11.4. STRENGTHENING

The development of the archer's strength is a fundamental step of the preparation, both to improve the technical skills, and to guard against injuries caused by the repetitive nature of shooting a bow.

Archery is a sport discipline with a very high need of precision and fine motor control (including the ability to use only the muscle groups required for the specific actions, at the moment required, and with the necessary intensity and duration). Additionally, different parts of the shot sequence require distinct types of muscular contraction or release. Therefore, it is important to have a strength program that incorporates a high degree of archery-specific muscular activity.

On the other hand, a generic strength program involving the whole body must be pursued as well, tailored to the novice's ability level, in order to develop the strength required to support the shooting technique. In fact, many technical actions can only be carried out, or improved, if there is a sufficiently high level of other physical qualities relating to the strength of the student.

Normally strength is defined as the ability to lift or to move a certain weight. This is called a "concentric contraction" and it is, for example, the strength exerted by the string side during the drawing of the bow. The reverse action, an "eccentric contraction" is identified as the opposition of a force in the direction of the action produced by the force itself. For example, letting down from full draw back to the rest position without shooting.

Finally, an "isometric contraction" is identified as the application of a strength action without any kind of resulting movement. For instance, holding the bow out at arm's length is a case where the shoulder muscle is engaged with a muscular contraction without any perceived or intended movement.

There are other aspects of strength training, such as explosive-reactive movements, that are not important to proper archery physical preparation and, therefore, they will not be described or discussed.

From the time the novice lifts the bow up until after the follow-through, many muscle groups are activated simultaneously or in a rapid sequence using the three types of contractions described above.

Performance improvement will come faster using carefully chosen and specific programs comprised of targeted exercises. Bear in mind that, in the majority of situations, muscular intervention is not due to a single muscle, but to a "chain" (a synergistic or consequent action of multiple muscles) often activated with different contraction methodologies.
The strength of a muscular chain is limited by its weakest link. A deficit in a single muscle within a particular muscle group will affect the performance of the routine, and consequently reduce the effect of the whole motoric action.

Controlled strength is an essential component in executing a successful shooting sequence. However, the use of indiscriminate overloads without following the basic rules of strength development can create unpleasant side effects. For instance, if the load and the number of repetitions are not properly suited to the training objectives, not only will the performed action not get the desired results, but it may cause undesired and sometimes serious damage. A common occurrence is when the athlete performs an excessive number of sets or repetitions. Instead of developing resistance or strength, this produces a muscular hypotrophy (muscle loss or weakening) and/or a loss of articular mobility (flexibility or range of motion).

The following are some simple tips to minimize the risk of injuries, aches, inflammation, etc. due to poor handling of the movements or of the load.

- The load used must always allow a "clean" execution, i.e. without any loss of control. In short, the novice must be able to demonstrate complete control of the exercise during the whole routine.
- The pause between each routine/series must allow sufficient recovery to ensure the next routine/series is not jeopardized.
- The working sessions dedicated to strength development must have enough rest time in between for the body to

repair, rebuild and be ready for the next training session.

- Priority must be given to "how" over "how many". It is better to have fewer repetitions that are technically well done than many repetitions with poor form.
- The correct position of the backbone (posture) is the most crucial of the necessary requirements to produce an efficient movement and, therefore, to obtain the desired results. Correct posture creates the optimal conditions for the entire body to work in.
- Perform stretching exercises that involve the muscle group being worked before, during, and after the session.
- Use a training program where the number of repetitions and the loading intensity are a function of the desired result and the ability level of the novice.

It is very difficult, at this level, to describe fully the difference between the development of maximal strength and the development of resistance strength, otherwise known as stamina or endurance. For the purposes of this manual, maximal strength is generally developed with fewer repetitions (reps) of higher relative loads, while resistance strength comes from more repetitions with lighter loads.

When starting a strength-training regimen, the aim is primarily to develop coordination in load bearing movements by using light weights or resistance that can be easily handled by the novice. Once that has been achieved, the threshold of the physical exertion can be pushed forward using higher loading resistances or weights.

A simple formula is generally used to select the appropriate resistance or load for a student based on their unique ability level. First the student must discover their "one repetition maximal" load (RM). This is the amount of load at which the athlete can perform only one repetition of the exercise due to the high load intensity.

Development of resistance strength (stamina or endurance):
Use a load between 40% and 70% of RM in 3-5 sets of 20-25 reps, depending on the training level of the novice.

Development of maximal strength:
Use loads between 70% to 100% of RM. Usually 3 or 4 sets of decreasing numbers of repetitions are implemented with an increasing load such as: 6-8 reps at 70%, 4-5 reps at 85%, 2-3 reps at 90-95%, and one rep at 100%.

The methodologies for the development of maximal strength are, normally, quite intense during both the physical exertion and the recovery phases. Maximal strength development generates stimulations either on the nervous system or on the metabolic system often leaving the novice exhausted. Attempting technical gestures, such as those required to shoot an arrow, while exhausted or not sufficiently recovered often results in modifications in the tensions and the contraction sequences of the muscles normally used. Consequently, loss of fluidity during the various steps of the shooting sequence may occur. Worse than that, the novice may inadvertently use unusual muscles or muscle groups to compensate for any temporary strength deficit resulting from the fatigue of the proper ones. The consequence is generally a sensorial modification of the posture and of the action itself due to a variation of self-perception. Therefore, it is critical that specific archery training occurs only after sufficient recovery time has passed after a strength training session.

Finally, it is important to note that, for an archer, the physical preparation must be in service to the sport-specific actions and not the other way around. If properly implemented and monitored, a strength training program will be a benefit to the archer, providing a better foundation for the shot and its requisite movements.

11.4.1. Postural body control

Ideally, an archer should shoot from a stable, balanced and erect posture.

To achieve this, the novice must have a strong foundation connected through the feet, legs, hips, back and shoulder all the way to the head with no weak links
The muscles of the feet and legs continuously and imperceptibly adapt their tension to maintain and control the archer's balance.

In the same way, the gluteus and quadriceps (mainly the wide medial) muscles provide stability as far as the thigh muscles are concerned.

In this case, the gluteus muscles have the distinction of being very near to the novice's core and, therefore, are able (even with very small contractions) to balance or unbalance the bow/archer unit.

The back muscles give crucial stability to the novice and generate the required stiffness. "Stiffness" is the level of rigidity and compactness that the muscular-tendinous system generates during loading situations. These muscles dynamically control, easily and without a high level of wasted energy, the posture of the upper section of the body as a whole. The back muscles must be precisely employed, not only to allow correct and efficient operations, but also to avoid risk of injury.

Postural considerations generally take up much of the focus during a novice's first steps, either for obvious technical reasons related to stability and balance or for constructive reasons concerning the development of the novice and of the practice process.

A strong trunk muscular system, in particular the back, is essential to maintaining an ergonomic and effectual posture during the act of shooting. The stable and solid positioning of the other body segments is directly related to the efficiency of the trunk muscular districts. If we imagine the backbone and its muscles as the mainmast of a ship, we see that failures or tension deficit are unfavourable to the correct execution of technical actions.

In addition, an inadequate core strongly increases the risk of injury or pain caused by incorrect postural behaviour resulting from the lack of strength required to support the positions assumed by the novice while shooting.

The positioning of the different body segments (the scapula, the neck, the pelvis and so on) depends on the archer's capacity to generate stiffness.

When possible, it is advisable to introduce some asymmetric exercises using an unstable platform in order for the novice to experience and learn to control destabilising influences.

11.4.1.1. Core exercises on stable support

Static or semi-static postures are the first step in a series of physical exercises designed to build up a solid posture with a high level of proprioception. Proprioception is the capacity to perceive and to recognize the body's position in space and the degree of muscle contraction, even without visual cues. As such, good proprioception is essential in archery.

The object of the following exercises must always be to get the alignment of the ankle-knee-hip-shoulder-head axis as precise as possible (*). These elements must be kept in a straight line as a result of the continuous muscular contractions happening throughout the body.

(*) *One of the basic archery skills that the novice must develop – See Chapter 1 "Activity Description and Archer's Skills" and also section 6.11.1 "The importance of keeping the shoulders and hips directly above the feet."*

As is the case for strengthening, these exercises can grouped based on the part of the body they target. It is up to the coach to select some of them when preparing sessions. Do not try to do all of them in the same session because it would take too long, leaving no time for shooting. For the first sessions, one or two exercise(s) per targeted body part is enough.
These exercises can be performed in in any order. Start with 1 set, then progress to 2 then 3 sets of each exercise with variable

timing (depending on the ability level of the novices). 15 seconds to 1 minute is appropriate for the prone or supine positions whereas the lateral and the three support prone positions should have timing varying between 15 and 40 seconds. Careful monitoring and familiarity with the novices on the coach's part are usually a sufficiently precise method for determining the correct volumes to be used.
These exercises can be performed at the beginning or the end of the training session as part of the warm-up or warm-down. Alternately, they may be used as the central part and main objective of the session.

Prone plank

Prone plank (low and high variations)

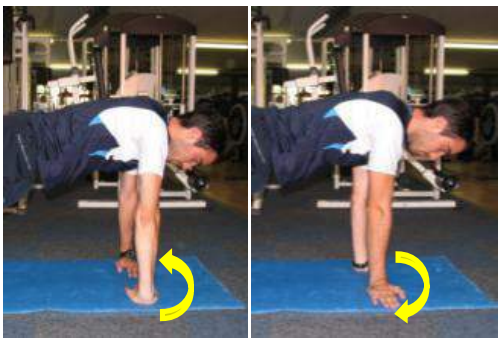
Low prone plank

With toes curled under, elbows under the shoulders, hands touching, raise the body to be a straight line from heels through hips and shoulders to the top of the head. If anything, the hips should be above this line. Hold this posture for the duration of the exercise. See the above illustration on the left hand side.

High prone plank

Similar to the low prone plank, but with hands below shoulders and arms extended. See the above illustration on the right hand side.

Hands turning variation:



High plank, hands turning variation

From the high prone plank position, lift the hands in turn and rotate them from neutral position to pointing inwards, then outwards and repeat for the duration of the exercise.

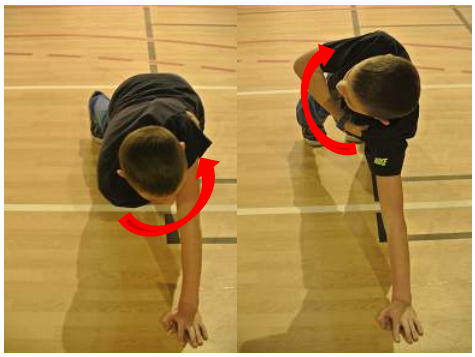
Tripod prone plank (one hand)

The same position as the high prone plank, but with one hand lifted from the ground. Repeat the exercise once for each hand.

Tripod prone plank (one hand)

Torso rotation variation:

From the tripod plank position, slowly rotate the torso from parallel to the floor to a perpendicular orientation and back.



Torso rotations upward and downward

Tripod prone plank (one foot)

Similar to the low or high prone plank, but with one foot lifted from the floor. Repeat the exercise once for each foot.

Three supports prone posture

Two support prone plank

Similar to the high prone plank, but with opposing hand and foot lifted from the ground. Repeat the exercise once for each foot/hand pair raised.

Two supports prone posture

Low Lateral plank

Brace on one elbow, with the feet stacked one on top of the other, the edge of the lower on the ground. Keeping the shoulder low and pushing the elbow into the ground, raise the hips from the floor to form a straight line from heels to head.

Low lateral plank (regular and elevated feet variations)

To add difficulty, raise the feet onto a support. Three sets on each hand.

High lateral plank

As with the low lateral plank, but braced with a hand on the ground and the arm straight. Raise the free hand or mime the shot process to increase difficulty level. Three sets on each hand.

High Lateral plank with leg raise

Same as high lateral plank, but raising the upper leg to roughly shoulder width from the lower.

Lateral plank with leg raise

Intermediate supine plank on two elevated feet

Brace on both elbows, facing upwards with the feet on an elevated support. Raise the pelvis from the ground to form a straight line from the feet to the head.

Supine plank

High tripod supine plank (one foot)

As with the supine plank but with extended arms and one foot on floor or elevated support, lift the other foot from the support.

High tripod supine plank

Low tripod supine plank on one elevated foot

With shoulders or elbows on the ground, facing up and the feet on a support, lift the body to form a straight line from heels to head, then lift one foot from the support.

Three supports supine posture

Dynamic supine plank

Start the hands under the shoulders, feet below knees. Lift one foot off the ground and slowly extend the leg while raising the hips to the supine plank posture. Repeat for three sets with either foot as the support.

Abdominal exercises

Abdominal exercises are usually classified as core exercises, since they involve the muscle group that allows the archer to maintain the proper ankle-knee-hip-shoulder-head alignment.

Abdominal shoulder lift

Abdominal shoulder lift: starting with the back flat on the ground, and with the hips, knees and ankles all at a 90° angle. Raise the shoulders roughly 8 cm from the floor while keeping the chin away from the chest and eyes looking at the ceiling. Exhale on the lift, inhale to lower. 3 sets of 10 reps.

Abdominal hip raise

Abdominal hip raise: starting in the same position as above, keeping the shoulders on the floor, raise the hips roughly 8 cm from the floor. Exhale on the lift, inhale while lowering. 3 sets of 10 reps.

There are many other popular exercises to strengthen the abdominals readily available on the internet or published in magazines and books. Thus, no more shall be discussed in this manual.

11.4.1.2. Core exercises on unstable support

The concept is to have the novice learn to control their balance while moving one part of the body or holding an unstable posture. These exercises are necessary when the classic postures are not efficient enough for the demands of the activity. In this case, when the novice is no longer being challenged by the exercises above, it is necessary to introduce some more difficult elements in order to create situations where the novice is obliged to reset his motor scheme.
The use of one or more "Medicine balls" or "Stability balls" can be very useful. For the following exercises, use the low range of the implementation recommendations as for the "Core exercises on stable support" in 11.4.1.1. as a guide for duration.

1. Unstable plank postures

It is possible to increase the efficacy of the basic plank exercises by creating a source of instability in either the hand supports, the foot supports or both. The three following images depict possible variations for increasing the difficulty of a plank posture.

Low plank on a ball

High plank on an unstable base

High plank on three balls

2. Balancing on a stability ball

By removing direct contact with the ground and supporting the entire weight on a stability ball, the novice is required to engage their core to maintain balance.

Seated

Sitting on the ball with arms and legs extended requires that the appendages be manipulated from the core to maintain balance.

Prone plane

Lying with the belly on the ball and arms and legs extended and maintaining a straight body position from heels to head requires good core engagement, especially from the back muscles, for balance as well as maintaining full extension.

Supine plane

Lying supine on the ball with arms and legs extended and body in a straight line engages the front core muscles for balance and strength.

Here again the abdominals must be engaged as part of the core muscles.

Abdominal shoulder raise on a ball

Abdominal shoulder raise on a ball: From a "table" position (lower back on the ball, feet at shoulder width or less, knees and ankles at 90° flexion) and keeping a flat back, raise the shoulders towards the ceiling, keeping the chin away from the chest and eyes looking up. 3 sets of 10 lifts.

11.4.1.3. Body control with load in suspension

These exercises voluntarily introduce a loss of equilibrium, (and recovery!), of the entire erect and aligned posture through the contraction of the tibia and fibula muscles. This will enable the novice to recover from a greater unbalancing angle, be it backward, forward, lateral, or a mixture.

One of the strongest advantages of the following exercises comes from their involvement of almost every supporting muscle, working the feet to the neck and everything in between. Every muscular element is engaged in order to maintain a stable posture. Additionally these exercises present a low risk of injury or overloading the backbone with an excess of weight or activity.

The exercises are normally performed with the added weight being proportional to the novice's level of conditioning. For example, young novices generally work with a bar plus round weights varying from 5 to 15 kg.

The degree of load must challenge the novice to work moderately to maintain balance, but be sufficiently light that correct execution and body control can be sustained.

a) Walking

In the early stages, the novice simply walks with a weight held overhead. The primary goal is to maintain an erect posture and stable equilibrium. Three types of walk are proposed below:

Walk on heels only, keeping toes lifted off the ground.

Walk with the weight rolling smoothly over the entire foot from heel to toe

Walk only on the toes of the feet, heels lifted.

These simple walks are done for about 2 or 3 sets of 20 metre "reps." Performing these walks on an incline generates better efficacy in the gluteus region. Alternately if the walks take place in sand, there is better engagement of the foot-leg district (gastrocnemius, fibular, tibial and foot muscles).

Once the novice is able to control these easier walks, more complicated walks can be considered, such as skipping, running with a back kick, running with a front kick, jumps and skips of any kinds and in any directions, with one or both feet. The level of difficulty increases proportionally to the adaptation. Maintaining posture with an overhead load during a simple movement is relatively easy, while maintaining the same overhead weight at higher speed and/or with large swings of various body segments is much more complicated with respect to coordination and requisite strength.

b) Challenge of balance

This exercise starts from an erect position supporting a weight. The weight must always be at a level commensurate to the ability of the novice, usually between 5 and 10 Kg.

The exercises are normally performed through a voluntary challenge to the equilibrium in the front-back plane or in the lateral plane. The subsequent recovery occurs through a sequence of muscular contractions without losing the alignment of the posture. Imagine a straight line passing through a projection of the novice's centre of gravity on the ground, their core and their head. This line must never be broken. When the novice reaches a high level of skill these exercises can be done on a wobble board or a balance beam.

These exercises can be performed at any time during training sessions, either during shooting sessions or the physical conditioning sessions. The number of repetitions is varies depending on the novice's ability level. Generally 15 to 20 seconds of exercises repeated 2 to 3 times

are enough to produce positive results for a novice.

Challenge to the front-back equilibrium

Challenge to the lateral equilibrium

11.4.2. Strengthening with body weight

In most cases the novice can use a part or all of their body weight for their strengthening routine.
In addition, free-standing exercises, without the use of machines, generally produce better results when proper form is used.

The following exercises are good general exercises and also strengthen the ankle-knee-hip-shoulder-head alignment.

Leg crossing

Alternately pass one leg under the other one

In addition to being an excellent general warm-up exercise, leg crossing (pictured above) strengthens the core and the muscles used to draw the bow.

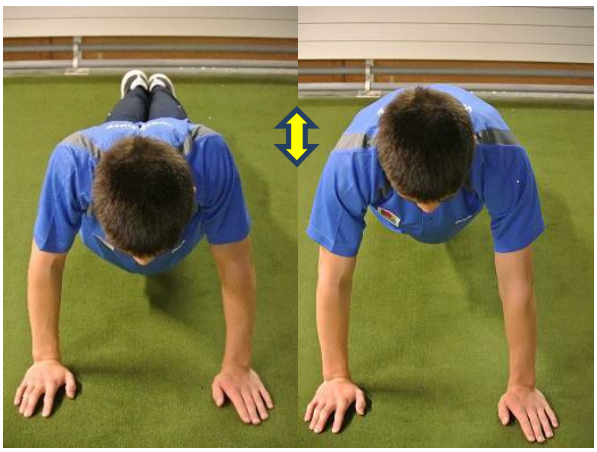
The dial

In the position below, ask the beginner to accomplish a tour of dial clockwise on the floor, by moving the hands across the body and keeping the feet still.

Follow it with another tour of the dial, counter clockwise.

Straight arm – Shoulder blade spreading

Starting from a high plank position, alternate between letting the shoulders sag with the shoulder blades squeezing towards the spine, and extending by spreading the shoulder blades away from the spine.



Facilitated push-ups on knees

Starting in a hands-and-knees position with the hands directly below the shoulders, the knees together and a straight line being made from the knees to the head. Tighten the shoulder blades and bend the arms, lowering the upper body until the elbows form a 90° angle, then return to the starting position. Repeat for 3 sets of 10 reps.

Facilitated push-ups on an elevated support

Starting with the body in a high prone plank position and the hands on an elevated support, bend the elbows to 90° and return to the plank position. Repeat for 3 sets of 10 reps.

Push-ups

Starting from the high prone plank position, with hands directly below the shoulders, lower the body so that the elbows are at 90° and then return to the high plank. Hold each position for five seconds. Repeat for 3 sets of 4 reps.

As a variation, widen the hand position as depicted below.

Push-ups on a ball against a wall

Starting with the body in a plank position and the hands on a ball, bend the elbows to 90° and return to the plank position. Repeat for 3 sets of 10 reps.

Arm extension in a bent over posture

Preliminary posture 1:
With the knees on the floor, place the forearms flat on the floor with the elbows directly below the shoulders and the hands directed forward. The thighs and arms should be at right angles with the floor.
Preliminary posture 2:
Without moving the toes, stretch out the legs. The body should be in a position like the one illustrated above on the left hand side.
Exercise:
Move the entire body forward as far as possible until the nose gets close to the floor (the right hand side of the pictures above), then return back to the original posture (left hand side). Repeat for 3 sets of 10 reps.

Triceps extension in a prone plank posture

Start from a high prone plank position with the hands a short distance forwards of the shoulders (left illustration). Bend the elbows to lower the body until the forearms are flat on the floor (right illustration), then return to the starting posture. Repeat for 3 sets of 10 reps.

Triceps wall/floor presses

Position the feet about 30 cm from a wall, lean the back against the wall and place the hands away from the body against the wall. Press the hands against the wall to move the shoulders and upper body away from the wall. Repeat for 3 sets holding one minute per set.

Triceps dips on an elevated support

Supporting the feet and hands on a bench or other support, lower the body with the arms until the elbows are at 90° and then raise to full arm extension again. Repeat for 3 sets of 15 dips.

Shoulder Shrugs

Sitting on the floor with the legs straight out in front, arms straight and hands placed beside the hips, extend from the shoulders to lift the buttocks from the floor. Repeat for 3 sets of 10 reps.

Exercises to improve foot articulation

The following exercises work on the foot articulation, developing the muscular-tendinous apparatus, making them stronger and more toned as well as more mobile. Therefore, in addition to being able to support the archer's weight more easily and for longer periods, the muscles will be able to adapt better to the ground and changing conditions without losing precision in the feedback. The exercises include:

- A series of intra and extra rotations of the tibia-tarsus section (ankle articulation) with controlled moves.
- Pronations and supinations with a stop at the maximum point of articulation.
- Plantar bending.

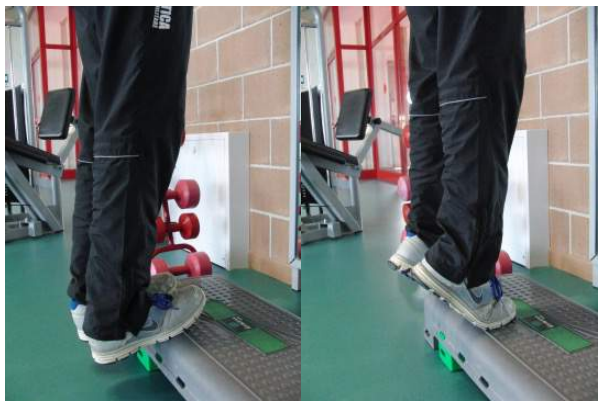
Below are two example of possible exercises.

The efficacy of the described exercises is increased if they are done barefoot, or better, in the sand.

Exercises loading the gastrocnemius (calf)

Often called a "calf-raise," this is a simple exercise of maximal extension performed using a simple step. Standing on the step, the athlete allows their heels to drop down as low as possible and then rises onto their toes to maximal height. This exercise is intended to be done "at maximum" repetitions, meaning that the novice ends the series when the burning sensation, during the lift does not allow a full raise. Generally, the exercise is done in 3-4 sets of 20-30 reps.

When the novice reaches the above working volumes with no difficulties, they should increase the challenge by using only one leg at a time. Later they can add either some overload (ballasted jacket, dumbbells or a barbell), or a balance component to the exercise.



Calf-raise starting and finishing position

Exercises loading the leg muscles

Proper methodology suggests starting with exercises using a natural load (i.e. the novice uses only their own body weight). This is due not only to the obvious reasons of safety and protection, but also to allow the novice to learn the posture and body sensations of the unusual working situations. A high degree of postural control is necessary to avoid osteo-articular problems.

As is often the case, the exercises have dual functions: firstly the development of a conditional parameter (in this case the strength) is pursued, and secondly proprioception-postural awareness and improvement (control of the body during exercises engaging medium to high intensities).

All of the following exercises can be executed using additional weights (i.e. ballasted jacket, suspended load or barbell), after the novice demonstrates complete control of the physical gesture and good strength development. The use of unstable platform as shown below is strongly recommended.

Example of use of an unstable platform for Front Lunge

Squat using the body weight only

From a standing position with the feet about shoulder width apart, lower the hips behind the feet until the thighs are parallel to the ground. Note that the back stays straight and the knees do not go forwards of the toes. Perform 3 to 4 sets of 10 to 12 controlled repetitions with 3 to 4 minutes of recovery time between sets. In the image below, the heels are raised on a flat disc.

Squat

Half squat using the body weight only

Squat half-way, using only the body weight, for 4 to 6 sets of 12 to 15 controlled reps with 3 to 4 minutes of recovery time between sets. Notice the heels are raised on a flat disc.

Half squat

Front Lunge

Take a large step forward, keeping the feet no more than shoulder width apart in the left-to-right direction, and push the trailing knee towards the ground. This can be performed as a walking motion or in place. 2 to 3 sets of 12 to 16 steps or reps with 3 to 4 minutes of recovery time in between.

Front lunge

Lateral Lunge

Have the legs wide apart laterally, move the body left and right, or simply up and down in place for 2 to 3 sets of 10 steps or reps with 3 to 4 minutes of recovery time in between.

Lateral lunge

Isometric Wall Squat – two feet

Wall squat in an isometric two-foot stand, holding for 20 to 30 seconds and 2 to 3 minutes of recovery for 2 to 3 sets. As the strength develops, increase the time proportionally to 60 or 90 seconds.

Isometric wall squat on 2 feet

Isometric Wall Squat – one foot

Wall squat in an isometric one-foot stand, similar to the exercise above but with reduced time - starting with 15 to 20 seconds and moving up to 60 seconds.

Isometric wall squat on 1 foot

During strengthening exercises, it is important to control the breathing rhythms. As a general rule, inhale during the less intensive moves i.e. while lowering in a squat, and exhale during force production, i.e. when switching from lowering to raising or during the rise of a squat.

In an isometric exercise, there are no alternating situations of muscular contraction, as the muscles maintain tension throughout the duration. Nevertheless, it is still important to control the breathing rhythm during each exercise. Novices have a tendency to hold their breath during isometric exercises, resulting in an anaerobic effort that produces excess lactic acid, which spoils the exercise.

Since control of the breath is a key aspect in archery technique, implementing a breathing sequence for strength training sessions is natural and reinforces the sport-specific application.
It is also useful to remember that the described exercises must be distributed throughout the week or overall training cycle and not practiced all together in the same session.

Ideally the coach will set priorities for the training sessions (either metabolic, or according to targeted body part/region) in order to plan the novice's adaptations to achieve a primary objective for the single session or for the whole training period. This must be planned according to the competition calendar and specific technical targets.

Exercise loading gluteus from a quadruped position – out-stretched limb

Start in a hands-and-knees position with the arms and thighs at right angles to the ground. Slowly lift one leg, straighten it, and then raise it as high as possible in the air before returning to the start position. Repeat for 3 sets of 10 reps per leg.
The exercise is demonstrated in the following 2 pictures.

Gluteus from quadruped position out-stretched limb

11.4.3. Strengthening with an elastic resistance

Not all novices have access to high-tech workout machines. Fortunately, a rubber strengthening band is sufficient for the novice to get a good workout. For those athletes who do have access to machines, it is still advisable, especially in the initial stages of the physical training, to use free-standing exercises. Specific machines often "drive" the execution of the exercise, reducing its effectiveness.

Using various elastic resistances, or the same elastic held at different distances, the required effort from the novice can be reduced or increased to suit their needs and ability level.

When using an elastic resistance band, 2 to 3 sets of 10 repetitions, or 20 seconds of isometric hold, or any combination of these two alternatives are appropriate.

Exercises for the legs

Exercises loading the leg abductors

Start from a standing position, sideways to a solid support with an elastic resistance band affixed and looped around the ankle of the leg furthest from the support. Pull the outer leg away from the centre line of the body, stretching the elastic band. Repeat for each leg.

Loading the leg abductors

Exercises loading the leg adductors

Start in a similar position to the previous exercise, but with the resistance band looped around the ankle closest to the support. Draw the inner leg towards the centre line of the body, stretching the band. Repeat for each leg.

Loading the leg adductors

As an alternative, each of the previous two exercises can be performed from a seated position.

Exercises loading the tibia and fibula muscles

The following exercise should be performed using a number of repetitions and sets appropriate to the skill level of the novice. The 5 to 10 minutes before starting a shooting session is a good opportunity to work the lower leg muscles to feel the adaptations and become sensitized to the activations required while shooting.

Start from a seated position with an elastic resistance band affixed to a solid support and looped around the toe of one foot. Pull the toe of the foot towards the body, stretching the band, and then relax.

Repeat the exercise for each foot.

Leg extension

Start in a seated position with a resistance band looped around the ankle of one leg and affixed to a solid support or held in one hand as shown below.

Slowly extend the leg forwards using the quadriceps muscle and then return to the starting position.

Repeat the exercise for each leg.

Leg curl

The starting position has the athlete lying face-down on a bench with the resistance band looped around the back of the ankle of one leg with the other end of the band held in a hand as shown below.

The novice bends the leg at the knee using the hamstring muscle and then returns to the starting position.

Repeat the exercise for each leg.

Exercises for the upper body and arms

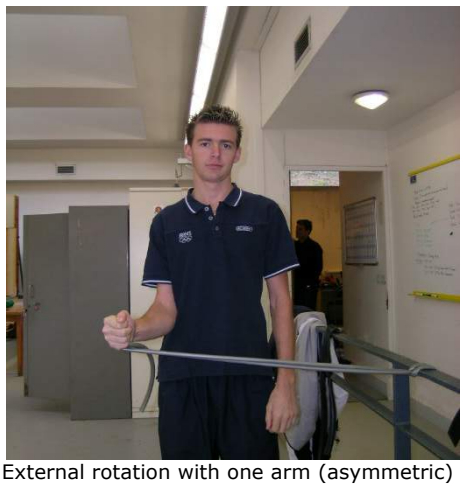
Most of the following exercises can be done with either both arms (as a symmetric effort, depicted in the first image below) or one arm (an asymmetric effort, shown in the second and third pictures). In the latter situation the entire body control and balance is involved in producing a controlled and smooth movement.

Rotator cuff

Start with the elbows at a 90° angle, close to the body, hands straight out in front, and holding a resistance band in each hand. With a controlled pull, move the hands away from each other as far as possible while keeping the elbows at a right angle and close to the body and then slowly return to the starting position.

External rotation with both arms (symmetric)

This exercise can also be done asymmetrically with an elastic resistance band affixed to a solid support.



External rotation with one arm (asymmetric)

In order to maintain good muscular balance, the exercise should be reversed to challenge the internal rotation as well.

Opposite direction: inner rotation

As an additional challenge, the one-handed variations can be done with the leg furthest from the support holding the resistance band lifted off the ground.

Posterior part of the shoulder and back

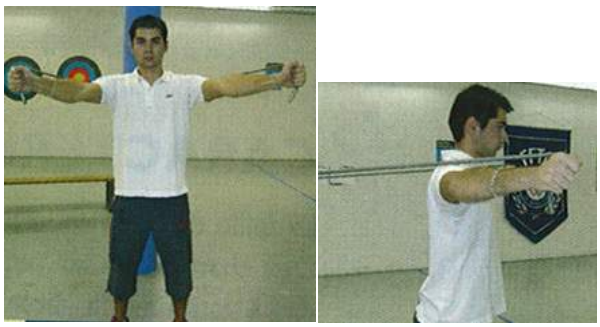
Start with the arms straight out in front of the body, shoulder width apart and holding the resistance band in each hand. There should be a small amount of tension on the resistance band in this position. Pull the arms away from each other until they are straight to the left and right of the body. As shown below, the band can be either simply held by the athlete or it can be looped around a support or a partner.

Horizontal opening

This exercise can be done with the hands at various heights, to target different muscle groups, and with either both arms (symmetric as shown above) or one arm (asymmetric). In this latter situation body control and balance is involved to complete a smooth and controlled movement.

Pectoral fly

Loop a resistance band around a solid support and hold one end in each hand facing away from the support and some tension in the band. Starting with the arms straight out to the side, move the hands in forwards an arc until they are straight out from the shoulders and then return to the starting position.



Standing row

Start with the resistance band looped around a partner or affixed to a solid support and one end held in each hand. Stand far enough from the support so that there is a slight tension in the band with the arms extended straight out from the shoulders. Draw the hands back in a line to the shoulders, keeping the elbows at or above shoulder level, and return to the starting position.

Lateral arm raises

Stand on one end of a resistance band and hold the other end in one hand with some slight tension when the hand is level with the hips. Raise the arm laterally until it forms an angle of about 30° above the shoulder and then lower it to the hip level again.

Single arm raise (asymmetric)

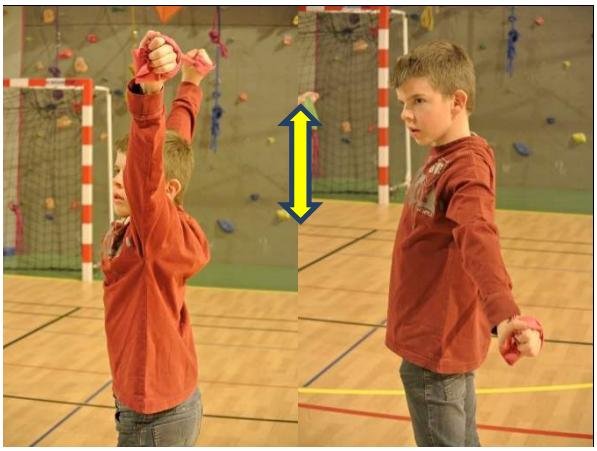
If the band is long enough, the exercise can be done with both arms at once by standing on the middle of the band and holding one end in each hand.

Double arms raise (symmetric)

If the exercise is too difficult to do while standing, it can be implemented from a kneeling position, as shown above.

Lateral arm extensions

Start with an elastic resistance band held in both hands, with the band either slightly in front or slightly behind the body. Extend the arms at hip level so there is a small amount of tension in the band. Raise the arms laterally until they are above the head, keeping the band 2-3cm from the body, and return to the starting position, maintaining tension in the band throughout.



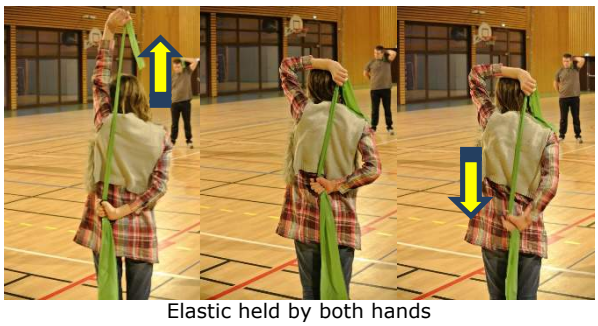
Forward arm raises

Similar to the lateral arm raises, stand on the resistance band, either in the middle or at one end and hold the free ends in one or both hands. Start with the arms straight, slightly in front of the body at hip level and some tension in the band. Raise the arms to shoulder level and return to the starting position. This exercise can be performed with either one hand or both.

Forward arm raise with both arms

Overhead Triceps extensions

Hold the resistance band in both hands and position the arms behind the back, with one arm at the waist and the other near the head. Starting with the elbow at 90° and some tension in the band, extend the upper arm above the head and return to the starting position.



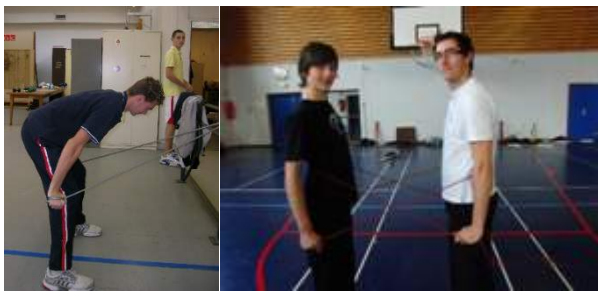
Elastic held by both hands

This exercise can also be done with both arms simultaneously if the athlete stands on the band as shown below. In this case, the starting position is with the upper arms at shoulder level and the elbows at 90°.

One end of the elastic locked under a foot

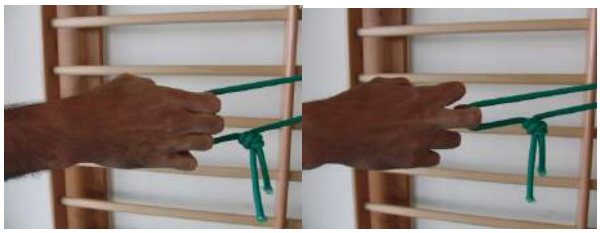
Straight arm pulldowns

Start with a band affixed to a support or looped around a partner at about shoulder level. Stand so there is some tension in the band with the arms straight and extended at shoulder level. Pull the arms down until they are beside the body and then return to the starting position. This exercise can be done with either both or one arm at a time.



Finger flexor muscles

Hold a loop of resistance band with the fingers in a similar grip to what would be used on a bow string. Curl the fingers towards the palm of the hand and then return to the starting position. The loop of elastic can be either fixed to a support or held in both hands.



This exercise can be done with one or more fingers at a time.

11.4.4. Isometric strengthening with a partner*

* *These exercises can also be done using a solid support: Table, Door frame, etc.*

These exercises are designed so that one member of the pair provides an effort and the other counteracts this effort. Only a few of the many possible exercises are illustrated below. Hold the effort 10 seconds during the first session, and smoothly progress up to 20 seconds.

Vertical hand presses

Position the upper arms vertically beside the body and the lower arms horizontally out in front of the body. As shown in the pictures below, the hands of one partner are on top of the other's hands pressing down, while the partner resists the push.
Repeat the exercise with the pair switching roles, holding the effort for 10 seconds in each direction.

One partner presses down and the other presses up

Arms rotation / Rotator cuff

The starting position is similar to the previous exercise, but in this case the palms are facing inwards and one partner has their hands inside the others. In the image above, the novice on the left-hand side is striving to move his hands apart while keeping his elbows against his body in an external rotation effort. His partner strives to block any movement through an internal rotation effort. Repeat the exercise with the pair switching roles, holding the effort for 10 seconds.
This exercise can also be done one arm at a time, which requires more body and balance control.

Lateral arm raising/lowering

One partner stands in front of the other with his arms at his sides, straight and slightly away from the hips. The partner behind holds the forearms or the wrists in his hands with his arms straight.

The novice in front strives to elevate his arms using his deltoid muscles while his partner strives to block any movement using his pectoral muscles. Repeat the exercise with the pair switching roles, holding the effort for 10 seconds.
This exercise can also be done one arm at a time, which requires more body and balance control.

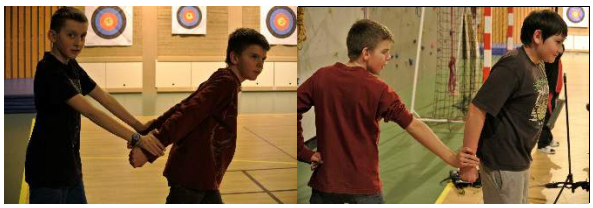
Forward arm elevation

In this exercise the partners stand facing each other. One partner holds his arms straight and slightly in front of his body. The partner holds his wrists or forearms in his hands, also with straight arms. In the images below, the novice on the left-hand side is striving to raise his arms in front of himself, while the novice on the right-hand side blocks any movement.

This exercise can also be done one arm at a time, which requires more body and balance control. Repeat the exercise with the pair switching roles, holding the effort for 10 seconds.

Backward arm elevation

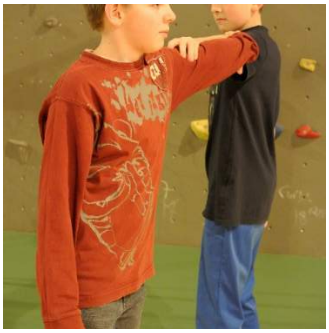
For this exercise, one partner stands in front of the other and extends their arms backwards from their body. The second partner holds the forearms or wrists of the first.



In the picture above, the novice on the right-hand side is striving to elevate his arms behind himself while the novice who is on the left-hand side blocks any movement. This exercise can also be done one arm at a time, which requires more body and balance control. Repeat the exercise with the pair switching roles, holding the effort for 10 seconds.

Horizontal backward push

The partners stand an arm's length to one side of each other and place one hand on the back of the other's shoulder or upper arm as shown below.



Both novices push their extended arm backward, working the muscles from the posterior part of the shoulder and the back as well as body control and balance. Repeat the exercise changing the extended arm, holding the effort for 10 seconds for each arm.

Horizontal forward push

The starting position is similar to the previous exercise, but with the hands placed on the front of the shoulder or upper arm in this case.

Both novices push their extended arm forward, working the muscles of the anterior part of the shoulder and the pectorals as well as engaging body control and balance. Repeat the exercise with the pair switching extended arms, holding the effort for 10 seconds for each arm.

Standing Rowing

As depicted below, one of the pair stands in front of the other with their upper arms extended at shoulder level and their elbows bent. Their partner braces the elbows in their hands with straight arms and a solid stance.

The novice in front strives to push his elbows backward, while the novice who is behind blocks any movement.
This exercise works the muscles from the posterior part of the shoulders and the back as well as body control and balance. Repeat the exercise with the pair switching roles, holding the effort for 10 seconds in each direction.
This exercise can also be done one arm at a time, which requires more body and balance control.

Many other exercises can be implemented by a group of novices with little or no equipment. Below is another valid example. The partners are standing back to back and twisting the trunk to pass a stone or weight from one to the other. Many other exercises are available on the Internet and innovative and effective variations are often invented during training sessions.

The exercises contained in this chapter are intended to help the novice precisely "feel" their own body (proprioception), either at a segmentation level, or at postural level. The specific workout machines normally used in gyms have the advantage of isolating, with some precision, specific muscular areas. However, they also quite often prevent the user from adapting other muscle groups to the movement. As a consequence, the creation of more complex kinetic chains and adaptive motor schemes is blocked.

For this reason, these exercise machines produce better results with more advanced archers, who need only specific "corrections" in particular muscle groups. In such a case, the machine helps them to achieve more than they would using of the normal exercises.