

## WHICH EXERCISE BURNS THE MOST CALORIES?



I see a lot of articles which purport to tell you the answer to the above question. Most however don't stand up to critical analysis. They use phrases like this exercise burns up to X amount of calories and then they compare that to running X mph. Very few of these articles mention Rate of Perceived Exertion (RPE). This is simply how hard an exercise feels at any given heart rate or calories burned per minute. As an example they might compare rowing to running and say rowing burns up to 650 calories an hour and running 5 mph burns 500 calories an hour. However if rowing at the speed necessary to burn 650 calories an hour might have an RPE of 14 and running at 5 mph might only have an RPE of 11. In order to compare different exercises in this way the RPE must be equal. A recent article in Women's Health entitled "The 10 Best Cardio Machines At The Gym, According To Certified Trainers" rated the Concept 2 ski erg as the #2 best cardio machine. This machine uses mostly your arms. As you can see in the chart below the arm erg was dead last. It also lists the rower as #1, but it's actually #7 out of 10 as far as calorie burn goes. To make matters worse, it didn't even include any ellipticals. In virtually all studies I have read on this subject running always comes out on top. There's good reason for this. Running (along with walking) is the human body's most natural movement. We start running when we are just babies and it is biomechanically a very efficient movement. It is what the human body is built to do. It is also weight bearing which further adds to the calorie burn effect. However as most people know, running has a huge downside, namely injuries from the pounding your joints takes. So many people never start or have to stop. The question then becomes what machine produces the calorie burn that comes closest to

running. The most recent [study](#) on this was published in 2019 and the chart below shows the results for calories burned per minute

<b><u>Machine</u></b>	<b><u>RPE 13</u></b>
Treadmill	12.6
Stair Stepper	11.8
Elliptical	10.1
Upright Bike	10
Cybex Arc Trainer	9.8
Airdyne	9.3
Rower	9.1
Recumbent Bike	7.6
Recumbent Stepper	7
Arm Ergometer	5.4

As you can see running (treadmill) was once again on top with the stair stepper 2<sup>nd</sup>. However the stair stepper is not a non-impact exercise and is not a natural flowing movement. That makes the elliptical the top calorie burner in a non-impact device. Also, the best ellipticals have a natural feeling movement. In addition, different ellipticals may have different results. For instance in this [study](#) and another [study](#) there was no difference in the energy expenditure between the elliptical and treadmill at the same RPE. In fact the elliptical was a little *higher, though heart rate was significantly higher (16 beats a minute)*. For the best “elliptical”, see my article “[The Ultimate Fitness Machine](#)”.

*So the top no impact machines were the elliptical, upright bike, and the arc trainer. All were very close to each other in terms of calorie burn at the same RPE. However, the upright bike is not weight bearing which is a strike against it. Because it will not strengthen bones. That leaves the elliptical and arc trainer as the top non-impact exercise machines.*

The chart below from the same study shows how many calories are burned on each machine in 30 minutes and how much time you would need to put in to burn 300 calories. Notice there is very little difference between the elliptical Upright bike and the Arc Trainer. So for those that want to avoid the impact of running the next best choices are clear. The stepper has the next best calorie burn rate but may aggravate existing injuries, especially knee injuries. Also, the stepper is not a fluid and natural motion. That means for most people the best choices would be the elliptical, upright bike or the cybex arc trainer. Which all have nearly identical calorie burn rates. I’ve already written about the Octane Fitness elliptical being superior to the Cybex so that narrows the choices down to 2, the upright bike or the Octane Fitness elliptical. The elliptical has the advantage of being weight bearing which provides superior bone development, along with superior functional leg muscle development.

**Table 5.** Energy expenditure in 30 minutes of exercise on each machine and how long it to expend a total of 300 kcal.

	Energy Expenditure 30 minutes	Time to Expend 300 kcal (min:sec)
Treadmill	378	23:47
Stepper	354	25:25
Elliptical	303	29:42
Upright Bike	300	30:00
Cybex Arc Trainer	294	30:04
AirDyne	279	32:16
Rower	273	32:58
Recumbent Bike	228	39:29
Recumbent Stepper	210	42:52
Arm Ergometer	162	55:34