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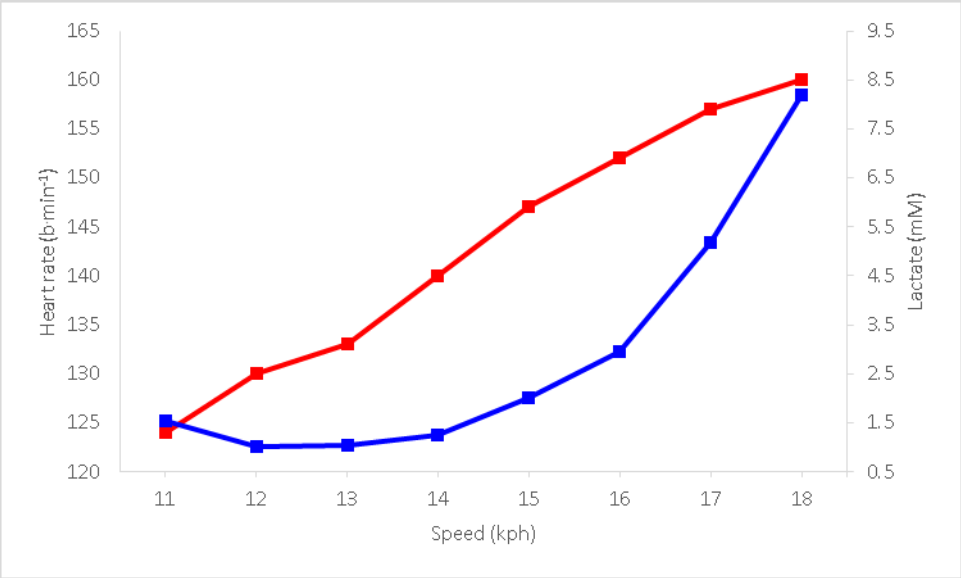
Test results summary

Lactate threshold	**12Kph, HR 130b·min^{-1}, La 1.0mM**
Lactate turn-point	**16Kph, HR 152b·min^{-1}, La 2.9mM**
Heart rate max	**161b·min^{-1}**
VO_{2max}	**62.9 ml·kg^{-1}·min^{-1}**



Blue line is lactate and red line is heart rate

Lactate threshold – LT1

The lactate threshold indicates the point where lactate first begins to rise and appear in your blood and muscles. This point is considered to be a very good indicator of marathon performance. For you this point occurs at a speed of **12kph** and an associated HR of **130 b·min^{-1}**. This point reflects the level of aerobic base as developed through a combination of continuous steady and interval work.

The 10k and marathon events are clearly reliant on aerobic ability hence a good aerobic base is required in order to perform well in these events. In terms of the marathon and half-marathon running that you do there needs to be a solid foundation of base on which to build all of the other training sessions without this firm foundation there will be a collapse in your performance. As you continue your athletic development this point will shift to the right on the lactate-speed graph and may be associated with a lower lactate concentration. This point also represents the end of recovery training and the onset of steady base work.

Lactate turn-point – LT2

The lactate turn-point represents the running speed at which there is a sudden and sustained increase in the lactate levels within your muscles and blood. For you this point corresponds to a speed of **16kph** and a HR of 1**52b·min^{-1}**.

The lactate turn-point determines the point from where the energy supply starts to be predominated by anaerobic metabolism. The further beyond this point the greater the reliance on anaerobic fuels as the source of energy. In order to work at intensities beyond LT2 you need to consider both aerobic development and lactate tolerance. LT2 is shifted through a combination of both steady continuous work and intervals. The intervals have the greatest effect, but only if a sound aerobic base has already been developed. The lactate tolerance is enhanced by the intervals and the exposure of the muscle to the acidic environment. The difference between LT1 and LT2 refers to your aerobic capacity and so defines the steady (**S**) zone of training. A critical point for success in endurance running is the %VO_{2max} associated with LT2. The higher this points occurs the better as this highlights the aerobic range over which you can work. Anything in excess of 85% VO_{2max} is considered promising and reflects the levels seen in elite runners.

Running economy

Running economy refers to how much energy you have to use to run at a particular speed. The more energy that you use, measured as VO_2, the less economical you are. Running economy is a complex component of endurance physiology and is influenced by such factors as biomechanics, running surface, flexibility and aerobic physiological adaptations. A standard maker that is used for the assessment of economy in male runners is the oxygen cost (VO_2) at a fixed speed normally 16kph (6min·mile pace). For you this equated to **53.8 ml·kg^{-1}·min^{-1}**. In comparison to elite athletes who have an O_2 cost at 16Kph of between 44 and 47ml·kg^{-1}·min^{-1}. We can further interpret the running economy in relation to the oxygen cost per kilometre of distance covered. A typical value for an endurance runner irrespective of speed is 200 ml·kg^{-1}·km^{-1}, at 12Kph you scored **201.8ml·kg^{-1}·km^{-1}**. This implies that you have a very good aerobic base (LT1-LT2) and that economy is strong, but that

more of an emphasis should be placed on work at LT2 and also in the tempo zone to reduce the oxygen cost and enhance your sub-maximal economy.

Maximal aerobic power (VO_{2max})

VO_{2max} is a measure of the maximal amount of oxygen you can take up from the air and consume aerobically. It represents the primary measure of cardio-respiratory power and fitness. Your VO_{2max} was calculated to be **62.9ml·kg^{-1}·min^{-1}**. Anything in excess of 65 ml·kg^{-1}·min^{-1} is considered to be excellent.

Although VO_{2max} is no longer considered a criterion measure for endurance performance it is still an important determinant of cardio-respiratory fitness and development. This denotes your upper workload intensity. There is little doubt that to be a decent endurance athlete VO_{2max} has to be >65ml·kg^{-1}·min^{-1}. The relevance of VO_{2max} declines as the distance increases, so at present it could be argued that VO_{2max} is of reasonable importance to your performance profile. VO_{2max} responds positively to training and the best enhancements occur following interval training which is conducted at and around VO_{2max}. However as has been mentioned previously interval training is only successful when a firm aerobic base has been developed. The other issue to consider with VO_{2max} is that of recovery. The ability to recover either from a session or between reps is dependent on your ability to consume oxygen effectively. Hence recovery is dictated by VO_{2max}.

Determination of training zones

The graph provided shows how the lactate data has been used to construct a series of discrete training zones. The four training zones identified are: easy running (E); Steady running (S); Tempo running (T) and Interval running (I). Each zone corresponds to HR limits based on the data. For you the Easy zone (E) is at a speed of less than **12kph** and with a heart rate of less than **130 b·min^{-1}**. Steady running (S) should be conducted at a speed of between **12 and 16kph** with heart rates of between **130 and 152 b·min^{-1}**. Tempo running (T) is between **16 and 17kph** with heart rates of between **152 and 157 b·min^{-1}**. Interval work should be conducted at a speed greater than **17kph** and with a heart rate higher than **157 b·min^{-1}**. Your aerobic base runs should be conducted at the upper end of the easy zone (E) and the lower end of the steady zone (S). So longer runs at the lower speeds in the **S** zone and shorter steady runs at the higher speeds in the **S** zone.

Kind regards

Dan Gordon