Heart rate monitor terms explained

Our cut-out-and-keep series to assist retailers with product knowledge

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A heart rate monitor is all about effective exercise. To make an exercise routine count, you need to exercise at the correct intensity to achieve your goals – whether you want to get fit, lose weight, or prepare for the next Comrades Marathon. A heart rate monitor (HRM) tells whether you are doing too much, too little or just enough to achieve your goals.

But, nowadays, heart rate monitors (HRM) do much more than monitor exercise levels – they double up as coaches or personal trainers, training aids for specific sports and even help outdoor enthusiasts to enjoy their activities in safety.

It is therefore not only an essential tool for the serious athlete, but also a handy accessory for the enthusiast starting out with all the right gear.

Just about every sport or outdoor retail customer can benefit from using a HRM – whether a runner, cyclist, hiker, rower, swimmer, soccer, rugby, cricket or netball player, gym trainer … the list is endless. Any member of the retail sales staff should therefore be familiar with the basic HRM terms in case they have to explain it to a customer.

Heart Rate Target Zones

The heart rate is a reflection of exercise stress. The two factors that determine your heart rate are the energy and oxygen demanded by the exercising muscles. As different muscle groups are used in different sports, typically the maximum heart rate may vary from one sport to another.

For example, swimming has the lowest weight bearing strain so it is the least likely to drive the heart rate high. Cycling has more of a gravity strain and so is a bit easier to drive the heart rate up, whereas running has the highest strain factor on the body relating to weight, accordingly it pushes the heart rate the highest.

Maximum heart rate refers to the highest rate your heart can achieve under exertion. It is individual and depends, among other things, on your age, genes and the size of your heart

– but it is not a direct indicator of your fitness level. It is recommended that you train at a pace where your heart rate does not exceed 80%-85% of your maximum heart rate.

The most basic way of calculating the maximum heart rate is to use the formula 220 beats per minute (bpm) for men, 226bpm for women, minus your age. This is however a very simplistic formula. Others recommend the formula 217bpm – (0.85 x age) as a suitable maximum heart rate calculation.

Resting heart rate (just as the name implies, measured when you are resting) is also very individual and usually gets lower as you get fitter.

Target heart rate zone: your customer will use his or her HRM to ensure that s/he exercises within their own target training zone, depending on the activity or goal you want to achieve. The target zone is calculated by multiplying the maximum heart rate with the training zone percentage he wants to achieve (see below).

Training zones

Training zones can be established in relation to the maximum heart rate, depending on your goals, what exercises are being performed and the required intensity and duration.

Warm up: 50-60% of maximum heart rate. This will be the target zone for serious athletes warming up before starting actual exercise, or for people just starting a fitness programme. Even though the level of exercise is relatively low, it will help decrease body fat as most calories burnt at this rate are fats.

Fitness Zone: at 60-70% of maximum heart rate, exercising at this rate burns more calories, most of them fat.

Aerobic Zone: exercising at 70-80% of maximum heart rate improves your cardiovascular and respiratory system and is the preferred zone for athletes training for an endurance event.

Anaerobic Zone: at 80-90% of maximum heart rate you aim at high intensity training. Benefits of exercising in this zone include improved endurance and a better ability to fight fatigue. It results in an improved VO2 maximum (the highest amount of oxygen one can consume during exercise) and thus an improved cardiorespiratory system, and a higher lactate tolerance ability.

Maximum Effort: most people can only stay in the 90-100% of maximum heart rate for short periods and it is recommended that only the fittest, cleared by a doctor, push themselves to this intense level.

Different models

The **basic HRM** will record your heart rate with a transmitter (usually a belt worn across the chest) on a receiver (usually in **To p54**

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the form of a watch). It allows the user to set his own heart rate zone limits (see below) and have alarms that go off when he exercises under or over his zone targets. It also allows the user to set the exercise intensity level.

The most popular HRM is the **intermediate model** that records additional functions like speed and distance, rest and recuperation, or training in a heart rate zone set for a specific exercise outcome. Many models have additional specific sport-specific functions. It will have memory recall to compare exercise sessions and can download and analyse the information on a computer or mobile application.

The advanced model will also be able to export data to send to coaches/training institutes in real time and post event. Typically, this would be the type of unit that sports scientists and elite coaches use to analyse the data in order to change the exercise programme of an athlete, and will not really be in demand by retail customers.

A chest strap transmitter is very accurate as its reading is based on the electrical discharge from the heart, and is easy to use. There is low interference, it is wireless and leaves the hands free to participate in activities. It is worn so that the transmitter sits directly over the solar plexus and the 'contacts' (areas that receive the heart rate) are in contact with the skin just below the chest/pectoral area.

The finger sensor, which records pulse, can be impeded by muscular activity and the accuracy is often very low in a high intensity arena.

Different needs

Losing weight: A customer wanting to exercise to lose weight and generally become fitter will not require more than a basic model. If your customer's aim is to lose weight, high intensity exercise is not a good idea and they should aim for mid- to low intensity exercise (60-70% of maximum heart rate.

Runners/cyclists/triathletes: These athletes will appreciate functions from intermediate models like speed and distance accessories; GPS data plotting and mapping functions, etc. Some new integrated HRMs can share mountain bike routes.

Athletes training for a demanding sport like triathlon will be warned by their HRM if they over-train. Cyclists need a HRM that is clearly visible, simple to read and have the addition of speed and distance data.

Hiking and trail running: Additional HRM functions that will greatly assist a hiker or trail runner are altitude data like the rate of altitude gain or loss; barometer data that predict weather conditions; storm alarms to warn of likely storms in the area; a compass, especially when in uncharted areas or in conditions that remove all reference points; sun rise and sun set – knowing when it will start getting dark will assist a hiker to plan their hike safely when planning night stops etc.

Swimming: When swimming one is constantly moving one's arm and it is thus difficult to monitor the heart rate. Swimmers generally monitor heart rates while recovering. A digital heart rate signal (found in the top end units) is limited in water as water molecules interfere with the digital frequency.

Measuring Progress

VO2 max: Not many heart rate monitors are able to calculate or test fitness. There are, however, some HRMs that are able to predict VO2 max, which is a measure of aerobic fitness. This is done by measuring heart rate variability during a rest test.

The goal over time is then to improve the fitness test result through consistent exercise at the appropriate intensity. Without the option of an integrated fitness test, a good measure of progress is being able to deliver more at the same intensity.

For example when starting an exercise programme, you may only be able to walk the hill at a heart rate of 140 beats per minute (bpm). As your fitness improves you may then progress to a slow jog at 140 bpm up the same hill and finally, to be running that hill at the same intensity/heart rate.

Troubleshooting

No signal, or an erratic signal, can be caused by one of the following:

- The incorrect positioning of the transmitter belt;
- Low battery power in either the transmitter or receiver;
- Lack of *pairing* of transmitter with the receiver – re-enter the heart rate zone data;
- Electromagnetic fields from power lines, computers, televisions or mobile phones may interfere with the transmitter's signal;
- An erratic reading could also be a physiological response to various issues, like stress, illness, etc.
- The product may be broken or damaged and must therefore be replaced.

Some key HRM terms

Aerobic threshold: The highest performance level, heart rate or speed at which your muscles are not forced to produce energy anaerobically (without oxygen). Most endurance training is best done at an intensity lower than, or just below, the aerobic threshold, i.e. at a low intensity

Anaerobic threshold: Intensity, heart rate or speed above which the anaerobic energy production in your muscles increases to a level at which more lactic acid is generated than is removed. Training at the anaerobic threshold, or just below it, improves endurance and aerobic energy production capacity.

Heart Rate reserve: The difference between your maximum and rest heart rate.

Heart Rate variation: The variation in time between heartbeats, which is affected by training and stress. The variation of a well-conditioned and rested heart is high at rest.

Maximum oxygen uptake or VO2 Max: Your system's ability to take in oxygen, transfer it via circulation, and utilize it in your muscles for energy production. This depends on genetics to a very high degree, but can be significantly improved by endurance training.

Recovery heart rate: The rate of recovery is a very good measure of fitness and/or progress in exercise. The faster your rate of recovery, the fitter you are. The rate of recovery is normally measured by how long it takes for the heart rate to drop to a predetermined recovery heart rate.

Sampled memory: Some models store training information every 1 second, 2 seconds, 5 seconds, 15 seconds or 60 seconds. This is then used to plot data curves in training analysis software for sports performance units.

Summary memory: Daily or weekly feedback on, for example, time spent in target zone(s), energy expenditure, exercise duration and other exercise parameters. It is normally in the form of an exercise or training dairy.