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Course Introduction

There are many components to an effective conditioning and weight-loss program (e.g., nutrition, warmup, flexibility training, strength training, muscular endurance training, cardiovascular training, and cool down). While there are numerous books written on the various types of diets, flexibility programs, and resistance-training programs, there is very little written on the most effective and efficient way to improve cardiorespiratory conditioning.

Commonly, the response by most health and fitness professionals is, “Just get on the bike or treadmill and go for 20 to 30 minutes at 60 to 80 percent of your maximum heart rate.” This one-size-fits-all approach does not follow two important tenets of effective fitness training: the Specificity of Training Principle and the Overload Principle, and certainly is not the most productive way to train.

This course is designed to help health and fitness professionals unlock each client’s potential through cardiorespiratory training. By using all of the components of cardiorespiratory training (aerobic, anaerobic threshold [AT], and anaerobic), clients can maximize their efforts to burn more calories, reduce their risk factors for cardiovascular disease, and improve their performance in everyday activities, such as work, recreational sports, etc. This course will:

- Review basic concepts of cardiorespiratory training;
- Discuss heart-rate (HR) training, how to find HR zones, and review how to use stage-training programs;
- Provide a comprehensive assessment process for cardiorespiratory fitness; and
- Help health and fitness professionals design cardiorespiratory training programs that enable clients to achieve their goals.

**Specificity of Training Principle:**
The principle that the body will adapt to the specific demand that is placed upon it.

**Overload Principle:**
The principle that to continually adapt, the body must be placed under a stress that exceeds the body’s current capabilities.
Introduction to Cardiorespiratory Training

The cardiorespiratory training (cardio) market is open to participants at any fitness level. Beginners need to know how to initiate a safe program that will spark success, instead of causing burnout from overtraining. A program with visible, continued improvements will encourage clients to stick to their fitness routines. Intermediate-level clients need goals and proper training guidelines to ensure continued progression. Anecdotally, the main reason that most clients stop training is because of the disappointment that results from hitting a plateau. Personalized cardio programs can help any client to reach any goal by maintaining program efficacy and client enthusiasm.

To have a complete cardio program, the health and fitness professional must assess the client, create a program with specific goals, and then apply a tool (such as an HR measurement) to evaluate the client’s training success. All three of these components working together create a new way to achieve overall fitness improvements.

Primary Cardiorespiratory Measurements

Heart Rate

This course uses HR as its primary basis of measurement during training. The health and fitness professional must utilize appropriate equations to obtain a client’s maximal heart rate (HRmax) and training heart rate (THR).

Blood Lactic Tests and VO₂ Tests

The ideal measurements, blood lactic tests and VO₂ tests, are not necessarily practical or easy to perform. There is a new piece of equipment designed for fitness centers, performance centers, and sport teams. This unit is called iMett. The main goal of the iMett is to create personalized HR training zones and individualized cardio programs. The unit uses ventilation to determine AT based on Wasserman’s theory. The AT will allow the health and fitness professional to determine the break point for developing energy systems. This will help in creating a more personalized program for any fitness level or goal. Further details are outlined in the section of this manual titled Assessments for Cardiorespiratory Fitness.
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Measuring Workload

Another preferred method of measurement is workload (usually measured in watts/speed/level). Unfortunately, most commercial fitness equipment is not properly calibrated and, therefore, watts and speed are not always reliable measures in gym settings. Thus, HR training gives health and fitness professionals the most usable, real-time feedback on how clients are performing.

Basics of Cardiorespiratory Training

Of the various components that comprise a client’s total physical fitness program, cardiorespiratory endurance is probably the most misunderstood and underrated. Clients often fail to understand why an endurance component is so important to their total training programs.

In order to understand how to perform cardiorespiratory training in the most effective and efficient way, each client must first learn why he or she is engaging in it. Many people incorrectly assume that cardiorespiratory training is synonymous with aerobic training. This misunderstanding can prevent a client from training in a program that properly meets his or her intended goals.

The most common goals of performing cardiorespiratory training are:

- To improve performance in work, life, and sports;
- To improve health by reducing cardiovascular risk factors (e.g., unhealthy body composition, unbalanced blood lipid profile, high blood pressure, etc.);
- To reduce mental anxiety; and
- To monitor weight management.

Cardiorespiratory training is more than just training the aerobic energy system. In order to meet the above-mentioned goals, the aerobic energy system and the anaerobic energy system must both be trained. This is especially true for clients who constantly switch between their aerobic and anaerobic energy systems, maximizing performance and minimizing fatigue (such as construction workers who swing picks for 10 to 20 seconds at a time to dig ditches, or tennis players during a match).
Review of Energy Systems

The body cannot perform any work (or even survive) without energy. This energy is provided in the form of adenosine triphosphate (ATP), which is produced by the body from the foods it consumes. The two primary methods of producing ATP are aerobically (with oxygen) and anaerobically (without oxygen). Of these two methods, the more efficient, by far, is the aerobic system.¹

A normal heart beats at a rate of approximately 70 beats per minute (BPM) at rest.³ A well-conditioned heart can actually beat fewer than 40 times a minute. This kind of heart conserves energy and can supply oxygen-rich blood to the rest of the body with up to half the effort.

---

**Aerobic exercise:**
Exercise that requires a constant and adequate supply of O₂.

**Diffusion:**
The movement of oxygen into the circulatory system and the resulting removal of CO₂ from the blood.

**Systolic Blood Pressure:**
Pressure that occurs in the blood vessels during each contraction of the left ventricle.

**Diastolic Blood Pressure:**
Pressure remaining in the blood vessels during the relaxation phase of a heart contraction.

Since the heart is a muscle, it can become larger and stronger through exercise that progressively increases the body’s demand for oxygen (O₂). This type of exercise is called aerobic exercise. Aerobic energy production requires a constant and adequate supply of O₂. The respiratory and cardiovascular systems transport the O₂.

The respiratory system begins with the lungs, which bring O₂ from the air, across the alveolar membrane, and into the circulatory system. This process is called pulmonary ventilation. The movement of O₂ into the circulatory system and the resulting removal of carbon dioxide (CO₂) from the blood takes place through a process called diffusion.¹

With each contraction, the cardiovascular system pumps blood out of the left ventricle of the heart into the aorta, distending it and creating pressure on the vascular wall. This pressure is called systolic blood pressure. During the relaxation phase of the cardiac cycle, blood pressure remains in the arterial system. This is known as the diastolic blood pressure.
The amount of blood the heart pumps per minute is referred to as cardiac output. This number is determined by multiplying the HR by the volume of blood pumped out of the heart per heartbeat (otherwise known as stroke volume).

An individual who is in good health will have a higher resting stroke volume and lower resting heart rate (RHR). An increase in stroke volume will also increase maximum cardiac output, which is the most significant improvement in cardiovascular function derived from aerobic training.

Aerobic System

Aerobic exercise requires the body to take $O_2$ from the atmosphere, into the lungs, transfer it into the blood, and then pump it to the working muscles, where it is utilized to oxidize carbohydrates and fats in order to produce energy. This energy pathway is often termed the oxidative (oxygen) system. It involves several body systems, including the respiratory, cardiovascular, muscular, and endocrine systems.

Through a complex series of chemical reactions, glycogen and fats are broken down in the presence of $O_2$ to provide energy. During rest and light activity, the energy required for muscle contraction comes almost entirely from this aerobic production of ATP.

Most cells (including muscle cells) contain mitochondria, which are the site of ATP production. The greater the number of mitochondria, the greater the aerobic energy production capabilities of the cell will be. During prolonged exercise, more than 99 percent of the energy required is generated by aerobic reactions. These aerobic pathways provide the major supply of energy to all cells of the body. Thus, one of the most important characteristics of the aerobic energy pathway is the ability to utilize stored body fat as a primary source of energy.

When the muscles are being used aerobically, they utilize both fat and glucose to produce ATP. The aerobic system produces much more ATP than the anaerobic system. This is primarily because of the ability to convert fat, which yields nine calories of energy per gram, while glucose and protein yield only four. Additionally, the waste products of aerobic ATP production are water and $CO_2$, which are both easy for the body to process, making aerobic energy production more efficient and averting muscle fatigue.
Anaerobic System

Anaerobic capability is the ability of the body to produce energy by metabolizing carbohydrates in the absence of O₂. With increasing exercise intensity, the cardiovascular system makes every attempt to increase its delivery of O₂ into the mitochondria of exercising muscle cells to produce enough ATP aerobically. At some point in increasing intensity (determined both by a client’s level of aerobic fitness and by genetics), the cardiovascular system becomes unable to supply enough O₂ to the exercising muscles, forcing them to switch to the anaerobic systems to produce ATP rapidly. The intensity level at which adequate O₂ becomes unavailable is referred to as the **anaerobic threshold (AT)**. It has also been termed the **lactic threshold**. Even though these terms are often used interchangeably, the true lactic threshold is reached before the AT.

The lactic threshold is determined by blood analysis, while the AT is ascertained through VO₂ submaximal testing (such as the step test or walk test, discussed later in this text). The latter kind of testing is more practical in the fitness setting, due to its ease of use, versus the understandable reluctance of clients to have repeated blood samples taken.¹²

The anaerobic system cannot be used for a prolonged period. The primary source of anaerobic ATP production is glucose, which is stored in the muscles and liver as glycogen, a large molecule made up of chains of glucose. This energy pathway is often referred to as the **glycolysis (lactic acid) system**.¹ During muscle contraction, stored glucose is broken down into CO₂, lactic acid, and water. During this breakdown, chemical energy is released.

The chemical reactions that transform energy in the cells of the body are collectively known as **metabolism**. The purpose of metabolism is to supply the energy needed to carry out the mechanical work of muscular contraction.⁴ This supplied energy can be used in moderate- to high-intensity activities.¹²

A second source of anaerobic ATP production is **creatine phosphate (CP)**, a molecule that can be broken apart quickly to help produce ATP. This energy pathway is often referred to as the **ATP-CP system**.³ As with the muscle’s store of potential ATP, there is an extremely limited supply of CP, from which...
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about 10 seconds of energy can be produced. The main drawback of the anaerobic system is that not as much ATP can be produced as with the aerobic system, while yielding a higher level of lactic acid waste, potentially inhibiting exercise. This energy pathway is, therefore, used for high-intensity, short-duration activities.\textsuperscript{1,2}

Regardless of the system being used, lactic acid is continuously being produced and removed, even when the body is at rest. When lactic acid appears at a greater rate than it can be removed, fatigue occurs. A major goal of training should be to minimize lactic acid production and to enhance lactic acid removal during competition (exercise).\textsuperscript{3} It is also suggested that a combination of high-intensity interval training and prolonged \textit{submaximal training} can aid in accomplishing this task.\textsuperscript{4} Interval training helps maximize cardiovascular adaptation and increase $\text{VO}_2\text{max}$.\textsuperscript{6} The more $\text{O}_2$ that is consumed, the less of a reliance there is on the anaerobic breakdown of carbohydrates to lactic acid. Prolonged submaximal training can help to induce an increase in mitochondrial functions. These adaptations will help to reduce lactic acid formation by increasing utilization of fatty acids as a mitochondrial fuel source, while facilitating lactic acid removal.\textsuperscript{5,7}

Consider an average client on a treadmill that is going 7 miles per hour (MPH). After the client’s first step forward, his or her muscles have to increase the rate of ATP to produce the required energy to move them from rest to 7 MPH. In the transition from rest to light or moderate exercise, $\text{O}_2$ consumption ($\text{VO}_2$) increases rapidly and reaches a steady state within one to four minutes. The fact that the $\text{VO}_2$ does not increase instantaneously to a steady state suggests that an anaerobic energy source contributed to the overall production of ATP at the beginning of exercise. There is evidence to suggest that at the onset of exercise, the ATP-CP system is the first active bioenergetic pathway, followed by glycolysis, and then finally aerobic energy production.\textsuperscript{5} After a steady state is reached, the body’s ATP requirement is met via aerobic metabolism. This shows the energy needed for exercise and sports is not provided by any one single bioenergetic pathway, but rather a mixture of several metabolic systems that overlap (Figure 1).
Figure 1: Bioenergetic Continuum

- Oxygen or Aerobic System
- ATP-PC System
- Lactic Acid System

- Percent ATP Supplied
- Seconds → Minutes
- Performance Time
- Kgm/Second → Power Output
Understanding Heart-Rate Formulas, Heart-Rate Training Zones, and Stage Training

Designing cardiorespiratory training programs is much the same as any other form of exercise programming, such as resistance training or flexibility. It requires the ability to calculate, monitor, and manipulate training intensities. As previously mentioned, there are a variety of methods to derive cardiorespiratory-training intensities. These methods include metabolic ventilation analysis (VO₂), like iMett, which directly analyzes O₂ and CO₂; blood lactate tests, in which blood is drawn and analyzed (which are very effective, but can be very invasive and impractical for the health and fitness professional); and the monitoring of exercise workloads, using watts. Employing an analyzer like the iMett or simple formulas like 220 minus age will help determine HR zones. Because blood samples and true watts are not always available, HR is the most reliable measurement for health and fitness professionals to use.

Heart Rate Formulas: Estimating Heart Rate Maximum

In the health and fitness industry, HRs and HR training zones are generally determined by a mathematical formula because of the convenience it affords. Mathematical formulas are extremely useful when used to estimate the HRmax at which a person can safely train. Discussed below are three valid formulas for calculating HRmax.

Formula One: 220 Minus Age

The most commonly used formula used to find HRmax is 220 minus age, which is seen in Figure 2.

Watts:
The standard international unit used to measure power output during exercise training.

Equation for Estimated Maximal Heart Rate (HRmax):

220 – age = HRmax
William Haskell, developer of the aforementioned formula, has been quoted as saying, “The formula was never supposed to be an absolute guide to rule people’s training.” Accordingly, health and fitness professionals should not use this (or any other formula) as an absolute. Rather, it should be used as a broad guideline to create very general training zones that are used to make up a structured cardiorespiratory training program. Estimating HRmax from mathematical formulas can produce results that are 10 to 12 BPM higher or lower than an actual reading. Additional research has been done on a variety of formulas, with the conclusion that no formula is reliable by itself. We suggest that when using a formula, the health and fitness professional should make adjustments to each client’s zones.

**Formula Two: The Karvonen Method**

Since this basic formula was developed, many new formulas have been established to help improve HR training zones and training programs. One formula, the Karvonen method, adds the calculations of resting heart rate (RHR) to the 220 minus age formula. The formula can be seen in Figure 3.

**Figure 3**

**Formula for the Karvonen Method**

\[
[(220 - \text{age}) - \text{RHR}] \times \text{desired \% for training} \\
+ \text{RHR} \\
= \text{HRmax}
\]

However, it must be noted that all formulas have a flaw. One flaw in the Karvonen method is that the percent from AT to HRmax can be an arbitrary number. There is no set number for this based on a client’s fitness level; it might be 5 or 50 percent. The only way to calculate the precise percentage is to use a metabolic ventilation analyzer, which measures CO₂/VO₂ with a ventilation mask and respiratory unit. The calculations given in this text are useful, although they may not be precise.

Another possible flaw in the Karvonen method can be demonstrated in the following example, using a 40-year-old client. The formula says to use the RHR to determine HR training zones.

If this 40-year-old client has a RHR of 40 BPM, which is very good, then it would look like this (using 85 percent of HRmax, which is approximately the AT):
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220 – 40 = 180
180 – 40 = 140
140 x 85% = 119
119 + 40 = 159 BPM

However, if that client is in a car accident and cannot walk for four months, that person’s RHR may increase to 70 BPM, which is not as good. Using the same formula, the outcome would be:

220 – 40 = 180
180 – 70 = 110
110 x 85% = 93.5
93.5 + 70 = 163.5 BPM

This will give the client a higher HR required for his AT when he is deconditioned, as opposed to when he is in great shape. Given his condition, is this the most appropriate training zone for this client?

There are many factors that can affect HR zones, so simply using a set formula will not always give accurate results. However, the Karvonen method will provide a usable guideline. This text intends merely to point out existing flaws in order to increase the awareness of the health and fitness professional. It should be noted that the Karvonen method has been shown to be very useful for clients with chronic disease.

Later, this text will demonstrate how to calculate HR training zones and make adjustments in these zones based on the client’s performance, based on more than his or her age.

Respiratory Exchange Ratio and Training Zones

The health and fitness industry has used many catch phrases to help people understand or utilize training principles. Relative to cardiorespiratory training, the phrases fat-burning zone and cardio zone are often displayed on various pieces of exercise equipment.

These zones were derived from the respiratory exchange ratio (RER). RER is simply the amount of CO\textsubscript{2} exhaled divided by the amount of O\textsubscript{2} inhaled, measured during rest or a steady state of exercise using a metabolic analyzer.

Respiratory Exchange Ratio:
The amount of CO\textsubscript{2} exhaled divided by the amount of O\textsubscript{2} inhaled, as measured during rest or a steady state of exercise.
As Table 1 illustrates, the body is able to derive the highest percentage of its energy from fat when it has an RER of 0.71.7

Table 1

<table>
<thead>
<tr>
<th>RER</th>
<th>Percentage of Calories Derived From Carbohydrates</th>
<th>Percentage of Calories Derived from Fats</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.71</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>0.75</td>
<td>15.6</td>
<td>84.4</td>
</tr>
<tr>
<td>0.80</td>
<td>33.4</td>
<td>66.6</td>
</tr>
<tr>
<td>0.85</td>
<td>50.7</td>
<td>49.3</td>
</tr>
<tr>
<td>0.90</td>
<td>67.5</td>
<td>32.5</td>
</tr>
<tr>
<td>0.95</td>
<td>84.0</td>
<td>16.0</td>
</tr>
<tr>
<td>1.00</td>
<td>100.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Logic may imply that in order to burn the most calories from fat, a client should exercise at an RER of 0.71. The problem is, the only time the body is truly at 0.71 RER is when it is at a state of complete rest. Therefore, although it is possible for a person to be in the fat-burning zone, his or her total caloric expenditure would be so low that he or she would lose very little, if any, weight.

As the intensity of exercise increases, the RER will rise. During moderate exercise (65 percent of maximum HR), such as a fast walk or a light jog, the RER will rise to 0.80 to 0.90.1 At this intensity, the body still uses fat as a major source of fuel. More importantly, the total caloric expenditure is greater.

In other words, although the percentage of calories that are coming from fat has decreased, the total caloric expenditure has increased, so the total fat calories burned may be the same, or even greater.

An RER of 0.80 to 0.90 is a great zone to start in. It can be used for a beginning client to improve his or her blood’s capability of delivering \( O_2 \) throughout the body and removing waste. With regular exercise, the body increases its output of blood and blood volume increases, which allows more blood to get to the cells. The result is a greater flow of \( O_2 \) to a greater number of cells throughout the body, which helps the muscle cells and the cardiovascular system work more efficiently.
**RER — Zone One**

From this point on, this text will refer to an RER of 0.80 to 0.90 (or, approximately 65 to 75 percent of HRmax) as Zone One. Although many people know this as the fat-burning zone, it is more properly referred to as a recovery zone or cardio base zone.

This initial zone is part of a three-zone system that trains the body to maximize its potential. Clients who stay in this zone without variation will initially improve their volume of O₂ consumption, but will quickly plateau. When this occurs, weight loss is slowed (or sometimes stopped). If Zone One is maintained, the only solution to end the plateau is to keep increasing the length of time exercising.

**RER — Zone Two**

Some clients may mistakenly think that performing a high-intensity (cardio zone) workout every time is the only way to go. These people usually have an RER of about 1.0. This text will refer to an RER of 1.0 (approximately 80 to 85 percent of HRmax) as Zone Two.

Zone Two is close to the AT. In this zone, the body can no longer produce enough energy for the working muscles with just the aerobic energy system. The higher the intensity the body can train at while remaining aerobic, the greater the number of calories burned from fat. Thus, one of the main goals of cardiovascular training is to increase AT.

The bottom line in weight loss is to burn more calories than are consumed. By referring to Table 1, it is easy to see that at an RER of 1.0, the body is using predominantly carbohydrates for fuel and the total caloric expenditure is high. Because total caloric expenditure is the most important issue, this approach is an effective one for weight loss.

The problem is that staying in Zone Two all the time will lead to a plateau for most clients. The reason is simple. To improve fitness level or increase metabolism, a client must overload the body. (Refer to the Overload Principle in the Introduction.) A client who does the same intensity of exercise during every workout may not be able to recover completely enough to do an overload workout. In turn, this may create an inability for the client to perform a true high-intensity workout.

**RER — Zone Three**

A true high-intensity workout would be considered going to an RER of 1.1 (approximately 90 percent of HRmax), which could consist of several short sprints. This is called overload. It requires achieving peak exertion, or working in Zone Three.
A client may exercise in Zone Three for 30 to 60 seconds. It would be advisable to recover in Zone One (for a suggested amount of time, depending on the goal) and then return to Zone Three.

For most individuals, exercising in Zone Three once a week is enough. Research has shown that regardless of whether a client performs interval training once a week or three times a week, both frequencies have the same cardiovascular benefits.⁴

If weight loss is the goal, then a client would certainly burn more calories by training in Zone Three more often. The problem is that this may be more strenuous to a client and can lead to overtraining. Weight loss requires long-term solutions, which are impossible for a client to accomplish when he or she must take time off as a result of overtraining.

Heart-Rate Training Zones

The information above can be transferred into practical application by using the HR formulas to establish the THR. The THR will assist the health and fitness professional in determining the specific zones that a client can train in safely and effectively, and thus optimize aerobic capacity.⁵

The THR can be obtained by multiplying the HRmax by the desired percentage of intensity of training (Figure 4).

![Figure 4]

**Example equation for finding the THR of a 27-year-old client:**

(220 – age) x 0.85 = 85% of HRmax

(220 – 27) x 0.85 = 164

The 85% training intensity is 164 BPM.

Heart Rate Training Zones:

A range of BPM at a certain percentage of HRmax, which is used to establish training intensity.

The estimated THRs can now be formulated into HR training zones. HR training zones are a good starting point for developing cardiorespiratory training programs.

These HR training zones can be found by simply taking the appropriate percentage of the formula 220 minus age (or any
of the HRmax formulas) for each HR training zone. The percentage that is appropriate will be determined by the goal or adaptation that the client is trying to achieve.

- **Zone One** is 65 to 75 percent of HRmax (RER of 0.80 to 0.90) and is used for recovery, or lower intensity.
- **Zone Two** is 80 to 85 percent of HRmax (RER of 1.0) and is closer to the AT, or higher intensity.
- **Zone Three** is 86 to 90 percent of HRmax (RER of up to 1.1) and is considered closer to peak training, which is just below HRmax, but above AT.

For a 40-year-old client, the formula would work like this:

\[
220 - 40 \text{ (the client’s age)} = 180
\]

To find Zone One for that client, the health and fitness professional would multiply 180 by 0.65.

\[
180 \times 0.65 = 117 \text{ BPM}
\]

To find Zone Two for that same client, the health and fitness professional would multiply 180 by 0.85.

\[
180 \times 0.85 = 153 \text{ BPM}
\]

To find Zone Three for the client, the health and fitness professional would multiply 180 by 0.90.

\[
180 \times 0.90 = 162 \text{ BPM}
\]
Table 2 can be used to determine in which HR training zone a client should train.

<table>
<thead>
<tr>
<th>Training Zone</th>
<th>HR Formula</th>
<th>Purpose</th>
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<tbody>
<tr>
<td>Zone One 65–75%</td>
<td>( (220 - \text{the client's age}) \times 0.65 \text{ or } 0.75 )</td>
<td>This zone builds an aerobic base that is critical for improving heart and lung capacity. This improved capacity affects the body's ability to store and transport oxygen and nutrients to produce energy. It is used for warm up and recovery.</td>
</tr>
<tr>
<td>Zone Two 80–85%</td>
<td>( (220 - \text{the client's age}) \times 0.80 \text{ or } 0.85 )</td>
<td>This zone is used to increase anaerobic and aerobic capacity by straddling the energy systems. A client could work on both leg strength and cardiovascular capacity by sustaining this zone for long periods of time.</td>
</tr>
<tr>
<td>Zone Three 86–90%</td>
<td>( (220 - \text{the client's age}) \times 0.86 \text{ or } 0.90 )</td>
<td>This zone is used only in interval training. It can increase speed, power, metabolism, and anaerobic capacity by repeatedly exposing active muscles to high-intensity exercise, improving resistance to fatigue. A client will be able to sustain a given exercise intensity for a longer period of time, increasing endurance.</td>
</tr>
</tbody>
</table>

This method is simple to use. There is no equipment required to measure the appropriate HR training zones. Unfortunately, the simple way is not always the best way. As previously stated, HR formulas based solely on age are not always reliable. Because this formula is based on averages, almost every client's true HRmax will be above or below the estimate given. As mentioned earlier, these estimations can be off by up to 10 to 12 BPM. Knowing how to factor in this variable will be important.

Even with the shortcomings of the 220 minus age formula, it is usually a safe bet to start a client with the formula 220 minus age times 65 to 75 percent. This will create a low zone to start training in. It will also be a great zone to create an aerobic base. Once a client has this base, then he or she can slowly build up to Zone Two, using 80 to 85 percent. At this point, the health and fitness professional can use a few short workouts at this HR to see if the client can handle the workload. From here, the health and fitness
professional can add or reduce a few beats as needed. Once the client is working comfortably in Zone Two (up to 30 minutes), the health and fitness professional can introduce the client to Zone Three. This can be 86 to 90 percent of 220 minus age, or just a few percentages above the comfort zone the health and fitness professional created in Zone Two. Without using a metabolic ventilation analysis (VO₂), the best way to create zones is to slowly make adjustments like those made with weights during a weight-training session.

**Helpful Hint:** If a client has been training for a period of time, the health and fitness professional can have him or her wear a heart-rate monitor during a normal 30- to 40-minute workout (this can be a group exercise class). The average HR during this workout can be the client’s 80 percent zone, and the health and fitness professional can make additional adjustments from this to create the other zones.
Assessment for Cardiorespiratory Fitness

In order to optimize any cardiorespiratory-training program, it is necessary to perform a comprehensive assessment on each client. Assessments are vital to monitor possible contraindications to training and ensure an appropriate beginning point and progression sequence for each client.

It is important that the health and fitness professional understand that a fitness assessment is not designed to diagnose any condition, but rather to observe each client’s individual structural and functional status (Table 3). Furthermore, the assessments presented in this text are in no way intended to replace a medical examination. If a client exhibits difficulty or pain with any observation or exercise that is not alleviated with simple technique modifications, the health and fitness professional should refer the client to a physician in order to identify any underlying cause(s).

Table 3
Guidelines for Health and Fitness Professionals Who are Training Clients in Cardiorespiratory Fitness

<table>
<thead>
<tr>
<th>DO NOT:</th>
<th>DO:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnose medical conditions.</td>
<td>• Obtain exercise or health guidelines from a physician, physical therapist, registered dietitian, etc.</td>
</tr>
<tr>
<td></td>
<td>• Follow national consensus guidelines of exercise prescription for medical disorders.</td>
</tr>
<tr>
<td></td>
<td>• Screen clients for exercise limitations.</td>
</tr>
<tr>
<td></td>
<td>• Identify potential risk factors for clients, through screening procedures.</td>
</tr>
<tr>
<td></td>
<td>• Refer clients who experience difficulty or pain, or exhibit other symptoms to a qualified medical practitioner.</td>
</tr>
<tr>
<td>Prescribe treatment.</td>
<td>• Design individualized, systematic, progressive exercise programs.</td>
</tr>
<tr>
<td></td>
<td>• Refer clients to a qualified medical practitioner for medical exercise prescription.</td>
</tr>
<tr>
<td>Prescribe diets or recommend specific supplements.</td>
<td>• Provide clients with general information on healthy eating, according to the Food Pyramid.</td>
</tr>
<tr>
<td></td>
<td>• Refer clients to a qualified dietitian or nutritionist for specific diet plans.</td>
</tr>
</tbody>
</table>
Cardiorespiratory Training for Fitness

<table>
<thead>
<tr>
<th>DO NOT:</th>
<th>DO:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescribe treatment of any kind for injury or disease.</td>
<td>• Refer clients to a qualified medical practitioner for treatment of injury or disease.</td>
</tr>
<tr>
<td></td>
<td>• Use exercise to help clients improve overall health.</td>
</tr>
<tr>
<td></td>
<td>• Assist clients in following the medical advice of a physician and/or therapist.</td>
</tr>
<tr>
<td>Provide rehabilitation services for clients.</td>
<td>• Design exercise programs for clients after they are released from rehabilitation.</td>
</tr>
<tr>
<td></td>
<td>• Provide post-rehabilitation services.</td>
</tr>
<tr>
<td>Provide counseling services for clients.</td>
<td>• Act as a coach for clients.</td>
</tr>
<tr>
<td></td>
<td>• Provide general information.</td>
</tr>
<tr>
<td></td>
<td>• Refer clients to a qualified counselor or therapist.</td>
</tr>
</tbody>
</table>

When conducting a comprehensive fitness assessment, it is essential to utilize a variety of observation methods in order to obtain a balanced overview of the client. Specifically for clients who are seeking cardiorespiratory training, a thorough assessment becomes very important because of the large variety of potential clients. By properly assessing each client, the health and fitness professional can develop an individualized exercise program that will help each client achieve safe and effective results.

The recommended assessment process for cardiorespiratory training should include both subjective and objective assessments (Figure 5).

**Figure 5**

**Components of a Fitness Assessment**

*Subjective Information*
- General History
- Medical History
- Personal Information

*Objective Information*
- Dynamic Postural Assessments
- Cardiorespiratory Assessments
Subjective Assessments

Subjective information is gathered from a prospective client to give the health and fitness professional feedback regarding that person’s personal history, such as occupation, lifestyle, and medical background.

Physical Activity Readiness Questionnaire (PAR-Q)

Start the assessment process by having the client fill out the Physical Activity Readiness Questionnaire (PAR-Q) (Figure 6). The PAR-Q has been designed to help qualify a person for activity levels ranging from low to high. Furthermore, it aids in identifying people for whom certain activities may not be appropriate, as well as those who may need further medical attention.

If a client answers yes to any question in the PAR-Q, refer that person to a medical professional, unless he or she has already been under, or is currently under, medical care.

If the client answers no to all questions in the PAR-Q, continue with the assessment process by having the client fill out the General and Medical History Questionnaire.
Figure 6: Sample Physical Activity Readiness Questionnaire (PAR-Q)

<table>
<thead>
<tr>
<th>Questions</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Has your doctor ever said that you have a heart condition and that you</td>
<td></td>
<td></td>
</tr>
<tr>
<td>should perform only physical activity recommended by a doctor?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2  Do you feel pain in your chest when you perform physical activity?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3  In the past month, have you had chest pain when you were not</td>
<td></td>
<td></td>
</tr>
<tr>
<td>performing any physical activity?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4  Do you lose your balance because of dizziness or do you ever lose</td>
<td></td>
<td></td>
</tr>
<tr>
<td>consciousness?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5  Do you have a bone or joint problem that could be made worse by a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>change in your physical activity?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6  Is your doctor currently prescribing any medication for your blood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pressure or for a heart condition?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7  Do you know of any other reason why you should not engage in</td>
<td></td>
<td></td>
</tr>
<tr>
<td>physical activity?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If you have answered yes to one or more of the above questions, consult your physician before engaging in physical activity. Tell your physician which questions you answered yes to. After a medical evaluation, seek advice from your physician on what type of activity is suitable for your current condition.

General and Medical History

Once the client has completed the PAR-Q, have him or her fill out the General and Medical History Questionnaire (Figure 7). Having a client sit down and complete these questionnaires may also help him or her to relax. This will be very important when taking RHR and/or blood pressure readings. (A five-minute relaxation time period is suggested prior to these assessments.)
**Figure 7: Sample General and Medical History Questionnaire**

<table>
<thead>
<tr>
<th>Occupational Questions</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 What is your current occupation?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Does your occupation require extended periods of sitting?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Does your occupation require extended periods of repetitive movements? (If yes, please explain.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Does your occupation require you to wear shoes with a heel (dress shoes)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Does your occupation cause you anxiety (mental stress)?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recreational Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Do you partake in any recreational activities (golf, tennis, skiing, etc.)? (If yes, please explain.)</td>
</tr>
<tr>
<td>7 Do you have any hobbies (reading, gardening, working on cars, exploring the Internet, etc.)? (If yes, please explain.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Medical Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 Have you ever had any pain or injuries (ankle, knee, hip, back, shoulder, etc.)? (If yes, please explain.)</td>
</tr>
<tr>
<td>9 Have you ever had any surgeries? (If yes, please explain.)</td>
</tr>
<tr>
<td>10 Has a medical doctor ever diagnosed you with a chronic disease, such as coronary heart disease, coronary artery disease, hypertension (high blood pressure), high cholesterol or diabetes? (If yes, please explain.)</td>
</tr>
<tr>
<td>11 Are you currently taking any medication? (If yes, please list.)</td>
</tr>
</tbody>
</table>
Medications

Some clients will be under the care of a physician and may be required to use any one of a variety of medications. It is not the role of any health and fitness professional to administer or prescribe medications, or educate the client about the usage and effects of any of these medications. Always consult with a client’s physician for health information and any medication he or she may be using.

Despite this limited role, it is vitally important for a health and fitness professional to understand how certain types of medications can affect or alter exercise performance.

This section is designed to briefly outline some of the primary classes of pharmaceutical medications and their potential physiological effects (Table 4). The table is merely intended to present a simplistic overview of some common medications. It is not intended to serve as conclusive evidence regarding the medications and/or their effects. For more complete information regarding medications, contact the client’s physician and/or refer to the Physician’s Desk Reference. If the client is on certain medications, it is also important for the health and fitness professional to consult with the client’s physician to determine a safe and effective program strategy.

Table 4

<table>
<thead>
<tr>
<th>Medication</th>
<th>Basic Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta-Blockers (β-Blockers)</td>
<td>Generally used as anti-hypertensives (high blood pressure); may also be</td>
</tr>
<tr>
<td></td>
<td>prescribed for arrhythmias (irregular heart rate).</td>
</tr>
<tr>
<td>Calcium Channel Blockers</td>
<td>Generally prescribed for hypertension and angina (chest pain).</td>
</tr>
<tr>
<td>Nitrates</td>
<td>Generally prescribed for hypertension, congestive heart failure.</td>
</tr>
<tr>
<td>Diuretics</td>
<td>Generally prescribed for hypertension, congestive heart failure, and peripheral edema.</td>
</tr>
<tr>
<td>Bronchodilators</td>
<td>Generally prescribed to correct or prevent bronchial smooth muscle constrictor in individuals with asthma and other pulmonary diseases.</td>
</tr>
<tr>
<td>Vasodilators</td>
<td>Used in the treatment of hypertension and congestive heart failure.</td>
</tr>
<tr>
<td>Antidepressants</td>
<td>Used in the treatment of various psychiatric and emotional disorders.</td>
</tr>
</tbody>
</table>
Table 5

Effects of Medication on HR and Blood Pressure

<table>
<thead>
<tr>
<th>Medication</th>
<th>HR</th>
<th>Blood Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta-Blockers (β-Blockers)</td>
<td>↓</td>
<td>↓</td>
</tr>
<tr>
<td>Calcium Channel Blockers</td>
<td>↑ or ↓</td>
<td>↓</td>
</tr>
<tr>
<td>Nitrates</td>
<td>↑ or ↓</td>
<td>↓</td>
</tr>
<tr>
<td>Diuretics</td>
<td>← or →</td>
<td>← or ↓</td>
</tr>
<tr>
<td>Bronchodilators</td>
<td>← or →</td>
<td>← or ↓</td>
</tr>
<tr>
<td>Vasodilators</td>
<td>↑ or ↓</td>
<td>← or ↓</td>
</tr>
<tr>
<td>Antidepressants</td>
<td>↑ or ← or ↓</td>
<td>← or ↓</td>
</tr>
</tbody>
</table>

Key: ↑ = Increase  ← = No Effect  ↓ = Decrease

Objective Assessments

Objective Information: Measurable data collected about a client that can be used to assess the “before” and “after” status of that person.

Objective Information is gathered to provide the health and fitness professional with forms of measurable data. This information can be used to compare beginning numbers to those measured weeks, months, or years later, denoting improvements in the client, as well as the effectiveness of the training program. Categories of objective information include dynamic postural assessments and cardiorespiratory assessments.
Dynamic Postural Assessments

Dynamic postural assessments are often the quickest way to gain an overall impression of a client’s structural and functional status and should relate to basic functions such as squatting, pushing, pulling, and balancing. These assessments provide crucial information about muscle and joint interplay during exercise or everyday movement. They also can help the health and fitness professional to determine potential muscle imbalances that may increase the risk of injury when performing cardiorespiratory exercise. An example of such an assessment is the overhead squat (Figure 8). Visit www.nasmpro.com to learn more about this and other dynamic postural assessments, as well as corrective strategies for particular muscle imbalances that can be used as a warm-up prior to cardiorespiratory exercise.

Cardiorespiratory Assessments

Cardiorespiratory assessments provide the health and fitness professional with valuable information regarding the client’s cardiorespiratory efficiency and overall condition. They will also be used to provide the health and fitness professional with a starting HR zone for a client, specific to his or her physical condition and goals, in which the client can begin cardiorespiratory exercise.

Two common forms of assessing cardiorespiratory efficiency are the step test and the Rockport walk test.
iMETT

The iMett ventilation analyzer (Figure 9) is an effective tool to determine fitness levels. This easy-to-use unit will give the client HR training zones based on AT and peak (end of the test, about 90 to 95 percent HRmax). It will take the guesswork out of the age-predicted HR zones. The main reason the iMett is recommended is its ease of use and repeatable data.

Figure 9 – iMett Ventilation Analyzer

Using the iMett, the client will do a ramping protocol on a bike or treadmill while watching ventilation (VE) increase smoothly. The point at which the VE takes a sharp raise is where AT starts. This is determined by the increase in CO$_2$, which is a byproduct of lactic acid. To get rid of the CO$_2$, there is a sharp increase in VE. At the end of the test, the client will walk for two minutes to watch HR recovery.

The iMett will also give VO$_2$ numbers based on workload and body weight using the Foster/ACSM formula and the ACSM treadmill VO$_2$ readings. This makes it very easy, when repeating the tests, to see improvement. More important, however, it is looking at more than just VO$_2$ numbers. It will look at HR recovery,
AT numbers, and percentage of AT to peak, as well as watts to help determine a cardio progression for the client. The problem with most VO\(_2\) units is that they conduct only a test. Instead, the iMett conducts a complete assessment to determine a fitness program, and does not simply provide a score or fat-burning zone. The iMett will give cardio programs and progressions that can be used instead of the stage training that will be discussed in the next module. Stage training will slowly create HR zones for a client as he or she learns the cardio programs, while the VO\(_2\) test will give complete data to let the health and fitness professional know what stage to start the client in and the personal HR zones for that individual. To learn more about the iMett, visit www.woodway.com.

**YMCA Three-Minute Step Test**

This test is designed to estimate a cardiovascular starting point.\(^7\) The starting point is then modified, based on ability level.

**Step One: Determine the client’s maximum heart rate.**

As mentioned earlier, estimated HRmax can be determined by subtracting the client’s age from 220. Then, take the client’s estimated HRmax and multiply it by the intensities shown below to determine the HR ranges for each zone.

If the client is a beginner with no previous exercise history, the appropriate percentage of HRmax may need to be below 65 percent.

---

**Figure 9**

<table>
<thead>
<tr>
<th>Heart Rate Intensities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Zone One</strong></td>
</tr>
<tr>
<td>HRmax x 0.65</td>
</tr>
<tr>
<td>HRmax x 0.75</td>
</tr>
<tr>
<td><strong>Zone Two</strong></td>
</tr>
<tr>
<td>HRmax x 0.80</td>
</tr>
<tr>
<td>HRmax x 0.85</td>
</tr>
<tr>
<td><strong>Zone Three</strong></td>
</tr>
<tr>
<td>HRmax x 0.86</td>
</tr>
<tr>
<td>HRmax x 0.90</td>
</tr>
</tbody>
</table>
**Step Two: Perform a step test.**

Perform a three-minute step test by having a client perform 24 steps per minute on a 12-inch step for a total of three minutes (roughly 96 steps total). It is important that the client perform the step test with the correct cadence. Using a metronome or simply saying aloud “up, up, down, down” can help keep the client stepping at the correct pace. After three minutes, help the client sit down and immediately (within five seconds) calculate his or her HR for one minute.

**Step Three: Categorize the client.**

Locate the final number in one of the categories in Figure 10.

![Figure 10: Norms for Recovery Heart Rate Following Three-Minute Step Test](image)

<table>
<thead>
<tr>
<th>Heart Rate</th>
<th>MALE</th>
<th>FEMALE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rated by Age (years)</td>
<td>18–25</td>
</tr>
<tr>
<td>Excellent</td>
<td></td>
<td>70–78</td>
</tr>
<tr>
<td>Good</td>
<td></td>
<td>82–88</td>
</tr>
<tr>
<td>Excellent</td>
<td></td>
<td>72–83</td>
</tr>
<tr>
<td>Good</td>
<td></td>
<td>88–97</td>
</tr>
<tr>
<td>Above Average</td>
<td></td>
<td>100–106</td>
</tr>
</tbody>
</table>
Step Four: Determine the appropriate starting program using the appropriate category (Figure 11).

**Figure 11: Starting Program**

<table>
<thead>
<tr>
<th>HR Training Zones</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Poor</td>
<td>Zone One</td>
</tr>
<tr>
<td>Poor</td>
<td>Zone One</td>
</tr>
<tr>
<td>Below Average</td>
<td>Zone One</td>
</tr>
<tr>
<td>Average</td>
<td>Zone Two</td>
</tr>
<tr>
<td>Above Average</td>
<td>Zone Two</td>
</tr>
<tr>
<td>Good</td>
<td>Zone Two</td>
</tr>
<tr>
<td>Very Good</td>
<td>Zone Three</td>
</tr>
<tr>
<td>Excellent</td>
<td>Zone Three</td>
</tr>
</tbody>
</table>

**Rockport Walk Test**

This test is designed to estimate a cardiovascular starting point. The starting point is then modified, based on ability level.

**Step One: Determine the client’s maximum heart rate.**

This is performed the same as Step One in the step test.

**Step Two: Perform Rockport walk test.**

First, record the client’s weight. Have the client walk one mile on a treadmill, as fast as he or she can control. Record the time it takes the client to complete the walk. Immediately record the client’s HR (BPM) at the one-mile mark. Use the formula in Figure 12 to determine the client’s VO₂ score.¹⁴
Figure 12: Formula for the Rockport Walk Test

\[
\text{VO}_2 \text{ score} = 132.853 - (0.0769 \times \text{client's weight}) - (0.3877 \times \text{client's age}) + (6.315 \times 1) \text{ for men} \quad \text{OR} \\
+ (6.315 \times 0) \text{ for women} - (3.2649 \times \text{time, in minutes}) - (0.1565 \times \text{heart rate})
\]

For example, if a 7-year-old female client, weighing 158 pounds, walks one mile in 16 minutes at a HR of 116 BPM, her VO\textsubscript{2} would be calculated as follows:

\[
\text{VO}_2 \text{ score} = 132.853 - (0.0769 \times 158) - (0.3877 \times 7) + (6.315 \times 0) - (3.2649 \times 16) - (0.1565 \times 116) = \text{VO}_2 \text{ score of 39.8}
\]
Step Three: Categorize the client.

Locate the VO₂ score in one of the categories in Table 7.

Table 7
Categories of VO₂ Scores

<table>
<thead>
<tr>
<th>Age</th>
<th>Poor</th>
<th>Fair</th>
<th>Average</th>
<th>Good</th>
<th>Very Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40–44</td>
<td>22–25</td>
<td>26–29</td>
<td>30–33</td>
<td>34–37</td>
<td>38–41</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age</th>
<th>Poor</th>
<th>Fair</th>
<th>Average</th>
<th>Good</th>
<th>Very Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30–34</td>
<td>29–34</td>
<td>35–40</td>
<td>41–45</td>
<td>46–51</td>
<td>52–56</td>
</tr>
</tbody>
</table>


In the case of the client example above, her VO₂ score of 39.8 would be considered average.
**Step Four: Determine the appropriate Quick Reference Program in which to start the client.**

Use the Quick Reference Programming Guide (Figure 13) to start clients out, and then use one of the progression programs provided later in this course to add variety.

**Figure 13: Quick Reference Programming Guide**

<table>
<thead>
<tr>
<th>Poor</th>
<th>Give Stage I Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fair / Average</td>
<td>Give Stage II Program</td>
</tr>
<tr>
<td>Good / Very Good</td>
<td>Give Stage III Program</td>
</tr>
</tbody>
</table>

In the case of the example client above, with a cardiovascular efficiency of 39.8 and a HR score of average, she would be best started in a medium cardio program.
The Benefits of Interval Training and Stage Training

If the goal is to bring positive physical changes to a client’s cardiovascular system, then overloading is necessary. The body must be presented with a workload that challenges its current fitness state. This increased workload will cause fatigue and, with the proper recovery, eventually yield cardiovascular improvements.

If the workloads are of the right magnitude (i.e., slightly more than the body is currently used to), then adaptation occurs. It is important to note that the overload happens during the exercise, while the adaptations occur during recovery. Recovery is, therefore, a vital part of any client’s program.

Interval Training

Because recovery for the body is vital, the most effective workout is one that involves interval training, which is training at different intensities for certain periods of time in a given workout. A day of cardiovascular exercise utilizing interval training would start in Zone One (THR of 65 to 75 percent and RER of 0.85). The program would slowly work through Zone Two (THR of 80 to 85 percent and RER of 1.0). Finally, it would reach Zone Three (THR of 86 to 90 percent and RER of 1.1). This exercise session would typically yield a higher caloric expenditure than working in any one zone alone.

As an example, take an average 150-pound woman exercising on a stationary bike. She can burn approximately 82 calories during a 30-minute ride by staying in Zone One. Half of those calories will be burned from fat. As this woman rides at a harder rate, she will raise her RER to around 1.0 (Zone Two) and burn up to 152 calories. A smaller percentage of those will come from fat.

There are two benefits of interval training that become very clear. First, there is an increase in calories burned (152 versus 82). Second, there is a possible increase in the amount of fat calories burned depending on the duration of activity.

There are three other less-evident benefits of interval training. First, varying a client’s programs will have a positive motivational impact by helping to avoid monotony. Second, by overloading the heart and lungs,
a client will increase the efficiency of his or her cardiovascular and respiratory systems. Finally, interval training will increase a client’s metabolic rate.

To lose weight, the amount of fat burned during the day is even more important than how much fat is burned during a workout. Studies have shown that interval training raises metabolism after a workout and keeps it higher for a longer period than any steady-state workout.15–19

**Stage Training for Beginners to Set HR Zone and Build a Base**

To create a balanced cardiovascular program, the health and fitness professional must not only design HR training zones, but also adjust them to fit each client’s fitness level and goals.

**Stage Training:**
A pre-set system of interval training designed to use all three training zones.

Testing for cardiovascular fitness levels is important, but *stage training* is another effective way to get started. Stage training helps to determine adjusted HR training zones and creates a strong aerobic base to build on. Stage training can serve as the basis for designing any cardiovascular workout program.

The health and fitness professional should not only design workouts, but also ensure that his or her clients understand the reasons that workload (speed, incline, level, etc.) varies from workout to workout. Clients need to understand that stage training is intended to take them in and out of each zone.

**Examples of Stage Training**

Following is an example of three stages for a beginning client who is 40 years old. In this example, the client is using a treadmill at 3 MPH.

This client’s health and fitness professional should be most concerned with the client’s change in HR. The type of exercise equipment used to train is unimportant unless the client has movement deficiencies or compensations. The client should simply be trying to build a base.

*Note that this example is based on the HRmax formula, 220 minus age; however, the Karvonen method can also be used.*
**Stage One**

Stage One is for the beginner who has not been working out on a regular basis. This client needs to build a base for future exercise.

In Stage One, the client should start slowly and work his or her way up to 30 to 60 minutes in Zone One. However, if this client has never worked out, the health and fitness professional may choose to start the client in Zone One for only five minutes, instead of thirty.

For this particular client, Zone One would be calculated as:

\[
220 - 40 \text{ years old} = 180 \\
65\% \times 180 = 117 \text{ BPM}
\]

After the client is able to maintain his or her Zone One HR for at least 30 minutes for two to three weeks, then he or she can slowly work his or her way up to Stage Two. (It should be noted that a true beginner might be in Zone One for two to three months.)

In the example given, the treadmill is set at a speed of 3 MPH. This should be slow enough to ensure that the client is working in an aerobic state. This is intended to be a light workout.

The speed may change for each individual session, since the goal is to have the client work exclusively in Zone One. Thus, the health and fitness professional should adjust the treadmill speed accordingly in order to keep the client at a Zone One heart rate.

During this stage, the health and fitness professional will be able to tell if the THR zones that he or she has created are working well for the client. The goal is to have the client comfortably add additional time to the workout segment.

**Stage Two**

In Stage Two, the client should have established a good exercise base, but should not be pushing him- or herself too hard. Stage Two is the introduction to interval training.

For this client, Zone Two would be calculated as:

\[
220 - 40 \text{ years old} = 180 \\
85\% \times 180 = 153 \text{ BPM}
\]
In Stage Two, the health and fitness professional should begin by warming up the client in Zone One (about 117 BPM) for 10 minutes. The client should proceed slowly up to Zone Two within a one-minute time frame. Once the client's HR reaches the top of Zone Two (which in this case is 153 BPM), he or she should maintain that pace for the remainder of the minute. It might take 45 seconds for the client to reach that HR, which means he or she will be at the top end for only 15 seconds before reducing the workload (speed, incline, or level) and returning to Zone One.

As mentioned before, the 220 minus age formula is not precise. As a result, a client's true 85 percent HRmax might be different than the health and fitness professional's calculation.

**Adjustments to Zone Calculations**

During the first workout, the health and fitness professional will have to make adjustments. The first thing to look at is the one-minute push (that is, the one-minute interval into Zone Two).

- Did the client get to Zone Two?
- Was it easy for him or her?
- Can the client hold that HR?

Based on these questions, the health and fitness professional can start to create accurate training zones for each client. Regardless of the type of cardiovascular exercise being performed, be sure to increase the workload to get the client's HR up to his or her personal top of Zone Two.

With the example client, speed remains at 3 MPH. However, to increase the client's HR to Zone Two, the health and fitness professional could increase the treadmill to an eight-percent incline.

The use of increased speed or incline is unimportant. Workload is determined by HR alone. The exception to this would be the client who does not have adequate dorsiflexion, as demonstrated in the dynamic movement assessment (feet flatten/turn out or the heels rise off the ground during an overhead squat assessment). Increasing the percent of incline requires the client to have more dorsiflexion. A lack of dorsiflexion with an increase in treadmill incline will increase stress to the lower extremities and low back. In this case, an increase in speed would be preferential.

Some clients may be unable to reach the Zone Two predicted HR. For these clients, begin using the BPM that they were able to reach as the new high-end standard for Zone Two. Subtract five percent from this number to get the lower end of that client's zone.
For example, if the 40-year-old client mentioned earlier was able to reach 148 BPM only during his one-minute push, then 148 should now be considered that client’s upper range of Zone Two. Next, it is calculated that five percent of 148 is approximately 7 beats. Thus, 148 minus 7 is 141. So, the client’s low end of Zone Two is 141.

If the client’s HR goes above the predicted zone, and he or she is still able to recover back to Zone One at the end of the workout, then the health and fitness professional can add a couple of beats to the zone and work on increasing the client’s time spent in that zone.

On the other end of the spectrum, some clients will be able to exceed the 220 minus age formula prediction of BPM. If a client still feels comfortable and in control of his or her movements, the health and fitness professional should use the higher BPM that the client was able to reach as his or her new standard number for Zone Two.

Clients who reach Zone Two with ease should use the original figures. The health and fitness professional should work slowly to increase a client’s time spent in this zone.

After finishing the one-minute push, a client will return to Zone One prior to repeating the one-minute push again. He or she should recover back to Zone One in between intervals. The fitness professional should have the client repeat this, based on the amount of time the client has to exercise.

**Alternating Intensity in Stage Two**

Even though a client may have moved on to Stage Two, it is important to continue to spend some days in Stage One. This means dividing sessions into low-intensity days and high-intensity days.

If a client exercises three days a week, he or she should start with Stage One on Monday, then go to Stage Two on Wednesday, and return to Stage One on Friday. The next week, that client should start with Stage Two and maintain this rotation, so that his or her workouts stay balanced. This becomes even more important moving forward to Stage Three.

**Stage Three**

Stage Three is reserved for clients who have worked their way up through the first two stages and find the need for more work in their ATs. It can also be a useful stage for those who have hit plateaus.

Again, the client must begin in Zone One and then slowly increase to his or her peak in Zone Three. After five minutes in Zone One, the client should increase the workload every 30 seconds until he or she is in
Zone Three. (This means a slow climb through Zone Two for at least two minutes.) After pushing for an additional minute in Zone Three, the client should decrease the workload. This one-minute break helps gauge improvement. The client should then drop the workload down to the level he or she was at during the beginning of the interval. During this minute, the client’s HR will drop.

As improvements are made over weeks of training, the HR will drop more quickly. The faster a client’s HR drops, the stronger his or her heart is becoming. Ideally, over the course of a few months, the client’s HR should consistently drop to the same number. When this happens, the client will be able to use this as a gauge to prevent overtraining, because if the client is fatigued, his or her HR will typically not recover as quickly or drop as low.

**Preventing Overtraining during Stage Training**

If a client’s HR does drop to his or her normal rate (or the high end of Zone One) during rest, then overload the client again and go to Zone Three for one minute. After this minute, go back to Zone One for 10 minutes before starting over. However, if the client is truly performing in Zone Three at a peak level, then he or she should take a 10-minute break before starting the next interval (Figure 16).

Zone One is very important for recovery, but not for fat burning. The goal is to reach the peak three to four times per workout. By doing so, the peaks will raise metabolism and, in turn, burn fat the rest of the day. However, a full recovery is required to reach those peaks each time.

Stage training is great for muscle toning and calorie burning because of the extended time spent in Zones Two and Three. However, accomplishing those goals requires ample recovery.

If a client increases intensity but his or her HR is slower to respond than normal (and is also slower to reach recovery at the end of an interval), then he or she is probably overtrained. In this case, reduce the client’s training volume and do not have the client perform any Zone Three training for at least one full week.

The health and fitness professional can use a client’s RHR to determine if that person is being overtrained. For five days, have the client record his or her true RHR (i.e., RHR taken as soon as he or she wakes up in the morning). The fitness professional should average the client’s five days of RHR, and that will be the client’s true RHR. Then, when taking the client’s pulse in the fitness setting, his or her BPM should be no more than eight beats higher than the true RHR. If the RHR in the fitness setting is indeed more than eight BPM higher than the average morning pulse, it is advised that the client take that day off from training.
Another useful test to check for overtraining is to instruct the client to lie flat on the floor for several minutes and rest. The fitness professional should take the client’s HR and then instruct the client to stand up. The client’s HR after standing up should not increase by more than 10 BPM. If there is an increase of more than 10 BPM upon standing, again, it is advised that the client take that day off from training.

**Checking for Signs of Overtraining during Stage Training**

Be sure to keep an eye out for obvious signs of overtraining in each client, including:

- The inability to reach his or her training zones;
- Inadequate sleep at night;
- Workouts that are described by the client as “draining”; and
- A client’s lack of feeling refreshed at the end of the workout.

It should be clear by now how important recovery periods are to a client’s health and progress. Likewise, an overtrained client who is not achieving results may be tempted (or forced) to stop his or her personal training.

**Adaptations to Stage Training**

As with Stages One and Two, all three stages can be rotated. This rotation will create several physical benefits, as seen in Figure 15.

**Figure 15: Adaptations to Stage Training**

- Increase VO$_2$max and aerobic base
- Increase stroke volume
- Increase cardiac output
- Increase oxidative capacity of muscle
- Decrease RHR

Clients should mix low-, medium- and high-intensity days to avoid overtraining. This mix can be seen, using the example of the 40-year-old client, in Figure 16.
Figure 16: Example Stage Training

Low Intensity Day: 30 - to 60 - minute workout (Recovery/Fat Burning)

- Warmup/Cool down: 5 - 10 min
- Zone 1: Recovery
- Zone 2: Anaerobic Threshold
- Zone 3: Peak Interval
- 25 - 55 minutes workout

Medium Intensity Day: 28-minute workout

- Warmup/Cool down: 10 min
- Zone 1: Recovery
- Zone 2: Anaerobic Threshold
- Zone 3: Peak Interval
- 6 min
- 1 min

High Intensity Day: 15-minute workout (repeated 2 to 4 times)

- Warmup/Cool down: 5 min
- Zone 1: Recovery
- Zone 2: Anaerobic Threshold
- Zone 3: Peak Interval
- 1 min
- 1 min
- 1 min
- 1 min
- 1 min
Once the client has completed Stage Three, the health and fitness professional can alter the high-Intensity (Zone 3) workout to increase cardio strength and help with weight loss. One option is using a series of sprints in an interval to create a cardio overload.

The client should start with one-minute sprints and work up to two-minute sprints. Depending on the client’s fitness level and the amount of time the health and fitness professional can spend with the client, the client can start with three one-minute sprints with a one-minute recovery in Zone Two between each sprint (Figure 17). After the third one-minute sprint, the client should drop into Zone One for two to three minutes before repeating the sprint sequence. The goal is to push the client into Zone Three during the one-minute sprints, but the key is to have him or her push hard for one minute (his or her HR will reach Zone Three by the end of the sprint). The health and fitness professional should not wait until the client hits Zone Three to start the minute. Instead, the health and fitness professional should start the minute and push the client to hit the zone. This sequence should be repeated for the desired number of sprints and finish with a five-minute cool down.
These sprints should be at the same workload each time. This means that the first and last sprint should be at the same speed, incline, watts, or level, depending on what type of equipment the client is using. If the client is running outside, each run should cover the same distance at the same speed. It is important that the health and fitness professional does not push the client too hard on the first sprint to ensure that he or she does not decrease performance throughout the workout. This drop in performance is a sign of fatigue and more than likely poor form or technique, which can lead to injuries. Instead, the client's...
workload should be increased slowly over every speed. This will enable the client to do his or her best speed or time on the last sprint with perfect form. The health and fitness professional should use the workload on the last sprint to gauge the next workout’s workload. As the client improves, the health and fitness professional can increase the number of sprints before doing the two- to three-minute recovery in Zone One (Figure 18) and then increase the duration of each sprint (Figure 19).

**Figure 18: Stage Training Progressions B**

![Stage Training Progression B Diagram](image-url)
A good way to judge a client’s improvement and know when to move him or her to the next stage is to note the HR recovery during the break (green). The client’s HR should drop at the same rate after both the first and last sprints. When the recovery is slowing, go to a complete recovery or stop the workout. Over weeks of training, this recovery should improve. If it is not improving, it could be a sign that the client is overtraining. In that case, the health and fitness professional should look at the client’s overall training schedule as well as his or her nutrition.

Another way to add sprints to the intervals and to oversee the client’s progress is with the 30/30 Interval Training Program (Figure 20). This program will help anyone get started in interval training or push an advanced client to the next level. More important, it will track improvements in HR recovery, which is
a key factor in tracking the client’s overall fitness gains. The goal with this form of training is to do a 30-second challenging interval followed by a 30-second recovery. The client should begin by performing a warmup for 5 to 10 minutes in Zone One. He or she should do a series of three to five intervals before doing a 2- to 5-minute exercise at Zone One. The client should repeat this for the desired number of intervals before finishing with a cool down.

**Figure 20: 30/30 Interval Program**

Regarding intensity, the key is finding out what is challenging for a particular client. If he or she normally walks at a pace of 3 MPH, the interval may be at 3.5 MPH or perhaps a three-percent incline on the treadmill. For others, it may be a 9-MPH sprint for 30 seconds. It is based on the individual’s current fitness level, which will increase as he or she continues the interval training program.

This type of interval training not only enhances cardiorespiratory efficiency, but also can increase caloric expenditure and keep the workout stimulating due to its fast-paced design. This can break up the monotony and keep the client motivated. However, it is important to keep in mind that the client must qualify to perform both the sprint intervals and 30/30 intervals by going through all three levels of stage training prior to engaging in these more-intense routines.
Cardiorespiratory Programming Strategies for Goals Involving Body Composition

The cardiorespiratory assessment process has provided a comprehensive overview concerning the client’s goals, needs, and abilities. In order to be used in a safe, effective, and productive manner, this information must now be placed within a practical programming system that helps the client reach his or her specific fitness goals. The main goals discussed in this chapter are losing weight, handling plateaus, overcoming obesity, and gaining weight.

The National Academy of Sports Medicine (NASM) utilizes an interval-training scheme made up of the stage training system previously discussed. This system is a simple periodization scheme for cardiorespiratory training, which provides a systematic method of using a client’s HR training zones to structure a cardiorespiratory training program specific to him or her.

Sample programming strategies for each fitness goal are provided in this course. The programming templates are based on a variety of interval programs. The goals for each may vary but the base programs will work on cardio strength, leg strength, HR recovery, or improved endurance.

Programming Strategies for Weight Loss

Most people look at weight loss as being synonymous with reducing caloric intake. This holds true for people who take in too many calories to begin with. However, for those who eat fairly well but still seem to have a problem with those extra pounds, the key may be to work more on increasing metabolism instead of worrying about every calorie that is taken in.

The cardio weight-loss program has three major steps:

• The first is to burn more calories during each workout. Having the client work in Zones Two and Three will accomplish this, as will cross-training and using different types of exercise equipment whenever possible.

• The next step is to increase a client’s metabolism so that more calories are being burned throughout the rest of the day.
Lastly, as the client’s body becomes more efficient, the client will have a better chance of burning fat during the workout by raising his or her AT.

*Day One – Low-Intensity Day:* This workout will give the client a lot of time in Zone One for recovery. The goal is to help increase the client’s cardio strength while burning some fat calories. (Suggested: 30 minutes of cardio.)

*Day Two – Medium-Intensity Day:* With weight-loss programs, the aim is to increase metabolism, so cross training is the first step. It is recommended that a bike or stair machine be utilized for this workout. (Suggested: 30 to 60 minutes of cardio on a bike and/or stair machine.)

*Day Three – High-Intensity Day:* This workout will give the client a lot of time in Zone Two while also allowing for some variety to help increase the client’s time spent in Zone Three, up to a minute at a time. The program gives the client up to a five-minute recovery during the workout. This will allow the fitness professional to gauge the client’s fitness improvement as his or her HR starts dropping more quickly. Note that if the HR is not dropping, it may mean that the client has been overtraining. (Suggested: 30 to 60 minutes of cardio.)

If the client is exercising only three days a week, he or she will perform Days One through Three in that order. If the client wishes to add a fourth day, it should include a low-intensity workout for recovery. A walk or light bike ride would be a good recommendation, but remind the client not to go out of Zone One for the duration of the workout. If the client opts for more than four exercise days in one week, simply start with Day One again and repeat the order.
### Figure 21: Example Weight-loss Program

**Weight Loss**

**Day 1**

- **Recovery / Low Intensity**
  - Warmup/Cool down: 5 - 10 min
  - Zone 1: Recovery
  - Zone 2: Anaerobic Threshold
  - Zone 3: Peak Interval

**Day 2**

- **Medium Intensity Day**
  - Warmup/Cool down: 5 - 10 min
  - Zone 1: Recovery
  - Zone 2: Anaerobic Threshold
  - Zone 3: Peak Interval

**Day 3**

- **High Intensity Day**
  - Warmup/Cool down: 5 min. recovery / cool down
  - Zone 1: Recovery
  - Zone 2: Anaerobic Threshold
  - Zone 3: Peak Interval

Repeat the 5 min of work and recovery based on client’s time frame that day.

Rotate the three workouts.

Change Day 2 and Day 3 every 4-6 weeks.
Programming Strategies for Overcoming Plateaus

When a client first starts any cardio activity, he or she will use different muscle groups than in the past and will work hard to learn the program. Because of this increase in muscle stimulation, and the extra effort needed, the client will burn more calories and probably increase metabolism at first. This is why many people lose weight when they start such a program. However, if a client continues with that activity and does not increase intensity, his or her body will become accustomed to the program and metabolism will plateau. A person may look unchanged after many months of doing the same cardio routine.

Many people do a series of cardio activities or classes a week and work at a very high intensity, but still do not see results. These people have increased their cardiovascular fitness levels and raised their ATs, which are both very good and very important. The problem, however, lies in trying to improve, whether the goal is weight loss or increased endurance. These people never truly get to their peaks or improve, due to a lack of recovery. It would never be suggested to anyone that he or she discontinue cardio or classes. There are a lot of benefits from these activities, including improving balance, strength, and endurance, burning calories, and staying motivated. However, it is suggested that people break up their weekly routines and do other activities, so that they can have low-intensity days to recover as well as high-intensity days to overload the body (Figure 22). The typical cardio or aerobic classes will act as the medium-intensity days.

Day One – Low-Intensity Day: This workout will give a client a lot of time in Zone One, for recovery. The goal is to help increase cardio strength while burning some fat calories. (Suggested: 30 minutes of cardio.)

Day Two – Medium-Intensity Day: This is the day the client can do a group exercise class or a cardio program. This will keep the client in Zone Two, but increase variety. The client should use different pieces of equipment every five minutes, while not allowing his or her HR to drop. (Suggested: 30 to 60 minutes of endurance.)

Day Three – High-Intensity Day: With weight-loss programs, the goal is to increase the metabolism. So, cross training is the first step. It is recommended that clients use a bike or stair machine for this workout. (Suggested: 30 to 45 minutes of cardio on a bike and/or stair machine.)
## Figure 22: Example Plateau Program

### Get Over a Plateau

<table>
<thead>
<tr>
<th>Day 1</th>
<th>Recovery Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warmup/Cool down</td>
<td>Zone 1: Recovery</td>
</tr>
<tr>
<td>5 - 10 min</td>
<td>30 - 60 minutes workout</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day 2</th>
<th>Medium Intensity Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warmup/Cool down</td>
<td>Zone 1: Recovery</td>
</tr>
<tr>
<td>5 - 10 min</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 min</td>
</tr>
<tr>
<td></td>
<td>5 min</td>
</tr>
</tbody>
</table>

Goal is to get distance training without overloading at AT for too long.

<table>
<thead>
<tr>
<th>Day 3</th>
<th>High Intensity Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warmup/Cool down</td>
<td>Zone 1: Recovery</td>
</tr>
<tr>
<td>5 - 10 min</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 min</td>
</tr>
<tr>
<td></td>
<td>5 min</td>
</tr>
</tbody>
</table>

Add workload (watts, incline, level) to each sprint. The goal is to increase strength by overloading the legs. The 1 min yellow is for leg recovery. Repeat the 5 min of work and recovery based on client’s time frame that day.

Rotate the three workouts

Change Day 2 and Day 3 every 4-6 weeks
Programming Strategies for Weight Gain

If a client is concerned about adding muscle, he or she still needs to consider cardiovascular improvements, while avoiding burning too many additional calories (Figure 23). The main goal of cardio conditioning for weight gain is to increase the client’s AT and HR recovery. With the increase in AT and HR recovery, the client will be able to perform more effective weight-training programs. The result is a faster recovery of muscles. The quicker the recovery, the stronger the client will be for the next set. The benefit will be additional weight lifted or more reps in each set.

Day One – Low-Intensity Day: This workout will give the client a lot of time in Zone One for recovery. As with weight training, the body needs to recover during cardio exercise. The goal is to help the body recover, so the workout should be only 10 to 15 minutes long. (Suggested: 10 to 15 minutes of cardio.)

Day Two – Medium-Intensity Day: Depending on the client’s activities, a medium-intensity workout may not be needed. The client will be wasting too many calories in this way. Only if the client is an endurance athlete will this day be needed. If so, the client would stay in Zone Two for up 30 minutes. (Suggested: 30 minutes of endurance training.)

Day Three – High-Intensity Day: The high-intensity day is where the client can build the most cardio strength by overloading the cardiovascular system, without burning up any additional calories. The strategy is to work in Zone Three for short intervals, with little rest. The cardio workout should not be more than 12 to 15 minutes in duration. (Suggested: 15 minutes of cardio.)
Cardiorespiratory Training for Fitness

Figure 23: Example Weight-Gain Program

<table>
<thead>
<tr>
<th>Day 1</th>
<th>Recovery / Low Intensity</th>
<th>Zone 1: Recovery</th>
<th>Zone 2: Anaerobic Threshold</th>
<th>Zone 3: Peak Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warmup/Cool down</td>
<td>5 - 10 min</td>
<td>10-15 minutes workout</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Day 2

<table>
<thead>
<tr>
<th>Day 2</th>
<th>Medium Intensity Day</th>
<th>Zone 1: Recovery</th>
<th>Zone 2: Anaerobic Threshold</th>
<th>Zone 3: Peak Interval</th>
</tr>
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<tbody>
<tr>
<td>Warmup/Cool down</td>
<td>5 - 10 min</td>
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<tr>
<td></td>
<td>5 min</td>
<td></td>
<td>10 min</td>
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Endurance training only

Day 3

<table>
<thead>
<tr>
<th>Day 3</th>
<th>High Intensity Day</th>
<th>Zone 1: Recovery</th>
<th>Zone 2: Anaerobic Threshold</th>
<th>Zone 3: Peak Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warmup/Cool down</td>
<td>5 - 10 min</td>
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<td>30 sec</td>
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<td>1 min</td>
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<td>2 min</td>
</tr>
<tr>
<td></td>
<td>2 min, recovery / cool down</td>
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</table>

Rotate the three workouts
Change Day 2 and Day 3 every 4-6 weeks
The Marketability of Cardiorespiratory Personal Training

While personal training has come a long way in the past 10 years, there is still a large market that the majority of health and fitness professionals are not tapping into—cardio training. Most will spend an hour with a client doing core and resistance training, while requiring their clients to handle cardiorespiratory exercise on their own. However, many fitness facility members utilize cardiorespiratory exercise each time they visit their facilities. Therefore, the health and fitness professional who can provide advanced cardio information will find that he or she can serve any of the facility’s diverse populations by offering this training service.

Offering Cardiorespiratory Personal Training as a Service

A finely tuned, supervised cardiorespiratory program may be the best way to assist clients with their goals (particularly weight loss). It gives the health and fitness professional a great opportunity to provide one-on-one expertise in this area and, at the same time, it creates new opportunities in the field of personal training. A health and fitness professional can provide useful skills and create programs that are more cost-effective for clients.

By introducing HR training zones to clients who are not yet familiar with them, the health and fitness professional can pique a member’s interest in participating in personal training. During an initial fitness assessment, the health and fitness professional can record a client’s HR, determine the appropriate HR training zones for that client, and propose a personalized fitness assessment. As a result, an individualized cardio program can help a client reach his or her goals more quickly and safely.

Promoting Cardiovascular Personal Training Services

After studying this course and passing the exam, each health and fitness professional should advertise this new skill, so that he or she will be seen as the “cardio specialist” of the fitness facility. By providing a new service to existing and potential clients, a new market will be created, as will new clients.

Health and fitness professionals can easily market their cardiorespiratory personal training skills through educational workshops for club members. From the material provided in this course, a health and fitness professional can put together a 45-minute workshop on proper cardiorespiratory exercise and cardio-training programs. At the workshop, low-cost 30-minute personalized cardio-training sessions can be offered in order to get new clients to try the service.
Health and fitness professionals can also utilize the option of selling group cardio-training sessions. It is easy to set up and monitor four people training at once on cardio equipment, as long as they are all equipped with HR monitors. The hourly fee will be lower for each client, and the health and fitness professional will still make a profit and gain new clients.

Additional packages can include shorter sessions for individuals or small groups. If a client is taken through one of the Stage Three workouts, the client will see how important it is to have a health and fitness professional with him or her to push through the sprints. The lower cost of doing short sessions can open a new market for potential clients who did not initially see the value of the training session, but were willing to try it. Once they do a few cardio sessions with the health and fitness professional, they may be more open to doing some additional weight-training sessions. These could even lead to a one-hour session, where 30 minutes is weight training and 30 is cardio training.

Since cardio is very popular with clients, the health and fitness professional can create another new market by doing a cardio-training session once a week or once a month and giving clients workouts to take with them until their next appointment. Again, this is appealing to a new group that doesn’t need a health and fitness professional all the time but does seek program design and motivation.

**Providing Effective Cardiorespiratory Training**

The health and fitness professional can use the assessments, formulas, and cardio programs from this course to help develop personalized programs that will yield measurable results for clients. He or she can train clients each week by using one of the given cardio programs provided in this course and following the provided progressions, based on each client’s results.

During the client’s program, the health and fitness professional will have an opportunity to teach the client how to maximize the benefits of cardio workouts. Weekly contact will enhance the client’s knowledge of interval training, stage training, and use of HR zones. The health and fitness professional should provide useful fitness tips during a client’s workout, such as:

- What the fat-burning zone really is;
- Why clients need to drink water; and
- Why it is important to combine resistance training with cardio training.
This interaction will provoke discussion with the client, which will give the health and fitness professional a good platform from which to lend his or her expertise. Of course, this can easily lead to offering additional personal training sessions.

By offering cardiorespiratory training, a health and fitness professional can help create a healthy habit for each of his or her clients. Hopefully, after forming this new habit, clients will be motivated to repeat their program progression with new HR zones and workloads, or work with their health and fitness professionals in other areas of fitness.
Summary

The proper cardiorespiratory program is very important for each client. Cardio is not a one-size-fits-all program. Personalized cardio programs can help any client reach any goal by maintaining program efficacy and client enthusiasm.

Using the HR as the primary basis of measurement during training, the health and fitness professional must utilize appropriate equations to obtain a client’s HRmax and THR. Developing a cardiorespiratory exercise program entails a comprehensive assessment process and designing a structured program to meet the client’s goals and needs.

Training zones were originally derived from the respiratory exchange ratio and have been used in the health and fitness environment. Two main training zones that have become commercially accepted are the fat-burning zone (low intensity) and the cardio zone (high intensity). These zones should be renamed Zone One (the recovery zone or base cardio zone), which is based on an RER of 0.80–0.90; Zone Two (typically the high-intensity zone), which is based on an RER of 1.0; and Zone Three (a true high-intensity zone), which is based on an RER of 1.1. These zones are incorporated into a systematic cardiorespiratory training programming process called stage training.

Stage training is a system that dictates the specific intervals to be used over a given period of time. It varies the intensity of each workout using the three zones discussed in Module Two. Stage One involves only Zone One. Stage Two involves Zones One and Two. Stage Three involves all three zones.

Before beginning any exercise routine, it is imperative that health and fitness professionals perform a comprehensive fitness assessment (which includes both subjective and objective information) on each client. The assessment will aid in monitoring possible contraindications to training and ensure an appropriate beginning point and progression sequence for each client.

Cardiorespiratory personal training is a new, untapped niche for most health and fitness professionals. A health club may provide personal training services to a small percentage of its membership. However, most health club members include some type of cardio workout in their fitness regimen, leaving this population open to specialized instruction or guidance on how to maximize this component of their fitness routines.
References


