STREET FIT

Interval Training: Burn More Calories in Less Time

By Kathleen Vonk

Box as hard as you can for 10 seconds, then jog for 2 minutes. That is interval training.

The primary reason why Americans say they don't work out is lack of time. Of course, they also report watching three hours of television each day. So just how are you supposed to be able to juggle your full-time job, part-time job, family and fitness on top of it all?

Priorities are always a good answer, but even those dedicated to working out and staying fit don't always have the time to fit their workout into a busy day. Fortunately, there is a time-efficient alternative, and you don't even have to leave home to do it (unless you want to).

Interval training is a type of workout in which training intensities vary between high (usually anaerobic) and low (aerobic). The overall results include a higher calorie burn during a shorter session, an improvement in performance (speed, power and endurance), an increase in aerobic power, higher tolerance to lactic acid and a higher caloric burn during and after the session due to "excess post-exercise consumption" or EPOC. Such a workout will improve both aerobic and anaerobic systems, depending on the intensity and duration of the designed interval and recovery periods.

EPOC

When you first start exercising, your body requires more oxygen than is immediately available. You may feel "winded" until your oxygen intake matches that which is required by your exercising muscles. This period of about 10 minutes is called the "oxygen deficit state" because your body is trying to catch up to the oxygen and fuel requirements. If you continue to exercise beyond this 10 minutes, you reach a point when your breathing feels like it matches your exertion level, and you have reached your "steady state" of exercise.

After you stop exercising, you continue to breathe faster than at rest as your body recovers and repays the oxygen / fuel debt it has run up. This phase is called "excess post-exercise oxygen uptake," or EPOC. You are burning more calories than at rest during this recovery phase. The greater the intensity and duration of the workout, the greater the oxygen deficit, thus the greater the EPOC to recover. In other words, you will burn more "recovery calories" after your workout.

ENERGY SYSTEMS OF THE BODY

Knowing which energy system is being predominantly utilized during exercise is important in achieving specific goals. For example, if Officer Gonzales wants to improve his speed, he should not run long distances slowly because his goals

would not be realized. The intensity of exercise and the type and length of the rest intervals would have to be specific to the energy system he wanted to improve or train.

For street cops, it is important to train all the metabolic systems for a lifetime of good health and satisfying leisure time with family. But more importantly, they need to train for survival when an officer is the only one in between an MMA wanna-be and prison; that criminal who prides himself on his tolerance to pain may be willing to die before going back.

The energy systems of the body are all in use during physical activity; however, a person's intensity and duration of exertion determines which one is predominantly used at any given time. The goal of all three systems is to produce and use the energy found in adenosine triphosphate, or ATP.

Each system, however, produces ATP at a different rate and in different amounts. Because of these benefits and limitations, each system is used for different levels of exertion. The three systems are the phosphagen system, glycolysis (fast and slow) and the oxidative system.

The anaerobic system used during the first 10 seconds of intense activity produces ATP in only small amounts.

PHOSPHAGEN SYSTEM

The anaerobic system used during the first 10 seconds of intense activity is the phosphagen system, which produces ATP very quickly but in small amounts—hence it is good for only those first seconds of a sprint or a fight. In order for an officer to train this system to improve his start-up acceleration or forceful strikes and takedowns, he would need to incorporate short bouts of highly intense exercise with enough recovery to replenish the ATP (3 to 5 minutes) and creatine phosphate (8 minutes).

Aerobic metabolism will assist in replenishing these phosphagen substrates more quickly, so an active aerobic recovery is preferred over passive (walk rather than stop after short sprints). Work-to-rest ratios are generally in the range of 1:12 to 1:20 when training the phosphagen system, and exertion levels are 90% to 100% of maximum power. Adequate recovery in between is of utmost importance, because if not, the next work interval will be performed while fatigued and results will wane.

An example of incorporating inter-

Interval training burns more calories in a shorter period of time.

You must know which energy system is being used during activities. The one that powers a 10-mile run is not the one that powers the burst up a flight of stairs.

val-style training for this energy system might include performing the clean-and-jerk exercise repeatedly for 10 seconds, then walking or stationary cycling at an easy pace for eight minutes, and repeating this cycle for a set amount of time.

Another example might include a cycle of boxing as hard as possible for 10 seconds, then jogging for 2 minutes. Start-up power can be trained with very short sprints (up to 10 seconds), then walking the rest of the track back to the starting line for the next short sprint. Plyometrics are also excellent exercises for training the phosphagen system.

Glycolysis is the utilization of carbohydrates (glucose / glycogen) to produce ATP, which is produced in greater amounts than the phosphagen system, but not as quickly. Carbohydrates are stored in the muscles and liver as glycogen and used as fuel during glycolysis. Carbohydrates are the only source of fuel that can be metabolized anaerobically, so consumption of adequate carbs is of utmost importance for those who serve in emergency service professions.

Carbs are the only fuel that can be metabolized anaerobically. That makes carbs critical for cops.

Fast glycolysis is considered anaerobic and will become the predominant system used if the intensity of the activity remains high during the first few minutes. To train and improve this system, work-to-rest ratios should stay around 1:3 to 1:5, and replenishment of fuel for this type of activity is obtained through the ingestion of carbohydrates post-workout. This means no low-carb / high-protein diets for officers who must be able to fight at high intensities at any given moment!

Training the fast glycolysis system through the use of intervals can be achieved with just about any type of activity, whether indoors or out. Treadmill intervals might consist of a five-minute warm up, 10 inclined or speed intervals of 60 seconds each, followed by two minutes of level or slower running. The result will equate to more calories burned when compared to an equal amount of time spent at a steady pace, and both the oxidative and glycolysis systems will improve because intervals toggle between the two.

Outdoor hill repeats, fartleks, and cycling sprint intervals are all examples of outdoor interval training. Rowing machines, elliptical and stairclimbers are all great options for interval training and improving the glycolytic system, as long as the work intervals are increased to the point of higher intensities into anaerobic metabolism.

Results will enhance an officer's acid-buffering mechanism so that the increases in lactic acid within the working muscles will take longer to accumulate; thus the officer will better tolerate

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No low-carb, high-protein diets for emergency responders.

that "burning" feeling, making it possible to fight longer. Through training, achieving even a slight delay in the onset of lactic acid accumulation can buy an officer valuable seconds in a very intense altercation.

Slow glycolysis is sometimes (incorrectly) called "aerobic" glycolysis, even though neither form of glycolysis is dependent upon oxygen. Slow glycolysis is the breakdown of carbohydrates (glucose) to produce ATP to be used aerobically in the oxidative system and without lactic acid being produced (as it is in fast glycolysis).

LACTATE THRESHOLD

During aerobic or slow glycolysis, lactate is produced but recycled continuously, and the acidity in the muscle remains stable. Activity that pushes the upper limits of aerobic metabolism and crosses over into anaerobic metabolism (fast glycolysis) can result in an increase in lactate above the baseline concentration because the blood lactate cannot be recycled as quickly as it is produced, as is the case in a prolonged, intense fight.

This point at which lactate begins to accumulate markedly is called the lactate threshold, or LT. Those who train at and near the LT can increase the time it takes to start this accumulation of blood lactate and therefore delay the time at which they MUST slow down or move with less intensity.

An important training goal for street cops is for their personal LT to occur later in the altercation than it does for untrained criminals. Even if this buys an officer only a few seconds more than what the suspect has, it could mean the difference needed to win that forcible arrest situation.

OXIDATIVE

The oxidative system has the greatest capacity for producing the most ATP—hundreds if "burning" fat—but the process takes much longer than the

Interval training is a workout in which intensities vary from high (anaerobic) to low (aerobic).

phosphagen system or glycolysis. The oxidative system is the primary system used at rest and at lower intensities. It burns mostly fat and carbohydrates, and proteins are used only during times of starvation or prolonged activity such as a marathon or triathlon (90 minutes of exertion or more).

The oxidative system is the primary system employed beyond the first three minutes of activity, and intensities are lower than in the anaerobic systems already described. The oxidative system can be trained with intervals as well, whether tapping into anaerobic intensities or staying just below. Greater improvements can be made and more calories and fat burned as the intensity levels rise near the point at which you transition from aerobic to anaerobic activity or LT.

Work-to-rest ratios are usually 1:1 or 1:2 depending on fitness levels when training the oxidative system. Higher intensities but staying within aerobic zones will even better train the oxidative system, improve cardiovascular health and burn more calories (and fat) as well. Sitting on a stationary recumbent bicycle and pedaling at a nice easy pace while reading a magazine is still beneficial (just as getting up and changing the channel rather than using the remote is); however, you are not necessarily burning a lot of calories or improving aerobically.

Interval training for the oxidative system may include stationary cycling for one minute, then kicking it up a few notches but remaining aerobic for the next minute, and repeating for the duration of the workout.

Training the oxidative system can also be achieved with anaerobic intervals or higher aerobic intervals. Training at such intervals can last for up to five minutes or even longer, depending on fitness levels and desired goals. The most accurate way to ensure proper intensity levels is through the use of a heart rate monitor.

HEART RATE MONITORS

Using a heart rate monitor will make it easier to ensure proper goal achievement through the use of target heart rate zones. It is much easier (and more accurate) to glance at your wrist to see your intensity level than it is to stop and obtain your heart rate manually. To make it even easier, most monitors will give some type of audible signal or "beep" if you are below or above your desired target zone.

Maximum heart rate (MHR) is determined by the general formula 220 - age. During interval training, target heart rates can fluctuate between 60%-70% MHR during easy portions and reach up to 85%-90% of MHR during work intervals. Training the phosphagen system is best achieved when attaining 100% MHR levels with adequate recovery in between each interval (up to eight minutes).

Polar's Protective Services Division is a heart rate monitor and training program specific to law enforcement, government and military personnel. The program is managed by exercise physiologist Tricia Sterland, who has extensive experience in applying all levels of heart rate data and training. She can be reached at tricia.sterland@polarusa.com.

Remember that proper nutrition both before and after exercise sessions can enhance results. After all that hard work you put into a session and program design, make sure to maintain those benefits through optimal caloric, protein, carbohydrate, fat, water, fiber, vitamin and mineral intake. Proper training intensity and duration, proper rest and recovery, proper nutrition and adequate rest will all result in better performance on the street and more satisfying leisure time with loved ones while off duty and throughout retirement. So, get out there and work your gluteus to its maximus…but then eat, rest and recover appropriately for maximal life satisfaction.

Kathleen Vonk has been a certified police officer in Michigan since 1988, currently with the Ann Arbor Police. She has been the primary fitness instructor for the WCC Police Academy in Ann Arbor Michigan since 2001. She earned a BS in exercise science and a BA in criminal justice. She can be reached at kathyvonk@aol.com.