

# WEIGHT TRAINING AND WEIGHT LOSS

By Wayne L. Westcott, Ph.D.

and completed 20 minutes of aerobic activity at 70% to 80% of maximum predicted heart rate. After 10 weeks of training, the study participants averaged a 3.1-pound increase in lean weight and a 3.9-pound decrease in fat weight. Although the mean bodyweight loss was less than one pound, the participants averaged a 2-point reduction in percent body fat (28.1% to 26.1%), which actually represented a 7.0 pound improvement in body composition (3.1 pounds more lean weight and 3.9 pounds less fat weight). The study subjects also experienced significant reductions in mean systolic blood pressure (-3.8 mmHg) and mean diastolic blood pressure (-1.8 mmHg) over the 10-week training period. These results supported the ACSM Position Stand that combined resistance and aerobic training as an effective means for decreasing fat mass, increasing lean mass, and reducing health risks.<sup>3</sup>

Recent research also has provided affirmation for the ACSM Position Stand statement that resistance training and higher protein diets may enhance fat loss and lean tissue retention. In a 2013 study,<sup>16</sup> 121 men and women were divided into 3 training groups. Group 1 performed 9 standard resistance machine exercises interspersed with 3 bouts of recumbent cycling (5 minutes each). Group 2 performed the same exercise program and consumed a higher protein diet (1.5 grams of protein per kilogram of ideal body weight on a daily basis). Group 3 performed the same exercise program and followed the same higher protein diet, along with a reduced calorie nutrition plan of 1,200 to 1,500 calories per day for women and 1,500 to 1,800 calories per day for men. After 10 weeks of training, Group 1 (exercise only) experienced a 1.1-point improvement in percent fat (26.9% to 25.8%), adding 1.1 pounds of lean weight and losing 2.4 pounds of fat weight. Group 2 (exercise and higher protein diet) experienced a 1.9-point improvement in percent fat (29.9% to 28.0%), adding 2.8 pounds of lean weight and losing 3.9 pounds of fat weight. Group 3 (exercise, higher protein, and lower calorie diet) experienced a 2.9-point improvement in percent fat (28.9% to 26.0%), adding 1.7 pounds of lean weight and losing 7.1 pounds of fat weight. Based on these findings, the study authors concluded that the higher protein nutrition plan enhanced the effects of the exercise program for increasing lean weight, and that the higher protein plus reduced calorie nutrition plan enhanced the effects of the exercise program for decreasing fat weight without muscle loss. In addition, both exercise and nutrition plans produced significant reductions in resting blood pressure readings.

*Photo credit*

In 2009, the American College of Sports Medicine (ACSM), released a Position Stand entitled, “Appropriate Physical Activity Intervention Strategies for Weight Loss and Prevention of Weight Regain for Adults.”<sup>3</sup> Based on the research reviewed, the authors concluded that “Resistance Training does not enhance weight loss but may increase fat-free mass and increase loss of fat mass and is associated with reductions in health risk” (page 459).<sup>3</sup>

The ACSM Position Stand referenced studies that reported no effect of resistance training on body fat, studies that reported a modest effect of resistance training for reducing body fat, studies that showed combined resistance and aerobic training superior to aerobic training alone for decreasing fat mass and increasing lean mass, and studies that revealed resistance training and higher protein diets superior to resistance training and lower protein diets for reducing fat weight and retaining lean tissue.<sup>3</sup>

A large-scale study with more than 1,600 participants examined the effects of a basic strength and endurance exercise program on body composition parameters in men and women between 21 and 80 years of age.<sup>15</sup> Consistent with the ACSM exercise guidelines at that time, 2 all of the subjects performed 1 set of 10 resistance machine exercises for 8 to 12 controlled repetitions,

## How Resistance Exercise Effects Energy Requirements

Resistance exercise uses energy during and immediately after the strength training session. In a study by Haltom et al.<sup>8</sup> 20 minutes of circuit strength training burned about 200 calories during the exercise performance, and used about 25% as many additional calories (50 calories) during the first hour following the training session.

*Weight loss (continued on page 14)*

## Weight loss (continued from page 9)

Resistance training also increases energy requirements at rest for up to 72 hours after a high-volume or high-intensity workout. In a study by Hackney et al.<sup>7</sup>, two groups of young men performed a single high-volume strength training session (8 resistance exercises; 8 sets each; 6 repetitions per set). Over the following 3 days (72 hours post-training), the untrained subjects averaged a 9% increase in resting energy expenditure and the trained subjects averaged an 8% increase in resting energy expenditure.

In a similar study by Heden et al.<sup>9</sup>, untrained young men completed a single high-intensity strength training session (10 resistance exercises; 1 set each; 10 repetitions per set). Over the following 3 days (72 hours post-training), the subjects averaged a 5% increase in resting energy expenditure (approximately 100 calories per day).

These research results support the findings of other studies that have examined the effects of resistance exercise on resting energy expenditure.<sup>4,5,10,11,13,14</sup> On average, these studies showed a 7% elevation in resting energy expenditure for strength trained subjects from various populations, using different resistance exercise protocols and study durations. This extra energy expenditure most likely represents the muscle remodeling response to the tissue micro-trauma experienced during resistance training workouts.

## Monthly Calorie Contribution

If we assume that a 20 to 30 minute circuit strength training session uses 200 calories, 3 weekly workouts would burn approximately 2,400 calories per month (200 calories x 3 days x 4 weeks). If we assume that the resulting elevation in resting energy expenditure is at least 100 calories per day, this would approximate an additional burn of 3,000 calories per month (100 calories x 30 days). The total energy use associated with this relatively brief resistance training program is therefore about 5,400 calories per month, which is roughly equivalent to 1.5 pounds of fat. Interestingly, the amount of fat loss reported in several strength training studies using relatively brief exercise sessions is approximately 1.5 pounds per month.<sup>5,13,15</sup>

Although a large amount of research indicates that strength training significantly elevates resting energy expenditure,<sup>4,5,6,9,10,11,13,14</sup> one study did not find an association between resistance training and resting energy expenditure in experienced exercisers.<sup>1</sup> It is possible that the metabolic impact of resistance exercise decreases as muscles become accustomed to a given training program, so it may be prudent to periodically change exercise protocols and procedures.

A recently published paper in the *Journal of the American Medical Association*<sup>12</sup> calls for an end to the diet debates, stating that “The pursuit of the ideal macronutrient content diet is unidimensional, ignoring 2 of 3 major components of lifestyle intervention: behavioral modification and exercise.” This is sound advice, which correctly contends that attaining and maintaining a healthy bodyweight and body composition require a comprehensive approach to lifestyle change, including proper nutrition, appropriate behavior, and effective exercise. Based on the research reviewed in this column, it would appear that regular resistance training may be a significant factor in successful and sustainable weight management programs.

## About the Author

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## References

1. Abboud G, et al. Effects of Load-volume on EPOC After Acute Bouts of Resistance Training in Resistance-trained Men. *Journal of Strength and Conditioning Research*. 27(7): 1936-1941, 2013.
2. American College of Sports Medicine. *Guidelines for Exercise Testing and Exercise Prescription*. 5th ed Philadelphia (PA): Lea and Feliger, 1995; 172-175.
3. American College of Sports Medicine. Position Stand: Appropriate Physical Activity Intervention Strategies for Weight Loss and Prevention of Weight Regain for Adults. *Med Sci Sports Exerc*. 2009; DOI: 10.1249/MSS.0b013e3181949333.
4. Broeder C, et al. The Effects of Either High-intensity Resistance or Endurance Training On Resting Metabolic Rate. *American Journal of Clinical Nutrition*. 55: 802-810, 1992.
5. Campbell W., et al. Increased Energy Requirements and Changes in Body Composition with Resistance Training in Older Adults. *American Journal of Clinical Nutrition*. 60: 167-175, 1994.
6. Hackney K, et al. Resting Energy Expenditure and Delayed-onset Muscle Soreness After Full-body Resistance Training with an Eccentric Concentration. *Journal of Strength and Conditioning Research*. 22: 1602-1609, 2008.
7. Hackney, K., et al. Timing Protein Intake Increases Energy Expenditure 24 h After Resistance Training. *Med Sci Sports Exerc*. 42: 998-1003, 2010.
8. Haltom R, et al. Circuit Weight Training and Its Effects on Excess Post-exercise Oxygen Consumption. *Med Sci Sports Exerc*. 31: 1613-1618, 1999.
9. Heden T, et al. One-set Resistance Training Elevates Energy Expenditure for 72 Hours Similar to Three Sets. *European Journal of Applied Physiology*. 111: 477-484, 2011.
10. Hunter G., et al. Resistance Training Increases Total Energy Expenditure and Free-living Physical Activity in Older Adults. *Journal of Applied Physiology*. 89: 977-984, 2000.
11. Lemmer J, et al. Effect of Strength Training on Resting Metabolic Rate and Physical Activity. *Med Sci Sports Exerc*. 33: 532-541, 2001.
12. Pagoto S and Appelhans B. A Call for An End to the Diet Debates. *Journal of the American Medical Association*. 310 (7): 687-688, 2013.
13. Pratley R, et al. Strength Training Increases Resting Metabolic Rate and Norepinephrine Levels in Healthy 50- to 65-year Old Men. *Journal of Applied Physiology*. 76: 133-137, 1994.
14. Van Etten, L, et al. Effects of An 18-week Weight-training Program on Energy Expenditure and Physical Activity. *Journal of Applied Physiology*. 82: 298-304, 1997.
15. Westcott W, et al. Prescribing Physical Activity: Applying the ACSM Protocols for Exercise Type, Intensity, and Duration Across 3 Training Frequencies. *Physician and Sportsmedicine*. 37 (2): 51-58, 2009.
16. Westcott W, et al. Nutrition Programs Enhance Exercise Effects on Body Composition and Resting Blood Pressure. *Physician and Sportsmedicine*. 41 (3): 85-91, 2013.