

VT2 THRESHOLD ASSESSMENT PROTOCOL

The second ventilatory threshold (VT2) is equivalent to another important metabolic marker called the onset of blood lactate accumulation (OBLA), the point at which blood lactate accumulates at rates faster than the body can buffer and remove it (blood lactate >4 mmol/L). This marker represents an exponential increase in the concentration of blood lactate, indicating an exercise intensity that can no longer be sustained for long periods, and represents the highest sustainable level of exercise intensity, a strong marker of exercise performance. Continually measuring blood lactate is an accurate method to determine OBLA and the corresponding VT2. However, the cost of lactate analyzers and handling of biohazardous materials make it impractical for most exercise professionals. Consequently, field tests have been created to challenge an individual's ability to sustain high intensities of exercise for a predetermined duration to estimate VT2. This method of testing requires an individual to sustain the highest intensity possible during a single bout of steady-state exercise. This obviously mandates high levels of conditioning and experience in pacing. Consequently, VT2 testing is only recommended for well-conditioned individuals with fitness and performance goals.

Well-trained individuals can probably estimate their own heart rate (HR) response at VT2 during their training by identifying the highest intensity they can maintain for an extended duration. In cycling, coaches often select a 10-mile time trial or 60 minutes of sustained intensity, whereas in running, a 30-minute run is often used. Given that testing for 30 to 60 minutes is impractical in most fitness facilities, personal trainers can opt to use shorter single-stage tests of highest sustainable intensity to estimate the HR response at VT2.

In general, the intensity that can be sustained for 15 to 20 minutes is higher than what could be sustained for 30 to 60 minutes in conditioned individuals. To predict the HR response at VT2 using a 15- to 20-minute test, trainers can

estimate that the corrected HR response would be equivalent to approximately 95% of the 15- to 20-minute HR average. For example, if an individual's average sustainable HR for a 20-minute bike test is 168 bpm, his or her HR at VT2 would be 160 bpm ($168 \text{ bpm} \times 0.95$).

This assessment is best performed using HR telemetry (HR strap and watch) for continuous monitoring. Individuals participating in this test need experience with the selected modality to effectively pace themselves at their maximal sustainable intensity for the duration of the bout. In addition, this test should only be performed by clients who are cleared for exercise and ready for Performance Training.

Pre-assessment procedure:

- ▶ Briefly explain the purpose of the assessment, review the predetermined protocol, and allow the client the opportunity to address any questions or concerns.
- ▶ Take the client through a light warm-up (2- to 3-out-of-10 effort) for three to five minutes, maintaining a heart rate below 120 bpm.

Assessment protocol and administration:

- ▶ Begin the assessment by increasing the intensity to the predetermined level.
 - Allow the individual to make changes to the exercise intensity as needed during the first few minutes of the bout. Remember, he or she needs to be able to maintain the selected intensity for 20 minutes.
- ▶ During the last five minutes of exercise, record the heart rate at each minute interval.
- ▶ Use the average HR collected over the last five minutes to account for any cardiovascular drift associated with fatigue, thermoregulation, and changing blood volume.
- ▶ Multiply the average HR attained during the 15- to 20-minute high-intensity exercise bout by 0.95 to determine the VT2 estimate.