



Exclusive
ACE research
examines
the fitness
benefits of
kettlebells

Kettlebells:

Twice the Results in Half the Time?

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It's funny how workout trends come and go, and how a centuries-old piece of cast iron can inspire legions of exercisers in 2010.

That's the way it seems to be going for the good ol' kettlebell.

These cannonball-shaped iron orbs with handles lifted in a swinging motion were developed by Russian strongmen in the early 1700s as a way to build strength, balance, flexibility and endurance quickly. And they do work well. If you want proof (at least anecdotal), rent the film epic *300* and take a look at the physique of lead actor Gerard Butler who plays King Leonidas of Sparta. Butler used kettlebells to prepare for his role in the film. But it's not just Hollywood types who are getting into it. Kettlebell-themed fitness classes are now being offered at gyms across the country.

"It's great because it brings cardio and strength training together in one quick exercise," says Michael Shade, kettlebell instructor at Sports Club/LA in Miami. "Instead of lifting weights for a half hour and doing the treadmill for another half hour, you can get everything done with kettlebells in 20 minutes."

Shade says that in his gym, kettlebells went from gathering dust in the corner to becoming so popular there is now a waiting list for his weekly kettlebell bootcamp classes. There are even kettlebell-only gyms

opening around the country that attract exercisers who really like the simple, total-body exercises.

Given kettlebells' surge in popularity, the American Council on Exercise (ACE) decided to look into the science behind this workout trend.

The Study

To analyze the energy cost and exercise intensity of kettlebell workouts, ACE enlisted the help of the research experts at the University of Wisconsin, La Crosse Exercise and Health Program. The team, led by John Porcari, Ph.D., and Chad Schnettler, M.S., recruited 10 volunteers, male and female, ages 29 to 46 years, all of whom were experienced in kettlebell training.

"They [kettlebell enthusiasts] make these all-encompassing claims about increasing your muscular strength, endurance and aerobic capacity with kettlebells, like, if you do this, that's all you need to do," says Porcari. "So we wanted to look and see how much of an aerobic workout you really do get and how many calories you really burn."

Prior to beginning the actual study, each volunteer was given a maximal exercise test on a treadmill while oxygen consumption and heart rate were constantly monitored. Next, they surveyed each subject and their ratings of perceived exertion (RPE) for the treadmill test.

Once a fitness baseline was established, each subject returned to the Human Performance Laboratory on a separate day to perform a five-minute kettlebell $\dot{V}O_{2max}$ snatch test to establish a baseline of their specific kettle-

bell fitness. For this test, the subjects used a 12-, 16-, or 20-kilogram kettlebell (depending on their gender, body weight, fitness level, and experience level) swinging it one-handed between their legs and up and over the head in a snatch motion. The subjects continuously performed snatches to a specific cadence during each minute, switching to the opposite hand for the snatch every other minute.

The maximal kettlebell test format went like this:

- First minute: 8 repetitions at a rate of 1 snatch every 7 seconds
- Second minute: 12 repetitions at a rate of 1 snatch every 5 seconds
- Third minute: 15 repetitions at a rate of 1 snatch every 4 seconds
- Fourth minute: 20 repetitions at a rate of 1 snatch every 3 seconds
- Fifth minute: The subject went all out, performing as many snatches as they could until fatigue.

Meanwhile, heart rate (HR) and oxygen consumption ($\dot{V}O_2$) were measured during each stage. A peak RPE was taken following the test as well as blood lactate levels, which were tested using the finger prick method three minutes after completion of the test.

The number of snatches each subject successfully completed during the final minute of the test determined the number of snatches they would be asked to perform during the actual kettlebell testing (to be conducted on a separate day). For example, if a subject completed 24 snatches during the final minute, this number was divided by four and they were required to complete at least six snatches during each timed 15-second period of the 20-minute kettlebell snatch workout.

After both the maximal exercise and maximal kettlebell tests had been completed, each subject then performed a pre-determined 20-minute kettlebell snatch workout typical of a common kettlebell routine. Following a basic warm-up, subjects did 15 seconds of one-armed snatches, first with their dominant hand, then after a 15-second rest period, they performed another 15 seconds of snatches with the other hand. The workout continued like that, with intervals of 15 seconds of work and 15 seconds of rest, for 20 minutes, followed by a five-minute cool-down.

Throughout the workout, researchers monitored each subject's HR at 60-second intervals, followed by a blood lactate test which was taken immediately following completion of the workout.

The Results

During the 20-minute workout, the average calorie burn was 272 calories, not counting additional calorie burn due to the substantial anaerobic effort.

"We estimated oxygen consumption and how many calories they were burning aerobically, and it was 13.6 calories per minute. But we also measured the blood lactate, so anaerobically they were burning another 6.6 calories per minute," explains Porcari. "So they were burning at least 20.2 calories per minute, which is off the charts. That's equivalent to running a 6-minute mile pace. The only other thing I could find that burns that many calories is cross-country skiing up hill at a fast pace."

Researchers credit the brisk calorie burning to the fact that the kettlebell snatch workout is a total-body movement that is also done very quickly due to the interval-training format. "We knew it would be extremely intense," says Schnettler. "It's a quick workout, and you do get a big bang for your buck in a very short amount of time."

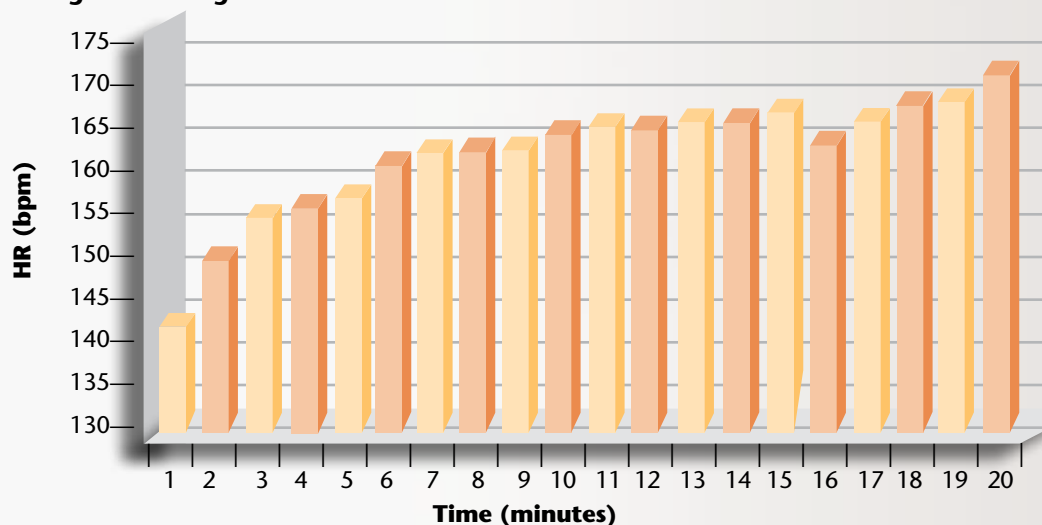
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TABLE 1
Average HR, $\dot{V}O_2$, RPE and Caloric Expenditure
Values for the Kettlebell Workout*

	Mean $\pm$ SD	Range
HR (bpm)	164 $\pm$ 14.7	128 – 180
% HRmax	93 $\pm$ 4.5	86 – 99
$\dot{V}O_2$ (ml/kg/min)	31.6 $\pm$ 3.71	24.6 – 36.6
% $\dot{V}O_{2\max}$	78 $\pm$ 8.0	67 – 91
Kcal/min	13.6 $\pm$ 3.08	8.75 – 17.85
RPE	15.9 $\pm$ 2.21	10 – 18

*All HR and $\dot{V}O_2$ values are compared to maximal values measured during the kettlebell snatch test.

FIGURE 1
Average HR During Kettlebell Workout



This study was funded solely by the American Council on Exercise.

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Ring in the New Year with Kettlebells

Kick start your get fit resolution with a centuries-old workout revved up for 2010 by ACE exercise physiologist Fabio Comana

As our ACE-sponsored research demonstrates, kettlebells can offer a highly effective workout. In addition to boosting your strength and cardiovascular fitness, it is likely you'll also increase your balance and flexibility, too. And since kettlebell training is so efficient, you may be able to get better results while spending less time in the gym.

We tapped Fabio Comana, M.A., M.S., one of ACE's resident exercise physiologists, to design the following total-body kettlebell workout and six-week training regimen. While traditional kettlebell training calls for 18-pound kettlebells for women and 35-pound kettlebells for men, it's a better idea to choose a lighter weight and

focus instead on developing correct technique. For women, kettlebells weighing 8 to 15 pounds would be a good place to start. Men may want to go with 15- to 25-pound kettlebells. As you become stronger and more skilled, add reps and shorten your recovery time between sets. If you still need a greater challenge, only then should you increase the weight of the kettlebell you're using.

Aim to do this kettlebell routine at least two to three times a week, performing each of the exercises in the order shown below. For a more detailed progression, see Comana's Six-Week Training Plan. As always, warm up before working out and cool down and stretch afterward as needed.

1. Kettlebell Deadlift (targets glutes, quads, back)

- Stand with feet hip-width apart, arms at your sides, and place a kettlebell adjacent to each foot.
- Engage your core and abdominal muscles ("bracing") to stabilize your lower back and maintain this contraction throughout the exercise while breathing normally.
- Depress your shoulders and squeeze your shoulder blades together ("setting your shoulders") and maintain this position throughout the exercise.
- Initiate your downward movement by pushing your hips backward ("hip hinging") before lowering your body toward the floor.
- Avoid allowing your knees to travel forward to initiate your downward movement.
- Firmly grasp the kettlebell in each hand, pausing momentarily to check your body alignment.
- Your heels should be in contact with the floor and remain in contact with the floor throughout the exercise.
- Your tibia (shin bone) and torso should be parallel to each other, with your shoulders positioned directly over the kettlebells or slightly in front of them.
- Maintain your "bracing" and "shoulder set-position," exhale while firmly grasping each kettlebell, raising your body until you return to a full standing position.
- Inhale and slowly return to the lowered position.
- Complete the recommended number of repetitions.



2. Kettlebell Single-Arm Swing (targets glutes, quads)

- Stand with feet hip-width apart, and place a kettlebell between your feet.
- Set your shoulders and brace, maintaining these contractions throughout the exercise.
- Hip hinge to lower your body down to grasp the kettlebell with one arm.
- Exhale, initiating an explosive upward movement to swing the kettlebell upward, returning to a vertical standing position (do not swing your torso beyond vertical).
- The momentum gathered through the lower extremity should allow the kettlebell to swing until the arm is parallel to the floor. Maintain alignment through the wrists, preventing them from flexing or extending past the parallel arm-position.
- Remember that this is not a shoulder exercise, but an exercise to generate explosive forces in the hips. If you are unable to achieve the desired arm position, attempt to thrust harder with your glutes from the lowered position.
- Complete the recommended number of repetitions and then repeat with the opposite arm.



The number of reps and circuits listed are just a recommendation. It's important that you select an intensity (number of reps and circuits) that allows you to challenge your body, yet still complete all the reps without compromising your exercise technique or body alignment.

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3. Turkish Half Get-up (targets abs, core, shoulders)

- Lie flat on the floor with your right leg in a bent-knee position and a kettlebell placed close to your right shoulder.
- Using both arms if necessary, pick up the kettlebell and rest it against the back of your right forearm while maintaining a neutral wrist.
- Extend your right arm out to the side and rest it on the floor.
- Set your right shoulder, slowly exhale and then gently press the kettlebell upward, extending the elbow while maintaining a neutral wrist position.

- Begin the half get-up by exhaling, contracting your abdominals, and pushing off your left arm to curl your trunk upward to a vertical position while keeping the kettlebell pressed overhead.
- Hold this position briefly before slowly uncurling your trunk and lowering yourself back to the floor, using your left arm for support.
- Complete the recommended number of repetitions and then repeat with the opposite arm.



4. Kettlebell Push-up (targets chest, triceps, core)

- Grasp the handle of each kettlebell and assume a full or bent-knee push-up position. Maintain neutral wrists throughout the exercise.
- Brace to stabilize the trunk, and maintain a stiff, rigid trunk throughout the exercise.
- Inhale and slowly lower your body toward the floor to a level where the chest is aligned with your hands.
- Exhale and slowly press your torso upward.
- Complete the recommended number of repetitions.



5. Kettlebell Single-arm Row (from push-up position) (targets back, biceps, core)

- Assume the starting push-up position, but place one kettlebell beneath the left shoulder.
- Open up your stance, widening your feet to help stabilize your body.

- Brace to stabilize your trunk, and maintain a stiff, rigid trunk throughout the exercise.
- Grasp the kettlebell in the left hand, exhale and slowly perform a row movement, lifting the kettlebell toward your left shoulder, holding it in the raised position briefly before lowering it back toward the floor.
- Attempt to prevent any rotation of your torso throughout the movement.
- Complete the recommended number of repetitions and then repeat with the opposite arm.



Six-week Training Plan

WEEK 1:

Do one circuit of eight reps per exercise with a 30-second recovery between each exercise. Aim to complete this workout a minimum of two times this week.

WEEK 2:

Do one circuit of 10 to 12 reps per exercise with a 30-second recovery between each exercise. Aim to do this workout a minimum of two times this week.

WEEK 3:

Do two circuits of eight reps per exercise with a 30-second recovery between each exercise. Aim to do this workout a minimum of two times this week.

WEEK 4:

Do two circuits of 12 reps per exercise with a 30-second recovery between each exercise. Aim to do this workout a minimum of three times this week.

WEEK 5:

Do three circuits of 10 reps per exercise with a 30-second recovery between each exercise. Aim to do this workout a minimum of three times this week.

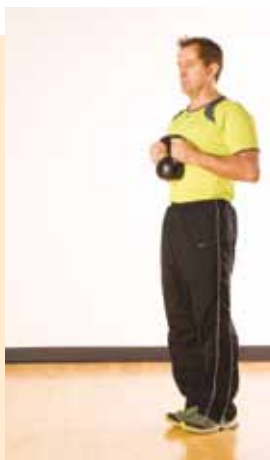
WEEK 6:

Do three circuits of 15 reps per exercise with a 30-second recovery between each exercise. Aim to do this workout a minimum of three times this week.

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6. Kettlebell Walking Lunge (targets quads, hamstrings)

- Stand with both feet together while holding a kettlebell at chest height, close to your body.
- Slowly perform a series of lunges while holding the kettlebell close to your chest.
- When lunging, attempt to “hip-hinge” to initiate the lunge movement (when your lead foot touches the floor) and avoid driving your knee forward too prematurely.
- Complete the recommended number of repetitions and then repeat with the opposite arm.



7. Kettlebell Shoulder Press (targets shoulders, triceps)

- Stand with both feet together while holding a kettlebell in your right hand.
- Set your shoulders and brace, maintaining these contractions throughout the exercise.
- Pull the kettlebell upward to assume the starting position as illustrated. The forearm should be positioned vertically, slightly inside the hips, with the kettlebell resting against the back of the forearm and wrist in a neutral position. [Note: Due to possible breast interference that may prevent one from positioning the elbow inside of the hips, some women may need to shift their hips outward to the same side (a).]
- Exhale and slowly press the kettlebell upward, maintaining a neutral wrist position.
- Some individuals may favor using both arms to press the kettlebell upward. Grasp the right forearm with your left arm and press the kettlebell overhead (b).
- Complete the recommended number of repetitions and then repeat with the opposite arm.



a.



b.



8. Kettlebell Halo (targets core)

- Stand with feet hip-width apart and hold a kettlebell in both hands.
- Set your shoulders and brace, maintaining these contractions throughout the exercise.
- Exhale and slowly raise the kettlebell above your head (bent-elbow position) as illustrated.
- Perform slow circles around the head (“halo”), keeping the wrist neutral and elbows bent.
- Complete the recommended number of repetitions and then repeat in the opposite direction. 

Kettlebells

Continued from page 7

As for heart-rate data, the average HR during the kettlebell snatch workout was between 86 percent and 99 percent of the kettlebell HR max for all subjects (Figure 1). "The average heart rate was 93 [percent], but some people averaged, for the 20-minute workout, 99 percent of heart rate max," says Porcari. "Anytime you're using that much muscle effort, it's going to be a vigorous workout."

As for the $\dot{V}O_2$ max, the treadmill $\dot{V}O_2$ max was 23 percent higher (38.9 ml/kg/min vs. 31.6 ml/kg/min) than the $\dot{V}O_2$ max attained during the kettlebell $\dot{V}O_2$ max test (Table 1).

The Bottom Line

Kettlebells can provide one heck of a workout. Based on comparisons with data from previous research on standard weight training, the HR and $\dot{V}O_2$ responses during the kettlebell snatch routine suggest it provides a much higher-intensity workout than standard weight-training routines. Furthermore, the kettlebell snatch workout easily meets industry recommendations for improving aerobic capacity. "This is good news for people who are looking for a very good resistance-training workout that will also help them lose weight," says Schnettler. "For people who might not have a lot of time, and need to get in a good workout as quickly as possible, kettlebells definitely provide that." 



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