PACE®

Progressively Accelerating Cardiopulmonary Exertion

Clinical Practice Guidelines

By Al Sears, MD

Progressivity – Repeated Changes in the Same Direction

Exercise is much more effective when you do a little more of one component each time you do it. Progressivity is repeated changes in the same direction. Rather than exercising for longer periods, I want you to increase your intensity levels. As your heart capacity increases, you should add resistance or pick up your pace gradually.

Progressivity is also the need to change your routine over time (more on this later). Doing the same routine over and over – whether cardio or weight training – will lead to failure. Your body needs a consistent set of new challenges in order to grow and achieve.

These changes – made over time – embody the concept of **progressivity**.

Acceleration – Adapting to New Demands

As you train your body to respond faster each time you exercise, your physical condition improves. Then, as your body responds more quickly – by increasing your pace, or the resistance, in each progressive workout session – it adapts to the demands. This is the principle of **acceleration.** It is the best way to gear up for unexpected increases in cardiac demands.

When you first begin exercising, it will take several minutes to get your heart rate and breathing up. This is your low cardiopulmonary capacity, or de-conditioned phase. But as you begin moving at a faster pace, you'll condition yourself to meet the challenge.

By starting at a comfortable exercise level, you'll enhance your response capacity by increasing your pace sooner in each workout as you progress. The quickness of the demand each time accelerates the development of your adaptive capacity.

Intensity – Build the Heart of a Warrior

How hard you exercise refers to **intensity**. This is how you build your heart capacity. Most people believe that exercising longer increases the cardiovascular challenge. But the key is to exercise *harder,* NOT *longer.*

When you walk or jog, you can pick up the pace by going faster or uphill. If you ride your bicycle, you can pedal faster or add resistance... gradually and in a controlled manner. Your cardiac capacity increases, allowing you to do more work without feeling additional strain.

Duration – Shorter Intervals of Higher Intensity

Exercising for shorter and shorter episodes, while gradually increasing your intensity, will change the **duration** of your workout. With slightly shorter intervals, it gets easier to increase the intensity of each session.

It's important that you DO NOT come to a complete stop during your rest periods. Try to keep an easy pace going for two very important reasons:

- It allows your blood to continue circulating to replenish your muscles' depleted energy.
- It removes lactic acid wastes from your muscles.

Preliminary PACE® Workout

Very often, my patients get excited about PACE®, but don't know where to start. If you're new to exercise or extremely de-conditioned (out of shape) then I suggest you start with the 10-minute workout below.

Your goal is to reach cardiopulmonary exertion. In other words, you want to give your heart and lungs a good workout. You can use various exercises or machines to give your heart and lungs a challenge, depending on your fitness level.

PACE® is very flexible. Whether you like the gym or prefer the outdoors, PACE® can adapt to any environment. Indoors, you can do your PACE® workout on a stationary bike, recumbent bike, elliptical, stair-stepper or treadmill. Outdoors, you can run, swim or ride your bike.

This easy, 10-minute workout is very straightforward. For now, you're NOT going to apply the principles you learned in the last chapter, like acceleration, intensity and duration. To get started, you're just going to focus on interval training (IT).

Start Here: The 10-Minute Program Chart

INT	Rest	INT	Rest	INT	Rest	INT	Rest	INT	Rest
1 min.	1 min.	1 min.	1 min.	1 min.	1 min.	1 min.	1 min.	1 min.	1 min.

Interval training is simply alternating between periods of *exertion* and *recovery*.

The exertion period is called the ***repetition interval***. The recovery period is called the ***rest interval***. I will be referring to these throughout the book, so let's use this 10-minute program to get a better idea of how it works.

Look at the program chart above. Your first minute is a repetition interval. For the first sixty seconds, you're going to exercise at a pace that gives your heart and lungs a challenge.

If you're new to exercise, or feel out-of-shape, take it easy for the first two weeks. The speed and intensity of your repetition interval should be fast enough for you to break a sweat, but not so intense that you can't finish the 10-minute program.

After your first repetition interval, begin your first rest interval. During your rest interval, slow down to an easy pace – as if you're walking. You should never stop moving during your rest interval. Simply slow down and go at a slow, easy speed. This gives your body a chance to rest and recover.

Now that you have a feel for it, repeat the process. Start your next repetition interval and follow it with a rest interval. You'll soon get into the groove of exercising in short bursts followed by periods of rest.

Getting your feet wet with interval training will help you get started right away. What's more, it will prepare you for the PACE® program, which builds on interval training by adding other dimensions like acceleration, intensity and duration.

At this stage, you're taking on new ideas and new challenges and giving your body a chance to adapt. And this ***adaptive response*** is critical for change and advancement.

Modern science tends to view your body as a lifeless machine. If something breaks down, simply replace the part and move on. But nothing could be further from the truth… Your body is a living organism with its own sense of timing, intelligence and connection to its environment. Your body makes decisions based on what you subject it too. It can think, react and make changes – all in the space of a split second.

The PACE® program works *with* your body. By giving it the right set of challenges, it enables your body to make adaptive responses that result in weight loss, fat burning and a build up of reserve capacity in your heart and lungs.

This gives you the opportunity to transform your body – no matter how overweight or out-of-shape you were when you started. By starting with this simple 10-minute workout and giving your body new challenges over time, you can burn fat like a champion – guaranteed. And you'll avoid the chronic diseases that kill millions every year.

Now that you're comfortable with interval training, we're going to add the elements that make PACE® unique: Progressivity, Acceleration, Intensity and Duration.

In the 20-minute program below, you're going to focus on building intensity as you work through each repetition interval.

The 20-Minute PACE® Program Chart

Weeks	INT 1	Rest 1	INT 2	Rest 2	INT 3	Rest 3
1	20 min					
2	8 min	2 min	8 min	2 min		
3	5 min	2 min	5 min	2 min	5 min	2 min

During week 1, you're going to take it easy and just exercise for 20 minutes at a low to moderate intensity. Just do what feels comfortable.

Try and do this 20-minute interval at least 3 times during the first week. But each time you do it, slightly *increase* the intensity level. By the end of the first week, you should feel like you've given yourself a challenge you were able to accomplish.

How hard you push yourself should depend on your current level of conditioning. At this beginning stage, don't push yourself too hard. This is just a warm-up.

During week 2, you'll start doing intervals of exertion and recovery, just like you did for your interval training in chapter 3. This means you'll do a ***repetition interval*** followed by a ***rest interval***.

Look at the table above. Your first repetition interval is 8 minutes. Start at a low to moderate intensity.

When 8 minutes is up, rest. But remember, don't stop during your rest interval. Your rest interval should be a slow, easy pace. If you're on an elliptical, you should slow down so you feel like you're walking. During your rest period, your heart rate slows down. This is your recovery period.

After 2 minutes, start your second 8-minute repetition interval. But this time, increase the intensity to give yourself more of a challenge. How you adjust the intensity, will depend on what instrument you're using. If you're on a stationary bike, increase the level on the control panel so it becomes harder to pedal. If you're on an elliptical, boost the incline so it's harder to run.

When 8 minutes is up, rest. And that's it – you're done for the day! Again… during week 2, try and repeat this workout 3 or 4 times.

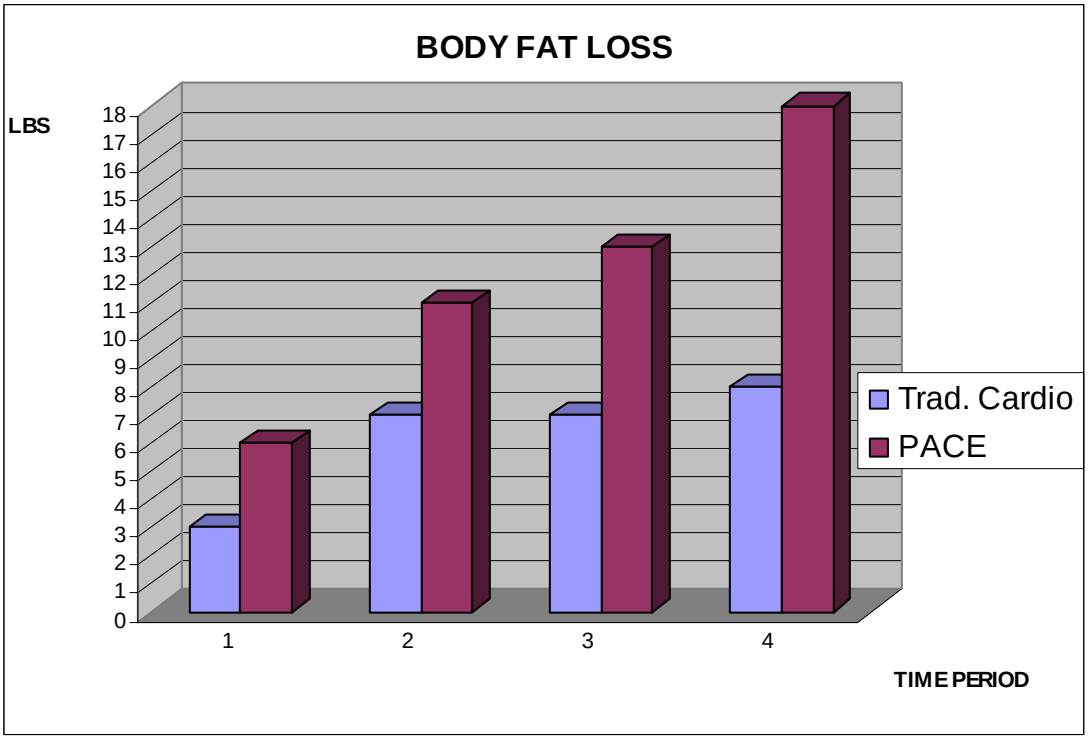
When you hit week 3, you're going to do 3 repetition intervals and 3 rest intervals. Except this time, you're going to reduce the repetition intervals to 5 minutes each, followed by 2-minute rest intervals.

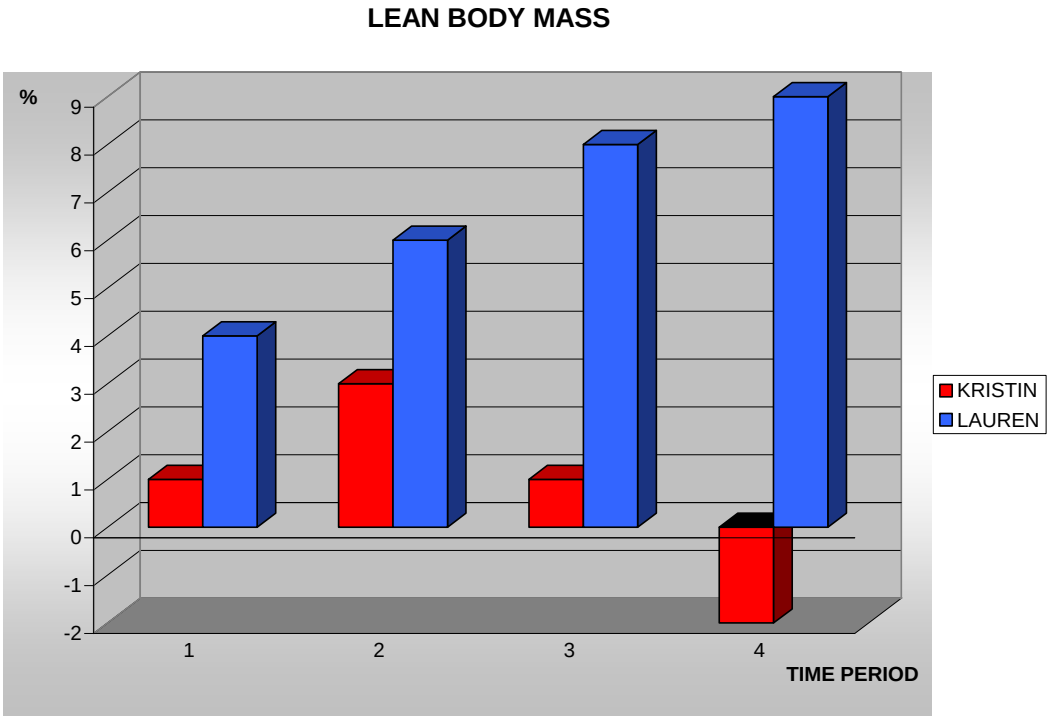
Apply the same principles. Take your first interval at a low to moderate intensity. After your rest period, start the next repetition interval but turn up the intensity.

Control Trial: The Twin Study

Our research center recently conducted on study on female twins. Kristen did progressively more long endurance exercise in each session. While Lauren did progressively shorter bursts of intense exercise, increasing the intensity in each session, too.

In the sixteen-week course of the study, the twin doing interval training lost 13 pounds of fat and increased her muscle mass by 8 pounds. Her body fat fell from 24.5% to 14.2%. The twin doing long bouts of aerobic exercise lost only 7 pounds of fat and gain only 1 pound of muscle mass. Her body fat fell from 24.5% to 19.5%. Neither of these women became bulky, but the twin doing interval training had a much better tone to her look at the end of the study.

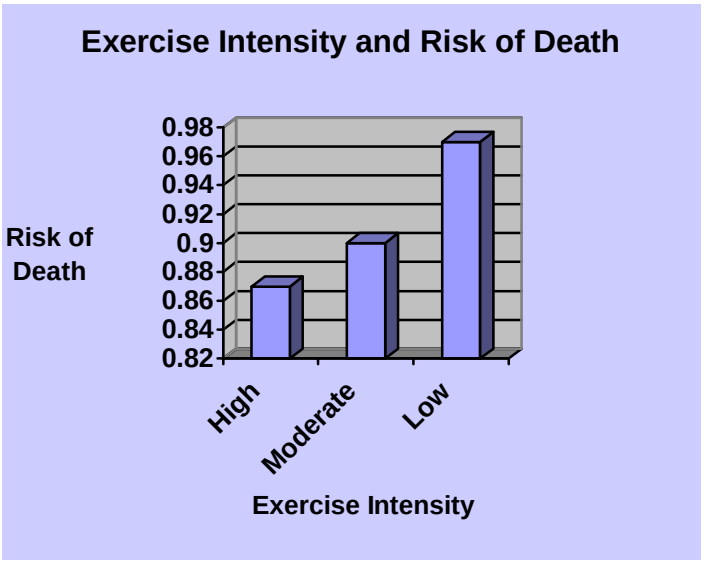




Research Sources

We get a great source of data about heart health from the large Harvard Health Professionals Study. Researchers followed over 7,000 people. They found that the key to exercise is not length or endurance. It's *intensity*. The more energy a person exerted, the lower their risk of heart disease.[1]

High intensity exercise can also help you live longer. Another Harvard study compared vigorous and light exercise. Those who performed more vigorous exercise had a lower risk of death than those who performed less vigorous exercise.[2]



Short interval exercise maximizes fat "after burn." Developed in the 1960s by Dr. Per Astrand, the term *fatrtlek,* meaning "speed play," described this type of exercise used by the Swedes.[3]

Researchers at Laval University in Quebec divided the participants into two groups: long-duration and interval short-term exercisers.[4] They had the long-duration group cycle up to 45 minutes without interruption. The short-term interval group cycled in numerous short bursts of 15 – 90 seconds, while resting in between.

The long duration group burned twice as many calories, so you would assume they would burn more fat. However, when the researchers recorded their body composition measurements, the interval group showed that they lost the most fat. In fact, the interval group lost 9 times more fat than the endurance group for every calorie burned.

Additional Benefits of Interval Training (IT):[5]

- **Raise Levels of Human Growth Hormone (HGH):** HGH is your body's "anti-aging" hormone. It's been clinically proven to build muscle, burn fat, improve bone density, raise your 'good' cholesterol and reverse the negative effects of aging. Blood levels of HGH rise dramatically during and immediately after IT. (Traditional aerobic exercise has no effect on HGH.)

- **Burn More Calories:** IT turbo-charges your metabolism. After intense bursts of exercise, your body needs to burn extra calories to repair muscles, replenish energy and bring your body back to its "normal" state. This process takes anywhere from a few hours up to a whole day – meaning you'll burn calories long after your workout is over.

- **Tap the Strength of Large Muscle Fibers:** Regular aerobic exercise uses smaller muscle fibers, as these fibers are more oxygen efficient. IT draws upon larger muscle fibers, which generate more power but get tired more easily. Moderate aerobic workouts tend to ignore these larger fibers, leaving them weak and shrunken. By exercising these larger muscle fibers, you get stronger muscles that can handle heavy-duty demands. (Critical for mobility and independence as you get older…)

- **More Strength, Greater Fitness in Less Time:** After a few weeks of a "cardio" routine, you stop making progress and hit a "plateau." IT helps you break through those dead spots and keeps you moving forward. Within just a few months of IT, you'll be able to pump more blood and deliver more oxygen to your muscles – raising your energy levels like never before.

- **Bigger, Stronger Heart:** IT gives your heart a boost you'll never get from traditional aerobic exercise. Because IT demands more oxygen, your heart adapts by increasing both its heart rate and stroke volume (the amount of blood your heart can pump in one beat). This increased pumping power makes your heart stronger – and last longer.

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[1] Lee I, et al. Relative intensity of physical activity and risk of coronary heart disease. *Circulation.* 2003 Mar 4;107(8):1110-6.

[2] Lee I, et al. Exercise intensity and longevity in men. The Harvard Alumni Health Study. *JAMA.* 1995 Apr 19;273(15):1179-84.

[3] American Council on Exercise. *Fit Facts: Interval Training.* www.acefiness.org.

[4] *Metabolism* 1994; 43: 814-818

5 Nitti J. The Interval Training Workout: Build Muscle and Burn Fat with Anaerobic Exercise. Hunter House Press. 2001