meta-analysis of 12 RCTs high-risk overweight individuals who achieved intentional weight loss had improved outcomes in insulin sensitivity, glucose response, and weight regain compared to those who did not achieve intentional weight loss. Further studies are needed to evaluate if long-term weight loss results in improved clinical outcomes.

Keywords: Weight loss, Coronary heart disease, Coronary risk factors, Prognosis

Progress in Cardiovascular Diseases 56 (2014) 448–456

Available online at www.sciencedirect.com

ScienceDirect

www.onlinelibrary.wiley.com


Weight Loss in CAD

• In 12 studies, 14 cohorts with CAD (N=35,335)
• Over all weight loss was associated with 30% increase in major events (OR 1.3; CI 1.0-1.69; p=0.05)
• Presumed intentional WL in 4 cohorts was associated with 33% reduction in risk (OR 0.67; CI 0.50-0.80; p<.001)
• Observational WL in 10 cohorts associated with increased risk (OR 1.62; CI 1.26-2.08; p<.001)

**Weight Loss and Survival**

- In 15 RCTs (N=17,186)
- Mean Age 52 yrs; 53% female; follow-up avg 27 months; wt loss mean 5.5 kg
- 264 deaths WL vs 310 non-WL
- WL group had 15% lower mortality (RR 0.85; CI 0.73-1.00)

Kritchevsky SB et al. Plos One 2015;March 20

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**Obesity, HF and Weight Loss**

**Guideline Statements**

- American Heart Association 40 kg/m²
- Heart Failure Society of America 35 kg/m²
- European Society of Cardiology 30 kg/m²
- Canadian Cardiovascular Society 30 kg/m²
- Vastly different cut-points due to minimal data by which to base these exact recommendations
- Clearly further research is needed to determine ideal BMI and body composition in CVD, including systolic and diastolic HF

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**Obesity, Weight Loss and Maintanence**

**ACSM Position Stand on Physical Activity and Weight**

- Maintaining and Improving Health: 150 min/wk
- Prevention of Weight Gain: 150-250 min/wk
- Promote Clinically Significant Weight Loss: 225-420 min/wk
- Prevention of Weight Gain after Weight Loss: 200-300 min/wk
Obesity and Weight Loss

Summary and Conclusions

- Overwhelming evidence supports the importance of obesity in the pathogenesis and progression of most CV diseases, including HF risk factors and HF
- An Obesity Paradox exists, in most CVD
- At present, evidence supports purposeful weight reduction, especially for Class III and possibly Class II obesity, especially incorporating exercise training to increase fitness and preserve muscle mass
- Further studies are needed on the efficacy and safety of purposeful weight loss in CVD

Lavie CJ et al. JACC 2009;53:1925-1932

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