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The Exercise Caloric Challenge

Although every once in awhile I am reminded it is not universally known, it seems that the role of exercise in the achievement of fitness or health-related outcomes, such as weight control or the primary or secondary prevention of chronic disease, is well established. Exercise guidelines elucidating the type, frequency, intensity, and duration are readily available, and special considerations have been nicely defined for specific medical diagnoses. Research and position papers have established exercise thresholds for attainment of fitness, weight loss, management of diabetes and hypertension, and even heart disease reversal (1–5). What is not particularly clear is how the health fitness professional connects the dots between established evidence-based exercise guidelines and achieving the thresholds necessary for optimal outcomes, particularly when exercise is most often prescribed in terms of intensity, duration, and frequency without regard to the overall caloric volume, which differs depending on the targeted outcome. For example, fitness outcomes are associated with a daily exercise caloric expense of roughly 150 to 400 calories, or a minimum of about 1,000 per week, whereas recommendations for weight loss or cardioprotection are in the neighborhood of 1,500 to 2,000 calories weekly, respectively. While it is logical that increased volume is important for weight loss, a specific dose–response relationship for fat loss and, in particular, abdominal obesity has not been well established (6). That said, other data have shown, at least for overweight adult women, that a

dose–response relationship exists when the primary outcome measure is weight loss and, in particular, maintenance of weight loss (7).

Consideration of goals and outcomes is always a mix of the client's priorities and the exercise professional's assessment of the client's health needs and priorities. The common priority is usually weight loss and fitness, suggesting an exercise prescription that leads to a weekly exercise expenditure of about 1,500 calories, or greater depending on the desired rate of weight loss. For clients with an established history of cardiovascular disease, or perhaps at high risk as determined through assessment of the client's risk factor profile, further progression to a program approximating 2,000 Kcal of exercise weekly is warranted.

The challenge for the exercise professional, then, is to develop an exercise prescription that brings the client to a volume of exercise that in a parallel way ensures an improvement in fitness given the evidence that higher fitness levels confer lower cardiovascular mortality (8). The tools for meeting this challenge are readily available. While *ACSM's Guidelines for Exercise Testing and Prescription* provide metabolic equations to estimate oxygen uptake and thus caloric expense, a practical and very useful equation was published by the American Heart Association (9) and appears in subsequent ACSM guidelines (10), which requires only knowledge of body weight and exercise intensity as rated by METS, to reasonably estimate caloric expenditure during physical activity:



$$\text{Calories/minute} = [\text{METS} * 3.5 *$$

$$\text{Body weight in kg}] / 200.$$

This can be likewise reasonably reduced to:

$$\text{Calories/minute} = [\text{METS} *$$

$$\text{Body weight in kg}] / 57.$$

In practice, then, estimation of caloric expenditure is not necessarily problematic. If the exercise prescription is derived from a graded exercise test, the comparison of the MET value from the treadmill test at the heart rate (HR) and/or perceived exertion rating (RPE) that the exercise professional would use to prescribe a fitness program can be used to guide increases in weekly exercise volume to the necessary level. In the event exercise test data are not available,

CLINICAL APPLICATIONS

the exercise professional can estimate the MET cost from assessment of the client's program, or perform a submaximal exercise test to the target HR/RPE already prescribed. For example, if the workload at the targeted HR/RPE is 10 METS, and the subject weighs 200 lbs (91 kg), the expected gross caloric expenditure per minute is ~16. Estimating the number of minutes necessary to reach a threshold of 1,500 or 2,000 calories per week (94 and 125 minutes, respectively) at their target HR/RPE or 10 MET workload allows the client to see how their program should unfold in terms of weekly volume of exercise to achieve a fitness effect with a better probability of achieving personal goals and associated health benefits.

One caveat: There is a school of thought that one should use the net caloric cost of exercise to ensure an appropriate exercise dose. In this case, the adjustment is simple: subtract 1 MET (resting value) from the exercise prescription to estimate the caloric expense. In our example, this changes the weekly exercise volume at the target HR/RPE to about 107 (1,500 calorie threshold) to 143 minutes (2,000 calories), based on a recalculated caloric expense of ~14 net exercise calories per minute.

The example of a client exercising at a 10 MET level yields a volume of exercise that might be easily accomplished in the three to five days per week frequency often prescribed as part of the fitness-based exercise prescription. However, for

lower-functioning clients, and particularly those for whom weight loss or cardioprotection is a high priority, the total number of minutes necessary to achieve these caloric goals is going to be substantially greater. A significant challenge for the exercise professional is to help the client gradually progress their program by varying the days per week, even the number of sessions per day that is necessary to achieve the caloric goal(s) set. In this regard, a behavioral approach is fostered, wherein the client is encouraged to integrate multiple sessions into an overall program that suits their lifestyle.



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