DISCOVER THE AFTERBURN

Incinerate calories both during and after exercise by manipulating intensity and duration. Cardio isn't the only way to crank up your metabolism post-workout, and some methods are far better than others. Here's the latest research on getting more firepower for your cardio buck.

By Scott W. Stevenson, PhD, LAc
Lead photo of IFBB Pro Phil Heath by Jason Breeze

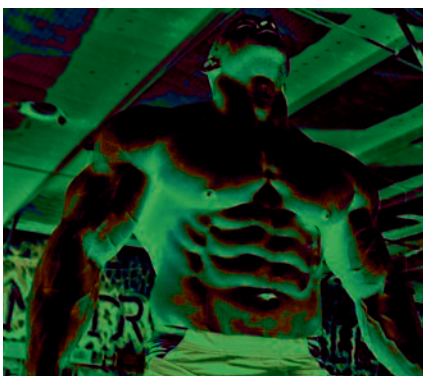
We all know the old mantra: To lose fat you've got to eat less than you burn. Expend more energy than you take in, and your body will be forced to use unwanted bodyfat to make up the caloric difference. (This is easier said than done, of course.) Except for perhaps the genetic elite, cardiovascular exercise is considered a necessary evil in the pursuit of a leaner you.

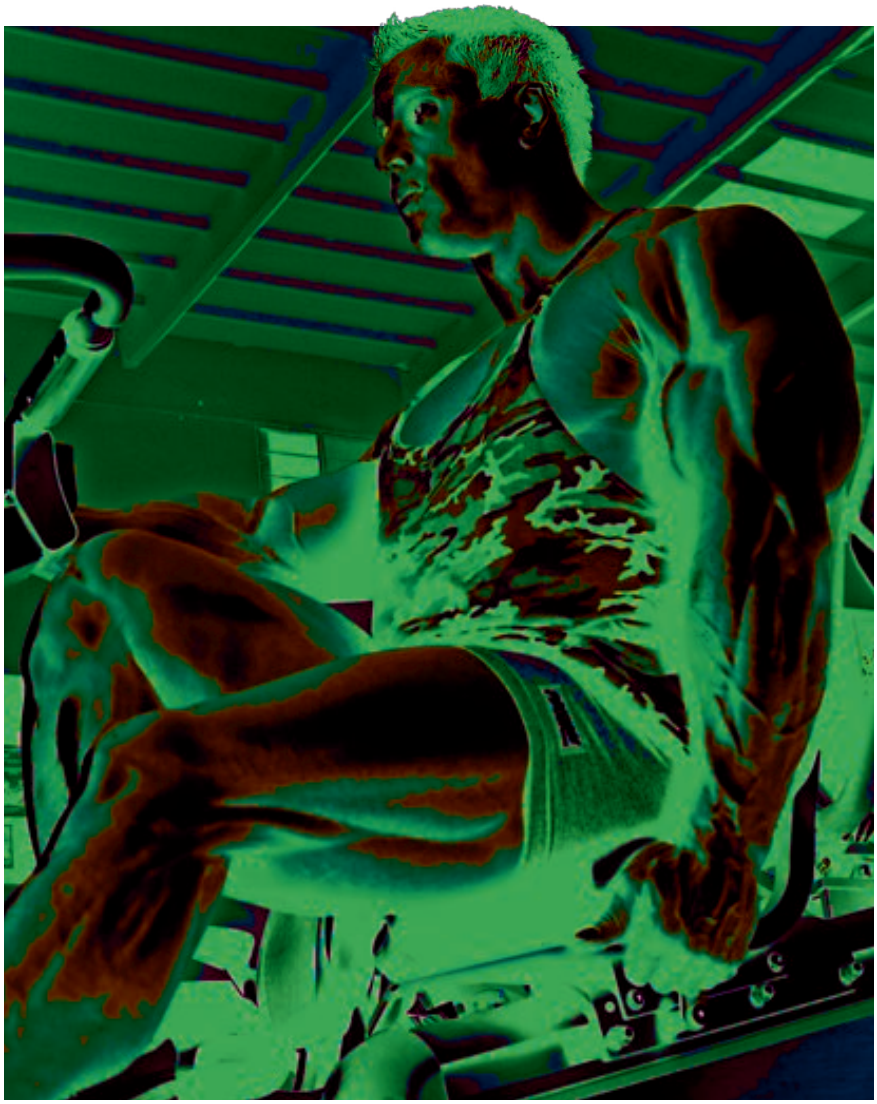
Conventional lore tells us you can count on cardio for rapidly expending calories, and better yet, stoking your metabolism for hours after your workout is over. Thus, the toil of a long, boring cardio session is well worth it, given the distinct metabolic advantage you'll generate the rest of the day. Well, maybe.

What if you found out that some kinds of cardio crank up your metabolism better than others? What if cardio isn't even the best way (or even a very good way) to turn your body into a calorie-gobbling furnace? Here's the skinny on getting lean — even without cardio.

EPOC — NO, NOT A *STAR WARS* CHARACTER

Jump on any piece of cardio equipment and it'll give you an approximate read-out of how many calories you burned over the course of that workout. But that's not the complete story, at least as far as how many calories you've truly expended. In fact, you continue to burn calories long after the training session is over, and the total can be quite significant. The extra calories your body burns after vigorous exercise are because of various recovery processes. Exercise scientists quantify this energy expenditure by measuring the body's oxygen consumption. In essence, the more oxygen you consume, the more calories you burn. This excess post-exercise oxygen consumption, or EPOC, is the down-and-dirty way of calculating additional calories burned long after you've left the gym.





REAL-WORLD EPOC

EXERCISE BOUT			EPOC		
EXERCISE TYPE	INTENSITY	DURATION/VOLUME	CALORIES	DURATION	NOTES
Cardio	60% VO_2 max	30 minutes	16	<30 minutes	Ref. 13
Cardio	51% VO_2 max	60 minutes	22	<5 hours	Ref. 11
Cardio	70% VO_2 max	30 minutes	34	1 hour	Ref. 2
HIIT	105% VO_2 max	20 x 1 minute	73	8 hours	Ref. 2
Weights	45% of 8RM	18 sets	5	<2 hours	Sets not to failure /Ref. 7
Weights	85% of 8RM	18 sets	11	<2 hours	Sets not to failure /Ref. 7
Weights	70% of 1RM	50 sets x 10 reps	51	>14 hours	Ref. 11
Weights	12RM	50 sets x 10 reps	>100	>24 hours	Sets to failure /Ref. 9
Weights	10RM	12 x 10 reps	>700	>38 hours	Squats and leans /Ref. 12

Note: RM = repetition maximum (e.g., 85% of 8RM is 85% of a weight you can do for a set of 8, and only 8, reps before reaching failure).
VO_2 max = maximal oxygen consumption, an indication of intensity (e.g., 70% VO_2 max indicates exercising at a heart rate of about 125–140).

Photos (left to right) by Paul Buceta / Irvin Gelb
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WHAT AFFECTS EPOC

A number of variables influence the increase in the amount of oxygen you take in post-exercise, so let's go through the most significant ones.

» **Intensity and Type of Exercise.** EPOC relates to recovery, so when exercise stress and intensity are increased, the greater the EPOC. When it comes to cardio, faster heart rates, more perceived exertion and elevated blood lactate levels all indicate higher intensity. A conversational walk on a treadmill is much less intense than an all-out 3-mile run that breaks a personal record. Some 20 years ago, researchers at Purdue University (West Lafayette, IN) found that expending 300 calories at near maximal-effort levels (75% of maximal oxygen consumption, or 75% VO_2 max) more than doubled the EPOC compared to exercising at only 50% VO_2 max. In fact, even when exercising twice as long at the low intensity, EPOC was still less than half that generated by the more intense session.[1]

As those who've tried it can attest, interval-based cardio sessions (high-intensity interval training, or HIIT) are far more demanding than the monotonous low-intensity steady-state cardio sessions you see most people doing at the gym. In fact, a true HIIT session means exercising at intensities above what you could maintain continuously. As you might have guessed, HIIT amplifies EPOC beyond what even a maximal-effort continuous cardio session can produce. Australian researchers found that 20 one-minute all-out intervals on a treadmill (at speeds faster than what an athlete would be capable of maintaining for more than a few minutes) doubled EPOC compared to 30 minutes of continuous but still intense running (70% VO_2 max).[2]

Naturally, you must perform a significant duration of exercise to make a difference (in other words, a couple of minutes won't cut it), but EPOC is considerable only when the intensity of exercise is high.[3,4] Long-duration, low-intensity cardio burns off calories during exercise, but it's only the most demanding bouts that really generate EPOC, as demonstrated by research studies.[5]

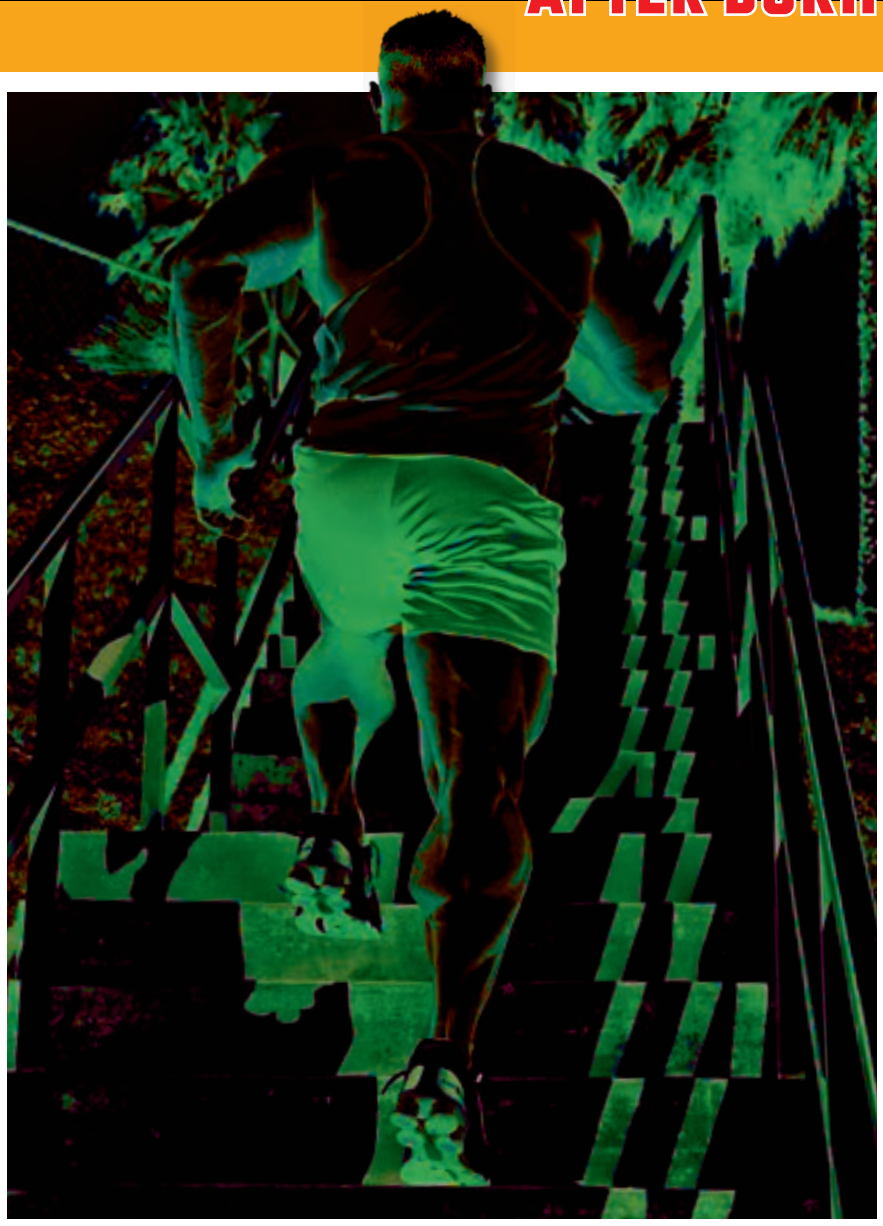

Photo by Robert Reiff
Model IFBB pro Ben Pakulski

MAKE EPOC WORK FOR YOU

Now that you know the basics of EPOC, how can you use it to your advantage? Here are some considerations.

1 CARDIO PLUS WEIGHT TRAINING? Recognize that hitting the weights with vigor may burn as many calories as a hearty cardio session, so plan accordingly. For example, cardio after a squat and deadlift session may be overkill.

2 MONITOR YOURSELF — DON'T OVERTRAIN. A large EPOC is associated with elevated body temperature and heart rate.[13–15] Monitoring these factors in the morning (upon waking) can give you an idea as to whether your metabolism is still elevated the day after a brutal workout. Chronic overtraining, however, can also elevate your resting heart rate, so be wary.[16]

3 PICK YOUR POISON. Create your caloric deficit judiciously when dieting. Low-intensity cardio, while weak in the EPOC department, may interfere less with your ability to train with the heavy weights needed to build offseason muscle. Strength loss can spell muscle loss for the dieting bodybuilder. (On the other hand, when strength increases muscle hypertrophy is actually possible, even when dieting.)[17]

WHAT ABOUT WEIGHTS?

Now you must be thinking, "The tougher the exercise, the higher the EPOC. Does that also apply to hitting the weights really hard?" That's a good question. In fact, weight training generates EPOC so effectively that even when the calories expended during exercise are matched, the EPOC of weight training wins out over running on a treadmill.[6] Let me repeat that point: If you burn the same number of calories hitting the weights, you get a larger post-exercise energy burn than after a calorically equivalent cardio session. In fact, if you equate the work performed during your weight-training session (reps multiplied by weight), the more intensely you train (meaning the heavier the weights or the more muscle mass you engage), the greater the EPOC.[7] In other words, when it comes to EPOC, "go heavy or go home" is the bottom line.

THE BIG PICTURE: EPOC, FAT LOSS AND CALORIES

Early researchers were optimistic that elevating metabolism after a typical cardio session might help with fat loss. After more than a decade of research, however, some scientists have shifted their opinions. A group of researchers recently reviewed the past 20 years of studies examining EPOC and concluded, "The earlier research optimism regarding an important role for the EPOC in weight loss is generally unfounded."[8]

Essentially, those scientists are now telling us that cardio is really only good for expending energy *during* exercise and that, while weight training burns more calories after the workout, it's really not enough to make a difference for fat loss. For the average person (or the average research subject), this may be true. As with many endeavors in bodybuilding and life, however, you get out what you put into it.

A typical moderate-pace cardio session may elevate metabolism for only a few hours or less and produce an EPOC

MAKE EPOC WORK FOR YOU

4 PICK YOUR CARDIO. High-intensity cardio may counteract weight training gains and, thus, how well you hold onto your hard-earned muscle.[18] However, the superior EPOC of high-intensity interval training (HIIT) may explain why this mode of cardio has been shown to triple fat loss compared to continuous (lower-intensity) cardio, even if you burn fewer calories during each session.[19]

5 PICK YOUR PHYSIQUE. When the main goal is to get cut, a noncompetitive bodybuilder might choose to generate a hearty and frequent EPOC with weight training, even if that means risking some loss of strength and muscle mass.

6 TAKE YOUR TIME. Fat loss takes time. Trying to lose fat too quickly, by dieting too restrictively or exercising too much, can actually bring your metabolism and your fat loss to a screeching halt.[20]

Photo by Robert Reiff
Model IFBB Pro Quincy Taylor

Research has shown that four sets of 10 grueling reps of squats can elevate metabolism for at least 38 hours and can generate a whopping estimated EPOC of over 700 calories.

equivalent to maybe 20–30 calories (see "Real-World EPOC"). Your average gym member who trains with weights also does relatively light training with mostly isolation exercises and never really approaches true muscular failure. Therefore, he or she probably elicits only a similarly measly, short and essentially insignificant EPOC.

If you're reading this magazine though, you probably exercise like a different animal than the average weekend warrior. Rightfully, the payoff from your physique-building efforts is larger than average, as is the EPOC you generate. Truly intense weight-training sessions, where working sets are taken to failure, may elevate metabolism for more than 12 hours and even well into the next day.[9–12] Surprised? Pause for a moment and consider how taxing some of your best workouts have been — maybe that last point isn't so surprising after all.

Perhaps the most brutal exercise stress tested in the EPOC literature was created by Mark Schuenke and colleagues.[12] Their subjects completed a simple but effective round-robin of large muscle, compound exercises including both power cleans and the granddaddy of them all, the back squat: four sets of 10 repetitions, each set taken to absolute failure, with two minutes of rest between sets. Schuenke's team even adjusted loads during the bouts to make sure no one got off easy by doing any fewer than 10 grueling reps. Afterward, metabolism was elevated for at least 38 hours, and the bout generated a whopping estimated EPOC over 700 calories. This kind of EPOC is equivalent to about an hour of cardio (at a decent clip, too) and is the type of post-workout "burn" that really matters. In essence, the participants in this study got double the bang for their training buck: one heck of a muscle-building weight workout plus a metabolic boost to aid fat loss, minimize offseason fat gain and/or simply balance out a well-earned cheat meal of pizza or cheesecake.

When you want to grease the wheels of your metabolism, it's hard to beat a down-and-dirty battle with the iron. Don't

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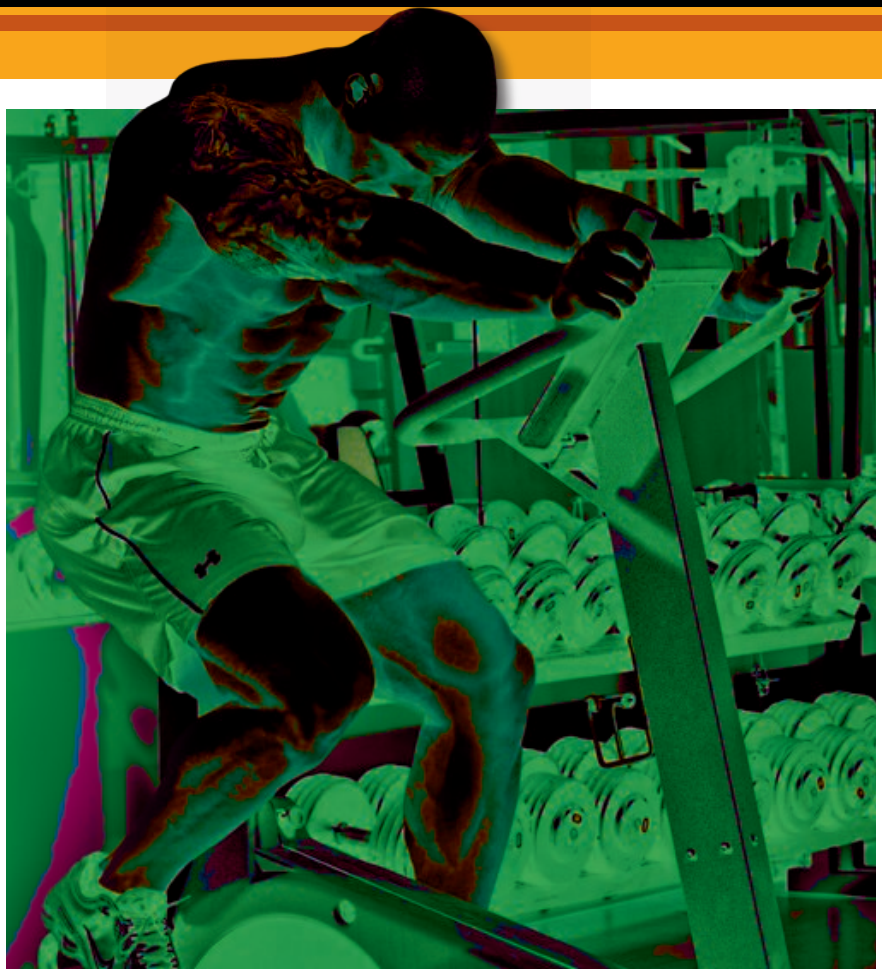

forget that both low- and high-intensity interval cardio training though, and, of course, the right diet and supplement regimen are fundamental tools for shedding bodyfat. Successful fat loss comes down to selecting the right devices to match your physique goals. For helpful hints on getting lean, see "Make EPOC Work for You."

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