Suunto t6 Heart Rate Monitor Review

When it comes to heart rate monitors Polar has been the international leader for many years. Many of us have been devoted Polar users and realise the benefits on their reliable products, wide range of tools, and effective software. However, with a new player on the market, things are getting interesting. Suunto released their t6 heart rate monitor earlier this year. Since then it has received a lot of attention worldwide due to some of the unique functions it has to offer.

Suunto have not only managed to develop a great heart rate monitor, but they have also worked closely with Finnish sports science organisation, First Beat Technologies, to develop software that allows the analysis of detailed physiological variables to be assessed upon downloading heart rate data to PC.

The Finns have been the leaders in heart rate variability assessment for many years now, and are now focusing their energies on analysing the exercise recorded RR interval data (time between individual heart beats).

Why is the Suunto t6 unique?

Many heart rate monitors are available on the market, including many with the ability to download data to PC. However, only a couple of monitors are capable of recording and downloading RR interval data. Until this year the Polar S810 has been the only heart rate monitor capable of undertaking this function, meaning that if you want to assess heart rate variability, then there has only been one option.

The t6 offers similar functions to the Polar S810 in that it can record RR data. There are several differences between the two models however, with the t6 having a much greater memory and therefore the ability to capture a large amount of exercise recorded RR data. However, the main difference is in the software, and how it uses this information to provide feedback. While the Polar software offers a great number of functions, it offers no means of analysing and interpreting exercise based RR data. This means that any use of the recorded data has to be through your own methods of analysis.

Through research trials, First Beat Technologies have established a relationship between RR data and a range of key physiological variables that can assist in post training session interpretation. The key variables assessed in the software include:
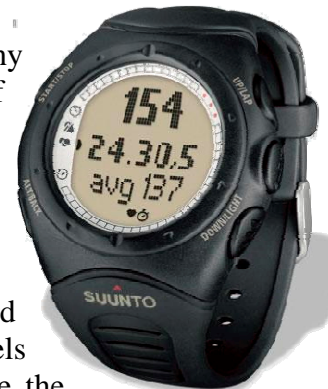
- EPOC (Excess Post-Exercise Oxygen Consumption)
- VO2
- Respiration rate
- Ventilation

What does this mean?

With the availability of this information not only will you be able to assess heart rate as a means of monitoring your session, but you will also be able to see how effective the session was in stimulating the required response. By determining VO2, you will be able to more accurately see the load on the body during different sessions and whether you are actually hitting the mark in regards to achieving your session goals.

However, the big breakthrough has really come in assessing EPOC.

What is EPOC?

After cessation of exercise, VO_2 doesn't immediately return to resting levels, rather, VO_2 makes a gradual decrease even though energy demands are only at resting levels. Oxygen consumption during the exercise recovery is above what is needed to maintain the resting metabolic rate. The term excess post-exercise oxygen consumption, or EPOC, is used to describe the elevated VO_2 during recovery, and the amount of EPOC is usually greater than the amount of the O_2 deficit. After exercise, the body is thought to pay back the O_2 debt along with some extra.

The software accompanying the t6 predicts EPOC throughout the session based on the load currently undertaken.

EPOC is being advertised as a great means of tracking training load or session demand. From our experience it is a useful means of assessing the load or demand of intensity sessions, and therefore training effect. For longer aerobic sessions however, EPOC is not a good indictor of overall load when used in its current form.

In order to allocate session EPOC, the software determines your predicted EPOC at every point throughout the session, and uses the highest value as your overall load.

Is it accurate?

Coming from a scientific background ensures that the scientists at First Beat Technologies have attempted to create an accurate means of determining physiological variables based on RR data. The research conducted into this area shows that there is good scientific backing for such a system.

There is no doubt that the measurement of heart rate is accurate just as it is with all the Polar heart rate monitors, however the use of an algorithm to determine the likes of

EPOC and VO2 based on recorded RR data means that these variables may not be accurately determined in all instances.

All these variables are assessed post session based on the recorded data and pre-inputted individual characteristics. Therefore in order to get accurate assessments you need to know your VO2 max and maximal heart rates.

In order to get an idea of how accurate this data was in comparison to laboratory recorded data, we undertook a case study comparing actual lab results to what was predicted from the Suunto software. This showed a discrepancy of about 5% between actual and estimated VO2 values, however we did see a similar progression in both VO2 curves throughout the course of the incremental test.

Even if the accuracy of these physiological variables is not 100%, they are all still relative. This means that a good comparison can be made on an ongoing basis between sessions for any individual.

One thing that we did not like about the software was it's methods of determining session load. Using peak EPOC appeared to be a good method for the intense sessions but did not provide accurate information for long endurance sessions, and all sustained efforts with a long recovery. For this reason FitSense Australia is currently manipulating EPOC data to determine area under the curve as opposed to the peak value.
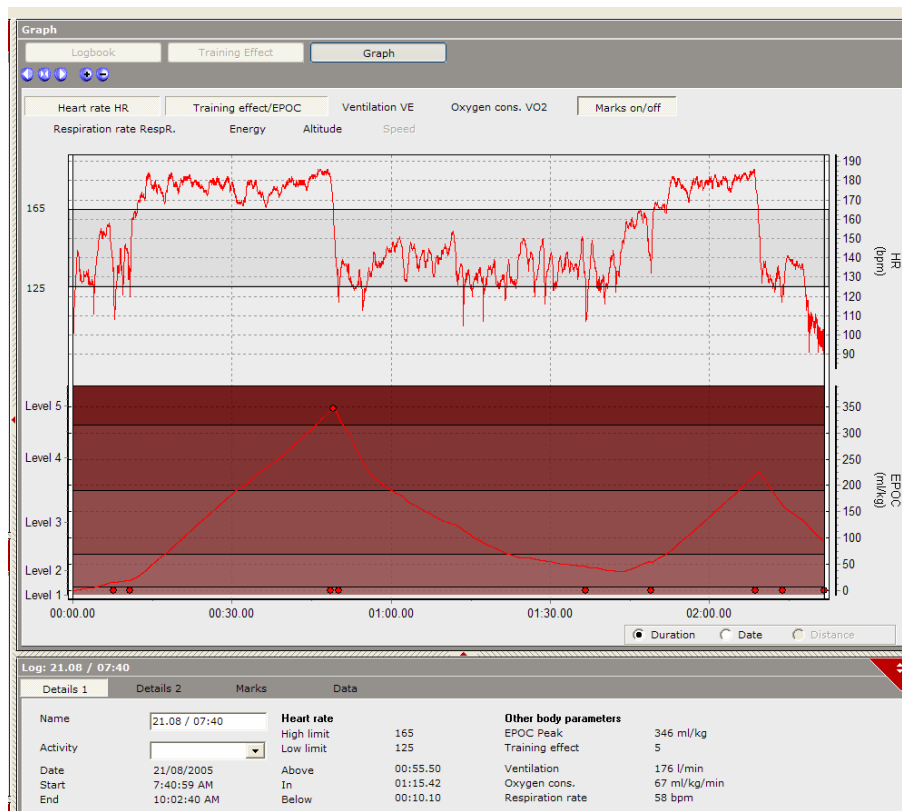

Figure 1. HR and EPOC curve showing that the second effort after a long recovery did not increase session EPOC measure.

Practical use of the t6.

Enough of the scientific jargon, how can the Suunto t6 used in a day to day training.

During training the Suunto t6 is similar to using a normal heart rate monitor. It is small, comfortable and provides HR feedback, lap splits, count down timers etc. and uses several customised display options.

The real difference between the t6 and other heart rate monitors is noticeable when you download the data. It uses a fool proof download method and the package comes with the software and USB interface, and calculates a range of physiological variables upon download.

Outlined in Figure 2 is a screenshot of the data presented after a running session. From this information we can see a consistently high, but variable VO2 (~86-93% of max, see second graph from bottom in figure 2) during the 20x1min efforts. An easy walk period is also evident during the short recovery after the 10th effort. Steady state VO2 was not reached in the 11th effort (after the walk) but all subsequent efforts result in steady state VO2 being achieved due to the short recovery. We can also see recovery being impaired between the later efforts, although goal VO2 was still being achieved.

Looking at EPOC we can see quite a rapid increase during the series of efforts. Due to the short recoveries, EPOC does not have the opportunity to decrease during this period. The EPOC of 225 ml/kg reached at peak indicates that this session was quite intense given that there was only 20 min of hard running. This resulted in a training level of 4, as indicated by the software, however it is unlikely that an intervals session is going to reach a higher level. Level 5 is often only seen during races, or long hard intervals sessions.

From the altitude profile we can see that the run was quite flat, especially during the efforts. The only real climb occurred in the warm-up, and this was minor, with minimal overall ascending occurring.

Figure 2. Session file showing HR, EPOC, VO2, and altitude.

In Figure 3 below we can see both session duration and peak EPOC tracked over 6 weeks. Looking at the EPOC chart (top chart) we can see 3 sessions getting an EPOC of 300+ ml/kg. In this instance they were all races (8-10km running events) and show that each posed a severe load on the body. Key intervals sessions also stand out, being those that cause a level 4 EPOC response. The training cycles are evident, predominately highlighting hard/easy cycles. A series of easy days can also be seen after the 2 more intense races.

The bottom graph in Figure 3 shows session duration. This provides a good measure of endurance load, and in conjunction with EPOC an assessment of overall load can be determined. From this it can be seen that there is no connection between session duration and recorded EPOC.
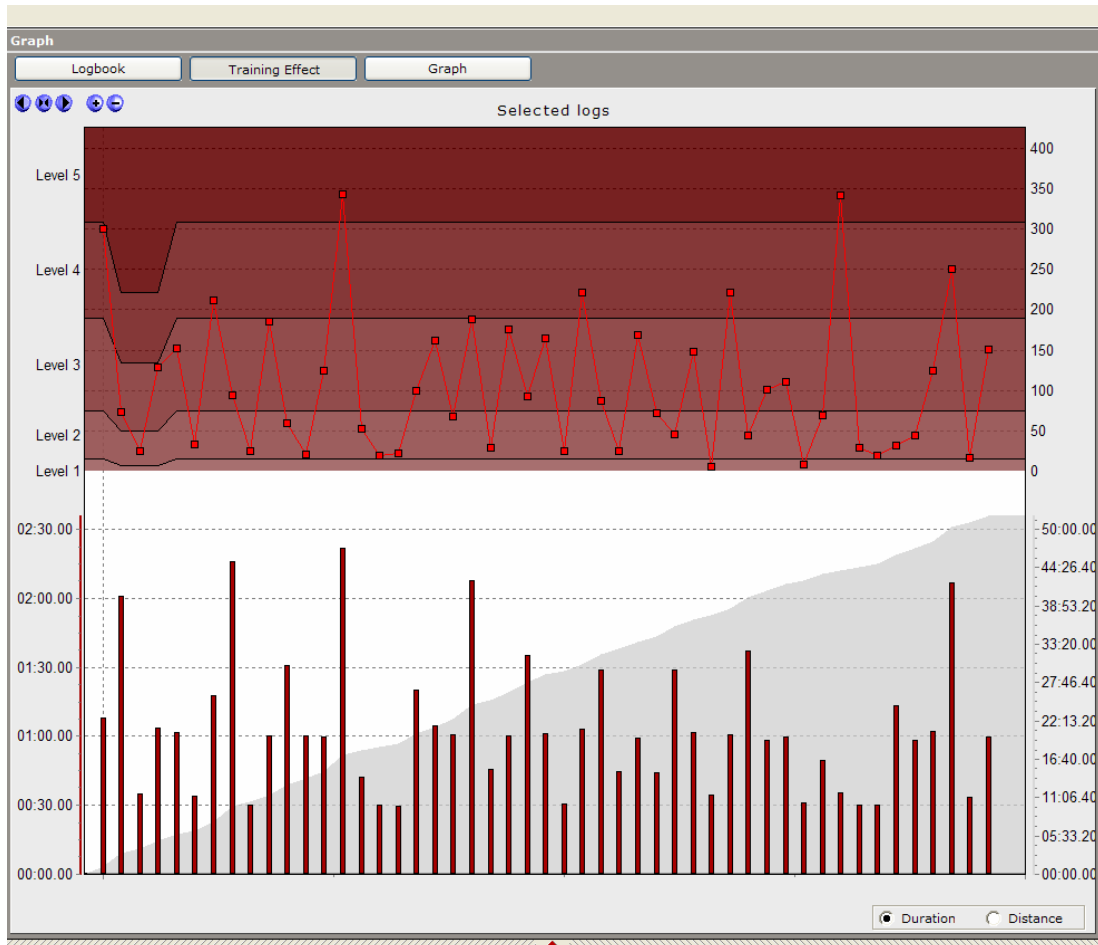
Figure 3. Charts showing session load. EPOC on the top graph giving a measure of load in intensity sessions, and duration on the bottom graph giving an indication of endurance load.

Additional t6 functions

The Suunto t6 is also compatible with the number of optional add-ons.

For cyclists a speed sensor is offered that sends a wireless signal straight to the monitor, while runners have the option of a foot pod which uses an accelerometer to measure speed.

Altitude and temperature is also recorded, with all these variables able to be viewed during training and downloaded to PC.

One unique function developed specifically for team sports is a wireless link between the heart rate transmitter and a laptop.   This telemetry system allows live heart rate information to be viewed and recorded for up to 30 athletes at once, with a range of 100m. This system is available next year and will offer sporting teams and group training coordinators a new dimension to feedback.

Summary

Heart rate monitors have a place as part of any physical training program, and can be especially beneficial for endurance athletes. However, they are by no means essential and many well performed athletes prefer to steer clear of them. The functions of the new Suunto t6 make a much stronger case for the use of a HRM in training.