Exercise Intensity and Body Fat Loss

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Aerobic exercise is often added to a weight loss program as a means to both increase caloric expenditure and improve muscle tone and overall fitness. Many individuals who include aerobic exercise in a weight loss program believe that in order for exercise to aid in fat loss, the exercise must be performed at low intensity.

Anyone who watches a 10K run, marathon, triathlon or other endurance sports event will recognize the fallacy of this belief. The top finishers in such events are invariably lean individuals. Yet these athletes train at very high intensities. Why, then, does the myth persist that exercise must be of low intensity if it is to lead to fat loss? The question may be answered by identifying the type of fuel substrate (fat vs. carbohydrate) the body uses during exercise.

During prolonged exercise at low intensity (for example, a young healthy adult walking three miles in one hour), exercising muscles derive the majority of their energy from the aerobic use of fats (3). However, a significant amount of carbohydrates are also being used. As exercise intensity increases, the proportional use of carbohydrates as a fuel source increases, while the proportional use of fat decreases (3). Hence, during high intensity exercise, the muscles are deriving more of their energy from carbohydrates than from fats. This is advantageous, since the body gets more usable energy from the oxygen it uses when it burns carbohydrates.

Identification of the major fuel substrate used during exercise of varying intensities provides the basis for the belief that only low intensity exercise is beneficial to fat loss. Since the body derives a greater percentage of energy from fat during low intensity compared to high intensity exercise, many individuals believe that low intensity exercise is better for fat loss than high intensity exercise.

This seemingly simple explanation fails to consider two important factors. First, an exercise bout is a single event occurring during the day. During an average day, a person will participate in many activities, and ingest quantities of various foods. The activities will draw from both the carbohydrate and fat fuel stores, while the ingested food will act to resupply both stores. Withdrawals and replenishments are continually occurring throughout the day. However, it is the balance between total calories consumed and total calories used, NOT the source of the calories used, which determines whether a person actually loses body fat. Second, while the body does indeed derive a greater percent of its energy from fat during low intensity exercise, the total amount of energy derived from fat may, in fact, be greater during high intensity exercise.

During low intensity exercise, a large portion of the fuel is from fat stores, and relatively little is taken
Table 1. Caloric and substrate use during exercise bouts

<table>
<thead>
<tr>
<th>Exercise Mode</th>
<th>Distance (miles)</th>
<th>Speed (mph)</th>
<th>Duration (min)</th>
<th>Total Calories* (kcal)</th>
<th>Calories from Fat** (percent)</th>
<th>Calories from Fat** (kcal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk</td>
<td>4</td>
<td>4</td>
<td>60</td>
<td>270</td>
<td>60</td>
<td>160</td>
</tr>
<tr>
<td>Jog</td>
<td>4</td>
<td>6</td>
<td>40</td>
<td>450</td>
<td>40</td>
<td>180</td>
</tr>
<tr>
<td>Jog</td>
<td>6</td>
<td>6</td>
<td>60</td>
<td>680</td>
<td>40</td>
<td>270</td>
</tr>
</tbody>
</table>

** Approximate percent and amount

from the carbohydrate stores. The food ingested at the next meal is used to replenish these stores. Some of the fat in the meal will be used in essential body functions, but most of it will not be used immediately. Instead, it will be put into fat storage for use when needed. The carbohydrates in the meal will be used to refill the carbohydrate stores, but since relatively few carbohydrates were used during the exercise, only a small amount of carbohydrates will be used to replenish the stores.

During high intensity exercise, when more carbohydrates than fat are used, significant withdrawals are made from both the fat and carbohydrate stores. While the percentage of energy from fat is not as great as during low intensity exercise, the absolute amount may be greater. Additionally, a significant portion of food ingested during the day will be used to resupply the carbohydrate stores, leaving little excess carbohydrates to be temporarily stored as fat.

Over the course of the day, if the body burns the same amount of carbohydrates and fat as was taken in through the food ingested, then no weight is lost or gained. The fact that an exercise bout may have used a greater percentage of fat than carbohydrates during the event will not affect the overall fat stores, if there is a balance between caloric intake and caloric expenditure. If, however, over the course of the day, the body withdraws more from its stores than it deposits (burns more calories than consumed), then there will be a weight loss. Since stored energy in the body is in the form of fat, the excess energy used must have been withdrawn from the fat stores, regardless of the fuel source used during the exercise.

Consider the exercise sessions presented in Table 1, completed by a typical 35-year-old woman, weighing 140 pounds.

During the four-mile walk she will indeed derive much of her energy from fat stores, but it results in only a 270 kcal expenditure. Completing the same distance (four miles), but increasing the intensity of the exercise to a jog, increases the caloric expenditure to 450 kcal. If the exerciser increases the intensity and jogs six miles in one hour, there is a further increase in caloric expenditure to 680 kcal - more than double the caloric expenditure of the one-hour walk. High intensity exercise burns more calories than low intensity exercise when both are done for the same distance (four miles) or the same time (one hour). Additionally, the total calories from fat are greater for both examples of high intensity exercise than for the low intensity exercise. If weight loss is a major goal, high intensity exercise will lead to quicker weight loss.

A 40-minute session of high intensity exercise will result in more calories burned and faster body fat loss than a 40-minute low intensity exercise session. However, low intensity exercise does provide other health benefits, including improved blood cholesterol, (2), reduced hypertension (4) and improved ability to manage stress (5). Additionally, low intensity exercise programs are often easier to continue than high intensity programs. Because of that, greater weight loss may occur during a low intensity exercise program, since the average exerciser is more likely to continue a low intensity program. For example, much more fat can be lost through six months of daily four-mile walks than through two months of daily four-mile jogs.

As discussed above, weight loss or gain is determined by the balance of caloric expenditure and intake. If weight loss is a primary goal, and low intensity exercise seems most appropriate based on lifestyle and interests, then managing caloric intake may provide an alternative method to higher intensity exercise for more rapid, safe fat loss. Several key elements described below will assist in successful management of food intake in a
weight management and exercise program:

1. The fat (or carbohydrates) burned during exercise (whether high or low intensity) will be replaced if enough calories are consumed. Consequently, an overall reduction in food intake - with special emphasis on reducing fat-rich foods - will assist in weight loss. A loss of one pound of body fat requires a 3,500 calorie deficit - either through additional expenditure (exercise) or a reduction in food intake or both. As discussed above, low intensity exercise does not make a large contribution to a caloric deficit. Reduction of caloric intake by up to 700 calories per day (provided total caloric intake does not fall below 1200 calories per day) may help in speeding weight loss safely.

2. A greater volume of food, with fewer calories, can be eaten if the fat content of the food is low. For example, two cups of cooked carrots provide about 100 calories (8 grams of protein, 16 grams of carbohydrates, and 0 grams of fat), whereas one cup of potatoes fried in one tablespoon of corn oil provides approximately 235 calories (14 grams of carbohydrates, 15 grams of fat). By eating the carrots rather than the potatoes, not only can a larger portion be eaten, but more vitamins and minerals are consumed.

3. Water is an essential nutrient often overlooked by exercisers and individuals interested in weight control. Exercisers, regardless of the intensity of the exercise, do not consistently take in enough water to ensure proper hydration. Low intensity exercise typically does not result in sufficient water loss through perspiration to significantly stimulate the thirst mechanism. Drinking 64 ounces of water (8 cups) each day will help maintain both proper hydration and a level of fullness that may help reduce caloric intake. Since many people choose to eat when they are actually thirsty, careful attention to fluids consumed may help reduce caloric intake.

**Practical Application**

The choice of exercise intensity in a weight-management program should be based on a clear evaluation of goals. If relatively rapid, safe weight loss is the primary goal of the exercise program, high intensity exercise may be preferable to low intensity exercise, provided the exercise is not so stressful that it is discontinued after only a few weeks or months. If, on the other hand, reduction of coronary risk factors, an improved outlook on life, or simply socialization are significant goals, in addition to life-long weight management, then low intensity exercise can provide as much or more benefit as high intensity exercise. Individuals who choose a low intensity exercise program, yet want a more rapid weight loss than is possible with exercise alone, can increase the rate of fat loss through diet manipulation which emphasizes low-fat foods and plenty of fluids.

**References**