LEVEL 2
Pre-Learning Modules

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A coaching philosophy is a thoughtful foundation for determining coaching action, but will not cover all situations and coaches must endure the mistakes and setbacks of a sport that exposes and highlights imperfections. However, smart coaches reduce the risk by learning from errors and constantly amending and updating their philosophy. In succinct terms, a coaching philosophy is: '*An attitude held by a coach that acts as the guiding principle for the training and development of an athlete or team.'*

It has to be a collection of ideas that determine everything you do as a coach; from how you handle situations you face with your players and community, to how you want your team to train and play. A coaching philosophy should give an insight into how you are as a person and a coach. The values that coaches teach may be few or numerous, but they almost always include such concepts as being on time, working as a group, accepting responsibility, and being good citizens. In short, your philosophy is composed of the same values that govern your own life; therefore, they are easy to teach and easy to use on a daily basis. If you try to become someone that you are not or if you adopt someone else's values, you will have a difficult time representing foreign values in your own actions.

A coaching philosophy changes over time as you build experience and face the many situations that come with being a coach. But the core values of a philosophy should be consistent because they are an embodiment of how you are portrayed, the style of play you like to see and the way in which you handle each situation you face. That is why not only is it important to have a philosophy, it's important that you tailor it to what you believe in and not what others want to hear or see.

Part of developing your philosophy should be identifying your core values as a coach. These core values will outline how you expect your athletes to behave and what you as a coach believe in. Once you start to understand your core values, you start to become more consistent in your actions and set standards for how you want your athletes/squad to function. It is important to think about how you see success in your athletes and act this through your philosophy on a regular basis, as the standards you set for yourself are normally reflected in the people you coach.

The first question you should ask yourself is *WHY* do you coach. Once you've answered this honestly, you're on your way to building your coaching philosophy. Create your philosophy today and develop it until you stop coaching. It is an ongoing refinement that will take place as you undergo interaction with athletes and other coaches.

Developing a coaching philosophy

There are many categories/points to consider when developing a coaching philosophy. Here are just a few areas to get you started:

- People Management
- Leadership
- Character
- Care & Interest
- Discipline
- Planning & Preparation
- Training
- Innovation
- Strategy & Tactics
- Success
- Failure
- Criticism
- Assistant Coaches

- Recruiting
- Communication
- Feedback systems
- Honesty
- Motivation vs inspiration
- Developing 'game sense'
- Continual improvement & professional learning
- Measuring success

- Individual –v- team
- Goal setting
- Expectations/Rules
- Commitment
- Lifestyle Balance
- Passion and fun
- Attitude
- Organisation
- Build relationships
- Managing failure
- Big picture

EXAMPLES OF COACHING PHILOSOPHIES

"My coaching philosophy is I am a firm believer that if you have knowledge pass it on to those who do not. I also believe that playing sports as a child not only builds character and confidence but also gives a sense of accomplishment. It also prepares children for life, teaching them about working as a team or as a team player, not as an individual. I also feel it can bring a child out of his/her shell or shyness." Coach George Hornung, Head Coach, Stafford Soccer Club

"My coaching philosophy is pretty basic: To have an environment that encourages athletes to learn and develop on and off the playing field, to create a positive learning environment in good and bad times. I developed this by reading about, listening to and observing other Coaches, Wayne Bennett, Bo Hanson, John Buchanan and John Wright." Mark Coles, Vanuatu Cricket

"*To open minds and hearts; enhance souls by growing righteous values within and instill that one's maximum effort on a daily basis is the only pure way to live an honest and fulfilling life. Sport participation at high levels is not forever. It is reserved for a small percentage of the population. Providing an avenue for young adults to become great people is the only way I know how to change the world for the better. I developed my coaching philosophy based on what is important to me (what I have learned about life and myself). I learn from people and environments by detailed observation. I read and take notes. I use on-line videos and former great Coaches to teach me more about life.* "Coach Mark A. Keller

"*I believe in a coaching philosophy that is interlaced with "grace" (unmerited favor). If team members embrace this concept they end up coming alongside their teammates, being encouragers, offering forgiveness when necessary, helping teammates to succeed and ultimately creating team success. Anyone can win a tennis match through skill or by cheating. It is playing with integrity, making the right choices during and after each point and playing with heart and no excuses that determines a successful tennis player at Smith College. There is no substitute for hard work and combined with the "servant-leader" philosophy of others first, success is inevitable. This is a tall order but we work across the four years of an athlete's time here to help the scholar-athlete to grow in this direction. It is still amazing to me to see the results of putting this philosophy in action.*" Christine Davis, Varsity Tennis Coach, Smith College

"My philosophy is to learn about my athlete- not every athlete responds to the same method- some like the repetition, some get bored, some like coached sessions, group workouts etc. I have an extensive evaluation for the athlete to fill out and then we meet face to face…my goal is to learn what motivates the athlete (daily communication, weekly recap, email, phone, texting) what the athletes pain points are (what do they like the least and need the most help with), what is going on in the rest of their life….I gather a lot before we set up a plan. From there I am all about what is realistic, setting attainable goals- long term and short term and keeping the athlete engaged. No cookie cutter plans, constant feedback and monitoring and regular communication. Come race day there are no surprise…we have practiced it all and emotionally gone through all that is possible." Coach Julie Dunkle

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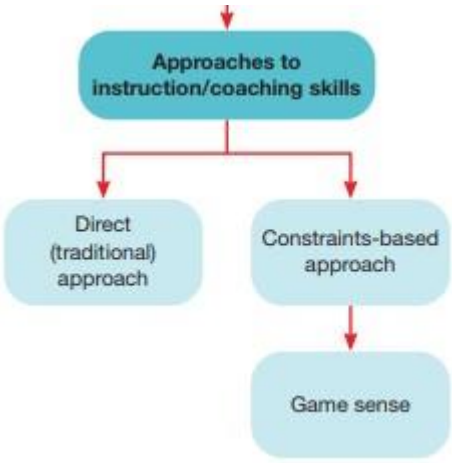
COACHING AND INSTRUCTION

http://www.jacaranda.com.au/wp-content/uploads/2017/04/C03-Coaching-And-Instruction.pdf

There are different approaches to coaching and instruction. These reflect different methods of teaching movement skills, as well as sociocultural factors and theories about how people learn.



This information will explore:

- Direct (traditional) approach
- Constraints based approach

There are different methods of teaching movement skills. The direct approach to coaching is a 'skill and drill', instructor-driven method that is particularly effective at enhancing skill development in the early stages of learning. The constraints-based approach to coaching is a learner-driven method that develops both technical and tactical awareness through involvement in short-sided modified games.

The direct (traditional) approach to instruction

The direct approach is an instructor-orientated approach to coaching movement skills, where the learner is told what to do and how to do it.

The direct approach, often referred to as the traditional approach, is a coach-oriented instruction model in which learners are given explicit instructions about skill execution and tactical awareness. In the direct approach, the instructor employs a more autocratic coaching style, organising highly structured drills and providing the bulk of feedback to the learner regarding their skill errors. In direct instruction, the learner is told what to do and when to do it.

The direct approach involves breaking sports down into technical skill components. For example, in tennis these skill components would consist of the ground strokes, both forehand and backhand, the volley, overhead shots and the serve. Often referred to as 'skill and drill' or the progressive part method, this approach dictates that athletes must learn and attempt to master these skill components in isolation, before applying them to a game situation.

Skills are introduced to learners in their simplest form. As the learner becomes more competent through supervised drill practice, the coach introduces more complexity to the skill. For example, once the learner can perform the basic mechanics of a tennis serve, the coach may introduce the concepts of spin, speed and accurate placement. In time, the coach will move the learner from the predictable closed environment, practising the serve in isolation, to the less predictable open environment of serving to an opponent.

The emphasis is on participants replicating the appropriate textbook technique. Once the learner is deemed suitably competent in these textbook techniques, they are considered ready for a competitive game.

"The traditional (direct) approach teaches the skills isolated from the game before putting the skills and game back together" (Play with Purpose, ACHPER 2009).

The direct approach is based around coach-centered instruction, where the learner is a relatively passive receiver of information. The direct approach emphasises repeated supervised skill sessions in which the

learning is explicit, and the feedback comes from an external source; that is, a coach or teacher. In a direct learning environment, participants receive explicit instructions about how to interpret visual cues in a game situation. The participants also receive implicit instructions about how to respond to these cues. In the sport of tennis, players are instructed to observe the service ball toss as a means of anticipating the type of serve they are about to receive. For example, a wide service ball toss is likely to suggest a wide swinging serve will be performed. For such a scenario, the receiver is explicitly instructed to adjust their court position to cover the swinging ball and look to strike the return down the sideline.

The direct approach is considered effective at facilitating skill development in the early stages of learning. This can be attributed to its emphasis on initially teaching simple skills in a relatively 'predictable' environment but also to a more regimented and instructor-driven approach that keeps the participants 'on task' and ensures the maximum use of practice time. In other words, prescribed learning goals are achieved through structured drills in an allotted period.

Advantages of the direct approach

The direct approach has several advantages:

- The instructor-centered approach keeps the learners 'on task'.
- It provides a predictable/closed environment to assist the beginner skill learner.
- It facilitates early-stage skill learning.
- Improvements in practice performance are rapid compared with indirect instruction.
- There is an emphasis on mastering technique.
- The learner is provided with a set of rules to guide decision making.

Direct versus indirect instruction

Instruction or coaching can be classified on a direct/indirect continuum (see figure below). The indirect approach is more closely aligned with the constraints-based approach to coaching, which is discussed later in this chapter. While in the direct instructional approach, the emphasis is on the learner following the coach's commands toward prescribed learning outcomes, the indirect approach allows the learner to discover effective skills and performance strategies for themselves.

The constraints-based approach to instruction

The constraints-based approach to instruction encourages the learner to discover effective skill technique and develop tactical awareness through participation in short-sided modified games.
The direct approach encourages the learner to master skills in isolation, in a closed and predictable environment, before applying these skills in a less-predictable game situation. A potential weakness of this approach is that skills developed in isolation may lack the necessary complexity or adaptability to be effective in a game. Furthermore, the learner may not develop sufficient tactical awareness to be an effective competitor.

However, the constraints-based approach to instruction differs from the direct approach by seeking to develop effective movement skills within a game context. Rather than focusing on mastering 'textbook techniques' and then attempting to apply them within a game, the constraints-based approach places the learner in a game context as soon as it is practical to do so. There may be some initial rudimentary skill development, however participants are placed in game situations at an early stage of learning, unlike the direct approach that delays game exposure to the latter stages of learning.

In constraints-based instruction, the learner is immediately involved in short-sided, modified games, the purpose of which is to develop both technical and tactical awareness. Through the process of finding solutions to games-based challenges, the learner discovers and develops effective motor skills. Furthermore, the learner develops a sense of when and how to perform these skills within the context of a competitive environment. Hence the constraints-based approach improves the learner's decision making as well as their movement skill execution. The constraints-based approach is an indirect instructional method with an emphasis on learner-centered practice. The coach takes the role of a facilitator in a process of guided discovery where the learning is implicit rather than explicit.

Constraints-based instruction facilitates what is known as perception–action coupling. Perception–action coupling describes the reciprocal relationship between what the performer sees (perception) and the actions they take; that is, the performer's perception influences their actions, and, in turn, their actions influence what they see. This relationship between perception and action underlines the importance of using games in practice.

For example, a batsman in cricket learns to interpret (perception) a bowler's action and the bowler's grip on the cricket ball to predict the type of delivery before playing the appropriate shot (action). This may not happen if a batsman is only exposed to 'throw downs' — a coach throwing the ball to a predetermined length (spot on the cricket pitch) to replicate and perfect a prescribed technique, for example an 'off drive'. Central to constraints-based learning is the understanding that all performance is influenced by three fundamental boundaries or constraints.

These constraints are:

1. Individual
2. Environmental
3. Task.

The coach manipulates these constraints during practice to achieve a desired learning outcome.

Individual constraints

These are the physical, psychological and behavioural characteristics of the individual performer. They include such things as height, weight, fitness, motivation, confidence, decision-making skills and learning styles. For example, the decision-making skills an individual has developed by playing a team sport maybe transferrable to other team sports.

Environmental constraints

These are the characteristics of the environment in which the performance takes place. These include physical characteristics such as climate, the playing surface and stadium lighting. Environmental constraints can also include social factors such as the influence of peers and cultural norms. For example, different cultures and nationalities identify with sports.

In India, cricket is extremely popular, and this facilitates the development of skills such as throwing, catching, batting and bowling.

Task constraints

These describe the defining characteristics of the activity/sport. Task constraints explain the goal of the sport, for example kicking the soccer ball into the goal; describe the rules of the sport, for example soccer players may not use their hands (apart from the goalie); and describe the equipment and facilities used, for example the dimensions of a soccer field and the size of the soccer ball.

Using constraints to teach a skill

The aim of constraints-based instruction is for the coach or teacher to manipulate the constraints, particularly the task constraints, to achieve a desired learning outcome. For example, a coach wants his junior soccer players to pass more frequently and effectively. Using the constraints-based approach, the coach designs a short-sided game that helps the young soccer players to discover and understand the importance of passing. In this example, the coach manipulates constraints to encourage effective passing and deters the player's natural inclination (Individual) to show off their dribbling skills. The goal of the game is for the team in possession to move the ball from one side of a defended area to the other. The coach designs/manipulates the game rules (Task) to limit the player's capacity to dribble by adopting a maximum three seconds possession rule. A team that successfully crosses the area also gains a bonus point if every member of their team possesses the ball (Task) — that is, they are encouraged to share the ball. The young players discover their best chance of success (moving the ball the length of the field) is to employ quick passes, utilising all their teammates. The passing game style is further entrenched and encouraged by the coach engendering a team culture (Environment) that rewards selfless play and sharing the ball.

In constraints-based instruction, such as the previous soccer example, the learning is implicit; that is, the players learn through participating in an activity. Through participation in games, the players discover what is required for successful skill execution and effective decision-making. Furthermore, a player who learns in this implicit manner, whose skills are forged within a competitive environment, is less inclined to compromise their skill execution or 'choke' under the pressure of competition. In constraints-based instruction, participants become autonomous or independent learners who are not overly reliant on a coach's instructions. Independent or autonomous learners are better equipped to solve the unexpected problems and challenges they encounter in competitions. Another advantage of constraints-based instruction is that practice sessions are more varied and interesting, marking a departure from 'boring' repetitious drills associated with direct coach-centred instruction.

Advantages of the constraints-based approach to instruction

Practice closely replicates the game environment, facilitating the development of more applicable skills. Practice is more varied ensuring the development of versatile skills, as well as providing the learner with a more interesting and engaging learning environment. The learning is implicit. Implicit learners make better problem solvers and are less likely to choke at times of stress. It develops both technical and tactical awareness. It engenders independent/autonomous learning.

Internal focus vs External focus

Internal focus is time spent internalising feeling of muscles; external focus is more on the outcome. It can also be the difference between focusing on internal concentration while shooting, as opposed to relaxing and chatting while walking to the target. Elite athletes spend their day being

flexible between the two modes, and as coaches we need to provide opportunities to practice both.

Coach detection vs Athlete detections
This comes back to communication, sometimes athletes won't understand the importance of changing an aspect of their technique over another correction. Working together to understand next steps will support athlete development, ignoring the athlete can lead to frustration and a lack of trust in the coach.

Levels of Analysis
This also comes back to the styles of the learners, sometimes training isn't always shooting, it could be time to look and analyse video, data etc. This could also include time to plan, looking at upcoming events and periodisation of training, or impact of family life on training, it could also be time spent goal setting, or it could also be time spent on equipment.

Effective Coaching Feedback

https://www.sports-training-adviser.com/coaching-feedback.html

Effective coaching feedback helps athletes learn how to correct errors quickly. After an athlete performs a skill or trial, they may ask, "how did I do?" or "how close to my mark was I?". Providing essential information to athletes at just the right time can accelerate their progress. Three primary reasons for providing meaningful information to athletes and teams after a performance are to: (a) motivate, (b) reinforce good performances or discourage poor ones, and (c) speed up improvement.

Types of Coaching Feedback

Intrinsic.
Athletes have built-in mechanisms that tell them how well they did. They can see the results, sense movements that caused the results, and form perceptions about how they think they performed. For example, an athlete has a good idea about the result of a shot in basketball by feeling the release and watching the flight of the ball toward the basket.

Extrinsic.
Coaches can provide additional information to give athletes more detail about their performances. This helps them narrow the gap between what they perceived about what they did, what happened, and how they can improve. This type involves information about a performance provided from an external source, such as the coach, who may provide additional information in terms of *knowledge of results* and *knowledge of performance*.

Knowledge of results means that the coach provides information that is specific to the outcome: "You were about 3 inches off your mark". Knowledge of performance is information about what the athlete did that led to the outcome: "You leaned back just a bit too far, so shift your weight forward"

Coaching Feedback Tips

1. **Motivate athletes** with supportive, informative statements soon after performances. A common technique is **positive-negative-positive**, where the coach points out what went well, specific areas where the athlete can improve, then ends with another positive comment.

2. **Provide meaningful verbal information** about what happened to supplement an athlete's perception of performance. For example, make points about actions the athlete can take to correct an error, rather than simply provide analysis.

3. **When using videos, point out specific features** that you want athletes to notice. This prevents overwhelming them with too much information to process and keeps them focused on the most relevant points.

4. **Rely most on positive reinforcement** about performances. Negative reinforcement and punishment are less effective.

5. **Offer reinforcement intermittently**, rather than after each attempt. Allow athletes time to learn and process independently at times to avoid dependence on coaching

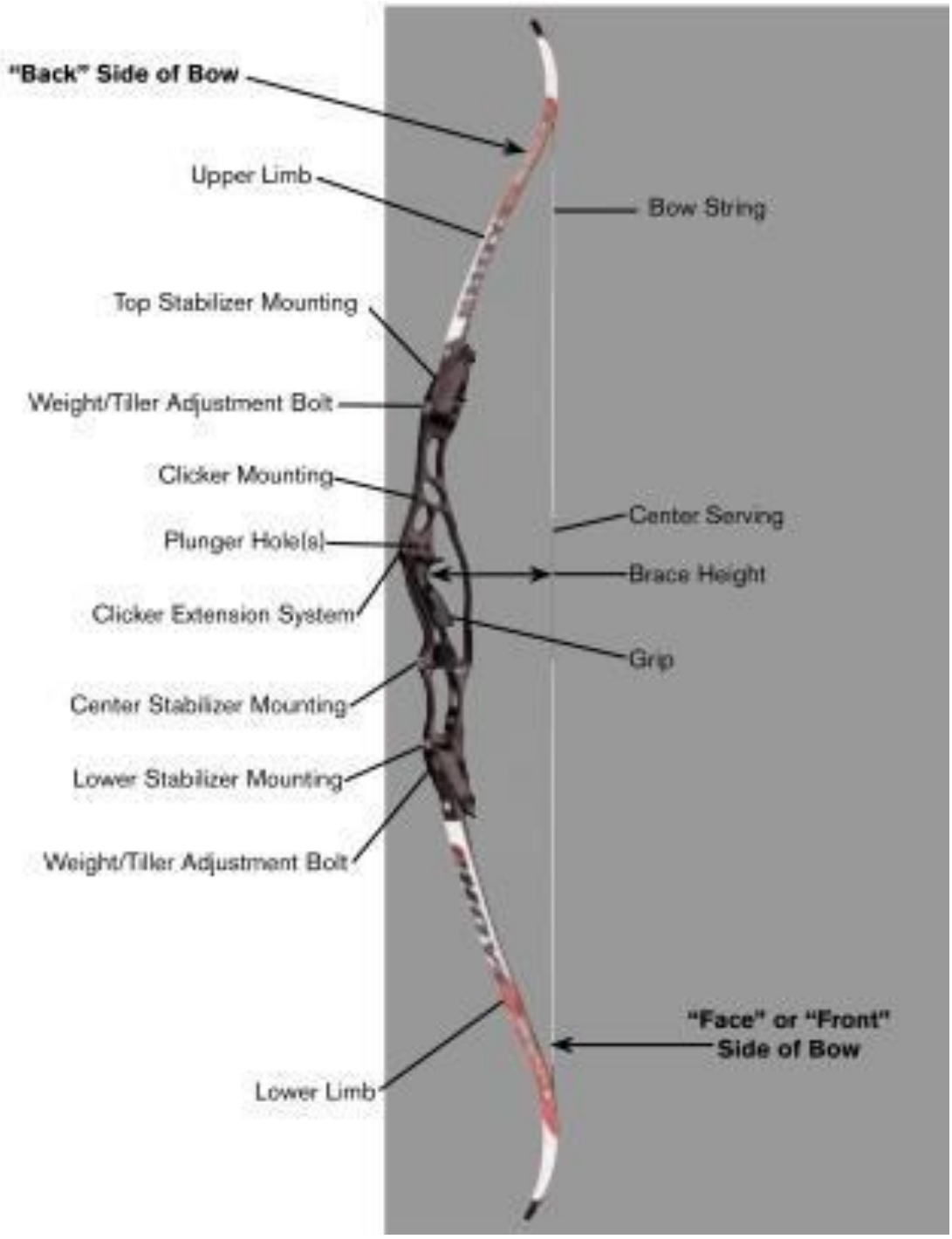
EQUIPMENT

EQUIPMENT SET UP RECURVE BOW
FINGER TABS
EQUIPMENT SET UP COMPOUND BOW
NOCK FIT AND NOCKING POINTS
ATTACHING D LOOPS
STABILISERS
TUNING OVERVIEW

EQUIPMENT SET UP - RECURVE BOW

It is important that equipment to be used must be set up correctly to allow the archer to obtain maximum accuracy and performance. This article supports the set up of a newly purchased recurve bow.

This process is designed as a basic initial set-up, it is straight forward and assumes a bow can be set-up within some basic parameters and will be suitable for most archers. Further fine tuning and set up can be engaged once the archer's ability improves.



1. STRING LENGTH AND BRACE HEIGHT

Most recurve bows today when purchased do not come with a bow string and these need to be purchased separately. By using the correct string this ensures the right amount of string is sitting around the recurve on each limb and the brace height is within the manufacturer's specifications. Check the handbook that comes with the bow to ensure the recommended brace height for a given bow brand, model and length. This measurement can vary between brands and models.

Once the bow has been strung, the brace height can be measured. The brace height of recurve bows is measured using a bow square. The brace height is the measurement between pivot point of the bow and the string measured at 90°.

The process for checking and adjusting the brace height is:

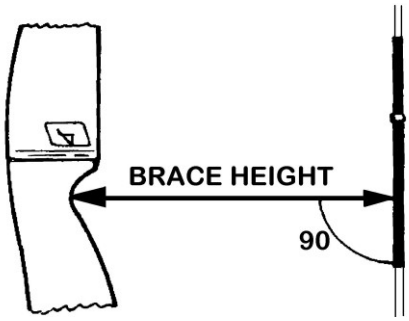
a. Place the bow square into the pivot point of the bow (the throat or narrow part of the bow grip) and measure the distance to the bow string, keeping the bow square at right angles to the string for this measurement.

b. Measure the brace height.

c. If the brace height is too low (most common) unstring the bow and increase the brace height by putting 5 to 10 turns into the string in a clockwise direction.

d. Restring the bow and recheck the brace height. Repeat this procedure until the minimum recommended brace height is reached. Never put more than 20 to 30 twists into a string. If greater than this number is required, you will need to replace with a shorter string.

e. If the brace height is too high and the string has a large number of twists, you can lower the brace height removing a few twists thereby increasing the strings length. If the brace height is too high you will need to replace it with a string which is longer.



Bow manufacturers recommend a brace height for each model and length of bow, but as a guide most bows fit within the following tolerances in brace height.

62" Bow	7 3/4 to 8 1/4	197mm to 210mm
64" Bow	8" to 8 1/2"	203mm to 216mm
66" Bow	8 1/4" to 8 3/4"	210mm to 223mm
68" Bow	8 1/2" to 9"	216mm to 229mm
70" Bow	8 3/4" to 9 1/2"	223mm to 242mm

Another method to determine the appropriate brace height is to measure the length of the bow and divide by 8. Never use a bow with a brace height lower or higher than the tolerances specified. If you use a low

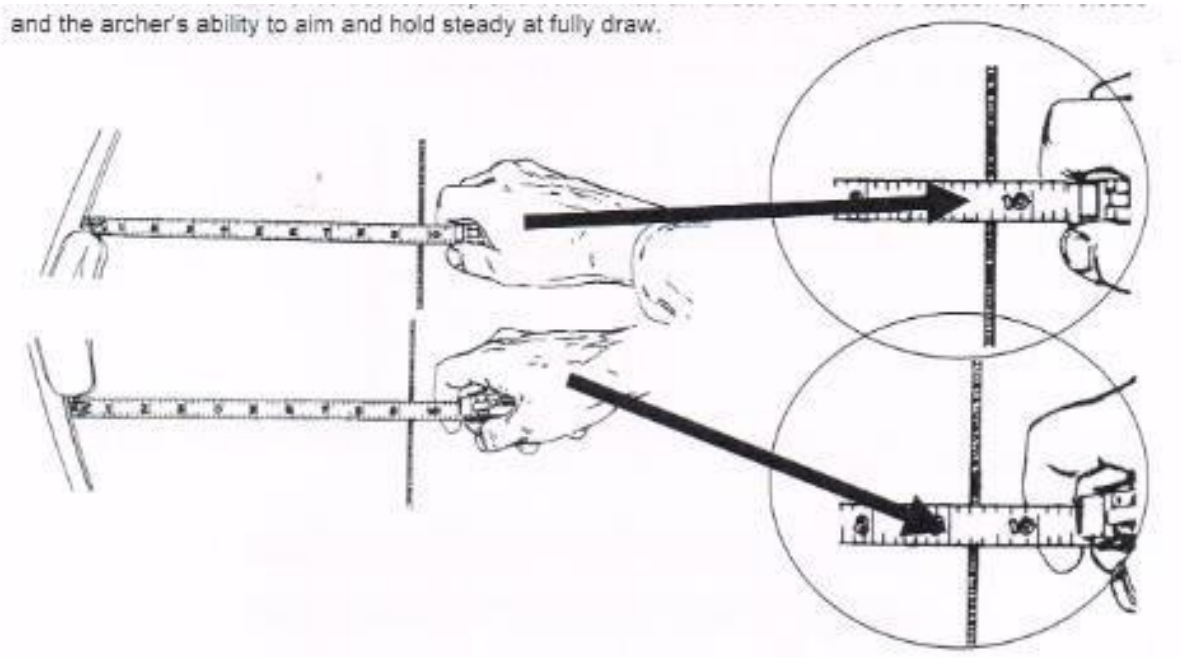
brace height, this can damage the bow but most importantly can cause the string to hit the archers bow arm around the wrist. A bow with a high brace height can over stress the bow and cause damage.

2. TILLER AND BOW WEIGHT SET UP

Most modern bows have the feature where you can vary the bows draw weight which in turn can change the bow's tiller. The tiller is a measurement which indicates the weight difference between the top and bottom limb. It is important as the grip (pivot point) of the bow is usually in the centre of the bow but the arrow rest and nocking point are positioned above the centre. This means the measurement from nocking point to the bottom limb is longer than to the top limb. The bottom limb should be set slightly heavier in weight to give a consistent bend at full draw. Correct tiller on a recurve bow helps with aiming when at full draw but also helps to optimise the recovery behaviours of both limbs, resulting in less vibration after the shot.

Finding the correct tiller is partly a function of string finger pressure and grip hand pressure. Good results can be obtained with a surprisingly wide range of tiller settings depending on individual archers shooting technique.

To change the bow weight/ tiller you simply use an 'allen' key and screw in or out each limb. To increase the bow weight screw in the limb (clockwise) and to decrease bow weight screw the limb out (anticlockwise).



Ideally bows should initially be set up with the bow weight set in the mid setting. To start with set the tiller so that the top measurement is with a 3/8" (6mm) greater than the bottom limb. The amount of tiller difference between top and bottom influences the bow's reaction upon release and the archer's ability to aim and hold steady at full draw.

Ensure manufacturer's instructions are followed when carrying out this adjustment. Some bows can be adjusted when strung while others must be unstrung to adjust.

3. LIMB ALIGNMENT

Some modern recurve bows come with the ability to adjust the side-to side alignment of the limbs. As brands and models of recurve bows currently on the market have interchangeable limbs and risers. This allows for mixing brands of limbs and risers, so the need to align the limbs and riser is important, as this ensures accurate alignment between the limbs and grip which increases the bows accuracy.

As part of the initial bow set up this must be checked to ensure the bowstring sits down the centre of each limb and (most importantly the centre of the grip) and that the riser is square to the bow string. To start, locate the centre of each limb. There are tools on the market for doing this or simply place a piece of tape on the face of each limb as it enters the riser, then measure finding the limbs centre and mark with a pen. Align the limbs so the string passes through the centre of the upper/lower limb (using the marking on the limb) and the centre of the grip (fig 1).

It is very important that special attention is given to ensure that both limbs are aligned, for example both limbs are not set off to one side of the riser (fig 2 and 3) or each limb aligned differently or opposite each other (fig 4 and 5).

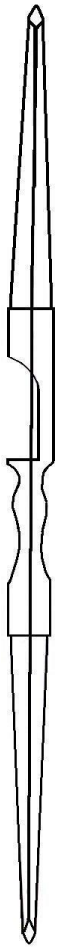


Fig 1

Fig 2

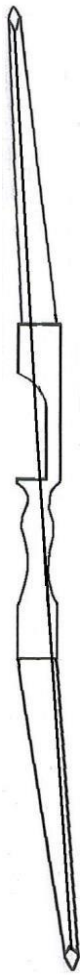


Fig 3

Fig 4

Fig 5

It is also very important that limbs tips are aligned and are straight, side to side adjustments of the limbs can correct this situation (Fig 6).

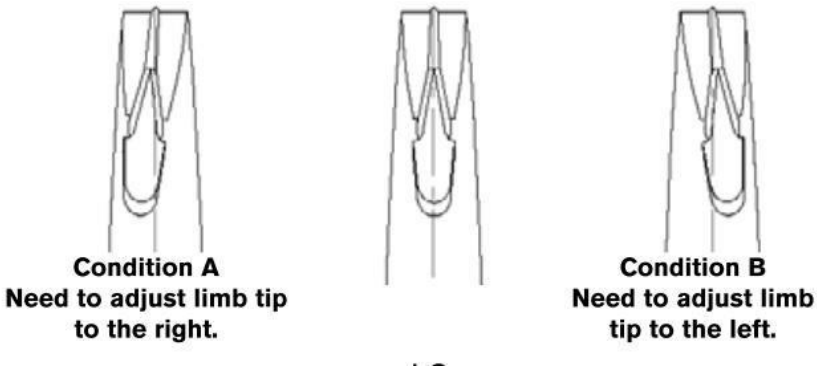


Fig 6

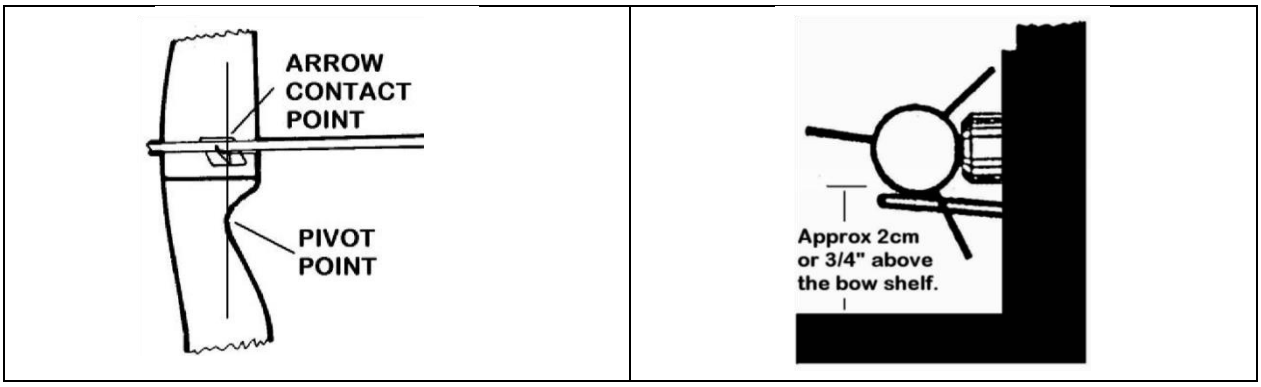
This can also be checked by placing a straight edge (arrow shaft, ensure it's a parallel arrow shaft and not a barreled shaft) along the side of the bow window and the string. The straight edge should sit just inside the bow string (this is since in most bows the sight window is cut just inside centre). If the straight edge is not square or sitting just inside the string this indicates the limbs are not aligned down the centre of the bow and grip.

The use of the front stabiliser could also be used to assist in aligning the limbs and riser. The stabiliser mounting hole should be square to the riser so by fitting a stabiliser it can be uses as a straight edge reference point for aligning the string. The process for checking and aligning the limbs is:

1) Stand the bow up (vertical as possible) supporting the bow by the front stabiliser. Stand behind the bow and align the string with the centre marks you have placed on each limb and the centre of the grip.
2) Align the limbs using the instructions provide by the manufacturer (this will vary from brand and model of bow).
3) Check that the string is aligned with the stabilizer and using a straight edge check the string is square to the riser (sight window).

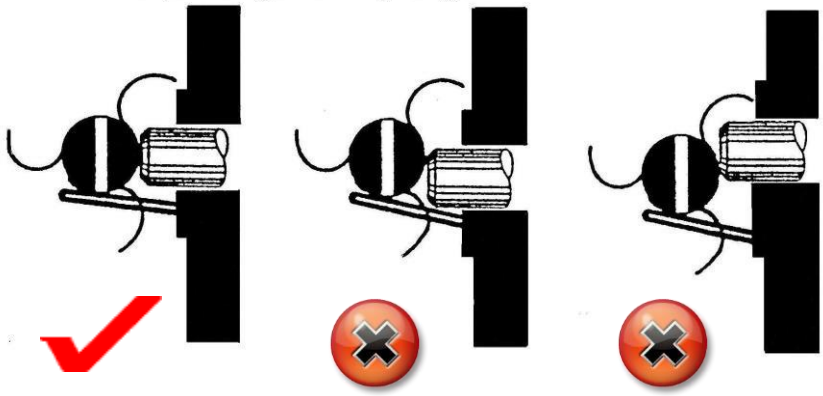
4. ARROW RESTS

Arrow rests should be fitted to the bow window so the contact point of the arrow on the rest is directly above the 'pivot point' of the bow. Recurve bows usually come pre-drilled with a hole in the riser for the plunger button. If the riser comes with two holes always use the rear hole for the plunger button (the hole directly above the bows pivot point). Always install the arrow rest before installing the nocking points.

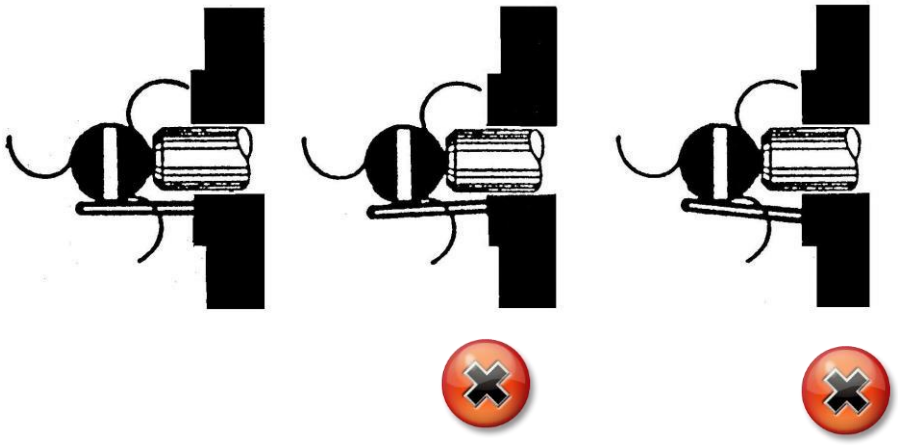


The arrow rest must be positioned correctly to ensure the arrow sits on the arrow rest square to the plunger button, this ensures even side pressure against the plunger upon release.

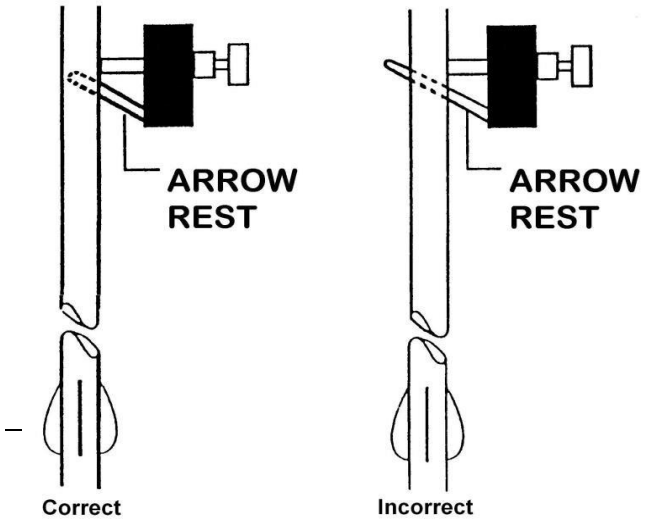
Install the arrow rest to ensure the arrow sits square againt the plunger.



The arrow rest must also be positioned to ensure the arrow remains on the rest upon release and does not fall off the rest.



It is also important that a minimum amount of arrow rest arm protrudes out from the arrow; excess arrow arm may cause a clearance problem as the arrow moves forward.



5. NOCKING POINT AND NOCK FIT

To obtain consistent arrow flight, a point on the bowstring must be found at which the force of the string will act directly along the shaft of the arrow. The archer holds the bow in the grip which is generally around the centre of the bow with the arrow rest mounted above center of the bow. For this reason, the bottom limb is usually heavier than the top limb, this is called the tiller. So, the nocking points are positioned slightly above square to the arrow rest to balance the stresses on the limbs.

To determine the starting point for the nocking points, the bottom of the nock should be positioned about 4mm above square. If the points are positioned too low the arrow will be forced down on the arrow rest upon release and cause the passage past the bow to be further complicated and cause undue wear on the arrow rest. It is therefore desirable to have a nocking point slightly higher than the arrow rest to avoid interference.

Setting the Nocking Points:

a. String the bow and set the string or brace height to within the manufactures recommended tolerances.

b. Determine the bows tiller.

c. Place a “bow square” onto the string and arrow rest.

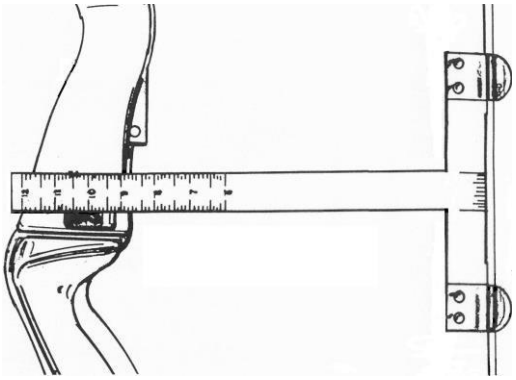
d. Using a marking pen, place a mark on the serving, which is about 4mm above square, this represents the bottom of the arrow nock.

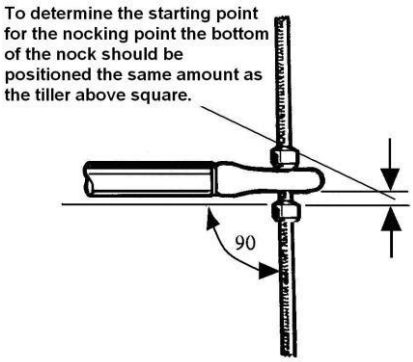
e. Place an arrow on the string, locating the bottom of the nock on the pen mark and, using the marking pen, make another mark at the top of the nock. This represents where you will place the top nocking point.

f. Now attach a top nocking point to the string.

g. Now install a second nocking point on the string leaving a gap of about 2mm below the bottom of the nock and the top of the bottom nocking point. This allows for movement of the nock as the string closes up when drawn back to full draw. You do not want the bottom nock point making excessive contact with the arrow nock.

h. It is highly recommended that two nocking points always be used, a top and bottom nocking point.





When setting up a bow it is important that the arrow fits correctly onto the string. Most nocks made are designed to snap onto the bow string, but it is important the fit is not too tight or loose.

The nock should fit in such a way that it snaps onto the string but still has enough movement to freely slide up and down the string. As the bow is drawn, the string will rotate. The nock fit should be such as to allow this rotation without placing excess side force on the arrow.

You can carry out a simple test to determine correct nock fit. Firstly, place an arrow on the string and hold the bow in one hand so the arrow hangs down towards the ground. Now with your other hand using your thumb and first finger, rotate the string. The arrow should not move with the strings rotation but remain hanging. If the arrow moves with the rotation of the string, then the nock fit is too tight.

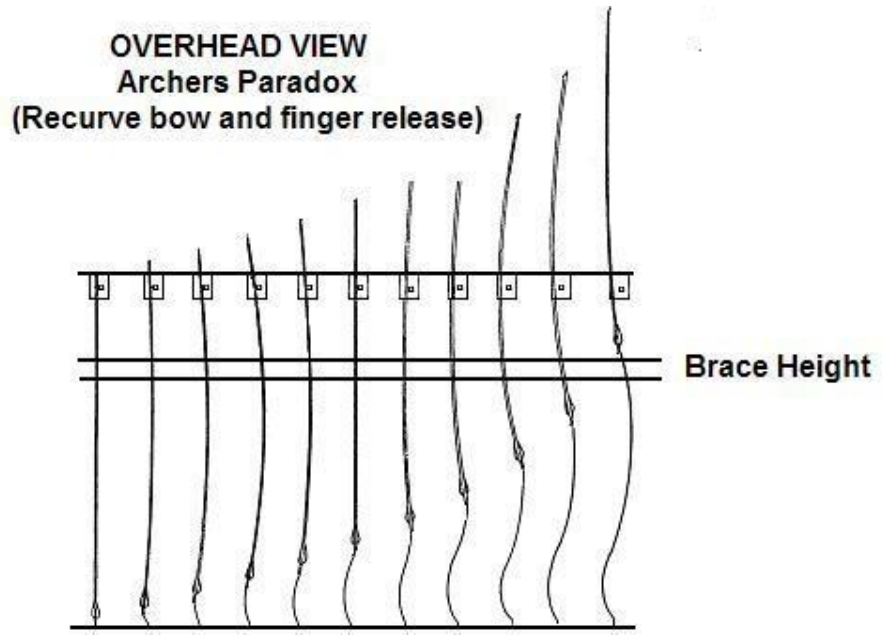
More information is available in the 'Nock Fit and Nocking Point section'.

6. CENTRESHOT

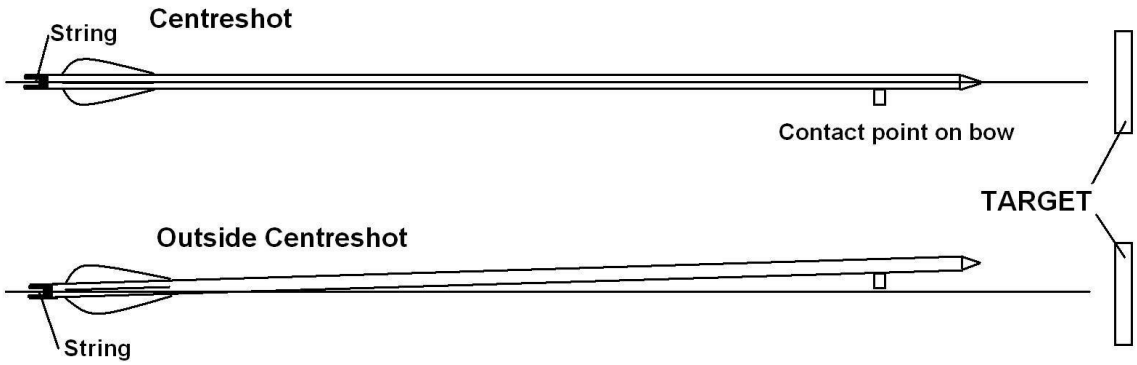
Centreshot refers to aligning the point of the arrow to the centre line of the bow. As an arrow is shot, it wants to bend, and the bow needs to be set up to allow the arrow to travel forward in a straight line. To achieve this, the arrow is not set up in centreshot, but initially set up with the point of the arrow positioned slightly outside of centreshot.

As the arrow is shot it initially places side pressure on the side of the bow. This is caused for two reasons, one is the rotation action of the release and the second is the flexing action of the arrow as it moves forward, this flexing action is known as the 'Archers Paradox'.

The Archers Paradox initially pushes against the side of the bow for about the first 20 mm to 40 mm of the arrows travel. The arrow then moves away from the arrow rest and bow as it continues forward movement and clears the bow.

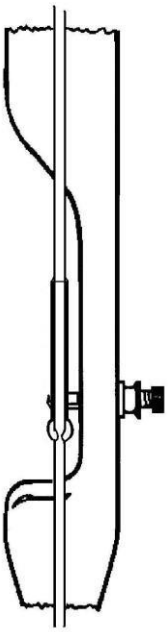


Most bows are fitted with a plunger button which is designed to initially absorb this side pressure allowing the arrow to move into centreshot as it commences its forward movement..

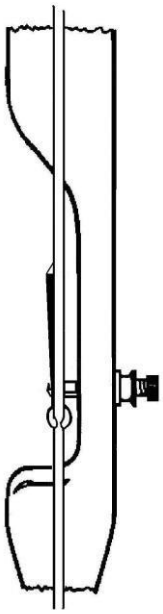


To set centreshot:

1. Stand the bow up with an arrow on the string and rest. Place under the clicker if one is being used.
2. Standing behind the bow line the string down the centre of the bow, it may be necessary to measure centre and mark on the bow limbs. To do this place a piece of tape on the top and bottom limb just above and below the riser. Measure the centre of the limb and mark.
3. Lining up the centre lines with the string, observe the position of the arrow point in relationship to the string.
4. Set the bow so that the arrow is ½ its diameter outside of centreshot
5. This is the best location to initially set up a recurve bow particularly for a new archer who is not skilled enough to undertake a detailed tuning process.



Arrow set up in centreshot



Arrow set up 1/2 arrow outside of centreshot

7. CLICKER

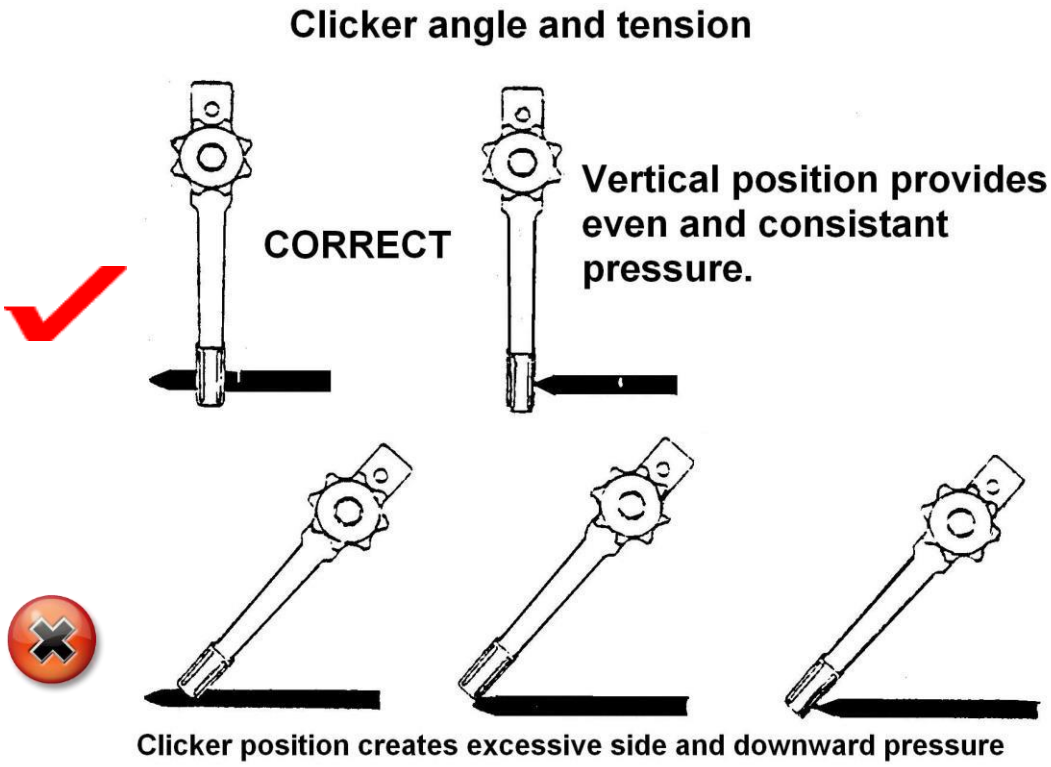
The use of a clicker is vital for consistent shooting. It is used to ensure consistent draw length which translate into consistent bow weight but most importunately as a trigger to shoot, in simple terms when it clicks you release. In saying this, you need to develop a shooting technique that allows you to control the shot and the clicker.

It is important to understand that to effectively use the clicker the archer must have a developed a reasonable level of structural competency that ensures a consistent draw length. If the archer is unable to achieve a consistent draw length they will tend to focus on pulling the arrow through the clicker rather than maintaining focus on the structural components of the shot.

To use a clicker all arrows must be cut to the same length. The clicker removes the need to think about releasing the arrow. The clicker is the signal to the brain to release.

To use a clicker place the arrow under the clicker and draw the bow. The objective is when at full draw to have be about 1mm to 2mm of arrow point under the clicker (this may be larger depending on the skill development of the archer). As the archer expands the arrow comes through the clicker making an audible clicking sound. This is the signal to release the arrow.

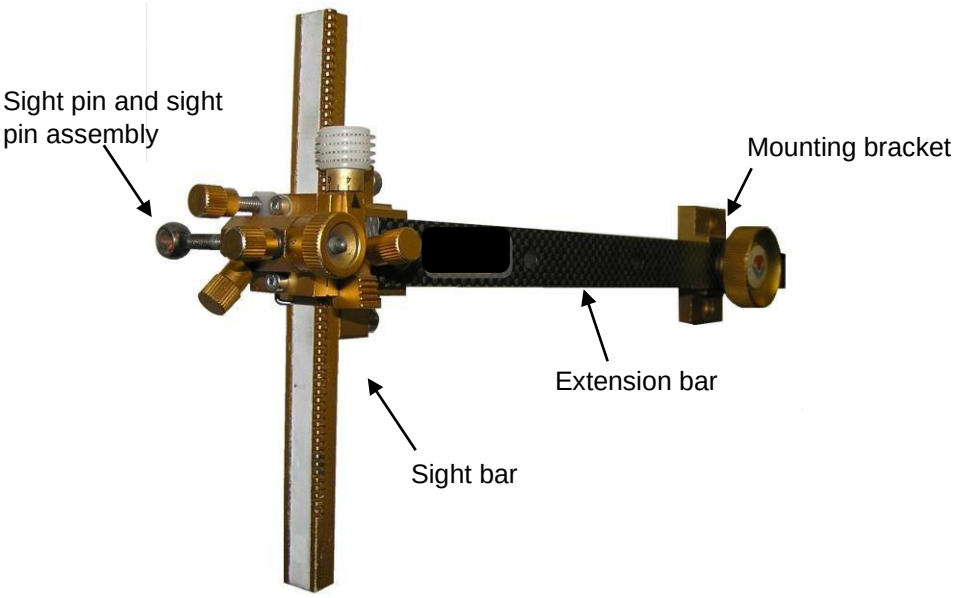
Ideally, the clicker should be positioned as vertically as possible. Check the tension that it places on the arrow (down and/or to the side), as too much tension will interfere with the arrow flight It is important to ensure that the clicker is not used to hold the arrow on the rest as this can mask technical errors concerning the drawing fingers on release



8. BOW SIGHT

On most bows the sight is attached to the riser on the opposite side of the arrow rest. Most sights are designed to have an extension bar which places the sight pin in front of the bow. On the front of the extension bar, and holding the sight pin assembly, is the vertical sight bar, which allows the sight pin assembly to move up and down for elevation.

The sight bar must be set up to ensure it is vertical to the bow string. Usually the sight bar is attached to the extension bar with two screws which can be loosened to allow the sight bar to be adjusted.



The best method for vertically setting the sight bar with the bow string is to:

1) Lay the bow (strung) on a flat service.
2) Using a 'builders string level' attached to the string, pack up either end of the handle until the string is level.
3) Without moving the bow take the "builders string level" and place on the side of the sight bar.
4) Now loosen the screws holding the extension bar to the sight bar and adjust until level, retighten the screws.

The sight bar is now parallel with the bow string.

The next step is to ensure the sight pin is set up, so it is 90^{o} to the sight bar. Using a bow square, check that the sight pin is square to the sight bar, if not there are usually two screws in the front of the sight pin housing, simply loosen these screws, square the sight pin and retighten screws.

9. TUNING YOUR BOW

For a new archer setting up their first bow following the process detailed above should be all that is required for them to shoot and enjoy the sport. A new archer's ability and experience would make attempts to fine tune a bow difficult and give inconsistent results

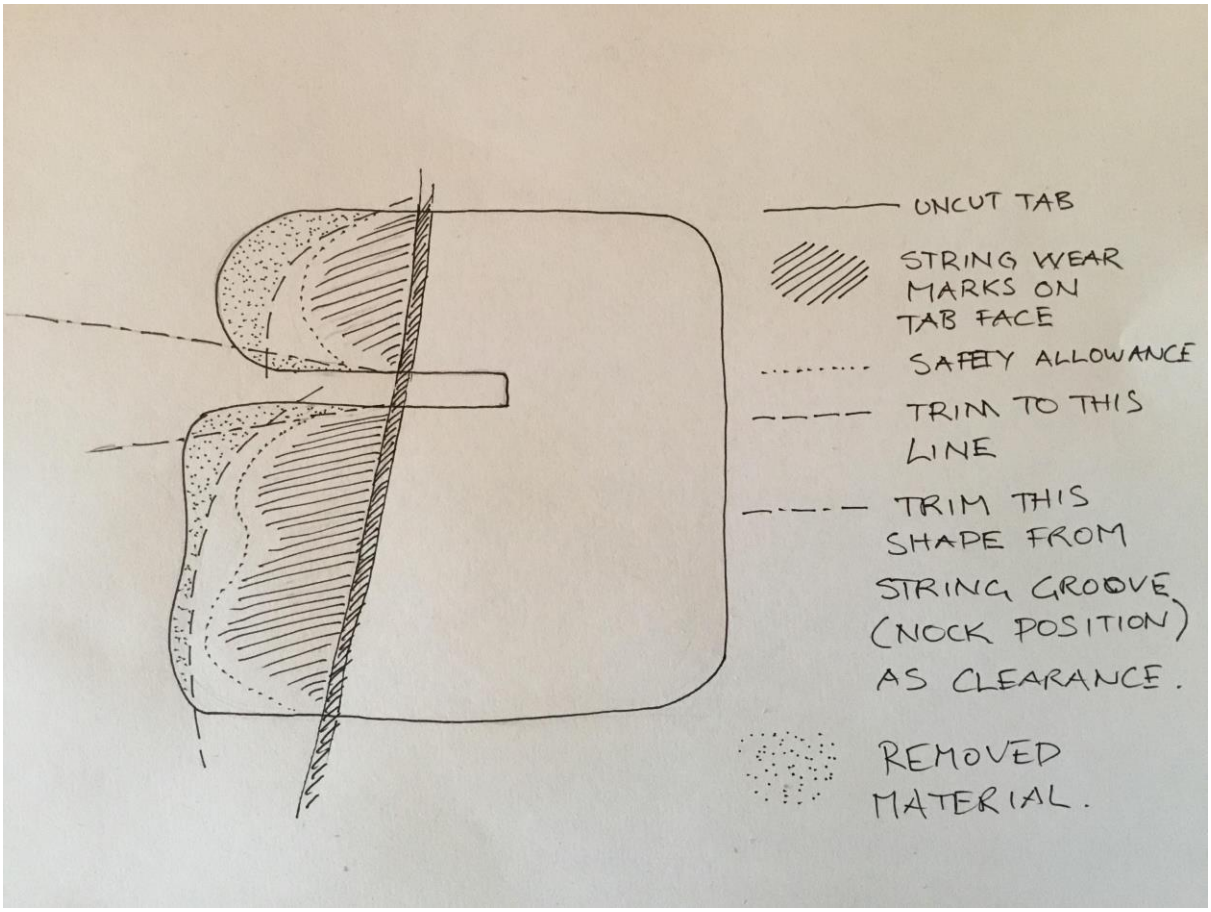
Once an archer has been shooting for a reasonable amount of time and has gained more consistency in their shot process, further tuning can be undertaken. Refer to further modules for support in this area.

FINGER TABS

Written by Simon Fairweather

When selecting a finger tab ensure that the tab not only is the correct handed, but it is a suitable fit for the archer.

Ensure that the tab covers all three fingers at full draw. Most finger tabs will need to be trimmed to meet the needs of the archer. When trimming excess leather, use powder on the tab to ascertain finger contact on the tab during shot execution. Alternatively, after shooting a few sessions, the leather will have wear patterns. Check the leather to ensure that the tab face is smooth and not worn. Guide for trimming finger tab:



Finger tabs come in various sizes and shapes. The plate of the tab should sit comfortably in the palm of the hand, and not impede the hook of the fingers.

Using a spacer

A spacer can be fitted to the tab if the archer is constantly pinching the arrow at full draw. When fitting a spacer ensure that it fits snugly between the top two fingers and is not too thick as this can cause pressure problems. When looking at the need for a spacer also look at the way the hand is being set during the draw.

Equipment – Finger Tabs

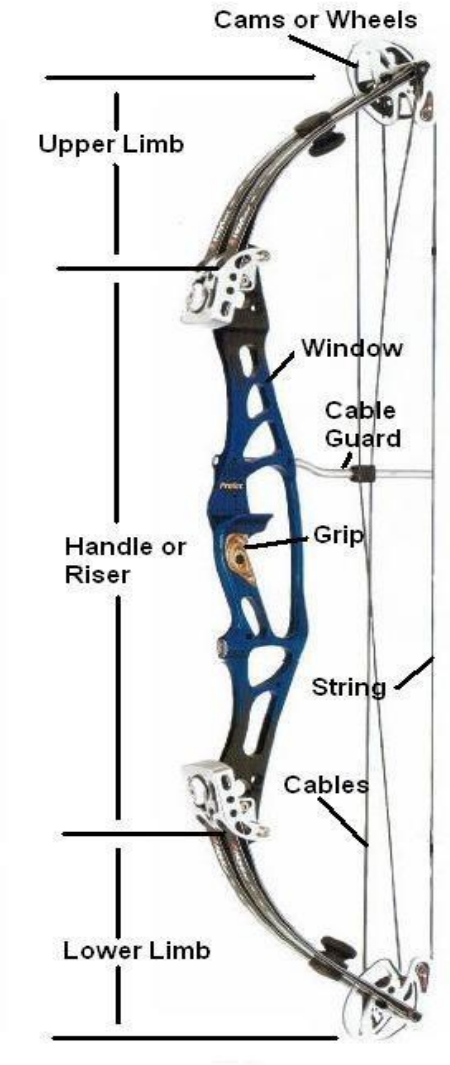
Curled/Clawed

Extended/arched

Archers who curl/claw their hand slightly tend to roll the top finger over and it comes down onto the arrow and will require a thicker spacer. Conversely those who hold their hand with fingers extended (first knuckle from the palm end held arched or extended from the back of the palm/hand) tend to maintain a parallel alignment of their fingers, meaning a smaller spacer is required.

Fitting a shelf to the finger tab can assist the archer in achieving a consistent anchor, however, it is important that this is not achieved at the expense of having the anchor move away from the neck. Finger tabs with a plate fitted should be of a size that allows the fingers to naturally form a hook on the string. Generally a small shelf is all that is needed. Most tabs have overly generous sized shelves which need paring back and smoothing off to avoid scraping or dragging on the archer's throat.

EQUIPMENT SET UP - COMPOUND BOW



PURCHASING A FIRST BOW

It is important when a person purchases their first compound bow that they understand:

- There is generally no difference between a hunting compound bow and a tournament compound bow except for the colours, with hunting bows usually finished in black or camouflage while tournament bows are usually in bright colours.
- Archery Australia Rules restrict bows to 60lbs for competitions.
- Archers undertaking social and tournament archery should start with a bow weight for men around 40lb to 50lb while women around 30lb to 35lb.
-

EQUIPMENT SET UP - COMPOUND BOW

It is important that equipment is set up correctly to allow the archer to obtain maximum accuracy and performance. The following sequential steps should be undertaken in this process

1. STRING LENGTH AND BRACE HEIGHT

Compound bows come set up from the factory and you should not make any adjustment to string length or brace height. Such changes will take the bow outside the manufacturers design specifications and may affect the bow weight range and draw length and void any warranty.

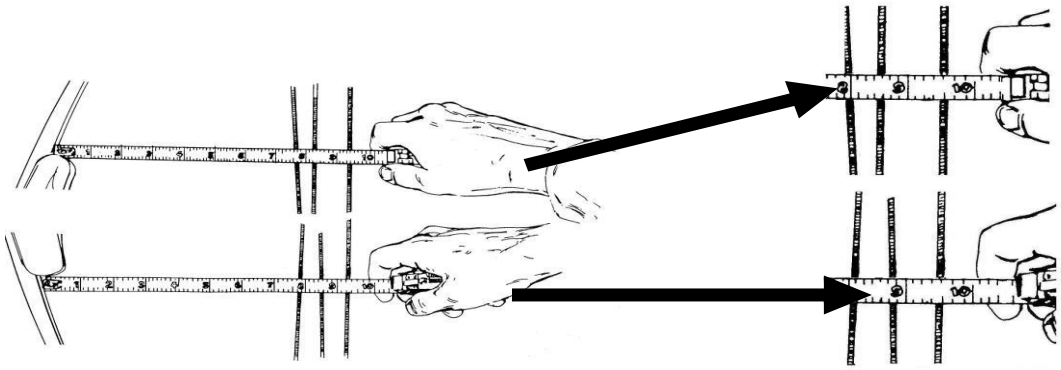
2. TILLER AND BOW WEIGHT SET UP

With most modern compound bows, by changing the bow draw weight the draw length does not change. With older style compound bows as bow draw weight is altered so does the draw length and alternatively when the draw length is changed, the bow draw weight will change too. With some brands the draw length is limited while others have the ability for enough adjustment.

To change the bow weight/ tiller simply use an 'allen' key and screw in or out each limb, screw in to increase bow weight and out too decrease bow weight. Compound bows work more efficiently when set at or close to the maximum weight. Set the bow weight at the desired setting. The tiller is a measurement which indicates the weight difference between the top and bottom limb.

Tiller is important as the design of most compound bows have the geometric centre of the bow around the grip (pivot point) and the arrow rest and nocking point positioned above the centre. With compound bows there are three adjustment points, tiller, cam (wheel) timing and nocking point. If one is changed there is generally a need to adjust the other two as well.

Ideally the tiller should be set to a measurement of **ZERO**. This then allows for necessary adjustments to be made to the cams which will also affect the nocking point position.



3. ARROW REST AND CENTERSHOT

ARROW REST

Unlike a recurve where the arrow initially pushes against the side of the bow upon release the action of the arrow from a compound bow (shot using a release device) is downward, this is due to the action of the

cams and wheels. Arrow rests for compound bows principally come in three styles, rigid, downward spring actions and drop-a-way. Personal choice supports which is best for the archer.

RIGID (Blade type) REST

The rigid rest has a blade (with slight downward spring actions), simple, reliable and accurate. You can experience clearance problems with the tail of the arrow striking the arrow rest as it moves past the rest. Currently these are the most popular style rests.

SPRING REST

The arm which accommodates the arrow is spring loaded downward and moves down as the arrow moves forward. Simple and easy to use but you can experience clearance problems with the tail of the arrow striking the arrow rest as it moves past the rest

DROP AWAY REST

The drop-a-way rests design has the rest lifting into position as the archer draws and then dropping away as the arrow moves forward giving a clear path for the arrow. This rest gives good arrow clearance, but it is critical that the rest lifts early in the draw and drops late in the passage of the arrow past the bow. If the rest drops too early the result can be variable high/low arrows.

Arrow rests can also be described as 'Shoot Through' or 'Shoot Over'. 'Shoot Through' usually means (found mainly on the spring-loaded rest) the arrow rest can have two arms and the arrow sits between the arms. In this case the 'index' fletch of the arrow must be positioned **DOWN** when the arrow is nocked on the string, this allows for fletch clearance as the arrow passes the rest. 'Shoot Over' can be found on both the rigid and spring rests. The 'Index' fletch of the arrow must be positioned **UP** when the arrow is nocked on the string, this allows for fletch clearance as the arrow passes the rest.

Drop away rests can be either 'Shoot Through' or 'Shoot Over' design. The arrow should be positioned with the index fletch pointing up but in theory the rest should have dropped away as the fletches pass and clearance should not be a problem.

Ideally arrow rests should be fitted to the bow window so the contact point of the arrow on the rest is directly above the "pivot point" of the bow.

CENTERSHOT

The arrow rest should be set up in what is generally called true centre.

To determine centreshot:

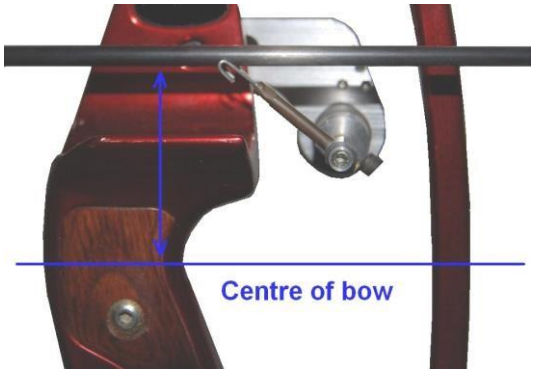
1) Place the rest on the bow and place an arrow on the string and rest.
2) Using a stabiliser, stand up the bow vertically and stand behind the bow.
3) Line the bow string down the bow so the string dissects the centre of the bow grip.

4) Make sideways adjustments to the arrow rest until you visually see the bow string dissect the centre of the arrow while visually maintaining the string on the centre of the grip.
5) This position is centreshot.

As the archer's technique and consistency increases further tuning can be undertaken.

ARROW REST HEIGHT

Using the arrow rests vertical adjustment, adjust the rest so the arrow dissects the centre of the rest mount hole.



4. NOCKING POINT AND NOCK FIT

NOCKING POINT

To obtain consistent arrow flight, a point on the bowstring must be found at which the force of the string will act directly along the shaft of the arrow upon release. Initially this is only a temporary setting while you set up the rest.

Setting the Nocking Points

1. Place a bow square on the string and arrow rest, taking into account how the arrow sits on the arrow rest.
2. As a starting point, install the nocking points so the bottom of the arrow is 1mm to 2mm above square.
3. It is highly recommended that two nocking points always be used, a top and bottom nocking point.

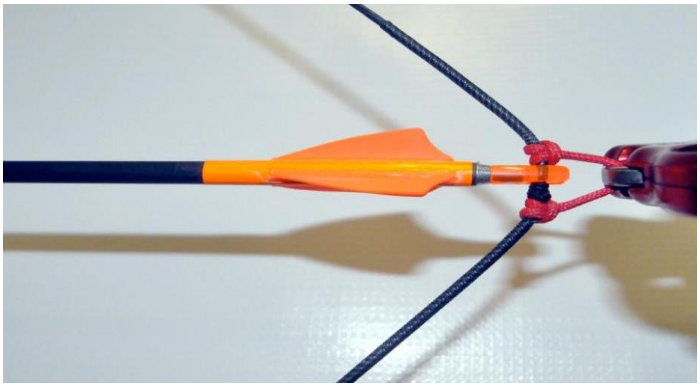
When setting up nocking points ensure there is about 1mm to 2mm area of free space so the nock can move freely up and down on the string. At full draw compound bow are at a very sharp angle around the nock; leave gap to ensure the nocking is not pinching on the arrow nock.

D LOOPS

In recent times D loops have become very popular, there are several benefits obtained by using a D loop over rope attached to the release device**.**

These benefits are

- When letting down the arrow will not fall off the string.
- String wear is virtually eliminated because your release rope is no longer attached directly to the string, this increases the life of the string and serving material. The string is drawn directly behind the centre of the arrow



There are many configurations that can be used when setting up a D loop; it is important that firstly some form of nocking point is used above and below the arrow, never attach a D loop to the string without the use of nocking points.

It is also important that the D loop is attached so at full draw the release device is directly behind the arrow.

A D loop is then placed on the string with knots above and below the nocking points. The theory behind string loops, particularly the one that attaches above and below the arrow, is that the string is being drawn directly behind the arrow and not below the arrow which is the case with the loops attached to a release device.

NOCK FIT

When setting up a bow it is important that the arrow fits correctly onto the string. Most nocks made are designed to snap onto the bow string. It is important that the fit is not too tight or too loose.

The nock should fit in such a way that it snaps onto the string but still has enough movement to freely slide up and down the string. Also, as you draw a bow back the string can rotate as you draw, the nock fit should be such as to allow this rotation without placing excess side force on the arrow. This is particularly important on compound bows as the string rotation will affect the 'peep sight'. Much like the recurve bow, ensure the appropriate groove size has been selected that gives a good nock fit.

5. CABLE GUARD

Compound bows come fitted with a 'cable guard'. These are fitted either at the lower half of the riser or on the upper half of the riser. Cable guards are designed to keep the cables under tension and away from the path of the arrow as it moves forward.

Many cable guards are adjustable, and necessary adjustment should be made to ensure adequate clearance as the arrow moves forward, without excessive side force on the cables. Cable guards are also fitted with a 'cable slide' these are designed to hold the cables and to keep the cables apart to eliminate wear.

6. DRAW LENGTH

Each brand and model of bow may have different methods of adjusting draw length such as adjustable modules or replaceable modules.

Some brands have no adjustment and to change draw length you must purchase different size cams and cables which can be an expensive exercise. When purchasing one of these bows you must know exactly the draw length you require.

Follow the manufacturer's instructions for changing draw length. With most brands of compound bows you can make draw length changes without the need to take any pressure off the bow.

7. PEEP SIGHT

Peep sights sit between the strands of the string. To hold the peep in the string attach moveable knots to either end of the peep sight.

To install:

1. Split the string evenly in half. It may be necessary to place the bow in a bow press to remove tension off the string to enable this to happen.
2. Draw the bow back to anchor point and move the peep up or down until it can clearly be seen through the sight.

NOTE: The anchor point using a compound bow and peep sight, floats and is in a different position on the face for each distance.

At long distance the anchor is low on the face and at short distance is high on the face. For comfort, it is recommended that the peep sight be set aiming at a mid-range distance.

1. Now tie the peep into the string by tying knots above and below the peep. Tying the peep around the middle is not necessary and can prevent the making of adjustments later to ensure the peep is always square to the eye when at full draw.
2. The peep sight is now installed. Sometimes, the peep can rotate as the bow is drawn. This is normal and it may be necessary to adjust to prevent this from
3. happening. A possible solution is moving one or two strands from one side of the peep to the other.

Points to consider:

- The fit of the nock on the string will affect the rotation of the peep sight.
- When moving strands from one side to the other use a tool that will not cut or damage the string.

8. WHEEL/CAM TIMING

The critical element of setting up and tuning a compound bow is timing of the cams (wheels). Ideally, both cams (wheels) should reach full draw at the same time and move forward together reaching brace height and releasing the arrow at the same time.

It should be noted that cam (wheel) timing is usually not required with single cam bows. These are self-aligning although it is necessary to ensure the limb tiller is correct, so the handle is vertical when at full draw.

To check wheel timing draw back the bow with the release device and observe the cams as they come to full draw. Both cams should arrive at full draw and roll over together, if not then adjustments should be made.

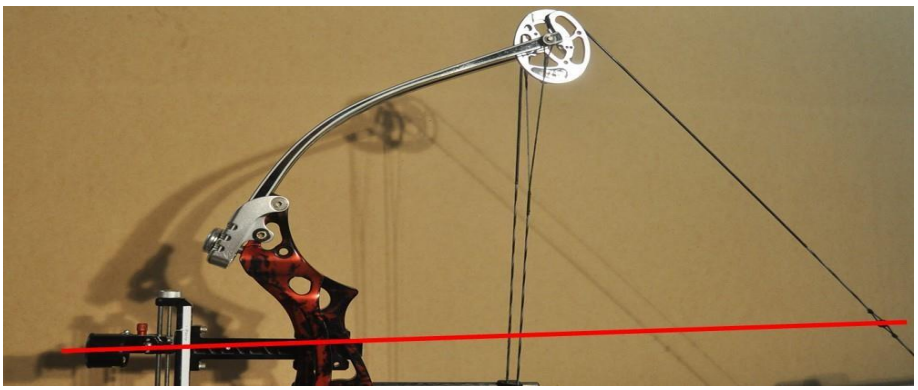
Place the bow into a bow press and remove tension off the bow. Remove one of the cables from the cam (wheel) and either add or remove twists as required. Replace cable on cam (wheel) and add tension and re-check timing again. Before checking the timing again, it is important to reposition the nocking points as they may have altered position in relationship to the arrow rest.

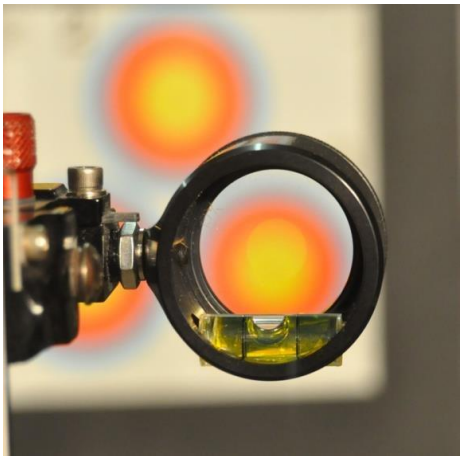
9. BOW SIGHT

Compound bows use a sight and scope combination. The scope is a magnifying sight with a bubble level to assist in holding the bow vertical. This needs to be set up to ensure the sight bar and the bubble are square to the bow string. Scopes have three axis planes and these need to be set up to ensure accuracy.

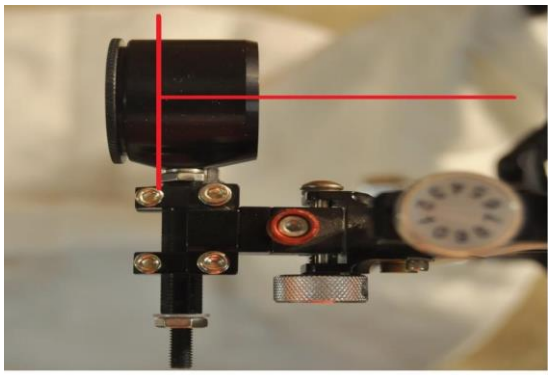
First Axis

This is the basic axis and relates to the scope lens orientation to the string (tilt). Ideally the scope lens should be aligned to the peep sight position at full draw so the scope body may need to be angled about 2 to 4 degrees above square.



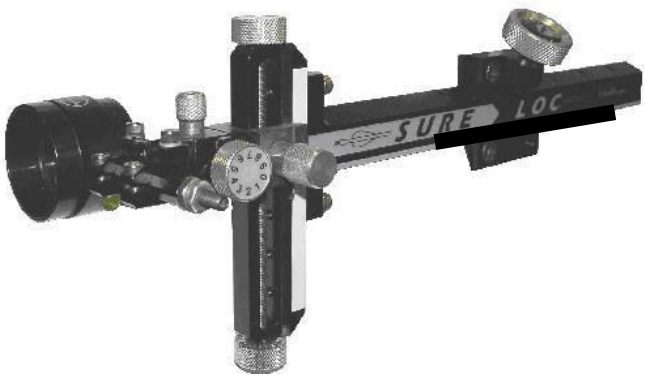


This is the most critical of the three axis adjustments as it effects day to day shooting. The 2nd axis relates to the bubble being square to the sight bar and bow string. If the bubble is not square to the sight bar the archer will get inconsistent left to right arrows.



Third Axis

This axis is critical when shooting up and down hills such as in field archery and relates to the scope lens being square to the eye. If the lens is not square the arrow will go either right or left (depending upon the angle) when shooting up hill and opposite when shooting downhill.



The best method for vertically setting the sight bar with the bow string is as follows:

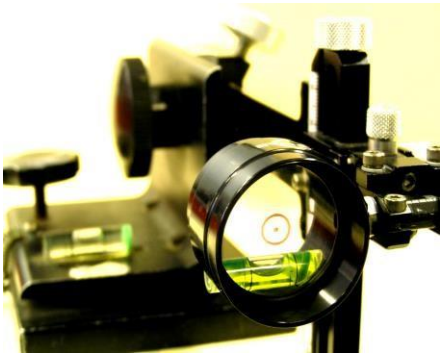
1) Fit the scope onto the sight and set the first axis.
2) Lay the bow onto a flat surface, a table or bench.
3) Using a builder's string level attach it to the string and pack up either end of the riser until the string is level.

4) Without moving the bow's position remove the builder's string level from the string and place on the side of the bar.

5) Now loosen the screws holding the extension bar to the sight bar and adjust until level. Retighten the screws. The sight bar is now level with the bow string.

6) The next step is to set up the 2nd axis. A scope levelling device can help with this, alternatively use a straight, vertical surface. Adjust the scope in the 2nd axis until the bubble is square with sight bar.

7) The final step is to set the 3rd axis, but not all bow sights come with this feature. To check the 3rd axis raise the sight to about 30o and then lower to about 30o. Check the bubble is still level, it may vary in the 3rd axis from the 2nd axis. Make the appropriate adjustments to set the bubble in the centre at the 3rd axis. Adjusting the 3rd axis will not change the 2nd axis setting, although this may depend upon sight design.



10. TUNING THE BOW

For new archers, these steps should be all that is required when setting up their first compound bow. Once the archer's technique and consistency has increased, further work can be done to tune the bow.

NOCK FIT AND NOCKING POINTS

NOCK FIT

When setting up a bow it is important that the arrow fits correctly onto the string, it does not matter if you are using a recurve, compound or longbow having the correct nock fit is critical. Most nocks made are designed to snap onto the bow string, but it is important the fit is not too tight or too loose.

The nock should fit onto the string in such a way that it snaps onto the string but still has enough movement to freely slide up and down the string. As you draw a bow back, the string will rotate, the nock fit should be such as to allow this rotation without placing excess side force on the arrow. This is particularly important on compound bows as the string rotation will affect the 'Peep Sight' position.

Fig 1

A simple test can be carried out to determine if the nock fit is correct.

Firstly, place an arrow on the string holding the bow in one hand so the arrow hangs down towards the ground (Fig 1).

Now with your other hand using your thumb and first finger, rotate the string. The arrow should not move with the string as it is rotated but remain hanging (Fig 2).

If the arrow moves with the rotation of the string and starts to swing, then the nock fit is too tight. Alternatively, if the nock will not stay on the string then it is too loose.

Fig 2

Never wrap material (such as dental floss or cotton thread) around the nocking point to build up the serving. This can be used as a temporary measure only but should never be used as a permanent solution. This material can quickly wear giving you a poor fitting nock.

CORRECTING NOCK FIT

Many brands of nocks come with two groove sizes, 0.88 mm and 0.98 mm also called small or large groove; select the nock groove size that best suits the strings diameter.
Also, string serving material comes in different sizes, experiment and find which size material gives the best nock fit. If all this still does not work, try laying additional strands of bow string materials onto the string and then serve the string including these additional strands.

TIE ON NOCKING POINTS

Tie-on nocking points are very popular with experienced archers, they are easy to apply, long lasting and most importantly, don't move when installed correctly.

The use of metal nocking points is not recommended as they can move during shooting, damage the bow string if installed too tight and they have been known to fly off the string when shot. Metal nocking points also add unnecessary weight to the bow string, when the aim should be to try and keep the bow string (around the centre) as light as possible.

Cut a piece of bowstring serving about 150mm (6 inches) long. Any serving material will do although the old-style Braided Nylon serving works best, this product is now being marketed as nocking point material by one manufacturer.

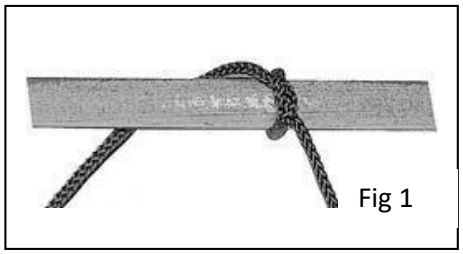


Fig 1

Using the bow square mark where you want the nocking point and tie a half hitch knot (Fig 1) and pull tight.

Then tie another half hitch knot on the other side of the string to the first knot, pull tight (Fig 2)

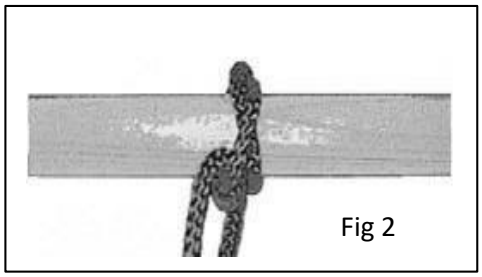


Fig 2

Continue to tie half hitch knots opposite to the last one on either side of the string until 6 to 8 knots have been tied.

To finish off tie a hitch knot which is two half hitch braided knots. Finish and seal by melting the serving by using matches or a lighter *(therefore braided nylon is best as it melts where other types of serving tend to burn).*

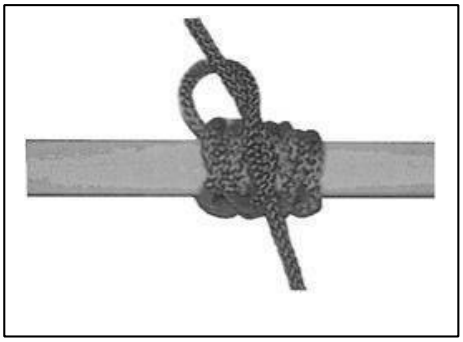


Fig 3

Tie-on nocking points will not slide up or down the string, but adjustments can be made; just like a thread and nut, the tie-on nocking points acts like a nut with the serving material acting like a screw thread.

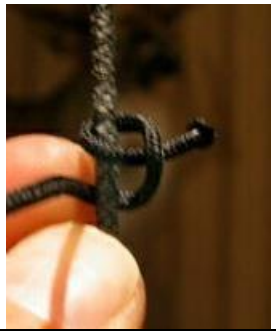
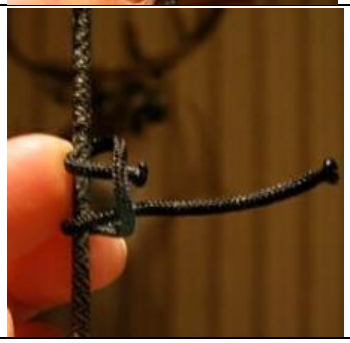
INSTALLING A D LOOP

The steps below detail the process for installing a D loop on a string.

Use non-stretch nylon or polyester material designed for the purpose, this material should be about 2.00 mm in diameter. To start cut a piece of D loop material usually about 110 mm long. After the material is cut to length, first use your fingertip to fray each end of the string by pushing the fibers apart. Once separated use a flame to melt each end you just frayed.

Melt each end of the D loop material until it makes a melted ball about twice the size of the material. Blow out the flame and the small ball will immediately begin to harden.

Next, mark the string for the top of the arrow and attach the top D loop above the arrow and pull tight. Then attach a tie-on nocking point above and below the arrow but ensure that about 2mm of free space is left under the arrow. Never use the metal nocking points, these are too large and can impact on the effectiveness of the D loop

Take the D loop material and place it on the left side of the bow string with about 12 mm of material pointing towards the back of the bowstring.	
Wrap the D loop material around the front of the bowstring and bring it back around over itself.	
Now wrap the D loop material around the bowstring again and back through the loop you just made.	 

Now pull the D loop knot tight by pulling on the longer end of the material. The small ball made earlier will keep the material from pulling through the loop.	
Now you are ready to make the bottom knot of the loop. Start with the string material placed on the back side of the bowstring.	
Next wrap it around the bowstring passing the long end through the loop you just created.	
Next move the long end down and around the front of the bowstring moving the long end through the lower end of the loop.	
When you do this, you form a tiny loop	

Now push the beaded end through.	
Using your release device or special D loop pliers apply pressure to the D loop by pulling the D loop until it is tight.	

NOTE – The picture above only describe how to install a D Loop and for clarity does not have the nocking points attached. The melted ends hold the D loop tight and prevent it from coming apart.

STABILISERS

Understanding the Process

As a coach it is important that you understand the reasons for and benefits of using stabilisers. Archers can be fixated on purchasing trendy stabilisers that remove vibration and noise without realising that attempting to remove vibration and noise after the shot has no bearing on their ability to hold the bow steady at full draw or contribute to the accuracy of the arrow. This article details why stabilisers are used, some of the science involved with stabilisers and what the archers should be looking for when selecting and setting up a stabiliser.

It must be remembered the bow is a simple mechanical device and follows all the principals of engineering and physics. Stabilisers used on modern equipment have three main functions:

- Provide balance at full draw while maintaining the bows 'point of balance' or 'centre of mass', allowing the archer to hold the bow steady at full draw making aiming easy and consistent.
- Reducing or delaying bow movement (torque or rotation) upon release until the arrow has left the string and passed the bow.
- Removing or reducing vibration after the arrow has left the string and passed the bow and the bow and string begins to react to the after effects of the shot.

POINT OF BALANCE OR CENTRE OF MASS

Ideally a bow should be set-up so the 'point of balance' at full draw is just in front of the bow grip and just below the pivot point of the bow. This places it just in front of the point where the bow contacts the bow hand.

Adding accessories such as sights & extra weight will change the point of balance and therefore change how the bow shoots or in the case of recurve will have a significant effect on bow tuning.

It is particularly important that upon release, the bow, arrow and nocking point must be maintained in the same plane as at full draw until the arrow leaves the string and passes the bow handle. As previously mentioned, it is also critical there is limited rotation of the bow around the pivot point until the arrow has passed by the bow.

Stabilisers and their effect can be divided into three areas, 'Before the Shot', 'During the Shot' and 'After the Shot'.

BEFORE THE SHOT

Stabilisers are designed to help with the balance and control of the bow during the hold and aiming process. During this element in the shot sequence, they ensure the 'Point of Balance' is maintained, making it easier for the archer to hold the bow steady, sitting comfortably in their hand; reducing movement at full draw and making aiming quicker and easier. With a recurve bow, ensure the stabiliser and any weight added to the end of the long rod has no effect on the bow's tiller. Too much weight on the front of a recurve bow means gravity will pull on the stabiliser and the bow will pivot in the hand changing the bow's tiller. A stabiliser set up should assist in keeping the bow vertical at full draw, hence the use of "V" bars for recurve and compound bows and bubble levels for compound bows. Any cant to the bow off the vertical at full draw will send the arrow off the target in the direction of the cant.

Care must be taken to ensure that too much weight is not added to the stabilisers,, this has the effect of moving the point of balance low and forward. Excessive weight will cause fatigue and potentially long-term bow shoulder injuries.
Additional weight on the front stabiliser will force the bow to excessively rotate forward as the arrow moves out of the bow. This action will effect bow tuning, accuracy, as well as making aiming difficult, as the archer is fighting to keep the bow upright.

The stabilisers' should be stiff enough so that their resonant frequency is well above the frequency of muscle tremors and bow movements, otherwise the archer will develop a linkage between the stabilisers' vibrations and their movements, and the archer may find it more difficult to hold steady and aim.

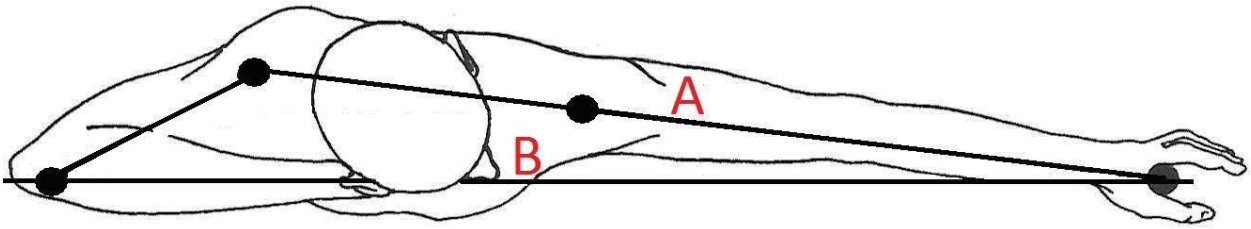
In simple terms if the stabilisers are very flexible they will develop a high resonant frequency (vibrate at full draw) this will cause muscles to tremor (shake) in sequence with the stabilisers at full draw. Alternatively, due to poor bow set-up or poor fitness (strength) muscles develop tremors (shake) causing the stabilisers' to increase their resonant frequency (they vibrate even more) and this increased vibration can be transferred back into the body and the bow can further increase shaking and movement.

EXECUTING THE SHOT

The most critical part of the shot sequence is the actual execution (release)of the arrow. Stabilisers are designed to keep the bow, arrow and string (nocking point) in the same plane maintaining the point of balance at full draw and ensuring the arrow reaches brace height and leaves the string passing the bow handle without the arrow being moved out of line.

The natural reaction is for the bow when the arrow is released is to rotate in the bow hand (torque). For a right-hand archer it will rotate toward the right, moving the bow tips to the left and causing a left shot. This rotation can be inconsistent if the force being placed on the bow handle varies from shot to shot. The force placed on the bow by the bow hand and bow arm at full draw causes this rotation. The rotation of the bow during the release is critical; the bows top limb will want to rotate away or toward the archer depending on bow design and bow/stabiliser set-up. This action is unavoidable but can be minimised with stabilisers set-up. Stabilisers should be used to encourage only slight forward rotation of the bow.

At full draw the force behind the arrow is in a line from the point the bow hand contacts the bow through the arrow to the fingers (or release device) holding the string and along the drawing arm to the elbow. But as we cannot shoot the arrow down our bow arm, we are forced to apply side force to the bow at an angle that will cause torque (rotation) to the bow when shot.



In the diagram above - “A” is the line of force along the bow arm, which is at an angle to the line of the arrow, which is “B”. Therefore, technique is critical, the greater the angle (gap) between shoulder and arrow the greater the torque forces being placed on the bow at full draw.

It should be noted that it takes between 15 and 20 milliseconds (this time depends upon draw length and the arrows physical weight) for an arrow to go from the full draw position to brace height where the arrow leaves the string and then passes the bow. This is an extremely short period of time but critical to accuracy and it is critical the bow remains in the same plane as at full draw as the arrow is shot and leaves the bow and any rotation is minimal and forward.

It is important that the archer develops a technique that has the bow shoulder pushed (not rotated) in as close to the arrow at full draw as possible without the string hitting the arm upon release. This will assist in reducing bow hand torque, hence the main reason for the use of long stabilisers that will reduce or delay the rotation until the arrow has passed the bow.

AFTER THE SHOT

After the arrow has left the string and passed the bow, stabilisers no longer have any effect on the arrow or accuracy of the arrow, the main use of stabilisers after the shot is to remove shock and vibration. It should be stressed that vibration and noise have no effect on the arrow; this vibration happens after the arrow has left the bow.

Some people feel it important to ensure the bow moves or rotates in the hand in a particular manner to ensure accuracy, the reality is that once the arrow has left the string and then passed the bow handle the stabilisers have no effect on the arrow what-so-ever and any such movement (after the arrow has left the bow) will have no effect on the accuracy of the arrow in any way.

When purchasing stabilisers many people focus on the reducing or removing vibration and/or noise believing if you remove this effect you will make the arrow more accurate, this could be no further from the truth.

Removing vibration and associated noise has become a major marketing exercise for many bow makers and accessory companies without any recognition to the fact that it has no relationship with accuracy or has any effect on the arrow which has now left the bow and is on its way to the target.

When selecting a stabiliser set-up, the principal focus should be on 'Before the Shot' and 'Exexuting the Shot'. Controlling vibration and associated noise 'After the Shot' should also be a consideration as it could lead to fatigue, loosening screws and possible damaging equipment but any consideration should be only to a minor extent.

DISPLACEMENT

Displacement is very common during the holding/aiming process and just prior to release, it relates to being at full draw and the sharp quick movements of the bow from one place to another such as left to right with the most common up and down. Technique, minute muscular tremors reacting to the load of the bow, general fitness and strength are all factors with this movement.

Adding stabilisers and increasing the physical weight of the bow can be used to assist in reducing or slowing these movements until the archer has sighted, released and the arrow has left the bow, but too much weight can increase these tremors.

ROTATION

Rotation relates to the movement around an axis of the bow. The axis or pivot point is where the bow hand contacts the bow and the bow will rotate around this point. There are three rotational axes movements critical to archery.

- Forward and backward roll
- Side to side (rotational torque)
- Side to side roll

BACKWARD AND FORWARD ROTATION

This relates to backward or forward movements of the bow around the pivot point (axis) of the bow. This can be caused by bow design, addition of accessories such as a sight, stabiliser weight and bow hand pressure.

This movement is controlled by ensuring correct technique bow hand placement but also by adding weight in the form of long stabilisers or counter weights to the rear of the bow to ensure the "Point of Balance" is maintained.

Upon release there will also be unavoidable backward or forward "kick", this kick is unavoidable but can be reduced by using stabilisers, ideally any kick should be forward.

SIDE TO SIDE ROTATION (ROTATIONAL TORQUE)

This movement is possibly the most common rotation and the main reason why stabilisers are used. The bow is easy to rotate along its long axis as its long and narrow (particularly recurve bows). The archer's hand position and any side pressure exerted on the bow has a major effect on creating rotational torque upon release as the bow reacts to the side forces on the bow created by the bow arm and bow hand.

With compound bows there is the double issue of the bow arm and bow hand plus the side forces being exerted by the cable guard. If you are using a 50lb compound bow at full draw there will be 50lb plus of pressure pulling the cable guard in toward the arrow. The archer resists this movement at full draw by

increasing the amount of pressure exerted by the bow arm and bow hand. As the archer releases and the force is taken off the cable guard the bow will want to react to this additional rotational torque. The use of long stabilisers is designed to reduce or slow this rotational torque upon release.

SIDE TO SIDE ROLL

Side to side roll is the quick sharp side-to-side movement viewed by the archer around the pivot point when at full draw, holding and aiming.

The movement can be created by bow hand placement as well as minute muscular tremors to the load of the bow, also to the weight of accessories placed on the bow that create an imbalance. Shooting technique can be a major factor with correcting this effect or the use of V Bars or side counter weights can assist with reducing movement.

VIBRATION

When a bow is shot there is a large amount of the stored energy not transferred to the arrow, this energy remains in the bow and string and must be dissipated, this happens in the form of vibration. This vibration does not happen until the arrow is well past the bow and on its way to the target and is a reaction to the string's forward movement.

When the string reaches brace height, the arrow leaves the string this is the last time the arrow has any contact with the bow as the front of the arrow should have left the arrow rest early on its forward movement.

When the string reaches brace height and the arrow leaves the string, the string continues to move forward in many cases coming to within 60mm of the back of the bow. In line with Newton's third law "To every action there is an equal and opposite reaction" this is where vibrations commence as the string moves back to brace height and then backward and forward many times until it settles.

Before the string settles the stabilisers start to react and start to vibrate and any rubber shock absorbers start to move. This is also where all the sounds associated with the shot are created (unless the arrow has clearance problems and has struck part of the bow as it passes). It should be noted that this starts to happen some 25 to 30 milliseconds after the arrows has left the bow and is some 10 to 15 metres from the bow.

Vibrations created after the arrow has left the bow will not have any effect on the arrow. Stabilisers fitted with soft rubber attachments and similar attachments to the bow will help in removing or reducing vibrations and reducing the noise created following the shot. The more rigid the stabiliser the greater effect, as rigid stabilisers vibrate at lower frequencies and will absorb vibrations much easier.

It should be noted at this time that the use of soft flexible stabilisers should be avoided; these have a high resonant frequency and generally fail to absorb vibration in fact these flexible stabilisers can develop rhythmic vibrations at full draw, which can be transferred into the bow and archers body making it difficult to hold steady at full draw.

STABILISER LENGTH

There is no rule to this but the longer the stabiliser the less weight needs to be added to the front of the stabiliser for the same effect, alternatively the shorter the stabiliser the more weight needs to be added. It's a matter of experimenting to find the best length stabiliser for each person but generally the long front stabiliser should be around 28" to 32" in length.

TUNING OVERVIEW

What is tuning and why is it important?

To achieve the maximum result commensurate with the archer's ability we are adjusting the bow, arrow and archer so we achieve the best arrow flight.

There are many documented methods of achieving this goal and it is important as coaches to not only be able to instruct an archer on these methods but also have a basic understanding of the principals involved.

To achieve maximum efficiency loads must be applied along the axis of the arrow. Arrows will always flex due to loads being exerted to the rear of the arrow on release. The rear of the arrow has the initial movement therefore causing the arrow to initially flex (bend).

The extent of the arrow flexing will depend on the Spine (stiffness) of the arrow shaft, the components that are added to the shaft, the load imparted by the bow on release, whether it is shot with fingers or a mechanical device, the string material and size of the string, condition of the finger tab as well as the ability of the archer.

It is important for the coach to understand that the ability of the archer will directly impact on any tuning results and therefore ensure that expectations are commensurate to skill adaptation at any time.

Arrows will flex along different planes depending on the bow type being used. Releasing the string with the fingers causes the arrows to flex horizontally whilst compound arrows shot with a mechanical release will flex in the vertical plane, therefore initial bow set up is critical. Arrows flex around two points called nodes. These are towards the front and rear of the arrow. The object of tuning is to align these nodes so that the arrow will flex along a theoretical line towards the target.

For further information on tuning, please read the following sections:

- How arrows work
- Bare shaft tuning
- Paper Tuning

HOW ARROWS WORK

How Arrows Work

It is important that a coach fully understands how arrows behave as they leave a bow and then travel toward the target. An understating of this behavior is important especially for coaches when attempting to tune and set-up a bow.

It is also important to understand that arrows behave differently when shot from a recurve bow or longbow compared to a compound bow. Recurve bows and longbows are shot with fingers whilst compound bows use release devices. It is because of this and the engineering differences between recurve/longbow and compound bows that arrows behave differently.

All arrows vibrate or flex when they are shot, this vibration or frequency is unique to each arrow and relates to several factors; size, material, construction, stiffness, length and weight. Any changes to an arrow such as the point weight, will change the frequency of the arrow and the amount it vibrates.

RECURVE BOW

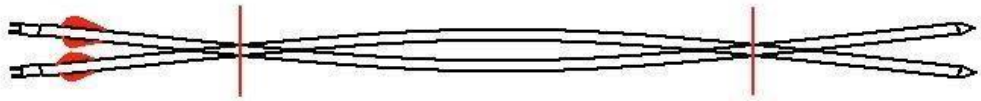
For a recurve bow the frequency of the arrow (flexing) is a side to side action hence the design of recurve arrow rests. Recurve bow arrow rests have a supporting arm and a side point for the arrow to push against during the initial contact which is between 30 mm to 50 mm as it starts to move forward. After the initial push against the bow the arrow then moves away from the bow, never making contact again as it leaves the bow.
The use of a plunger button will absorb this initial side push which is used to bring the arrow into centreshot. Changing the spring tension on a plunger button has no effect on the vibrations of an arrow.
The arrow frequency (vibration or flexing) is critical to allow the arrow to pass the bow without interference. You can never efficiently shoot an arrow that is not the correct size, so it is critical that you select and use the correct size arrow for a given bow weight and arrow length.

NODES

Arrows have node points at the front and rear and the arrow vibrates (flexes) around these points. It should be remembered that the node points always remain on the same line during the flexing action.

The node points can be easily located. At about 50 mm or 100 mm down from the point, along the shaft, hold the arrow shaft by the thumb and first finger and tap the arrow shaft just above the fetches. You will feel the shaft vibrate, now move your finger slightly up or down the shaft and continue to tap the shaft until you find the location where the vibrations continue for a long time, this is the front node.

Now turn the arrow around and do the same test, starting about 50 mm down from the fletches until you find the rear node. As the arrow flies toward the target the arrow will vibrate between these 2 points.



Picture 1 – Front and rear node points.

Changes cannot be made to the node points unless you change the arrow or change the arrows specifications. It is not important to know where the nodes are located on arrows, but it is important to have an understanding that the arrow vibrates (flexes) around these node points.

For more information on setting up and tuning a recurve bow refer to Recurve Bow Set Up and Tuning a Recurve Bow.

Aligning the Nodes

Fig. 3 - Nodes

Arrow Nodes - As the arrow oscillates, the nodes remain in direct alignment to the target. This diagram clearly illustrates the front and rear node positions of the arrow. The front node is usually closer to the front end of the arrow than the rear node is to the nock end. This is due to the mass weight of the point—nodes will always be located closer to the heavier mass.

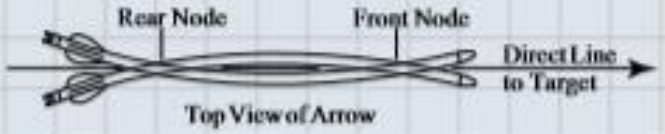


Fig. 4
Finger Release (RF, CF)

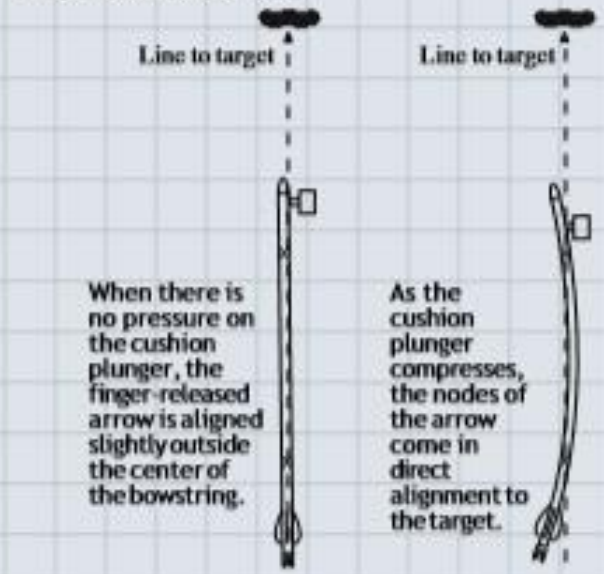


Fig. 5
Compound Mechanical Release (CR)

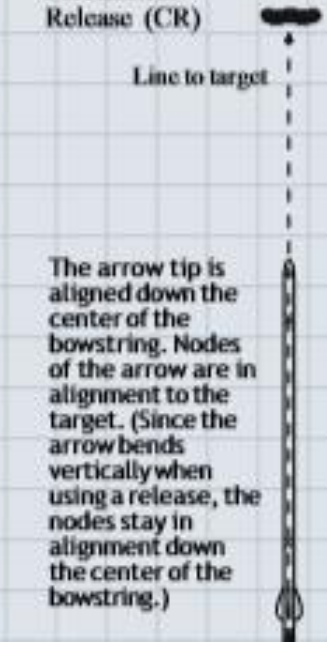
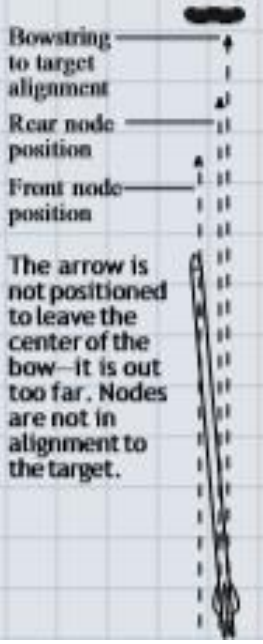


Fig. 6
Misaligned Arrow RF, CF, CR
(Incorrect Arrow Rest Position)



RECURVE

RECURVE BOW TUNING

Bare Shaft

INTRODUCTION

Setting up and tuning equipment is a vital part of archery although the outcomes achieved directly relate to the archers shooting ability, technique and skill.

Tuning should be a quick and relatively easy process if a few simple steps are followed. The bare shaft method has been used for many years and is very simple and straight forward having clearly defined steps.

In the past the accepted tuning method required the adjustment of the plunger button spring tension. Although many achieve acceptable results history has shown results can be hit and miss and does not allow for accurate set up of centreshot or determine correct arrow size.

The method described below relies on setting and forgetting the spring tension of the plunger button and then adjusting the bows draw weight as required. The method also allows for the accurate set of the centreshot.

If a bow is being used that does not have the facility to adjust draw weight, Easton provide an alternative method in their promotional material.

BOW SET UP

It is very important no matter what tuning method is being used, that the bow is set up with all accessories and components correctly installed.

In detailing this tuning method, or any tuning method, the assumption is that the bow has been set up correctly:

- Ensure the correct string length is being used. This ensures the correct amount of string is sitting around the recurve on each limb and the brace height is within manufacturer's specifications.
- If the bow has adjustable tiller/bow weight set the bow weight to mid location and set the tiller, making the top tiller about 6mm greater than the bottom tiller.
- Attach both top and bottom nocking points to the string (ensure the nocking point can easily be adjusted during the tuning process). Initially set the nocking point with the bottom of the nock 4mm above square.
- If the bow has the ability to make side to side adjustments with the limbs, then ensure the limbs have been aligned. The limbs should be aligned and set up with the string running centrally down the limbs and the riser. The riser should be square to the string and not twisted off to one side.

For consistency always use a bow sight and clicker, this step does not apply to Barebow archers.

ARROWS

Select the arrows to be shot, choose carefully to ensure the correct arrow size is being used to match the bow weight and arrow length. To do this, weigh the bow poundage, measure the arrow length and consult the manufacturer's arrow chart. Never guess the bow weight, ensure the exact bow weight for the draw length is known.

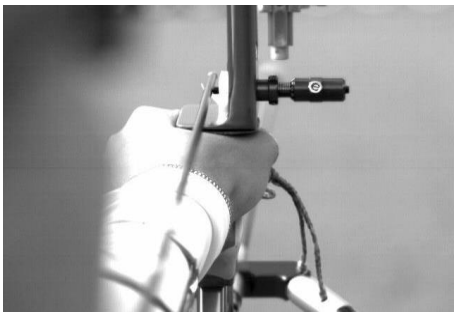
HOW ARROWS LEAVE A BOW

Arrows vibrate (flex) as they are shot; this is a normal reaction known as the 'Archer's Paradox'. It is very important to allow an arrow to pass the bow without interference. This degree of flexing may be increased depending upon the ability of the archer and the quality of their release.

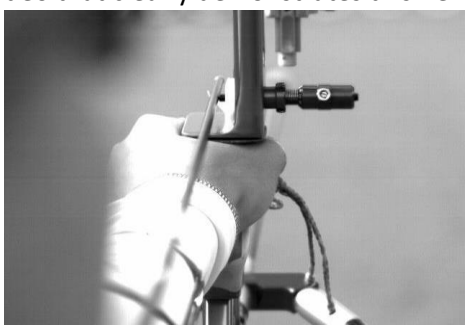
Arrows vibrate at about 50 vibrations (cycles) a second and an arrow takes about 0.002 of a second to leave the bow. Choosing the correct arrow size is important to ensure the arrow takes one vibration cycle to go from anchor to the point where it passes the bow. If an arrow takes more or less than a single cycle the tail of the arrow will strike the bow or arrow rest as it passes.

This vibration cycle is important as it allows the tail of the arrow to pass the bow without touching or interfering with the rest, creating clearance problems. It should also be noted that the flexing (vibration) continues in the arrow as it moves down range and hits the target, it does not stop flexing after it leaves the bow.

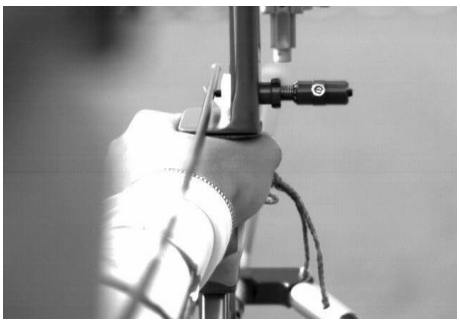
Below are a series of still photos from a slow-motion video that clearly demonstrates this flexing cycle.



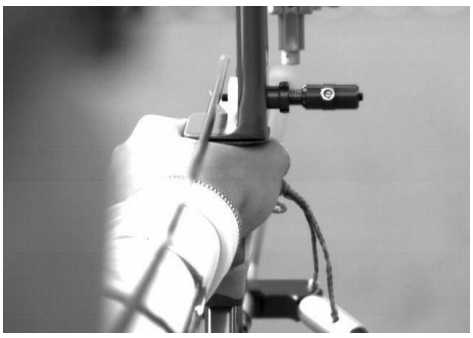
Full Draw



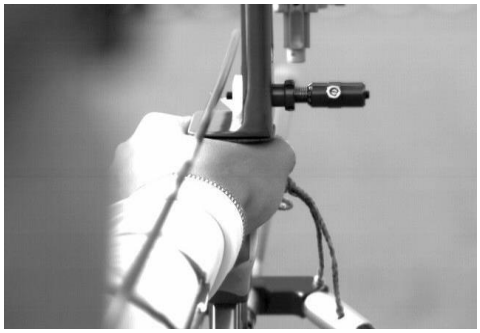
Release – initial flex of arrow and arrow has started to move forward



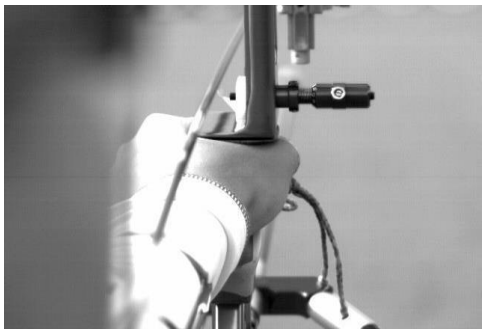
Arrow pushes against plunger, moving plunger in about 5mm



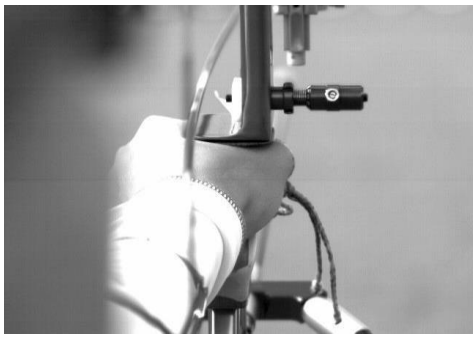
Arrow has started to move away from plunger



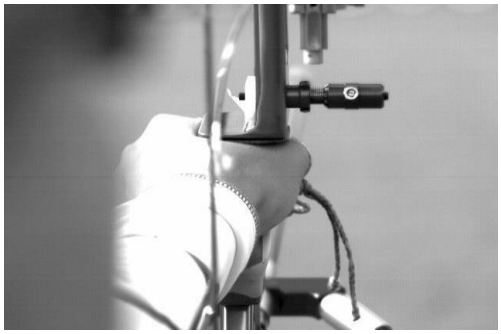
Arrow begins to straighten



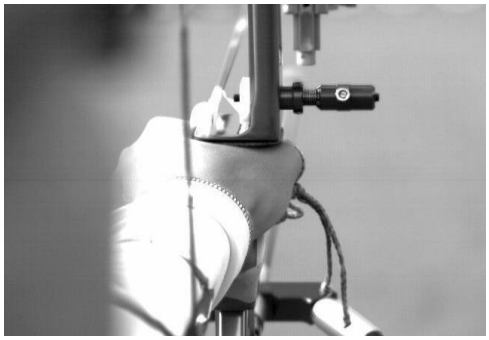
Arrow now flexing in opposite direction



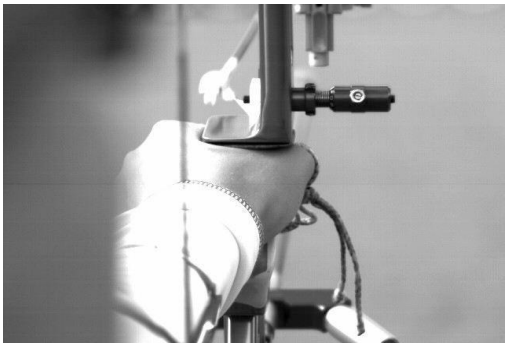
Opposite flex increases



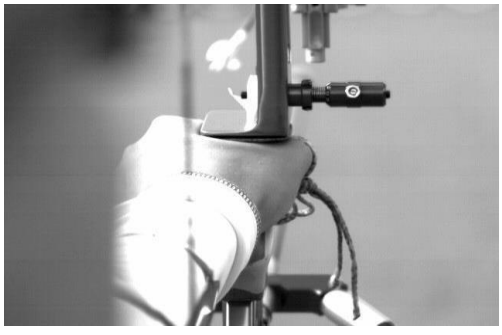
String has reached brace height; flex has reached maximum and arrow leaves string



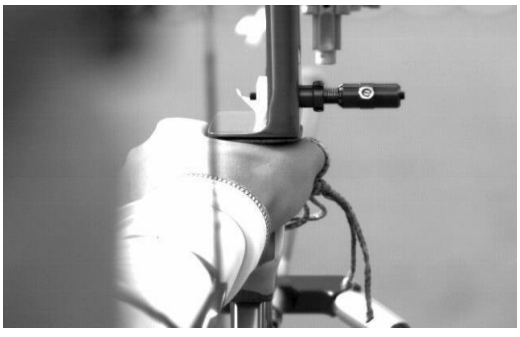
Arrows tail approaches the bow handle and arrow rest



Arrow passes arrow rest without contact



Arrow leaves bow



Arrow commences next flexing cycle

Slow motion video by Lloyd Brown and photos by Jim Larven.

From the images above it is visible that the arrow has almost no contact with the plunger button upon release.

After release and about 20 mm to 40 mm into the forward travel of the arrow, the arrow pushes against the plunger. Usually the arrow moves the plunger about 0.5 mm, although this amount may be increased for the less experienced archers whose release is still developing.

This pushing action against the plunger lasts for about 30 mm to 40 mm of the arrow's travel and then the arrow moves away from the plunger and rest. As the flexing action increases, the arrow does not come into contact with the plunger or rest again as it leaves the bow, unless the tuning is not correct and the tail of the arrow strikes the rest or plunger, which is not a desirable outcome.

The reason a plunger is used needs to be understood: as the arrow starts to move forward the point of the arrow must be in centreshot, that is the arrow is in the true centre of the bow.

As the arrow wants to initially push against the side of the bow at the start of the flexing action, if the arrow is set up in centreshot the arrow will start to move forward inside centreshot.

The arrow must be in centreshot to ensure it is travelling in a straight line at all distances. If the arrow leaves the bow either in or outside of centreshot shot it will not travel in a straight line to the target and the archer will get left to right sight positions at different distances.

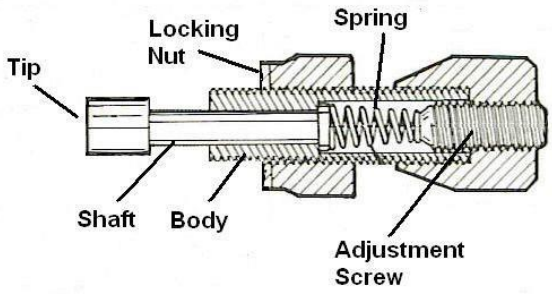
This is why the arrow is set up somewhere between half an arrow to a full arrow width outside of centreshot. As the arrow initially pushes against the plunger the arrow moves into centreshot for its travel past the bow.

The amount of centreshot needed to be set up depends on the ability of the archer. Experienced archers set up centreshot about half an arrow outside of centreshot, while less experienced archers about a full arrow outside of centreshot. The release of the less experienced archer usually causes the arrow to flex more, pushing harder against the plunger, hence the need for extra centreshot.

The spring tension should be set about mid tension, although for the more experienced archers it may be necessary to set much stiffer.

TUNING PROCESS

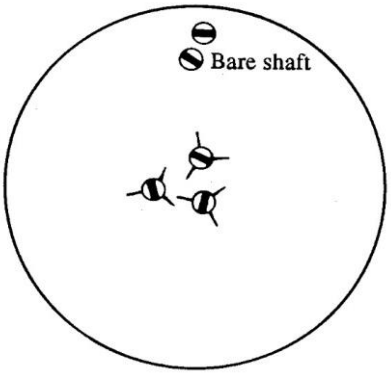
1. Firstly, the plunger button needs to be made rigid (no spring movement). Disassemble the plunger button (ideally use a spare button for this) and remove the spring and replace with a piece of wire or wood (a match stick).

2. 

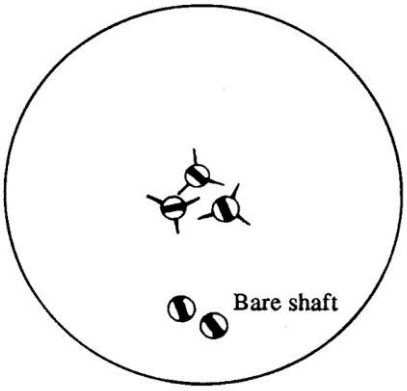
3. Now reassemble the plunger and install in the riser and adjust so the arrow is sitting exactly in centreshot, **the plunger should have no spring movement.**

4. Now shoot a number (2 or 3) of fletched arrows and a number (2 or 3) of bare arrows at about 15-20 metres.

5. Firstly, check the nocking point position; adjust the nocking point so the fletched and bare shaft arrows hit the same height. If the bare shaft arrows are hitting high this indicates the nocking points are low and must be raised; alternatively, if the bare shaft arrows hitting low this indicated the nocking points are high and must be lowered.



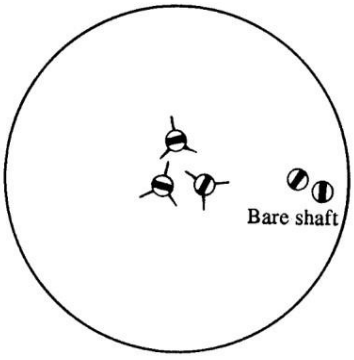
Move nocking point down

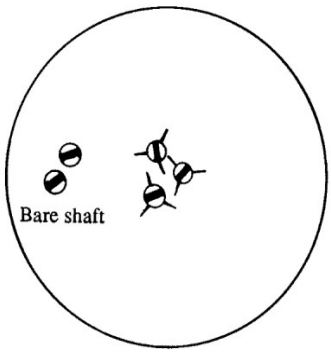


Move nocking point up

6. The bare (unfletched) arrows may also be landing to one side of the group of fletched arrows. Ideally the fletched and bare arrows should land together. To adjust the position of the bare arrows, adjust the bow's draw weight increasing or decreasing the bow weight until the bare arrows land with the fletched arrows.

7. Indicates soft spine arrow decrease bow weight





Indicates stiff spine arrow increase bow weight

Note - Adjustments suggested above are for a right-hand archer, so adjustments should be reversed for a left-hand archer. It should be noted, if the arrows are not the correct size the archer can never achieve this step, and there will be little that can be done to fix the situation other then sell the arrows and buy new ones - with a recurve bow the archer must have the correct arrow size, one size wrong will not tune correctly.

If the bow draw weight will not go high enough try using a lighter string. If the bow draw weight will not go low enough try using a heavier string.

1. With the solid pressure button, shoot several arrows at 20 metres and adjust the sight so that the arrows are grouping around the centre of the target.
2. Without changing the sight setting, replace the plunger button or replace the spring adjust the spring tension to about a mid-setting.
3. Adjust the plunger so the arrow is positioned about half an arrow width outside of true centreshot.
4. Shoot some arrows and see where the centre of the group is in relationship to the centre of the target. If the arrows group to the left then move the pressure button position bringing it in to the right (into the bow), until the arrows land in the center of the target.
5. Alternately if the arrows group to the right, move the plunger button to the left (out from the bow) until the arrows land in the center of the target.
6. This is now the correct position for the plunger and allows the arrow to be in centreshot as it pushes sideways on the plunger during release.
7. The final step is to shoot some fletched arrows at a longer distance (50 m) and check that they appear to be flying well.

NOTE

If the archer is not getting the results they require, try a 'powder test' to ensure that the rear of the arrow is not striking the rest or pressure button.

To do this purchase from a chemist or supermarket a spray can of powder foot spray. Spray the powder on the rear of the arrow and around the arrow rest and plunger, allow the powder to dry and shoot a test arrow. If there is any contact of the arrow, fletch or nock with the rest, plunger or riser the strike mark will be seen. If powder cannot be found, try powder foot spray or red lipstick as these can work as well.

This may indicate the wrong size arrow or there may need to be a change of rotation of the fletches on the arrow. The easiest way to do this is to rotate the nock of the arrow maybe a ¼ turn which changes the fletch position as the arrow passes the bow.

REMEMBER

This method does not require any adjustment or fiddling with the spring tension to try to get the fletched and bare arrows to group together. If you do this, you are only compromising trying to get the wrong size arrows to shoot with some degree of efficiency but in truth it does not work like that. The key adjustment with this method is changing the bow's draw weight.

Tuning method originally developed by Dick Tone. Sections of this document were reproduced with permission from 'Mastering Bow Tuning' by James Park

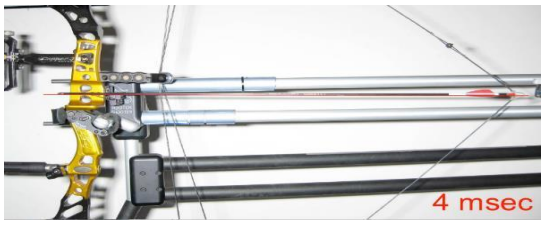
COMPOUND BOW TUNING

PAPER TUNING
CABLES AND STRINGS

PAPER TUNING

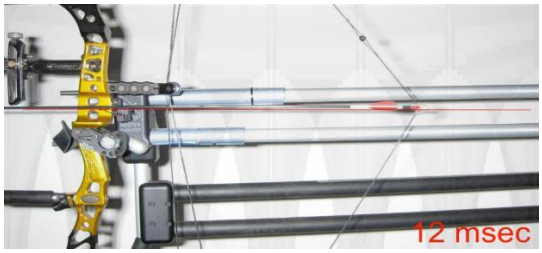
The paper tuning method has been widely used for tuning compound bows when being shot with release devices. It is not recommended for recurve bows or when shooting compound bows with fingers. This is because when shooting with fingers the arrow goes into a side-to-side flexing action (Archers Paradox) as it leaves the bow. The tear created by this bending action can give false and misleading readings when arrows are shot through paper.

Arrows shot from compound bows should not have any side to side flexing action, although the arrows do flex but in an up and down motion due to the action of the cams, hence the reason for the design of compound arrow rests. The technical information relating to how arrows work out of compound bows has been produced by Dr James Park:



4 msec after release, the rear of the arrow has started to flex up and the front of the arrow push down on the arrow rest.

8 msec and the flexing has increased



12 msec and the flex has reached its peak.

16 msec and the flex has changed and the arrowhas started to lift off the rest.

17 msec almost at brace height and the arrow has risen further above the rest

18 msec and the arrow has just left the string and the arrow is now at its peak above the rest.

19 msec the arrow is passing the rest with adequate clearance.

20 msec and the arrow has left the bow.

To carry out this test you need a timber or steel frame mounted on a tripod or similar. The frame should be a minimum of about 60cm x 60cm square and positioned usually about two metres in front of the target butt; the frame holds a sheet of brown paper at shoulder height. Note: newspaper can prevent the tear from being seen clearly.

The idea behind paper tuning is to shoot arrows through the paper and observe the tear left by the arrow. This gives immediate feedback as to what the arrow is doing and what adjustments are required.

The objective is to have a slightly upward tear although many are seeking a clear tear although this not possible which will be explained later. Before carrying out this test ensure:

1. The bow and accessories have been set up correctly.
2. The arrow has a clear path.
3. The archers shooting technique does not affect the flight of the arrow.

EQUIPMENT SET-UP

The way in which the bow has been set up can affect the results obtained and can make the job of tuning easy or frustrating. Be aware of how to set up a bow and the factors that will affect tuning. These factors can be:

Centreshot - Initially set up a compound bow so the arrow is positioned in centreshot of the bow. To compensate for the slight rotation of the bow due to sideway forces created by the cable guard the paper test should be undertaken to determine final adjustment position.

Tiller –Usually compound bows are set up with an even tiller, the measurement between both limbs is the same. Once this is obtained the next step is to ensure the wheels (cams) are timed equally.

Cam Timing – Cam timing refers to both cams achieving full draw at the same time. Incorrectly timed cams will create aiming problems but most importantly will affect the way the bow reacts upon release effecting nock point travel. Some bows perform better if the top cam comes to full draw just slightly before the bottom.

String Weight – The number of strands and the physical weight of the string can affect tuning. The weight of accessories such as peep sight, kisser buttons and nocking points but most important the weight of any serving can also affect tuning.

Nocking Point and D Loop Set-up – Tuning involves setting the nocking point position on the string, but also the number of nocking points used and the gap between these points is important in tuning. Always use two nocking points and ensure there is an adequate gap between the nocking points and D loop when at full draw and they are not touching (pinching) the arrow. Initially the nocking point should set slightly above square.

Arrow Rest Location – The location of the arrow rest in relationship to the bow's pivot point is critical and may take some experimentation. Also be aware of competition rules regarding measurement for overdraw.

Release device use – the way in which the release device is held but most importantly the way in which it is used will greatly affect tuning.

Clearance – Is where the fletching, nock or any part of the arrow touches the face, chest or strikes the arrow rest or part of the bow upon release. This can give results that are difficult to interpret.

CONDUCTING THE TEST

FIG 1

To carry out the test the archer should stand about two metres from the paper, shooting at shoulder height (shooting up or down can give false readings). Only fletched arrows are used for this test. Shoot a fletched arrow through the paper and observe how the arrow has torn the paper. There are a few possible tears that can result. The tear will indicate what action should be taken.

This tear shows the fletches following directly behind the shaft. Paper turning will work through processes to get the tear as close to this as possible. Arrows shot out of a compound will want to flex (vibrate) in an up and down action. Ideally as the arrow is shot it will flex downward for half of its travel out of the bow and then flex up for the second part of its travel out of the bow. This action provides clearance past the arrow rest and bow window. If FIG 1 is not attainable, then the next best outcome is that of FIG 3, with a slightly upward tear.

FIG 2

This tear indicates the arrow is passing through the paper with a low nocking point.

Solutions:

1. Check cam timing
2. Check clearance. The tail of the arrow may be striking the rest. Powder test the rear of the arrow.
3. Check nock travel. It is most likely moving back in a downward action as the bow is drawn. Ideally the nocking point should move back in a straight line or a slightly upward line.

FIG 3

This tear indicates the arrow is passing through the paper with a high nocking point. A correctly tuned bow will have the arrow vibrate once as it leaves the bows initially with a downward flex and then an upward flex as it passes the arrow rest and bow. The tear height will vary if the arrow is shot from different distances. Ideally the maximum tear length will be about 30mm to 40mm. Greater than this indicates adjustment required.

Solutions:

1. Check cam timing
2. Check nock travel
3. Check clearance. The tail of the arrow may be striking the rest.

This tear could indicate:

FIG 4

Centreshot position may not be correct due to the rotation of the bow because of the forces on the cable guard.
Arrow striking the arrow rest or bow window as it passes.
Excessive bow hand torque at full draw which is changing the centreshot position at full draw.
Face or chest contact with the string at full draw which is causing the string to move out of line when shot.

Solutions:

1. Check arrow rest position (centreshot). For a right-hand archer the arrow rest may be positioned too far out from the bow window.**NB** Due to the factors listed above the rest may have to moved the opposite way if results are not improved by the first movement
2. Arrow hitting the rest or bow window as it passes by. Use the powder test to detect any arrow/rest/bow contact.
3. Excessive bow hand torque caused by poor bow hand position or tension particularly in your thumb. Always use a sling but beware if using one that attaches between the thumb and first finger, the natural tendency is to tense the thumb and fingers creating bow hand tension. Also ensure that a bow or wrist sling is not putting pressure on the wrist at full draw.
4. Face, chest or armguard contact is the most common cause of this problem as it forces the string out of line as the arrow is shot.
5. Change the anchor position moving the string away and toward the front of the face.
6. The draw length may be two long, creating face or chest contact.
7. Check clothing is not loose and interfering with the string, particularly important in cold and wet conditions when you wear bulky clothing.
8. Wear a chest protector but make sure it is tight fitting and smooth and will not create further interference to the string.
9. Check technique for leaning back, causing the string to contact clothing and chest.

This tear could indicate:

FIG 5

1. Centreshot position may not be correct.
2. Arrow striking the arrow rest or bow window as it passes.
3. Excessive bow hand torque at full draw which is changing the centreshot position at full draw.
4. Face or chest contact with the string at full draw which is causing the string to move out of line when shot.

Solutions:

1. Check arrow rest position (centreshot), for a right-hand archer the arrow rest may be positioned too far into the bow window. NB Due to the factors listed above the rest may have to moved the opposite way if results are not improved by the first movement
2. Arrow hitting the rest or bow window as it passes by, use the powder test to detect any arrow/rest/bow contact.
3. Excessive bow hand torque caused by poor bow hand position or tension particularly in your thumb.
4. Although not a common cause, face, chest or armguard contact may also be an issue.

FIG 6

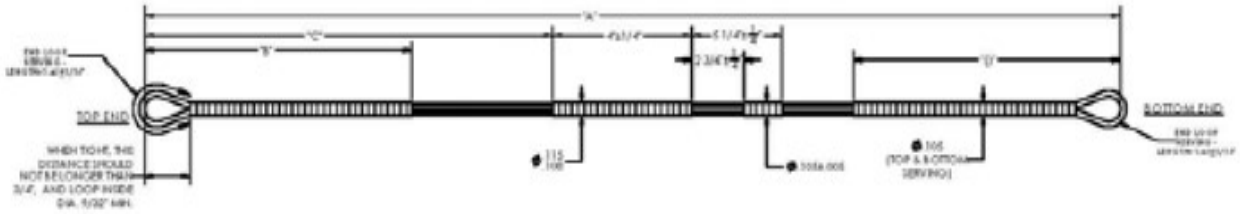
These tears could indicate a combination of problems

Solutions:

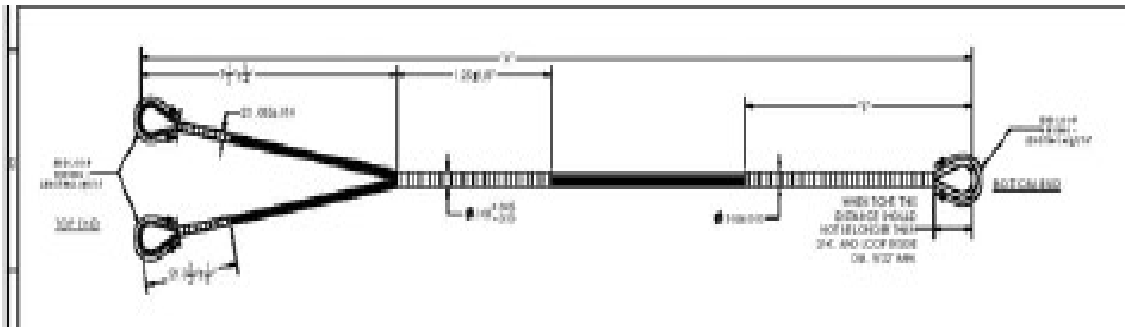
Try a combination of methods detailed above but remember clearance is the most common problem.

Compound
Cables and String

String



Yolk Bus Cable



Control Bus Cable

APPLIED PSYCHOLOGY

Growth Mindset

Psychological Demands

Training Games

Goal Setting

General Psych Resources

GROWTH MINDSET

The Mindset of a Champion by Carol Dweck *Lewis & Virginia Eaton Professor of Psychology*

There are things that distinguish great athletes—champions—from others. Most of the sports world thinks it's their talent, but I will argue that it's their *mindset*. This idea is brought to life by the story of Billy Beane, told so well by Michael Lewis in the book *Moneyball* (Lewis, 2003). When Beane was in high school, he was in fact a huge talent–what they call a "natural." He was the star of the basketball team, the football team, and the baseball team–*and he was all these things without much effort***.** People thought he was the new Babe Ruth. However, as soon as anything went wrong, Beane lost it. He didn't know how to learn from his mistakes, nor did he know how to practice to improve. Why? Because naturals shouldn't make mistakes or need practice. When Beane moved up to baseball's major leagues, things got progressively worse. Every at-bat was a do-or-die situation and with every out he fell apart yet again. If you're a natural, you believe that you shouldn't have deficiencies, so you can't face them and coach or practice them away. Beane's contempt for learning and his inability to function in the face of setbacks—where did this come from? With avid practice and the right coaching, he could have been one of the greats. Why didn't he seek that? I will show how his behaviour comes right out of his mindset.

Mindsets

In my work, I have identified two mindsets about ability that people may hold (Dweck, 1999; Dweck, 2006; Dweck & Leggett, 1988). Some hold a fixed mindset, in which they see abilities as fixed traits. In this view, talents are gifts—you either have them or you don't.

Other people, in contrast, hold a growth mindset of ability. They believe that people can cultivate their abilities. In other words, they view talents as potentialities that can be developed through practice. It's not that people holding this mindset deny differences among people. They don't deny that some people may be better or faster than others at acquiring certain skills, but what they focus on is the idea that everyone can get better over time. These mindsets and their lessons are highly applicable to the world of sports, but before we delve into that and before we delve more deeply into the psychology of the mindsets, let's address some questions that are frequently asked about mindsets:

Do people hold the same mindsets with respect to different traits? Not necessarily. People can hold one mindset about intelligence and another about sports ability. Whichever mindset they hold about athletic ability will guide their choices and their motivation in sports.

Are people's mindsets related to their level of ability in the area? No, at least not at first. People with all levels of ability can hold either mindset, but over time those with the growth mindset appear to gain an advantage (Aronson, Fried, & Good, 2002; Blackwell, Trzesniewski , & Dweck, 2006; Good, Aronson, & Inzlicht, 2003; Robins & Pals, 2002).

Are mindsets fixed or can they be changed? Mindsets are stable beliefs, but they are beliefs, and beliefs can be changed. Later, I will discuss interventions that altered students' mindsets and had a real effect on their motivation and performance.

Mindsets and Goals

We have found in our research that people's mindsets set up completely different motivations (see Molden & Dweck, 2006). The fixed mindset, in which you have only a certain amount of a valued talent or ability, always leads people to want to look good. You need to prove that you are talented and not do anything to contradict that impression, so people in a fixed mindset try to highlight their proficiencies and hide their deficiencies (see, e.g., Rhodewalt, 1994). In fact, we have found that they will often reject valuable learning opportunities if these opportunities hold the risk of unmasking their shortcomings (Dweck & Leggett, 1988; Hong, Chiu, Dweck, Lin, & Wan, 1999; Mueller & Dweck, 1998).

Doesn't everyone have shortcomings? Isn't that what learning is for—to overcome them? Of course. However, this mindset does not give people the leeway to expose and remedy their weaknesses because any weakness can indicate a permanent lack of ability.

In contrast, the growth mindset, in which you can develop your ability, leads people to want to do just that. It leads them to put a premium on learning. This difference is starkly demonstrated in a study I performed with Ying-yi Hong, C.Y. Chiu, Derek Lin, and Wendy Wan (1999). In this study, we recruited entering students at the University of Hong Kong, an elite university where everything—classes, textbooks, term papers, exams—is in English. But not all incoming students are proficient in English. Surely, they would be eager to improve their English skills. To find out, we told them that the Faculty was thinking of offering a remedial English course and asked them how likely they were to take it if it were offered. Students with a growth mindset about intelligence were eager for this course. It could help them master the very skills they needed. However, students with a fixed mindset were not enthusiastic. Because they did not want to expose their deficiency, they were willing to put their whole college career in jeopardy.

In another study (Mueller & Dweck, 1998), we've seen students in a fixed mindset lie about their deficiencies. Students performed some very challenging sets of problems and then were asked to write about their experiences to students in another school—students they would never meet. There was a place on the sheet where they were asked to report their scores. Almost 40% of the students in the fixed mindset, perhaps feeling that their poor scores were a reflection of their permanent ability, lied about their scores. Only 13% of those in the growth mindset saw fit to falsify their performance. Like Billy Beane, those in the fixed mindset didn't think they should make mistakes!

We have also studied the brain to examine the impact of mindsets on people's attention to ability-relevant information or to learning-relevant information (Dweck, Mangels, & Good, 2004). Here, college students came to the EEG lab, where an electrode cap was placed on their heads and recordings were made from the parts of the brain that reflected attentional processes as they performed a highly difficult task. Each time they answered a question on the task, they were told whether their answer was correct or incorrect, and then a little later were told the correct answer. What did they pay attention to?

The students who held a fixed mindset about intelligence paid attention only to whether their answer was right. Once they knew this, they had little further interest in learning what the right answer was. Thus, their interest in being right took strong precedence over their interest in learning, and we later showed that this significantly hurt their subsequent performance.

Students who held a growth mindset about intelligence paid close attention to the both kinds of information. They paid attention to whether their answer was right or wrong and they paid attention to what the right answer was. As a result, they did substantially better than students with the fixed mindset

on a later test. It's clear that both things—wanting to do well and wanting to learn– are important in a sports setting. It's important to validate your abilities through high quality performance in a competitive setting, and it's also important to grow your skills over time. The problem with a fixed mindset is twofold. One is that any lapse in performance is a threat to people's sense of their underlying ability and hence their sense of their future. And the second is that this great concern with ability tends to drive out learning, often when they are most needed. It's hard to see how people can thrive in the world of sports if they don't have strong desire to address their weaknesses and learn.

Mindsets and Effort

As we have seen, people in the fixed mindset feel measured by setbacks and mistakes. They also feel measured by the very fact of exerting effort. They believe, like Billy Beane, that if you have true ability, you shouldn't need a lot of effort (Blackwell, et al., 2005). Yet, there is no important endeavour in life—certainly not in the sports world—that can be accomplished and maintained without intense and sustained effort. However, in this mindset, it's a sign that you are lacking talent or ability.

This is serious because many young athletes who have a great deal of early ability can coast along for some time, outshining their peers. They may even come to equate athletic ability with the ability to outperform others without engaging in much practice or training. At some point, however, natural ability may not be enough, and others may begin to pass them by. Whether they can now learn to put in that needed effort is critical to their future success. Many do not. In contrast, people in the growth mindset understand that effort is the way that ability is brought to life and allowed to reach fruition. Far from indicating a lack of talent, they believe that even geniuses need great effort to fulfil their promise.

People with a growth mindset not only believe in the *power* of effort, they hold effort as a *value*. Ian Thorpe, the illustrious Australian swimmer, feels that as long as he's tried his best, he's been victorious. "For myself, losing is not coming second. It's getting out of the water and knowing you could have done better. For myself, I have won every race I've ever been in."

Mindsets and Coping with Setbacks

It will come as no surprise that the mindsets lead to different ways of coping with difficulty. Because in the fixed mindset, setbacks are indicating a lack of ability, this mindset often leaves people few good ways of reacting to setbacks. In one study (Blackwell, et al, 2005), we found that those with a fixed mindset were more likely to say that if they did poorly on a test—even if it were in a new course and one they liked a lot—they would study *less* in the future and would seriously consider cheating. This is how people cope when they think setbacks mean they lack permanent ability.

In contrast, those students with a growth mindset said they would study more or study differently. They planned to take charge of the situation and work to overcome the setback. When the going gets rough, people in the growth framework not only take charge of improving their skills, they take charge of their *motivation* as well (cf. Grant, 2004). Despite setbacks—or even because of them—they find ways to keep themselves committed and interested. Instead, students with a fixed framework lose interest as they lose confidence. As the difficulty mounts, their commitment and enjoyment go down. Since all important endeavors involve setbacks sooner or later (more likely, sooner *and* later), it is a serious liability to lose interest and enjoyment just when you need greater effort.

Putting it all together, this means that a fixed mindset leads people to value looking good over learning, to disdain and to fear effort, and to abandon effective strategies just when they need them most. A growth

mindset, on the other hand, leads people to seek challenges and learning, to value effort, and to persist effectively in the face of obstacles.
Billy Beane, over time, came to recognize that these growth-mindset ingredients– the ability to see setbacks as a natural part of learning, the ability to improve through effort, and the ability to sustain enjoyment and commitment–were keys to success in the sports world (Lewis, 2003). With this knowledge, as general manager of the Oakland Athletics, he led his team to several seasons of almost record-breaking wins on nearly the lowest budget in baseball.

Naturals Revisited

But aren't there people who *are* true naturals? Michael Jordan? Babe Ruth? Wasn't Babe Ruth this out-of-shape guy who dragged his paunch to the plate and belted out his home runs? An examination of almost any of the greats will reveal people who practiced like fiends and honed their skills over many years. The story of Babe Ruth's development as a home-run king is interesting (Creamer, 1974/1983). Ty Cobb argued that it was Ruth's career as a pitcher that helped him become a great hitter. No one expected a pitcher to hit well, so Ruth would experiment with his big swing, seeing what worked and what didn't. When it didn't work, nobody cared. After all, he was the pitcher. Over time, he learned more and more about how to control his swing, so that when he became an outfielder, he was ready to hit.

Take any "natural" you can name—Jackie Joyner-Kersee, Mia Hamm, Muhammad Ali-and if you just look more closely, you can see the discipline, perseverance, and commitment that went into their success. Sure, they had talent, but they also had the right mindset.

Mindsets and Confidence

Isn't motivation just a matter of confidence? To some extent, yes, but to me one of the most fascinating findings in all of my research is the fact that within the growth framework, with its focus on growth, it is far easier to sustain your confidence (see Blackwell, et al, 2005; Grant & Dweck, 2003; Mueller & Dweck, 1998; see also Jourden, Bandura, and Banfield, 1991; Martocchio, 1994; Wood & Bandura, 1989). In the fixed framework, with its focus on proving your ability, a poor performance casts doubt on your deep-seated ability and can undermine your confidence. Someone else's good performance can undermine your confidence ("Maybe they have more talent than I do.") (see Butler, 2000). Even needing effort and practice can undermine your confidence–so it's a constant battle to stay confident in the face of inevitable challenge.

However, in the growth framework, making mistakes or even having clear deficits doesn't mean you aren't or won't be good at something. It's simply an occasion for learning. Moreover, you don't need a wagon-load of confidence to embark on learning. You just need to believe in improvement over time.

Some years ago, I received a letter from a competitive swimmer who had come across my work. She told me she had always had a confidence problem. Coaches told her to believe in herself 100%–never to doubt herself—but she couldn't do it. Every time she posted a disappointing time or lost a meet, she fell into self-doubt. However, thinking of things in a growth framework—where setbacks are just information about what you need to do in the future—now allowed her to keep things in perspective and maintain confidence in those very same situations. The setbacks simply meant: Get back to work.

The Idea of Potential

Many of the scouts in the sports world scouted for naturals, for people who looked like superstars, that is, were shaped like superstars and moved like superstars (Lewis, 2003). If they didn't look the part, they

weren't recruited. Yet Ben Hogan, one of the greatest golfers of all time did not have the grace of a natural golfer. Muhammad Ali did not have the build of the natural boxer. He did not have a champion's fists, reach, chest expansion, and heft. People gave him no chance against Sonny Liston, who seemed to have it all (Dennis & Atyeo, 2003). Mugsy Bogues at 5'3" or the little quarterback Doug Flutie—anyone could look at them and tell you they were not naturals and by that they would mean they did not have the potential to make it. Within a fixed mindset, potential is easy to judge. You just look at the person's gifts right now and project them into the future. Talented now equals talented in the future. Not talented now equals not talented in the future. Boy that was easy!

Yet within a growth framework, potential is hard to judge. Sure "natural talent" buys you a lot, and if you're accomplished now, you've got a leg up on others. But after that you cannot know where someone might end up with years of passion, discipline, and commitment—and good instruction.

Thus, this work, which takes mindsets directly into the world of sport, provides exciting support for the view that passion and excellence in sport are guided by people's mindsets about their sports abilities.

Where Do Mindsets Come From?

More and more we are finding that mindsets are fostered by the kind of feedback students get from the people who evaluate them: their parents, their teachers, and presumably their coaches. Specifically, the mindsets are fostered by a focus on the *person* (e.g., talent or ability) as opposed to a focus on the *process* (e.g., effort, learning) (Dweck & Lennon, 2001; Kamins & Dweck, 1999; Mueller & Dweck, 1998).

First, we have found that when adults evaluate students on their abilities—even if the evaluation is positive–it puts students into a fixed mindset (Kamins & Dweck, 1999; Mueller & Dweck, 1998). For example, in one set of studies (Mueller & Dweck, 1998), we gave students some problems to solve from a nonverbal IQ test and then, in one condition, lauded their performance and praised them for their intelligence.

These students:

- now favoured a fixed mindset of intelligence (compared to a group that was praised for their effort)
    - when then asked about the task they would like to work on next, rejected an opportunity to learn in favour of a chance to look smart again
- lost interest and performed poorly after the tasks became harder

These are the students who lied about their performance when asked to report their scores to students in another school.

However, students who were praised for the *process* they engaged in—in this case, their effort:

- now expressed a more growth mindset of intelligence
- overwhelmingly went for the task that would give them a chance to learn
- maintained their interest and their performance even after the task became harder

It would be fascinating to look at this with coaches too. The illustrious John Wooden, who coached the UCLA basketball team to 10 NCAA championships, constantly focused on his players' learning and improvement (Wooden, 1972, 1997). Although he recognized that some players had more talent than others, he was committed to developing each player's ability to the fullest. As an example, he recruited another player the same year he recruited the great Bill Walton. He informed this player, who played the same position as

Walton that he might get very little playing time in actual games, but he assured him that he would be offered a professional contract when he graduated. True to Wooden's promise, this player not only got a pro contract, but was also named rookie of the year in his league.

Wooden also tells countless stories about players who arrived at UCLA seeming like sorry (even hopeless) raw material, but who blossomed into top players on his championship teams. By focusing on process and learning, Wooden seemed to imbue his players with a belief in their own development—a belief that paid good dividends.

Can Mindsets Be Changed?

Can a growth mindset be taught, and will people reap benefits from learning it? In four studies to date–two from our lab (Blackwell, et al, 2005; 2007) and two from Joshua Aronson, Catherine Good and their colleagues (Aronson, Fried & Good, 2002; Good, Aronson, & Inzlicht, 2003))—workshops have been developed to teach a growth mindset. In these workshops, students (from junior high through college, depending on the study) learned that the brain was a dynamic, malleable organ and that every time they learned something new their brain formed new connections. Over time, these proliferating connections would make them smarter. Students were also shown how this idea could be applied to their schoolwork. These interventions were relatively modest but had rather immediate and striking effects.

In every one of these studies, students who learned the growth mindset of intelligence showed significant gains in grades and/or achievement test scores. In some studies, these gains were made relative to control groups that were also given noteworthy interventions, such as an intervention involving training in important study skills.

In one of our studies (Blackwell, et al, 2007), teachers singled out the students who had been in the growth intervention and noted clear changes in their motivation (even though these teachers were blind to the intervention condition their students were in). Here are some of the things they said:
"L., who never puts in any extra effort and often doesn't turn in homework on time, actually stayed up late working for hours to finish an assignment early so I could review it and give him a chance to revise it. He earned a B+ on the assignment (he had been getting C's and lower)."
"M. was far below grade level. During the past several weeks, she has voluntarily asked for extra help from me during her lunch period in order to improve her test-taking performance. Her grades drastically improved from failing to an 84 on the most recent exam."
"Several students have voluntarily participated in peer tutoring sessions during their lunch periods or after school. Students such as N., and S. were passing when they requested the extra help and were motivated by the prospect of sheer improvement."

It would be fascinating to see how a growth mindset intervention works in the domain of sport—to see the impact that it has on the desire to practice, the enjoyment of sport, and the ability to cope effectively with setbacks, especially for those who have been turned off the joy of sport. It would also be fascinating to look at the impact of such interventions on elite athletes as well. Would it help "naturals" to develop the attitudes and habits that would allow them to fulfil their potential, instead of going the way of Billy Beane?

Finally, it would be fascinating to see what a growth mindset intervention does for teamwork. Instead of each player vying to be the most talented star—always trying to look better than his or her teammates–would a growth mindset foster a more cooperative, learning-together environment?

Conclusion

Without denying the importance of that thing called "talent," I have tried to show that something else—an athlete's mindset—can be equally important. I have described one mindset, built around a belief in fixed traits, that can limit athletes' ability to fulfil their potential. It can do this by making them value looking good, being "the star," and staying in their comfort zone over stretching themselves to learn new things. It can do this by making them feel that naturals should not have to work as hard as others to shine and it can do this by fostering defensive strategies – a desire to hide mistakes or make excuses—instead of confronting the mistakes or deficiencies.

I have described another mindset, built around the belief in expandable skills, that can foster athletes' ability to fulfil their potential by making them prize learning, by making confidence (in improvement) easier to maintain, and by fostering effective strategies and sustained effort in the face of difficulty.

In an honors thesis done with Stanford teams, my student, Richard Cox, found that athletes who believe that athletic success was due more to practice and hard work and less to natural ability had more success that next season. He also found that athletes who thought that their *coaches* believed in practice and hard work more than natural ability had more success. In fact, we are finding more and more that people absorb the mindset that is prevalent in their organization. This means that coaches must themselves adopt a growth mindset and send messages to their athletes that they believe in improvement and that they value the practices that lead to it.

This article, "The Mindset of a Champion", is adapted from an article of the same title originally published in Morris, T., Terry, P, & Gordon, S. (Eds.), Sport and exercise psychology: International perspectives. Morgantown, WV: Fitness Information Technology. Carol Dweck is the Lewis and Virginia Eaton Professor of Psychology at Stanford University. Her work bridges developmental psychology, social psychology, and personality psychology, and examines the self-conceptions people use to structure the self and guide their behavior. Her research looks at the origins of these self-conceptions, their role in motivation and self-regulation, and their impact on achievement and interpersonal processes. This area of research is highly relevant to sports.

PSYCHOLOGICAL DEMANDS IN COMPETITION

Most archers spend a lot of money on equipment, a lot of time setting up equipment, lots of time developing a shooting technique that is consistent and biomechanically correct and then spent a great deal of time practising and perfecting sequence and timing into a quick and efficient shooting routine.

Inevitably the archer's you coach will then head off to a tournament as this is the logical next step or striving for records or classification pins. The event comes, the weather is good, but the score performance was nowhere near that of practice. Time for reflection, during all these coaching sessions and practice in the lead up was as much time spent on preparing for the mental demands of the competition as the physical? As a coach much of what is happening inside the archer's head is hidden, relying so heavily on communication in order to support this development.

Elements that are different in competition than in practice: more competitors, people talking about score and goals, timers, judges, leader board, announcers/director of shooting, all these things need to be recognised and strategies to be prepared. Inevitably the brain will switch to think about score more than technique as the archers strive to beat personal bests or beat the person on their target or try and move up the leader board.

If they are not prepared and have not trained for this situation, they are more than likely going to have a poor performance. Not only is the brain having different thought patterns, breathing can change under pressure, generally becoming shallower; muscles can tense creating less fluidity of movement and possible restrictions to known movement patterns. All these can lead to negative thoughts as performance drops. This can be attributed in some ways to a fear and flight response as the body deals with anxiety about experiencing something new and the focus becomes more on the outcome rather than the task itself.

Some archers also add to the pressure of performance by thinking about expectations of those around them. Pleasing the coach, club, family and friends, sponsors, social media, which can all contribute to self-doubt and unrealistic expectations. All these thoughts/ pressures can impact on the emotional response to each shot and ultimately impact on the outcome and effectiveness of shooting.

These hidden attributes to an archer's approach can be prevalent at all levels within the sport and is an integral part of an archer's development. As a coach it is important to understand and recognise the problems that can occur and develop strategies in training to support the processing and strategies to overcome these demands. Building in opportunities for archers to practice deep breathing, progressive relaxation and visualisation can support their mental development.

DEEP BREATHING

Known as diaphragmatic breathing, abdominal breathing, belly breathing, or deep breathing is the act of breathing deep into your lungs by flexing your diaphragm rather than breathing shallowly by flexing or expanding your rib cage. Under tense situations archers can quickly start to shallow breath which leads to reduced oxygen in the body and increased muscle tension. This deep breathing is marked by expansion of the stomach (abdomen) rather than the chest when breathing. It is generally considered a healthier and fuller way to ingest air and is often used as a therapy for hyperventilation and anxiety disorders. Deep breathing is more desirable for archery; shallow breathing leads to flexing the rib cage and expanding the chest creating several biomechanical issues when shooting. It is desirable not to expand the chest when shooting.

Though the diaphragm is the primary breathing muscle, it is believed that many people have little sensory awareness of their diaphragm and almost no idea of how to engage it more fully or even how it works. There

are some breath therapists and breathing teachers who believe that because of the increasing stress of modern life and the resulting over-stimulation of the sympathetic nervous system, as well as of the ideal of the hard, flat belly, that many people carry excessive tension in the belly, chest, and back, and this tension makes it difficult for the diaphragm to move freely through its full range of motion.

Performing diaphragmatic breathing can be therapeutic, and with enough practice, can become the standard way of breathing. To breathe diaphragmatically, or with the diaphragm, one must draw air into the lungs in a way which will expand the stomach and not the chest. It is best to perform these breaths as long, slow intakes of air - allowing the body to absorb all the inhaled oxygen while simultaneously relaxing.

To do this comfortably, it is often best to loosen tight-fitting pants/belts/skirts as these can interfere with the body's ability to intake air. While at first one may not feel comfortable not expanding the chest during breathing, diaphragmatic breathing fills up most of the lungs with oxygen, much more than chest-breathing or shallow breathing.

A common diaphragmatic breathing exercise is as follows:

1. Sit or lie comfortably, with loose garments.
2. Put one hand on your chest and one on your stomach.
3. Slowly inhale through your nose or through pursed lips (to slow down the intake of breath).
4. As you inhale, feel your stomach expand with your hand. If your chest expands, focus on breathing with your diaphragm.
5. Slowly exhale through pursed lips to regulate the release of air.
6. Rest and repeat.

During a stress situation such as a tournament, archers can tend to inhale and hold their breath. The most significant, therapeutic aspect of this breathing is the exhalation which is at least two times the length of the inhalation. The exhalation alerts the body that it can relax and resume essential body functions and not remain in a state of fight or flight.

PROGRESSIVE RELAXATION

Learning progressive relaxation is achieved by sitting in a comfortable chair or lying on a bed. Get as comfortable as possible – no tight clothes or shoes and don't cross your legs. Take a deep breath and let it out slowly ideally using the deep breathing technique.
Progressive relaxation involves tensing and relaxing specific groups of muscles. After tension, a muscle will be more relaxed than prior to the tensing. Concentrate on the feel of the muscles, specifically the contrast between tension and relaxation. In time, they will recognise tension in any specific muscle and be able to reduce that tension.

Don't tense muscles other than the specific group at each step. Don't hold breath, grit teeth, or squint. Breathe slowly and evenly and think only about the tension-relaxation contrast. Each tensing is for 10 seconds; each relaxing is for 10 or 15 seconds. Note that each step is really two steps – one cycle of tension-relaxation for each set of opposing muscles.

The following is a recommended practice sequence through various muscle groups. practising once daily will lead to more control of the muscles and should an archer feel tense during competition, this can be a useful strategy. Archers with known injuries should be careful, as well as those with pulled muscles, broken bones, or and medical condition and should consult a doctor first before trying.

1. **Hands**. The fists are tensed; relaxed. The fingers are extended; relaxed.
2. **Biceps and triceps**. The biceps are tensed (make a muscle – but shake hands to make sure not tensing them into a fist); relaxed (drop your arm to the chair). The triceps are tensed (try to bend your arms the wrong way); relaxed (drop them).
3. **Shoulders**. Pull them back (careful with this one); relax them. Push the shoulders forward (hunch); relax.
4. **Neck (lateral)**. With the shoulders straight and relaxed, the head is turned slowly to the right, as far as possible; relax. Turn to the left; relax.
5. **Neck (forward)**. Dig chin into chest; relax. (Bringing the head back is not recommended).
6. **Mouth**. The mouth is opened as far as possible; relaxed. The lips are brought together or pursed as tightly as possible; relaxed.
7. **Tongue (extended and retracted)**. With mouth open, extend the tongue as far as possible; relax (let it sit in the bottom of your mouth). Bring it back in your throat as far as possible; relax.
8. **Tongue (roof and floor)**. Dig your tongue into the roof of your mouth; relax. Dig it into the bottom of your mouth; relax.
9. **Eyes**. Open them as wide as possible (furrow your brow); relax. Close eyes tightly (squint); relax. Make sure to completely relax the eyes, forehead, and nose after each of the tense.
10. **Breathing**. Take as deep a breath as possible – and then take a little more; let it out and breathe normally for 15 seconds. Let all the breath in the lungs out – and then a little more; inhale and breathe normally for 15 seconds.
11. **Back**. With shoulders resting on the back of the chair, push your body forward so that your back is arched; relax.
12. **Butt**. Tense the butt tightly and raise pelvis slightly off chair; relax. Dig buttocks into chair; relax.
13. **Thighs**. Extend legs and raise them about 6 inches off the floor or the foot rest but don't tense the stomach' relax. Dig feet (heels) into the floor or foot rest; relax.
14. **Stomach**. Pull in the stomach as far as possible; relax completely. Push out the stomach or tense it as if preparing for a punch in the gut; relax.
15. **Calves and feet**. Point the toes (without raising the legs); relax. Point the feet up as far as possible (beware of cramps – if you get them or feel them coming on, shake them loose); relax.
16. **Toes**. With legs relaxed, dig your toes into the floor; relax. Bend the toes up as far as possible; relax.

Upon completion of this sequence, relax for a while. This exercise can be done daily and within a few weeks archer's will articulate a stronger understanding of their muscles and when they are tense. Ideally this can be done in the evenings before bed. These exercises will not eliminate tension, but when it arises, they will know it immediately and recognise the tension.

VISUALISATION

Common examples of visualising or mental images include daydreaming, or the mental visualisation that occurs while reading a book. It is clearly understood that words (printed or spoken) are translated by the brain into images; if an action is carried out in related to printed or spoken words then creating an image and enacting that image can be practiced. We are all aware of the saying "we are what we eat" consider even more "we do what we think". In times of stress our mind can wander and can start to think of the outcomes or negative thoughts that contribute to raising anxiety levels.

Associated visualisation is looking through your own eyes and using all your senses. In other words, what you see, feel, hear and smell. It is important for archers to be able to keep themselves in the present moment and see their perfect shot through their own eyes.

Dissociated visualisation is when you are viewing yourself through external eyes like a delayed video feedback. This can be useful when trying to learn a new skill or make a technical change. As visualisation skills develop and progress, archers can move from associated to disassociated perspectives to further enhance their archery skills.

From a practical perspective if an archer has a poor performance, it is a good opportunity for them to review their shot and/or match in a disassociated state to separate themselves and emotions attached to the memory. Leaving the emotional content behind enables archers to identify technical and skill corrections in a neutral state.

HOW MENTAL IMAGES FORM IN THE BRAIN

When something is read, something is spoken to another (such as coach instruction) or self-talk is engaged in, these words are translated into images and then actions follow these images. Therefore coaches (and us engaged in self talk) should be very careful how words are phrased, what we say must be positive and reinforcing words which can be easily visualised.

Never use words such as don't, won't and can't, these words cannot be visualised. Acting out the instruction, such as "Don't shoot an 8", ends up being shoot the eight. If all the words are positive and the actions and resulting outcome can be visualised. Every archer and coach need to think about self-talk and the catalog of positive words that can be used when shooting or coaching.

In stressful situations during a tournament it is critical the words used for self-talk are positive and practiced; as well as positive or assertive tones. If you are a coach and you are after results from your archers, it is critical you only talk in positive words. Also, as a coach you should consider your body language. The archer can see your body language and translate this into either positive or negative thoughts.

Negative words can lead to self-doubt which long term can manifest itself in such archery ailments as "Target Panic" and "Gold Shyness", flinching and compound archers "Trigger Banging". You can see it every day, during practice the archer has a quick flowing technique, but when they start to score the flow is lost, the body stiffens, and the results are poor. This problem becomes very evident in a tournament. In practice they shoot with plenty of time, but when they start to score it is up and down with each arrow, they hold for a long time at full draw and they usually only have a few seconds to shoot the last arrow.

As a coach it is important to plan for these processes and build the skills in your archers. Other areas that can support the psychological demands of our sport are in relation to goal setting, deliberate practice, affirmations, developing shot sequences.

TRAINING DRILLS

Challenge	• Highly competitive - in self improvement (task mastery) and vs teammates • Simulate critical competition moments in your sport including distractions or when things go wrong
Confidence/Belief	• Set challenging task and allow the archer to figure out the solution through guided questions. • Introduce a surprise or unexpected element to each practice – get comfortable being uncomfortable
Control	• Identify factors in your control, influence or no control Letting go of mistakes and getting back in the game. • Taking a risk and failing is encouraged in training and matches.
Concentration/ Attention	• Focus on relevant internal or external performance cues

Coaches need to set challenges in training, and by supporting archers to understand and reflect on the experiences, learning occurs. Depending on how archers respond will determine how and when you set the next challenge.

Block training (doing the same thing over for the whole session i.e. continuous shooting at 70m) vs random training (doing similar skills in various situations i.e. varying, targets, number of arrows, adding time limits, implementing 'games' & challenges)

Constraints led approach: have the archer problem solve rather than the coach telling them what to do. For instance, you may be aware an archer has hand tension on the bow. So instead of saying don't grip the bow, have the archer not wear a finger sling and you catch the bow. Have them figure out what they need to action for this to happen.

As a coach we need to provide learning opportunities that develop the archers mental resilience, while at the same time developing their technical skills.

There is no doubt that it is nearly impossible to put an archer in a training environment that fully represents the experience of competition.

If we can develop different training games that reward performance whilst penalising non-performance, have a measurable outcome, and inadvertently allow the archer to experience frustration but allow for that frustration to be understood and overcome then we may be able to train our archers to achieve the highest performances.

These are some of the "games" that have achieved some increased performances.

Any training session should finish with a measurable outcome, and a way for the archer to put what they have been practicing under pressure. Any and all of these "games" can be changed, developed to meet archer's skill level, you can define a hit zone as a specific area on the target rather than score. An archer can adjust the 'scoring/hit zone' to meet current ability, but the goal should be set high but at a realistic and achievable level.

In the initial stages it is important to set tasks that can be achieved, therefore lifting the confidence level of the archer. As the tasks are achieved, they then should be ramped up incrementally to push the archer's boundaries. The significant difference between practice and training is that practice is the repetition of a task to imbed a skill and training is the development of those skills to achieve a specific goal.

GAME 1: Gold Game

6 Arrows in gold or 10 or Xs and can be varied to allow for inside out scoring (line cutters are lower values). Shoot 6 arrows at the specified distance, leave the arrows in target that meet the performance goal and reshoot the balance. Repeat until outcome achieved. No time allowance, (distance, face size and hit zone can be varied to meet archer's skill level). Note the number of arrows shot to achieve the required outcome.

GAME 2: (Variation of Game 1) – Gold Penalty

6 Arrows in gold or 10 or Xs and can be varied to allow for inside out scoring (line cutters are lower values). Shoot 6 Arrows at the specified distance, leave the arrows in target that meet the performance goal and reshoot the balance.

For any arrow not in the "hit" zone implement a penalty: i.e. remove a successful arrow from the hit zone for any unsuccessful shot.
Example:

- Hit zone gold
- Archer shoots 10,10,9,9, 8,8
- Remove the 2 reds and as a penalty remove 2 golds.
- 4 arrows now must be shot.

Repeat until outcome achieved. No time allowance (distance, face size and hit zone can be varied to meet archer's skill level). Note the number of arrows shot to achieve the required outcome.

GAME 3: 72 hits

- Shoot 6 arrow or 3 arrow ends.
- Keep shooting until the goal is achieved - 72 golds or 72 10s or 72 Xs.
- Record the number of arrows required to achieve goal
- That becomes the outcome to be improved on at the next session

GAME 4: Consecutive Hits

Session is undertaken by noting the number of consecutive hits that can be achieved. That then becomes the benchmark for the next session.
Goal is to achieve a minimum of 15.
15 is based on the number of arrows shot in a compound match and the number of arrows shot in 5 sets for recurve.
Archer can also set a number of consecutive hits that must be achieved in a training session.

GAME 5: Winning Streak

This can be used with a group session
Use multiple targets (6), all at the training/competition distance. Each archer starts on a different target, archer's shoot 1 arrow. Go to target to retrieve the arrow, if it is a hit then they move to the next target. Winner declared as the first archer to complete circuit.

GAME 6: Walk back

- Start at 10 metres 122cm face (This can be 80cm if needed)
  - Shoot 1 arrow into the gold, walk back 5 metres or move target 5 metres (whichever is safety at the target range)
- Shoot 1 arrow, if it hits the gold walk back 5 metres
- Keep repeating until the maximum distance that is normally shot is reached
- If the gold is missed go back to the previous distance
- If missed again go back to the first distance and start again (no time limit)

GAME 7: Aim Off

This can be added to any of the above-mentioned games.

- Move the windage so that the archer must aim in the 8,7 or 6 rings to hit the gold
- Do this for both left and right sides

GAME 8: Target Score

- Shoot the number of arrows in Column A and achieve the relevant sore in Column B
- If successful proceed to the next end in Column A and achieve the corresponding score in Column B.
- Work through the list.
- If required score is not achieved, then go back to the previous end.
- If unsuccessful again go back to the start of the column
- if unsuccessful again, archer must start from the beginning.
- The aim is to complete all columns.

This can be shot on a 122cm or an 80cm face at any of the specified distances for various age groups. As archers achieve all the levels they can then add additional points to the outcome score.

Arrows per end	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	38	38	39	39	40	40	41	41	42	42	43	43	44	44
2	15	15	16	16	16	16	16	17	17	17	17	17	18	18
4	31	31	32	32	32	33	33	34	34	34	35	35	36	36
1	8	8	8	8	8	8	8	9	9	9	9	9	9	9
2	15	16	16	16	16	16	17	17	17	17	17	18	18	18
4	30	31	31	32	32	32	33	33	34	34	34	35	35	36

GAME 9: Bank

This drill

Great game with more than one archer as there becomes a competitive element.

- Each archer shoots 1 arrow at a time.
- If hit zone acquired, the archer is awarded 2 points.
- The archer can choose to 'bank' or 'double up'
- If the score is banked it cannot be lost
    - If "double up"; is chosen and the hit zone is not acquired, the archer loses all accumulated scores and returns to last 'banked' amount. If they have not banked, then they return to zero and begin again.
    - Example 1st arrow hit receives 2 points. Archer doubles and achieves another hit so the progressive score becomes 4. This will continue until the score is "banked" (Saved) or The agreed outcome is achieved or the target requirement is not achieved.
- Set a target goal to be achieved ie 128 (this equals six consecutive doubling up)

GAME 10: King Of The Hill

A game for a group or squad.

- Each archer is designated a target and an opponent.
- Archers shoot 1, 3 or 6 arrows (coach or athletes to decide)
    - Whoever loses stays on the target and the winners rotate up a target across the playing field. With exception to the 'king' who remains on the top target (most left target).
- Archers to count the number of opponents as 'king'

GOAL SETTING

To enable an archer to undertake a training program, the archer needs to know what their program is trying to achieve; to this end, short term and long-term goals need to be set and monitored to see that their goals are being met. The athlete's coach is a vital part of helping with the setting and monitoring of these goals.

DIFFERENT TYPES OF GOALS FOR DIFFERENT PURPOSES

TYPE OF GOAL	PURPOSE	EXAMPLES
PROCESS GOALS	Keep the archer focused in the present moment (not thinking about past mistakes or future scores etc.,). It is 100% in their control. These must be used in competition phase.	Take 3 deep breathes to reset after a poor shot. A process for managing windy conditions. Maintain your shot timing even if you feel the urge to be more careful and aim for longer.
PERFORMANCE GOALS	Measure their improvement against themselves rather than others. These goals drive deliberate practice for improvement and helps build self- confidence. These can be used in the daily training environment.	Performance goal might be to consistently shoot a score of 25 for a 3-arrow end.
OUTCOME GOALS	Dream big – see yourself on the podium. The purpose of these goals is motivation. This is what helps with perseverance when things get tough and are not going well. Set at the beginning of the season and can help planning on how you might get there.	Top 10 finish at World Youth Championship.

SETTING EFFECTIVE GOALS

A good tip to remember; the characteristics of effective goal setting is to think of the word SMART and remember the following associated principles:

- Specific
- Measurable
- Actions
- Realistic
- Time limited

GOAL-SETTING TIPS

- Write goals down
- Set short, medium, and long-term goals
- Set a combination of process, performance and outcome goals
- Set goals for training and competition
- Visualise achieving goals
- Always remember to acknowledge the successful achievement of goals

Applied Psychology – Goal Setting

GENERAL PSYCH RESOURCES

AIS Performance Psychology Online Training Modules for coaches and athletes
https://www.sportingschools.gov.au/resources-and-pd/online-learning

High Performance Mental Skills

Goal Setting teaches athletes to set and use big picture, short-term, and action goals. High Performance Goal Setting is fundamental to success.

Motivation is designed to increase enjoyment and performance in sport. Athletes will learn about factors that influence motivation and strategies to maintain their desired motivation level.

Concentration aims to help athletes identify where their focus needs to be and learn strategies to help manage distractions and stay focused when performing.

Imagery teaches athletes about the different ways to use imagery to improve performance. Athletes will learn to create their own scripts for performance.

Getting in the zone teaches athletes about different activation levels and their influence on performance. Athletes will explore their optimal performance level and strategies to get 'in the zone' and stay 'in the zone'.

Competition routines explores why routines are important and what is needed in a competition routine. Athletes will create their own competition routine.

SAMPLE PSYCH WORKSHEETS

Session 1: Getting in the zone

What do I usually worry/think about before shooting?

What are the consequences for me? (body, mind, performance) how does it make me feel?

What I am going to start thinking about or start doing in the warm up area?

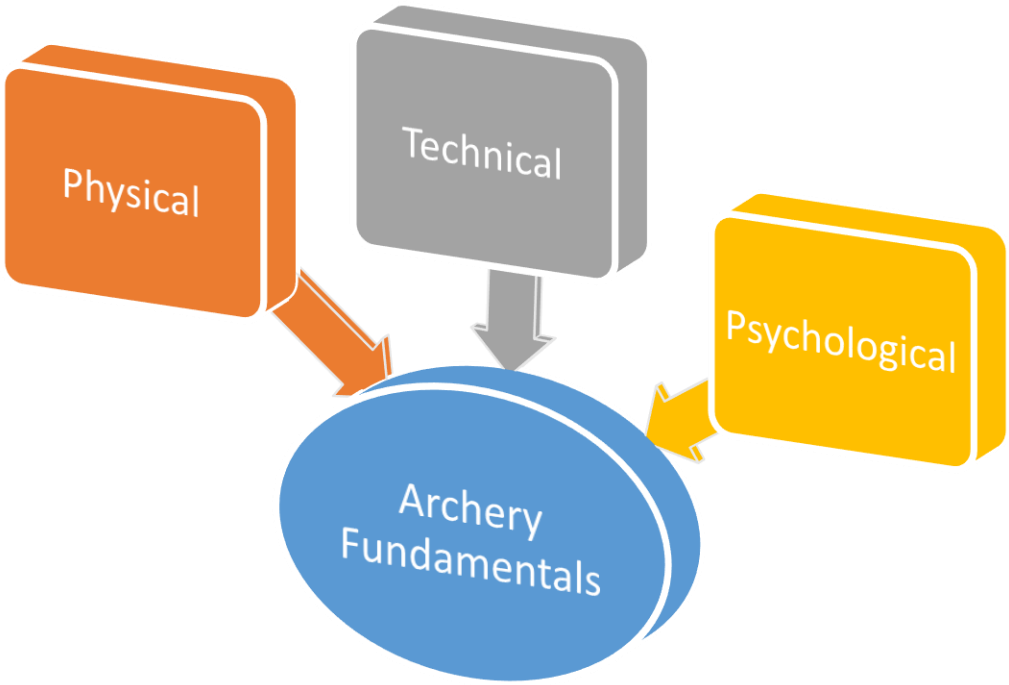
How will this help me? (body, mind, performance)

Session 2: My confidence back pack

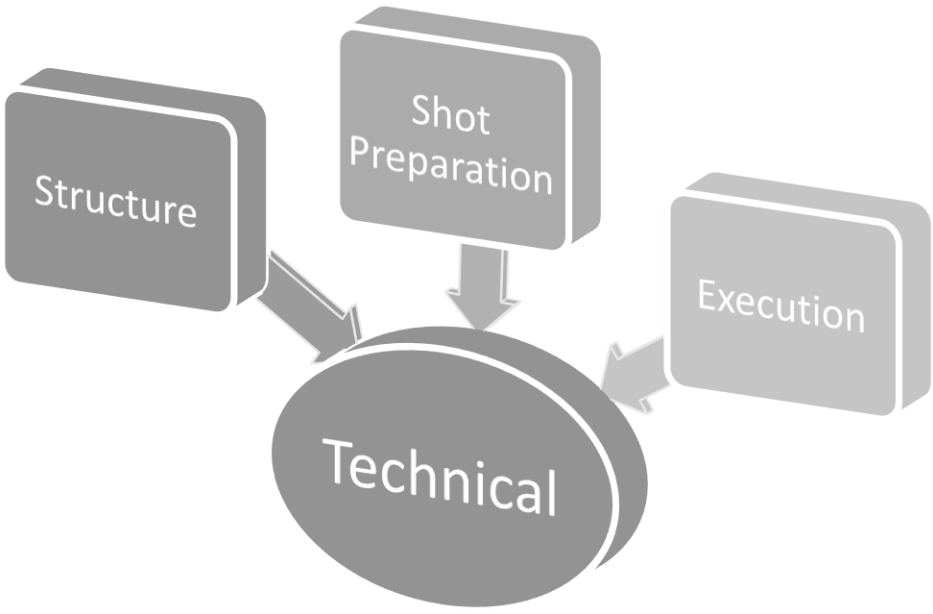
ARCHERY FUNDAMENTALS

FUNDAMENTALS

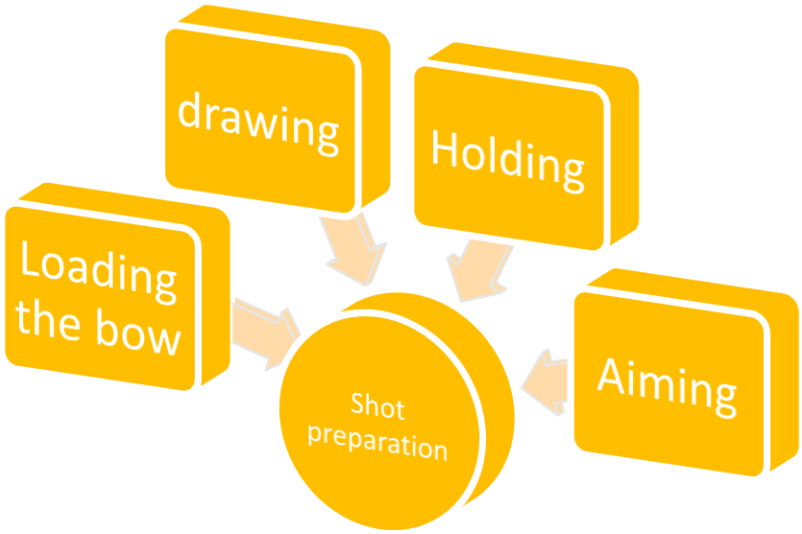
The fundamental or central components of Archery can be broken down into 3 core elements.



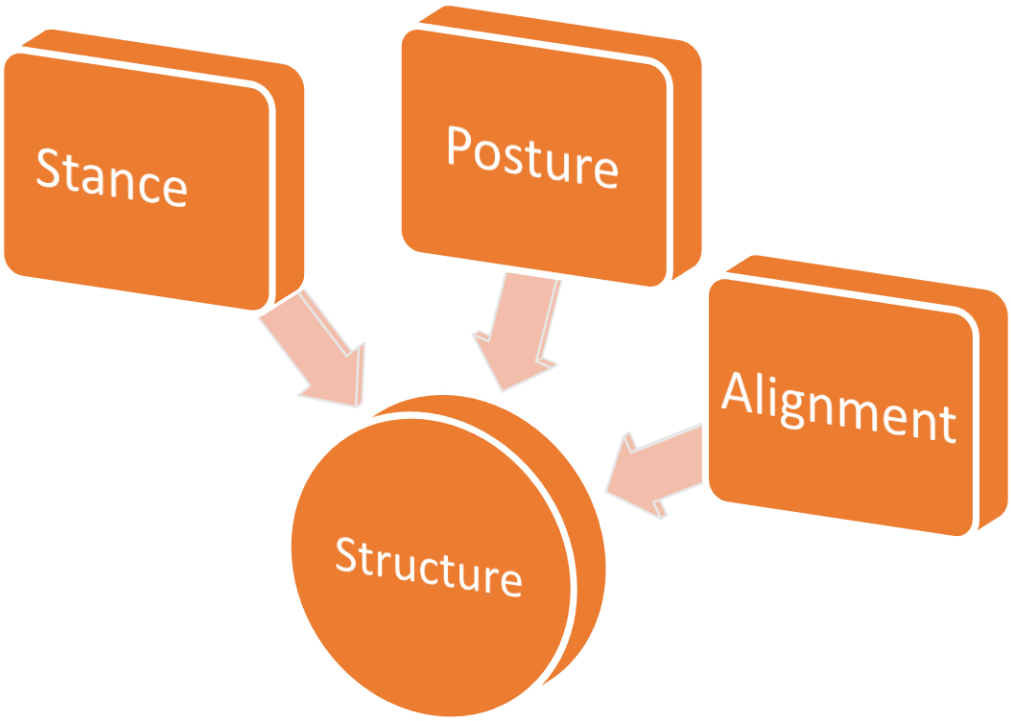
These can then be unpacked into the additional core elements that underpin the initial fundamentals.



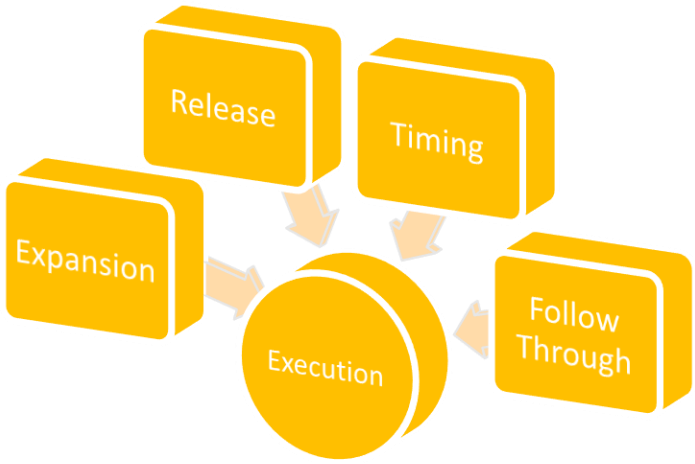
Structure can be considered as these three elements.



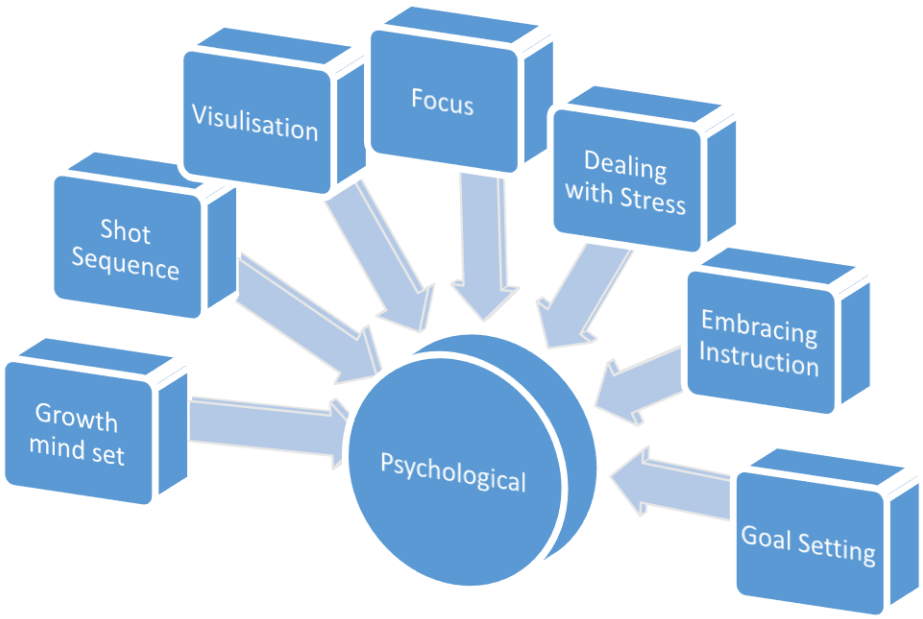
Shot Preparation can be considered as these four elements.



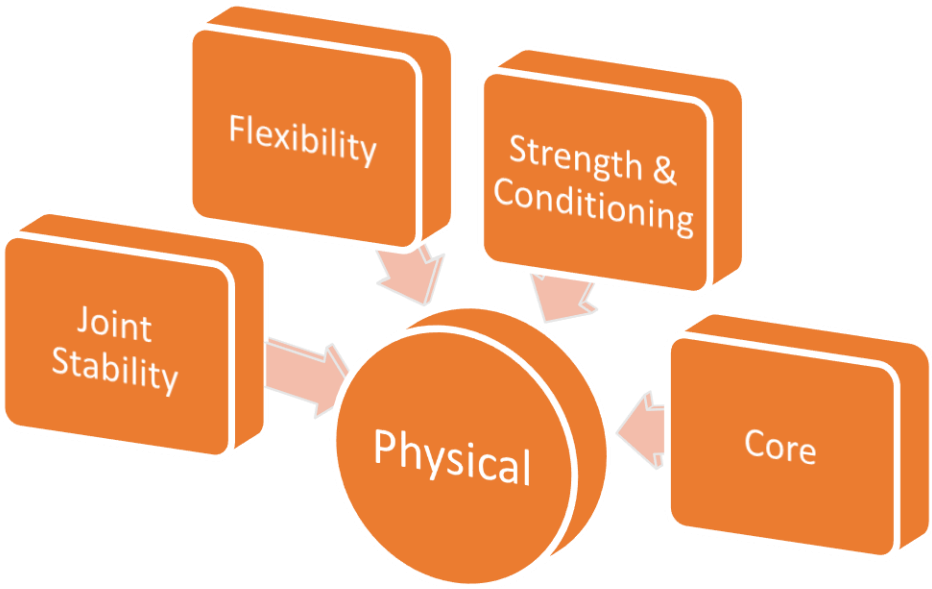
Shot Execution can be considered as these four elements.



Psychological components can be considered as follow



Physical components can be considered as follows



To obtain any degree of excellence in the sport of archery, the shot must be executed in a relaxed, controlled and consistent manner.

To undertake and maintain this relaxed, controlled and consistent shooting technique it is essential for an archer to develop a shooting cycle. This cycle has been developed based around ten basic steps. Each step having a direct bearing on the next step and ultimately the overall shot.

It is also essential that archers are taught a shooting technique that ensures good posture and alignment from day one to minimise any chance of injury.

STANCE

Stance or the standing position on the shooting line is the foundation of the shot. It is imperative that the stance must be simply, repeatable and above all comfortable.

For good balance both feet should be shoulder width apart.

The hips should be square to the target when at full draw.
Legs should be relaxed and straight.
Knees should be straight but not locked tight (locking joins requires the use of muscles and crates tension in the body).
At full draw the body weight should be evenly distributed on both feet with 60%-70% of body weight taken on the balls of the feet and 30%-40% on the heels.
At full draw from a side view the spine and head should be straight over the centre of the body.

There are principally three common stance positions: the Square, Open and Closed stance.

SQUARE STANCE

The square stance is the **RECOMMENDED** stance, it is easy to achieve and requires the feet and hips to be square to the target. Most importantly a square stance requires little or no tension in the lower body and is easy to repeat shot after shot.

As skills improve and for some people, in particular those people with a large frame or large chest may feel uncomfortable with the square stance or may have be clearance problems with the bowstring. If this is the case it may be necessary to slightly open up the stance.

To achieve good balance, it may be necessary to experiment with slight variation with the width of the stance and the angle of the feet

Square Stance – Rear View

Square Stance – Side View

OPEN STANCE

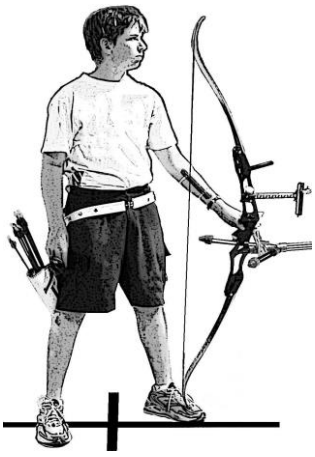
Open stance requires the rear foot to be positioned in front of the centre line to the target, this opens the hips and upper body to the target.

The angle of the hips and shoulders is usually somewhere between 15 and 35 degrees from the target centerline. When drawing the bow, the open stance requires the archer to maintain their hips in the open position whilst rotating and upper body into line with the target. To successfully achieve this alignment the archer must ensure that their core remains engaged to maintain hip stability.

It is important that the archer develops good core strength and upper body flexibility to maintain a consistent shooting position particularly if using an open stance.

When implemented correctly the open stance will give greater stability when shooting

Open Stance – Rear View



Open Stance – Front View

Posture

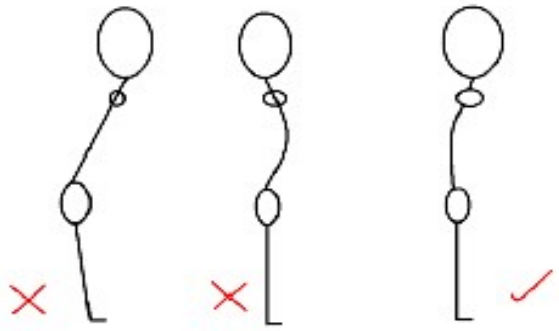
Looking from the front stand upright with a straight spine without leaning back or forward.
Their spine should be straight and their head directly over their spine.

Looking from behind the archer the lower spine should also be straight. This should not be confused with standing straight. The spine has a natural curve as it comes from the upper body into the waist and then joins the hip. This natural curve needs to be maintained throughout all phases of shooting.

Ideally the body's centre of balance should be centered in a line below the archer's spine toward their feet.

By not standing straight and keeping the spine straight, can cause injuries as well as affect the archer's development.

See diagram below.



The correct posture is the one on the right with the tick. This is also known as the chest-down technique. It is using the abdominal muscles to pull the chest down to the hips. Not to be confused with sucking the stomach in, rather, just flexing the abdominal muscles, this technique straightens the lower spine.

Stability

Control of the skeletal muscle activity is reliant upon information from receptors within the body. Correct interpretation of this information creates an appropriate movement response by the brain.

Balance and postural control structures rely on the information from eyes (relative spatial location) and the canal structures in the inner ear (vestibular system).

The vestibular system is a sensory system responsible for providing our brain with information about motion, head position, and spatial orientation. It is also involved with motor functions which allow us to keep our balance, stabilize our head and body during movement while maintaining posture.

Kinaesthetic receptors are sensory receptors, in muscles, tendons and joints, monitoring the position and movement of muscles. This information provides the relative location of one body part to another. From an early age, 7-10 years, the individual becomes more reliant on these receptors for balance control and is carried out at a subconscious level.

Archers can increase their ability to engage core and joint stabilisers to enhance posture and stability by using balance /wobble boards within their training program.
To achieve consistency and accuracy in the shot we need to eliminate body movement during the shot process. In other words, an archer must obtain and maintain a stable centre of gravity. To achieve this an archer must be able to identify, strengthen and activate the correct muscle groups as well as ensure weight is distributed evenly.

Balance can also become a problem for archers during the aiming and expansion phases. To assist in identifying balance issues, coaches should look for body movement as the shot progresses. Checking the hip and quiver movement on execution can also give you an insight into whether the archer is ‘stable’.

NOCKING THE ARROW

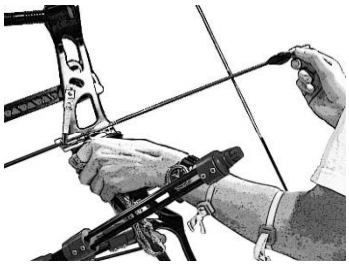
Nocking the arrow is really the first step in the shot sequence as the stance should be position for the first shot in an end and the feet not moved from shot to shot.

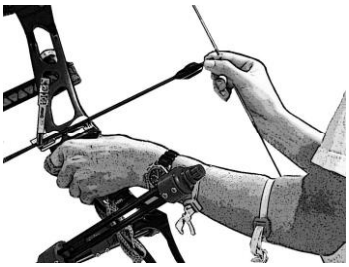
Nocking the arrow should become a smooth, quick and automatic action requiring little effort or thought.

The arrow is placed on the string at the nocking point, which is positioned slightly above the centre of the string. For recurve bows the index vane or fletch is placed so that it is pointing away from the bow. For compound bows the index vane or fletch is placed either up or down depending upon the style of arrow rest being used.

The recommended method of nocking the arrow is –

- Hold bow across body, canted at a slight angle. Care should be taken to ensure the bow tips do not interfere with other archers.
- Draw the arrow from the quiver, holding the arrow by your thumb and index finger between the nock and fletch.
- Place the arrow onto the arrow rest.
- Sliding the arrow along the rest rotating the arrow until the index vane or fletch is point away from the bow (recurve) or either up or down (compound).
- Carefully draw the arrow back against the string until the nock engages and clicks onto the string between the nocking points. It is recommended that two nocking points be always used, even if using a compound bow with a loop on the string.





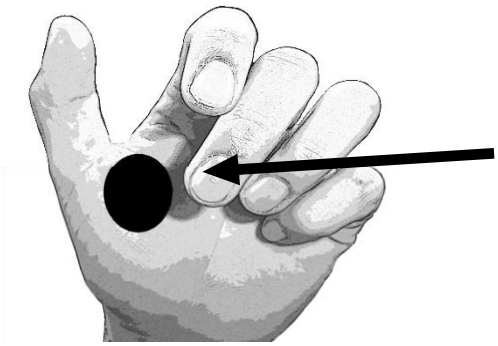
BOW HAND & BOW ARM

Bow Hand

Hand Position: The hand is placed on the bow handle with the bow grip sitting along the thumb muscle and slightly to the side of the lifeline.

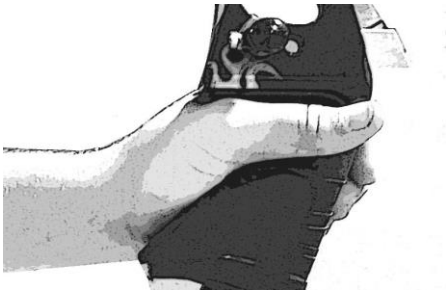
Ideally all the fingers and thumb should be relaxed, the fingers slightly curled around in a natural position toward the palm of the hand. Do not grip the bow or have the fingers straight or open.

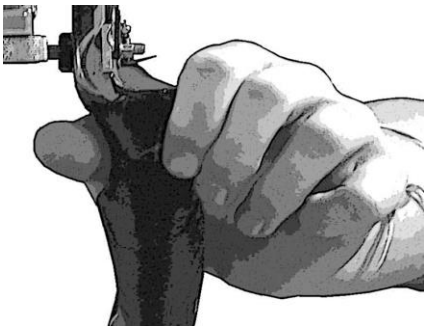
This bow hand position requires the use of a wrist or finger sling.



The bow hand should be positioned directly the centerline of the bow. With the arrow positioned over the centre of the V of the thumb.

The only part of the bow hand that should contact the bow grip should be about the size of a 20 cent piece with the contact point high into the pivot point of the bow grip and the thumb, pointing toward the target.

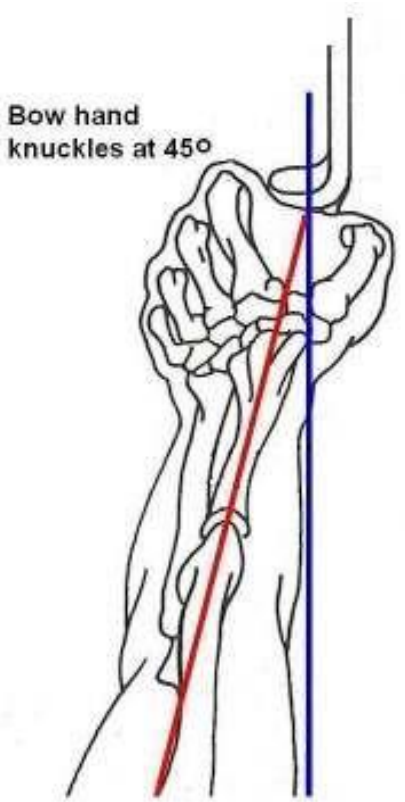


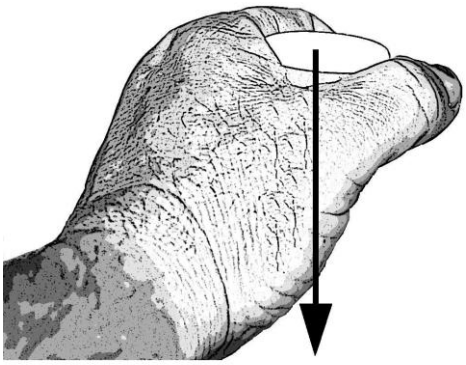


Ideally the bow hand should be rotated on the bow with the knuckles angled at 30° to 45°; this assists in achieving correct elbow rotation providing elbow clearance as well as setting the bow shoulder into the correct position by aligning the bones of the arm for maximum strength.

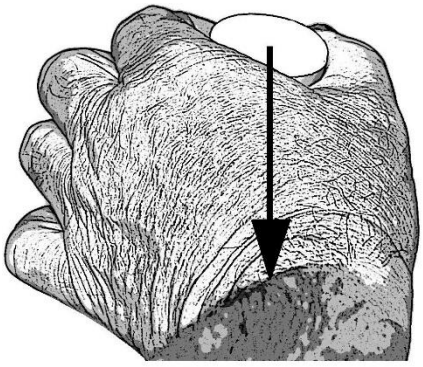
The bow hand, fingers and thumb should remain fully relaxed during the entire shooting sequence to avoid introducing side pressures (torque) on the bow which will affect the flight of the arrow. The hand should be

positioned directly behind the centre line of the bow with the thumb straight and pointing directly toward the target. This aligns the forces over the strongest part of the wrist joint.





Incorrect position, wrist out and hand not behind bow.



Incorrect position, wrist in and not behind bow.

THE DRAWING HAND

Recurve Bow

The first three fingers of the drawing hand are placed on the string, the index finger above, and the second and third fingers below the arrow nock.

- At predraw take a hook around bow string behind the first joint of the middle finger, slightly behind the joint of the bottom finger and in the joint of the top finger.
- As the bow is drawn the string will roll forward slightly settling in or just behind the first finger joints,.
- Either rest the tip of the thumb in the palm (diagram A) of the hand or straight along the first finger. If the thumb is straight along the first finger this can be used as an additional anchor reference under the chin.
- The little finger should be behind the string with a slight bend. The little finger should not be bent into the palm of the hand, as this will create tension in the hand. Do not force the thumb or little finger into the palm of the hand, as this will create tension
- At full draw the bowstring should be in the first joint of the three fingers (not on the fingertips) with about 40% pressure on the middle finger and 30% on the top and bottom fingers.
- The drawing hand, elbow and wrist must be relaxed and tension free at all times giving you a soft feeling.
- The back of the hand, wrist and forearm must be kept flat and straight from the elbow to the fingers.
- At full draw the fingers and the back of the hand should be as vertical as possible

The recommended method is -

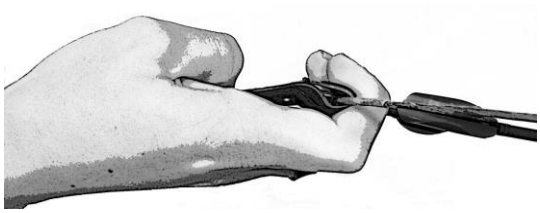


Diagram A

If teaching a person the principles of release undertake a mimicking exercise, using a bucket or a bag have then pick up the bucket or bag by the handle.

Instinctively a person will take the same grip as they would take holding a bowstring, taking the pressure behind the first joint of the middle and bottom fingers and in the joint of the top finger, keeping the back of the hand flat with the wrist and forearm straight

Have them take the pressure of the bucket or bag and ask them to not hold (release), instinctively they will release the bucket or bag in the same manner required to release a bowstring.

Compound Bow

Most compound shooters will use a release devices are used for as they provide a much cleaner and efficient release.

Generally there are two styles of release devices, hand held and wrist held.

There are three types of release devices, “Thumb Trigger”, “Hinge Trigger” and Index Finger Trigger”.

The secret of using any release device is surprise.

The Thumb and Hinge Trigger release devices are available in two, three or four finger designs and are usually hand held while the Index Finger Trigger style usually attached to the wrist with an adjustable strap.

Hand Held Thumb Release Devices

The thumb generally activates the trigger type of release device.

To use a Thumb Release device grip the release by the fingers taking the grip between the first and second joint of the fingers. This allows the knuckles and back of the hand to be flat which will assist with achieving a consistent anchor against your face at full draw.

Hand Held Hinge Trigger Release Devices

The Hinge Trigger also known as Back Tension release devices has the release head mounted on a hinge or half-moon which is held in place by the angle of the head as you draw back, hold and aim.

To activate the release you rotate the release device in your hand altering the position of the head and ultimately releasing the arrow.

Index Finger Trigger Release Devices

The Index Finger Trigger release device is attached to the wrist and should be adjusted so at full draw the first finger can wrap around the trigger between the first and second joint

PREDRAW & DRAWING THE BOW

Once the fingers have been positioned on the bowstring and the bow hand positioned on the bow, a slight tension is taken up on the string.
The archer should now begin to focus on preparing on the shot by narrowing their focus to the task at hand thereby removing external distractions.

This preparation and focusing is a major element of a repeatable process

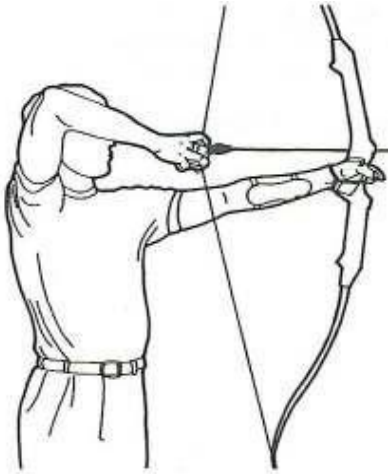
To assist in achieving a more relaxed state have the archer take a deep breath and slowly exhale focusing on allowing the tension drain from the body

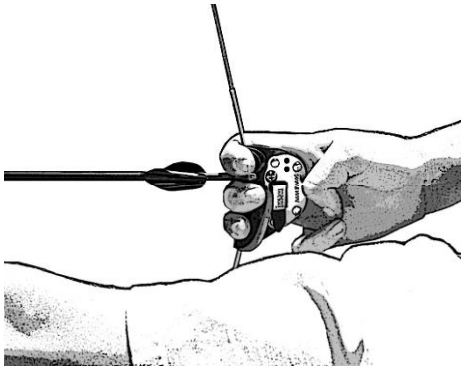
Bow Arm and Predraw

The bow, bow arm and drawing arm/elbow are raised together and set above shoulder height, drawing the bow back a few inches taking a small amount of tension.

The bow arm shoulder should be sitting down in its natural position and the drawing elbow high.

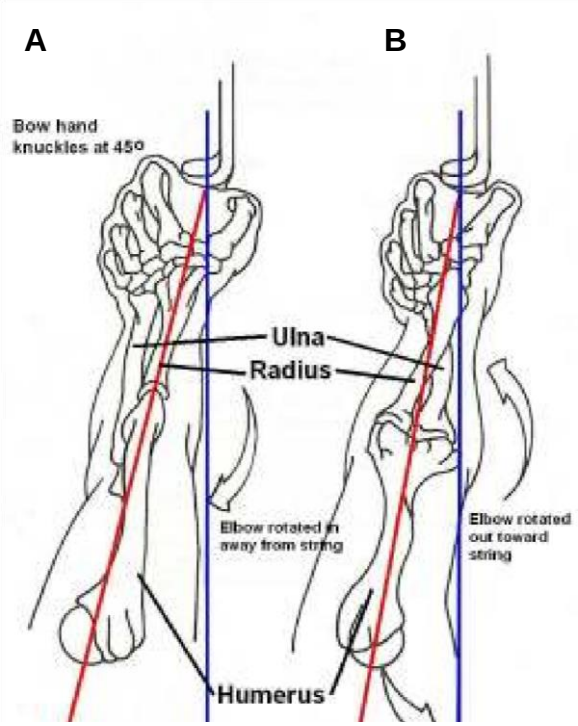
The drawing hand should be positioned in close to the bow arm with the back of the drawing hand flat .





Pre-Draw- Rear View

DRAWING ELBOW



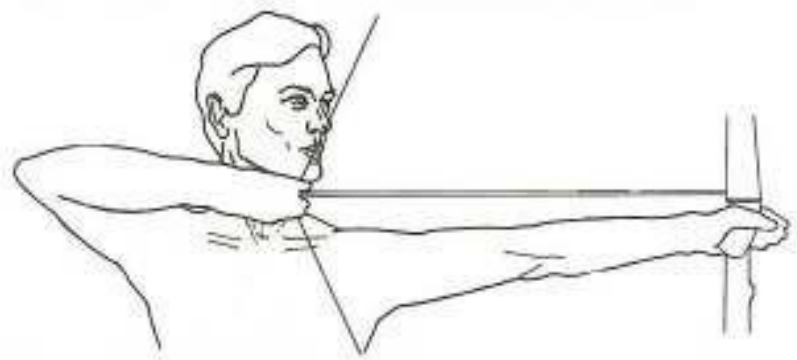
The correct orientation of the elbow should have the ulna and radius aligned with the shoulder, drawing A above; this orientation of the bow arm requires almost no use of muscles to control the elbow, this position also gives you clearance for the string.

DEMONSTRATION

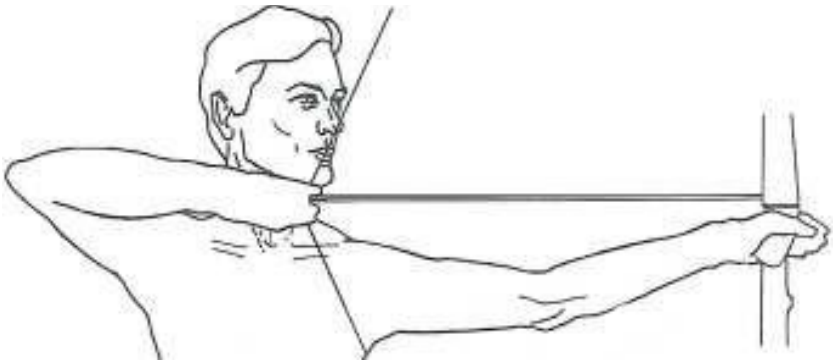
To demonstrate the correct elbow position have the student extend their bow arm toward the target with their palm down. Without moving their elbow, have the student rotate the hand so the knuckles are at a 45 angle. This produces the correct elbow position.

BOW ARM ELBOW

The elbow joint should be straight, a bent bow elbow forces the archer to use muscles unnecessarily to control the elbow joint.



Correct - Straight bow arm requires little or no use of muscles to control the elbow



Incorrect – Bent bow arm, requires the use of muscles to control the elbow

The elbow should be straight but not locked.

DRAWING THE BOW

The drawing arm shoulder and elbow are rotated back and down to bring the drawing elbow in line with the arrow when seen from behind.

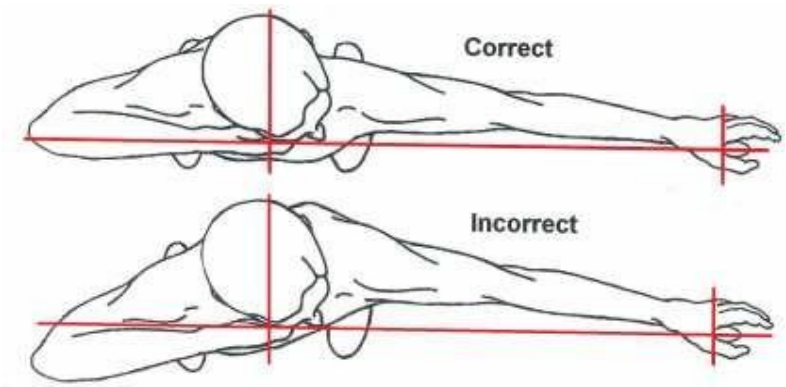
As the drawing arm is moving back, the bow arm is extended toward the target ensuring that the archers maintains the bow shoulder in its natural (down) position,

The bowstring is drawn back in a straight line as close to the bow arm shoulder as possible. The bow sting is drawn back under the chin, keeping the drawing hand as flat as possible. Allow the drawing hand to slide in under the jawbone with the top finger making firm contact under the jaw and the string contact with the chin and nose.

The archer must maintain a stable head position throughout this process

In the images below the CORRECT image has the chest square to the target and the drawing arm in alignment. The scapular has been rotated across and slightly down the back, there is little to no use of the biceps and triceps which then means the process of activating the clicker/release device is more controlled and smoother,

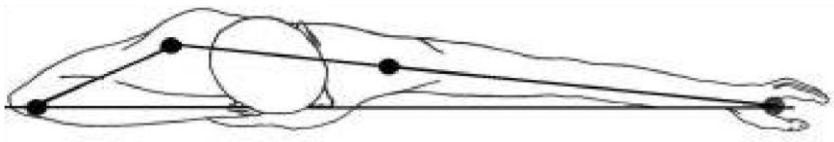
With the INCORRECT image below the chest is open to the target and the drawing arm is out of alignment (under rotated), this is very common and in most cases an open chest and poor drawing arm alignment (under rotated) go together.



As the biceps and triceps are under tension this will make releasing difficult and forced. For a recurve activating the clicker will be difficult and for a compound activating the release device will be inconsistent, the result will be a forced shot and inconsistent timing from shot to shot.

To correct an open chest and to rotate the drawing arm into alignment in most cases all that is required is a more dynamic drawing process. To do this simply rotate the upper part of the body around so the chest in square to the target during the drawing process. This rotation brings the chest into line with the target and assists with the rotation of the shoulder and scapular bringing the drawing arm around into alignment.
Over rotating the drawing arm is as undesirable as under rotating. With over rotating it may raise the drawing arm elbow high; this can place stress on the shoulder joint and will have the effect of releasing out from the face.

Looking from an overhead the shoulder joint should be positioned as close as possible towards the arrow at full draw without creating clearance problems with our forearm.
Having the bow shoulder joint as close to the arrow as possible is very advantageous from the point of view of minimising the muscles being used.
Never attempt to achieve a close position with the shoulder joint by rotating the shoulder as this will require the use of shoulder muscles in particular the use of the rotator cuff and will also cause the should to rise.

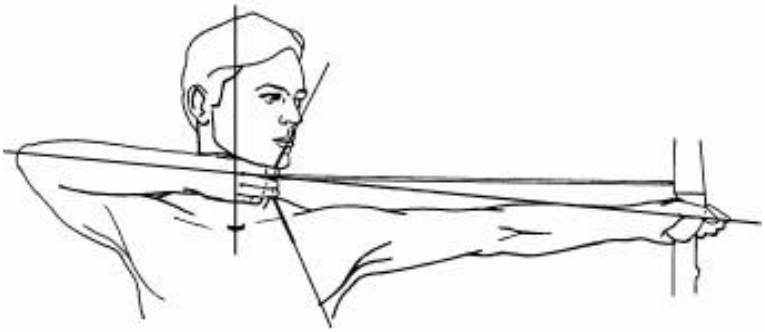


ANCHOR

ANCHOR

The anchor is the relationship between the sighting or dominant eye and the drawing hand at full draw

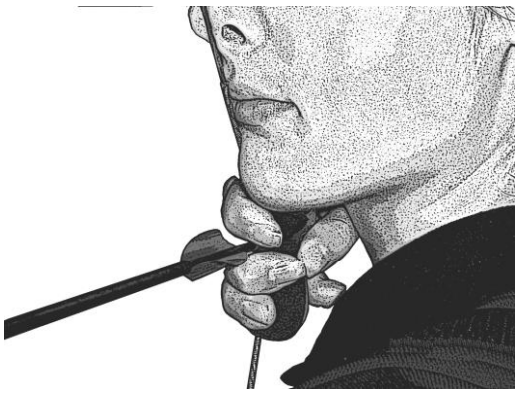
For the archer achieve good performances they must maintain a consistent reference position of the drawing hand on the face.



RECURVE
When using a recurve bow the anchor position should be toward the front of the chin.

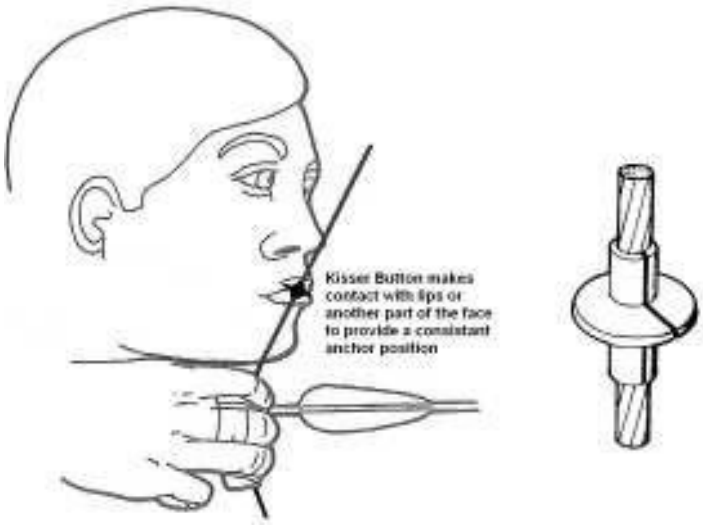
The archer should maintain the drawing fingers as vertical as possible and avoid excessively twisting or rolling the drawing handed.

Diagram showing bow hand, drawing hand/elbow alignment



KISSER BUTTON

When shooting a recurve bow if a consistent anchor cannot be maintained n try using a “Kisser Button”. This is an attachment to the string which makes contact usually with the lips, hence the name “Kisser Button”. A Kisser Button should be used as a last resort as it can become a crutch and lead to variations in draw length if not used correctly.



COMPOUND

When using a compound bow the anchor position will vary as you move from distance to distance but the position on the face is critical and directly related to draw length.

When using a peep sight a you look direct through the centre of the string. It is then important that the peep sight should come to rest at full draw directly in front of the eye. The eye always wants to sit in the center of the eye socket, it is also important that the head is upright and not tilted

It is important that the string does not make excessive contact with the face but is positioned lightly on the face. any excessive string contact with the face can create interference with the string causing left to right shots.

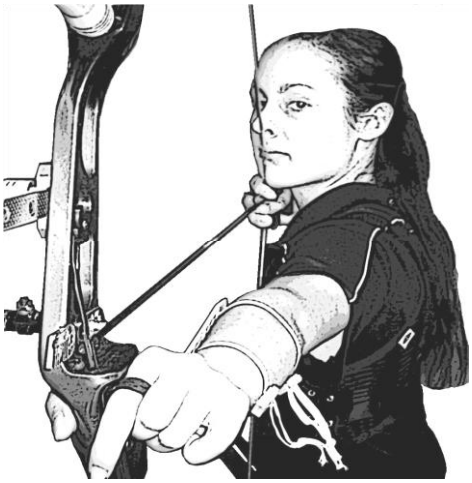
The drawing hand should make contact with the side of the face (jaw) around the first knuckle

The ideal position at full draw will have the nock of the arrow at the corner of the mouth,

Always use the release device you plan to use when determining draw length, as the head of different brand and model release devices vary as much as 25mm (one inch).

HOLDING AND AIMING

Holding is an isometric contraction taken in the short time frame between the anchor, expansion and the release of the arrow. .



Holding, if done correctly, is like shooting a rifle as compared to shooting a pistol. In achieving the proper alignment of drawing elbow, arrow and bow hand, we try to duplicate the idea of a long barrel rifle using the body's skeletal structure.

If holding is done correctly, the archer's body is maintaining resistance against the natural forces that would cause the form to collapse. (That is, the drawing arm that wants to be pulled forward and the bow arm that wants to be pull back toward the archer's body).

Aiming should only commence once the draw and holding steps has been completed. Once the archer has gone through the process of drawing and holding they may then start the process of aiming and expansion to ultimately shoot the arrow. If aiming is started too early, then the archer becomes more focused on the outcome rather than keeping the focus on maintaining a consistent technique that must always feel the same It is shot sequence consistency that will allow the arrow to hit the gold shot after shot.

The archer focus must be on the target and the sight pin should simply an image in their vision..

It is almost impossible to hold the sight pin steady; there will always be movement usually caused by minute muscle twitches and heartbeat. The student should be aware of this and learn to simply relax and allow the pin to float. The archer must never be tempted to hold the sight pin as still; this is a sign of over-aiming. Over-aiming will cause tension to build up making aiming even harder. The archer must remain relaxed and allow the sight pin to float on the target.

In time with practice, and learning to relax will increased confidence in the process and the movement of the pin is reduced to the point where it appears to be is minimal.

The sight should only be changed to make changes to the arrow groups; never adjust the sight to correct a single arrow

STRING ALIGNMENT

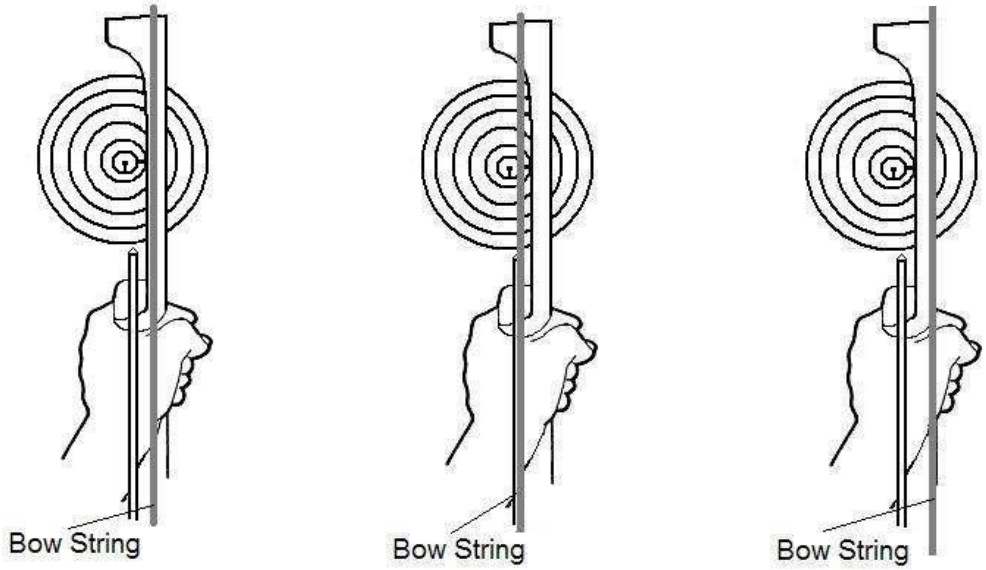
When shooting a recurve bow consistent string alignment must be maintained during aiming.

String alignment is the relationship between the blurred image of the bowstring and the bow or sight pin.

To achieve string alignment align the string with the bow handle, or sight pin whichever feels comfortable.

Any variation in string alignment will show as a change in left/right arrow placement.

VARIATIONS IN STRING ALIGNMENT



RELEASE

The release should be a continuation of the drawing process and should never be treated as a separate step in the shooting process. The archer must develop a technique where they release while still maintaining their focus on aiming.

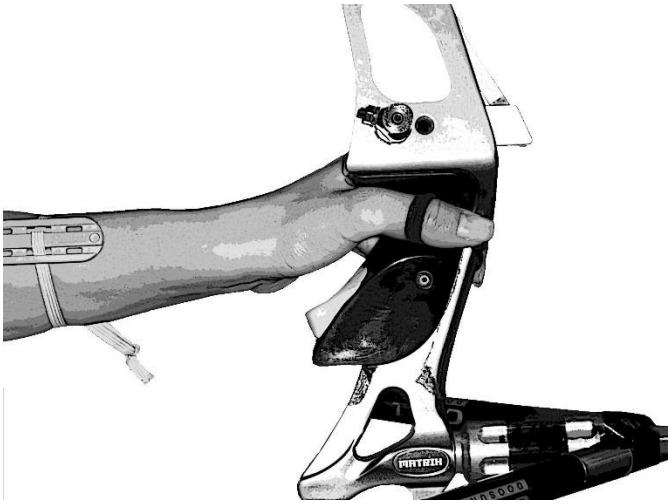
The focus on aiming must be maintained through the release process and follow through.

For recurve archers the release is achieved by relaxing the muscles in the drawing forearm, this relaxes the drawing fingers, allowing the weight of the bow to pull the string from the fingers. The resulting reaction being that the drawing hand moves slightly backwards.

When releasing the arrow, you must make sure the push / pull process is maintained thus ensuring the release hand stays close to the face.

Ideally, during release the bow should move forward without any interference or side to side (torque) pressure on the grip.

The bow hand should be relaxed during release so it is advisable to use a bow, wrist or finger sling to prevent the bow's falling to the ground.



FOR THE COMPOUND ARCHERS

The method used to release will vary slightly depending upon the design of the release device you are using.

In principle the release device is designed with a handle or some method that allows you to grip the device.

The release is achieved by firmly placing either (depending upon release device design) the finger (around the second joint) around the trigger mechanism or in the case of a thumb release placing the trigger mechanism into the base of the thumb.

Hinge release devices, are operate by changing the angle of the release head by applying backward tension. To activate and release the device you simply apply increased backward tension during the hold/expand/aim process.

This increased tension will either rotate the release into the triggering finger or thumb or in the case of hinged devices, rotate the release off vertical, which then creates the release.

It does not matter how you achieve this release, the method varies between people, the important point is not to trigger or force the release.

The release for a compound bow must be achieved so it is a surprise and requires no anticipation on the part of the archer.

FOLLOW THROUGH

The follow through should be the natural reaction of bow arm/hand and drawing arm/hand when the loads imparted on the body during drawing, holding and aiming are removed when the release occurs.

Correct follow through will be achieved if the expansion process is maintained during the release

It is important to maintain focus by looking at target until the archer hears the arrow has struck the target.

RELAX and RECOVERY

After the arrow has hit the target, lower the bow arm so that the bow is either resting with the limb tip on the foot or with the stabilizer resting on the ground. This is the time to relax and recover from the shot allowing any tension to drain from your body.

Now analyse the shot. If you are using a telescope or binoculars, have a look to check the arrows position in the target and prepare to shoot the next arrow. This time should take longer than the act of shooting the arrow.

Learn to relax after shooting each arrow, analyse the last shot and mentally rehearse the next shot.

PROBLEM SOLVING

Correction Strategies:
Structural
Technical
Psychological

CORRECTION STRATEGIES: STRUCTURAL

Possible Structural Problems:

- Bow Weight
- Bow Arm Elbow
- Alignment
- Shoulder Stability
- Balance
- Posture

Bow weight:

If the bow weight is too heavy the participants cannot control the bow and this impacts on their developing structure. During the drawing process, they can struggle to control the bow, struggle to reach an anchor point, are unable to maintain a good posture and structure.

Coaching points:

❒ Immediately down grade the poundage of the bow;

❒ Reinforce that they are not weak but rather it's an opportunity for them to understand and achieve a strong technical base on which to develop their skills.

String hits the Bow Arm, Elbow or Forearm:

If the string hits any part of the arm it can be painful and increase anxiety of re-occurring and reduce enjoyment for the participant. Participants can distort the position of the bow arm to try to ensure clearance of the string.

Coaching points:

❒ Ensure the bow arm elbow joint is vertical at full draw.

❒ To assist the participant in understanding the correct position of the bow arm elbow use the following process:

1. Without a bow, have the participant extend the bow arm towards the target.
2. Position the elbow joint, when the arm is bent the hand touches the chest
3. Extend the bow arm back towards the target whilst focusing on maintaining elbow position

❒ Check bow does not have a low brace height.

❒ Ensure correct placement of the hand on the bow.

Leaning Forward at Full Draw:

A problem caused by participants leaning over the front of the hips to try and bring the bow up; generally associated with a bow that is too heavy in draw weight or is too heavy for the participant to lift to the correct height.

Coaching Points:

- ❒ Emphasise having equal weight on both feet at full draw.
- ❒ Use a light draw weight bow
- ❒ Use a Resistance band to practice the drawing action.
- ❒ Emphasise setting a solid core/base through the hips, butt and thighs

Leaning Back at Full Draw:

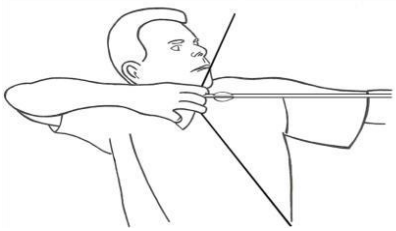
A problem caused by participants transferring their body weight onto the back foot instead of evenly distributed over both feet.

Coaching Point:

- ❒ At pre-draw have the participant exert more of their body weight onto the front foot. As the bow is drawn the body weight should evenly distribute to both feet and assist them in standing up straight at full draw.
- ❒ A facial reference needs to be established for the participant to come to full draw without moving their weight towards the rear foot.
- ❒ Use a light draw weight bow or 'Resistance band' to aid draw length and facial reference.
- ❒ Ensure bow shoulder pushes forward to take the force generated by the bow being drawn.
- ❒ Ensure upright posture is being maintained.
- ❒ Ensure the student maintains the correct head position during the drawing process
- ❒ Lack of strength in abdominal muscles – recommend additional exercises

Bow Shoulder High/Low and Out of Alignment:

This technical fault will cause the participant to lean back, placing additional pressure on the rear foot at full draw. Drawing the bow at or below shoulder height forces the shoulder to raise when drawing the bow. Long-term, this will contribute to fatigue and potential shoulder injuries and inconsistent results. At full draw, the bow shoulder should be in a horizontal plane to the bow arm.



Coaching Points:

- ❒ Ensure that the draw weight is not too heavy.
- ❒ Check that they are standing up straight.
- ❒ Ensure a good pre-draw position.
- ❒ The repositioning of the bow hand on the grip may also assist in overcoming this problem
- ❒ Using the Resistance band reinforce the pre-draw set up position, by raising the bow hand, drawing hand and drawing elbow above shoulder height.

❒ By setting up the correct pre-draw position and drawing the bow in a straight line forces the drawing shoulder to remain in a low position.

Bow Shoulder Moving Upwards and Backwards:

A problem caused when participants commence the draw with the draw arm below shoulder height. It could also be attributed to lifting the bow arm with the bow shoulder. Participants can have lack of control of their shoulder-stabilising muscles.

Coaching Points:

❒ Utilise a Resistance band to ensure the participant understands and can maintain shoulder stability throughout the shooting process

❒ Draw the bow with the drawing arm slightly above the bow shoulder.

❒ Ensure bow shoulder is relaxed and held down.

❒ Pushing forward with the shoulder while keeping bow arm relaxed

❒ Ensure hips are engaged prior to drawing the bow

CORRECTION STRATEGIES: TECHNICAL

Possible Technical Problems:

- Eye Dominance
- Bow Hand
- Drawing Hand
- Release
- Anchor
- Drawing technique

Eye Dominance:

This may occur for your participant who will have difficulty perfecting technique and/or hitting targets when their dominant eye and hand are on opposite sides of their body. For instance, your participant may be right eye dominant but must draw their bow left handed. As a result, participants may be unable to close their dominant eye independent of their non-dominant eye.

Coaching Points:

❒ Utilise an eye patch to cover the dominant eye

❒ Utilise a small opaque shield in a medium density colour fixed to the peak or brim of a hat and lowered in front of the dominant eye

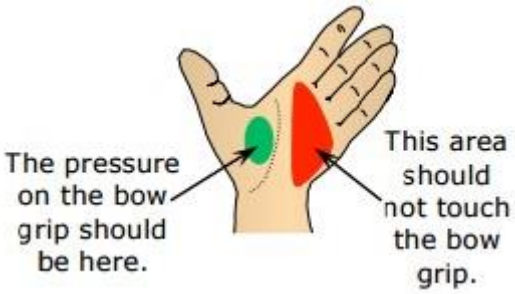
❒ Change them to the opposite bow (may require negotiation)

Bow Hand:

A common problem is the participant will be grabbing the bow on release. A problem caused when participants are concerned with dropping the bow as it jumps forward on release. The bow's movement should be natural and dynamic on release without being influenced by the bow hand.

Coaching Points:

- ❒ Ensure the participant is not gripping the bow too tightly. Hand and fingers should be relaxed with knuckles facing away from the bow and the heel of the hand not touching the bow.
- ❒ Ensure bow shoulder is not rolling inwards towards the bow. Shoulder joint should be held in its natural position.
- ❒ Use a finger or wrist sling
- ❒ Promote a relaxed bow hand
- ❒ Ensure focus of participant is on "following through" rather than watching the arrow impact the target.



Drawing Hand:

Finger slipping, lifting off the tab or not gripping the string consistently can be associated with a poor pre-setting of the wrist and fingers. This problem can also develop if the student cups the hand during set up and draw.

Coaching Points:

- ❒ Check pre-setting of the wrist and fingers
- ❒ Place string in the first joint of the index and ring fingers, then place the middle finger on the string where the string lays naturally (between the first and second joints).
- ❒ Ensure draw elbow position is consistent. Variations in the draw elbow position will alter the pressure on the fingers of the draw hand. A high elbow will result in more pressure on the ring finger, while a low elbow will alter the pressure on the index finger.
- ❒ The first three fingers of the drawing hand are placed on the string, the index finger above, and the second and third fingers below the arrow nock.
- ❒ The student must be taught to take a deep hook; this ensures the hand is relaxed and most importantly, the back of the hand and wrist is kept flat. The knuckles must not be poking out and are flat. The wrist is also flat and stretched straight along the arm - there should be a straight line from the elbow to the fingers.
- ❒ Initially the string should be positioned behind the first joints of the fingers *(Diagram A)*. The student takes a deep hook. As the bow is drawn the string will roll forward settling in or just behind the first finger joints *(Diagram B)*; this position will prevent soreness and calluses in the fingers. As the middle finger is usually longer than the top and bottom fingers, the string should sit behind the first joint of this finger.

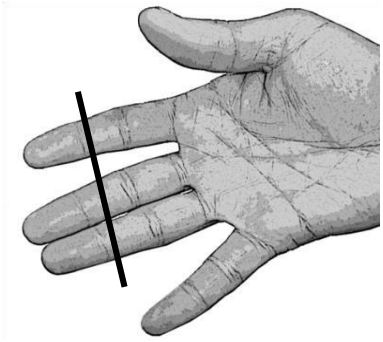


Diagram A

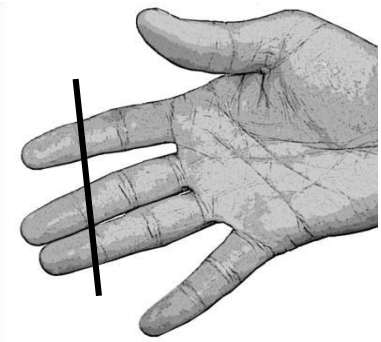


Diagram B

❒ If the student was to commence in front of or in the first joints, when the bow is drawn the string will roll toward the finger tips. This will create tension in the finger, hand and wrist and will lead to soreness and calluses.

❒ The finger tips should be curled around the string to form a deep hook. You will note when looking at Diagram C that the three finger tips are set at 3 different angles. This is representative of the differing amount of pressure on each finger. The middle finger, holding the highest percentage, is more around and then comes the top or index finger and the lower or third finger. Note also, that the back of the hand, though it is flat, it is not vertically straight (diagram C.)

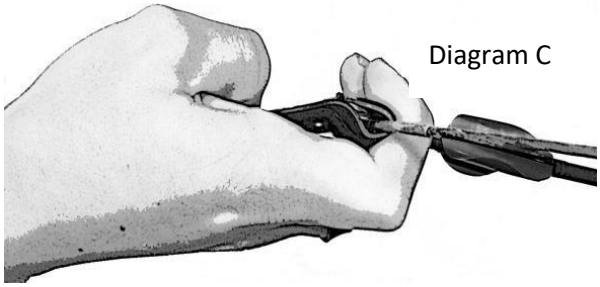


Diagram C

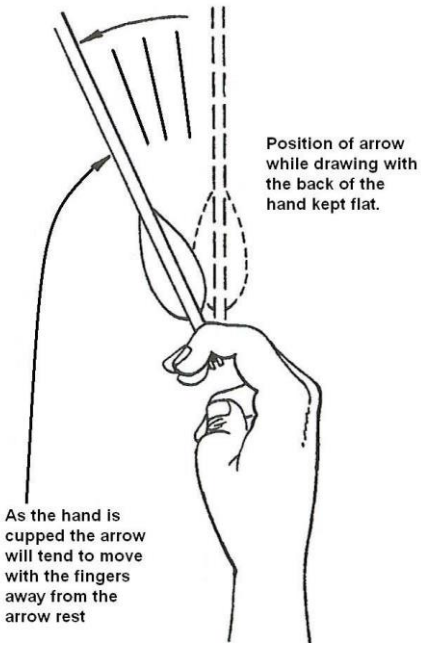
❒ This is to allow proper and solid contact with the lower jaw bone with the index finger. Note also that the index finger tip does not touch the jaw bone. The finger tips should be curled around the string to form a deep hook, with the fingertips pointed back toward the wrist, this helps to flatten the back of the hand and straighten the wrist.

❒ Some students assume that to obtain a good release, they should hold the string on the tips of their fingers. This is incorrect. If a student holds the string by their fingertips, the fingers and hand must be under excessive tension to hold the weight of the bow, making it almost impossible to achieve a clean, smooth release. If the student holds the string on the finger tips, the back of the hand will be cupped, and the wrist usually bent

❒ To demonstrate to students the correct way to hold a bow string, have them pick up a bucket or bag. They will automatically grip the handle with the first three fingers in or behind the first joints, with the finger tips pointing toward the wrist.

❒ To achieve the feeling of release, have the student relax their fingers and release the bucket allowing it to fall to the ground, mimicking the release. In comparison, have them pick up the bucket with their finger tips and feel the tension in their fingers, hand and wrist. To allow them to experience how difficult it is to hold the bucket on their fingertips, have them let go of the handle.

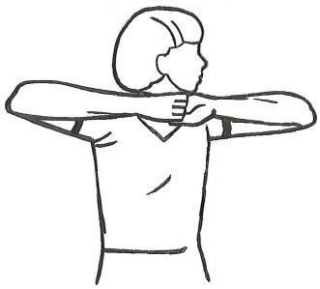
❒ Take care not to pinch the arrow nock between the index and middle finger as this may cause the arrow to rotate off the rest during drawing, ideally to prevent this, and keep the hand relaxed, archers should be encouraged to use a finger spacer between the first and second finger.



Release:

This is an action most people have never done before and the body cannot understand the process. Also, like the anchor, there can be an element of fear of injury when they release.

Coaching Points:



❒ Use a Resistance band to demonstrate the release.

❒ Have the student hook their three fingers together and exert pressure on the fingers, by increasing back tension. Then, relax and notice how the hand they release from each other.

❒ This involves using a bow. Have the student hook their fingers around the string and have them draw the bow (without an arrow) 30 to 40 millimetres allowing a slight amount of pressure on the fingers. Now have them relax and allow the weight of the bow to pull the string from the fingers.

❒ The important point of these methods is to demonstrate the concept of relaxing the hand and forearm allowing the weight of the bow to pull the string from the fingers. The release should never be forced but should be a reflex action associated with relaxing the hand and forearm.

Consistent anchor:

During the draw and anchor process students can encounter problems with understanding how to achieve a consistent anchor

Coaching Points:

❒ Use a role model to show expected outcomes

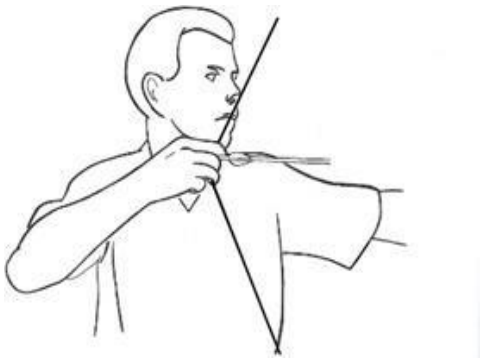
❒ Use the Resistance band to reinforce anchor position

❒ Reverse learn the process. Have the student, with the assistance of the coach, use the Resistance band and put the drawing hand in the preferred anchor position. The coach /student then increases the load by extending the bow arm

❒ Revisit three fingers under the arrow and draw to the cheek bone, when this has been achieved repeat with split fingers and then gradually move the anchor to the desired position

Unable to understand, undertake the draw with the shoulder/back muscles Drawing with a Low Elbow:

This is one of the most common errors of a new participant. During the introductory phase with the Resistance band, stress the importance of drawing with a slightly high elbow.



Coaching Point:

❒ If required return to this training aid to correct technique and then resume with bow and arrow. With the Resistance band reverse learn the drawing process by assisting the student to locate and hold the "anchor" position and the coach pulling forward on the Resistance band

Coaching points:

❒ For the novice archer have them focus on their drawing elbow through the drawing process

❒ Demonstrate the difference from drawing with the arm to mobilising the drawing shoulder to move the drawing arm.

❒ After consultation and agreement with the archer place your finger at the lower part of the scapula near the spine and have them focus on this contact whilst drawing the bow so as to maintain connection with the back

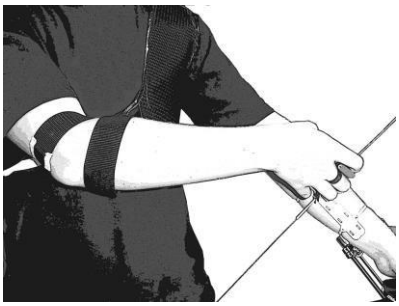
❒ Maximise the use of low load training i.e. miming, Resistance band

❒ Have the student close their eyes whilst practicing to understand the feel of maintaining connection at full draw.

❒ For the more experienced student to correctly learn the process of drawing, holding and release is by using a 'Formaster'.

❒ When the "Formaster" is correctly fitted to the archer, the archer draws the bow, holds and releases without an arrow nocked.

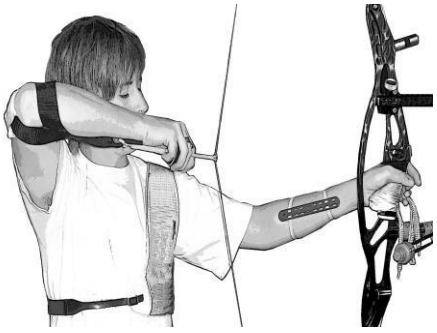
❒ The "Formaster" fits around the elbow and **attaches** to the bow string



Archer at full draw

Following release, the archers form has not collapsed indicating the use of the correct muscles

If the archer does not correctly carry out the process, the Formaster causes the archers form to collapse upon release.



CORRECTION STRATEGIES: PSYCHOLOGICAL

Possible Psychological Problems:

- Outcome focused
- Fixed mindset

Outcome Focused:

When coaching a novice archer, they understandably are interested in where the arrows land. This causes them to initiate a combination of errors including dropping their bow arm, moving their head and pre-empting the shot to see where the arrow lands.

Coaching Points:

❒ Develop an understanding in the Student of process versus outcome

❒ In the early stages shoot at a blank butt

❒ Explain the positive outcomes of maintaining their focus on the aiming point during the shooting process.

❒ Have the students shoot under controlled conditioned with their eyes closed

Fixed Mindset:

Students can limit their understanding and advancement in acquiring the skills necessary to improve performance by not believing that they can understand/learn the skill being trained. This can manifest its self with comments like

- I can't do this
- It's too hard
- The other people are stronger than me
- I'm no good at this

Coaching Points:

The coach must be able to refocus the student by directing them to believe that this is an opportunity to learn.

Examples

- I can't do this **Yet**
- It's too hard **this is an opportunity for me to prove that I can do it**
- The other people are stronger than me **but if I try, I can get stronger**
- I'm no good at this **now, but if I try, I can be better**

General Coaching Points:

- Ensure participants are at ease by being positive in your coaching approach Participants learn by doing, don't talk too much.
- Focus on one point at a time. Avoid overwhelming participants with too much information.
- Ensure participants are not at full draw when adjusting technique.
- Remember mistakes are commonplace and are essential to the learning process. Mistakes can be corrected easily whilst ensuring participants are having a go and having fun.
- Gain correct feel of drawing the bow using muscles in the back, without a bow.

- Use a ‘Resistance band’ to introduce a light load to the drawing action, and ensure correct technique is maintained.
- As confidence increases, continue to introduce bows with load additions until the appropriate bow weight is being technically correctly used.
- Focus mainly on the beginning of the draw, followed by closed eyes to better feel the action. Aim for as little as possible tension in the drawing hand or arm.
- Have participant complete action with eyes closed focusing on feeling
- Video/photographs to review the particular skill component being taught

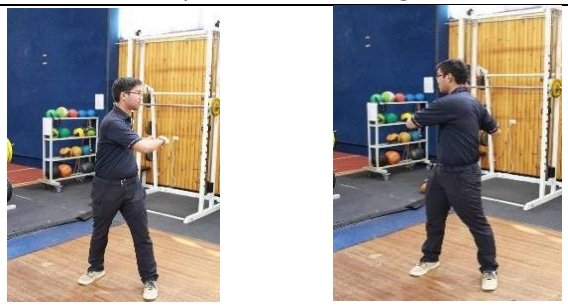
STRENGTH & CONDITIONING

Warm up and Cool Down
SPT
Whole Body Strength and Conditioning

Warm Up Exercises

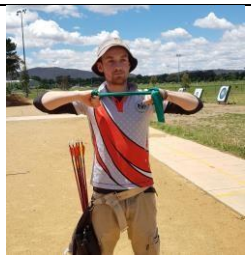
All archers should be encouraged to do stretching and warm up exercises before commencing shooting to help prevent damage to muscle tissue and elbow and shoulder joints. Illustrated are some simple exercises that can be carried out 5-10 minutes prior to shooting.

Dynamic stretching: (repeat for 10 seconds each) Loosens chest, torso, and shoulder muscles

<table>
<tr><td colspan="2">Body Twist Left and Right</td><td>Bent Over Twist Left & Right</td></tr>
<tr><td colspan="2">  </td><td>  </td></tr>
<tr><td>Arm Swings Front and Back</td><td>Arm Swings Up and Down</td><td>Hip Rolls</td></tr>
<tr><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Shoulder Circles</td><td colspan="2">Opposing Shoulder Circles</td></tr>
<tr><td>  </td><td colspan="2">   </td></tr>
<tr><td colspan="3">Body Roll</td></tr>
</table>

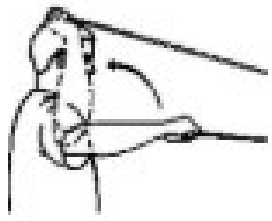
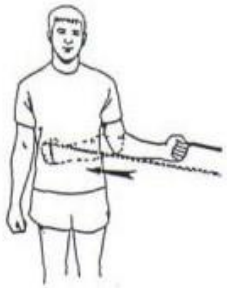

Static Stretching (Hold for 20 Seconds)		
Lat Stretch Left and Right	Triceps Stretch Left and Right	Pectoral Stretch Left and Right
		
Scapula and Lat Stretch Left and Right sides	Scapula Stretch – Push Spine Out	Hip and Lat Stretch
		
Lat and Arm Stretch	Hip and Lat Stretch Left and Right Sid	Pec and Torso Stretch
		
Neck Stretch Opposite Hand Behind Back Left and Right	Neck Stretch Head Slightly Forward Left and Right	Neck Stretch Forward and Back

Forearm Stretch Elbow Straight Finger Pointing Down Left and Right		Forearm Stretch Elbow Slightly Bent Left and Right
 		
Resistance band stretching		
Reverse Fly Stretch arms from the front then to the side Squeeze the scapula and hold	**Pull Apart** Engage back muscles and pull Resistar band apart to move elbows, repeat	**Lat Pull Apart** Stretch arms above head and use lats to pull down to the sides, in line w shoulders
		 
Elbow Drag Resistance band drawing motion w control, band behind elbow, hold for several seconds and repeat.	Resistance band drawing behind neck, w control, hold and repeat.	Resistance band, natural drawing motic with release to finish. Compound can add shoelace and use release aid for this exercise
	 	

For injury prevention rotator cuff exercises can increase stability of the shoulder joint. The rotator cuff is a group of four muscles and their tendons that wraps around the front, back and top of the shoulder joint. Together the rotator cuff helps guide the shoulder through many motions and lends stability to the joint. The ends of the rotator cuff muscles form tendons that attach to the upper arm bone (humerus). It is the tendinous portion of the rotator cuff that is usually involved in a rotator cuff tear.

Rotator cuff exercises:

Upper External rotation 	Upper Internal Rotation 	Lower Internal Rotation 
Lower External rotation 	Resisted Flexion 	Resisted Extension 

SPT Training

SPT is otherwise known as *Special Physical Training.* SPT is an exercise which, when performed correctly, will increase the shooting strength, conditioning and endurance of an archer. The technique has been used in Korea and other places for quite some time. This strength technique involves the use of the archer's own bow.

To perform SPT, the archer must use the correct technique to draw and hold the bow at full draw. Once at full draw, the archer must hold the bow using correct technique and the correct muscles for as long as possible. If the technique deteriorates, the archer must let down – it is imperative to the exercise that the correct technique must be maintained and better to let down, have a short rest and recommence than to hold for the full period but with poor structure for half of it.

The general principle revolves around traditional interval training where the athlete will work for a period and rest for a period before restarting the exercise. In archery resting for double the holding period is generally considered the norm. If for example, the archer held the bow at full draw for 20 seconds, they can then double this in calculating their rest period, i.e. 40 seconds. On completion of the rest period, the archer must then draw again, concentrating on using and maintaining the correct technique.

The archer follows this process for an entire hour. Naturally over the hour, the maximum hold time that the archer can maintain at full draw will decrease. This is normal but will improve over time and with continued commitment to training. SPT should be practiced for an hour daily to gain the maximum benefit.

It should be noted that the form and technique for SPT replicates that of shooting. Nothing should be done differently from any aspect of posture, draw, setup and holding. It would be totally counterproductive for an

archer to exercise at SPT one way and shoot another, so concentration must be just as strong during SPT as when shooting.

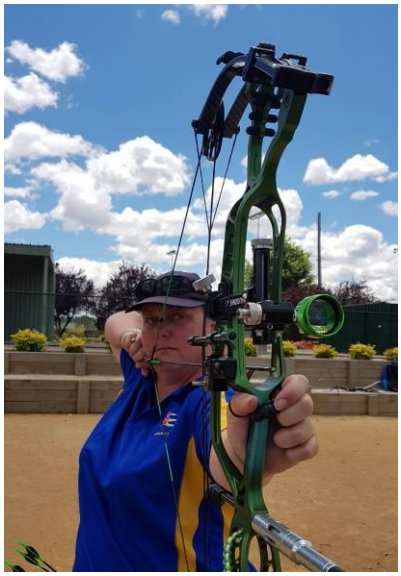
SPT for RECURVE:

LONG HOLD:

20 seconds at full draw (holding position) with 40 seconds rest. After 6 times through, break for 2 minutes, and then start from scratch again. Continue sets within the set timeframe (ideal length of SPT time is an hour per day)

PUMPS:

A little harder to describe but simple enough to perform. The bow is drawn back, held at full draw (holding position) for 2 seconds then the archer lets down slightly (not all the way down) then returns to full draw. This is done a total of 6 “pumps”, rest for 60 seconds, follow with 2 more sets (3 in total) then extend rest to 2 minutes rest. For this style of SPT to be effective it is essential archers are using their back muscles to draw, otherwise strain will be placed on the shoulder.



SPT for COMPOUND:

LONG HOLD:

20 seconds at full draw (holding position) with 40 seconds rest. After 6 times through, break for 2 minutes, and then start from scratch again. Compound archers will not be holding much weight due to the let off on their bow, but the focus should be on control. Compound archers will need something to aim at and the aim of SPT is to reduce the amount of movement on the dot or the bubble.

Compound archers will need to ensure a nock is placed in their nocking point, to ensure continued pulling back does not reduce or move the nocking point and D loop.

Letting down on a compound can be strenuous on the shoulder muscles compared to recurve, so PUMPS are not recommended. Archers can decide whether to let down or to release the arrow, if the latter is chosen, they will need to complete SPT in front of a target.

SPT is a great strategy for coaches to recommend to archers, particularly if time to shoot is a challenge. They can still work on their strength and bow stamina, whilst being at home (even in front of the television!) Coaches should also be aware of implementing this strategy with very high poundages and after large changes to form and technique.

Whole Body Strength and Conditioning

Remember, for muscle development as well as recovery, it's always important to eat and re-hydrate after a cardio or weights session. Developing the correct muscles for archery can give you extra control. Here are some example exercises to discuss with archers. It is always worthwhile seeking medical advice if there has been a previous injury.

Push ups

- Lie chest down with your hands at shoulder level, palms flat on the floor and slightly more than shoulder-width apart, your feet together and parallel to each other.
- Look forward rather than down at the floor. The first contact you make with the floor with any part of the face should be your chin, not your nose
- Keep your legs straight and your toes tucked under your feet
- Straighten your arms as you push your body up off the floor. Keep your palms fixed at the same position and keep your body straight. Try not to bend or arch your upper or lower back as you push up.
- Exhale as your arms straighten out
- Pause for a moment
- Lower your body slowly towards the floor. Bend your arms and keep your palms in fixed position. Keep body straight and feet together.
- Lower body until chest touches the floor. Try not to bend your back. Keep your knees off the floor, and inhale as you bend your arms.
- Pause for a moment. Begin straightening your arms for a second and push up. Exhale as you raise your body

Adaptations:

- Have an exercise partner place a closed fist underneath your chest – don't come all the way to the floor
- Lower your knees so that they rest on the floor. Keeping your back straight and your toes tucked under your feet, proceed with the exercise normally. This decreases the amount of pressure placed on your arms.
- Leaning on a vertical surface, such as a wall, place your hands shoulder width apart and slowly proceed with the normal exercises
- Adding a balance ball can add stability to the push up

Scapula retract push ups

- Let the chest fall towards the wall, sending the scapula back towards the spine. Notice the elbows haven't met but it looks like squeezing the shoulder blades together.
- Forward, back, forward, back. We call these scapular push ups. The only movement occurs as the shoulder blade moves forward and back on the ribcage
- Try and increase the incline to eventually do on the floor

Tricep dips

- Use a bench chair. It will need to be sturdy enough to hold your body weight. Stand in front of the bench, with your back to it
- Place your hands on the bench with palms down and your knuckles facing forward. Hands should be slightly closer than shoulder width apart. As you are doing this you will bend at the knees and your legs should be at a 90-degree angle
- Lower your body by bending at the elbow. Exhale slowly as you bend. Lower for a count of two. Elbows should not point out away from the body as you lower
- Straighten your arms out. This will push your body back up. Inhale slowly through your nose as you straighten your arm

Adaptations

- Move your legs further out in front to increase difficulty as you advance.

Core exercises

- Sit ups - Effective sit ups pull the torso towards the knees from a lying position. Bend knees so that the big leg muscles do not take over. Too much momentum can also detract from the muscle working.

- Leg lifts – keep legs straight and do not let the feet touch the floor. Lay on the floor with your hands by your sides. Keeping your legs straight lift them to 90 degrees and back down

• Jack-knife sit ups – This is a more advanced version of sit up, where you bring straight arms and legs up to meet each other, whilst keeping your abdominal muscles engaged. Without bending your knees, simultaneously lift your legs in the air and your head and shoulders so that your whole body makes a V shape. If you can manage it touch your toes. Then relax and go back to the starting position
• Static Hold (plank)– Get into the push up position, but with your forearms touching the ground. Make sure your body is a straight line from your shoulders down to your toes and hold that position for a minimum of 1 minute Adaptations:
• Reverse flys (hold arms and legs up)
• Superman (1 arm, 1 leg at a time)
• Add a balance ball to increase difficulty (either put arms or legs on the ball)

Chair squats:

• Stand in front of a chair with your feet apart, parallel to your hips. With your abs tight and your back straight, slowly lower yourself down onto the chair. Touch the chair lightly with your butt and raise back up, squeezing your butt tightly.

Lunges:

• Get on your hands and knees and lift your leg up and back slowly, keeping your knees at a 90-degree angle and your abs tight. Lift your leg until your thigh, knee and hip are parallel to the floor, keeping the sole of your foot facing the ceiling.
• Walking lunges, with hands on hips, take a step and lower your body, until the front foot is close to a 90-degree angle (or knee is just off the floor). Make sure that as you lower the hip does not move out and you maintain your core.

Step Ups:

• Using a box or a step, practise stepping up and as you lift squeeze your butt. Repeat both sides. Ensure that as you step, the hip does not become unbalanced.

SESSION PLANNING

Purpose of a plan

Templates

OzBow

PURPOSE OF A PLAN

Learning occurs where there is a need which has been accurately identified. People sometimes participate in training that is irrelevant to their interests, their skill sets, or the requirements of their coaching and officiating environments. When this happens, learning is unlikely to occur.

It is important to develop a training session plan that meets the identified needs of the participants. For example, a coach operating with beginner level participants will need a different plan from working with a more advanced club archer.

Any training session, from beginner courses to club development programs, involves the coach giving consideration who the participants are, what stage of development they are at or wish to attain. The following information is to assist the level 2 Archery Coach in organising, planning and running an archery beginner's course. Plans are a reference to ensure that the relevant content is covered when developing a new archer but must be flexible enough to adapt to the learning and development stage of the student.

How to structure a training session:

It is important a coach takes time to plan each training session. Training sessions should be developed from two or three goals that have been identified for that session. The elements of a training session that all coaches should include are:

- session introduction
- warm up
- games, skill and fitness activities
- cool down
- review

Gathering information and setting goals

Before planning a training session, coaches should gather information about the participants, and set goals.

If you are working with a new group, the type of information you might need includes:

- previous experience in the sport
- level of development, both with the technical and physical aspects of the sport as well as their level of physical fitness
- why they like to play the sport and what motivates them
- goals and aspirations in the sport
- any illness, injury or medical condition that might restrict their ability to participate.
- Goals should be established for the season as well as each training session. Goals help to guide the program and provide a reference point to monitor progress throughout the season

Tips for planning training activities

Session content:

- Over-plan rather than under-plan. It is easier to omit drills than to add unplanned drills.

- The session must have variety of activities to ensure the participants stay active and enthusiastic. Look for new ideas and adapt old favorites or games form other sports.

Appropriate activities:

- Avoid activities that require inactivity or drills that eliminate participants. It is likely that the participants to be first eliminated will be the less skilled, who are the ones that need most practice.
- Use more groups with a small number of participants rather than a few groups containing large numbers.
- The activities must be appropriate for the participant's ability and age.
- Even younger participants are capable of working independently in small groups. Develop activity station cards that explain the drill to be practiced.

Progression:

- Plan so that activities flow from one to the next smoothly. Have equipment close at hand and develop routines so that participants know what to do next.

Practice:

- Ensure enough time for participants to practice and experiment with activities. Practice in small sided games is beneficial as it allows skills as well as technique to develop.

During the session:

- Briefly introduce the session, explain what is going to happen and establish a few basic rules.
- Get things moving quickly.
- Spend the first few minutes on the warm-up - make sure this becomes a habit and fun to complete.
- Ensure that you allow plenty of time for game play and select a range of games that will develop skills, using questions and challenges to assist the participants to learn.
- Use skill demonstrations at key points to assist participants to understand techniques that may assist them to perform better. Ensure that techniques are shown in the context of how they will be performed in a match, and not in isolation.
- Making mistakes is a natural part of the learning process. Provide lots of opportunities to practice and learn to master a skill.

After the session:

- Conclude the session properly. Include a slower game activity (use of a (resistance band) Therraband,.

- Encourage stretching at the end of the session as it can be beneficial for developing flexibility, as well as reducing muscle soreness.
- Talk to the participants as they cool down and revise the key points of the session through questioning, provide lots of praise.
- Remind participants of the time and venue of the next practice session or competition.
- Distribute any flyers, information or other items that you may have for them.
- Evaluate the session by asking yourself:
    - Was it fun?
    - Did the participants enjoy themselves?
    - What might be done to improve the session? o Did the participants participate enough?

The warm up and cool down:

Warm-up and cool-down activities should be incorporated into training and competition routines. The warm-up prepares the body for activity, as well as helping to prevent injury to muscles, which can be more susceptible to injury when cold. The cool-down helps the body clear lactic acid that builds up during any activity. Less lactic acid means less soreness and stiffness the next day!

What is the ideal warm-up?

The ideal warm-up will depend on the level of competition and the age of the participants. The warm-up should incorporate the muscle groups and activities that are required during training or competition. The intensity of the warm-up should begin at a low level gradually building to the level of intensity required during training or competition.

For most athletes, 5 to 10 minutes is enough. However in cold weather the duration of the warm-up should be increased.
The warm-up aims to:

- prepare the body and mind for the activity
- increase the body's core temperature
- increase heart rate
- increase breathing rate.

What about the cool-down?

Cool down is just as important as warm up, especially after vigorous exercise because the body needs time to slow down and it is an important step in aiding recovery. The cool down should occur immediately after training activities and should last 5 to10 minutes.

The cool-down can be the same sort of exercise as the warm-up but with low intensity body movement such as jogging or walking substituted for running. Stretching after activity helps to ensure maximum flexibility, relax the muscles, return them to their resting length and helps develop long-term attitudes to maintaining healthy lifestyles.

Stretching

Stretching activities can be included in the warm-up and cool down. There is now less emphasis on static-stretching during the warm-up, so stretches should move the muscle groups through the full range of movement required in the activity being performed (active stretching).

Static stretching is still appropriate during the cool-down and can be used to improve flexibility.

Some rules when stretching:

- warm-up the body prior to stretching
- stretch before and after exercise (active stretching during the warm up, static stretching during the cool down)
- stretch all muscle groups that will be involved in the activity
- stretch gently and slowly
- never bounce or stretch rapidly
- stretch gently to the point of mild discomfort, never pain
- do not hold your breath when stretching; breathing should be slow and easy.
- do not make stretches competitive.

Organising a group:

Establishing Routines

By establishing routines and giving the responsibility for routines to the participants the coach can devote more time to nurturing the sport skill development of the players.

Coaches should:

- establish set-up and put away systems for the equipment and facility that participants can assist with. These must be supervised by the coach.
- use consistent warm-up and warm-down routines.
- set up areas and equipment in advance for specific elements of the program.
- ask more experienced participants to help the less experienced ones.
- have a consistent routine for moving between coach instruction and activity to reduce management time. If the participants know where to go, how quickly they need to be there and what behaviour is expected of them on arrival, then more time can be devoted to activity
- prior to commencement of the course, it is important that the appropriate facility and equipment is available that meets all relevant safety requirements.
- prepare lecture notes and other instructional aids.
- provide nametags for beginners and coaches.

Ratios:

Participant to coach ratio is important to maximise the learning experience for the participant and allowing the coach to deliver targeted instruction and maintain a safe shooting environment If possible, have no more than six students to each instructor. When a large number of people are interested in taking lessons, divide them into groups of similar age/skill to facilitate teaching.

Plan to issue equipment as quickly as possible.

Examples of a training plan

The objectives of the course are to introduce archery as a fun and safe sporting activity that course participants will want to engage further at club level. This will be achieved by developing core competencies in the participants over three or four 2-3-hour sessions.

When planning the content of the course it is important to allow time to review activities prior to and at the conclusion of each session.

Safety is paramount and adequate time must be allocated to ensure compliance and understanding of the relevant Archery Australia Safety rules.

When developing the basic archery fundamentals with the students, ensure that they have gained an understanding and can demonstrate the skill prior to moving to the next element.

The coach must also be aware that the students will want to have a bow in their hands and shoot arrows as soon as possible (even prior to any skill development), so each session should focus as much as possible on practical activities rather than long theoretical sessions. In all cases allow sufficient time is allocated to ensure compliance with all safety controls.

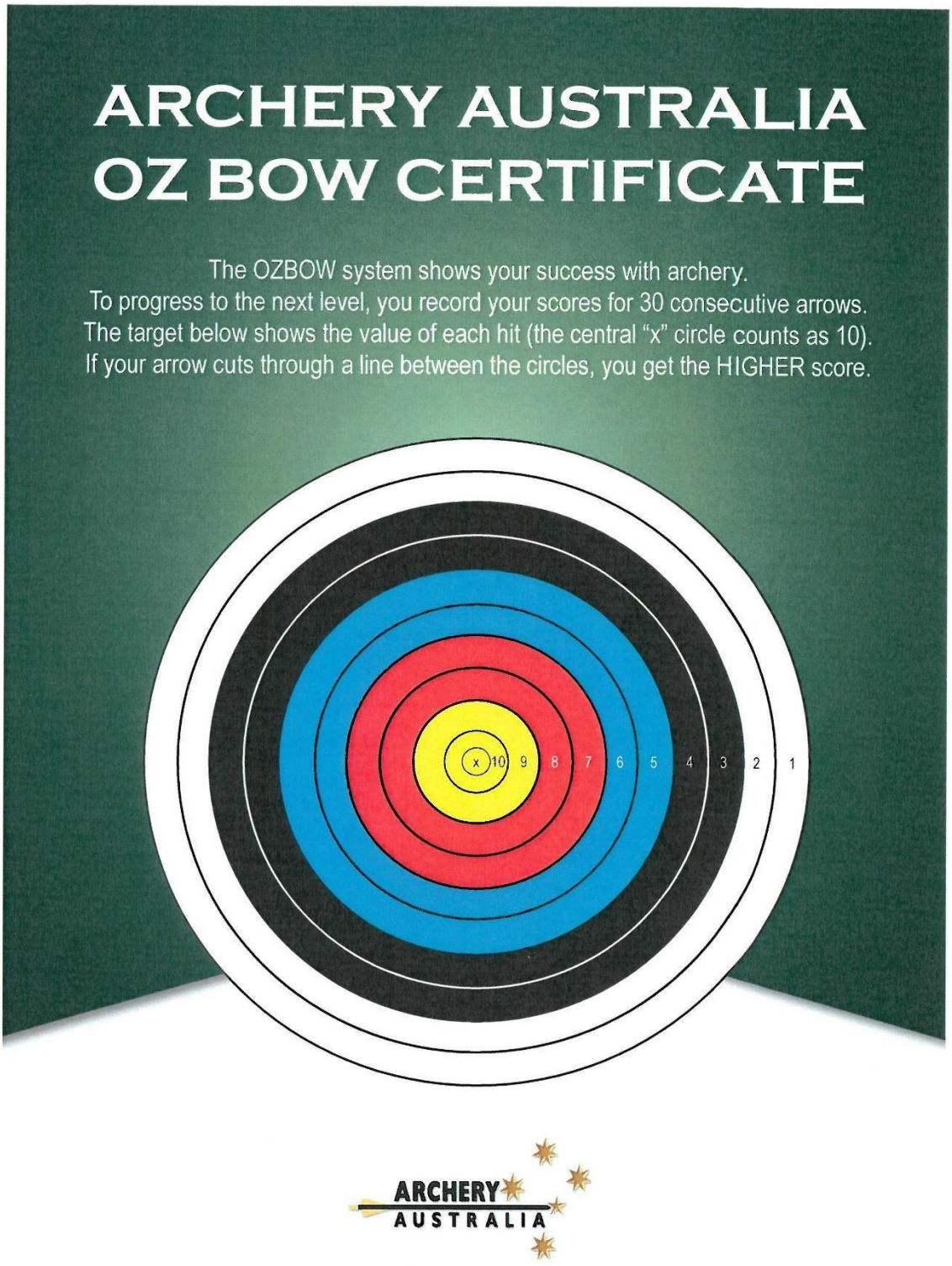
The following template is a suggestion of a typical 4-week session plan. Coaches can put their own stamp on the session plans; however, the important point is **having a plan**. This ensures that you include and cover the basic safety and technical elements of the sport

At the completion of each session reflect on your course delivery and amend accordingly.

Introduction to Archery Training Course Template Session 1 Duration 2 -2.5 Hrs	**Time**
Coach to prepare range for conducting session (set up of butts, allocation of shooting lanes, shooting line, specific venue requirements etc.)	
• Introduction and welcome • Signing in, complying with any administration requirements • Identify any physical attributes such as pre-existing injuries that may impact on the session	15 Minutes
Safety (covering shooting controls, use of equipment, range safety, collection of arrows expected behaviours)	15 Minutes
Issue equipment	15 Minutes
Warm up/stretching exercises	10 Minutes
Practical application and correction of core archery fundamentals: structure, alignment, drawing the bow, shot execution	60 Minutes
Review fundamentals and take questions	10 Minutes
Warm Down	5 Minutes
Introduction to Archery Training Course Template Session 2 Duration 2 -2.5 Hrs	**Time**
Coach to prepare range for conducting session (set up of butts, allocation of shooting lanes, shooting line, specific venue requirements etc.)	

Signing in, complying with any administration requirements • Review Safety components	10 Minutes
Issue equipment	10 Minutes
Warm up /stretching exercises	10 Minutes
Review archery fundamental elements • Review individual competencies, advise how to correct mistakes	75 Minutes
Introduce: scoring, use of bow sights or other aiming processes	15 Minutes
Warm Down	5 Minutes
Introduction to Archery Training Course Template Session 3 Duration 2 -2.5 Hrs	**Time**
Signing in, complying with any administration requirements	2 Minutes
Students to assist in preparing range for conducting session (set up of butts, allocation of shooting lanes, shooting line, specific venue requirements etc.)	15 Minutes
Issue equipment	5 Minutes
Practical: stringing a recurve bow, equipment care and maintenance • Demonstration and student's practical application	15 Minutes
Warm up/stretching exercises • Review safety components	10 Minutes
Review archery fundamental elements • Review individual competencies, advise how to correct mistakes • Review scoring, use of bow sights or other aiming processes Introduce shooting games/balloons etc	75 Minutes
Practical: de-stringing a recurve bow	15 Minutes
Warm Down	5 Minutes
Introduction to Archery Training Course Template Session 4 Duration 2 -2.5 Hrs	**Time**
Signing in, complying with any administration requirements	2 Minutes
Students to assist in preparing range for conducting session (set up of butts, allocation of shooting lanes, shooting line, specific venue requirements etc.)	10 Minutes
Issue equipment	5 Minutes
Review: stringing a recurve bow	15 Minutes
Warm up/stretching exercises • Review safety components	10 Minutes
Review archery fundamental elements • Review individual competencies, advise how to correct mistakes • Review scoring, use of bow sights or other aiming processes. • Shoot a scoring round/shooting game.	75 Minutes
Practical: de-stringing a recurve bow	15 Minutes
Warm Down	5 Minutes
Introduce: club activities; determine appropriate equipment for each student and detail local archery suppliers	5 Minutes

OzBOW


ARCHERY AUSTRALIA
OZ BOW CERTIFICATE
The OZBOW system shows your success with archery.
To progress to the next level, you record your scores for 30 consecutive arrows.
The target below shows the value of each hit (the central "x" circle counts as 10).
If your arrow cuts through a line between the circles, you get the HIGHER score.
x 10 9 8 7 6 5 4 3 2 1

WHAT THE KIT INCLUDES:

1. INSTRUCTIONS AND SCORECARD

500 instruction and scorecards in a convenient tear off pad.

The score card is double sided with instructions on one side and the scorecard on the other side. Scoring is a round of 30 arrows. There is a set score which must be achieved at each distance to receive the appropriate award.

OzBow Program Instructions

Here are the scores you need to achieve on a 120cm target face in order to gain the award for each distance using the bow of your choice! Good luck!

1. Write your name, Distance and bow type (if you are unsure of your bow type ask the Director of Shooting) in the spaces provided below.

2. Let the Director of Shooting know that you are ready to start your first scoring end. (An end of arrows in this program is 6 arrows AND you will shoot 5 Ends to arrive at your final score.)

3. You will need a 2nd person on your target to help you with scoring. They will call the value of each of your arrows - starting with the highest scoring arrow.

4. Write the value of each arrow in the spaces provided and then add up the score for that end. Then keep a running total for the distance as you complete each of the 5 Ends.

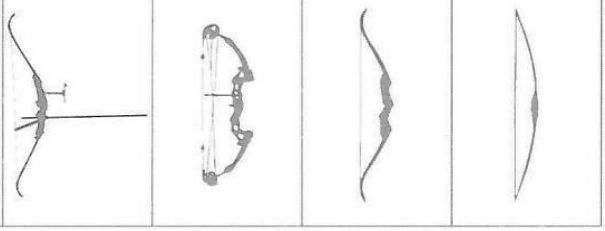
Distance	Level	Recurve	Compound	Barebow	Longbow
10m	Novice Archer	120	130	100	80
15m	BLACK 15	130	140	110	90
20m	BLUE 20	140	150	120	100
25m	BLUE 25	150	160	130	110
30m	RED 30	160	170	140	120
35m	RED 35	170	180	150	130
40m	GOLD 40	180	190	160	140
45m	Club Archer	190	200	170	150

The recurve bow is similar to the beginners bow and usually has a sight, stabilizers and a pressure button and a clicker.

The compound bow can be identified by several strings and a wheel / cam system

The barebow recurve is similar to the beginners bow but does not have a sight

The Longbow has no curve in the limbs is one piece and does not have a sight.



5. When you have completed 5 ends have the person who was calling your arrows initial your score sheet and sign the score sheet yourself before returning the score sheet to the Director of Shooting.

6. If you have achieved the score required to complete the distance you will receive a sticker for your OzBow certificate to indicate your success.

7. Then next week you can move on to the next distance!

OzBow Program
SCORE SHEET

NAME

DISTANCE

BOW TYPE

CLUB USE:

DOS:

VERIFIED:

DATE:

							End Score	Accumulative Total
End 1								
End 2								
End 3								
End 4								
End 5								
							Distance Score	

ARCHERS SIGNATURE:

WITNESS SIGNATURE:

2. CERTIFICATE

200 OzBow certificates printed on laminated paper.

Each participant receives an OzBow Certificate which they place their Award Stickers on.

OZ BOW CERTIFICATE

ARCHER .....

BOW TYPE .....

CLUB .....

CLUB SEAL VERIFIES SUCCESSFUL COMPLETION

Score
Date
Certified by

Score
Date
Certified by

Score
Date
Certified by

Score
Date
Certified by

Score
Date

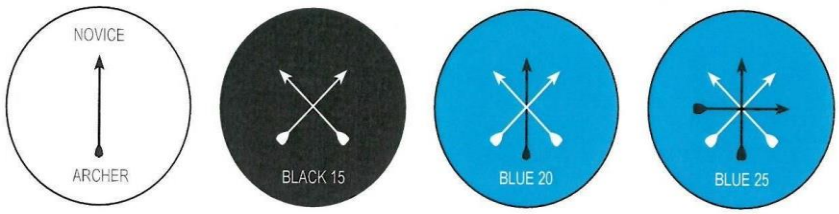
Score
Date

Score
Date

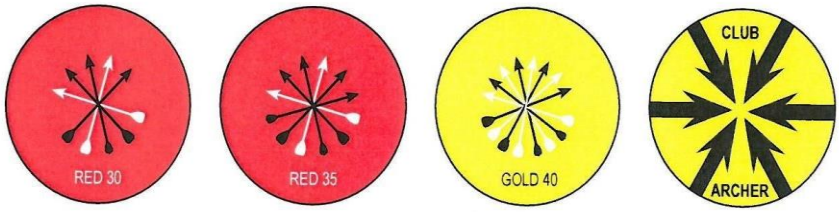
Score
Date

3. AWARD STICKERS

Each kit comes with 8 boxes of 200 Award Stickers on a roll dispenser. One sticker for each award level.



NOTE
These are the 8 different award stickers for each level in the Oz Bow program. Each of these stickers will be supplied on a roll dispenser of 200 stickers.



THE KIT ALSO INCLUDES:

1. Plastic box to hold all the elements of the kit
2. 10 pens
3. 5 x A5 clipboards (for scoring)
4. Information on Archery Australia and other award programs

ARCHERY AUSTRALIA

ATHLETES WITH DISABILITIES

INSTRUCTING THE DISABLED ARCHER

As an archery coach you will encounter students with a disability. Archery is a sport that anyone can undertake irrespective of their disability. Archery offers an excellent opportunity for archers with a disability as a recreational and competitive activity; it places on an equal basis with the able-bodied. As a coach you need to be aware of the challenges and rewards of teaching archers with a disability.

Types of disabilities

Within competitive archery, there classifications of levels of disability.

W1

These people have severe upper spinal injury or suffer from a medical condition that allows them only limited or no use of the lower body, allowing only limited use of their arms and neck. Usually, restricted to a wheelchair they may have an assistant due to their limited mobility. Being classified in W1 category is a loss of a minimum of 50 functional points in the lower body, 10 functional points in the core and 25 functional points in the upper body. Athletes may have impairment in the legs and make use of a wheelchair. W1 athletes may shoot either a recurve or compound bow modified from standard rules, do not have separate competitions for the two disciplines, and the category is featured at the Paralympic Games.

W2 OPEN (sitting, standing, stool)

These people have mid or low spinal injury, giving them no use or limited use of their lower back and legs. They usually have full use of the upper body. Usually restricted to a wheelchair they may have limited use of their legs, but this depends upon the severity of their disability. Being classified in W2 category is a loss of a minimum 25 functional points in the lower body or upper body.

This is a wide encompassing category that includes amputees, polio, birth defects and other conditions that do not fully restrict mobility but limits balance and stability. Open (W2) category athletes may shoot in recurve or compound competitions, under standard rules, and the category is featured at the Paralympic Games.

VISUALLY IMPAIRED (V1,2,3)

Although not common in Australia the vision impaired have shot quite successfully. Athletes may have impairment in their vision. V1 athletes must wear blindfolds or black-out glasses while competing. V1, V2/3 athletes use tactile sights and are permitted an assistant sitting or standing one metre behind the shooting line to relay information about the position of the arrows in the target, safety and help with scoring. The category is currently not featured at the Paralympic Games.

You should check if the person was born blind or have lost their sight later. This will make a difference to the way they perceive the world. For example, a person who has never seen will have no understanding of colours. When coaching the vision impaired during the first lesson allow to them feel all the equipment so they can obtain a mental picture of the equipment.

Early shots may need to be undertaken with the coach by having a hands-on approach. This allows them to get the feeling of shooting. You should also consider using a Resistance band for early shots. The vision impaired develop the ability to recognise how accurate the shot was by the sound the arrow makes when it hits the target.

To allow the archer to obtain a consistent position on the shooting line place large horseshoe shaped makers on the ground which act as foot markers.

Sighting

There are two main types of sighting methods used by the vision impaired.

1. Use a tripod with a standard bow sight fitted. The standard sight pin is replaced with a large pin. The back of the bow hand contacts the large pin. This pin provides elevation for the bow. The archer has an assistant who spots the arrow and adjusts the bow sight, the adjustment is made the same as a standard sight.

2. Another variation to this method is to replace the large pin with a large upside-down V. The archer can use a stabiliser when they draw and raise the bow, they raise the bow into the V, raising the bow until it reaches the top of the V then the archer shoots. Again, the assistant adjusts sight if required.

3. Another method is the use of an electronic device that sends a signal to a receiver worn by the archers as an earphone. The sound changes as the signal changes as it passes over the various colours of the target.

Scoring

It is not recommended that the archer goes to the target during scoring. Usually the assistant takes a rubber device, cut into raised circles of the target, the scorer places pins into the foam to indicate the position of the arrows. When scoring is completed, the rubber target is returned to the archer who can then feel the position of the arrows in the target.

The explanations above are for established competitive categories, as a coach you may also encounter para athletes who do not fit into these established categories. Instructing these people can be challenging but also very rewarding not only for the student but also the coach.

These other disabilities could be:

- **Physical -** People with a physical disability.
- **Sensory -** Usually the vision impaired but will also include the hearing and speech impaired.
- **Intellectual -** Various forms of intellectual disability.
- **Medical Condition -** A disability developed following a medical condition may also fit into one of the other categories.

Meeting the Person

People take up archery for many reasons; they may wish to do archery for the social and personal achievement aspects of the sport, or they may wish to be competitive with aspirations for the World Championships and Paralympic Games.

When you first meet the person, you should spend some time talking to them to find out their goals. The person may have limitations which you will need to be aware of, such as they may tire quickly, and you may have to tailor the lesson to personal requirements.

The person's condition may also limit their ability to use the bow and you may need to vary the way you coach, it may be necessary to be creative in your method of instruction.

It may even be necessary to go outside of the established shooting rules for the disabled archer, to allow them to shoot, be inventive. You may need to create shooting aids to allow them to take part. This should not be an issue; the important point is to allow them to shoot.

It may even be necessary to contact the doctor of the student, to ensure that archery will not be detrimental to their condition, as well as get a better understanding of their limitations.

Wheelchairs

A high proportion of archers with a disability are in wheelchairs. The wheelchair should be placed on the shooting line with the wheels on either side of the line. The student's shoulders should be positioned in line with the target, with the feet positioned at 90 degrees to the target, the same as the square stance for the able-bodied. Similarly, it may be necessary to angle the chair to the target like an open stance in order to obtain better clearance.

The brakes of the wheelchair must be on, and you must check that the four wheels of the chair are firm and stable on the ground.

W2 Wheelchair Archer

W2 Wheelchair Archer

It is very important to ensure the student has a comfortable and consistent seating position, use cushions if necessary. The students balance is critical as they may have only limited, or no use of the upper body, making balance difficult; this will become worse when drawing and shooting the bow.

It may be necessary to strap the person into the chair; this is very common with people who fit into the W1 category. This can be achieved by using a lap strap which provides added upper body support. It may also be necessary to provide additional upper body support by using a chest strap which fits either around the chest and attaches to the back of the chair or fits over the shoulders and attaches to the back of the chair.

The archer may need support from the back of the chair if they have poor balance. The fabric back of the chair should have slight sag in the back of the chair. The height of the back support must provide support but must not restrict movement of the shoulders. Under international rules the archer must not support their arms using the back of the chair.

Use of Arms

Limited use of bow arm

These archers may be in a wheelchair or may fit into the W2 (standing) category. They may be fitted with a prosthesis which has a device to hold the bow, or they may have one designed for day to day use which can be adapted for this purpose. They may have limited use of their fingers and a strap may need to be fitted to hold the bow. It may also be necessary to add a splint to the elbow to assist with holding up the bow.

Limited use of drawing arm

If the drawing arm is missing, a prosthesis may be fitted which can be fitted with a hook that attaches to the string. It can be twisted to release the hook.

Alternatively, the archer may draw with their teeth. A piece of leather is attached to the string on either side of the nocking point. The archer holds the leather in their teeth and opens their mouth to release. Some archers use a modified release aid used by compound archers.

Archers with balance problems

If the archer chooses to stand either with their leg, or an artificial leg they may use a wooden block to compensate for differences in leg length. They may also choose to sit on a standard chair or stool placed on the shooting line.

W2 standing amputee archer using a stool for support and balance

W2 standing archer using a stool for support and balance

Equipment

Archers with a disability can use either recurve or compound equipment. For international competitions W1 archers may use a compound bow, but accessories such as the bow sight must comply with recurve rules, they cannot use a peep sight; although they may use a release, and the bow poundage must not exceed 45 pounds.

The W2 division is divided into those that use recurve bows and compound bows which must comply with standard World Archery rules.

Shooting and Scoring

In all cases, shooting is conducted the same as able-bodied. Usually the disabled archers have an assistant who goes to the target to score and collect their arrows. This is due to the uneven grassy terrain on most venues.

String Clearance

One of the issues that should be considered is string clearance experienced by archers in a wheelchair; the major issue is clearance from the wheel of the chair. The use of shorter bows or compound bows is recommended. Also try removing the armrest of the chair, or the hand rim of the wheel. You can also try canting the wheels slightly or placing a board (13mm) under the cushion of the chair to raise the archer slightly.

Classifications

Disabled archers wishing to compete in national or international events must be medically classified. This involves being examined by an approved classifier; the archers will be classified into their appropriate division. They will receive a classification card which also indicate the various sub division the archer may fit into. Sub divisions may also allow the archer to use additional aids.

For further information consult www.paralympics.com.au or World Archery Rules.

BAREBOW & LONGBOW

Barebow is an increasingly popular discipline within archery. In Australia barebow is shot in all types of competition; target, field, indoor and clout. As the name implies the bow is shot bare of any attachments or aids such as sight and stabilisers, some disciplines are allowed to have some additional pieces, as a coach always consult with the Archery Australia and/or World Archery Rules to determine what can and can't be used and encourage your archers to know as well. As a guide, longbow is indeed, the more 'natural' bow, with no additions; protection to the shelf where the arrow sits, minimal finger protection and no references for aiming. Barebow archers have no sights, are allowed rests, and finger tabs can have more complexity. Barebow recurve and compound also differ in additions to the bow, again consult the rules for clarification.

Some archers who shoot barebow will shoot 'instinctively'. This means they will come to the same anchor and not change and will not engage in any string of face walk. Instinctive shooting is used widely within the hunting archery community, and still requires practice to reference different distances, naturally adopting a 'point of aim' or 'gap' in their aiming method. In addition to this method, barebow archers can utilize face walking, or string walking to support their aiming at different distances.

Point of Aim or Gap Shooting

Aiming is achieved by placing the point of the arrow on a pre-determined position for a given distance; below the target, on the centre of the target or above the target face, although the position will vary for different distances. The same principles apply to barebow as to using a bow sight; the longer the distance the higher the arrow must be aimed.

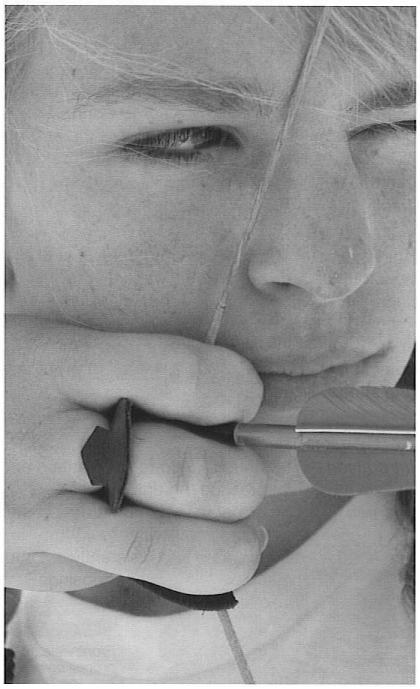
The same as shooting with a sight, the point of aim or gap used, will vary if things are changed such as bow, bow weight, or arrows used. Establishing different points of aim or gaps for each bow/arrow combination is required. All bows are different even the same model, brands and draw weight and will store energy in different amounts and will then shoot differently. Also, if the archer changes arrow size, weight, brand or length they this will impact on their point of aim.

To start to determine points of aim or gaps, it is recommended to start at a short distance such as 10 metres, using the point of the arrow to aim. Most likely at short distance, the point will be positioned under the target face giving a gap between the centre of the target and the point. Once the gap has been determined at 10 metres, advance to 20 metres. The gap should be less than at 10 metres. Continue through a range of distances recording the required gap that allows consistency at each distance.

Shooting Technique

Elements of shooting technique are similar and even more importantly draw length becomes critical when shooting longbow or barebow. It is very important that a consistent draw length is achieved from shot to

shot. Any variation in draw length will change the bow weight at full draw and greatly affect the efficiency of the bow. In freestyle shooting a clicker can be used, which gives a consistent draw length; but clickers are not permitted in barebow archery.



The main variation to the standard technique, and this is the anchor for barebow and longbow archers.

Freestyle (sighted) archers anchor under the jaw to give them a greater gap between their eye and the arrow, this allows them to use a sight over long distances. Barebow archers on the other hand should have the smallest possible gap between their eye and the arrow.

Ideally the archer should anchor so they are looking straight along the arrow shaft, but this can be dangerous as it brings the arrow close to the eye at full draw and is not a recommended practice.

Generally, the recommended anchor for barebow archers is where the top finger touches the corner of the mouth. This provides a repeatable and consistent anchor position and also brings the arrow closer to the eye.

String Walking

To greatly improve accuracy, barebow recurve and compound archers can 'string walk'. This is not permitted for longbow archers and can only be implemented for compound archers if they are shooting off their fingers with no release device. String walking is when the bow is still drawn back to the normal anchor position but for a particular distance the fingers get placed on a different position on the string.

Fig 1

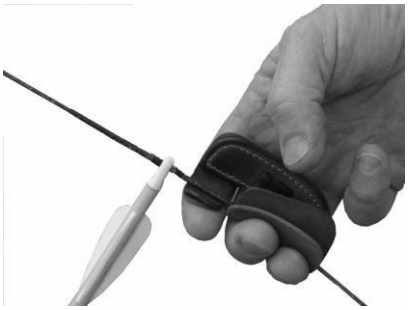


Fig 2

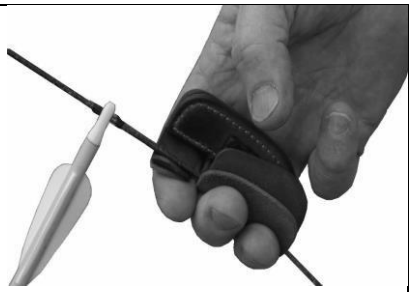


Fig 3

For example, the standard finger position on the string is 'split fingers'; one finger above the arrow and two fingers below the arrow (Fig 1). Changing the position of the fingers on the fingers on the string, changes how the bow shoots as it changes the tiller (limb balance), nocking point and compound cam timing.

For example, when shooting at 50 metres the archer may shoot with split fingers (Fig 1), but for 40 metres they may have the three fingers under the arrow (Fig 2) and at 20 metres they may move their fingers down the string further (Fig 3) while maintaining the same or a similar point of aim/gap and anchor.

It is important to remember that great results can be achieved, but this method will throw out tuning, which is a compromise barebow archers make compared to freestyle archers.

For this reason, it is imperative for components of tuning to be established with the fingers placed in the mid string walking position. Setting up the bow tiller and nocking point (recurve) and tiller, nocking point and cam timing (compound) will allow some balance to be determined, and then as the fingers move adaptations can be made. This decision can be made determined on the types of shooting/distances the archer wishes to participate; archers only wanting to shoot short distances may choose to complete their tuning set up using the lower string position.

Face Walking

Face walking is another system used with Point of Aim or Gap shooting but instead of walking the string, the fingers are kept on the same place on the string. The bow is drawn back to a different anchor point depending upon the distance being shot. Sometimes a combination of both face walking and string walking are used with barebow archers.

For example, when shooting a short distance (15 metres) a possible anchor could be high on the face looking along the arrow, while at long distances an anchor low on the face, below your jaw, may be used. The point of the arrow is still used to aim but the variation in gaps might be less. With practice archers can develop anchor points that give you 'point on' (tip of the arrow is always on the target) at different distances.

For detailed rules regarding string walking and face walking parameters for barebow disciplines refer to Archery Australia and World Archery Rules.

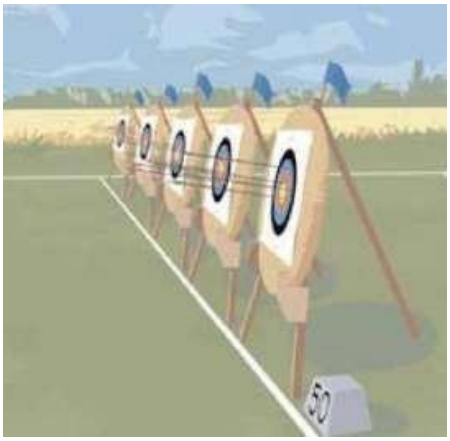
ARCHERY AUSTRALIA

FIELD SHOOTING

Understanding Field Archery

Field shooting is a popular archery shooting discipline in most countries but in order to make it more popular and easier for beginners to take up field shooting we will use this booklet to try and explain some of the "secrets" of field archery.

Shooting field archery is basically the same as shooting target archery, and very often one will find that a good target archer will also become a good field archer. However, there are quite a few things that should be kept in mind when shooting field.

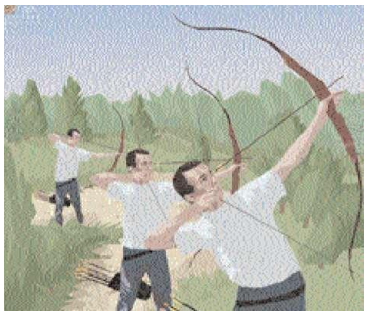


Field archery differs in some ways from outdoor target archery. The main differences being that an outdoor target archer shoots on marked distances only, some longer than in field archery.

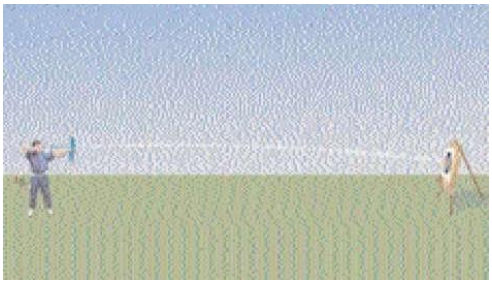
The field archer shoots on both known and unknown distances from 5 metres to 60 metres, depending on division.

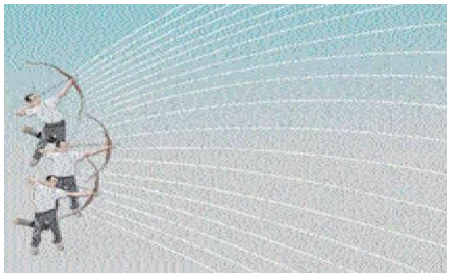
The field archer needs to practice at many different distances, as well as practising how to judge the distance when shooting an unmarked course.

Target archery is shot on level ground, and the shooting position is usually the same. Field archers shoot on uneven terrain, on rocks and around shrubbery, and quite often can have legs in different positions to each other. Field shooting is also a question of shooting uphill and downhill, so the field archer needs to practice various shooting positions. It is essential for good technique that archers understand the importance of setting core and maintaining balance of the hips throughout the shot process.

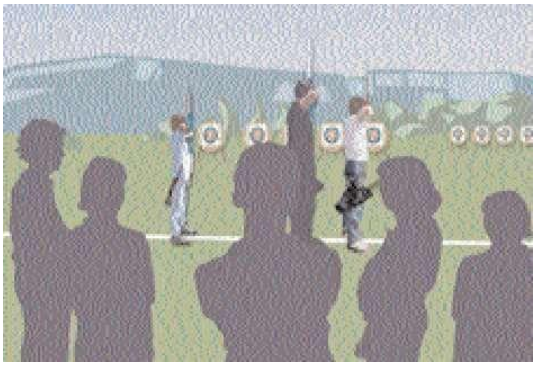


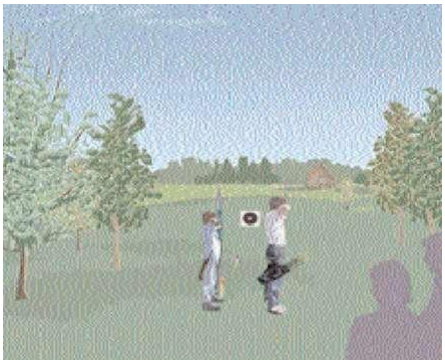
For target archery the arrow flight is the same for a given distance, only influenced by the wind. In field archery the arrow flight differs on a given distance due to the angle of the shot. A field archer must know by experience how much to subtract from the distance due to angle of the terrain.



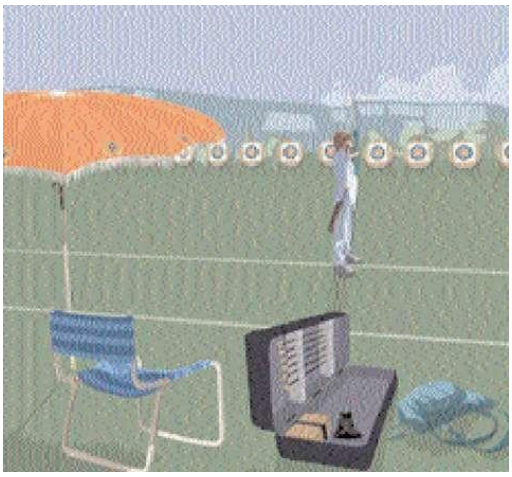


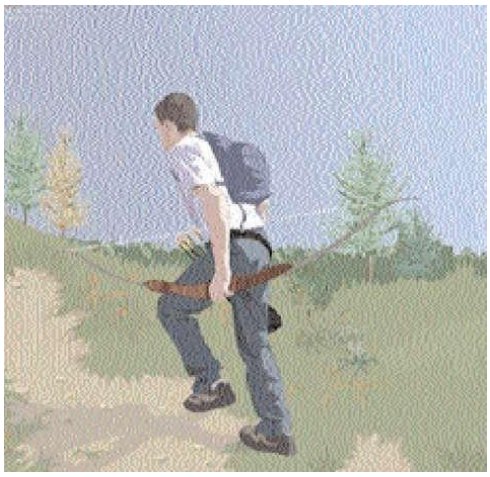
Target archery is always shot close to the competitors and spectators, which may lead to an increase in tension. Normally, Field Archers shoot in their own group and not close to other competitors. Spectators may be present at major International competitions.





The target archer has all their equipment close by. The field archer needs to plan and experiment with clothing and equipment in order to be prepared for "'everything". The field archer has to carry whatever is required with them. In target archery, the archer shoots with one foot either side of the designated shooting line. In field, the archer must have both feet behind the designated post which identifies the target to be shot.



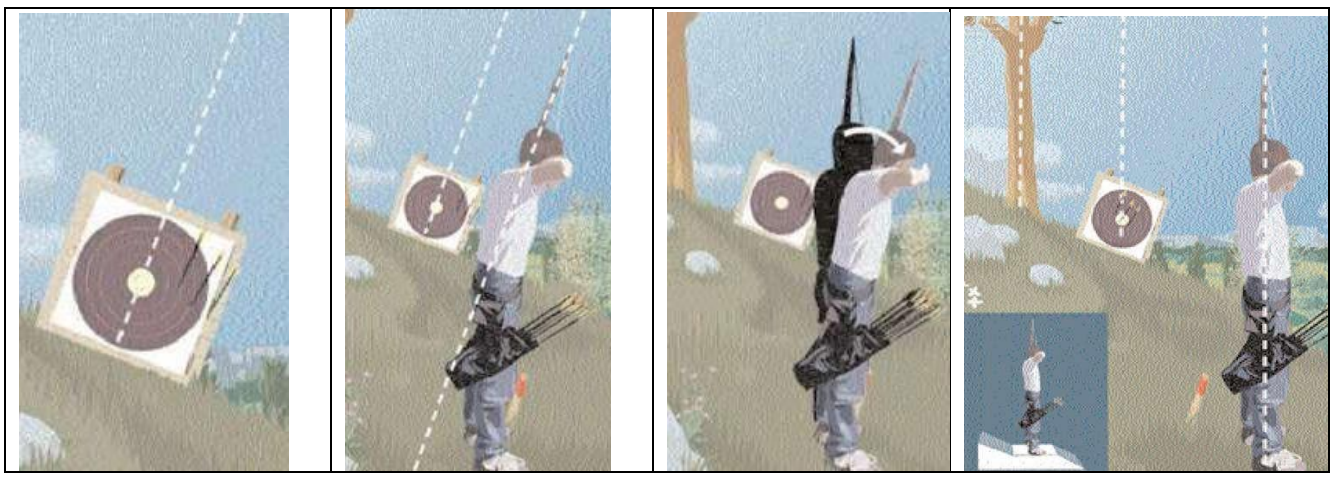


The fundamentals of the shooting technique need to be considered and adapted to the various trajectories and terrain being shot in. Archers need to understand the importance of maintaining core and hip stability, and whilst adaptations may need to be made, there is still a strong connection for the shoulders and alignment ensures minimal clearance issues, particularly for downhill shots.

Archers may need to adapt:

- Stance – create a more open stance to remain stable, sometimes it may require standing with feet further apart.
- Placement of hips – if on uneven terrain or straddling rocks etc. Shooting uphill can be supported by pushing hips forward to start the shot.

As the terrain changes, so to can the angle of the target being shot. Archers need to remember to maintain vertical alignment and stand straight, rather than lean into or cant he bow, as this can be an optical illusion that they need to navigate. Encourage your archers to prepare the shot by leaning the top of the bow towards the hillside. At full draw, they can check vertical alignment against a tree or through an imaginary line through the target. Compound (scope) shooters will of course check their level. Always start by leaning the bow towards the hillside. This reduces the tendency of canting the bow away from the slope.



Executing good shots becomes imperative so that the archer can determine if a sight adjustment is required. Should the distance be estimated incorrectly, archers need to know how much of a sight adjustment is required, depending on where the first arrow lands. So that the second arrow is close to the centre, rather than needing adjustments again, leading to the least amount of points lost. Archers are allowed binoculars and coaches should encourage them to use them.

As with all archery it is important that the archer understands all the components of the rules and these should be checked for updates regularly.