

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.

Determining Heart Rate from MET Intensities

Prescribing exercise for aerobic training, circuit training, and conditioning has traditionally used heart rates to quantify the intensity based on premeditated structured training zones. Two common methods to identify the heart rate training zones include the Max Heart rate Formula and the Karvonen or Heart Rate Reserve Method. Of the two, the heart rate formula is most widely used and recognized. The formula simply uses a prediction of heart rate max ($220 - \text{age}$) and defined percentages (75-90% HRmax) of that value to determine the training intensities. The zones created by the age-predicted formula are commonly displayed on commercial cardio-equipment found in most fitness facilities. Many exercisers reference their age-predicted zone on the illustrated graph on the machine to determine their work rate.

Although universally accepted and used for decades, quick review of the heart rate max method should bring questions as to the validity of the predictive value. Based on the variables used in the formula, the training zones place every person of the same age in the same training zone. The assumption that every person, both male and female, at the same age will have the same heart rate when training makes little sense. For instance, based on the formula, a 28 year-old sedentary, obese female training at moderate intensity, lets say 75% of HRmax, would use the same steady state heart rate as a 28 year-old professional basketball player training at the same predicted intensity. Granted the zones allow for variation in intensity to match the users capabilities but at each defined intensity the predicted heart rate

is still the same. Secondary to this shortcoming, the formula for max heart rate has a standard deviation of 10-12 beats. Suggesting it is likely off for 32% of the population based on standard bell curve theory. So, not only does the formula identify everyone of the same age as equal, but is probably inaccurate at some level for one-third of all people regardless of age.

The Karvonen Formula or heart rate reserve method has been used to enhance the accuracy of predicted heart rate training zone by adding a second variable to the equation. The shortcomings of the Heart Rate Max Formula related to variations in fitness level are accounted for by factoring in a person's resting heart rate. The use of the resting heart rate in the formula has two purposes. The first is based on the relationship between resting heart rate and cardiac output. At one MET intensity (rest) the resting heart rate is primarily determined by the stroke volume of the heart. Individuals with more efficient myocardium have lower resting heart rates due to greater stroke volume per beat. Therefore, fit individuals will have a broader range of potential heart rates compared to someone that is unfit and has an elevated heart rate to meet the oxygen demands at rest. This concept lends itself to the second purpose of the heart rate reserve method. Heart rate reserve is the difference between max heart rate and resting heart rate. A 20 year old for example, will have a predicted max heart rate of 200 beats ($220 - 20 \text{ years} = 200 \text{ beats}$). Max heart rate obviously means the highest attainable rate of contraction by the heart when functioning properly.

If the same individual had a resting heart rate measured at 60 beats per minute, their lowest functional heart rate, the difference would reflect the heart rate reserve (Max HR – Resting Heart Rate). Heart rate reserve reflects the range between the upper and lower limits of heart rate. The training zones for exercise would then fall somewhere within that range since one cannot exceed their max heart rate without a cardiac arrhythmia and can not surpass the lower value unless asleep or comatose.

Although the Karvonen Formula factors in the considerations for variations in cardiac output, it does not account for the problem associated with the heart rate max prediction. Additionally, neither the Heart Rate Max formula nor Karvonen formula take into account other variables that ultimately determine the heart rate response to exercise. Bodyweight, tissue extraction capabilities, energy system efficiency, and muscle tissue force capabilities all affect the heart rate response during exercise. Therefore it is likely that neither formula has the ideal validity for use in “exact” programming for maximal efficiency and adaptation response.

Scientists use percentage of VO₂max to better gauge the training intensities rather than using heart rate predictions. VO₂ expressed as ml · kg⁻¹ · min⁻¹ represents the actual use of oxygen to accomplish a task at a given workload. Both direct (GXT) and predicted tests (1.5 mile run, step test) are used to identify VO₂ and percentages (60-80%) of the max value are used to create the training zones. The inherent problem with this more accurate method of defining training zones is people have no reference value to monitor their training. For example, if a 20 year old, 170 lb.

male performs the 1.5 mile run test at maximal effort and completes the distance in 12:00 minutes an absolute oxygen value can be determined. By factoring in the individuals weight the value will reflect a relative predicted VO₂max. His predicted VO₂max value would be 49 ml · kg⁻¹ · min⁻¹. To create the zone the value would be multiplied by the recommended training intensities (60-80%).

$$60\% \text{ VO}_2\text{max} (49 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}) = 29.5 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$$

$$80\% \text{ VO}_2\text{max} (49 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}) = 38.5 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$$

With these values identified the individual now has the training zones. But what good are they? If the individual was told to train within these zones he would likely have no clue what the values mean, let alone be able to apply them. At this point, the heart rate zones seem to make more sense from a practical perspective. Therefore VO₂ values have to be converted into correlating heart rate values so that exercise can be easily quantified. To do this takes two steps. Step one is converting the VO₂max into a usable unit of measurement that can be tracked. The MET or metabolic equivalent described above is ideal. One MET equates to 3.5 ml · kg⁻¹ · min⁻¹, therefore dividing the VO₂max value by the MET value will convert VO₂max into METs. Using the example the 1.5 mile run prediction of VO₂max, the value can be converted into a Metmax value since they use the same units.

$$49 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1} (\text{VO}_2\text{max}) \div 3.5 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1} (\text{MET}) = 14 \text{ METS}$$

With the conversion completed the MET training zones can be determined.

60% MET_{max} (14 MET) = 8.4 MET
80% MET_{max} (14 MET) = 11.2 MET

The MET value training zones reflect intensity between 8.4 and 11.2 METs. Step two requires the METs to be converted to the heart rate equivalents. To do this the individual would use a treadmill that has a button to display the MET intensities of the exercise. Most commercial treadmills, bikes, and stairclimbers have this button. Avoid using the elliptical machine for this calculation, as their MET value validity is in question. To get the heart rates, set the speed of the treadmill at the 60% MET value, 8.4 METs in the case of the example. The exerciser will then run for the duration of time necessary to reach a steady state heart rate response. Steady state heart rate means no variation in heart rate by more than 5 beats per minute. A heart rate monitor works very well for this purpose but heart rates can also be palpated. Once the steady-state heart rate is attained (usually within 5 minutes), record the value. This is the measured 60% VO₂max or lower end of the training zone. Once defined, increase the MET intensity to the 80% value, 11.2 METs in the example. Again the exerciser will perform at the defined workload until steady-state is attained. When steady-state is reached, record the value which will represent the defined upper heart rate range of the zone.

The heart rate values that have been established can be used to implement training intensities with better accuracy than those created from the heart rate prediction formulas. The error created from predicted heart rate max is taken out of the equation so validity is enhanced. The MET to heart rate conversion method does though come with possible limitations. When maximal

run tests are used to calculate VO₂max the predicted outcome is based on the individual's effort. If a person runs at 80% of their capabilities the value will reflect this in error. For this reason, tests should be selected to match the abilities of the client or exerciser. Run tests that use measured heart rates in the conversion to VO₂max are often better than simply using bodyweight and speed. Likewise, step tests or bike tests that predict VO₂max should be paced to account for effort and selected based on client capabilities and by specific population. Two such examples are the Forestry step test and YMCA bike test. To maximize the validity of the testing, protocol should be closely adhered to and the client should clearly understand the test parameters and the need for maximal effort.

CEU Quiz

Determining Heart Rate from MET Intensities

1. The most commonly used method to identify the heart rate training zone is:
 - A. Heart rate reserve method
 - B. Max heart rate formula
 - C. Karvonen method
 - D. RPE formula
2. The standard deviation of error for the max heart rate formula is:
 - A. 6 - 8 beats/min
 - B. 8 -10 beats/min
 - C. 10 -12 beats/min
 - D. 12-14 beats/min
3. In the heart rate reserve formula, variations in fitness level are accounted for by factoring in a client's:
 - A. MET intensity
 - B. HR max percentage
 - C. Fitness level
 - D. Resting heart rate
4. Lower resting heart rates in trained individuals as opposed to untrained individuals are usually attributed to:
 - A. Greater stroke volume
 - B. Less blood volume
 - C. A higher maximal heart rate
 - D. Higher oxygen demand
5. Which of the following does not have an affect on heart rate response during exercise:
 - A. Bodyweight
 - B. Tissue extraction capabilities
 - C. The time of day exercise is performed
 - D. Energy system efficiency
6. When a VO_2 max value for a client is determined the ideal training zone for the client would involve multiplying the VO_2 max value by _____ for optimal training intensities:
 - A. 30-50%
 - B. 50-70%
 - C. 60-80%
 - D. 70-90%

7. One MET equates to _____ of oxygen utilization.
- A. $1.5 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$
 - B. $2.5 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$
 - C. $3.5 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$
 - D. $4.5 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$
8. Steady-state heart rate means no variation in heart rate by more than:
- A. 3 beats per minute
 - B. 5 beats per minute
 - C. 7 beats per minute
 - D. 9 beats per minute
9. What is an inherent problem with accuracy of max run test for estimating VO_2max ?
- A. Heart rate max is not reached
 - B. Effort defines outcome validity
 - C. Most people cannot run 1 mile
 - D. All of the above
10. Tests used to calculate VO_2max should be selected based on:
- A. The client's preference
 - B. The trainer's preference
 - C. The client's abilities
 - D. The general simplicity of the test

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 | |



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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