

There are four guiding principles which apply to all fitness training. They are ...

↑ Bach.

1. Specificity

Training must be specific to ...

... the **SPORT** or **ACTIVITY** ...

... the **TYPE OF FITNESS** required ...

... the **PARTICULAR MUSCLE GROUPS.**



• Marathon runners do mostly ...
... **ENDURANCE WORK.**

• Swimmers exercise ...
... **'SWIM SPECIFIC' MUSCLES.**

2. Overload

Training must be raised to a higher level than is normal to create the extra demands to which the body will adapt. This can be done in three ways.

INCREASE THE INTENSITY ...

... by running faster, lifting heavier weights etc.



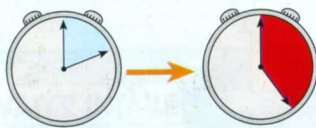
INCREASE THE FREQUENCY ...

... by training more often, 3 or 4 times a week.



INCREASE THE DURATION ...

... by training longer to prolong the demands.



FITT is an easy way to remember the first and second guiding principles:

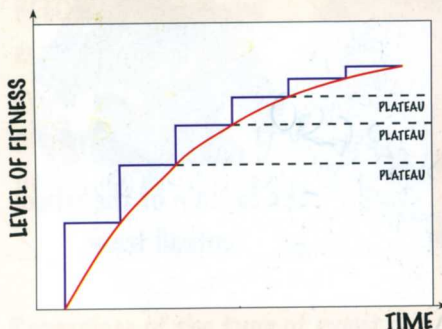
- F - Frequency (how often you exercise)
- I - Intensity (how hard you exercise)
- T - Time (how long you exercise for)
- T - Type (what exercises are suitable for your chosen sport)

3. Progression

As the body adapts to training it **PROGRESSES** to a new level of fitness.

Progress to the next level is achieved by a **GRADUAL INCREASE IN INTENSITY** to **CREATE AN OVERLOAD.**

A typical graph of **LEVEL OF FITNESS** against **TIME** would look like:

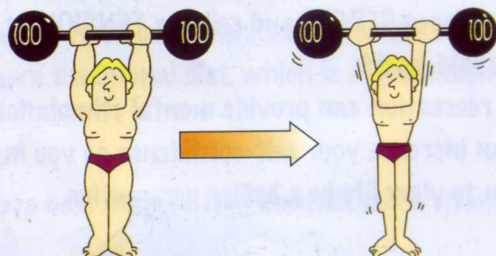


Three important points about the graph.

1. Most progress is made in the early stages.
2. At higher levels of fitness there is less progress.
3. A **PLATEAU** may be reached where further **PROGRESSION** to a higher level of fitness is difficult to achieve.

4. Reversibility

Training effects are reversible. If exercise is reduced in intensity or stopped altogether then the benefit can be quickly lost. Deterioration sets in after about one week. Strength and speed are gradually lost with muscles losing their tone and size, i.e. **ATROPHY.**



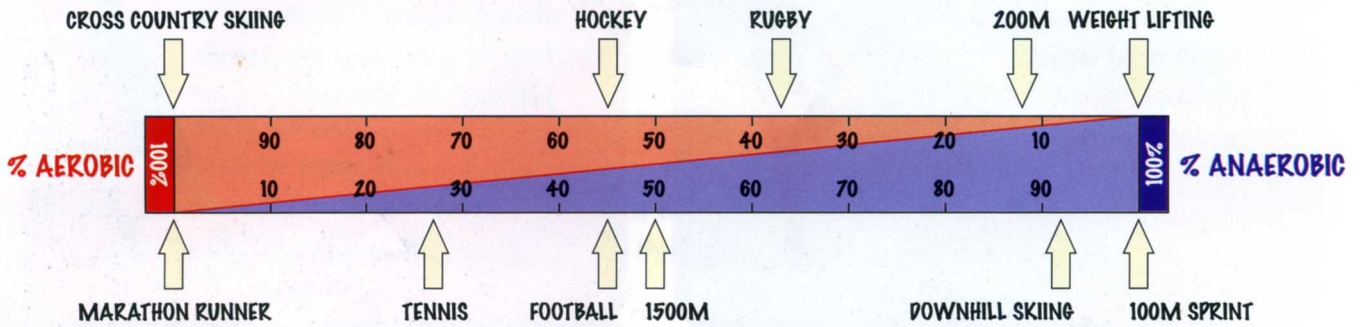
1st Bach.

Aerobic And Anaerobic Fitness

Most physical activities require a combination of ...

- ... **AEROBIC FITNESS** which is attainable through low intensity training and is needed for endurance and 'recovery' for the removal of lactic acid. It provides a good foundation for reaching higher levels of fitness.
- ... **ANAEROBIC FITNESS** which involves higher intensity training and is needed for short, explosive bursts of activity. It requires a good foundation of aerobic fitness. *↳ sports*

Typical fitness demands of different activities is shown below.



Aerobic And Anaerobic Training

AEROBIC TRAINING should ...

- ... be **STRENUOUS, RHYTHMICAL** and **PROLONGED**.
- ... be **BETWEEN 60% and 85%** ... *↓ 170 pl/min* ... of the **MAXIMUM HEART RATE**.
- ... use **LARGE MUSCLE GROUPS**.

ANAEROBIC TRAINING should ...

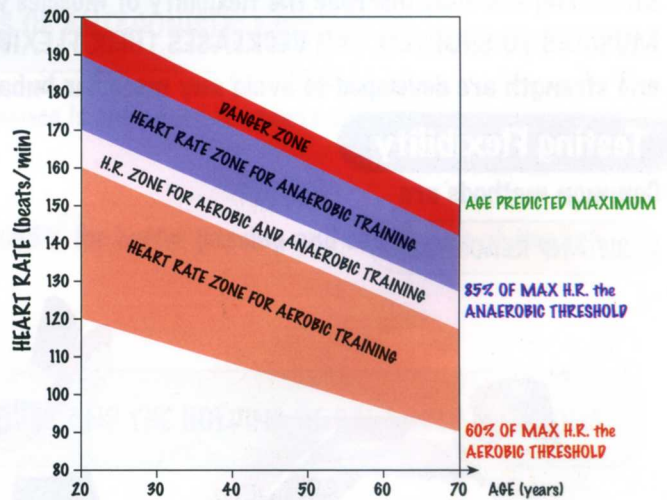
- ... be **VERY STRENUOUS** in short bursts.
- ... be **AROUND** or close to **85% of MAXIMUM HEART RATE**. *↑ 180 pl/min*
- ... include **REST** and **RECOVERY PERIODS**.
- ... be undertaken with **CAUTION**.

The graph below shows the **HEART RATE (H.R.) ZONE** required for an individual to be training aerobically and anaerobically. The thresholds are the minimum heart rates required by an individual to benefit from the respective exercise types. *↳ UmbraP*

- The "age predicted maximums" are based on '220 minus the age in years' and can only be used as a guideline between aerobic and anaerobic.
- Note the region of overlap.
- The figures of 60% and 85% are generalisations and vary from individual to individual.

HEALTH WARNING

Training close to one's maximum heart rate should be done with caution and medical advice should be sought by people who are starting training after a long period of inactivity.



AEROBIC TRAINING AFFECTS THE BODY by ...

- ... raising the **AEROBIC THRESHOLD**. *(UMBRALE AEROBICO)*
- ... improving **ENDURANCE** and **CARDIOVASCULAR FITNESS**.
- ... increasing **LUNG CAPACITY**.

ANAEROBIC TRAINING AFFECTS THE BODY by ...

- ... raising the **ANAEROBIC THRESHOLD**. *(UMBRALE)*
- ... improving **MUSCULAR STRENGTH**.
- ... improving **LACTIC ACID TOLERANCE**.

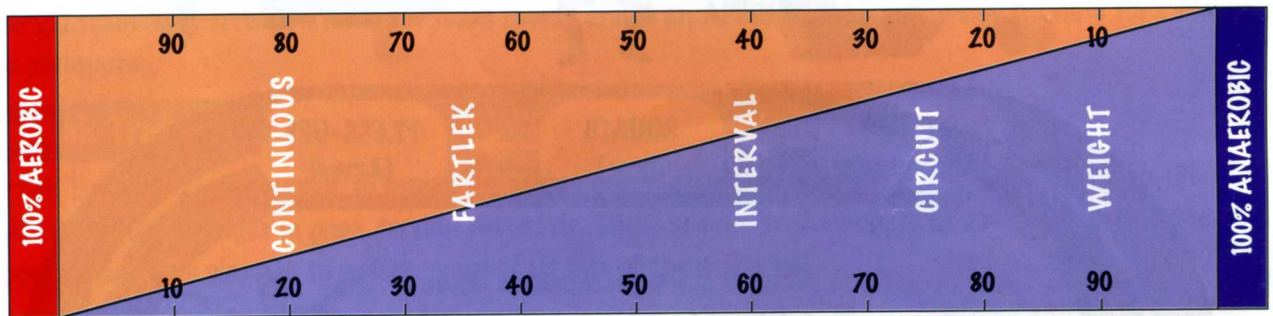
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Training Methods

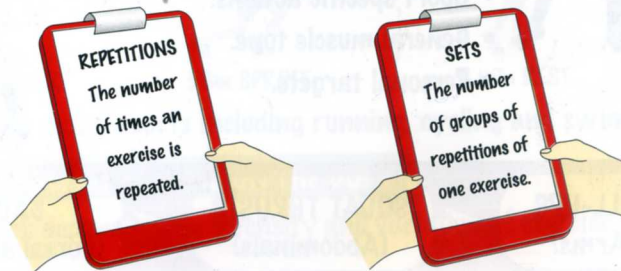
There are a variety of training methods which can be used to benefit most training programmes. The FIVE common ones are ...



All of them train both the AEROBIC and ANAEROBIC systems. The training intensity of each method can be modified to increase the gains for either type of fitness. Typical values could be ...



Each method consists of exercises or activities which may be organised into:



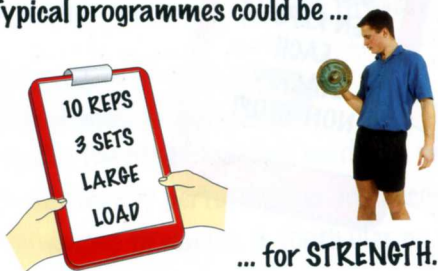
Weight Training

Weight training involves a series of exercises where each one focuses on a specific muscle group in the body. All of these exercises involve the overcoming of a RESISTANCE or LOAD by the use of a MACHINE or FREE WEIGHTS.



REPETITIONS AND SETS

These depend on whether a person is attempting to build up STRENGTH or ENDURANCE. Typical programmes could be ...



EFFECT OF WEIGHT TRAINING ON THE BODY

- It improves ... MUSCULAR STRENGTH, ENDURANCE, TONE, POSTURE
- It increases ... MUSCULAR SIZE, BONE DENSITY, METABOLIC RATE

Circuit Training

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Circuit training involves a series of exercises or activities, with each one taking place at a different STATION. Each station involves an exercise aimed at a specific muscle group in the body.

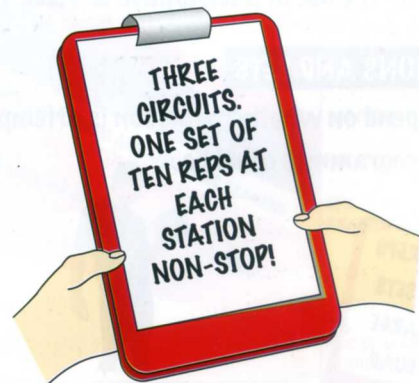
The exercises are arranged so that ...

- ... **MUSCLE GROUPS ALTERNATE** between work and recovery, to allow lactic acid dispersal.
- ... **OPPOSING MUSCLE GROUPS** are worked for balanced strength distribution.



REPETITIONS AND SETS

Circuits can be organised on the basis of TIME or REPETITION and may include REST INTERVALS or they could be NON-STOP. A typical programme could be ...



EFFECT OF CIRCUIT TRAINING ON THE BODY

- It improves ... **GENERAL MUSCULAR STRENGTH**, **ENDURANCE**, **MUSCLE TONE**, **POSTURE**, **SKILL LEVELS**
- It increases ... **BONE DENSITY**, **METABOLIC RATE** and decreases ... **BODY FAT %**

Interval Training

4^o/3^o 1^o Bach

Interval training involves **ALTERNATING** between **FIXED PERIODS OF EXERCISE** and **FIXED PERIODS OF REST** (or light exercise) for recovery. Careful planning is needed to match the duration and intensity of exercise and recovery with the level of fitness of the individual.



Interval training is effective for most team sports and is an **APPROPRIATE** method of training for running and swimming.

Fartlek Training

Fartlek Training is very similar to interval training except that the **INTENSITY** and **TYPE OF EXERCISE ARE VARIED** through changes in pace, terrain and style. There are no fixed amounts of each component and a programme can be planned to suit the level of fitness of the individual.



Fartlek Training is effective for many sports including running, cycling and swimming.

EFFECT OF INTERVAL AND FARTLEK TRAINING ON THE BODY

Both have similar effects which depend on the intensity and variation of exercise, but generally ...

- They improve ... **AEROBIC AND ANAEROBIC FITNESS**
- They increase ... **METABOLIC RATE**
- They decrease ... **BODY FAT %**

Continuous Training

Continuous Training involves **LONG, SLOW, DISTANCE EXERCISE (LSD)** at a **CONSTANT RATE WITHOUT REST**. Training at first should be at **60% maximum Heart Rate** progressing to **85% maximum Heart Rate** as fitness improves and the distance involved increases to beyond competition distance.

EFFECT OF CONTINUOUS TRAINING ON THE BODY

- It improves ... **AEROBIC FITNESS**
- It increases ... **METABOLIC RATE**
- and decreases ... **BODY FAT %**

Pressure Training

Unlike the other training methods, pressure training involves a **COMBINATION OF SKILLS AND FITNESS**. A skill is continually performed as you become more and more tired. With practice the skill level can be improved with increasing tiredness. A footballer or a basketball player may practice ...

- ... dribbling and shooting ...
- ... over a set distance, ...
- ... a set number of times, ...
- ... in a set time.

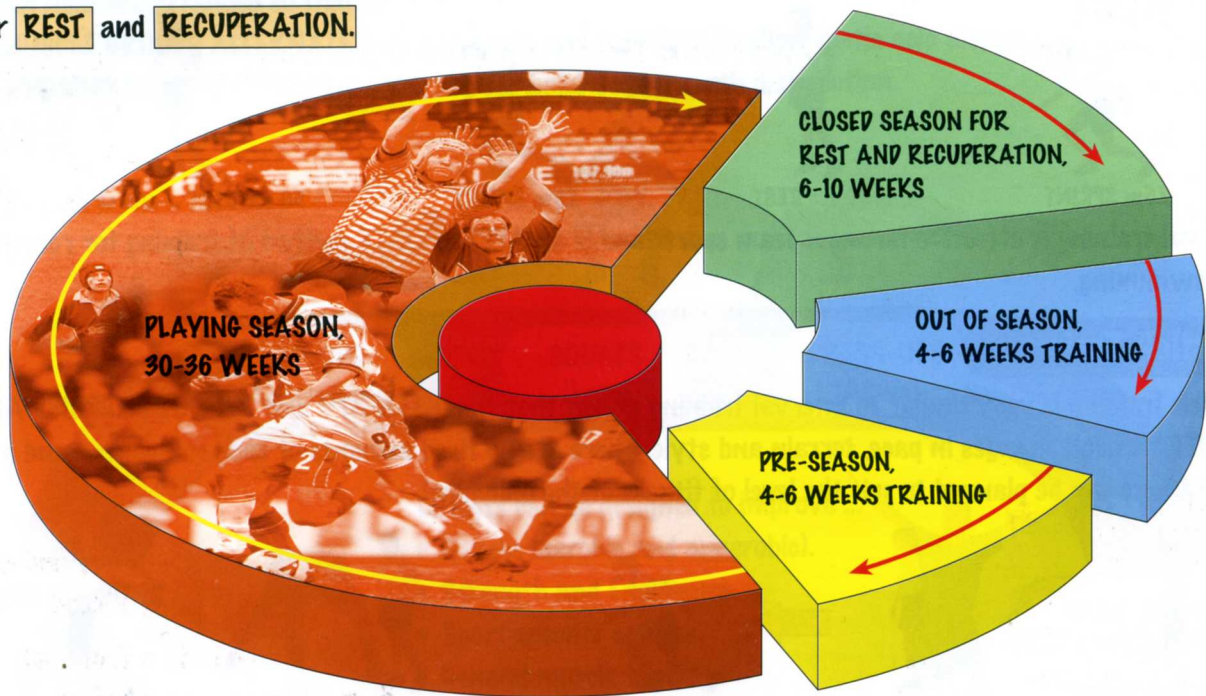


This training is beneficial as it can represent the pressure they can expect to experience in an actual game.

Seasonal Sport

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Many sports take place **SEASONALLY** and may be classed as **SUMMER** or **WINTER** activities. Hockey, Netball, Rugby, Football, Cricket and Rounders are all examples of seasonal sports. These activities have a **CLOSED** or **OFF SEASON** ...
... for **REST** and **RECUERATION**.



- Complete break.
- Recovery from injuries.
- Recreation and relaxation in other sports or activities.



- Light training with gradual build up to a good level of aerobic fitness.
- Light skills training with non-competitive games.



- High intensity interval and weights training.
- Flexibility and 'pressure' skills training.
- Practice matches.



- Playing once or twice a week.
- Maintenance and light weight training.
- Speed work.
- Quality rest and appropriate diet.

'All Year Round' Sports

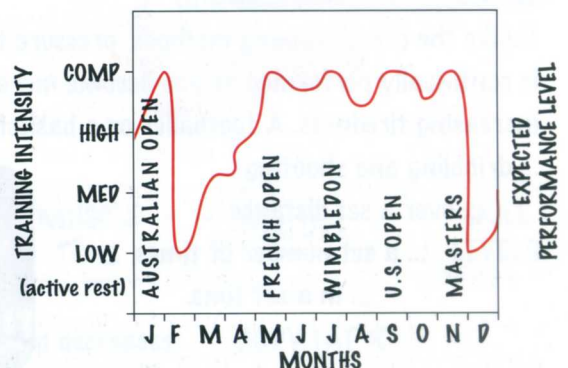
Some sports have become **'ALL YEAR ROUND'** activities with specific training requirements. Field and Track Athletes and Tennis players participate in **INDOOR** and **OUTDOOR EVENTS** throughout the year, around the world. In order to perform to their maximum potential they need to undergo ...

... WARM WEATHER AND ALTITUDE TRAINING

- Elite athletes and players train abroad in warm climates or at altitude to enhance performance. This option depends on funding and financial support being available.

... PERIODISATION

- Training programmes are planned to achieve **PEAKS** at certain times throughout the year.



Long term training causes the body to adapt to the increased load placed upon it by the training. Various parts of the body start to show changes ...

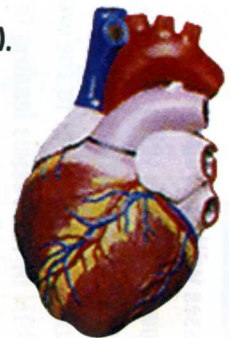
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The Circulatory System

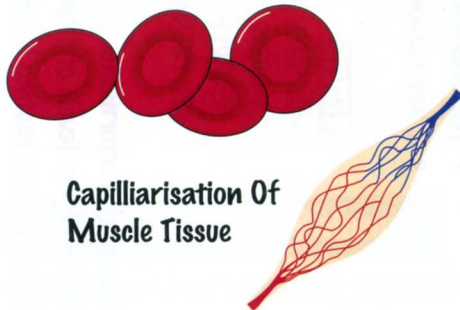
a) The HEART

- The heart becomes **BIGGER** and its walls become **THICKER** (they're muscles remember!).
- The coronary arteries become better at supplying the heart with blood.
- It is able to pump more blood per min ...
- ... and is therefore capable of higher **HEART RATE, STROKE VOLUME AND MINUTE VOLUME.**

The heart needs less beats per minute to supply the body with blood when at rest. Resting heart rate is therefore lower when you are fit. Good athletes have resting heart rates of around 50 b.p.m.



The Red Blood Cells



Capillarisation Of
Muscle Tissue

b) The BLOOD and CIRCULATION

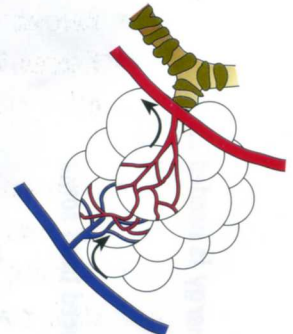
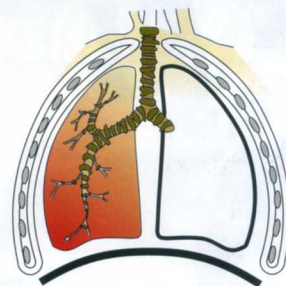
- The number of **RED BLOOD CELLS** increases to cope with the demands of carrying extra oxygen.
- The capillary networks in muscles start to grow more and more branches and are therefore able to transport more blood.

ALTITUDE TRAINING has this effect on the body, a fact used by many athletes to improve their fitness capacity before important events.

The Respiratory System

- The diaphragm and intercostal muscles become stronger ...
... which increases the maximum lung volume.
(**VITAL CAPACITY INCREASES.**)
- This allows greater gas exchange with each breath.
- There is an increase in the size of the capillary networks around the alveoli which means ...
- ... increased blood supply and more efficient gas exchange.

Endurance athletes work hard to specifically improve their circulatory and respiratory systems.



The Skeletal And Muscle Systems

- The muscles and their associated capillaries become more efficient at exchanging materials (e.g. CO_2 and O_2).
 - The muscle cells themselves use the available oxygen more efficiently ...
... which means they can contract for longer and do more work.
 - These two facts mean that the VO_2 MAX of the body is increased meaning that your body can transfer energy more quickly and is therefore more powerful (power is the rate of transferring energy).
 - Muscles may or may not get bigger depending upon the type of training you do (see p.26).
 - Tendons, ligaments and bones do get stronger to cope with the increased load ...
... and cartilage may increase to cope with impact (particularly in the knees).
- Sprinters, throwers and lifters work hard to specifically improve their explosive strength.



1^o Bach

Respiration In The Muscle Cells

- Increased muscle contraction means that more energy is needed ...
- ... so respiration in the muscle cells increases (see p.17 and 18), using oxygen and glucose.
- This means that lots more carbon dioxide is produced (and some lactic acid!) ...
- ... and because most of the energy produced is wasted as heat, the body starts to warm up and its temperature starts to rise.

RESULT:

- OXYGEN USED UP QUICKLY BY THE CELLS.
- GLUCOSE USED UP QUICKLY BY THE CELLS.
- LOTS OF CARBON DIOXIDE PRODUCED.
- SOME LACTIC ACID PRODUCED. LOTS OF HEAT PRODUCED.

Cooling Effect Of The Skin

- Blood vessels just beneath the skin open up (VASODILATE) to allow blood to pass close to the surface and lose heat. This causes the skin to flush.
- Sweat is produced by the sweat glands and then evaporates taking heat energy away from the skin.

RESULT:

- VASODILATION OF SKIN CAPILLARIES AND EVAPORATION OF SWEAT CAUSES THE BODY TO LOSE HEAT AND MAINTAIN NORMAL TEMPERATURE.

The Effects Of Exercise On:

- 1 A TRAINED ATHLETE: maintains high fitness levels; fine tunes motor skills; enables peak performance
- 2 AN AVERAGE PERFORMER: maintains health and fitness; facilitates the reaching of higher levels of fitness and performance.
- 3 AN UNFIT PERFORMER: allows improved levels of fitness and health - rapid at first; lowers resting heart rate and blood pressure; improves sleep patterns and general physical and mental well-being.

Cardiovascular System

- The heart rate increases with exercise (see p.13).
- ... and the stroke volume increases with severe exercise (see p.13).
- These both increase the cardiac output (see p.13).
- Blood now flows faster and is diverted to the working muscles ...
- ... due to VASODILATION in the vessels leading to the muscles.
- This vasodilation helps to prevent the blood pressure from rising to too high a level.

RESULT:

- THE SYSTEM NOW DELIVERS MORE OXYGEN, ...
- ... AND MORE GLUCOSE TO THE WORKING MUSCLES, ...
- ... AND REMOVES CARBON DIOXIDE FROM THEM MUCH MORE QUICKLY.

Cardiorespiratory System

- The respiratory rate increases with exercise (see p.15) ...
- ... and the tidal volume increases with exercise (see p.15).
- These both increase the minute volume (see p.15).
- The intercostal muscles and the diaphragm ...
- ... are responsible for these increases.

RESULT:

- OXYGEN FROM THE ATMOSPHERE, AND CARBON DIOXIDE IN THE LUNGS ARE EXCHANGED MORE RAPIDLY. THIS RESULTS IN GREATER (AND FASTER) OXYGENATION OF THE BLOOD.

