

## Smoking and Fitness

It is a well-known fact that smoking reduces fitness. It does this in a number of ways, chiefly by reducing the amount of oxygen available in the body. Since oxygen plays a major role in energy production, even a minor depletion has an impact on physical performance.

### MAJOR EFFECTS OF SMOKING ON FITNESS

David Pyne, an Australian sports physiologist, lists the major effects of smoking on the body's respiratory and circulatory system as follows:

- High levels of carbon monoxide from smoking reduce the amount of oxygen absorbed into the blood from the lungs.
- Carbon monoxide in the blood also reduces the amount of oxygen that is released from the blood into the muscles.
- Smoke inhalation has an immediate effect on respiration, increasing airways resistance and therefore reducing the amount of oxygen absorbed into the blood.
- Smoking causes chronic (or long term) swelling of mucous membranes, which also leads to increased airways resistance.
- Smoking increases the heart rate for a given level of exercise.

### CARBON MONOXIDE – THE MAIN OFFENDER

Carbon monoxide, the same lethal gas that is released by motor vehicle exhausts, is present in cigarette smoke and is absorbed rapidly into the bloodstream. The mechanisms by which it does this are as follows:

- Once it leaves the lungs, oxygen is transported in the blood by attaching to the haemoglobin within red blood cells. Oxygen has a great affinity for haemoglobin. However, carbon monoxide has a much greater affinity (200 to 300 times greater than oxygen) and so binds preferentially to haemoglobin.
- Therefore, as the level of carbon monoxide in the blood increases, the level of oxygen decreases.
- Raised levels of carbon monoxide in the blood also impair the release of oxygen from the blood into the cells. This has a significant effect on heart and other muscle cells where there is a high demand for oxygen.
- Blood levels of carbon monoxide from smoking can also produce distortions of time perception, psychomotor and visual impairment and negative effects on cognitive skill.
- Oxygen is important for the functioning of all energy systems in the body, so any mechanism which interferes with oxygen transport and uptake interferes with energy production and therefore sports performance.

### AIRWAYS RESISTANCE

Inhaling cigarette smoke results in airways resistance (narrowing of air passages) in a number of ways:

- Inhalation of smoke from a cigarette can, within seconds, cause a two to three-fold increase in airways resistance, the rate at which air moves in and out of the lungs.
- Smoking also causes chronic swelling of the mucous membranes of the airways, which adds to airways resistance.
- When demand for oxygen is elevated, such as during exercise, this increased resistance is more noticeable. Reduced lung capacity can cause a smaller volume of oxygen to reach the alveoli, resulting in impaired gas exchange and less oxygen in the blood.
- The tar in cigarette smoke adds to airways resistance. This tar coats the lungs, reducing the elasticity of the air sacs, and resulting in the absorption of less oxygen into the bloodstream.
- Tar also affects the cleaning mechanism of the lungs, allowing pollutants to remain in the bronchial tubes and lungs. Increased phlegm and coughing, and damage to the cilia (the hairlike projections which 'sweep' pollutants out of the airways) are the result.

## EFFECTS ON THE HEART

The combined effect of carbon monoxide and increased airways resistance is to cause the heart to work harder in an attempt to compensate for the lack of oxygen reaching the muscles.

The nicotine in cigarette smoke also acts as a stimulant, increasing the heart rate and blood pressure, and decreasing the flow of blood through the blood vessels.

## EFFECTS ON ENDURANCE

Smoking reduces physical endurance, and impedes the improvement in physical performance in smokers compared with non-smokers. It also increases fatigue during and after exercise. David Pyne noted the following:

- While exercise training can increase maximal oxygen uptake by up to 20%, smoking can reduce this effect by up to 10%.
- In a recent study adolescents who had smoked for five days had an 8% reduction in endurance time compared to controls.
- Individuals who smoke are less likely to continue in exercise programs.
- A US study of more than 3000 naval personnel found smoking was detrimental to physical fitness even among relatively young fit individuals. The study also found smokers have lower physical endurance than non or ex-smokers.
- The same study found those who smoked undertook less physical exercise sessions each week than non or ex-smokers. They also exercised less time per session.
- An earlier US study found that smokers had higher levels of fatigue during both exercise and recovery. The authors believed this increased fatigue may explain why smokers are less likely to participate in regular exercise.

## PASSIVE SMOKING

Exposure to environmental tobacco smoke either before or during an event also impairs athletic performance.