

# Quiz Policies

## **Eligibility**

The NCSF online quizzes are open to any currently certified fitness professional, 18 years or older.

## **Deadlines**

Course completion deadlines correspond with the NCSF Certified Professionals certification expiration date. Students can obtain their expiration dates by reviewing either their certification diploma or certification ID card.

## **Cancellation/Refund**

All NCSF continued education course studies are non-refundable.

## **General Quiz Rules**

- You may not have your quiz back after sending it in.
- Individuals can only take a specific quiz once for continued education units.
- Impersonation of another candidate will result in disqualification from the program without refund.

## **Disqualification**

If disqualified for any of the above-mentioned reasons you may appeal the decision in writing within two weeks of the disqualification date.

## **Reporting Policy**

You will receive your scores within 4 weeks following the quiz. If you do not receive the results after 4 weeks please contact the NCSF Certifying Agency.

## **Re-testing Procedure**

Students who do not successfully pass an online quiz have the option of re-taking. The fees associated with this procedure total \$15 (U.S) per request. There are no limits as to the number of times a student may re-test.

## **Special Needs**

If special needs are required to take the quiz please contact the NCSF so that appropriate measures can be taken for your consideration.

# Quiz Rules

## **What Do I Mail Back to the NCSF?**

Students are required to submit the quiz answer form.

## **What do I Need to Score on the Quiz?**

In order to gain the .5 NCSF continued education units students need to score 80% (8 out of 10) or greater on the CEU quiz.

## **Where Do I Mail My Quiz Answer Form?**

You will mail your completed answer form to:

**NCSF**

**Attn: Dept. of Continuing Education**

**5915 Ponce de Leon Blvd., Suite 60**

**Coral Gables, FL 33146**

## **How Many CEUs Will I Gain?**

Professionals who successfully complete the any continuing education quiz will gain .5 NCSF CEUs per quiz.

## **How Much does each quiz cost?**

Each quiz costs the student \$15.00.

## **What Will I Receive When The Course Is Completed?**

Students who successfully pass any of the NCSF online quizzes will receive their exam scores, and a confirmation letter.

## **How Many Times Can I Take The Quizzes For CEUs?**

Individuals can take each NCSF quiz once for continuing education credits.

# Clinical Considerations When Working With Hypertensive Patients



With the increased emphasis of the changing healthcare system on prevention, there is no question that the personal trainer's role in an effective therapeutic lifestyle intervention to combat major diseases is more important now than ever in the United States. Therefore trainers need to better understand clinical aspects of common co-morbidities with cardiac and metabolic diseases, such as high blood pressure – or what is commonly referred to as Hypertension. To underscore this relevance, estimates are that approximately 70 million American adults have high blood pressure.

High blood pressure exists once the systolic blood pressure (arterial pressure during ventricular contraction) is greater than 140mmHg, OR when diastolic pressure (arterial pressure during ventricular filling) exceeds 90mmHg. Although clinically diagnosed as hypertension, stage I (140/90 mmHg) does not require medical clearance and in most cases is treatable with diet and lifestyle changes and weight loss. When vascular pressures reach 160/100 mmHg medical referral is necessitated because treatment takes on a pharmacological approach. For individuals with high pressure it is important that following medical clearance regular participation in moderate levels of physical activity are added to the daily treatment regimen since exercise has an equivalent effect of lowering blood pressure as a class one anti-hypertensive medication. Regular aerobic exercise, performed most days of the week, has been shown to chronically lower blood pressure and each bout of exercise may lower blood pressure acutely for up to 23 hours.

The adaptations to cardiovascular exercise act on the agitators that cause elevations in pressure. Exercise causes a reduction in renal sympathetic nervous system activity, resulting in lower spillover of norepinephrine from the kidneys into circulation and a reduction in blood pressure. This is an important cardioprotective and stroke-preventive effect of regular exercise, since lower blood pressure reduces endothelial disruption leading to a reduced risk of vascular disease. When blood pressure is chronically high, turbulent blood flow causes damage to the vascular wall that begins the cascade of events for vascular disease.

When routine aerobic exercise is employed it serves as the ideal treatment for hypertension and consequent heart disease because it lowers both systolic blood pressure (SBP) and resting heart rate. Reduction in these factors lowers the resultant product called the rate-pressure product (RPP) expressed as  $(SBP \times HR)$ . RPP is an index of myocardial oxygen demand. This translates into less oxygen needed by the heart muscle to perform a given amount of work. For example, if a client has a systolic blood pressure of 135 mmHg and a resting heart rate of 85 bpm, their RPP is 11,475. If after an exercise program the same client lowers their blood pressure to 120 mmHg and heart rate to 65 bpm, their RPP is reduced to 7,800. This is a reduction of myocardial oxygen demand by about one-third, meaning that at rest the client's heart requires one-third less oxygen due to improved efficiency. When high blood pressure is endured over a long period of time, the high demands of the heart can lead to central hypertrophy, valve problems, and potentially, congestive heart failure.

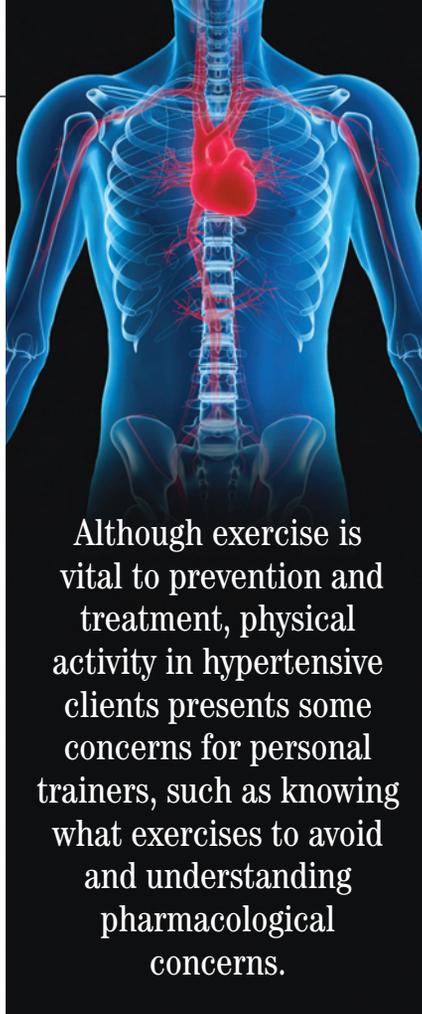
Although exercise is vital to prevention and treatment, physical activity in hypertensive clients presents some concerns for personal trainers, such as knowing what exercises to avoid and understanding pharmacological concerns. In general, PTs should avoid training hypertensive clients with heavy loads ( $\sim > 70\%$  of 1RM) with large muscle groups (compound movements) to avoid excessive arterial afterloads which may contribute to a greater risk of hypertrophic cardiomyopathy (enlarged heart) and transient, excessive increases in blood pressure. For instance, the leg press can lead to extremely high blood pressure responses. Similarly, the client should avoid emphasizing isometric exercises, which leads to prolonged increases in peripheral resistance and greater risk of the Valsalva Maneuver (exhaling against a closed glottis). The Valsalva Maneuver leads to an acute decrease in blood pressure followed by a reflexive and dramatic increase in blood pressure. Therefore, when prescribing resistance training, trainers should concentrate on intensities between 12-20 RMs, and alternating or isolateral movements. Isometrics, such as prone planks and wall sits should not be emphasized in the program and there

should be an emphasis on exhaling during the exertion phase of all lifts. Of further interest, hypertensive clients should not consume caffeine before exercise as it increases central arterial pressure and reduces the post-exercise parasympathetic response.

Understanding what contributes to blood pressure can help with its management. Blood pressure is the product of Cardiac Output (CO) and Total Peripheral Resistance (TPR). Cardiac output is the heart rate (in beats per minute) multiplied by stroke volume (left ventricular volume of blood ejected with each beat). In general, TPR is determined by the resistance of blood flow through the arterial vessels, and mainly influenced by the arterial vessel tone which is maintained by the smooth muscle cells of blood vessels in the arterial circuitry. The relative tone of an arterial vessel is tonically determined by the nervous system's influence on the smooth muscle cells, leading to an appropriate level of contraction to meet the blood flow demands of the parenchyma. Also, several blood chemicals work to alter the level of smooth muscle contraction leading to dilation or constriction of the vessel. The more constricted the vessel, the higher the blood pressure, and vice-versa. Therefore, drug interventions to lower blood pressure can target any of these parameters, such as drugs to inhibit heart rate and contractility to lower cardiac output, or to relax arterial smooth muscle cells to promote a dilatory response and reduced TPR. Since so many Americans take high blood pressure medications, Personal Trainers should be aware of what each medication does and how they affect exercise. The following is a list of common classes of anti-hypertensive medications.

### ■ ACE Inhibitors

A powerful system that regulates blood pressure involves communication between the blood vessels, brain, and kidneys. When the arterial pressure decreases below "normal," a signal is sent to the brain which leads to chemical stimulation of the kidneys resulting in a release of the hormone renin. This hormone will form angiotensin-1 from a protein in the blood. Angiotensin-1 "blood vessel constrictor" is converted to its active form, Angiotensin-2, by the Angiotensin Converting Enzyme (ACE) which is in the endothelium and the pulmonary capillaries. Angiotensin-2



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constricts blood vessels, especially the efferent arterioles of the kidneys to increase TPR and promotes the release of the steroid hormone aldosterone from the adrenal cortex. Aldosterone acts on the distal tubules and the collecting ducts of the kidney to promote potassium excretion and sodium re-absorption and increased water retention. Overall this system leads to vasoconstriction and increased fluid retention causing a rise in blood pressure.

To combat this phenomenon, a class of anti-hypertensive medications known as ACE inhibitors are often prescribed. These drugs, which end with the suffix "pril," will lower blood pressure by inhibiting the formation of Angiotensin-2, thus reducing TPR and sodium/water retention. These drugs are often used to treat hypertension, heart failure, and kidney failure, and have been shown to increase exercise capacity in patients with chronic heart failure. They should not reduce exercise capacity, however clients

should have their potassium levels monitored closely due to the risk of electrolyte imbalances which may cause muscle cramping or more serious effects such as cardiac arrhythmias. This is particularly important if the client is also taking a potassium-sparing diuretic.

### ■ Alpha-1 Blockers

The alpha-1 receptors are receptors for adrenaline (mainly norepinephrine) on smooth muscle cells (SMCs) and, when activated, lead to vasoconstriction. Drugs which end with the suffix "zosin" are usually alpha-blockers. By competing with adrenaline for these SMC receptors, they reduce excessive vasoconstriction and TPR to lower blood pressure. These drugs do not have any commonly observed adverse effects on exercise. However, due to the post-exercise induced lowering of blood pressure, these patients may notice a greater than normal drop in blood pressure following exercise leading to a reflexive elevation in heart rate and dizziness. Longer cool-downs should be employed with clients who are taking alpha-1 blocker medications.

### ■ Anti-arrhythmic Agents

Drugs such as quinidine and procainamide are prescribed to suppress arrhythmias by reducing the contractility of the heart. They may also cause overall muscle weakness and nausea leading to a reduced willingness and ability to exercise. These drugs can be

dangerous when used during exercise since they can also promote the development of new or worsened arrhythmias.

### ■ Beta Blockers

The chemical released by the Sympathetic, or “Flight or Fight” Nervous System is often referred to as adrenaline (norepinephrine and epinephrine). These peptides bind to receptors throughout the body to elicit a cellular response. In the heart, adrenaline binds to beta-1 receptors leading to increased sodium and calcium permeability to promote an accelerated heart rate (chronotropic effect) and contractility (inotropic effect). Anti-hypertensive drugs which end with an “olol” are commonly beta blockers. These drugs compete with adrenaline by binding to the heart’s beta receptors. Depending on the amount of drug prescribed and in circulation, there is an antagonistic effect on adrenaline’s ability to bind. This leads to a lower cardiac output, lower blood pressure, and reduced myocardial oxygen demand by lowering RPP. Beta blockers reduce heart rate so they prevent the use of traditional heart rate formulas for exercise prescription. However, these drugs increase exercise capacity in patients with angina and have no serious adverse effects on the exercise capacity on non-ischemic individuals. It is important to use Rate of Perceived Exertion (RPE), MET intensities, or the Talk Test when prescribing exercise to clients on Beta-Blockers.

### ■ Calcium Channel Blockers

These drugs lower blood pressure by competitively blocking the calcium channels that allow calcium release in heart and SMCs, thus lowering the heart’s contractility (lower stroke volume) and reducing arterial vessel tone to lower TPR. These drugs will increase exercise capacity in individuals suffering from angina, but have no adverse effects on work capacity of others.

### ■ Diuretics

Diuretics, referred to often by patients as their “water pill,” are sometimes used to treat hypertension alone or with Beta-blockers, as well as fluid retention, pulmonary edema

and heart failure. These drugs target various regions of the nephrons in the kidneys to reduce plasma volume and may lead to reduced work capacity, especially when training in the heat. Unless the drugs act on the aldosterone target areas of the collecting ducts (“potassium-sparing”) they will lower potassium levels. For example, thiazides or loop diuretics are commonly prescribed to patients and can lead to hypokalemia (lower potassium levels) and an increased incidence of arrhythmias, especially premature ventricular contractions (PVCs). These drugs may lead to hypotension, especially when used in combination with vasodilators. Physicians should clear clients for exercise as pharmacological adjustments may be warranted.

### ■ Nitrates

These vasodilating agents work through the mechanism of endothelial-derived relaxation factor, or nitric oxide (NO). Nitric oxide is ordinarily released from the endothelium of arterial vessels during increased blood flow and shearing stress against the vessel wall. Nitric oxide reduces the amount of calcium released into the smooth muscle cells and causes them to relax and the vessel to dilate. Patients with vascular disease often have impaired endothelial function and less of the natural endothelial derived relaxation factor. Nitrates can lead to increased vasodilation and an acute drop in blood pressure which lowers the afterload on the heart to reduce the work of the ventricles and lower the myocardial oxygen consumption to improve functional capacity in patients with angina. In patients with left ventricular heart failure and pulmonary edema, nitrates are often used to reduce pulmonary wedge pressure (PWP), a measure used to indirectly assess left atrial pressure, which can increase cardiac output and potentially improve work capacity of these patients. To prevent or relieve an angina attack, the powerful vasodilator nitroglycerine is often used. This drug can cause hypotension and syncope (fainting) when taken with exercise. Doctors should be consulted when exercising clients on nitrates for recommendations or adjustments to ensure optimal safety during and after training. ●



## New Personal Trainer Continuing Education

Starting January 1, 2010 all NCSF Certified Personal Trainers will be required to complete one continued education unit (CEU) in professional ethics and have a current CPR certification at the time of renewal. The original 2008 proposal received final approval at this year’s annual Board of Directors meeting held this past April. To assist professionals in preparing for the new 2010 requirement, the organization will publish the new alongside the current version on NCSF website. The new handbook will detail the new requirements and allow professionals who are renewing their credential

after January 1, 2010 the opportunity to review the new guidelines to ensure they will be compliant. To best assist the professionals in meeting this new requirement the NCSF is adding a new continuing education ethics section on its website so individuals will have easy access to qualifying educational content. Although up to three (3) credits can be attained through any approved coursework, NCSF E-news and newsletters will publish CEU articles on ethics so the requirement can be attained quickly and inexpensively for all applicants. For more information contact the NCSF.

# CEU Quiz

## Hypertension

- Recent estimates indicate that approximately \_\_\_\_\_ million Americans have Hypertension.
  - 20
  - 45
  - 70
  - 100
- Hypertension is defined as a systolic blood pressure over \_\_\_\_\_ OR diastolic blood pressure over \_\_\_\_\_.
  - 100 mmHg; 120 mmHg
  - 120 mmHg; 80 mmHg
  - 130 mmHg; 60 mmHg
  - 140 mmHg; 90 mmHg
- Regular cardiovascular exercise results in \_\_\_\_\_, resulting in lower blood pressure.
  - an increase of activity from the sympathetic nervous system
  - a reduction in the renal sympathetic nervous system
  - increased norepinephrine spillover from the kidneys
  - increased endothelial disruption
- The amount of oxygenated blood required by the heart tissue to function properly is known as the \_\_\_\_\_.
  - Systolic Blood Pressure
  - Mean Arterial Blood Pressure
  - Diastolic Blood Pressure
  - Rate Pressure Product
- Personal Trainers who work with hypertensive clients should avoid which of the following types of exercise?
  - High intensity (>70% 1RM) resistance training
  - Moderate intensity aerobic conditioning
  - Flexibility training
  - Moderate intensity circuit training
- \_\_\_\_\_ is determined by the resistance of blood flow through the arterial vessels and is mainly influenced by arterial vessel tone.
  - Cardiac Output
  - Total Peripheral Resistance
  - Mean Arterial Blood Pressure
  - Heart Rate
- Which of the following is a commonly prescribed class of drug for hypertensive clients?
  - ACE Inhibitors
  - Beta Blockers
  - Calcium Channel Blockers
  - All of the above
- ACE Inhibitors \_\_\_\_\_.
  - Reduce exercise capacity in patients with chronic heart failure
  - Increase sodium/water retention thereby increasing Total Peripheral Resistance
  - Are used to treat hypertension, heart failure, and kidney failure
  - Both A and C are correct
- Which of the following Hypertensive medications reduces the heart rate and therefore if being used by a client will result in the ineffectiveness of traditional heart rate formulas.
  - ACE Inhibitors
  - Potassium Channel Blockers
  - Beta Blockers
  - Diuretics
- Vasodilation is a helpful way to reduce blood pressure and is the response of the body after taking \_\_\_\_\_.
  - Nitrates
  - ACE Inhibitors
  - Beta Blockers
  - Diuretics

# Quiz Answer Form

FIRST NAME \_\_\_\_\_ LAST NAME \_\_\_\_\_ M.I. \_\_\_\_\_

TITLE \_\_\_\_\_

ADDRESS \_\_\_\_\_ APT. \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

COUNTRY \_\_\_\_\_ POSTAL CODE \_\_\_\_\_

CERTIFICATION NO. \_\_\_\_\_ CERTIFICATION EXP. \_\_\_\_/\_\_\_\_/\_\_\_\_

MEMBERSHIP NO. \_\_\_\_\_ MEMBERSHIP EXP. \_\_\_\_/\_\_\_\_/\_\_\_\_

Quiz Name	Member Price	Total
	\$15	



Discover



Visa



Mastercard



Amex



Check/Money Order

Account No. \_\_\_\_\_

Exp. Date \_\_\_\_\_

Security Code \_\_\_\_\_

Signature \_\_\_\_\_

Date \_\_\_\_\_

## Quiz Answers

- |          |           |
|----------|-----------|
| 1. _____ | 6. _____  |
| 2. _____ | 7. _____  |
| 3. _____ | 8. _____  |
| 4. _____ | 9. _____  |
| 5. _____ | 10. _____ |

Fill in each blank with the correct choice on the answer sheet. To receive 0.5 CEUs, you must answer 8 of the 10 questions correctly.

Please mail this Quiz answer form along with the proper enclosed payment to:

NCSF  
5915 Ponce de Leon Blvd., Suite 60  
Coral Gables, FL 33146

Questions? 800-772-NCSF