

# Training.

- THE BODY

Skeletal muscles are made up of long narrow cells which change their shape to contract. Women tend to have longer muscle cells than men, which is why their muscles appear more rounded and less peaked. The cells are bound together to produce a large mass of tissue which can contract as a unit. This contraction is controlled by the nervous system and can be complete or partial and strong or weak as required. Minute electrical impulses from the nervous system trigger the muscle fibres contraction by causing protein strands of actin and myosin to slide over each other, thus changing the shape of the cell.

There are over two hundred skeletal muscles in the body. They are attached to the bones by tendons. The bones in turn are attached to other bones by movable joints supported by ligaments. Muscles are usually arranged in pairs on each side of a bone e.g biceps and triceps. This is because muscles can only contract - they have to be stretched by an outside force such as gravity or an opposing muscle contracting. Muscles can cause movement when they contract because they pass via their tendons over joints to adjoining bones.

Muscles can work for a short time without oxygen and other nutrients (anaerobic work) and for a much longer time with both oxygen and fuel (aerobic work). If the muscle is worked very hard, the fuel burning process becomes incomplete and lactic acid builds up. This produces a burning feeling in the muscle and makes it much harder for it to contract, The muscles rely on the blood stream to help prevent this and keep them working. The blood supplies oxygen from the lungs and fuel from the stomach, intestines and liver. This requires a healthy pair of lungs, good nutrition and digestion and a heart that can beat at a high speed for as long as is required i.e. stamina. Good heart/lung fitness therefore is essential for the weight trainer, and becomes even more important if you carry greater muscles mass. After very hard work, muscles must recover. The greater the intensity of work, the longer recovery takes. Studies have shown that it can take up to 10 days for muscles to recover from deadlifts & also 10 days for testosterone levels to return to normal after an American Football game. During recovery, the strands of protein responsible for contraction within each cell must be repaired and strengthened. Unless sufficient calories & quantities of protein & particularly the 8 essential amino acids which the body cannot make itself are taken in this process will not be optimised. There is thought to be a window of about 1 ½ hours after training during which masses of calories must be taken to maximise growth. Recovery can take from 48 hours to 10 days so ideally work each muscle group twice weekly at the most & probably only once a week if an advanced trainer. Also over a much longer period, the blood supply to muscles that are regularly overworked will improve with the growth of new capillaries to feed the muscle better. Hence the pump & increased vascularity of bodybuilders.

These two factors, the swelling of each cell with protein strands and the improved blood supply result in the muscles enlarging and becoming pumped during training. It is important to note that men and women respond differently to weight training. Both will lose fat and tone muscles, becoming up to twice or three times as strong, but only men can build large muscles. This is because the amount of muscle that a body carries is determined by genetics, how active you are and most importantly by

male hormone levels. Most women produce only tiny amounts of male hormone and so will not build size however hard they train. Other positive effects of weight training include: -

- Improved heart/lung fitness.
- Improved posture.
- Heavier stronger bones with reduced risk of osteoporosis.
- Greater circulating blood volume.
- Reduced stress levels.
- Increased mental alertness.

Those trying to "lose weight" should note that it is not weight you want to lose, but fat. In fact it is common for weight to increase slightly during the first few weeks of training due to the increase in blood volume, heavier bones & increasing muscle density before reducing fat levels brings it back down.

- NUTRITION

Whether you wish to bodybuild or reduce fat levels, the body needs the same type of food. The difference is in the amount. To bodybuild, make sure you take in more calories than you use each day. Your muscles will grow but you will store excess food as fat - so watch your waistline. To reduce fat levels take in less calories than you need and the body will burn stored fat.

Either way you diet should be as below: -

- Carbohydrate

This supplies most of your energy for training. Avoid simple sugars that have been added to foods totally if possible as slow release complex carbohydrate plus naturally occurring simple sugars will give a more stable energy source. Eat plenty of brown rice, wholemeal bread and pasta, cereal and potatoes. Also eat plenty of fruit and vegetables.

- Protein

This together with a high calorie diet is essential for repairing the tissues broken down by training. The best protein sources are fish, seafood, poultry, red meat, dairy products and eggs. The less fatty the protein source the better. Protein powders can be used between meals to increase muscle mass, or as a meal replacement to help lose weight, because increased protein intake as part of a low calorie diet influences the thyroid gland to help keep the metabolic rate up. The best protein sources are those that are highest in the 8 essential amino acids (which the body cannot make for itself) such as whey, milk or milk and egg - but avoid soya based powders as they contain poor quality incomplete protein. Think of amino acids as a LEGO set – if you want to build a particular structure e.g. a thicker muscle fibre you must either have the right parts or be able to make them – if the 8 essentials are not there when you need them you cannot grow! If you do not eat meat, fish or dairy products you can add two incomplete amino acid sources such as rice & beans to obtain a good mix of the essential aminos.

- Oils and fats

These are necessary in small amounts. They are good for the skin and joints and are an essential part of every cell. Ones which are liquid at room temperature are better than solids. Good sources are olive oil, sunflower oil, cod liver oil and evening primrose oil. Avoid saturated fats as much as possible.

- Fibre

This is essential for inner health. A high fibre diet will be obtained by eating plenty of fruit, vegetables, cereal, bran and other good sources of complex carbohydrates. A good fibre drink supplement such as psyllium husks can help.

- Vitamins and minerals

In theory we should obtain enough vitamins and minerals simply by following a good diet. In practise this is unlikely to occur for a number of reasons: -

1. Due to modern farming methods using fertilisers, pesticides, insecticides, fungicides, antibiotics, steroids, growth hormones etc, our food is not as nutritious as it used to be. Also our food industry adds preservatives, colours, flavourings etc.
2. We are continually breathing in polluted air and in many areas our drinking water is also poor quality.
3. We are all exposed to levels of mental stress we weren't built for – i.e. our fight or flight instincts have often to be repressed rather than acted upon.
4. Many of us drink, smoke and take prescribed and recreational drugs.

All the above can lead to an increased need for vitamins and minerals. If you also add the extra load of training, it makes sense to at least take a good multi-vitamin and mineral supplement daily on every second day. (capsules are better as they are absorbed more efficiently than tablets & are less likely to upset the stomach). Additional vitamin C to help tissue repair and vitamin E to help the circulation and improve stamina are also a good idea. I would not however recommend extra high dosages of any vitamin. Large amounts of B or C do not agree with everyone, and A and D can accumulate to toxic levels.

With regard to minerals, a diet low in sodium (salt) and high in calcium, potassium & magnesium will keep your muscles strong and will reduce fluid retention. Calcium if supplemented is best taken in balance with magnesium. Milk products are good sources of both. Magnesium levels are easily depleted by alcohol & supplementation by magnesium malate can be useful. Potassium is found in fruit and vegetables, particularly dried fruit, bananas and orange juice. Never take potassium supplements however as they can damage the stomach. Extra iron and zinc will help the body produce red blood cells, insulin and other hormones. All the other minerals and trace elements should be obtained as part of your normal diet.

- Water

Water should be drunk regularly, but not excessively, throughout the day. Muscles are up to 80% fluid and do not like operating when dehydrated any more than a car engine does.

- Performance Enhancers

The use of performance enhancing drugs is seen as a modern phenomenon. The Ancient Greek athletes however were known to eat raw bulls testicles, Victorian distance cyclists were fuelled by morphine or cocaine based cough medicines & steroids are thought to have first been used in the 1952 Olympic Games by the Russians. There are two aspects of enhancers to consider, whether they are safe & whether their use is seen as cheating. The I.O.C. make decisions re both these aspects, but until blood testing is done on athletes the 'cheats' will always be ahead. Bodybuilding unfortunately usually gets a bad press – but at least it is honest in the sense that both contestants & audience know the score.

Supplementation of your basic diet with the vast range of pills and potions now available is a very complex subject. This is just a very brief & superficial overview. If you want more information there is a great mass of information on the web but I have deliberately not done any links as I would not want to encourage anyone to take the more unsafe performance enhancers. A study done a number of years ago found that competitive athletes would take something to help them win their event even if it killed them 5 years later..... There are now many products on the market claiming to be like anabolic steroids but without the side effects e.g. nor andro this that etc. These various 'safe' anabolic agents & steroid precursors are almost always a waste of money. If they had the magical effects promised they would be available on prescription only. Some of the more exotic versions of these chemicals may be harmful, and it appears some such as androstenedione, which is on the IOC banned list, but is not yet a controlled drug, metabolise to nandrolone so can cause legal problems such as the recent positive drug tests. It is difficult to have sympathy for athletes who are taking 'legal' supplements in the specific hope that they will boost their male hormone levels. Nevertheless there is the possibility that some athletes may naturally produce high levels of nandrolone, & some rely on team doctors that get it wrong. There are also many stimulants e.g ephedrine which are banned by IOC but not controlled otherwise, so an athlete should not even take a cough medicine or decongestant without the team doctor's approval. That said doctors often help athletes bend the rules - there were many positives in the Tour de France 2000, but apparently about half those tested were being prescribed medication for asthma...which just happens to help lung function. Below I list some of the most commonly used performance enhancers.

- Fat Burners

For those trying to reduce fat levels, the safest and most effective supplement is lecithin which may help you burn fat. Modest amounts of caffeine taken when training will also increase fat burning – but do not take caffeine habitually. Never use amphetamine or thyroid tablets. All serious bodybuilders should take whey protein powders mixed in high calorie low fat drinks as they will help build muscle & burn fat as they keep up metabolic rate. See our separate top ten tips for fat loss.

- Creatine

Creatine is made in the liver by the body & is also present in our diet in meat & fish. It is used as a source of energy for explosive exercise. It has been shown to increase speed, strength, mass & rate of recovery & to reduce fatigue. It is controversial because it works. IOC medical experts have defined it as a natural food & therefore it is not a banned substance. Despite some media reports there is no evidence that it is unsafe but we do not recommend it for the under 18s & suggest that you do not take it continually. For optimum results creatine must be freshly mixed with a carbohydrate source such as grape juice & never with anything acidic. Follow instructions on tub for best results.

And finally...the serious stuff. Drug use is almost universal, from antibiotics to caffeine and tranquillisers, the list is never ending. It is no surprise therefore that, whatever your sport, there are drugs or treatments to increase strength, stamina, recovery time, concentration etc. Bodybuilders take many drugs, the most important & common of which are steroids. Almost all top bodybuilders use them and often also growth hormone & insulin. It is very hard to compete successfully without them - even in supposed drug free contests. Their use is now so widespread that it is worth looking at them in some detail, so that if you are tempted to take them you know what the risks are.

- Hormones

There are three classes of hormones. The two most important are steroids, which are a group of chemicals that are based on the cholesterol molecule, peptides which are complex chains of amino acids, (such as growth hormone) & the third group which is made up of an assortment of other compounds.

- Growth Hormone

This will make your muscles, bones & possibly cancers grow. It increases protein production & encourages muscle growth, fat burning & carbohydrate sparing. A number of bodybuilders (& dwarfs given growth hormone to increase height) have caught CJD from the pituitary glands of the corpses used to make growth hormone - as a result of this synthetic versions are now available. Those who are unfortunate enough to naturally overproduce this hormone are giants often with extended chins & enlarged hands & feet. They are unlikely to live a full lifespan. Examples are Andre The Giant & Richard Kiel. (Jaws in the Bond films.)

- Insulin

Fast acting synthetic insulins are taken together with carbohydrate to drive glucose & amino acids into the muscle cells to maximise protein & glycogen synthesis & therefore growth. One of my best & fittest customers has been diabetic since 1½ years old & the thought of anyone injecting insulin voluntarily – bearing in mind it can be fatal - does not impress him. Repeated insulin injections will eventually lead your pancreas being unable to produce sufficient insulin & you will then become insulin dependent.

- EPO

This, and other similar substances are widely used by distance runners & cyclists to make the body produce more red blood cells & thus increase the bodies ability to absorb oxygen. Unfortunately too many blood cells will cause the blood to thicken with increased risk of blood clots & death.

- Steroids

Steroids can pass through fatty tissue & penetrate the blood/brain barrier. There are many natural and synthetic types. Some of them act as sex hormones such as the female hormones oestrogen & progesterone & the male hormone testosterone, which are chemically quite close & can be converted to each other by specific enzymes. Most of us are unaware that womens ovaries & adrenal glands produce small amounts of testosterone & that mens adrenal glands & fatty tissues produce small amounts of female hormone. They are very powerful drugs and have a wide range of effects. For bodybuilding only testosterone & synthetic male hormones are of interest & their effects are split into into two broad categories: -

- Androgenic - maleness characteristics such as deep voice, acne, high blood pressure, beard, body hair, aggression etc.
- Anabolic - growth of muscle and other tissues, increased strength and size, fluid retention etc.

Each steroid has a different balance of the two effects, so some are more useful to bodybuilders than others.

Steroids are the ideal drug for bodybuilders. They increase aggression, so you can train harder for longer, and also increase protein synthesis so reducing recovery time and speeding growth. They can also increase the sex drive initially and will make you feel good, strong and more self confident. They come in two forms.

- Oral

Tablets which are water soluble & short acting. These are absorbed in the stomach & go straight to the liver with levels suddenly peaking which will increase toxic side effects.

- Injectable

Usually oil soluble which are injected into muscle for slow release over a period of up to 6 weeks or more. These are less toxic on the liver but there are risks of shock & sciatic nerve damage if things go wrong.

For beginners steroids are useless and will just turn you into a fat spotty & grumpy blob. A more experienced bodybuilder however, can probably increase his strength by a further 50% to 100% compared with natural bodybuilding, with considerable size increases over a period of several years. Before you start reaching for your wallets however, there are problems associated with steroids use that must be faced: -

- The Law

Supply of steroids is illegal. Up to two years imprisonment plus unlimited fines. Possession can also be penalised. Steroids are big business world wide and there are now vast numbers of athletes taking them, often for little or no reward. Various governments including our own have started to realise that steroid use is a major problem. A side effect of the tougher legislation is that compared with 10 years ago there are now numerous counterfeit products on the market, often with convincing packaging. There are essentially three types. Ones that contain no active ingredients, ones that contain ingredients other than those specified, (which may be active and/or harmful) & ones that contain the ingredients described but not necessarily in the correct amount. Both oral & injectable products are counterfeited & some of these products can kill.

- Health

Steroids work by driving the glands and so all the other organs at high speed. They make you feel good and so become addictive. The more you use them, the more your body depends on them- finally becoming unable to make its own hormones. Steroids use is like riding the tiger - very exciting but getting off is tricky. Steroids will change the way you look, feel and think. Their physical & psychological effects vary widely from person to person and are not predictable. Some studies have suggested there may be a link between high testosterone levels & increased criminality & aggression. Some users have the strength of mind to use them only occasionally thus minimising risk, but if you have an addictive personality you will have problems coming off them & may progress onto higher levels of steroid & then to other drugs such as Nubain (opiate based painkiller) diuretics, growth hormone etc.

- Physical Effects

Short term effects include:- Acne, (it may become worse if you already have it) Fluid retention. High blood pressure. Muscle growth. Increased strength. Raised cholesterol levels. Liver and kidney strain. Increased sex drive. Hair thinning on head. Increased body hair.

Long term include, Hardening of the arteries. Muscle shrinkage and wasting. Brittle bones. Circulation problems. Shrinking testicles. Reduced sex drive. Impotence and infertility. Immune system problems. Heart failure. Strokes. Liver, kidney and prostate gland cancers. Gynaecomastia (enlarged breasts). Death.

Women run similar risks to men plus the problem that their body will try to change sex as their femininity is suppressed. They risk breast shrinkage, deepening voice, infertility, enlarged clitoris & increased sex drive (so not all bad news!)

- Mental Effects.

These range from early excitability, cheerfulness, aggression & high energy to later depression, uncontrollable mood swings, paranoia, rage, insecurity and fear of being too small. If taken for long enough, the whole personality may change and possibly fall apart leading to severe mental illness. Some men & women may also find their sexual orientation affected.

- How much is safe?

There is no such thing as a safe dosage of steroid. The female contraceptive pill contains just 0.5 mg of female hormone and at that level is associated with an increase in cancer and other side effects. In comparison, males naturally produce 5 mg or more of male hormone daily. A bodybuilder will take a minimum of 5 mg and more likely 20 mg to 100 mg or more daily in addition. As with cigarette smoking, some people get away with steroid use for many years with few obvious ill effects. There is no doubt however that if you take them for long enough they may contribute to or directly cause your death - even many years after you last took them. That said all life ends in death & we each choose our own risks eg driving fast, drinking to excess, smoking, taking recreational drugs, having unsafe sex, fighting Saturday night or whatever. My best advice however is to stay natural, be patient and know that any muscle gained is yours and not the chemists.

- TRAINING

Although the emphasis of this section is on bodybuilding, the same exercise principles apply whatever your goals. So here is a top twelve list for good results in the gym. Also remember our motto 'less is more' & that there is no substitute for good instruction.

- Warm up

Always warm up with a few minutes CV or high rep abdominal work followed by 1 or 2 high rep sets of your first exercise. This will both prepare the heart for the massive stresses on it & start to increase the body's energy production. Many bodybuilders & particularly powerlifters die simply because they don't do enough CV. They are especially at risk if taking steroids, which weaken the heart & increase the blood pressure & levels of the wrong type of cholesterol. Blood pressure elevation during heavy lifts can be as high as 480/350 mm Hg even without drugs, compared with a resting average of 120/80 mm Hg . Help keep this peak down by always exhaling during the effort rather than holding your breath. Apart from training in the gym as advised below, at least 10 minutes intense CV twice a week is a bare minimum.

- Growth

There is one thing alone that will make muscle grow and that is intensity. Once a muscle is worked beyond a certain limit it will try to grow. The beginner is usually so weak that on virtually any routine he will grow rapidly for the first 6 to 18 months. After that it is easy to prevent growth by over enthusiasm. Most bodybuilders work out far too hard and too often, because of this they look big, strong and fat with little detail in the muscle. All bodybuilders after the first year and a half should try and get into good shape at least once a year. Remember that as you become smaller and more defined you will look bigger.

- Equipment

Use dumbbells and bars as much as possible. Machines are fun and can feel good but they are too easy. They tend to give you a very good pump in a small part of a muscle rather than work the whole muscle hard. (a good example of this is the leg

extension machine) That said, some machine movements are safer than their free weight equipment e.g. squats done using a Smith machine.

- Which Exercises

Always build your routine round the basic exercise, such as squats, leg press, bench press, chins, pulldowns, dips and pullovers. As you become more advanced your muscles become so used to heavy loads that it is important to vary your exercises more, and work them from more angles. Your aim should always be maximum effort in minimum time so never do more than two or three different exercises on each muscle group.

All exercises when performed incorrectly can cause injury:-

If unsure of how to do a free weight squat correctly use a Smith machine if possible and never go below parallel as going too low will overstretch the knee ligaments.

Deadlifts are a terrific back builder and back breaker. They are not essential but if you insist on doing them do them correctly and carefully. Unless you are in a particular hurry to wreck your back, avoid totally good mornings and stiff legged deadlifts. If your elbows give problems, avoid movements which work the triceps at one end only - such as french press, triceps extensions etc. The same applies to your knees, leg extensions can put a lot of loading on the knee.

- Style

As in life style is all. Never do cheating or short range movements. (the exception to this rule is if you know you are doing them as a way of increasing intensity) Always make each exercise as hard for yourself as you can. This means using a full range of movement and a slow strict style. Throwing massive weights up and down and screaming may look impressive, but will not do your muscles, tendons, ligaments, joints or intervertebra discs any good.

- Concentration

Concentration is the key! On each exercise concentrate totally on the muscle you are working and not on the weight you are lifting. Ideally work alone or with one training partner only. Once you have started your workout, don't stop for anything until you finish. (a short rest between major bodyparts is acceptable).

- Weight

Always use a weight that will give you the number or reps you are going for in good style. The muscles 'know' only that they are doing work - they are not aware of whether they are lifting 20 lb or 200 lb. Trying to use too much weight to quickly leads to bad form (cheating) and to less intensity.

- Sets

Do as few sets as possible. Once a muscle has been worked with enough intensity to grow there is no need to remind it repeatedly as this can lead to exhaustion of the

muscle, hormonal systems & nervous system. Workout for 30 minutes three times a week if you are a beginner or lightly built. For the heavier trainer a maximum of 40 minutes three times a week is fine. Work as hard as you can within the above time limits, training for longer or more frequently will ultimately wear you out & lead to injury & illness & will also add a fortune to your food bills. You should leave the gym feeling good and relaxed rather than shattered.

- Repetitions

For beginners 3 x 10 is fine. As you become more advanced however, reps should be varied between 6-8, 8-12, 12-15, 15-25 & 25-50 on all muscle groups for maximum gains. For upper body do mainly 8-12 and lower mainly 12-15. The exceptions to this general rule are forearms which need up to 40 reps and calves and leg biceps which will benefit from 20- 30 reps. The reason for varying the reps so much is that within each muscle there are slow and fast twitch fibres. These contract under different conditions depending on the resistance and speed of movement. The more the loads are varied the more fibres will be worked and the more growth will occur. The speed & range of movement should also be varied. Speeds should go from ultra slow to very fast & although all movements should be done most of the time with a full range, partial movements are a very good way to increase intensity. Single reps or twos and threes can be fun and will increase your power, but are more likely to injure you so don't do them too often. Never do forced reps or negatives for the same reasons.

- Rest Intervals

If you train too slowly you will build power rather than size. If you train too quickly particularly on large muscle groups you will become too out of breath to work the muscles hard enough. This is the problem with super sets, giant sets and other "advanced" techniques. A general rule of thumb is 30-60 seconds rest for the heavier exercises and 0-30 seconds for the lighter ones. Most people rest far too long between sets. Basically, if you are not out of breath go for your next set as soon as possible. With regard to how often you should work a muscle I believe that a beginner should start by doing the whole body 3 times a week & within a month go to a 2 day split routine & within 3 months to training each bodypart once a week only as it is only when you rest that you grow.

- Stretch

Stretching is another way to increase intensity. Muscles can only contract - they have to be stretched by an outside force such as an opposing muscle group or gravity. This is why it is so important to do all your exercises with a full range of movement. Think of your muscles as being like elastic bands - the more stretched they are, the more powerfully they can contract. For this reason its a good idea to stretch the muscles you are working between sets. When stretching, pull the muscles concerned into a full stretch position very gently. Never bounce or try to force a joint beyond its natural range of movement. A stretch should be held for at least 15 seconds to be fully effective. Stretching is no longer though to be of benefit as part of warming up but is good both between sets as above & as part of a gradual warmdown.

- Injury

Finally a brief word about injury. If you train hard enough for long enough, you will almost certainly acquire the odd injury. There are two main types of injury in weight training -

- Chronic

These are generally wear and tear problems such as overstretched ligaments & tendons, torn cartilages, arthritis, rheumatism, etc. These can often build up over the years. Apart from early retirement, these are best dealt with by training less often and less hard, doing plenty of warming up & higher reps with a greater emphasis on aerobic work.

- Acute

This is a sudden often severe injury. The moment you feel something go, whether it's a muscle, tendon or whatever - stop immediately to avoid doing further damage. Never try to work through the pain as when you are training the endorphines released will often stop you feeling the full extent of the injury. Good basic first aid is to rest and support the injured area and apply ice for up to fifteen minutes. Do not apply heat or massage to the injury. Its often only the next day that you realise the extent of the problem. If in doubt, go to a sports injury clinic or see your G.P. and/or physiotherapist as soon as possible.

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