



ORTHOSTATIC TEST - Heart Rate Variability

SUMMARY SHEET

Test Procedure

It is best to first establish several baseline measurements of heart rate fluctuations during the orthostatic test, to allow future tests to be compared. It is important that this series of baseline measures are taken in a fresh state, and therefore it is recommended that you use a recovery week to establish these baseline values.

This test should be conducted just after waking in the morning. You need to repeat your routine before lying down to perform the test. A routine could mean, going to the toilet first or going straight from bed and then standing on the floor. Set your heart rate monitor to the R-R interval and start recording your HR once your laying HR has reached a steady state.

The room must be quiet to prevent any sudden increase in epinephrine (adrenalin) and thus heart rate. The athlete must lie down on the floor for 3 minutes resting peacefully and fully relaxed. After the 3 minutes the athlete should stand up slowly. The athlete should then stand in that position for the following 2 minutes, before stopping the heart rate recording. The whole 5-minute test should be recorded using your heart rate monitor on the RR setting.

Physiological Background of the Orthostatic Test

The basis of the test requires the athlete to lie down for 3 minutes and then stand up for 2 minutes while the heart rate is recorded. Lying down to a standing position produces changes in gravitational forces. This creates a head to foot hydrostatic pressure gradient within the cardiovascular system. The hydrostatic gradient causes a redistribution of blood into the compliant veins of the lower limbs creating a lower body negative pressure (LBNP). Venous pooling ensues resulting in the sequential reductions in central venous pressure, end diastolic pressure (cardiac filling), stroke volume and cardiac output. Put simply, lying to standing creates a change in blood volume redistribution in the venous system. It is the lack of sensitivity responses to various reflex components (sympathetic and parasympathetic responses) of the cardiovascular system to maintain arterial pressure which is of great importance.

Dehydration, stress, illness and overtraining will affect orthostatic tolerance.

However, it appears that the RR interval mode can also provide greater information in the heart rate variability responses to the change in blood pressure.

Using current methods of analysis it is also possible to gain a detailed look at the actual variability during the laying and then the standing periods. The lying period is believed to be dominated by the parasympathetic nervous system (PNS) with sympathetic nervous system (SNS) withdrawal, but when we stand quickly, the SNS must snap into action to compensate for the change in blood pressure and redistribution of blood volume. What this means for us is that we can measure the input from the autonomic nervous system during the overall period, and track the changes over a training cycle.

Individual differences

Sometimes an athlete may show signs of a low tolerance to orthostatic stress. This is quite normal. You can feel dizzy or even faint as a response to the altered blood distribution and slow reflexes of the central nervous system. Therefore, results must be considered in light of what is referred to as a normal or a reference orthostatic. This reference orthostatic should be taken during a given unloading period for that individual when they are reasonably recovered. Certain amounts of training and life stresses can also present an abnormal orthostatic test. However after a few days of quality recovery, the orthostatic test should return to what is considered a normal level.

The ability to resist intolerance to orthostatic conditions can also depend on the unique individual response of the cardiovascular reflex mechanisms. These individual differences, including a genetic component to the orthostatic stress, must be a considered when interpreting the response to the test.

These individual differences also affect heart rate variability when under different levels of stress and fatigue. Therefore it is very important to establish a baseline measure over 10-14 days of easy training, allowing future tests to be compared to this period.

Initially, more tests undertaken over consecutive days, during periods of both low and high stress, allows a more detailed individual profile to be established. This means that future analysis and feedback can be more accurate and more detailed.

If you have any further questions please contact bwisbey@endurancetraining.com.au