



Introduction to Sport, Fitness & Management

Sport: Fitness Testing

Shelly woods

You're basically up with the best in the world in terms of performance, elite level really. You're training six days a week, out there in all weathers, putting your body through all sorts of things so it's hard.

Karl Nicholson

It's always been the case that the sport comes first before anything, you know, the lifestyle of it, the nutrition, the training, the regime of it, all the going away and doing competitions, preparing for them it's always just been, you know, since the age of sort of 17, it's always been there for me.

Commentary

Whether athletes are competing in a marathon or a shorter race, a certain amount of endurance is required. To help develop this component, athletes undergo a series of fitness tests throughout the year.

On screen text: Dr Andy Middlebrooke Exercise Physiologist

Andy Middlebrooke

We try to test the athletes roughly four times a year and we try to time those testing occasions to the different phases of their programmes so typically we'd see a testing occasion in off-season or in their general preparation phase, we'd see one during the specific preparation phase, one during pre-competition and one during competition phase so we get a very clear picture of how their physiological response is changing over the year. We can then compare that year with previous years to see if there's any season on season improvement in performance.

Commentary

One test that is performed throughout the year is the VO₂ max test. Developed in the 1920's this helps to define an individual's aerobic limit, the maximum amount of oxygen that an athlete can use during exercise.

On screen text: Shelly Woods Paralympic Athlete

Shelly Woods

It tests your engine, how hard your lungs and your heart are working when you're being pushed to the maximum and basically it's just pushing yourself to the absolute limit.

Andy Middlebrooke

It allows us to look, to explore their aerobic function and to determine whether there're any training adaptations occurring within their aerobic function whether

there're any possible impairment that we need to look at, whether there's been a decrement in their aerobic function over time and whether there's anything we need to look at early on. By being able to do this sport science test and being able to look at the, essentially the engine of the athlete without the effects of external factors such as track conditions, such as wind resistance we're able to isolate the engine and find out whether the engine is actually performing to its potential.

Commentary

The test begins with the athlete performing a series of sub maximal stages which usually last around 4 minutes.

On screen text: Karl Nicholson Paralympic Athlete

Karl Nicholson

You'll get warmed up and the load will increase every three or four minutes so the load on the wheelchair, on the wheels, the resistance, will increase every three four minutes.

Andy Middlebrooke

We will increase the workload and when you increase workload you'll increase the amount of oxygen that person requires to power the muscles to actually perform that work. So the amount of oxygen the person uses increases and increases and increases all the time and when at the very end of the test they'll be in a situation where the person can't take in and utilise any more oxygen, that point is classified as their VO₂ max.

Commentary

After each stage, a blood sample is taken. This allows the physiologist to chart the increase in blood lactate and identify the lactate threshold as the turning point where there is a disproportionate increase in lactate during exercise.

Andy Middlebrooke

If you are continuing exercise, which isn't being completely met by the consumption of oxygen then you will steadily accumulate lactate in the blood. This typically happens as you increase the exercise intensity and so we can see lactate increasing, as the exercise intensity gets harder. The identification of the lactate threshold is a useful marker to look at training responses. Typically what we find is that with exercise training that the lactate threshold occurs later in exercise.

Commentary

Once the lactate threshold is identified the work load increases every minute until they reach their maximal oxygen consumption.

Shelly Woods

Your muscles start to get really heavy, full of lactic acid, sometimes you might start to get a bit dizzy, it's just basically like you're just reaching the maximum and you can't really go any more right to the end, your breathing gets faster, your heart rate gets faster and probably sometimes you feel a bit sick.

Commentary

The VO₂ max is the ultimate stage, the final thirty seconds of the test where an individual is unable to utilise any more oxygen.

Karl Nicholson

You go on until your muscles will not work anymore. You know you're zoned out completely. You're just not aware of what's going on, all you're aware of is how hard you are pushing.

Andy Middlebrooke

For some people they will not demonstrate a plateau in oxygen consumption, they may just simply demonstrate a peak in their oxygen consumption and therefore we need other criteria to be able to say, we are categorically certain that that person has achieved their maximal efforts. Such variables we may be looking at, things like heart rates, like their respiratory exchange ratio and looking at their actual physical characteristics.

Commentary

Once the VO₂ max test is over it's time to cool down. Then the test data is shown to the athlete and their coach. This can then be used to improve training in the shortest possible time.

Andy Middlebrooke

The data is tabulated and graphically represented, they can themselves then see any seasonal trends in their performance for instance whether their body weight is at its lowest during the competitive phase each season and so they know where they should be to improve upon the previous season's performance.

Shelly Woods

It's very personal because you kind of going from your results when you last did the test and obviously you want to improve on those results and you don't usually know what all your competitors are doing anyway. It's not that kind of information you find out so it's kind of going against your last results and you wanting to better them as well.

Commentary

The VO₂ max test is possibly the most robust and best single indicator of somebody's aerobic capabilities. However, in order to continue maximising an athlete's performance the test must be regularly monitored and assessed.

Andy Middlebrooke

For many of these athletes at the elite end of the sport, we're not looking at improvements of 1-2% can mean the difference between achieving a gold medal at the Olympics and finishing last so what we need to do is to try pick out all the parts of their physiology that may well contribute to their performance and see if we can assess and actually impact upon their training programme to improve all the factors which improve their performance.