

FITNESS AND GOOD TECHNIQUE TO REDUCE THE RISK OF ARCHERY INJURIES

DISCLAIMER

The authors of these notes are not responsible for how you use these notes and its consequences as **you will be aware that all physical exercise carries a risk of injury**. It is the responsibility of the persons that use the exercises suggested in these notes to consider carefully (a) whether they are suitable to their particular condition of health and (b) to consider carefully whether in carrying out any of these exercises that they should take additional precautions to reduce the risk of injury to themselves and to others.

Prior to undertaking any physical exercise, it is your responsibility to consult your doctor about your proposed physical exercise programme and obtain his/her approval of it.

Finally, in order to ensure that you carry out these exercises correctly you should purchase a copy of The Great Courses DVD course of 36 half hour lectures and demonstrations entitled "Physiology and Fitness" by Dean Hodgkin which explains clearly the physiological processes going on when we exercise, why we need to do warm-ups, cool downs and stretching exercises and how to do these in addition to a considerable variety of exercises to develop specific muscles and muscle groups. He covers a considerable number of fitness subjects and his approach is inspiring and stimulating. The Great Courses can be contacted on the internet at www.thegreatcourses.co.uk and by telephone on 0800 298 9796.

ISSUES COVERED

- Before starting any fitness programme **you must consult your doctor**
- You do not exercise through pain and if you suffer from any pain whilst exercising **you must consult your doctor**
- Before repeating the same exercise programme you must give those particular muscles at least 24 hours rest (ideally 48 hours rest) to reduce the risk of injury
- Before, during and after exercise it is vital that you do not become dehydrated by not drinking sufficient fluid
- Why fitness is important to achieve your potential in archery
- Breathing Technique
- Good Technique
- Good posture
- The severe dangers of over-bowing and the importance of keeping within the weight training concept of progressive overloading

- The reasons for warm-ups and the technique for doing them correctly
- The reasons for cool-downs and the technique for doing them correctly
- The reasons for stretching exercises and the technique for doing them correctly
- Exercises for the cardio-vascular system
- How to put together various exercises to form a set
- Core strength exercises for the muscles within the abs and back that are attached to the spine and pelvis that keep the body stable and balanced.
- Exercises for the upper back
- Exercises for the legs

Before starting any exercise programme you must consult your doctor

Before embarking on any fitness programme, you must consult your doctor about the fitness programme you wish to pursue. You need to give details of the fitness programme covering the exercises and the number of repetitions you plan to do and you must only pursue your proposed fitness programme when your doctor advises you that it is appropriate for your current physical condition.

You do not exercise through pain and if you suffer from any pain whilst exercising you must consult your doctor

Pain is a warning sign that you are damaging your body and you must heed this warning sign by ceasing to exercise and you should immediately arrange to consult your doctor. Do not follow the maxim “no pain, no gain” as this can cause serious and possibly permanent injury.

You exercise until you reach a reasonable level of fatigue but you do not exercise to the point where you feel nauseous, physically exhausted or you suffer pain. If you feel pressure or pain in your chest, arms, jaw, neck or face stop exercising and consult your doctor.

Before repeating the same exercise programme, you must give those particular muscles at least 24 hours rest (ideally 48 hours rest) to reduce the risk of injury

You need to rest sufficiently between exercise to reduce the risk of injury. For those exercising regularly, it is essential that they have good quality sleep. It is while you are sleeping that your body produces growth hormones that help in tissue growth and repair.

You need rest periods to ingest food to both replace your energy stores and to repair the damage caused to muscles by exercising. If you do not give adequate time for your muscles to recover by giving them a rest period, they are likely to fail because they have not been given sufficient time to absorb the protein they require for repair and they will consequently become weaker.

Before, during and after exercise it is vital that you do not become dehydrated by not drinking sufficient fluid

Dehydration due to lack of sufficient fluid in your body through not having drunk sufficiently can cause your blood pressure to drop making you feel sick and light headed. A drop in blood pressure can lead to serious medical problems. By drinking sufficient non- alcoholic fluids before, during and after exercise, you are replacing lost fluids and this promotes the removal of toxins and waste products from your muscles.

Why fitness is important to achieve your potential in archery

To ensure that you can achieve your maximum potential scores and to ensure that you have a healthy life it is necessary to carry out some form of fitness programme in addition to the very limited fitness that you achieve through just shooting the bow.

Rick McKinney (World Individual Target Champion in 1977, 1983 and 1985) in his book "The Simple Art of Winning" states "The amount of effort I was putting in for pole vaulting helped my archery training! What I learned from it was that it did not take a special training programme to be able to shoot well in archery, but a well balanced training programme with an emphasis on leg strength will do."....."Some of the most important parts of the body is in the legs. This is because if the archer moves just a little bit from the legs the sight movement will be much greater. So just moving 1 millimetre may be cause for the sight to move 5 mm. This could cause the archer to shoot a red or blue."

If the only exercise that you take is when you are doing archery, problems can result from the uneven development of the muscles and stretching of ligaments and tendons in the upper body. Uneven development of the body can lead to injury and to reduce this risk there is a need to equally develop the part of the upper body that is under less tension and strain when you are shooting.

Any fitness programme to improve both your archery and your personal health will include two elements:-

a) cardio-vascular fitness that improves the fitness of both your heart and lungs. The fitter the heart, the greater the volume of blood that it can pump around the body and that increases both the amount of oxygen supplied to the muscles and the amount of carbon dioxide it removes from the muscles. The greater the capacity of the lungs to both inhale oxygen and to exhale carbon dioxide increases the exchange of gases when the blood goes to the lungs.

b) the strength and power of the actual muscles that we use in the act of shooting which **includes not only the arm, back and shoulder muscles but the stomach and leg muscles that we use when we stand to shoot.**

A major benefit of cardio-vascular fitness and fitness of the muscles we use in standing and in shooting is that even at the end of the tournament we are less tired and consequently we are able to still concentrate right through to the last shot on good technique, feeling the shot and being aware of where the sight has moved immediately after releasing the arrow.

Archery should be viewed as part of a personal comprehensive exercise programme to improve our health that includes archery, resistance training (which includes weight training and/or resistance band workouts) and cardio-vascular training (such as walking, running, rowing, cycling etc) which will produce the following health benefits:-

a) increases in strength in muscles, bone, ligaments and tendons throughout the body

b) endurance in that we can continue to do physical and mental tasks for longer periods of time without becoming exhausted

c) improved balance so that we are less likely to fall

d) help in weight control so that mature adults can get to the point where calories in match calories out

e) exercise stimulates the brain cells by increasing the flow of blood with oxygen to the brain

f) by increasing the muscle to fat ratio (which as a consequence increases oxygen intake when exercising) improves our glucose tolerance and insulin sensitivity

and g) helping us to fully relax by making us physically tired.

Breathing Technique

When you are exercising, you do not hold your breath. The golden rule is to “exhale on the effort” which will give extra dynamism to your movement and allow you to perform better.

However, when shooting, the breathing control is different to doing other exercises. To quote from “Archery Anatomy” by Ray Axford :-

“Two breathing patterns are possible, neither of which is completely natural or comfortable. The first is to breathe in, in this position, breathing out as the arms are raised to full draw, which is unnatural, causing muscle antagonism and discomfort.

The second starts from exhalation in this position, breathing in as the load is developed to full draw. In this case, full draw coincides with full lungs which have to be emptied slightly, whilst the body is at full draw, before a steady aiming state is reached.”

It is a further advantage of a high draw technique in that in lifting your arms to a point just above your shoulders that the lungs automatically fill with air.

Rick McKinney (a World Target Individual Champion in 1977, 1983 and 1985) in his book "The Simple Art of Winning" describes his breathing method for shooting as follows:-

"I like to take a couple of nice slow breaths before I draw. This gets me to relax. I try to breathe deep in my stomach, not in my chest. This gives me a full relaxed state of mind as well as being strong to execute the shot. Next I start to inhale slowly as I start to draw back. This inhale gives me the strength to get the shot back. Once I have inhaled to the maximum that I want, then I start to exhale very slowly and calmly. This gives me the control I need in order to aim and continue my drawing motion to get through the clicker. Now, if I have the rhythm that I want, I will stop breathing about two thirds to three quarters of the exhale. This gives me a little strength while I am continuously coming through the clicker. I am able to settle down on the sight so I do not bounce around much on the target. Once the clicker clicks and I start to let go, I exhale the final amount of breath."

You should also note that world champions like Rick McKinney have a shooting technique that takes about 7 to 8 seconds from starting the draw to releasing the string. This breathing control is related to taking 7 to 8 seconds from the initial draw to release. It is not snap loosing and it is not taking an excessive time to make the shot.

When doing exercises other than archery, you do not need the controlled breathing required to reduce movement of your sight caused by breathing. With exercises other than archery, you inhale before making the effort and you exhale on the effort when you are contracting the muscles doing that particular exercise.

Good technique

Another source of possible injuries, is if you use a rotational twist of the spine in your shooting style. It is well known that golfers suffer from injuries because of the twist that they bring into the spine when teeing off. Archers need to consider carefully whether they should use a shooting style that has a twist in the spine. It should be of concern that in shooting a full FITA round that **if you have a rotational twist of the spine that this rotation will happen 150 times in the one direction and this creates considerable concern about possible future back problems.**

The majority of the top world archers do not use a rotational twist of their spine in their shooting technique.

In shooting, the bow arm should be extended towards the target without locking the elbow. If you lock the elbow in the arm that holds the bow this puts excessive strain on that elbow joint and can result in injury.

In performing any exercise, at no time should you lock any of your elbows or knees as this can result in injury to the joint.

Good posture

Also, to reduce the risk of possible future back problems, it is essential that archers develop the habit of constant good posture. Good posture depends on the abdominal stabiliser muscles (including the rectus abdominis, the transversus abdominis etc) which work to hold your posture in place and prevent the lower part of the spine (the lumbar area) from flexing excessively by having a slouch in your lower back. Good posture requires these stabiliser muscles to be exercised and developed so that you can maintain good posture throughout the day and avoid an excessive strain on the lumbar part of the spine by allowing our pelvis and consequently our stomach to move forward and create an excessive bend in that part of the lower spine.

Good posture with the rib cage raised stretches the stomach muscles and allows more space for the lungs to expand to their maximum when we breathe in and thus increase the exchange of oxygen for carbon dioxide. Also, it has the advantage of giving us a slimmer shape in that in stretching the stomach muscles, it narrows the waist.

Good posture requires the shoulders to be directly above the hips with the head erect and the weight of the head directly above the shoulders. At the same time you should feel a stretch in your stomach muscles by lifting the rib cage upwards and not allowing it to collapse downwards. The head is heavy and if it is not erect above the shoulders it can create a considerable strain on the neck muscles. When the stomach muscles are weak through constant poor posture and failure to exercise them and they become tired these muscles become relaxed and they allow the lower back to move forward pushing the pelvis and stomach forward and this poor posture can cause lower back pain.

To avoid the development of lower back problems, archers should develop the habit of holding good posture every day and to hold that posture as long as possible. Good posture requires you to stand as tall as you can. One of the ways of achieving this good posture is to imagine that there is a noose around your neck and the floor on which your feet are standing is slowly sinking away, in which case you would stretch your feet downwards and lift your rib cage upwards. **If you have a medical condition affecting the back, you must consult your doctor about continuing to shoot and about your planned exercise programme as any medical problem with the back could be adversely affected if you continue to shoot or exercise. If you suddenly have any back pain you should immediately stop shooting or exercising and consult your doctor.**

Poor technique that involves the combination of poor posture and/or involves constantly rotating the spine with drawing a bow in a full day tournament 150 times is going to increase the possibility of suffering from lower back pains.

The severe dangers of over-bowing and the importance of keeping within the weight training concept of progressive overloading.

Archers when they increase the draw weight on the fingers need to carefully consider whether this increased draw weight is excessive taking account of whether their bodies have fully

matured from that of a junior to an adult and if they are an adult whether their current physical condition is capable of coping with the increased draw weight without risking tearing the muscles, tendons and ligaments. **This damage could be permanent and seriously affect the quality of your life. This is particularly the case with junior archers whose bodies are still growing and consequently an excessive draw weight on the fingers and /or excessive repetitions of the shooting technique can cause serious and possibly permanent injuries to the bones, joints, tendons and ligaments that are still developing.**

Archery is in effect a specialised form of weight training. Weight training uses **the concept of progressive overloading where you progressively increase the number of repetitions and the weight you are lifting.** You should also bear in mind that even in a short practice period in an archery club that you will do about 60 shots which means that you are using the same arm, back and shoulder muscles for 60 repetitions. Most weight trainers will only carry out a particular exercise using the same muscles for a maximum of about 30 times in a single training session.

Before commencing any shooting, archers must do warm up exercise (explained below) and after shooting cooling down exercises involving stretching exercises (also explained below) to reduce the risk of injury.

When increasing the draw weight on the fingers, archers should start shooting just 3 arrows per end with a maximum of shooting 3 dozen arrows for each shooting session for about the first three months. They should then slowly increase the number of shots in each training session until they are able to cope with a full 12 dozen shots in a full day's tournament. If at any time they experience any pain, they must immediately stop shooting and arrange to consult their doctor.

The reasons for warm-ups and the technique for doing them correctly

Shooting or exercising without having done an adequate warm-up programme increases the risk of injury from either:-

a) muscles being contracted or stretched beyond their comfortable range which can result in a strain or even a tear in the muscle. This is more likely to happen if the muscle has not been warmed-up as warm muscles are more malleable and able to stretch or contract reducing the risk of strains or tears.

b) in the joints bone moves against bone if the synovial sacks have not been stimulated to provide fluid into the joints and this can result in the bones being damaged by this direct contact. Warm-up exercises stimulate the synovial membrane in the joints to produce synovial fluid which lubricates the movement of bone against bone and consequently reduces the risk of bone damage.

A further benefit of doing warm up exercises is that it increases the heart rate which increases the amount of blood carrying oxygen to the muscles and its ability to remove carbon dioxide from those muscles which is produced by exercise.

TECHNIQUE FOR WARM-UP EXERCISES

The point of doing warm-ups as explained above is to avoid damaging the joints by moving bone against bone before the synovial membranes have produced sufficient fluid to reduce friction between the bones and not to stretch or contract the muscles excessively before the muscles have been warmed-up. **Consequently, each of the exercises described below start with slow and smooth movements which gradually increase in intensity/tempo to avoid these dangers. You do not start any of these exercises with vigorous rapid movements.**

These exercises require you to have good posture with shoulders directly above the hips, the head erect and with the rib cage raised by stretching the stomach muscles.

You work slowly through the body starting with the neck muscles, the shoulders, trunk and legs.

NECK

a) keeping the head erect, slowly turn the chin towards one shoulder and then to the other shoulder and repeat the exercise about four times.

b) with the head erect, tilt the head slowly towards one shoulder and then to the other and repeat the exercise about four times.

c) with the head erect slowly move the head in a circle in one direction and then in the other direction.

SHOULDERS

a) make a slow backward circular motion with only your shoulders lifting them up towards your ears without moving the elbows or arms. After a few of these movements then bring in the elbows and after a few of those bring in the arms slowly increasing the tempo of the movement.

b) as above but a slow forward circular motion with your shoulders lifting them up towards your ears. After a few of these movements then bring in the elbows and after a few of those bring in the arms slowly increasing the tempo of the movement.

c) with arms extended at shoulder height bring your hands in slowly so that they touch your chest and then extend them fully again. Slowly increasing the tempo of the movement and do it about a dozen times.

TRUNK

a) Slowly twist your trunk whilst at the same time lifting the foot of the side being turned onto the ball of that foot so that there is no torque through that knee. Do it on each side of the body for about six times slowly increasing the tempo.

b) Bend your knees and put your hands on your knees with your back at about 45 degrees to the vertical. Then slowly lift your back up to the ceiling. Do about five times.

LEGS

- a) Squats. Keeping the back and head erect, slowly bend the knees a few inches and return to an erect standing position. Do it about four or five times.
- b) With your feet slightly more than shoulder width apart, shift your weight slowly from one foot to the other with a slight dip in the middle. Slowly increase tempo and do it about a dozen times.
- c) Lift each knee slowly to about waist height. Repeat with each knee about six times.

WHOLE BODY

Start marching slowly on the spot lifting your arms and legs. Slowly increase the tempo until you are jogging on the spot.

All the above exercises together should take about five to ten minutes and only when you have completed them will you be ready to shoot or to do any of the other exercises suggested in these notes and have the confidence that you have reduced the risk of any injury. **If in doing these warm-up exercises, you suffer any pain, you must immediately stop exercising and consult your doctor.**

The reasons for cool-downs and the technique for doing them correctly

Cool-downs are carried out for the following reasons:-

- a) to reduce the risk of pooling the blood in the muscles that we have just exercised
- b) to allow the heart rate to gradually reduce to its normal resting rate
- and c) to allow the body temperature to gradually reduce to its normal resting temperature

Consequently, while warm-ups use the principle of starting with slow and smooth movements with tempo slowly increasing, cool-downs start with the opposite principle of moderate tempo that gradually reduces to a slow tempo.

All the exercises mentioned above for warm ups can be repeated for cool-downs but starting from a moderate tempo and reducing to a slow tempo. In addition to these exercises, it is useful to do stretching exercises mentioned in the next section below.

The reasons for stretching exercises and the technique for doing them correctly

N.B. stretching exercises for particular muscles, tendons and ligaments should only be done after you have done warm-up exercises correctly by starting those exercises from a slow tempo that gradually increases to a fast tempo. Studies have shown that stretching prior to doing warm-up exercises correctly increases the risk of injury.

Consequently, you should only use a clingy band prior to shooting (which stretches the muscles, tendons and ligaments of the upper body) after you have done warm up exercises correctly for the upper body.

After appropriate warm-up exercises have been completed prior to you doing your shooting programme or your exercise programme, then after finishing shooting or an exercise programme, you need to do cool-down exercises (where you go from a moderate tempo to a slow tempo) and stretching exercises should be added to the end of these cool-down exercises.

The main purpose of doing stretching exercises is to progressively increase the range of movement of muscles, tendons and ligaments to their maximum safe distance having carried out these stretching exercises on a considerable number of occasions over a period of time. **Obviously, there is a danger of over-stretching these muscles, tendons and ligaments, so any stretch should not exceed the range of movement where you are comfortable and there is no pain. If you incur any pain, you must arrange to consult a doctor.**

It is notable that the Welsh national and regional rugby union teams keep “track of players muscle flexibility to reduce the risk of injury” Western Mail 2nd August 2012.

Each stretch should be held initially at mild tension for about 15 seconds. Ideally you should try to do stretching exercises daily **but only after the requisite warm-ups of the muscles, tendons and ligaments that you intend to stretch.** After every shooting session and exercise workout you should do stretching exercises of muscles that have been previously warmed up and exercised. After a number of weeks, you should seek to progressively increase the period you are holding this mild tension so that at the end of about 3 months that you are able to hold this mild tension for about 30 seconds.

With archery, you need to concentrate on stretches that involve the arms, shoulders and back.

You should note that weight training (including archery which is a specialised form of weight training) does not lead to you becoming muscle bound and consequently unable to stretch those muscles. Weight training increases the range of movement of the muscles, tendons and ligaments that are involved in the area that you are exercising and does not inhibit your ability to stretch any particular muscle, tendon or ligament.

STRETCHING EXERCISES

You are initially going to try to hold these mild stretches for about 15 seconds and over a number of months increase this mild stretch to about 30 seconds. **You do not push the stretch until it is painful. If you suffer any pain from them, you must stop immediately and consult your doctor.**

a) standing with good posture (with the rib cage raised), tilt your head to one of your shoulders and with the hand on the opposite side of the body lift to about 30 degrees from the body and with the palm facing the floor, press it gently towards the floor. Then tilt the head to the other shoulder and with the hand on the opposite side of the body lift to about 30 degrees from the body and with the palm facing the floor, press it towards the floor.

- b) stretch your shoulders by standing with good posture, you bring one of your arms across your chest. With the other arm, hold the arm that is across your chest just above the elbow, gently press it in further towards the chest and hold it. Switch to the other arm.
- c) standing with good posture, bring your hands together behind your back and gently lift them upwards until there is a mild tension and hold.
- d) standing with good posture, bring your hands together in front of your body level with your shoulders and push your hands gently forwards until there is a mild tension and hold.
- e) standing with good posture, bring your hands together in front of your body and lift them until they are directly above your head and push your hands gently upwards until there is a mild tension and hold.
- f) standing with good posture, put one hand behind your back on one shoulder and with the other hand on top of the elbow, gently push down until there is a mild tension and hold. Reverse the procedure with the other hand.
- g) starting with standing with good posture, bend your knees a little and then bend the back until it is about 30 degrees from the upright position and put each hand on the knee that corresponds with its side. Gently, lift the back upwards towards the ceiling until there is a mild tension and hold.
- h) starting with standing with good posture, extend the left foot backwards until it is on the ball of that foot, then bend both knees a little, then tilt your pelvis forward and upward until there is a mild tension and hold. Repeat with the other leg.
- i) if you can safely stand balanced on one foot with the other leg bent and putting one hand against a wall, hold the foot of the bent leg with your free hand and gently pull the foot upwards until there is a mild tension and hold. **N.B. you must take care that you do not bend the knee excessively in that this can damage the knee cartilages.** Repeat with the other leg.
- j) starting with standing with good posture with hands against a wall, lift both heels off the floor until there is a mild tension in the calves and hold.

Exercises for the cardio-vascular system

Before starting any cardio-vascular exercise programme you must consult your doctor and detail the programme you intend following including the initial intensity of the programme and the timetable you intend to follow in increasing that intensity.

As already mentioned you do not continue to exercise through pain. Pain is a warning sign that you must heed by immediately stopping to exercise and you must immediately consult your doctor.

There is a guide maximum safe heart rate which you should not exceed in doing any exercise. The guide maximum safe heart for someone who is in normal health and totally unfit is calculated by subtracting your current age from 220 and then calculating 55% of that figure. So if you are 40, you would calculate the guide maximum safe heart rate as follows :-

$220 - 40 = 180$ divide 180 by 100 and multiply by 55 = 99 beats per minute.

This is merely a guide maximum and should you feel exhausted, light headed or nauseous, you should immediately stop exercising and consult your doctor. When we are at our highest level of fitness, the guide maximum heart rate for someone in normal health can be calculated at 90% of 220 less your current age. So if you are 40, the calculation is:-

$220 - 40 = 180$ divide 180 by 100 and multiply by 90 = 162 beats per minute

Heart rate monitors to be used when exercising can be purchased from sports good stores ranging in price from about £30 to about £80.

There are a number of exercises that we can pursue to improve both the strength of the heart and the lungs and these include:-

a) walking-exercise related injuries are shown to be much lower for walking than for most other cardio-vascular exercises. Studies have shown that increasing the intensity of a walking programme does not carry any increased risk of injury. Also, walking can burn off as many calories as running but it just takes longer.

b) cycling

c) swimming-exercising in water allows you to comfortably move your upper and lower limbs through optimal ranges of motion while minimising the stress on your joints

d) rowing- rowing machines are available in most gyms and it does have the advantage of exercising both the upper and lower limbs

e) running- whilst this is an effective exercise, it does have a considerable drawback in that the constant pounding of the feet on a hard surface can injure the knee joints and cause shin splints.

f) shadow boxing- you need to keep your upper body erect and to keep moving back and forth on your feet (ideally on the balls of your feet) whilst you do blocking exercises to parry imaginary punches and when making jabs, crosses, hooks and uppercuts. It is best to do this in front of a mirror so that you can check that you are not bending the upper body forward and that you are not rounding your shoulders. Your shoulders should not come forwards as you should be keeping the trunk and head erect.

g) even a gym workout can act as a cardio-vascular workout if you do it at a sufficient intensity that you are near the maximum safe heart rate for your physical condition and age. This is achieved by exercising different muscle groups in a pattern that allows those that have just been exercised to rest whilst you are exercising a completely different set.

Whichever of the above exercises or combination of them that you pursue for cardio-vascular fitness, you must do the necessary warm-up exercises where you start your warm-ups slowly and smoothly and slowly increase the tempo as suggested in the appropriate section above. Also, after completing your exercise session, you must do cool-downs where you follow the principle of doing them at a moderate tempo and slowly reduce that tempo as suggested in one of the above sections. Also, after completing the cool-downs, it would be useful to do stretching exercises as mentioned in one of the above sections.

When you start a cardio-vascular exercise programme, you must start with a moderate programme that reflects your current state of fitness and that does not leave you exhausted.

Serious archers who compete regularly during the summer shooting season will need to adjust their cardio-vascular and gym exercise programme to reflect the increased amount of shooting that they do during the summer.

During the winter period, they should seek to do three sessions a week that include both cardio-vascular training and gym work from October to the end of March. From April to the end of September, they are likely to be shooting three times a week and this will mean that they could be doing at least 24 dozen shots in a week compared with about 12 dozen a week during the winter. With non-professional archers, this together with the cardio-vascular and gym work can create considerable physical stress on the body. The exercise sessions that include both cardio-vascular and gym work should be reduced to twice a week. If you reduced this to once a week, the effectiveness of this combined cardio-vascular and gym training will be considerably reduced. The amount of work that the individual archer is prepared to put into shooting and an exercise programme that includes both cardio-vascular and gym work is down to the individual archer. However, archers should note that only shooting the bow will not allow them to reach their potential. Archers should also note that their shooting programme can be improved by doing mental imaging of the shot from the moment you place your feet on the shooting line to the moment you hear the shot hit the target.

How to put together various exercises in the home or gym to form a set for an exercise programme

In carrying out an exercise programme, you do a number of repetitions of a particular exercise that works a particular muscle or muscle group. You then allow those muscles to recover by doing other exercises that work different muscles/muscle groups. This has the advantage of saving time and it increases the intensity of the workout. Obviously, the intensity of the workout will depend on your physical condition but **at no time should you work your body until your physically exhausted, feeling faint or nauseous. If you feel any pain, you should immediately stop and consult your doctor.**

A set of exercises at home or in the gymnasium could consist of:-

a) cardio-vascular exercise – using an exercise bike or a rowing machine for say about a minute of intense exercise. It could also be a shadow boxing programme of blocks and punches.

b) some core strength exercises- say prone bridge, sit-ups, side trunk leans from a kneeling position, lunge and twist.

c) some upper back exercises- bent over rows, prone fly, lateral raises, press-ups

and d) some leg exercises- say squats, plies ,lunges, single leg squats

When you initially start on any programme of set exercises, you will probably find that you can only do one set without becoming exhausted. As you slowly become fitter this can progress to doing two sets of your exercise programme. When you get really fit, you may wish to extend this to three sets.

When you do exercises that use dumbbells, **you always bend your knees to pick them up. Otherwise you could seriously injure your back.**

You decide what exercises you want in your set and only those exercises that you are confident that you can manage. **You must have rest days between your exercise sessions.** You need to do your workouts at least twice a week (ideally three times a week). Obviously, if you feel ill, you do not exercise until you are fully recovered (particularly if you have had flu).

WORKOUT STRUCTURE

Before you do any workout or exercise session (including archery) you do warm ups. You decide what exercises to put into your set but you should alternate between the core torso muscles, the upper body and the legs so you are able to rest each part of the body whilst you exercise another part as this will save time and allow you to increase the intensity of the workout.

N.B. you do not work to the level of exhaustion or where you become nauseous. If you feel any pain, you must stop immediately and arrange to consult your doctor. You will need to ensure that whilst exercising that you do not become dehydrated by drinking sufficient non-alcoholic fluid prior to exercising, during and after.

Below is an example of how you could structure your set of exercises. Which exercises you put in your set and the order of which part of the body to exercise is down to your preference. What is listed below is only an example to give you some idea how to structure your set.

A) warm-ups- prior to doing workout and is not repeated

B) work out

1) one minute intensive cardio-vascular exercise – in the home or gymnasium this could be on an exercise bike, rowing machine or shadow boxing.

- 2) core muscles - sit ups- working stomach muscles
 - 3) upper body -Bent over rows-exercises the rhomboids, latissimus dorsi, the trapezius, biceps and forearms.
 - 4) legs -squats- exercises the quadriceps, the hamstrings, the gluteals and core strength muscles around the torso
 - 5) core muscles -pelvic thrusts
 - 6) upper body- lateral raise- exercises your deltoids
 - 7) legs- lunges-exercises the quadriceps, the hamstrings, the gluteals and the core strength muscles around the torso
 - 8) core muscles- side trunk leans from a kneeling position- exercises the oblique muscles in the torso
 - 9) upper body- triceps press- exercises primarily the triceps with secondary emphasis on the forearms
 - 10) legs - plies-exercises the inner thighs, the gluteals and the hip abductors
- C) cool downs and stretching exercises when you have completed the number of sets you wish to do (whether it is one set, two sets or three sets). Stretching exercises can be done as part of the cool down process. The prime reason for cool downs is to avoid blood pooling in the muscles that you have just been exercising and allow the heart rate to return gradually to its normal rate.

Core strength exercises for the muscles within the abs and back that are attached to the spine and pelvis that keep the body stable and balanced

As stated in the other sections above, you must consult your doctor before commencing any exercise programme. Also, you do not do any of these exercises until you have completed adequate warm-up exercises which start with slow and smooth movements that slowly progress into rapid and energetic movements.

It must be emphasised again that you start with a moderate programme that does not leave you exhausted and **when you are exercising, you do not hold your breath. The golden rule is to “exhale on the effort”** which will give extra dynamism to your movement and allow you to perform better.

See article entitled “More Than Just a Six Pack “in the spring 2012 issue of Sporting Edge published by sports coach.uk.

When these muscles contract, they stabilise the spine, pelvis and shoulder girdle which creates a solid base of support for physical movement.

The muscles of the core run the length of the trunk and torso and include:-

- a) rectus abdominis
- b) erector spinae
- c) multifidus
- d) the external and internal obliques
- e) transverse abdominis
- f) hip flexors
- g) gluteus maximus
- h) hamstring group and i) the hip abductors

CORE STRENGTH TRAINING EXERCISES

- a) just think constantly of whether you have good posture when you are walking around in work and at home and consciously keep your head erect directly above your shoulders, with your shoulders directly above your hips and at the same time stretch your stomach muscles to raise your rib cage. You should progressively increase the amount of time you have good posture during the day until good posture becomes a habit that you maintain throughout the day.
- b) prone bridge – lie in a face down position on the floor, balance on the tips of the toes and elbows (with the forearms on the floor) whilst maintaining a straight line running from the heels through to the head. Try to hold initially for about 15 seconds but aim over a number of months to hold it for about 30 seconds. This exercises the anterior and posterior muscle groups of the trunk and pelvis.
- c) supine bridge- lying on your back, raise your hips so that only your head shoulders and feet are touching the floor. Again try to hold initially for about 15seconds.
- d) abdominal muscle squeeze- standing with good posture and feet about hip width apart, put one hand in the middle of your chest just below the rib cage and the middle of your other hand on where your belly button is and try to move them towards each other by squeezing your stomach muscles **without leaning forward**.
- e) sit-ups-these work predominantly the upper part of your abdominals. Lie on your back with your knees bent . Place your hands behind your neck/head and by contracting only your stomach muscles **just lift your shoulders and head off the floor** with the rest of your spine remaining on the floor.
- f) lower back curls- these work predominantly the lower part of your abdominals. Lie on your back with your hands down by your sides and bring your legs up with your knees bent keeping your back on the floor. Now slowly raise the lower part of your back off the floor **by only contracting your stomach muscles**, hold and then lower to starting position. It is the squeeze in the lower abdominals that lifts your hips off the floor.

g) side trunk leans from a kneeling position- exercises the oblique muscles in the torso kneeling on the floor with your body upright and not sitting on your heels, push one leg out to the side so that the floor, the thigh of the leg that you are kneeling on and your outstretched leg form a right angled triangle. Put your hands in the air straight above your head and bend your trunk in the opposite direction to your out-stretched leg, hold and return to the starting position. Repeat three or four times then change position with the other leg stretched out to the other side. The intensity of the exercise can be increased by holding a medicine ball or dumbbell above your head in the starting position.

Exercises for the upper back

As already mentioned on several occasions, **you do not do any physical exercise without having carried out warm up exercises correctly.**

These exercises are important to even out the lop-sided development of the back, shoulder and arm muscles that is produced by shooting. By balancing the development of these muscles it reduces the risk of injury through uneven development of the upper body.

You can consider using some of the following exercises:-

a) Bent over rows-exercises the rhomboids, latissimus dorsi, the trapezius, biceps and forearms.

Bend your knees to pick up dumbbells with one in each hand. Stand with your knees slightly bent and not locked with your back parallel to the floor. Do not allow your back to become rounded. Moving only your upper arms, lift your upper arms until your elbows point towards the ceiling and at the same time squeeze your shoulders together. Hold for about 2 seconds and then allow the upper arms to relax slowly until the arms are fully extended below your back at their starting position. If you can start with about 7 or 8 repetitions per set and over time aim to increase these to about 15 repetitions.

b) Prone fly- exercises the back of the shoulder and the upper back

Bend your knees to pick a dumbbell up in your left hand. With your right leg slightly forward and your left leg slightly back, bend your knees so that your right forearm can rest just above your right knee. Your back will be about 45 degrees to the vertical. With a slight bend in your left elbow, lift the dumbbell in your left hand to about shoulder height, squeezing your shoulder blades together and hold for about 2 seconds and return to the starting position. If you can start with about 7 or 8 repetitions per set and over time aim to increase these to about 15 repetitions. Swap the dumbbell into the right hand with your left forearm resting just above your left knee. And repeat the exercise that you have done with left hand.

c) lateral raise- exercises your deltoids

Bend your knees to pick up dumbbells with one in each hand. Stand upright with good posture and then place your feet about hip width apart. Then keeping your knees and elbows slightly bent, lift your arms up on each side of your trunk in an arc until both hands meet

above your head. Hold for about 2 seconds and return to the starting position. If you can start with about 7 or 8 repetitions per set and over time aim to increase these to about 15 repetitions.

d) press-ups-exercises the chest and abdominals

Lie face down on the mat and then sit up above your heels by bending your knees. Put your hands out onto the floor in front of you, move your hips forward until there is a straight line through your lower and upper legs, your trunk and your head which will place most of the weight onto your arms. You can then from this position bend your arms until your upper arms and forearms are nearly at 45 degrees. Hold and return to starting position. If you wish to make this easier, you can leave your lower leg touching the floor and hinging from the knees just keep the upper leg, trunk and head in a straight line and do the press up. If you can start with about 7 or 8 repetitions per set and over time aim to increase these to about 15 repetitions.

e) triceps press- exercises primarily the triceps with secondary emphasis on the forearms

sitting on the edge of a seat or bench with your hands at your sides on the seat, move your backside forwards until it is clear of the seat or bench, bend your arms to lower your body, hold and then return to the starting position. If you can start with about 7 or 8 repetitions per set and over time aim to increase these to about 15 repetitions.

f) dumbbell wrist curls- exercises all the muscles of your forearms and those in the wrists.

Sit upright at the end of a bench or seat with a dumbbell in each hand, palms up and forearms resting on your upper legs with your wrists extending beyond your knees. Sag both wrists down towards the floor as far as possible keeping your forearms resting on your thighs. Then curl both wrists up as high as possible, hold and return to start position. If you can start with about 7 or 8 repetitions per set and over time aim to increase these to about 15 repetitions.

g) dumbbell curls- primarily the biceps with secondary emphasis on the forearms

Bending your knees pick up a dumbbell in each hand, stand upright with good posture, then placing your feet shoulder width apart and your toes of both feet pointed slightly outwards. Your arms should be hanging straight down at your sides with your palms facing forwards. Lift both dumbbells upwards to shoulder height and then continue the movement by moving your elbows up to head height. Hold and return to starting position. . If you can start with about 7 or 8 repetitions per set and over time aim to increase these to about 15 repetitions.

Exercises for the legs

As already mentioned on several occasions, you do not do any physical exercise without having carried out warm up exercises correctly.

Strong legs are important for archery together with strong core muscles around the torso to hold the good posture that together provide a stable platform to carry out each shot throughout the tournament.

a) squats- exercises the quadriceps, the hamstrings, the gluteals and core strength muscles around the torso

stand upright with good posture with your hands at your side and now slightly bend the knees so that they are not locked. Keeping the abdominals in tight by keeping the rib cage raised with the torso upright, whilst keeping your heels on the floor, we bend the knees further until the shin bone is about at a 50 degree angle with the floor or to the point at which you are comfortable. You do not stick your backside out. If you can start with about 7 or 8 repetitions per set and over time aim to increase these to about 15 repetitions.

You can make the squats harder by holding a dumbbell in each hand or if you have resistance bands passing the bands under each foot and holding the handles at shoulder height. If you use dumbbells you must bend your knees to pick them up.

b) lunges-exercises the quadriceps, the hamstrings, the gluteals and the core strength muscles around the torso

stand upright with good posture with your hands by your sides. Now put your right leg forward by about a third of a metre without locking the knee of that leg and the left leg backwards by about a third of a metre keeping your torso and head upright. Lift your left backward foot onto the ball of the foot and then bend both knees downwards (keeping the torso and head upright) to a point that is comfortable to you and return to your start position. If you can start with about 7 or 8 lunges per set and over time aim to increase these to about 15 repetitions. Then swap over legs.

Again, you can make the lunges harder by holding a dumbbell in each hand. If you use dumbbells you must bend your knees to pick them up.

c) plies-exercises the inner thighs, the gluteals and the hip abductors

stand upright with good posture. Now place your feet about a little further than shoulder width apart with the toes of both feet and the knees pointing slightly out. Keeping your torso and head erect, bend the knees to a comfortable point, hold for about 3 seconds and return to starting position. Initially start with 7 or 8 repetitions and over time increase these to about a dozen.

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