

# Air Rifle Shooting

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# Rules

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Shooting is a technical sport that relies on equipment for performance. We have rifles, additions to rifles (butt plates, front sights etc.), clothes, ranges and supporting equipment like electronic trainers and shooting stands. Equipment changes and become better, requiring rules to be re-worked and amendments added to stay up-to-date. This means that over time, the number of rules have added up and are now extensive. Not all rules are directed directly to the shooter; many are for range officers, the construction of ranges and equipment controls. It's still good to know them, but these are things that should work without any interference from the shooter. It's not your job to make sure the light condition at the range is correct or that the correct measuring device is used in the equipment control.

As a newcomer to the sport, it can be tricky to know what you can and can't do. The rules are many and all have to be adhered to. At a lower level (below state/country and international) some are not being tested regularly for. These include mainly clothing rules which are hard to test for and require more elaborate equipment. Even though this is the fact, it's still important that they are adhered to, at least for the time you do participate in a competition with testing.

## Air Rifle Rules

Rifles have gone from standard looking to more of a blueprint of a rifle over the last 15 years which have made them much more individualized than before. They can be setup in almost any way you like without an easy way to determine whether you're within the regulations or not. Knowing what the regulations are and how to measure them, is very important. So here you'll find applicable rules for air rifles. See the official Statutes, Rules and Regulations document for reference.

Let's start from the butt of the rifle and work our way forward.



All specifications are taken from the Centre line of Barrel.

## General rules

An important one, and one you can check easily, is the total weight allowed, 5.5 kg. That is with all parts attached (butt plate, sights, cheek piece etc.) that you normally use during shooting. The total length of the system is set to maximum 850 mm measured from the back of the system to the muzzle (7.4.4). This is usually self-regulated by the manufacturers in the sense that you can't extend it further without replacing the stock extension tube with an aftermarket one.

Calibre is set to 0.177 or 4.5 mm and you can only use air pressure or (carbon dioxide – CO<sup>2</sup>) to expel the pellet with (7.4.6). The pellet itself can be a few tenths of a millimetre smaller or larger than this, but it won't give you any extra points. Scores are measured using a gauge set to 4.5 mm and that size also used in electronic scoring systems.

An electronic trigger can be used if it complies with all other rules. It has to be within total weight limit, attached to the rifle at all times and not be programmed or otherwise set to go off automatically (7.4.1.6). It's also good to know that if you run out of battery during a competition, no extra time or shots will be allowed to fix the problem. It's considered a fault by the competitor – not by the organizer – so make sure it works before leaving home. No restrictions on trigger resistance exist.

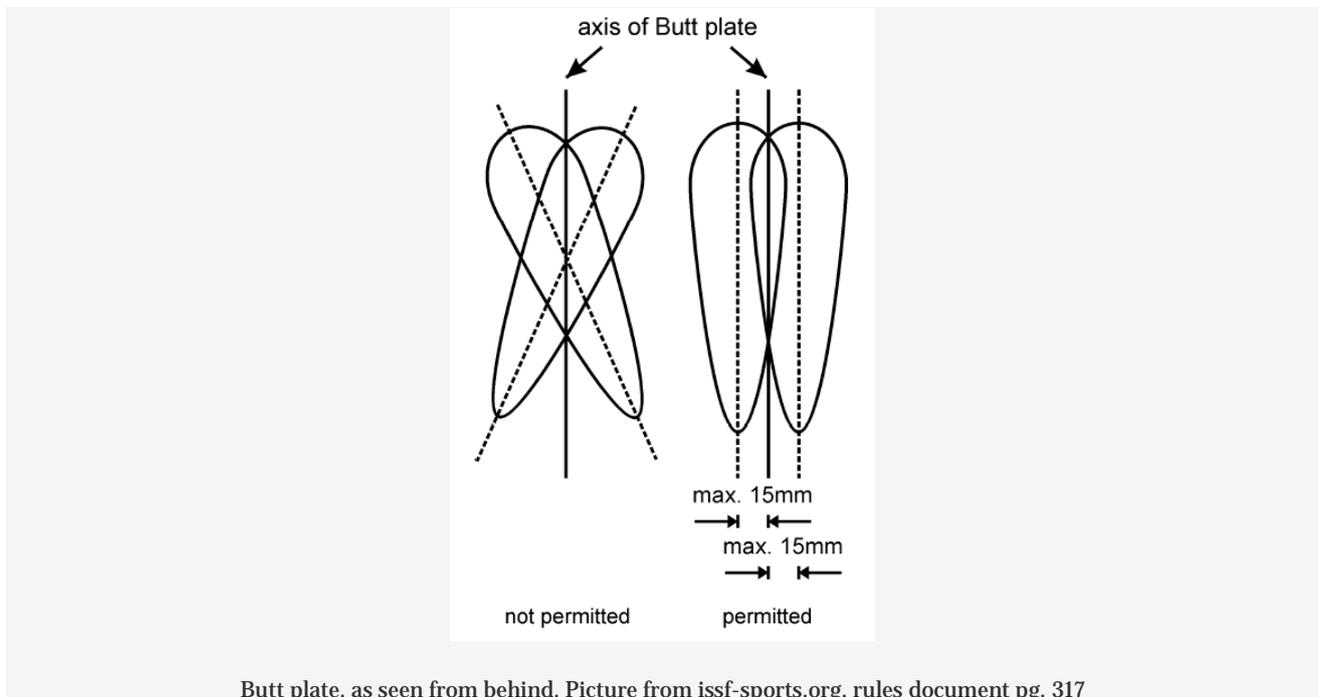
Then there's a specific rule (6.7.2), that say:

*Athletes must use only equipment and apparel that complies with ISSF Rules. Any gun, device, equipment, accessory or other items that may give an athlete an unfair advantage over others and that is not specifically mentioned in these Rules, or that is contrary to the spirit of these Rules, is prohibited.*

So anything that might be fine under the current set of rules, but pushes the limit or cover an area that hasn't been up to discussion before, could still be prohibited under this rule. This is to some point a subjective rule and is up to the equipment control officer to enforce.

## Butt plate and Cheek Piece

The butt plate has three important rules tied to it, depth of the butt plate (E), maximum distance from the barrel (D) and setup (7.4.2.1 & 7.4.4.1).



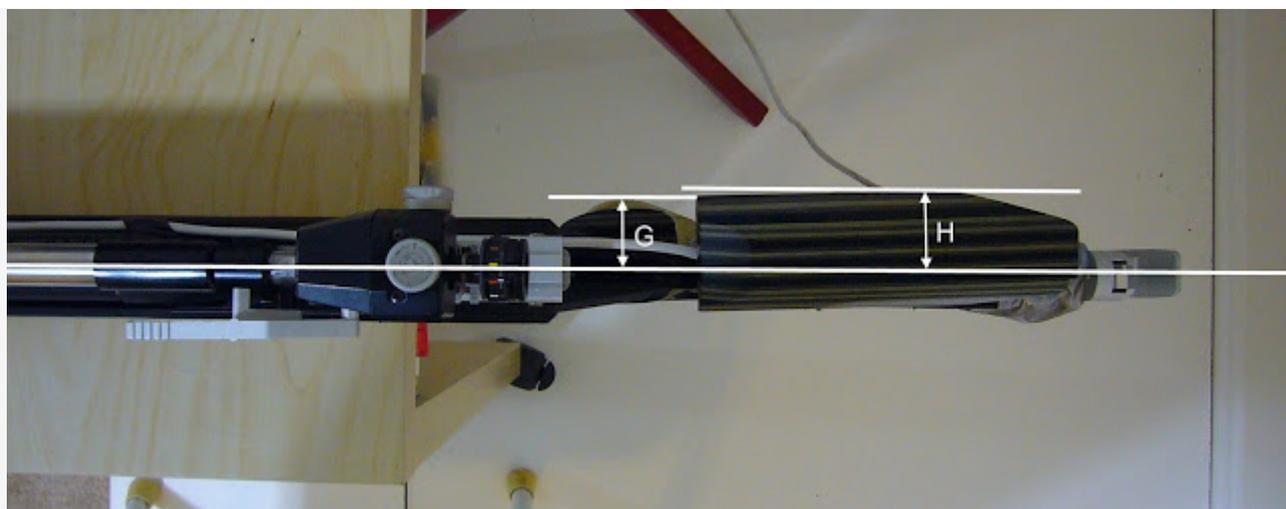
Maximum depth of the butt plate is set to 20 mm, measured from a line between upper and lower part of the plate to the maximum depth achievable. This is usually all the way in to the metal, so the attached rubber for increased friction is not considered if there's space in between them (like in MEC's contact butt plates). The lowest part the butt plate can be no further away than 220 mm, measured from the centre of barrel (I'll be using this expression more often, so the abbreviation CoB is in place). Also, the heel to toe length of the butt plate is set to maximum 153 mm.

Any weights protruding forward from the butt plate are prohibited. They neither fit under the rifle dimensions nor the "The rifle must not touch the jacket or chest beyond the area of the right shoulder" rule ([general interpretations](#) and 7.6.1.2)

Those rules are simple to understand, the trickier one is the setup. The butt plate cannot be turned around a horizontal axis (upper part to one side and lower part to another). It can be offset a maximum of 15 mm to one side (the whole plate at once) OR turned around a vertical axis (pointing either towards the body or away from it). Both these setups are to move the rifle in a horizontal plane without changing the shoulder contact.

Just make sure to only use one direction or else you'll have to change it at the equipment control. The butt plate is allowed to turn around a z-axis as long as the 220 mm rule is adhered to (the plate points downwards instead of straight back).

The cheek piece can't be anatomically formed (7.4.2.3) or extend further out to the side than 40 mm from the Centre of the Barrel (CoB) (H). If it does extend further than that, just cut it down on one side and it will be back within regulations.



Maximum distance for the pistol grip and cheek piece.

## Pistol grip

(7.4.2.2 – 7.4.2.5)

There are a few important rules for the pistol grip to adhere to. Since this is a standard part of the rifle to modify it's crucial to know what the rules are. For distances, there are only two to stay within; 160 mm (C) from CoB to the bottom of the grip and 60 mm (G) out to the side from CoB in a horizontal plane.

The second one is new for 2013 and the first one is rarely a problem. As for the cheek piece, the grip can't be anatomically formed. This means no ledge at the bottom to rest the hand on or any grooves between fingers for increased grip. It can be altered but has to have a flat surface and follow a similar profile as the original pistol grip. It can't have a thumb hole either which isn't a problem today when barely any rifle stocks or grips are made this way. Another important aspect is grip. No material can be added to increase grip. Since almost all production pistol grips are delivered lacquered, this can be seen as the upper grip limit.

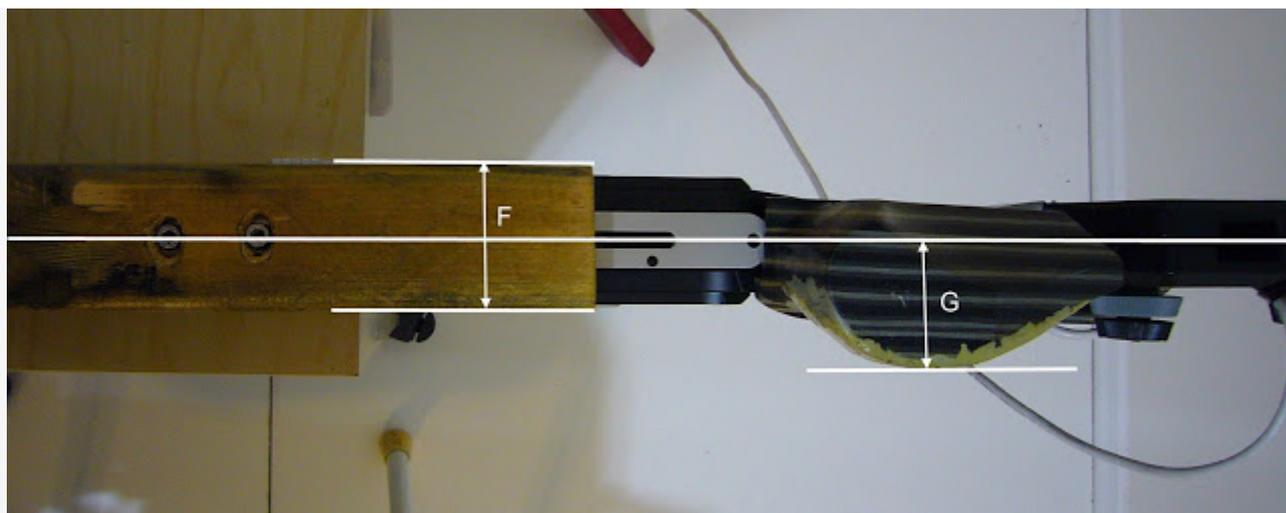
## Sights

(7.4.1.5, 7.4.4, 7.4.4.1)

No scope, magnifying glass or corrective lens attached to either the rifle or rear sight are allowed (a corrective lens can only be attached to eyeglass frames). Polarizing filters, coloured filters or variable iris apertures are allowed, as long as they don't have any of the properties mentioned above. Any device using mirrors to aim with the opposite eye (left eye for a right-handed shooter) is allowed provided no lens is used. The diopter can be moved sideways, just make sure the 40 mm offset rule for the cheek piece is adhered to while doing this.

A blinder may be attached to the rear sight (or the shooters head). It can be maximum 30 mm wide and 100 mm long and only be used for the non-aiming eye.

Maximum height of the sights is measured from the *centre* of front sight ring to CoB and has to be within 60 mm (A). This includes any sight raisers from the factory and those added afterwards. Front sight tunnel can maximum be 50 mm long, 25 mm in outer diameter and not protrude further than the muzzle.



View from below, pistol grip and width of front stock.

## Front stock and weights

(7.4.4.1, 7.4.2.6)

The maximum depth of the front stock is set to 90 mm (B) and the width to 60 mm (F). If the maximum allowed distances isn't reached, the stock can be brought up to this level. However, as for the pistol grip, it can't be anatomically shaped or increased the grip upon.

In case the upper maximum weight limit hasn't been reached, adding weight to the rifle is allowed with some restrictions. Barrel weights have to be within a radius of 30 mm from CoB. No restrictions on how they look exists (can hang under or on the side etc.) as long as they are within the 30 mm diameter.

Weights attached anywhere else on the rifle have to follow the contour of the rifle and be within the outer dimensions. That is, not outside of 40 mm distance for the cheek piece, 30 mm at the front stock, 60 mm at the pistol grip and 220 mm at the butt plate. But the only distance of importance is the 40 mm, the rest falls outside of the contour of the rifle and are thus prohibited. Keep them close to the stock to not end up at the equipment control and have to move them.

## Summary

What people normally have problems with when it comes to equipment controls are things that can be fixed relatively easy. Weights protruding too much to one side, a butt plate set too low or at a slight angle, the total rifle weight or the front sight protruding the muzzle. All these things are unnecessary to have but can be easily fixed by moving things slightly. Bigger problem areas may include moving parts that needs training to get acquainted with, like the pistol grip or cheek piece. Bigger faults in the butt plate are of the same magnitude. Make sure everything is fine at training so you stay out of trouble at competitions.

# How to Choose an Air Rifle

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## How to Select an Air Rifle



The question of how to select an air rifle that will suit you is one that comes up a lot. It's a big purchase of an item that will be used extensively (hopefully) so most people want to know it'll be a good one. It can be hard finding something within budget, has a supplier within a reasonable distance, that suits your particular needs and that looks and feels good.

There are so many rifles out there; the big makes (Anschutz, FWB, Walther, and Steyr) have had several different models through the years. Most of the top models are today based on an aluminium stock which can in an increasingly fashion be made to suit the user better than ever before. You pick and choose which bits you want for your rifle from the maker and this builds something that hopefully fits you better than a standard (one-size-fits-all) version.

One maker even brought back the wood stock a few years ago to meet the demand for a high-end wood rifle. The possibilities to change parts like the cheek piece or pistol grip makes the process even trickier. What is it I really want to see in a rifle? Do I like the pistol grip but not how the butt plate can be set up? What is more important and what can you learn to live with? The questions are many and I'll try answering some of them here.



Feinwerkbau 800, picture from feinwerkbau.de

## Variables

Variables to take into consideration are many. Is budget the big one or having a supplier nearby more important in case you need assistance? Before settling down on a specific model you have to decide what's important for you and what isn't and can therefore be discarded. The different variables that come into play are: looks and feel, features of the rifle, make, supplier, shipping and budget. The first four are tied directly to the rifle, the following two are such that can complicate the purchase procedure and the last one is what it is.

## Looks

It might not be a major variable when considering an air rifle, but it does influence your decision and therefore needs attention. By having a rifle that looks good (what is good-looking is of course very subjective) you're more likely to be happy with your tool and in turn use it more. If a good-looking rifle means you'll train more, then that's a good thing! How such a rifle looks like, I can't tell. It's something subjective and can only be decided by you. Don't take this one as a sole decider, but instead use it to reduce the number of possible models or as a final decision method.

## Feel

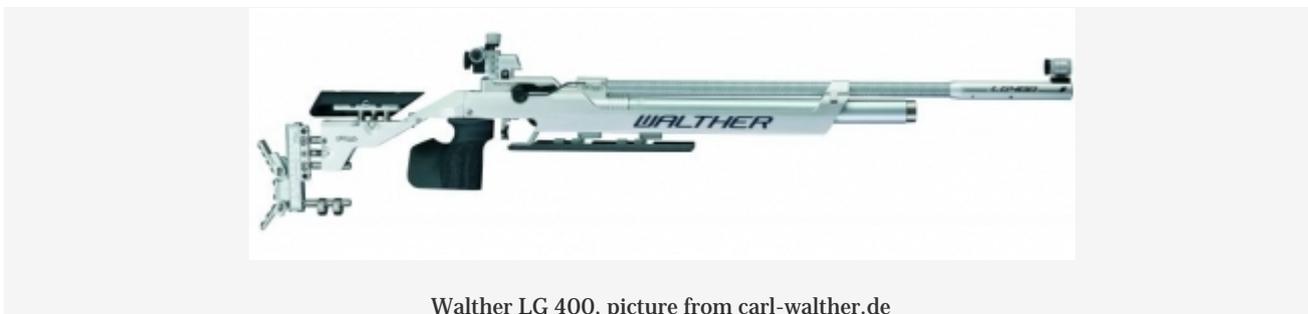
Another variable that's hard to put in numbers. How a rifle feels in position and how well it fits your body depends on how it's built. Where the centre of gravity is located and how the weight of the rifle feels depends on your position. A tall or a short person will have two completely different experiences from the same rifle. The position determines how long certain parts of the rifle have to be, in order to work with you.

So a tall person might need a rifle that's slightly longer in the butt and has the CoG further forward than a shorter person. Most of today's top end models can be adjusted in many directions and take this into account, but it's usually a good idea to go with something already somewhat fitted to your individual

needs. Furthermore, how the cheek piece feels (surface, angle) and the pistol grip work with your hand plays a major role in the feel. In case you use a looser grip, maybe Feinwerkbau grips work better than Anschutz (or the opposite). For a tighter grip it might be Walther that's the best for you.

Changing the grip isn't a major operation, but will require some work and additional cost. Is it worth it or should you go with the other model directly? The feel also affects how willing you are to find solutions to fitting problems that will occur later on. Buying a rifle just starts the process of fitting it and there will be times when you'll have to buy or make a part that to make it work even better for you. If you by that point like the rifle, you're much more likely to put in this work instead of giving up (or buying a new rifle).

So don't dismiss your negative feelings about a model just because it's supposed to be the one with all features. It won't be the best one for you if you don't like it and want to train with it (somewhat the same as with the looks above).



## Features

This is a category that most people consider the important one. It certainly is important, but don't buy a rifle based only on features, the other categories needs emphasizing as well.

Under features we find anything that separates this model from other models out there. For example, the new 800 has a 360 degree movable loading lever which no other model has. The LG400 uses a magnetic recoil absorber and the 9002 comes with an extremely movable butt plate. Steyr's LG110 can be taken apart and stored in a smaller gun case than any other model. Some features are smaller than this like being able to move the pistol grip independently in every direction or to slide the cheek piece forward.

There are lots of these variants and the best way to find out is to read specifications and try the rifles out for you. So make a list of what you need and what you can live without. Most parts of a rifle can be replaced so if you really don't like the cheek piece, fit one from another model instead. By thinking this way you can pretty much build your own rifle from the basics up. If this is what you're going for, find the best system and the stock for which you can attach anything you want to. This has become a lot easier over the last decade with stripped down aluminium stocks (compared with wood, which takes up more space and are harder to change to suit an individual shooter).

If you don't want to do this, it's not necessary by any means. Just replace the part you don't like with something better. A normal approach is to go with the MEC III butt plate instead of the original with its

slim design and good fit. It's easy to replace too which is a bonus. Most parts are not interchangeable between manufacturers. They all use their specific attachment system (the front and rear apertures are a good example of this) which in some cases means it's impossible to change them. In others, it just means you have to do some work or buy spacer's. The easiest is if the same manufacturer sells another pistol grip/front stock/diopter etc. which works better. If it's worth putting the work and money into the rifle is something only you can answer. Maybe there's another model out there better suited to your needs?

When you have the list with pros and cons of the models you like the looks and feel of, it's time to move on the last categories.



## Make

Have you heard some makers have better build quality? Do they have better support staff and fix problems fast? Have you used a specific brand before and want to stick with it? Are they likely to stay in business for a while and can produce replacement parts if necessary? It all comes into play. Rifles aren't cheap and you might have to deal with problems so trusting the maker doesn't hurt.

## Supplier

What suppliers do you have close by? Have you dealt with them before or heard good reviews from other shooters? Do they keep their promises? Which brands/models do they stock or can order? Usually you don't have many suppliers to choose from. If you're lucky there's one nearby and you can go there to try different models directly. Normally you are limited to online stores (which isn't a bad thing) but also makes it that much harder to try the rifles for yourself. In that case; look up the specs and check pictures, ask fellow shooters and read reviews to try to make up your mind. The best would be if you could borrow one for an evening (from a club shooter) or at least a couple of shots. Another way is to go to bigger competitions and check out the vendors section. There are usually some rifles on display which you can test for a minute or two.

So make sure the supplier has the model/brand you're interested in and that it ship to your destination within a reasonable time (it shouldn't take 6 months for example). Do a search to check whether they keep their promises and that you'll be compensated in case of damaged goods.



Steyr LG110

## Shipping

How much will it cost in shipping? Are there any rules that prohibit shipping to your destination? Do you need any documents for the rifle or the customs beforehand? How will it be shipped (boat, air plane, truck etc.)? Can you pick it up yourself?

## Budget

A major factor to consider is money. Should you buy new or used? From a store or a private seller? Do you need the latest model or is a slightly less advanced one fine for now? The last one is a way of saving some money for the time being. Most youngsters starting up don't need the newest model; they'll be fine with a plainer rifle for a few years. Later when they have learned the technique and know more about what they like/need in a rifle, then it's time to switch. If they start out with an advanced model directly it's easy to get lost in settings and hamper the development. Build up your equipment over time and learn to use every piece when you add it (instead of getting everything at once and not knowing what difference the new glove makes). Even at the elite level you don't always see the most advanced equipment or all possible accessories added. Some have this yes, but at the other side you find shooters with something that looks like it was bought yesterday, completely standard. As long as it works well for you, it'll be perfect.

Even when you've reached a certain level and know exactly what you need/want, it can be hard coping with costs. Make a budget; set aside some money for a future rifle and check prices at the different suppliers you have access to. Also have a look at buy and sell sections in forums, national federations or trading sites. Worth noting is that rifles sometimes don't come with all parts included necessary for shooting, like a diopter. That part will have to be bought separately so make sure of any hidden fees like this. Other standard changes people makes to their rifle is changing the butt plate, add an iris aperture or change the size of the front aperture. All these are costs not included in the original purchase.

## Summary

Hopefully this has been helpful when considering a new rifle. I haven't mentioned a lot about specific models and the reasons are three-fold. The first one is the sheer number of different models out there; this post will be way to long if they'd all be in it. Second, it would be subjective opinions or facts (both of which you can find in other places and in better detail) and finally because I haven't tried them all and therefore wouldn't have anything interesting to write. So in the end, buy the rifle you like the most not the most hyped model at the moment or the one other people think is the best. You are the one who's going to train several hours (hopefully) with it, not them, so make sure you actually like and want to use it.

# The Standing Position

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## The Standing Position

This is about the standing shooting position. We will be dealing with each part of the position in as much details as possible. This is however the tricky part. Every position is unique, and with a lack of research on the topic, somewhat subjective. Theories exist as to what works and what doesn't, but there are so many individual varieties that without knowing all influencing variables, it's close to impossible to give accurate advice on an unseen position. So, see this information for what it is: something that works for most people and a template to continue building from.

## Basic Principles

There are many ways of building a shooting position that will perform well during a calm training at home or in a stressful competition. If you look at top shooters and how they do it you'll see they all have a slightly different strategy. Which one depends on their body type and build, past injuries (or possible future ones), the current rules plus there's a cultural context as well (positions change over time and develops differently in different areas). Even though they are different from each other, there are some common nominators they all include (almost all anyway). It becomes much harder, or even impossible, to consistently perform at a high level without them.

## Muscle activation and Bone Support

The main idea in a shooting position, any position really but it's more obvious in the standing one, is to support the rifle using little extra muscle activation. To do this you have to find a way to add a 5 kg heavy rifle, while aiming, to coincide with the body's natural centre of gravity (CoG). You also need to use the body's own load bearing system, the skeleton, as much as possible. By resting the rifle close to the body's CoG you achieve two goals; a balance closer to that of just the body and less muscle activation to bring the swaying body-rifle back to equilibrium. By using the skeleton as a support, you minimize muscle involvement and thus reduce the aim area, muscle tremor and tiring muscles over time.

Muscle activation goes even further than this though. I have in the past used the terms muscle activation, relaxation or tension to describe the same phenomenon. When holding something, anything, there exist a minimal activation required to perform the task. How big it is changes due to what the task is (holding a 4 kg ball or a 10 kg ball in different positions). But even in exactly the same task it's possible to use different muscle activation levels (to squeeze the ball or hold it lightly). This applies directly to shooting.

There are many tasks involved, and each one can be performed with minimal activation or with a larger one. Which one is best are different to what the goal of each task is. Generally speaking though, less is better considering all activation will transplant itself in one way or another up to the rifle. This is showed as irregular movement patterns, larger hold area and body sway. This can be measured using an

electronic trainer, but is evident even without one. The shooter will most likely perform worse and have a worse inner feeling than normal. The smaller the number of forces that affect the rifle's movement, the better. Relaxing in all parts of the body while continuing aiming at the same place will make you perform better. Some areas might however need a higher activation than what the minimal requires. Right arm/hand is one of these. To ensure that the rifle is firmly attached in the shoulder, a slight backwards pressure can help. By pulling the rifle into the shoulder, you make sure it stays in place and have controlled recoil. This applies more to higher powered rifles than air, like smallbore, but the idea is still valid.

Even while applying extra force, there are different levels of muscle activation and different muscles to use. Only use the ones absolutely necessary to the task, nothing else. An extreme example could be this; by standing up you can also extend an arm out in front of you. This isn't necessary to the task of standing so you can easily relax it and continue standing without falling.

This example isn't very complicated to understand so let's change the scale: While just standing up (once again), not all leg muscles are necessary to perform the task. They might be crucial for walking or squatting, but not for standing. Those can therefore be relaxed without any inverse reactions (falling). Another example is headaches caused by unnecessarily tensed neck muscles through the day. If we apply this to the example above of adding some pressure to keep the rifle neatly pushed into the shoulder, we can figure out which muscles to relax and which to keep tensed (and then tensed just enough). This isn't easy to achieve, but time and focused training helps.

Let's go back to speaking generally again, novices to the sport all have more tensed muscles than needed. This together with an incorrectly balanced position accounts for a large portion of rifle movements in the beginning. On top of this, there's also a lack of finer muscle control and adjustments to those movements which can only come with training. So, a general rule is to relax as much as possible and build your position around the skeleton to minimize muscle activation.

## Centre of Gravity



*The yellow line is correct; it just looks strange because of the slightly off-angled picture*

While standing up, or in position, the body has a CoG roughly in the core region around which shifts in position occur. These shifts, or body sway are well controlled by the lower leg muscles, mainly calf and tibialis anterior (lifts the foot). Equilibrium is kept within a small range by constantly applying a small force to counteract any movements.

When adding the rifle, if its weight (and CoG) coincides with the existing CoG, the body sway won't increase more than necessary. It will become larger when focus shifts away from balance, mainly during aim, but minimally so. The two CoG's will probably not coincide perfectly and thus create a new CoG for the body-rifle system.

As long as this new centre doesn't shift equilibrium too far off the normal, it's not a bad thing. The further away from this point we move, the more strained the balancing muscles become. Both length and speed of sway increases up to an unsustainable point. Have a look at the pictures and the yellow line (which represents the supporting column and how the weight of the rifle is controlled) and note how it always falls within a small area of the foot.

The left foot is the most important one considering most weight are placed here (most shooters have shift their hips sideways, closer to the target) and the left is used for balancing up the position.

## Consistency

Consistency is something that can't be underlined enough. One aspect of a good position is with what ease it can be set up. The final position should be easy enough to set up that the routine never fails. Even in a highly stressing situation like a big final, the position should look the same as it does at home, in your quiet training facility. If, by following the trained-on routine, you sometimes end up slightly off, it could be a hint that the position isn't the best possible for you.

If the position shifts slightly over time during shooting, it could be because there's a weakness in how a specific part is set up. A strong shooting position doesn't change appearance (or if it does, as little and as equally from time to time as possible) more than the absolute necessary. This could be due to stretched muscles which can be overcome as much as possible before starting shooting (warm-up).

*Relaxed right arm*

## The General Position



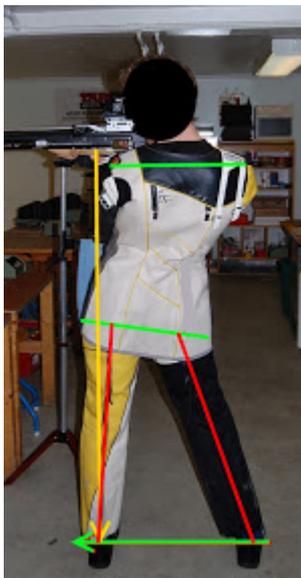
*Alignment of body parts*

Starting from the ground, feet and legs are there to hold the body up, give a direction to the entire position and balance it. Hips are for height of the rifle and give a sturdy platform to put the left elbow onto. It also aids in direction of the position and balances it. Shoulders are for attaching the rifle to the body and otherwise keep relaxed. Right arm/hand gives stability to the rifle and takes care of triggering.

Left arm/hand takes care of height and direction of the rifle plus some balancing as well. The head does aiming, position balancing and stabilizes the rifle. All parts have their major task but are also integrated in the whole position and any changes will affect each one differently. Changing hip placement can affect your feet in a way that they need to be re-aligned and height of the rifle and therefore shoulder attachment, left arm/hand and cheek placement.

The platform for placing the elbow might also change which could in turn require adjustments which will then again affect several body parts. Some of these changes are what you're looking for and the reason to why the change was made in the first place, but ripple effects has to be taken into account and dealt with. So, as you see, a change somewhere (even a

small one) will affect the entire position and must be treated as such. Don't see individual parts as just that, but an integration of the whole position.



*View from behind*

Like mentioned above, there are many ways of achieving the goals outlined here: skeleton support, minimal muscle activation, well-balanced position with a combined CoG close to that of just standing without a rifle, consistency and a solid platform for the rifle to rest upon.

People are built differently with a different set of strengths and weaknesses that has to be considered. This means there are a large variety of positions used by top shooters, everything from a very large distance between feet (Beate Gauss and Sonja Pfeilschifter), to a very narrow one (Jozef Gonci and many Asian shooters). Some have a large hip angle, and some have a small one almost parallel to the ground. There are different ways of achieving the needed rifle height by resting the rifle on a fist or in the palm of the hand.

The pictures try to show this but it was tricky finding images portraying the entire position. Most are cropped at around waist line or have been taken at an angle (as you can see). Hopefully the message goes through anyway: no matter how they look, they all follow the same ideas.

All lines in the pictures are added for clarity of what I'm referring to and are not part of the original image. Yellow is support of the rifle, red: alignment of limbs and green is alignment of shoulder, hips and direction of position.



*Katerina Emmons, from this link. Many angles going on here*



*Beate Gauss. Almost straight rifle support line.*



Jozef Gonci, from [this link](#). Narrow between feet and an upright position.



Qinan Zhu, [from here](#). Another upright position with tension in the right arm to facilitate consistent contact with the shoulder.

# The Standing Position Breakdown

## Foot Placement and Hip Alignment

We will now talk about foot placement and hip alignment and a bit on aligning the entire position.

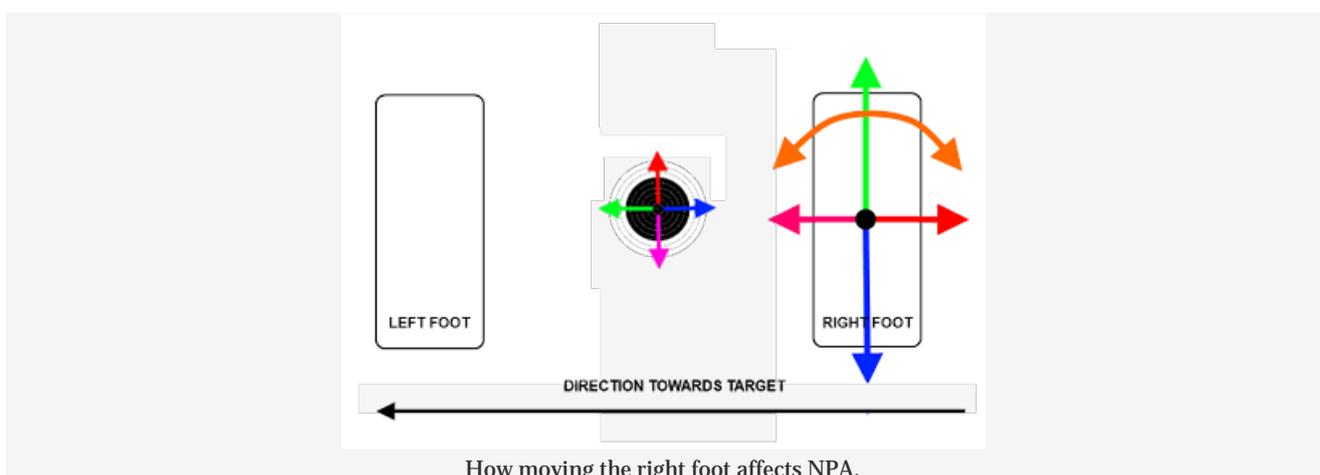
The feet are where you start building the position. Any mistakes here will be transplanted upwards and effect everything else. This is the most stable part of the position but is also the place where sway starts and is controlled. It's important to carefully and consistently place the feet where they belong and make the correct adjustments if needed.

### Left foot

The left foot is where it all starts. This is the first foot to place and the one that steers the position and aligns it according to the target. Most people place it at a 90° angle; it's an easy start and one that has proven to work. This angle makes sure the hip is locked in place and won't move easily in position. By locked in place I mean a more rigid position. The hip can't move as much in position and will stay in place and be easier to set up every time. Angling the foot outwards (toes pointing down the range) lets the hip move more in position and doesn't have an equally strict position. It also allows the hip to be more angled towards the target (open towards the target) which is unstable and should be avoided. If the foot is angled inwards instead (toes pointing towards the right foot), it allows the hip to angle itself inwards too. This can work well (and is used by some professionals) because it creates a "hole" where the hip sits in which in turn creates a stable position. The downside is more stress on joints, especially the hip but also the knee and ankle. The more of an angle (in any direction) the more of the up and downside you get. Therefore, the easiest place to start when building a position is a straight foot.

### The right foot

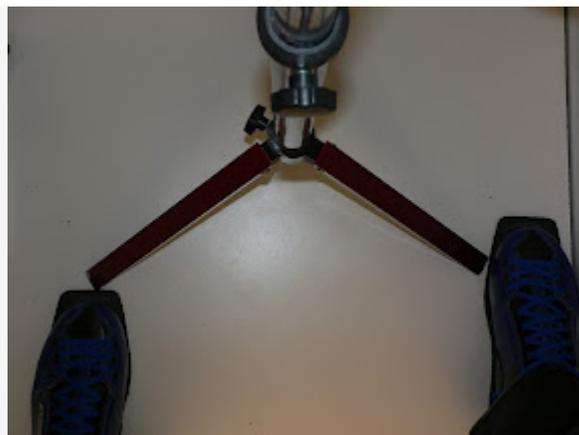
Here it becomes slightly more subjective. Several pointers still exists like creating a balanced position with low muscle activation which is correctly aligned and feels comfortable. If everything else is kept the same, where the foot is placed will determine height and sideways placement of the rifle. It's also important for controlling sway by setting centre of gravity (CoG) of the shooting position as close to that of your natural one.



By moving the foot forward, you move NPA left. Moving it backwards and NPA shifts right. More importantly though, is how balance changes with these shifts. No change ever happens in a vacuum and thus affects more parts of the position than only NPA. For balance, you want CoG to land a cm or two behind the middle of the foot. Exactly where is individual and something you have to figure out for yourself. A pointer is: the foot placement where sway is reduced to a minimum and being equally distributed around the CoG (sway shouldn't always start to one side, toes or heel, and compensate back to the centre). Test this by closing the eyes and feel balance shift.

Try different foot placement and take note of when sway is reduced, this is your starting point. If you change anything in the position that could affect balance like elbow or hand placement, head or hip placement or distance between feet, you have to look at the right foot placement again. Most shooters keep the right foot levelled with the left one or slightly behind it. I, on the other hand, am normally more heel heavy (my CoG is closer to the heel) and have to compensate by placing the right foot forward and thus shifting some weight backwards (together with a back bend).

You can also angle the foot both inwards and outwards which affects hip and NPA. NPA moves less than moving it front/back, but will affect it slightly. Angle it outwards (away from the target) opens up the hip and NPA shifts to the right somewhat. This also puts less strain on the right knee and feels more comfortably overall. With a slightly looser hip, stability is somewhat decreased. Extreme angles increases sway by reducing contact with the ground in that direction, smaller angles won't cause any problems though. By angle the foot inwards instead you lock in the hip well and move NPA to the left (the hip shifts somewhat left). More stress is put on the knee and foot and probably won't feel very comfortably. More weight will also shift towards the outside of the foot which changes contact with the floor and creates problems in correcting sway.



My stance.

If you avoid large angles in either direction, the rest is down to your subjective feeling and objective measurements like balance. Most shooters keep the right foot angled slightly outwards or parallel with the left one. A few keep it pointing inwards, but they are rare. The foot position that allows a balanced and relaxed position with NPA at the correct height is the one to use.



Picture from London Olympic final and can be found at [issf-sports.org](http://issf-sports.org). Different setups for all participants, note the inwards rotated left foot of Katerina Emmons (8th finalist).

## Distance Between the Feet

The distance between the two feet determines the height of the rifle. The further away, the higher the rifle sits. This is due to the more pronounced hip placement (larger platform). How far apart the feet should be is determined by your flexibility, skeleton and what type of position you like. If you have short arms, you need to compensate for this by any of these ways (plus a few other, smaller, ways): larger distance between feet, larger sideways shift of the hip and how the left hand holds the rifle. How much the hip can be shifted sideways is due to your flexibility level in hip and thighs. The further apart the legs are the less of a shift is possible without a stretching or flexibility program. With a larger distance, the back bend of the spine is exaggerated which can cause problems; a simultaneous bend and twist of the spine is less healthy than the two done separately (see below).

A good starting point is shoulder width and from there, tweak it to what works for you.



Picture from WCF 2012, from [issf-sports.org](http://issf-sports.org). Everyone is using different feet distances, angles and hip placements.

## Hip Placement

There are three goals here; providing a stable platform for the elbow, stabilizing the position by connecting the upper body with the lower body and controlling height of the rifle.

You want a straight line through the hip pointing directly downrange. Small twists can work fine in either direction (but preferably to the right) but stay away from larger ones. This directs the rifle and head weight straight through the hip down to legs and feet.

Then there's the question of shifting the hip forward or not. By doing this, you create two things; the left side will point upwards which proves a nice platform for the elbow to rest upon, and stabilizes the position. It moves less (can't be moved as much) both during position setup and in position. The downside of doing this is the extra stress that's put on the spine. The spine is the load bearing column for the upper body where most weight will travel down to the ground. Being offset to one side moves the weight to the other side which then has to carry a larger portion of the total weight. This is fine during shorter times, but can easily add up and create a problem after hours of training. The same kind of a sideways shift happens when standing on one leg outside of position. The difference is you also keep core muscles tight to counteract the shift and thus reduces stress on the spine. This won't work during shooting. Muscle activation is deteriorating for performance and has to be kept limited. This means you use more ligaments and bones to support the position. With most upper body weight collecting in one small place, this is a problem. Strength training helps, so does careful placement of the hip. By twisting it sideways, you add to the problem. A twist and a shift at the same time is not something the spine likes.

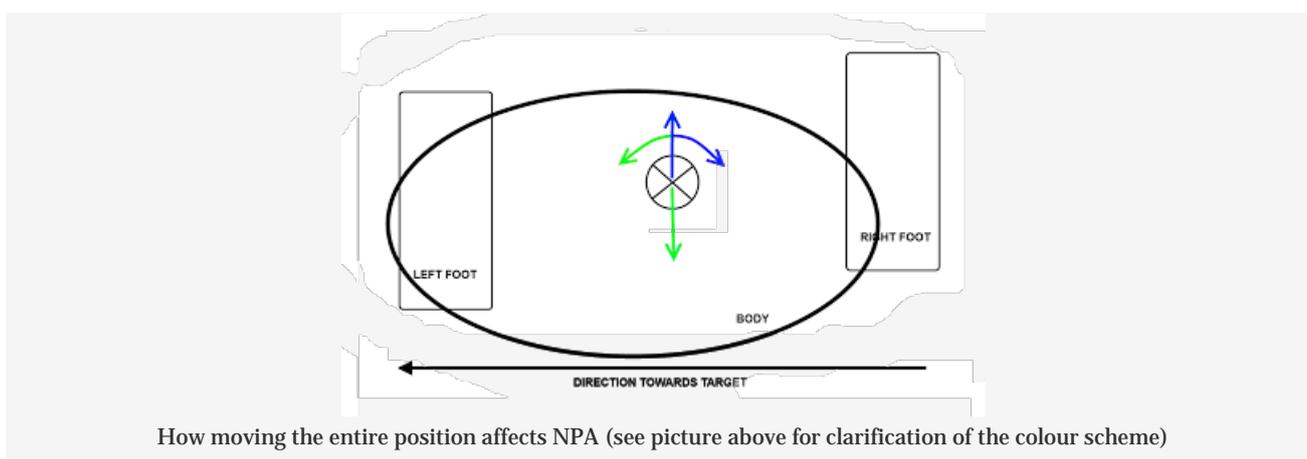
The larger these twist and shifts are, the more of a problem they can cause (including pain and future chronic back problems).

Most shooters still shift it sideways but keep the angle straight towards the target. Some have a very large shift (like Sonja Pfeilschifter and Beate Gauss), most have a smaller shift, like Matt Emmons or myself and some have no shift at all (rare). The upside of this hip placement (creating the platform, locking in the hip and allowing for the rifle to rest in the palm of the hand) is why so many have adopted it. Of course, if you do get any problems that can't be dealt with by refining the placement or by strength training, you have to change approach to something that works better right now and in the future.

## Target alignment

See 'How to be consistent with Foot Placement' and 'Consistency in Position Setup –A Training Session' for more information on the topic.

A common mistake when coordinating the position with the target is to only move one foot. Since moving the right foot controls where the rifle points, it's easy to use this when correcting faults in NPA. An example could be when you're aiming to the right and moves the foot forward to turn the position to the left and aim is subsequently moved to the target centre. The problem with this approach is how many other parts of the position are also affected by the movement. You can't just move the right foot without causing changes to the position. The way your feet and hip are set up reflects many training hours where this has been perfected for stability, consistency, performance and your subjective feeling. The setup you've figured out should then be the one you use every time unless you figure out a better setup (which you then stick to, and so on). So, by moving one foot you will correct the NPA fault but also change the position setup with possible detrimental effects.



Instead, consider the position as one solid unit which you can move sideways or angle as you please. You keep the feet in exactly the same distance between them at all times by moving both together. If NPA is to the right you have two options: the first and easiest one is to move both feet back the appropriate distance, and the second one is to turn (angle) the position to the left (green). Turning works for larger NPA faults because any such changes made to the position will be much larger ten meters down the range. This makes it trickier to know exactly how much to move to achieve what you're going for. If you

instead move both feet in a straight line it's easier to calculate the exact distance. The downside is you can only move so much before you're too far off (the monitor, target carrier, tools or even the shooting lane in trickier ranges). Therefore, use this system when the distance is shorter and turning for larger distances.

## Left Arm and Hand

After dealing with the basics of the position in the first post and feet and hip in the second post, we have now come to the left arm and hand. This is the continuation of the support column which goes through the left foot, left leg, hip and arm to support the rifle. The focus is to create a stable platform for the rifle to rest upon and to keep the structure as relaxed as possible. The more muscles involved, the more movements are transferred over to the rifle. The bottom part of this structure deals with balance, stabilizing the position and NPA, and the upper part is not that different. Balance (by controlling where the head rests) and NPA (where the rifle points) are key ingredients here too, as well as maintaining the stability and relaxation.

What we want is to have the rifle resting close to the body's CoG to not disturb balance more than necessary. The contact point between elbow and hip is what's controlling this. Where it's placed decides how the arm will be angled and thus where the rifle rests. This can to an extent be changed by the hand and rifle contact, but it starts at the elbow.

## Elbow



*The forearm is more vertical than it looks (the jacket is fooling us a bit)*

A stable platform is the first step which is created by foot and hip position. The elbow goes preferably right on the hip bone or just in front of it (towards the stomach). The further out on the stomach you get, the more soft tissue holds up the rifle. The hip bone creates a stability that muscles (or body fat) can't.

Another problem with being far out on the stomach is the pulse that's picked up and transferred to the rifle. This is usually not a problem during training, but can cause added movements in a competition setting or other stressful situations. The upside of this placement is the lower NPA and the backwards angle of the arm it creates.

But, let's back up a bit. NPA can be controlled by moving the elbow, up/down or sideways. Moving the elbow sideways for the sake of changing NPA should never be done. The proper way is moving the position as a whole with the feet instead. Up and down can be used to fix an occurring height problem. If you're always too high, changing elbow placement works well to lower the position. It's not an instant fix and shouldn't be used as one, as the butt plate setting is a better approach. By lowering the elbow, you also lower the NPA, and do the opposite, the result will of course be an elevated NPA.

A good jacket has added friction under the elbow to facilitate proper contact so the elbow won't slide in position. Without a jacket, this won't work at all. The upside is; moving the elbow this fashion only affects NPA (or as close to "only" as you get) so no need for additional compensations somewhere else. Make sure to not tense the shoulder or arm in position. The downside for when the elbow is higher than the hip is the same as placing it on the stomach; less stable. So, if the butt plate can be adjusted, do that first before looking at the elbow.

In case you can't reach the hip and there's nothing to be done about it (short arms, large triceps etc.), the same principles still applies. The arm and elbow will then be resting against the ribcage instead of the hip which provides enough contact when wearing a shooting jacket. It won't be perfect, but it is what it is.

## **Shoulder**

First, the shoulder should always be kept completely relaxed. There is no gain in tensing it (like with the right arm) and will only hurt performance. For novices, it takes practice to relax it completely since it's not something we normally do outside of shooting. The tricky part in the beginning is to both keep it relaxed and find a good butt plate contact, the right arm can help here but more on this later.

## **Hand position**

The left hand is what holds up the rifle and aligns it according to the target. The two other contact points with the rifle (shoulder and head) have different purposes even though they are connected with each other.

As with the elbow, the hand is the last link in the chain holding up the rifle. The support column should, as before, be kept as relaxed as possible. There are some exceptions from this rule, and depending on the hand position, the hand is one of these. There are no rules regarding how the hand holds the rifle, only for how the rifle can be setup and that the hand can't touch any other part of the body (right hand or chest/jacket). That is, as long as the hand only touches the rifle, you can do what you please in this area.

There are three classic hand positions; on a fist (rifle rests on the knuckles), between two fingers and in the palm of the hand. A variant of having a three-point contact with two fingers and the thumb exists too but rarely among the elite due to its disadvantages. I'll mention it since it exists, but suggest you do use another system instead. On top of these three (four) classic ways, there are several variants used and almost ever shooter have their own version. Due to this, I won't be able to go through them all, but as long as the basics are down, you can adopt the hand position accordingly.

## Three Point Contact



*Katerina Emmons, one of few using something similar to a three-point hand position*

It consists of two fingers and the thumb, usually the index and middle finger, but also the index and ring finger can be used. Fingers are kept tensed and the rifle rests on the platform created.

This is the highest of the hand positions available, and is mainly used by hunters or recreational shooters which don't have the means or time to adjust the rifle perfectly. Keep the wrist straight and bent slightly backwards.

The positive of this hand position is the rifle sits very high. The negative aspects are several; fingers will become tired fast and start trembling, it might hurt in the finger tips and transfer pulse beats from the thumb to the rifle. You have to keep the wrist tensed with the thumb and fingers which all creates movements we don't want. A variant where the fingers are kept more relaxed with a collapsed tripod being the support instead. Rifle sits lower but it will be less tensed and therefore better for rifle movements but still not as good as the last two.

## Between Fingers



*Biathlon shooters use a variant of this hand position*

Another high hand position is when the rifle rests between two fingers (like a V), usually index and middle finger. Keep the wrist and fingers straight for maximum height. This system was more popular with older wooden rifles like the FWB 300 or similar models which had a more rounded front stock.

Today's rifles come with a wide flat front stock which makes it impossible to fit in between two fingers like this. For this reason you won't see the classic setup used anymore. A variant still exists which occasionally pops up.

Instead of keeping the fingers straight, you relax them and a platform between the second joints opens up. The fingers are now bent backwards and the rifle rests on the first bone (proximal phalanges to use its correct name) with the fingers still on each side of the stock. Continue keeping the wrist straight. This is a lower overall position and a less painful one. However, it's still quite painful and most models are too wide to accommodate it, plus it's tricky finding a good wrist position.

*Positive:* higher position and a straight loading line.

*Negative:* painful, tensed, more wobbly and won't work with many modern rifle models.

## On a fist



*Abhinav Bindra using a fist for support.*

The most commonly used hand position in the past and is still going strong (together with the palm, see left).

By bending the fingers and creating a fist, the rifle can then sit upon the platform created by the knuckles and proximal phalanges. It's a good middle road between height, tension levels and rifle stability. The wrist is still to be kept straight because that position will require the least amount of tension to uphold. Less tension equals to less rifle movements and less tiredness over time.

When creating a fist, don't actually tense the hand at all, just bend at the knuckles and let the entire hand relax. Thumb is kept relaxed at the side, so are all fingers. Some shooters keep their baby finger besides the stock for a bit more stability. I doubt it actually creates stability, but it guides the rest of the hand and, if comfortable, no reason not to do so. To be able to use this position perfectly, your fingers have to be able to bend enough that a horizontal surface creates when the wrist is straight. If you can't, the wrist has to bend to account for this, which adds more muscle activation and rifle movements. I for example, can't bend my index finger far enough which means tension levels are a bit high using this hand positions (becomes tired and shaky over time).



I suggest you hold on before adopting an extreme hand position like this (or start shooting perfect scores on a regular basis)!

Because all knuckles normally aren't at the same height, this creates an opportunity to angle the rifle. To use me as an example again: my middle finger knuckle is higher than the index one, making it easy to angle the rifle inwards, closer to the head. There are no rules for where on the hand the rifle has to rest, place it wherever is comfortable and make it point in the direction you want. You can also twist the entire hand out or inwards if you like, just keep the tension levels intact (as relaxed as possible).

An alternative is to relax the wrist, which then bends backwards, but still support the rifle on the knuckles. You can only do this if you have enough flexibility in the joints (I definitely can't) but the upside is lower tension levels and, if needed, a lower position.

*Positive:* A middle road when it comes to height, comfortable when using a glove (required) and a relaxed hand, only the wrist is tensed (if even that).

*Negative:* still tensions there but less than in the previous ones.

## **Palm of the hand**



Three different hand positions using the palm for support.

The lowest positions you can use is resting the rifle directly in the palm of the hand. This doesn't require a glove if you don't want one due to it being very comfortable. A glove might even hurt stability because it acts like a "sponge", a softer area can decrease vertical stability. This is a minor possible problem and most shooters still use one, but some have opted for a thinner glove instead.

The upside of using the palm is the non-existing joints holding the hand up and thus decreased tension and movements it (can) create. A low hand position like this does bring down the overall CoG of the position which theoretically would decrease position oscillations. . In theory, the mass is sitting lower from the ground which requires less muscle activation to control. It probably won't make a difference in practice though.



How to hold the hand varies highly between shooters. Some keep it perfectly straight, rifle resting on top of the wrist with fingers forward, some turn the hand both inwards and outwards. This means the rifle can be resting on something that looks like the prone shooting position with the thumb and fingers on each side of the stock. Angle it a bit further and

the rifle rests from one the side of the hand over to the thumb (fingers to the right).

Angle the hand right instead and the rifle will rest on the thumb and a finger or two (my position). Or in a larger angle; the thumb and the side of the hand (reverse position from above). Dependent on how you turn the hand, the rifle will align with the target differently. It can point dead on, be right or left or angled towards or away from the head.

*Positive:* no muscle tensions in the hand, many hand positions available, glove optional and lower CoG.

*Negative:* a low shooting position which requires compensation by the hip or back to bring up the rifle (unless the shooter have long forearms).

## Right Arm, Hand and Shoulder

Now we move away from the support column (the left side of the body) to have a closer look at the right arm, hand and shoulder. This side deals with providing a stable contact point with the rifle and triggering. How the rifle attaches to the shoulder changes how close it sits to the body, sideways and height direction of the rifle and its angle (towards or away from the body). Different positions of the arm change the butt plate contact point and alignment with the target somewhat. Finally the hand; it deals with triggering and is another contact point with the rifle.

## Hand

The final piece of this post is the right hand and pistol grip. As before, I won't mention pistol grip setup for the same reasons as above. See this section as an introduction and a good starting point to continue working from.



Straight wrist and hand, good pistol grip contact. Picture from

The right hand does two things; control triggering and provide as the third contact point with the rifle. How you hold the pistol grip is another area which can be very different between shooters. The goal here is to provide a stable contact with the trigger and rifle without affecting its stability during aim. The second part is the tricky one considering all the tensions existing in this area. Both the lift (shouldn't

affect the hand significantly) and pull (an important factor), described above, exists, but also the trigger operating. This is one of few areas where we actually have a demand for movement. The finger has to move, otherwise no shooting can occur. We want the movement to be as miniscule as possible and not affect the position or aim in any way. Even though the act of moving the index finger the millimetre required to operate the trigger is a small one, it can, and does, influence shooting.



Katerina Emmons with an almost horizontal arm and tight grip. Picture from al.com

How the hand grips the pistol grip and with what tension is important. We want the finger to move individually from the hand and to not disturb the rifle. You achieve this by moving the trigger straight backwards. The force applied should follow the rifle lengthwise to not unnecessarily affect it. The easiest way to achieve this is by keeping the hand straight with the index finger horizontal. Grasp the grip with a firm hand, but not unduly strong. The hand should not slip or be close to slipping in position, that will only add insecurity to shooting position. Only bend the finger when pulling the trigger, do not apply extra force.

As mentioned above, keep the wrist in a straight line to ensure muscle tensions do as intended. For all this to work perfectly, the pistol grip has to be setup correctly. On most modern rifles, it can be moved separately for this reason. You can also (and should, but maybe not as a first priority) change the surface by adding or subtracting material to make it fit perfectly. Just keep in mind not to increase grip by adding sticky tape or similar material which isn't allowed. There are also rules on how the grip can be formed (not anatomically for example), check the rules for the correct wording if you're unsure about this.

After setting up the pistol grip you should be able to grip with extra force while in position without any NPA changes. Test it by doing just that, grip it harder than normally and check whether anything moves. If it doesn't, you have a good hand position on a properly set up pistol grip. If it does, changes need to occur. This of course doesn't mean that you should actually grip it harder during shooting, it's merely a test. Have a firm but not overly strong grasp of the pistol grip.

## Alternative gripping



A looser grip with a completely relaxed arm provides fewer surfaces for the butt plate but with less tension overall.

With that being the classic way to grip the pistol grip, and one that works well, there is a variant. It won't work particularly well in smallbore or rifles with recoil, but air rifles are quiet, without recoil, so a slightly different approach works too. That is, a looser grip with less strength and the hand almost hanging on the grip.

There are several requirements to be met for this system to work. The same confidence in the pistol grip contact has to exist. You either need a glove for the trigger hand or not be of a "sweaty hand type" to make sure no slippery takes place. A good trigger shoe contact is still crucial and requires more work to achieve with a looser grip. The index finger should still preferably be horizontal which is trickier to achieve with a looser grip. It is fine to not have a horizontal finger as long as the test described above (gripping harder) doesn't move NPA in any way.

A good contact with the grip is as important as before and can be achieved by changing setup and pistol grip surface. A possible problem is when the hand is hanging on the grip you add tension to the bottom portion which normally points out slightly. With more tension here, the rifle wants to move by twisting away from the body, creating a larger distance between cheek piece and head. NPA and rifle stability is affected when or if this happens. Go for a setup where minimum tension is added in the bottom part of the grip to minimize any influences to the rifle.



Rajmond Debevec barely holding the pistol grip... Picture from sti.si

Positive aspects are less muscle tension used and a more relaxed position. Negative: trickier to find a good trigger finger placement and hand position, plus tension might be added to the rifle.

## The Head

This is the final part for now about the shooting position which deals with head position.



Elaheh Ahmadi, upright head with the rifle brought in close. Picture from issf-sports.org

The head is the fourth and final point of contact with the rifle. It pushes the rifle down and thus locks it in place to prevent it from moving around. It is also a massive weight that easily can shift balance for the entire position if not carefully handled. The main focus of the head is aiming and controlling balance by the means of eyes and balancing organs. With all these very different tasks, care has to be taken when setting up the cheek piece, which is what determines the head's position on the rifle.



Alin George Moldoveanu is heavy on the cheek piece. Picture from en.rian.ru

The head weighs between 3.5 and 5.5 kg fully grown (or around 8 % of the body weight) depending on the person's size. It can easily shift balance when off-centre. You probably don't feel it when standing normally but try standing on a wobble board and move the head around. Balance shifts substantially following the head. Even if you don't move the head around, but instead keep it still off-centre, it will still affect balance.

The body finds a new CoG with its new head position which will need slightly different muscles to keep balanced. Even small shifts affect balance in a sport with as small margins as shooting. In a perfect world the head should be upright, sitting just above the spine, but that's an unlikely setup. It will most likely be shifted sideways somewhat and definitely forward towards the target.

This creates that shift in CoG compared with an upright head position, but as long as it remains within relative proximity of the CoG, it still works. Also keep the CoG in the same area of the feet to make sure sway stays the same. Go outside of your normal area and the body wants to shift in that direction, and then counteract the shift, back again. We have increased sway

The most important task for the head is aiming. The rifle is built for the head to rest upon so it's a matter of finding a solution where this can happen without adding tension to the overall structure or being too far off-centre that it affects balance. The easiest position for the eye to maintain focus over a long time (a competition) is looking straight out of the eye socket. You will most likely have to look upwards to some degree, but keep it minimal. Especially not look through the eyebrows since that distorts the image and puts more strain on the eye muscles which becomes tired over time.

## Cheek Piece



Vebjorn Berg with a upright head position. Picture from [aftenposten.no](http://aftenposten.no)

As before, how to set up the cheek piece isn't what the post is about, but it is a crucial component in the head's position so I'll write a few lines about it anyway.

What we want is the cheek piece to support the head's position but not push on the rifle in any way (or the opposite; not push on the head). Not pushing on either part means no added tensions to the rifle and NPA and rifle stability becomes better. If the cheek piece doesn't support the head perfectly, you have to compensate in some way using muscles to get back on aim. That could mean lifting or pushing the head down or sideways which is done by tensing neck muscles. It could also mean tensing the left arm to counteract the head pushing the rifle away or an incorrect NPA-setup to counteract the shift in NPA (which in turn affects balance and sway). So the goal is: upon resting the head on the cheek piece, nothing else moves (or if it does, it's an important part of the routine, controlled and consistent).



Lamie Lynn Gray with a forward head position. Picture from [mydr.com](http://mydr.com)

The outline of the cheek and chin bone and cheek piece along with setup and head position is what determines how close you'll get to this goal. You want to match the cheek piece outline to that of your cheek and chin bone. This could mean changing the surface or just a different setup. Most of the time the factory outline is enough, especially if you can turn the cheek piece 180° around and/or slide it forwards and backwards.



Gagan Narang with a low head position, picture [from here](#).

Two things to pay attention to are height and chin bone. You want to be completely relaxed on the cheek piece while looking through the centre of the sight which means the height is very important. Off by even a millimetre requires adapting to get back on aim (lifting or pushing down the head by using neck muscles). Really “hang” (that’s how I explain the sensation of a correct setup for myself) on the cheek piece and adjust height appropriately. If the outline and/or setup is incorrect, doing this can be painful over time. The head is heavy and it all comes down on the cheek which isn’t use to this kind of pressure. Play around with all its setup possibilities to find a solution (angle, sliding forward/backward, rotate etc) where it matches your bones. The second thing is paying attention to not pushing the rifle away from the body (or rotate it outwards). This usually comes from incorrect sideways setup or wrong cheek piece outline.

One problem area is the muscles used for closing the jaw, masseter muscle (biting) that affects the head if tensed. It can push the rifle away if not being completely relaxed (try biting when on aim and you’ll notice this). If this is a common problem, and something that occurs even when being relaxed, cutting of the lower part of the cheek piece might solve it. Less material that causes troubles plus there aren’t really any negative effects since the head rests upon the upper part anyway.

When set up correctly, the head acts like a weight, pushing down on the rifle and securing it in place. It locks the rifle in place and creates stability. The left hand supports the weight, the shoulder brings the rifle in close and the head stabilizes it.

## Sight Raisers



Siling Yi with a high head position and upright rifle. Picture from cbsnews.com

A commonly used addition to rifles are sight raisers and less commonly, sideways movement of the sights. They are in many cases needed to bring the head up far enough to aim properly. It depends on your position, body height and neck length how important they are, but look around and you'll see most shooters using extra raisers. Nowadays they are built into rifles directly, but can also be bought separately and in different heights to accommodate every possibility.

Generally speaking, you want to look straight through the diopter when on aim (less strain on the eye) which means having the head high enough to accommodate this. A more upright position requires a different height than the same person using a lower position. I can't say more exactly than this since it's so individual, you just have to try a few different ones or talk to a coach (or fellow shooter).

Adding raisers will change the relationship between cheek piece and cheek and require compensation. Different head positions (erect or more forward) exposes different parts of the cheek to the cheek piece and your previous setup won't work anymore. The larger the height differences are, the more change in setup is required. Pay attention to this, know that it happens and take appropriate measures.

## Sideways Movement of Sights



Stine Nielsen using no sight raisers (smallbore), a rare setup.

The second thing you can do with the sights is to move them sideways. This is in almost all circumstances done to get the sights closer to the eye, not in the opposite direction. If the rifle rests further away from the head naturally and you have to extend the neck sideways to reach the cheek piece, this can be a good middle ground. The head is closer to CoG which helps keeping control of balance and minimize sway.

However, the backside of this type of setup is the effects it can have on the overall position. Since the only change are the sights, the rifle still points in the same direction and rests away from the body. NPA and balance are probably affected by this and will remain the same. You might also add an extra problem by moving the cheek piece sideways which is the remaining space for the head is too small. That in turn pushes the rifle away with effects on NPA, balance and tension levels. Two other aspects are that it complicates how to adjust the sights when shots don't hit perfectly (turning the knobs) and complicates the overall setup (more aspects that can go wrong). Never underestimate what can happen during a stressful situation. What you do during training sets you up for the competition, yes, but even simple tasks can become hard when things are not working correctly.

There are many other options in bringing the head and rifle together than moving the sights sideways (like changing elbow placement, hand position, angle of the rifle, hip position etc). By doing some of these changes you might positively affect balance at the same time as achieving the goal of head and rifle contact. If the rifle position is inferior (that is if more work can go into positioning the rifle) moving sights sideways only solves one problem but the rest remains or might even create some new ones.

So if you have problems reaching the rifle, start by looking at the position setup and use the sideways movements of sights as a last resort. For some it really works, but most shooters can achieve the same result by getting the rifle positioned perfectly in the first place.

## How to be Consistent with Foot Placement

Placing the feet in the same place every time can be tricky if you don't have a system to follow. Most shooters spend a lot of time developing the perfect placement for their feet. You can control a lot by just moving the feet slightly (or a lot). Height of muzzle, balance, hip placement, tension levels and NPA can all be affected and worked upon by changing the stance. Of course this means that they should be in the same place every time you train. If you have developed a feel for the position, the actual placement will be quite similar from training to training since that is what feels the best. Still, some differences exist (which is not a bad thing per se, see below) and they might move you in an undesirable direction training wise. By this I mean a shift in position/balance/NPA that affects the performance negatively and was not a conscious choice by you. Usually this comes natural when in the normal spot at the home range, but how about a different range and competition nerves playing tricks? So you need a system. Most are taught when starting out to find the centre of the target and extend that line down to the firing point and this will be your reference to build the position around. This is a good start but leaves a few questions hanging:

- What if the target is to the side compared to the firing point or you have to work around a problem or accommodate a tripod?
- Distance between feet?
- Angles and general placements?

To answer these questions we need to add more steps to the routine (or change it entirely).

### Orientation to target

The classic way (explained above) works fine here with a tweak. Start behind the target, find the centre and extend that line down to you and put the rifle here. You might have to re-align by looking over the rifle to get the correct line. This sounds very easy, and is on some ranges, but it can be tricky on others depending on how the surroundings look like. If possible, try to use those surroundings by following floor boards or ceiling lamps. Maybe a lane number, TV-screen or any other marks can guide you right. What to look out for here are for example incorrectly lined up floor boards which might fool you or a lane number that is not straight under/above the target centre. If you need to stay close to a target carrier or change position to accommodate a tripod or stay away from a pole which means the centre of target line doesn't work anymore the rifle works even better. Decide where you need to stand for this to work, put down the rifle and make sure it points towards the centre of the target. Now you have a line that is angled but as long as you follow the rifle instead of the table you will be aligned correctly anyway. Just make sure your whole position follows, feet should be angled accordingly – not just moved sideways.

Once you have the line you want, the next step is to line yourself up using this line. Where exactly you need to stand I can't say since that will be different between people. A good way to start is to stand close enough that your body is just touching the rifle. This should mean you are lined up slightly to the left of the centre line. Take note after five training sessions of where you stood, measure it and you will find your own distance to use.

## Consistent Foot Placement

Once you have figured out a placement that seems to work, you'll have to measure it somehow. What you want to know is everything required to place you in this position every time and every place. So distance between feet, angles and the sideways shift. This can be directly measured by the use of a measuring rod (or tape) or indirectly by using something nearby like a target or tripod. Use the same system every time to avoid problems or unwillingly changing the setup over time.

Measuring rod has the advantage of being a scale, easy to have in the bag and if you want to save weight (air planes), can be cut to the desired length. It can also be angled to work in two dimensions. In case you make a position change it doesn't have to be replaced, just change the measurements and it will continue working fine. A negative aspect is that you have to place it on the floor before putting on shooting clothes and that also makes it harder to move later. The same goes for taking a break in the middle of shooting. Maybe you have moved and want to get back to this new placement, but you have to unzip clothes and move the rod first, so it can be a bit tricky.

## Making Your Own Model

A normal approach is making something out of targets (a 5 target string works well here) that defines the outlines of the foot position. It could look like an "L" or "I\_\_I". Positive is the level of individualization it gives you, it will fit you (but only you) perfectly. It's easy to keep in the shooting trunk and light weight. Negatives are that you have to make a new one when changing placement and the same as above (it has to be put on the floor before getting into position). Also, if you need to change placement later, the model might be in the way and you end up standing on it, which is not good.



Another way is to use the tripod as a measuring device. The width of the legs can measure the stance width and by suing reference points on the boots and tripod, feet angles and placement can be sorted out. I'll give an example of this further down. Positives are that you always have the tripod with you anyway, so no extra equipment is required and it doesn't has to be replaced when changing stance. Another good part is you can use it while being dressed and as a guide if stepping out of position in a training or match. Negatives are the width of the tripod base, it can't accommodate very wide or narrow positions and exact foot placement is tricky, meaning the exact angle won't be as perfect as a drawing of the position.

## How to



The easiest approach is to start with your left foot (or right foot in case you are left-handed) and then use this to place the right foot. The reason for this is to not get close to the table and touch anything in position. The left foot is also normally kept straight for most people while the right can be more angled and are therefore easier to place. So use the rifle as a guide and place your left foot accordingly. From its position, use the system you like and measure up the distance and place the right foot.

I would suggest doing one thing at a time to avoid problems, meaning you start with the distance, then do the sideways position and finish with the angle (or angle first). It's like with most things, trying to do several things at once usually ends up with lesser quality than to focus on one thing at a time. If you angle the left foot anything, add this to the routine so it's a 4-step routine, wherever it fits. Either before or after the right foot is in place. This depends on what kind of system you use. In case of your own model this part is easy, just place the feet accordingly. For the other two it might help to end with this foot since a straight foot is an easier starting point.

### **An example**



Since the first two systems are quite self-explanatory; you measure exactly where to place the feet and then place them there, I don't have to go into detail here. But the last one might need an explanation of how to use it.



Use the tripod legs to measure the distance between your feet. Some tripods have different length of legs so you can find a combination that works; others have an angle at the bottom so a few different lengths can be used. Also the shoes can have reference points to look at (or you make a mark somewhere on them).



That takes care of the distance, for sideways placement you can use shoe laces as a reference. Place the tripod straight with one leg pointing forward and the two other forming a straight line between them. So one leg touching one foot and the other leg close to the other foot. Using a reference, you can then move the foot to the correct place. The angle is a bit trickier, but the same system can

be used again, just different placement of the tripod legs. Measure different distances, for example toe to heel or lace hole to another hole (between the feet).



*Right foot forward*



*Right foot backwards*

Now when taking a break you just have to put the tripod touching your feet at some key points. When back from the break, just place your feet at the same place as before and continue your training or competition.

## Watch out



*Where to place your feet  
after a break*

One very important thing to watch out for is this: do not feel you have to stick to your placement every time. Stepping out of the stance now and again might be beneficial for performance. Stance is something that constantly can be improved on and to stick to one model when you really need to change something is not good. Yes, this placement did work before (and might still be the best one) but things change. A slightly different position, body or range might require a change here too.

Make a change, try out new ideas and you will continue developing in your shooting. On the other hand, making changes just for the sake of changing something is not good either. It's a cost-benefit balance to keep in mind. So what I'm getting at is to not feel locked into the "correct" stance when you'd like to (and need to) make a correction.

## Summary

A few different systems can be used for foot placement; they all have positive and negative aspects to them. Which one to use is up to the individual, but a combination is never wrong. Take the best from all systems and make your own. What is important though is to make it simple and easy reproducible. It should work wherever you might be shooting and in a stressful situation (like in all shooting technique). Start by finding the line through the target centre and use this to orient yourself. Find the spot for the left foot first and measure out where the right foot goes. Keep in mind that once the stance is found, it is ok to move a foot slightly if necessary. Don't stick to "the correct" placement only because it's supposed to be just that, the correct one. One day is different from another and the body change slightly all the time making this a constant, evolving, process.

## Consistency in Position Setup – A Training Session

Part of this training session is to figure out a way to set up and align yourself in relation to the target in such a way that you end up in the middle every time. This is an on-going process which, over time, will be refined. Training on this should preferably be done at the beginning of the season or during off-season. Since it's related to the position, any changes to it might also mean changes to how you set it up. Come back to this from time to time, especially when you find yourself too far off aim when starting a training session or competition.

### Preparation

- Read through a couple of past training journal pages for any important notes to use in this training session
- Warm-up/stretch
- Make sure all equipment are placed within reach

### Training session in blocks (90 minutes if each block is 15 minutes)

- Get into shooting position and train for 15 min to make sure you have it set up correctly. Use a familiar lane or range.
- When you feel that everything works like it should, step out of position and set it up again. Be careful to align the position correctly with the target and pay attention to what cues you go by. That is, what reference points and system you use to align yourself both in accordance to the target and your body parts. Shoot for 15 min and make the appropriate adjustments in case you ended up off-target. The goal is to end up exactly where you left off.
- When you are back and comfortably shooting in the centre, step out of position again. Set it up, shoot 3 pellets, adjust if necessary and step out of it. Repeat this as many times as you can over 15 minutes without rushing it. The goal is to continue shooting at the same place each time (preferably the centre) and any misalignments should be taken care of directly.

Focus above has mainly been on consistency in foot placement and hip-aligning and figuring out a system to use in this area. For the second half of the training session we will focus on aligning the body with the target.

- Move to another lane or move 1 meter left or right. Set up the position and shoot until you are back in the centre again, you might have to make adjustments until it's perfect. When you are back in the centre it's time to move to another lane (or 2 meter in the other direction). Continue moving around and setting up the position for 15 min. Figure out a system that works and continue improving upon it.
- The next step is to move outside of your comfort zone by changing surroundings completely. Do not shoot in this block for safety reasons and stay away from aiming at dangerous situations. So,

either have someone telling you to aim at a specific point on the wall or find one yourself. It should preferably be in a strange surrounding where your normal system won't work perfectly. For example; turn around and aim on the back wall or move to another room. (and again, absolutely no discharge of air or pellets – in fact, unscrew the cylinder to make sure of this). Set up the position as you would, align it correctly and start aiming. When you are in equilibrium, close your eyes and count to ten, open them and have a look at where you ended up. Make adjustments and repeat. Once you end up in the centre, find another point on the wall and start over. Without the normal cues on where to stand (target, target carrier, bench etc.), it forces you to adapt to the situation and fine tune your system of setup. In the end it will teach you to find solutions to every strange shooting range you might encounter. Do this for 15 min.

- Go back to the lane and finish the session by shooting for 15 min.

## After training

- Write in the training journal
- Stretch if necessary

This session will take 90 min in total (all blocks are counted as 15 min each). If you want to reduce the length, either reduce the time for each block or take away the second and the last training block.

Make sure you write down anything new you added to the routine so to not forget it until next training session.

## Natural Point of Aim (NPA)

On top of using a different elbow placement and hand position, you can control the height of the rifle by moving the hand closer or away from the head. The highest position can be reached by keeping the arm vertical. If the hand is then moved outwards or inwards, NPA drops. Avoid having it behind your vertical line because it lowers the integrity of the structure somewhat. The support column will be stronger when all its parts are in a straight line, carrying the load down to the ground. Many shooters have their arm angled outwards (most pronounced today is Katerina Emmons), no-one (that I've seen anyway) inwards. Changing contact point like this is a way to control for height and adapt the position to different ranges. Do keep changes to a minimum though. The setup normally used is also the one you're most familiar with and one that shouldn't be changed regularly. When you have found a hand and elbow position that induces minimal tension and keeps NPA at its correct place you want to stick to it. You especially want things to remain familiar in a competition where factors both inside and outside of your control affects shooting.



Niccolo Campriani, from ISSF YouTube channel.

Another aspect that also changes due to which hand position is used is sideways alignment. How the forearm aligns is due to where the elbow sits and how the hand is set up. What you definitely don't want is an arm that wants to fall outwards, away from the body. The bicep should be kept completely relaxed and the arm must stay in the same place. Move the rifle around on your preferred hand position to find the spot where this happens.



Jason Parker with a reversed prone hand position

The elbow can also be moved around to counteract such structural problems. Example, me: my arm likes falling outwards, so I fixed this by having the elbow further out on the stomach to angle the arm inwards and then counteract the shift in NPA by resting the rifle on the thumb – middle finger. The rifle sits close to the body and the arm doesn't move, it works for me but doesn't have to for you. Experiment, but keep away from extremes in the beginning. Most problems can be overcome by keeping things simple. Extremes usually come with a set of their own problems and might be the solution at this particular point in the position but create another problem somewhere else.



Qinan Zhu using a fist, [from here](#).

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## Butt Plate

I won't talk about how to set up the actual butt plate (or rifle) here, only how the contact with the shoulder affects NPA and rifle angle. Rifle setup is a subject too big for this article and would take up space from this is really about.

Goals are: relaxed shoulder, secure and consistent placement and alignment of rifle with the body and target.

Secure placement means that the butt plate won't move when in shooting position or setting up the position. By creating contact over the whole butt plate, you minimize any movements from happen. Butt plates of today can be adapted to fit many different shoulder profiles by changing the outline of the contact point. They also have rubber added for increase contact. Pay attention to creating a good profile and try to achieve the most contact possible to ensure no movement in position. [Check the rules](#) for exactly what's allowed and stay within those dimensions. Now we move to the next step, where to put the butt plate.

Extend your arm in front of you at shoulder height and bend in the elbow. Tense the muscles and take your left hand to find the point where the biceps, pectorals major and deltoid muscles meet. Where all these muscles meet, a small canyon is created which extends across the arm. Use this for your butt plate placement. It might feel like it's far out on the arm, but when you hold the rifle in position, it will sit close to the body, undisturbed.

By placing it further in, you have to rest the butt plate on either the pectorals or the deltoid muscles. The contact then becomes sensitive for muscle tensions and moves much easier when setting up the position. Another problem with a close setup is that the rifle most likely will be pushed away from the body. There's not enough space between the rifle and body which pushes the rifle out. If you at this point fight it back in, problems will mount up. If you instead set the butt plate up further out on the bicep, the same problem of sensitive contact point and movements during setup occurs (now from the biceps). The rifle will also be at a further distance from the body which you'll have to cover with the head. Position becomes front heavy and unstable. So keep the butt plate in the hole created between the arm muscles. When you have the location it's possible to angle the rifle differently. Angle it inwards and the sights and cheek piece will be closer to the head resulting in a straighter head position. A possibility to attach the butt plate higher or lower also exists which changes NPA. The higher in the shoulder the rifle sits, the lower the NPA is. The opposite is of course true too.

## Right arm



*Arm completely relaxed, butt plate could be deeper in the shoulder though*

It might not look like it at first glance, but the right arm is important in butt plate contact and rifle stability. There are two things normally done that goes against the general rule of staying as relaxed as possible, lifting the arm and pulling it backwards.

By keeping the arm completely relaxed, hanging down and touching the chest, no tensions are added. Very positive and what we're generally going for. The drawback is what happens in the shoulder and butt plate contact which becomes much smaller. A hanging arm has a smaller area where the butt plate can sit, lift it up and the area increases significantly.

A large contact area is, as mentioned above, important for a stable contact and should be sought after. The higher the arm is lifted, the more contact area can be used. Shooters usually lift it somewhere in the middle. Few people have it completely relaxed or as high as parallel with the ground. The idea is to only lift it high enough that enough contact exists for your build and butt plate position. Any higher and we have a situation where more tension is added than what the position benefits from. Experiment on heights to find what works for you.

Height of the arm will also change NPA and how the rifle is affected. A hanging arm puts more weight on the lower bottom of the pistol grip and thus creating a twisting motion of the rifle – it wants to move away from the body. The higher the arm, the more inwards of a twist the rifle can have (cheek piece closer to the head). We generally go for vertical or an inwards twist, never (rarely) outwards. If the rifle is twisted outwards, the body will constantly be in a forwards rotation, toe heavy, which requires

compensation. The position is unstable with increased sway and tension. NPA will be affected in a similar way, going left with a higher arm and right with a lower arm.

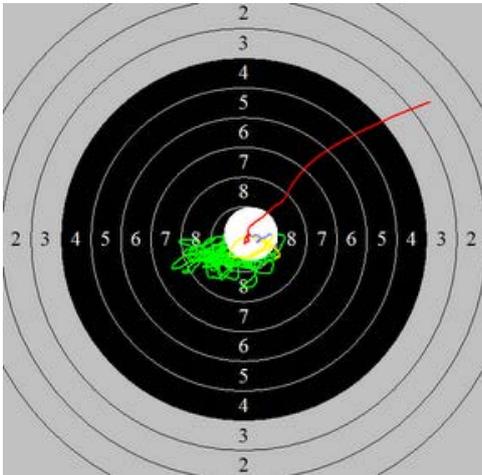
## **Tension**

When lifting the arm, only apply just enough muscle tension in order to get the job done and no more. As I've mentioned earlier, a muscle can be activated at different tension levels. In shooting, we strive to be as relaxed as possible to minimize any negative interactions with the rifle. Also, keep the shoulders as relaxed as you would without lifting the arm.

The second tension that is added by some shooters is a backwards pull to make sure the rifle sits tightly in the shoulder. By pulling the arm straight back you also pull the rifle backwards and make sure it doesn't move during aim. This is also positive for pistol grip contact. Make sure you only apply minimum required muscle tension to get the job done. By using more force the rifle will sit tighter in the shoulder, but that won't give you anything extra, more isn't necessarily better. If the rifle doesn't move, or have a chance to move, while in the shooting position, then no more tension is needed. An important aspect to think about which ties into the final topic of this post, is how the wrist is aligned. When adding tension like this you have to keep the wrist straight to not cause any disturbances to the position. A straight wrist is a stronger structure and can more easily absorb the tension and channel it properly down to the butt plate-shoulder contact. Adjustment to be made are either on the rifle (length of pull and/or height of butt plate) or hand and arm position (how you grip the pistol grip and how/if you lift the arm).

## After the Shot

### Follow Through



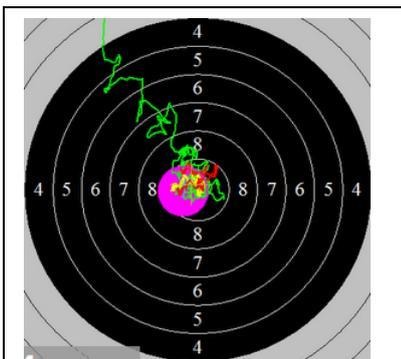
*No follow-through. Aim was held long enough to prevent the shot from being tweaked, but this makes it hard to evaluate the progress and call the shot.*

Follow-through refers to the act of continuing aiming after the trigger has been pulled and the shot scored. Usually this means treating the shot as if it's still under progress and staying on target for around an extra second. There are a few reasons for doing this which may or may not apply to you. They are; maintaining focus on the shot process, evaluation of the process and position, slowing down shooting pace and increasing technique awareness. Calling the shot falls within these categories as well but is more of a method for checking the actual position/technique than a category in itself.

### Maintaining Focus

By letting yourself continue the shot process even though the actual pellet has left the barrel you move the point where the shot process stops. Instead of stopping at the peak of importance (pulling the trigger) you continue through and make sure everything is in order even after this point. Focus shifts towards sticking to the thought-up, and trained-on, shot process which adds importance to the whole progress of the shot instead of just a small part. This will in the end increase performance (or so is the idea anyway).

### Evaluation



*Shot to the left (maybe due to the approach) but follow-through well placed over the last seconds aim trace*

How did the shot play through? Were all elements in place? Check and evaluate balance, inner position, relaxation, NPA, approach, triggering etc. Anything that you can easily change by just knowing what happened is of interest. Compare this with how it's supposed to look like when everything works like intended and make the necessary changes. Try to only look at the shot at hand and not count previous performances. That's for later when the training journal is filled out.

## **Slowing Down Shooting Pace**

By giving yourself an extra second after each shot to observe and think about what just took place you also slow down the shooting pace. The risk of switching focus to the monitor or react at a bad performance too fast disappears. It acts both as a physical slow down (you have to wait a moment before putting down the rifle and re-start the process) and as a mental one. Instead of reacting directly (usually angrily) at a less than perfect performance it allows you to check what happened and find an explanation and therefore move past the initial disappointment. Hopefully this stops any future bad performances that followed because of the initial reaction (the classic string of nines that's hard to stop). It also slows down the opposite, a string of tens which might build up tension over time or make you sloppy ("it's so easy right now – I don't have to work as hard to shoot them").

## **Increasing Technique Awareness**

By paying extra close attention to what's actually going on you'll also increase in technique awareness. Knowing exactly what happens in each step (tip: write it down once a year to make you think closely about every step involved) is important when it comes to refining the process or pinpointing where it went wrong. It makes you aware of what you do and why you do so. By continuing this line of thought, are there any better ways of receiving the same result? Overall you achieve a deeper understanding of how you work, in training and under pressure.

## **What you do**

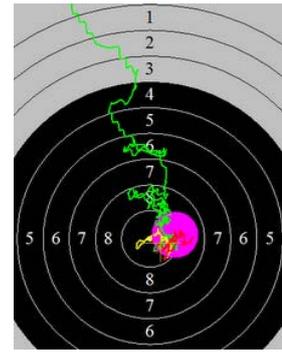
So how does it work? The first part has already been mentioned earlier in the post; stay on aim for one more second after the trigger has been pulled. This is only a part of it. The important part is to use that extra time for something specific, otherwise it's not used to its full potential. The big one is observing. Observe where the muzzle ends up after the pellet has left, how much does it move and with what speed. Keep track of any patterns that require changes in technique or position. Observe how the body moves.

Usually the body relaxes after "the important part" has passed and moves towards a balanced state. If you've been fighting with equilibrium during the shot, but have been too busy to note it, this is the time to realise it. Yes, you can't do anything about it for the moment but there's a new shot coming up in a short while where this knowledge comes in handy.

Observe muscle tensions. Any muscle that relaxes after triggering probably should have been relaxed already. A tensed muscle which shouldn't be tensed can cause the muzzle moving in an unwanted direction or shift balance, cause a twitch etc. Use the collected information towards the next shot and make that one a little better. Work towards a better understanding of how you work in general and in specific situations.

## Calling the Shot

A specific technique is used called, 'calling the shot'. It refers to the ability to say where the shot landed after pulling the trigger; what score (preferably in decimals) and where (use the clock as a guide). To be able to do this you have to closely watch how the barrel moves and where it ends up. So it's pretty much like previously described only you put it in an action to verify that you paid attention. With training you can become very accurate and use it as a quality check. If the shot doesn't land where called, something is wrong and needs fixing.



Shot overlap the follow-through perfectly. Centre of Aim not matched with target centre and shot placement (a couple of clicks left and a small change in NPA will solve this)

## How to use the information



0.51 s of follow through. Lucky shot since the barrel jumps up and the shot "should have" landed higher.

As mentioned, the pellet that just left the barrel is history. There's nothing you can do that will change the outcome once the trigger has been pulled (anything legal at least). The only thing left to do is to learn from what just happened (good or bad) and apply that knowledge to the next shot process, thus making that one slightly better. In a training environment there's a lot you can work on. Actually use follow-through the intended way.

As with all changes in shooting, they should always be tried and perfected in training before being used in a competition. From the muzzle jump, speed, direction and where it comes to rest you can get information of faults in NPA (both vertical and horizontal) which can be fixed by a multitude of changes (feet position, alterations to the rifle – body connections, tension levels, position). From body sway and especially how it moves after the shot you can get information about NPA, shooting position and foot placement. To complicate the matter further, in case of being front heavy; it could both be a NPA fault of right or left.

Left: a setup to the left will force you to compensate in one way or another to bring the muzzle up on target which lowers position quality.

Right: the normal problem of using muscle force to bring the equilibrium back a bit and when the trigger is pulled to sway forward.



0.58 s of follow-through. The barrel moves directly to the right, compensates back a bit but there's definitely a balance/NPA Problem

Opening up the position to the right (having the barrel sit in front of the positions CoG) lets the body continue moving forward with front heaviness and excessive sway being the result. Tension levels or how relaxed the body is can be a hint towards imperfect NPA (you have to add muscle force to move back onto target), wrong setup (foot position, hip position, butt plate or any other of all possible reasons) or just poorly relaxed muscles. Are all body parts arranged in the intended way?

For competitions, there's a limit to what you can change. For a lot of people, competitions add to tension levels and lowers overall quality of position and execution. The idea is to stick to your training routine, do as training predicts and performance follows. Don't try and fix problems you work on in training, leave those for the actual training session. Just make sure all details are as close to the optimal as possible and use follow-through as the test (same as in trainings) from which you make the necessary changes. The difference is you don't go on a bigger quest, trying to find a new solution to an old problem. Stick to what you know and trust.

As a finale it's worth mentioning to not over evaluate shots. In training that could work and be beneficial but when it comes to competitions flow and a steady motion forward is the best approach. Let the shot proceed, have a look afterwards if everything is in working order and move forward to the next one.

# Balance

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## Balance – The Research

### What Does the Research Say?

Balance is of key importance when it comes to shooting. It affects performance directly or indirectly by affecting steadiness of the hold, the hold area, and execution of movements and relaxation.

Later on in this document, you can find some good exercises for improving your balance both in and out of shooting position; and read about how stretching calf muscles just before starting a shooting session increases body sway. If it affects shooting performance or not is a different question but this is theoretically the case.

This article will look at studies that are directly related to shooting. Fortunately for us, there are a few made of this kind (which is rare since shooting isn't a big sport and thus less studied).

### How Balance Affects the Position

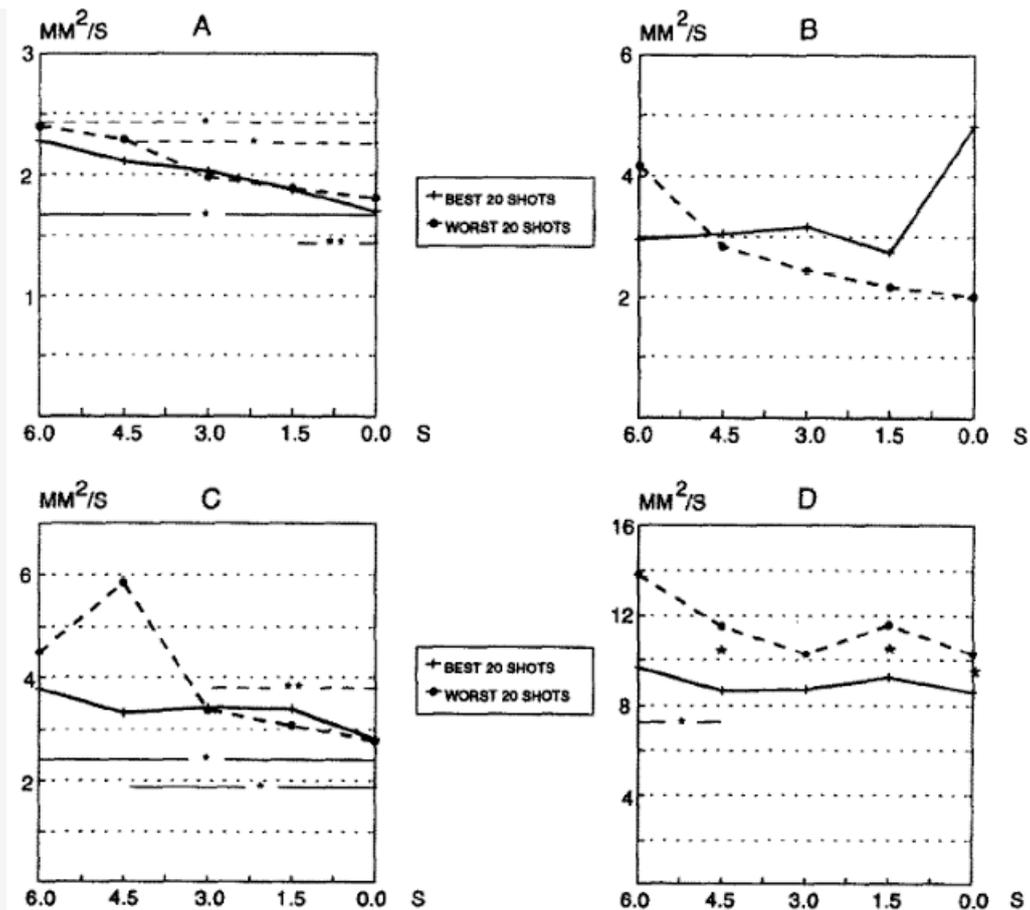
Balance affects the body in two directions, side to side and front to back. Standing in a shooting position, the first direction is up and down on the target and the second is left and right movements (normally called body sway). These two movements, and corrections thereof, start at two distinctly different places. Side to side movements are usually of a lesser degree with the larger platform formed by standing normally (feet about 20 cm apart from each other) which is sufficient for maintaining a good posture in this direction. Balance is affected by moving feet closer together or further apart or through specific training. Body sway, on the other hand, can't be changed in this fashion. It's based on foot length and the only way of reducing sway here is by becoming better at counteracting these movements. Sway starts in the ankles and is controlled by tensing and relaxing calf muscles. On the other hand, hip muscles are involved in correcting side to side movements and it seems like these two systems act at different times.

The study (2) says that changes in side to side movements are done by locking the calf muscles and then correcting the misalignment with the hip. Sway is corrected by tensing hip muscles and by counteracting movements with the calf muscles. This was found using a test where participants held a laser pointer fixed to the side of their body on aim at a target. They were told to only adjust the laser's position by correcting their body's position (similar to what happens during aim since the rifle is supposed to be held up as much as possible by bone structure and not muscle force). The researchers let participants stand in two ways, facing the target and at a 90° angle (exactly as shooters do). Results were consistent over the two positions. This gives some insight into why novices to the sport often counteract a problem in high or low NPA by moving the hip.

## The Difference Between Experts and Novices

The first study (1) looked at different levels of performance; international and national top-level shooters and novices to the sport in relation to balance. 24 subjects divided in three groups of eight were tested using a NOPTTEL sensor attached to their normal rifle. They stood on a force platform using their normal stance and equipment (shooting clothes, boots and stand). In total, between 100 and 200 shots were fired by each subject, the data from the force platform and NOPTTEL were combined for later analysis. Measurements were taken at 1.5 s intervals (7.5 – 6.0 s, 6.0 – 4.5, 4.5 – 3.0, 3.0 – 1.5 and 1.5 – 0 s before the shot was taken) and used for comparison. The quality of the shot was measured by the actual score and by movement pattern over that last 7.5 s of aim as evaluated by a coach. Results showed that the more skilled the shooters were, the better stability they had; the top group even increased in stability during the measurement period.

Something really interesting is what happens when you compare the 20 best shots with the 20 worst as defined by score and movement pattern. No difference between the best and the worst shots could be found in postural stability (balance) within the groups of skilled shooters. I didn't expect that, considering the importance of balance. For novice shooters, there is however a definite difference ( $p < 0.05$ ) suggesting that something changes the better the shooter becomes. One reason could be the analysis which was done on an inter-individual level. It's possible that shooters are too different from one another and that intra-individual testing is the way to go (variance within the subject, finding patterns between different shots fired by the same person). It would have been nice if they had included another group between top-level national shooters and novices to maybe see if the trend is a gradually declining dependence on balance or not. One explanation could be that the better the shooter, the better they are at aborting bad shots (i.e. issues with balance) before pulling the trigger; causing bad shots to not be recorded and part of later analysis.



Combined results of speed and distance from centre for the 5 intervals before the shot. A = international Men, B = International Women, C = National Men and D = Novices.

Movement speed reduces closer to the shot for experts but without a difference between good and bad shots.

One major difference between the three groups is that competitive shooters were allowed to use their normal shooting clothes but novice shooters were not. They wore jeans and a t-shirt making the comparisons harder. A study made by Aalto suggests the improvements are in the region of 20 % when adding supportive clothing. Skilled shooters are also better at using the vestibular system and proprioception instead of visual cues in maintaining postural control than novice shooters.

The problem in that study is the method of testing; subjects were quietly standing with arms crossed over their chest outside of a shooting position. This makes focus on balance easier which doesn't happen in an actual shooting situation. However, the current study shows improvements greater than 20 % (30 – 70 %), thus suggesting there is more at work than just shooting clothes (1).

Study number four focused completely on elite shooters (4). The subjects were two women and four men, all participating in international competitions and part of a national Olympic team. The setting was primarily the same as in study number one, where all participants were using their own equipment with a Scatt sensor to track muzzle movements and a force plate for shifts in Centre of Force (COF = balance). Participants were given time to familiarize themselves with the built up range and then asked to perform

20 competition shots. Analysis was done both intra- and inter-individually which means they were analysed for correlations both within the same person (within the 20 shots) and between different people (within 120 shots – 6 subjects with 20 shots each). Time frames used were 5 s, 3 s and 1 s before shots. Balance at the different time frames was measured against four different variables: Length (total distance moved in each axis) and Range (the distance between max and min values of COP) in both X- and Y-axis's. Scatt values were measured for score, PosX, PosZ (horizontal and vertical displacement of shots), Std 10.0, Std 10a0 (time in 10.0), Length X and Length Z (length of aim point trace in horizontal and vertical direction). All these measurements were taken over each time frame, for each shooter and each shot making it a major data collection. Results were as follows:

**Table 3.** Aim point fluctuation data for rifle shooters ( $n=6$ ; mean  $\pm$  s)

Parameter	5 s to shot	3 s to shot	1 s to shot
Std10.0 (% time)	54.3 $\pm$ 19.4	61.2 $\pm$ 17.9	72.1 $\pm$ 12.8
Std10a0 (% time)	62.4 $\pm$ 17.6	71.8 $\pm$ 15.4	88.4 $\pm$ 7.1
LengthX (mm)	64.9 $\pm$ 10.7	38.0 $\pm$ 5.9	11.9 $\pm$ 2.0
LengthZ (mm)	43.6 $\pm$ 6.2	25.7 $\pm$ 3.2	8.3 $\pm$ 0.9

**Table 4.** COP length and range for rifle shooters ( $n=6$ ; mean  $\pm$  s)

Parameter	5 s to shot	3 s to shot	1 s to shot
COPxLength (mm)	10.8 $\pm$ 2.6	6.0 $\pm$ 1.3	1.8 $\pm$ 0.4
COPxRange (mm)	3.3 $\pm$ 0.8	2.3 $\pm$ 0.5	1.1 $\pm$ 0.3
COPyLength (mm)	11.6 $\pm$ 3.5	6.9 $\pm$ 2.0	2.2 $\pm$ 0.6
COPyRange (mm)	1.2 $\pm$ 0.4	1.1 $\pm$ 0.3	0.7 $\pm$ 0.2

Mean shot score was  $10.1 \pm 0.3$ , mean PosX =  $1.6 \pm 0.5$  and PosZ =  $1.1 \pm 0.5$ . Stability in a vertical plane was better than the horizontal axis as is mostly the case considering the stable support in this direction. However, I find it surprising that scores were “only” in the low tens on average. Also, Std10.0 is low for international competitors. Two explanations I can think of, is that participants may have been smallbore shooters and they were tested in air rifle which is not a perfect situation; and that testing is a stressful situation. Overall, stability increases the closer to the shot we get with a 1.1 mm shift in balance the last second. For the Y-axis, the shift is 0.7 mm. These numbers are less than half of what can be seen in non-shooters (3-16 mm) (5, 6).

Despite this much data, no significant correlation on an inter-individual level (between different shooters) could be found. However, the interesting part is the result from the intra-individual analysis. The summary of this shows that all six participants have a correlation between at least one of the COP variables and one of the performance variables. For four of these a regression equation could be formed predicting performance (see Table 5).

**Table 5.** Multiple regressions predicting shooting performance from body sway parameters for individual shooters ( $P \leq 0.05$  only)

Parameter	Shooter	$R^2$	$P$	Regression equation
<b>5 s to shot</b>				
Score	R2	36.1	0.02	$11.7 - 0.34 \text{ COPxRange s5} - 0.84 \text{ COPyRange s5}$
PosX	R3	36.9	0.03	$5.83 + 0.26 \text{ COPxRange s5} - 2.93 \text{ COPyRange s5}$
PosZ	R6	23.0	0.03	$3.33 - 0.62 \text{ COPxRange s5}$
<b>3 s to shot</b>				
Score	R3	36.5	0.03	$11.1 + 0.28 \text{ COPxRange s3} - 1.64 \text{ COPyRange s3}$
Score	R5	37.2	0.02	$10.3 - 0.33 \text{ COPxRange s3} + 0.12 \text{ COPyLength s3}$
PosX	R3	40.9	0.02	$-1.42 - 0.73 \text{ COPxRange s3} + 4.7 \text{ COPyRange s3}$
PosZ	R5	33.2	0.03	$0.24 + 0.35 \text{ COPxLength s3} - 0.2 \text{ COPyLength s3}$
PosZ	R6	22.3	0.04	$2.45 - 0.47 \text{ COPxRange s3}$
<b>1 s to shot</b>				
PosX	R2	28.2	0.02	$2.39 - 3.25 \text{ COPyRange s1}$
PosZ	R5	26.7	0.02	$0.42 + 0.67 \text{ COPxRange s1}$

Shooters 2, 3, 5 and 6 show a correlation between performance and sway parameters.

Every shooter had a different prediction parameter and regression equation making it highly individualized. Shooter R5 for example had LengthZ as a very strong predictor ( $p < 0.01$ ). The closer to the shot the stronger the predictor with a  $R^2$  of 62.3 for the 1 s interval! The rest was not as strong as this one, but they all had an important variable tied to them, meaning it comes down to what your individual strengths are. It would be nice to see more studies in the future if this is a valid connection, that is; individual strength = performance parameter.

For novice shooters the relationship is somewhat different. [Mononen et al](#) (3) tested 58 novice male rifle shooters from the air force with a standard assault rifle, so not under ISSF's regulations. Results showed that there's a link between scores and postural stability on an inter-individual level. This is in line with the first study above, the better the shooter, the more individualized the correlations are. In this study, no link was found between score and postural stability when moving to an intra-individual level. It seems like more experienced shooters can control balance and the rifle individually and the more novice you are the more important postural control becomes. The different approaches to controlling the rifle between novices and experts have been seen in other studies as well (10, 7). Side to side and front to back sway accounted together for 26 % of total variance in scores. In earlier studies on running target and pistol, this variance has been 53 % and 75 % (8, 9).

## Summary

Balance is an important aspect of performance, but varies greatly among individuals. Standing rifle shooters differentiate themselves according to their level of performance. The better the shooter, the more individually balance and sway interacts with rifle stability and performance. In the case of non-shooters, sway can be in the magnitude of 16 mm, but is normally closer to 3 mm over one second of quiet standing. Novices rely mostly on visual input for monitoring sway which causes more movements in position due to the blinds and diopter blocking light, while we find the expert shooter with half as much sway as the beginner in the horizontal plane and in position. Expert shooters also rely less on visual input and use more proprioception, feet pressure and the vestibular system, making fine-tuning an easier task. Shooting clothes add around 20 % of stability and that's due to restricting movements in the ankle and hip region.

The closer to an expert level the shooter is, the more specific balance seems to be as suggested by two studies. So, anyone new to the sport will benefit from general balance training but the closer to expert level you get, the more specific your balance training has to be. Make an objective evaluation of the entire position and movement sequence, preferably with a coach, to find out what needs most work.

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## Balance - Training exercises

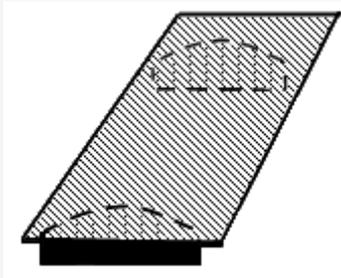
Below are a few ways to train your balance both in and out of position. Try to always challenge yourself, don't become lazy and just do the same thing as in previous sessions. You will quickly hit a plateau and stop developing. Also, balance needs to be maintained now and again to not decline. Put this kind of training into your plan in the beginning of the season or off-season. Preferably, the balance should just work when you are working on other parts in the technique. With a particular focus on this task you will quickly gain in performance and will later in the season just have to maintain it.

## In Position

The first step is to feel your balance shift when in position. Get into position, settle down and relax. Feel how the centre of gravity shifts from the toes to the heel and back again. The goal is to be aware of how it's supposed to feel when in control. This is important for later when the training is done on a more unstable ground. The next step is to do the same but with the eyes closed. Get into position, relax and close the eyes. Try to always be relaxed (applies to everything in shooting), it is much harder being well

balanced without being in a proper relaxed state at the same time so the two go hand in hand. Focus on standing as still as possible, feel the balance shifting.

After being aware of the correct feeling and how the feet control the body sway it's time to take it to the next level. Add an unstable ground like a wobble board. It is basically a flat board resting on a concave surface. There is really no point in having a standard wobble board where you can move in all directions since the position is only unstable side to side. A standard board will cause too much instability in unusual directions to draw attention away from the task at hand. A wobble board suited for training in position has only one direction of movement and is easy to make yourself.



Balance board. A piece of MDF resting on two wood blocks with a concave top.

Cut out a square of MDF in a size big enough for you to stand in position on. Fit two concave pieces of wood with a width of 3-4 cm and a height of 5 cm under both sides. My pretty picture to the left shows how one can look like. If done correctly, standing on it will increase the side to side movements. Instead of a bigger board you can make a smaller one for each foot. Easier to fit into the training bag and bring with you. The book [“Ways of the Rifle”](#) has an example of this.

While standing on it (or them), try to find the balance by moving your feet until you are reasonable stable. If your position has any problems with balance it will be exaggerated and this could be a way to find out and correct it. Stay relaxed and get into position. This is not as easy as it sounds, especially not the first time doing it. A training progression could look something like this: just stand on it, with a rifle in position, in position with head on cheek piece looking down, looking through the sights, shooting and finally with your eyes closed. Obviously, the difficulty can be increased by changing the radius of the concave surface. Smaller radius equals increased body sway.

In case you don't have the possibility (or don't want to) to make a wobble board there are other ways. The first level is to take off your shoes and stand barefooted on the floor. You can then add more instability by simply standing on two pillows, a folded blanket or just anything soft that will force you to have a better control of your balance at all times. Close your eyes and feel the balance shifting. Relax.

As in most training, only keep the sessions (or part of training session) short enough so you don't lose focus and long enough to increase in performance. 15-20 minutes is usually enough.

## Outside of Position

When it comes to balance training outside of shooting position, only your imagination sets the boundaries. The obvious choice here is the standard wobble board, a very useful tool. You can stand on it normally, with one leg or with your eyes closed. Doing exercises on it has become popular lately (some of them falling under the term functional training) which I am not a fan of. You will gain more from your balance training by adding more difficult exercises instead of weight. The other side is you won't really gain anything in strength either since the weights you are using will be too light. Either way, a wobble board works well for its intended purpose. Instead you can use squats and one-legged squats. They both put a lot of stress on the ankle muscles which play a major role in maintaining an upright stance. Running in terrain is another way to both increase in strength and balance.

Another very easy way to train balance is to stand on one leg with the arms above the head. To add difficulty, just close the eyes. This is a nice one to use just before starting a training session, activates the stability muscles quickly. Walking on a bar or rope-walking puts a lot of focus on balance as well, but all ways you can think of that creates an unstable surface and force you to focus on balance will work well.

Remember to continue add difficulty when you have mastered the current level. Yes, longer training sessions have a place since a match is over 75 or 105 minutes but try to mix it up between time and increased difficulty to continue up the performance.

## Summary

There are multiple ways to train the balance both in and out of shooting position. Wobble board's works well when out of position. Stand on a bar or just on one leg. Make a one-directional wobble board for training in your shooting position. Stand on some pillows, with or without the eyes closed. The possibilities are several. When it comes to training time, keep it relatively short (15-20 min) so as to stay focused all through the session. Sometimes a longer session has its place but try keeping a balance between time and difficulty. During other training periods just add a balance session once a week to maintain the current level.

## Balance - A Training Session

Balance is one of the keys to a good performance. Without it and you'll have to work much harder to remain on target and uphold a good technique. Read [this previous post](#) for some tips on how to train your balance.

## A session

### Preparation

- Read through a couple of past training journal pages for any important notes to use in this training session
- Warm-up/stretch
- Make sure all equipment is placed within reach

## **Training session in blocks (90 minutes if each block is 15 minutes)**

- Before putting on the shooting clothes, activate the balancing muscles by standing on one leg on the floor with eyes closed. For added difficulty, raise one or two arms above the head. Switch leg after 30 – 60 seconds. Do this routine twice before moving on to the next training block.
- Hold/relaxation training without boots or jacket, feel the balance.
- Add boots and jacket. Stand on a wobble board without target. Holding and dry firing is usually enough in the beginning.
- No wobble board, focus on feeling the equilibrium, no target (or use a white target). Don't take any shots that are not in perfect balance, don't worry about where the shot went.
- Instability training, target included. Stand on an elbow mat (used when shooting prone), a foam rest used when bench shooting or a folded blanket to add instability. Remain in equilibrium and shoot on a target.
- End with target practice. Again, only pull the trigger while in perfect balance. Score is of no importance.

## **After training**

- Write in the training journal
- Stretch if necessary

This session will take 90 min in total (all blocks are counted as 15 min each). If you want to reduce the length, either reduce the time for each block or take away the last two.

In all training blocks, focus on feeling the balance shift, make any adjustments necessary in the position to make it more stable (feet placement, hip & elbow placement, rifle positioning (shoulder, angle and how it's held by the left hand)). By making small adjustments over time, you move towards a better balance and ultimately, better performance.

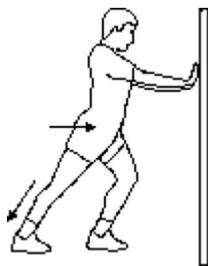
## **Static Stretching of the Lower Body and Balance**

### **Summary**

These two studies looked at stretching of the lower body muscles and balance and they both show a decrease in balance after stretching sessions. Even though the participants in the studies weren't shooters (with their increased body awareness towards postural control) they point towards something

interesting; stretching might be harmful for shooting. So right now it looks like stretching should be kept to a minimum. Two things to think about, how long does this effect stay for and is there a cut off time for when stretching more clearly increases body sway? Maybe it's fine to just stretch a little because it feels good and that the possible negative effect goes away before it has time to negatively affect performance. Usually we don't move directly from stretching to shooting, there's something like 30 minutes to first shot. Don't mix this up with warm-up though. A sport specific warm-up is usually a good idea (getting blood circulating in the muscle groups we'll later use). The second study discusses whether the results of the increased balance in the control group can be contributed to the warm-up and that it might have a carry-over effect of half an hour. Meaning warm-up might be beneficial for balance for 26 minutes or even longer.

## Stretching and Balance



Most people include some kind of stretching in their pre-shooting routine. It feels good and with the classic information that stretching increases performance, there's no reason not to do it. This post will take a closer look at two studies regarding static stretching of the lower body and postural stability.

The first study is called "Influence of vision and static stretch of the calf muscles on postural sway during quiet standing" and has taken a closer look at how a three minute static calf stretch affects balance. The researchers performed tests with both eyes closed and opened which is nice to see. In shooting, the visual input is decreased by the front aperture and blinders, leaving us to rely more on proprioception from the calf muscles and the balance organs in the inner ear for keeping an upright stable position.

### Abstract

The purpose of this experimental study was to evaluate the effects of vision and stretching of the calf muscles on postural sway during quiet standing. Under pre-stretch conditions, participants stood on a force plate for 30s and the sway of the ground reaction force centre of pressure was recorded. The following postural sway variables were calculated off-line: sweep speed, sway speed, standard deviation, maximal mediolateral range, maximal anteroposterior range, mean mediolateral position and mean anteroposterior position. For post-stretch conditions, participants stood quietly on a device that was utilized to impose a static 3 min ankle joint dorsiflexion stretch. Immediately thereafter, participants moved onto the force platform where postural sway parameters were again recorded. Randomized eyes-open and eyes-closed conditions were tested in both cases. Results showed that postural sway significantly increased due to stretch (sweep speed, sway speed, standard deviation, maximal anteroposterior range, mean anteroposterior position), as well as eye closure (sweep speed, sway speed, standard deviation, maximal mediolateral range, maximal anteroposterior range). The interaction between stretch and eye closure was also significant (sweep speed, sway speed, standard deviation, maximal mediolateral range), suggesting that there were only minor increases in postural sway after stretch under the eyes-open condition. It was suggested that stretching of the calf muscles has the effect of increasing postural sway, although this effect can be greatly compensated for when vision is included.

The study included 10 healthy males at around 26 years of age. Originally they were 11, but one was excluded due to problems to perform the stretching routine. Balance measurements were taken over a 30 second interval when the participants were standing as still as possible on a force plate. It measures changes in sway and speed of movements. Recordings were taken after a visual inspection concluded the participants were stable and in balance.



Stretching was performed on a platform at a 25 degree angle. Participants were told to stay as still and relaxed as possible for three minutes. Balance was then tested again with the same routine as before. In total, each person performed eight sessions with both eyes open and closed for a total of 48 minutes of stretching.

After the stretch, the result was statistically significant for an increased speed both with eyes closed and open ( $p < 0.05$ ). The same could be seen for the range of movement, which was significantly larger after a stretch and when closing the eyes compared to having them open. Movements were larger when the eyes were closed and they discuss whether having the eyes open might counteract the larger sway to some extent. An explanation for the larger sway could be that the golgi tendon organs (a sensor in the tendon that reacts to muscle stretching and signals a counter movement or pain) has a larger span before it reacts to the muscle stretch. Meaning it allows for a larger sway before it signals a counter movement (or pain). This is positive when you want more flexibility but not when it comes to fine tuning postural stability. It's not a huge difference in sway speed pre and post stretch (27.8 to 29 mm/s for eyes open and 29.3 to 32.1 for closed) but it does mean by stretching the calf muscle for 3 minutes you affects the same way as having your eyes closed to begin with (29 compared with 29.3 mm/s).

The problem with this study for shooting is first that they didn't use shooters. Maybe shooters have a better body awareness for balance and are better at counteract a shift in centre of gravity than the healthy individuals they used here and there for the results will be non-significant. Second, a 3 minute stretch is quite extensive as a pre-shooting routine. A more normal routine is closer to 30 s per muscle or less. The second study I'll mention, "Effect of acute static stretching on force, balance, reaction time and movement time", looked closer at how a standard lower body stretching routine affects several aspects or performance.

The stretch included hamstrings, quadriceps, dorsal flexors and plantar flexors (so front and back of the upper leg plus the front of the chin and calf's) after a five minute cycle warm-up. The stretch were held for 45 seconds for up to the point of discomfort with a 15 second break in between each muscle group.

The testing included several measurements with force and reaction time included, but I'll only mention what's of interest here; balance. Testing was done using a wobble board with an attached metal plate under so when it made contact to the wobble board, a timer started to keep track of the number of contacts and their length. Participants were 16 healthy males around 24 years of age. Everyone has got two test tries before the actual test to familiarize themselves with the equipment used. Recording was then done over a 30 second interval. Results were significant for balance ( $p < 0.009$ ) between control (no stretching) and intervention (stretching). The intervention itself showed a decrease in balance score by 2.2 % which is not so bad (8.8 to 9.0 in metal plate contact score). Balance scores for the control group increased by 17.3 % (10.8 to 8.9 contacts), and that means the difference between the two groups were big. An increase in balance is to be expected when learning a new skill (you become better at an activity by performing it), that's why a control group is important. In this case this 17.3 % increase turned out to be a negative 2.2 % instead. Stretching has counteracted the increased skill level and brought the total to a decrease in balance.

Problems with this study is again that they didn't use shooters but also the differences between the two groups. Balance was worse in the control group pre-test and the learning curve brought them up to the same level as the stretching group. This difference between the groups could be enough to skew the results. It could also mean that increases in balance score would have been much greater without stretching. Since we don't know I like to think the actual results are correct, stretching will affect balance negatively for a length of time we don't know yet. The positive effect from the warm-up cycling seems to hold for at least 26 minutes which was the distance between the warm-up and the second test (here's where the interventions group did their stretching).

I'd like to end the post by mentioning that since these studies only looks at lower body stretching; shooting performance might still be positively affected by an upper body stretch routine. So far I haven't seen anything that relates directly to shooting and upper body flexibility but if I do that will most definitely show up here. There's also more to come on the general subject of stretching in the future.

## **How Many Pellets should I Shoot per Target?**

How often should I check my shots; after every one, or less often? After replying to it I felt that the topic could be expanded upon further and that maybe more people were interested in the response.

Furthermore, since the number of pellets you shoot per target is tangent to the above question, I've added this as well. When it comes to electronic scoring systems this isn't a choice you can make (except for minor changes) yourself. But most people still use paper targets and then it's entirely up to you. With the two topics being interconnected, it makes sense to put the two together in the same post.

## **How often to check the shots?**

The question I received is a good one. Even though it's a relatively simple question, the answer tends to become big and very situation dependent. The short version reads: it depends on what you train on. Are

you training on something that requires the feedback of seeing where shots land? Then the answer is yes, check every time and learn something from each end every shot (whatever it might be). If not, the answer is the opposite. When you separate it in this fashion, a follow-up question comes directly; how do I know what the difference is, and when to do what?

Firing a pellet is the sum of a whole array of skills added together in a long row. You need to (simplified) have a correct NPA and position with proper tension levels all through the body. Mount and lift the rifle in the way trained on, drop onto the target, control breathing and put tension on the trigger. Balance still under control while adding aiming to the mix, add more tension to the trigger and take the shot when the sight and target are properly aligned. Then continue with follow-through and keeping emotions and stress levels suppressed before evaluating and starting over again. The list can be made much longer (or shorter) when considering even more specific parts of the shooting technique. Then, the outcome (the score) isn't something that can be contributed to a specific part in the technique. A 9.5 to the left could be the cause of faulty NPA; a foot placed incorrectly which in turn affects balance and tension levels or any other misalignment in position. Improper sight alignment, poor trigger control, a release of tension at the wrong moment and so on. When so many possible problems can explain a specific shot, how do you know which one is the main cause (or part of several causes)? Therefore, be restrictive when using scores as an outcome variable and only use it when absolutely necessary.

It's nice to see quality scores, deep tens or the equivalent, and it brings up the ego a bit. That can in turn bring more training motivation and enjoyment around training. But the problem is when training on something specific, let's say path to the target, shots in the centre isn't of interest. It won't help in moving technique forward, it might even hurt it. If, by seeing some good shots in a row you switch focus, even slightly, off the task at hand to continue scoring centre shots, you also lower the quality of that training session. You were there to train on descending onto target but are now trying to produce perfect shots instead, which just isn't the same. For that specific task, a hole in the target won't give you any new information. What's interesting is how the path down looked like, nothing else (an electronic trainer can help with this). The same argument can be used for a multitude of skills like balance and tension levels.

### **When is the just fired pellet of interest?**

Training related to position (balance, relaxation, position building) requires focus to be directed internally. Internal focus and internal feedback (yes, there's something to say about electronic trainers, but the use of them only clarifies the outcome, the work still has to be done). Training directly related to scores or shot placement could be; calling the shot, triggering in relations to the target, NPA (in some cases), competition practice or getting used to high scores (mental training) and consistency in outcome. One other way is making sure that what you felt/performed is consistent with shot placement. There are a few more of this kind, but generally speaking, most types of trainings don't need the addition of directly viewing individual shots.

By using shot placement as an outcome variable, make sure you reflect on every shot. When calling the shot, first call it, then look and compare the two. If similar, move on to the next shot. When they

differentiates from each other, think about what happened during the shot to come up with a reason to why they are different. If you're training on getting used to high scores, checking individual scores and the overall sum becomes important. This adds to your stress level and makes it slightly harder to continue making quality shots. It's not a good technique to use in a competition setting where you want to stay away from adding extra stress, but training doesn't have the same goal.

So as you see, even when you're checking shot placement, what you are looking at is different every time. When training, think about what you want to become better at, find an exercise that will train that particular skill and an outcome variable that shows the correct progress. Stick as much as possible to the task at hand, and stay away from the lure of wanting to shoot high scores when that's not the task at hand.

## **Number of Shots per Target**

The question, once again, is: what type of training are you currently doing? Is it necessary to know when each individual shot was fired or can it be a group instead? If yes, shoot one per target (or perhaps two), if no, more pellets are just as fine as less. One more question is; do you even have to shoot at all? Many types of trainings don't need firing pellets at all. Some are better off with dry firing; others work well without any triggering at all. It all comes down to the type of training.

But since this is a post about shooting, not dry firing, the decision to fire pellets has already been made. The number of shots to fire is something between 1 and 100 per target. The more shots, the less you'll know about scores or in which order they came. 100 shots is a bit much though considering the hole it leaves behind, a more normal maximum is closer to 20 per target. Or, stay away from counting the number of pellets all together. Shoot until you feel the hole in the target starts affecting sight picture (you can see the pellet group while aiming) and then switch target.

A reason to use the first option is easy track keeping of fired pellets or measuring group sizes. You can still keep track of pellets in the second option but need to use a pellet tray or a similar method instead. The second one could be that you don't have to think about pellets at all and can completely train on technique. One training technique is to continue shooting at the same target until you achieve something particular (like scoring a 10.5) and then you're allowed to move on to the next bull.

In case you are inclined to count scores (automatically, without thinking about it) it's a good idea to stay away from a specific number of shots on each target. Don't shoot two per target all the time, or four. Stay especially away from 5, 10 or 20 per target due to its ease of score calculating. Instead, go with either a different number on each target, or a number that's less easy to calculate: 3, 7 or 9, with 7 being the best one. The more shots, the better (and harder) it is to know exact scores and anything above 10 per target will achieve this without problems. You look at how the group is formed, moving away from individual shots (looking at the forest instead of the trees). What you are trying to achieve is a situation where you actively have to think about scores to know what you just shot. Having to make an effort to calculate scores makes it easier to stay away from it (it doesn't just happen anymore). An upside of shooting more

shots per target and not checking each individual one is the shift in focus towards technique instead of shot outcome.

So, more shots per target will do a few things: You'll be less inclined to count scores and focus shifts towards technique and what you're there to train on, less of re-setting position between target changes (unless you train on an electronic scoring system). Also, it makes you more inclined to look at the overall picture (performance, technique) instead of individual shot. This means a general shift towards thinking forward instead of dwelling on the shot that just passed. I have noted this to be an easy way of getting shooters on the correct path.

## **Electronic Scoring Systems**

I thought I would just say a few words on this topic since it's a more strict system with less choice left up to the shooter. If you have access to both a paper target system and an electronic system, then there's really no problem. If not, you have a few choices. Some scoring systems can be programmed (or just changed setting on) to show a different number of shots per target, usually 1, 5, 10 or all. Then pick an appropriate number corresponding to what you're going for. To not count scores, either cover up or don't look at the score list provided. Easiest can be to just cover them up completely or turn the monitor away. This isn't allowed during a competition, but training is fine. By turning away the monitor and only look at how the group progresses now and again you can achieve something similar to groupings on paper targets. Also, re-setting the target after a particular number of shots will give you the same result as changing targets. Trickier to keep track of fired pellets though, but easier training.

## **Summary**

Generally speaking, you don't need to look at each individual shot all the time. It's most likely more productive to shot several pellets and then check what happened. The same applies to the number of shots per target. The more pellets that go into a group, the harder it is to keep track of scores and easier to focus on technique.

Both these aspects are heavily influenced on what you're currently training on though. There has to be a thought process behind training and each aspect going into it. Progress of shooting drills, time spent on them, when in the training plan or session they should appear, how to keep track of progress (which includes the topic of the day) and so on. If you think about everything you train on in this fashion; if to fire pellets at all, the number of them if you do and how often to check the shots, will all be different each time. It will, however, rarely mean one per target or that you need to know what came out of the shot each and every time. Focus on the important aspects and stay away from scores.

# Training

## What is Training?

Have you ever thought about the question “What is training?” If not, maybe it’s time to do so (or continue reading!). Ask a novice shooter and they will most likely answer something on the line of firing pellets at a target. Of course, this has to happen for you to become better at shooting. But training doesn’t stop here. Any conscious act with the purpose of increasing ones skill, is training. If that means standing on a wobble board for five minutes while watching TV to train balance, then that’s training. Visualizing the perfect shot ten times in a row before going to sleep, is also training. For the non-shooter, a training session usually means going for a run or lifting weights in the gym. Even here there are situations less defined which could be called training. An example could be a physically demanding job. Is that training? Biking to the bus in the morning, training or transport? For some people, just the act of moving slightly faster than walking, is training. This, on the other hand, would not constitute as training to a marathon runner. Considering this, can we put a label on a particular movement or exercise and call it training? No, not really. What we can do is set some requirements for what we consider “training” to be and anything falling within this framework will then have to be so.

## Frame Work

To become better at something, the first rule is to actually perform the task in question. As in all forms of skill acquisition, during a repetition (memorizing a word, kicking a ball, pulling the trigger) the brain becomes increasingly better at performing that task. By also adding mental training, imagery, to the task, performance increases even faster. But the bottom line is, without repetition, very little increase in performance.

So by follow this, just shooting, spending hours in position and firing pellets will increase ones skill? Absolutely! It works well, many people have done so and become quite good at it too. Now, for this to work all the time and to bring you up to the highest possible performance level, shooting has to be just one individual, separate task. If it is, then training on that task, repeat it constantly, will be close to the only thing we need. So, can shooting be seen as an individual task? No, it can't.

Standing shooting is compiled of a whole range of skills and tasks. When performed after each other in the correct order, they together produce the perfect shot. Skills necessary are, among many; triggering, tension control, focus, controlling balance, position setup, follow-through etc. By training on the task “firing a pellet at the target” you are really performing many different skills put together. Let’s say you need 10 skills to shoot a deep ten (there are actually many more, but for the sake of this argument), by “just shooting”, you are effectively giving each skill a tenth of total attention. During a 30 second shot, 3 s is devoted to each separate part in average. Now, consider a problem exists in triggering (which again is constituted by multiple different skills), during a normal shot, only 3 s goes towards this skill’s execution. So by shooting you do increase all over, but slowly. Instead of training on everything at once, what if you take out the less-than-perfect skill and train on that one specifically?

So according to rule #1, repetition, repetition, repetition will make you perform better.

## **Stick to What you are Training on**

A common mistake while training is to slowly shift focus during the session to something else. You start off by training on triggering, have picked a few drills to work on which will make you better at that particular task. As time passes, maybe you find it boring, not up for it or just pulls a few good shots in a row and focus shifts towards something else. Instead of producing perfect triggering, you are now trying to continue scoring well which just isn't the same. Training effect is lowered and progression slower. Therefore, decide what you want from the session and then only do something that will get you there. Staying away from the lure of shooting for scores is the big one. If you are using an electronic trainer it becomes much easier to get side-tracked as the number of variables to focus on increases (steadiness of hold, aim time, hold area, approach etc.). Stay focused and if or when you do get tired, it's time to start doing something else. Either switch to another training task or end the session for the time being. As a pointer, a training session doesn't have to be a specific time, quality is more important. If a session is high in quality, you did exactly as planned, you were in the right place mentally and had picked good exercises it's not crucial if the session is shorter than planned. Keep training until you feel quality is dropping and move on to something else.

## **Self-evaluation and Planning**

To know what and when to train on something it's important to know your strengths and weaknesses. To understand this you will have to evaluate yourself in some way, either yourself or someone else. A coach usually does this on a regular basis to make sure training works the intended way. They might not say every time it happens (it's not that important to know), but still do it. Without a coach, you should too.

Evaluate yourself once or twice a year to figure out what to work on during the year and then later to make sure progression is on the right track. Something I've used is the list specified in the book "Ways of the Rifle". It's a list where you first evaluate yourself on several topics and then write in what you think is required to reach your goal. The discrepancy is what you have to train on before you reach the stated goal. It's always tricky to self-evaluate and get it correct, but much better than nothing. If you have the opportunity to get this done by someone else with the appropriate knowledge (a coach), then go with it. Otherwise, just do it yourself. Despite the complication of doing it yourself, it's still better than no evaluation.

When you know your weaknesses, it's time to plan the training. Focus on the worst aspects (or largest discrepancies between goal and current status) and come up with a plan that will deal with those. If you plan over a whole year, start with the basics. Position building, cardio and strength training are such areas. Then you add on tasks like shot execution, mental programs and aiming (requires the basics to work to get the most benefits out of) the closer to competition season you get. Just before or early competition season, add everything together and train on performing good competitions. After the season is over, take a bit of a downtime where you evaluate the season, write down a new plan, update your equipment and train for the fun of it.

Add your own specific drills and areas needing work throughout the season wherever they might fit. Planning can be hard to do and perform, especially a yearly plan like this, considering everything that might happen over the course of a year. A yearly plan is only supposed to be a broad plan, a general sense on what to train on during different parts of the year. You'll also have to plan training in smaller bits when they come up (every month and week for example) to fine tune the yearly plan. This is a faster process since you already have the large plan. Make sure you track what you trained on afterwards in a training journal. Excellent for keeping track on progression and is used for later evaluation of the past season and planning for the upcoming one.

## **Actually Train on What You Need**

This part ties into the previous one since it comes directly from the results from the self-evaluation test. Make sure you train on what you need and not something you're already good at.

Training is there to make you shoot better. Some aspects of the technique will always be a little worse than the rest and need more work to get up to the same standard. It's easy to assume that part is holding you back (the weakest part of the chain) and up the quality here will yield the highest return of invested time and effort. Or in other words: Train on what you're bad at.

When you know this (self-evaluation), you also have to know at what level you're at and pick a drill appropriate to the level. A too complicated one will put too much demand on your technique and end in frustration. A too easy one won't give you anything extra since you already know how to perform at that level. Pick an exercise that is just above your skill level and by the time you master it, pick another one. What is great is that an exercise can double up as several different ones depending on how it's executed. Aiming at a white wall is such an example. Depending on where focus lies, it can work for balance, position building approach etc. Different skill levels are incorporated as well and the difference is the focus. A novice will focus on a certain thing while an expert will focus on something completely different even though they are performing the exact same thing. This is usually the reason to why a drill is considered "boring" (dry firing) for some but not everyone. Dry firing is boring because no outcome (score) is produced. If the focus instead is on how the muzzle moves, you get an outcome from every shot. The two shooters are doing the same drill, but only one will get the most out of it.

## **Progression**

Let's take a novice and show her how to set up and align the feet correctly. Let her train on this for a while; maybe add a drill or two and she will become better at it. Then we take a 570 p shooter and show the same thing to, the probability that this person will benefit from the same information is slim. The performance level is higher and with this comes increased knowledge and what's required to continue increasing in skill level. The drill used in the first case (stepping in and out of position) is still a good one, but not for this person. Now we might need to add a level: "Score a 10 after stepping out of position" or use a variant where you close the eyes. This also means that when the shooter becomes better and masters the current task, increase the difficulty. Using a specific drill will make you as good as the drill is, so when that has happen, it's time to move to another drill.

Let's take a marathon race as an example. That's a long distance to just go out and run and will require time and training to build up to. Start by running 5 km; add another 5 km when that's easy. Continue adding distance (or speed) until you can run the whole distance of 42 km in one go. A simple shooting example of the same sort is working your way up in maintaining focus during a full match. Or balance; work your way up to shooting while standing on a wobble board. This isn't an exercise I'd suggest a novice should try, instead start by working on balance outside of the shooting position and then add levels when it becomes easier over time.

Always make training more and more challenging, otherwise you'll stale in performance.

## Summary

Evaluate yourself on a regular basis to have on paper what you need to train on for the fastest possible performance increases. When you have your strengths and weaknesses sorted, plan out the year and pick out what areas requires most work. Choose appropriate exercises to make each of those areas of your technique better. Make sure you constantly make training more challenging and never become lazy and just shoot while thinking about other things. If that happens it's either time to stop the training session for the time being or switch to some other type of training. Generally speaking, a shorter more frequent session with high quality will increase performance faster than longer ones where focus might not always be there. If you can keep focused, please continue training; just keep an eye out for wandering thoughts.

All the above aspects are important for increasing ones performance but it will never be as important as repetition. Keep repeating the task over and over again, preferably as close to the ideal movement as possible, and you'll definitely continue becoming better at shooting.

## Training with a White Background Instead of a Target

Do you change your background when training on different tasks (by background I refer to the aiming area whatever colour or shape it might have)? If not, maybe it's time to re-evaluate!

The standard air rifle target is ultimately only used for one task; to fire 40/60 shots at in a competition setting. It's an easy way to determine who currently is the best shooter and therefore earned the gold medal. Just because this is the case doesn't mean you should train with a standard target (or any target) all the time. Some exercises requires you to use something else instead of a target (or at least will benefit from it) like a white background, a vertical or horizontal line or even to completely turn the lights off.

This is what training is all about, using different exercises to overcome problems in technique or position for the purpose of high scores on a target. Take the analogy of a 100 m sprinter; she rarely run those 100 m in training but instead use weight lifting, start techniques, reaction time exercises, foot placement etc. as training tools to be faster on the track. If they would run a race very session, they would most likely catch an injury fast since it's an all-out task on the limit of what they can do. This is not the case for rifle

shooting, but the general idea to take all the required bits of technique and train on them individually is one that works very well.

For a shooter this means to separate balance, position setup, approach, aiming, pulling the trigger, thought pattern, follow-through etc., study them and come up with an approach that will best train each particular technique. If the answer is to not being on the range (weight lifting, balance, cardio, stretching), then that's the solution and what's required to become better at it.

The topic of today is different ways of training without a target and why it might be the best solution to a particular problem.

## White Background

This can be in the form of two different things; a completely white surface, like a wall without any reference points, or a much smaller area like the back of a target which have a defined area and therefore reference points. They can in some exercises be used for the same purpose but be aware that they act in a somewhat different way. By using a big white background you are taking away the sensory input from the eyes, you then have to rely more on other means of stabilizing the body, i.e. balance organs in the inner ear and proprioception from muscles.

These other two systems are less dominant in a normal environment which you can test by standing up and closing the eyes. You should now begin to sway a bit more than with eyes open. The amount of sway can be trained with specific balance training (wobble boards are great for this) and if you at the same time reduce the visual input, training becomes even more specific. During shooting, the athlete has reduced visual input because looking through a small hole (1-2 mm in the rear aperture) effectively takes away any depth perceptions. Add to this how much light the rear aperture and blinders take away, the focus being on aiming (not balance) and stress coming from the competition environment and you end up with a situation where the other two systems are important. So while training on balance, a white background is a good tool.

The best thing about a big white surface is its lack of visual input, forcing you to rely on other systems to determine what's going on. A target can act as a control for your position and technique which can be used by someone with a good position to determine if it's setup correctly. However, the problem is that it can also control your position in the sense that you build it to that particular point even though it isn't the correct one. By setting the position according to the target and dismiss any signals pointing in another direction (NPA is wrong or tensions exists) in a stressful situation (competition) will lead to sub-par performances. As an extension to this, by taking away the target you are forced to build the position on a feeling instead of where the muzzle is "suppose" to point. Train with the white background to set up your position time after time to get the consistency in. For this to work, you'll need a target now and again to check that the position doesn't change too much. If it does change the problem is to determine what's causing it. Is it a problem in the position itself (a change is required) or how it's setup (a change in position building or how it's supposed to feel)? This could be something for a trainer to evaluate and find

a solution to. The white background helps with switching focus from visual cues to internal cues to help improve consistency in position setup.

Another way of using it is to really focus on everything that's going on internally. This means to basically just stand and aim at the wall for a specific time frame (i.e. 15 min) and really focus on how the position feels and changes over time. Build a picture in your head of how it should feel like, tension levels in all body parts (or is one area more important than another?), how does the feet touch the ground or hip is aligned? Etc. By becoming aware of how it's all put together you make it easier to achieve this feeling over time. Consistency goes up and so does performance. By knowing how all body parts connect with each other you also up the chance of finding a solution when things don't go according to plan. It's easier to pinpoint which area is sub-par and what is working to not "fix" a non-problem. Most days when shooting just doesn't work it usually comes down to something being off in feeling. By accurately find where the problem lies and fix it you'll be able to focus on the specific task (training session or competition) without disruptions.

## **White Target**

As mentioned earlier, one difference between a large white surface and the back of a target is the addition of reference points. Another difference is the possibility to fire shots, which isn't necessary in some exercises but beneficial in others. The convenience of just flipping a target around without breaking position is nice to have too. This way, switching between training exercises is easier and the session might become more fun. Even though some training exercises (or part thereof) mentioned above also works with the back of a target, they are better with the larger surface instead of the smaller one. But as a middle ground between the two systems it works well. For example balance training can benefit now and again from having a reference box to stay within (the target). This does require more of the shooter when setting up the position since NPA will play a big role in stability when wanting to stay within a defined area.

When adding live fire to the training mix, you will start building a "target" of your own by the holes left behind from the pellets. This will affect shooting by adding a reference point which in turn steers aiming to this point. If this point is off to one side (poor shot), NPA will be affected and the training session maybe not as good as it could have been. If you know this happens you can change your approach while shooting (try to disregard the reference point) or take it into account while evaluating the training session.

## **Triggering**

Training on triggering facilitates by taking away the need to align with a target and subsequently time muzzle movements with triggering. This is of course necessary too, but first there's a need for a smooth trigger control before adding timing. Practice this by solely focusing on that particular part. Make it as smooth as possible, no extra forces should be present that will disrupt muzzle stability. In this first step it's enough to use the white wall and dry fire. The next step is to use the back of a target but still dry fire. This will allow you to see muzzle movements and time them with a certain area of aim. It's not as precise

as a target but will allow you to work on timing. Start with dry firing and add live firing when necessary. Of course the last step is to use a target (whether it's a standard air rifle target or a different shape), still use both dry fire and live fire.

## **Balance/NPA evaluation**

One way of evaluating a positions balance or holding area is to use a white target. Set up the position and go through all steps necessary for a good shot, start the initial aiming process by settling in on the target. Instead of moving to fine aiming, close the eyes and count to three (or five if you feel comfortable with that long) and take the shot after the time is up using a smooth trigger control (of course!). Fire 20 shots and the area you get is how big the hold is (which is affected by balance, position consistency, NPA etc.). This can be done on a regular basis (a month or two between) to check progress.

## **Summary**

By changing the background or target to achieve a specific goal you get there faster. A big white surface doesn't have reference points and will therefore affect you differently than the much smaller target. Of course these are only two ways of playing around with the background, you can also add structure to it. For example a drawn black ring will give you a guide area to stay within. A thin vertical line has the option of training the approach to the target but with more freedom without the actual target. There are more options like this for solving particular problems but a good start is using the above mentioned two. The common nominator is the lack of reference points to abide by and therefore forcing you to get the information of what's happening from other sources. Instead of relying on visual inputs, more information has to come from how the position feels. Proprioception, balance organs and pressure shifts in the feet. These are mechanisms already in use but can be overrun by what the eyes see, thus making the process slower. Use the back of a target for when firing is required but really ask yourself before shooting if it's actually necessary in the first place. More often than not the answer is the wall.

## **Training Start-up**

After moving here I have tried several times to get my training going. The longest one lasted 1 month (not very impressive) and the latest was in January. I have always found starting up a bit tricky. It's hard to get some actual training done when I am struggling with basics like where to put the elbow. NPA (Natural Point of Aim) changes over time due to changes/corrections in the position, relaxation doesn't work, the hip is not aligned correctly and it's hard in general to feel comfortable in position. The trick is to get over this initial period as quick as possible before getting tired of things not working properly. So what do I look for in my position before I can feel comfortable enough that I can work on specifics? I have in the past tried several different approaches to get back in shape. Classically it has mainly been to just shoot. After enough bullets have passed through the barrel I start to know where they end up on the target. This is a tedious process and usually not a fun one. One year I just jumped into it and entered a competition the first week back (have been shooting smallbore the whole summer though). I had no idea how I did it, but came home with a new personal record. That is the first and last time that has ever

happened, the complete opposite is usually the normal. The last few years my routine has changed to something that seems to work better than the “just shoot until it works” technique.

## **Relaxation and position**

Nowadays I barely fire any shots at all the first two weeks back. I focus all my attention on position and relaxation. First I try putting together the best position of the moment. That usually means reading some old notes on how it should look and feel and copying that. Since I can't build the perfect one directly, I have to move on when things are aligned sort of as they should. My main focuses are feet, hip and left elbow. When I have an ok CoG (Centre of Gravity) I move on to relaxation. Relaxation at this point usually means getting the whole body relaxed in position. Later in the season relaxation will be more specifically targeted at for example the left calf. Starting at the feet and slowly moving up, relaxing everything on the way is my standard procedure. The position usually collapses at this point due to it not being perfectly set up. That is ok, I just fix whatever needs to be fixed and get back into relaxing again. The relaxing/making changes in position goes on until I feel stable and my NPA doesn't change that much anymore. At this point, approx. 45 min has passed and I finish off by firing a few shots. For the next few trainings sessions I pretty much follow the same procedure with some slight changes. I either have to focus more on position building or relaxation but this is hard to know before I'm there. If the session is longer than 1 hour I just add more shooting after I'm finished with the first part (30-45 min). I find it better to have a structured session where time slots are fitted with specific tasks instead of doing everything at once, but more on this topic some other time. During the shooting part I mainly focus on approaching the ten in the correct manner.



## Goal

The goal for this start-up period is to reach a feeling which I call “sharp hip”. I assume this doesn’t mean anything to anyone else but me. The feeling I get is a combination of a proper relaxed position and correct hip placement. I use a forward hip position which creates a vertical line through my left hand, arm, hip and leg down to the foot. When this is combined with a relaxed hip, shoulder area and legs I have a feeling of the hip bone pointing up and creating a big platform for the elbow. My whole left side feels at this point like it has been built as one piece, very stable. Now, I know everything is placed like it should and I can comfortably move on to train on specific areas.

I do have to mention that this feeling does not mean I have actually finished with working on position or relaxation. The difference now is that I can work on details instead of the big things. At this point it is also much easier to feel and see what happens during certain changes.

In summary, I’m not happy before I can comfortably uphold my position while being relaxed and balanced. To me, balance is one of the core values in a strong position and shooting performance can only come when everything is properly aligned and relaxed. I reached the feeling I was going for during my last start-up period after only 10 hours of practice, which is fast for me.

## Training - Path to the Centre

### Approach from Above

Some people change to this technique to help fight the problem of spending too long of a time on aim. The benefit of slowly approaching from above is that once you reach the center you are ready to take the shot immediately. The idea is that you will be mentally ready to take the shot if you have been focusing on the descent instead of just standing and looking at the ten.

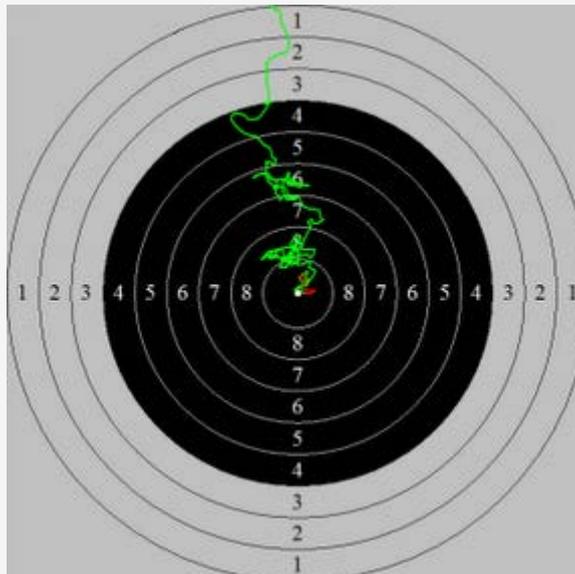
I don’t know whether this works for everyone though. I gave it some attention a few years ago but gave up after one month when I didn’t see any benefits. It’s not easy adding something new after having been doing the same thing for years.

My version is slightly different than the one described in the book “Air Rifle Shooting”. I start by finding the center directly, relaxing and then inhaling a bigger breath to start from above and sink down while breathing out.

The descent should be at 12 o’clock in a straight path down. Preferably with only small deviations from the optimal straight plumb line. I have set a small margin of error in the goal by allowing the descent to be between 11 and 13. This is not entirely correct though. I really want it to be within 11.30 and 12.30 in average to consider it ok.



Directly down to the center



Approach from above with a stop just before reaching the center

So, in pictures from previous training sessions; a path directly to the center could look something like this.

Or with a stop included just before reaching the ten could look like this:

I should not fall below the horizontal level which would increase the movement pattern when trying to get back up again.

After adding the aiming phase, this is what I'd like to see:



Left: all plumb lines are well coordinated. Right: plumb line with aim phase included

But since aiming is not included in this goal, it is fine as long as all descent lines are correctly lined up.

## Training

To use Scatt while training on this is an excellent way of receiving a lot more information than you normally would get. With this you can see exactly how the approach looks like, if the aborted shots were worse than the fired ones and where any problems occurred. All of which can be detected and put extra emphasis on. Of course there's no requirement to use Scatt, the classic way still works fine.

It is important that you remain focused all through the training session (this, of course, applies to all sessions). A way to make sure this happens is to work on a specific part for a limited amount of time and then change to something else. I personally prefer 15 minutes per training block, longer and I become unfocused (a competition is different though), but keep it at least between 10-30 minutes before moving on to the next part.

Since the approach is closely connected to a relaxed position and balance, I like to put these parts together in one session. The main focus is approach but to be able to train on it you need the other parts in working order. Balance is linked to how the position is built up, a strong position and the balance will be good. So for balance I make sure I use the correct position each time. Later in a season this should be natural and the normal state but early in it can be trickier. Relaxation is always important, and to add a training block here and there is sound. For this particular session, the idea is to learn how to relax most muscles directly while keeping a few specific ones tensed and then slowly release them to sink onto target. For me the muscles I keep tensed are in the left arm, the rest should be relaxed. This means I only have a small and confined area to focus on while relaxing which in turn is easier to control. Which area you decide to tense up, is up to you but I do suggest you pick a relatively small area for the above named reason.

## Preparation

- Read through a couple of past training journal pages for any important notes to use in this training session
- Warm-up/stretch

- Make sure all equipment are placed within reach

## **Training session in blocks (90 min if all blocks are 15 min each)**

- Build up your shooting position without a jacket, make sure it is set up correctly and focus on relaxation
- Put on the jacket and do the same again, focus more on relaxation this time
- Path to the center "in doubles"; first do a normal approach and when finished with the movement, start over by just lifting the rifle using only the correct muscles and re-do the approach. Do not pull the trigger, focus completely on the approach. You can even have a white target or wall in the beginning to really focus on the correct tensions. A drawn vertical line is another good tool, the tricky part here is if you are using a non-12 a clock descent, then don't use this technique. Do move to a target quite quickly to learn the correct height and to keep the descent line straight.
- Path to the center "normal"; treat it as you would a live shot, add dry firing in the end but don't focus too much on it. Abort any shots not going according to plan. This means you might not finish a whole lot of shots in the beginning, but everybody becomes better with time.
- Relaxation; focus entirely on being as relaxed as possible. Use a target to check height changes (in case actively tensing muscles has made the overall position shift upwards).
- Path to the center "normal" with dry firing or live firing

## **After the session**

- Write in the training journal
- Stretch if necessary

If you want a longer or shorter session the easiest would be to change the time for each block without changing the overall routine. Another way is to cut blocks, the first block might not be important for everyone so either just cut it or cut and extend the first relaxation block with a jacket. To make it longer, just add one or two blocks of approach and/or relaxation.

## **Training Journal Part 1 – Introduction**

Take a look at the two systems I use with explanations to how I think when filling them out.

Why do people use training journals? How are they built up and what to write in them?

The first answer is an easy one to give; because they work. People use a training journal to track progress, store information on how to perform in their sport, information on set-ups, different ranges and competitions, to see where in the plan one currently is etc. It is pretty much a big database where everything you need to know about yourself and how that links to your sport is stored. Yes, there are books written on how to train and perform in all sports out there and those are an excellent source of information, read them. The difference between them and your journal is how specific the information is. The journal contains information that specifically applies to you and books are more general. The idea is that you should be able to find the answer to pretty much any question you have about your own position, performance or how you behave during a competition in it. A training journal can (and should) look very different depending on what sport you are in to. Olympic weight lifting has other demands than

air rifle shooting and different information needs to be stored and kept track of. So, just because some athletes are using one type of training journal doesn't mean you have to use the same one.

## **Paper or Computer?**

You can either have a journal in paper form, for example a note-book or printed pages in a binder, or an electronic one made in excel or word (or a combination of the two). All versions have positive and negative sides to them. A paper one has the upside that you can easily bring it anywhere you need, it doesn't require electricity to work and you have a bit more freedom to write what you need when not having to stick to boundaries or tables. The negatives are the increased manual work you have to put in to create, maintain and evaluate your information. Positives with an electronic one is the ease in creating charts and tables, extracting the information you are interested in from a large data set, and to send it to your coach. Another possible thing to do is adding Scatt files (or any other training system you use) directly to your journal. Some journals are possible to bring with you in your smart phone or tablet, making them easier to use when no computer is around. It is really a matter of preference which one to use. Today it is even possible to find already made ones right here on the internet. Some books come with sheets you can just copy, ready to use (like [Air Rifle Shooting](#)). They might not be perfect but works well for most people. Of course nothing is stopping you to use a mix between them. A combination is usually the best anyway with all the different kind of information going into it.

## **What to write**

As previously mentioned, a journal is a tool where you collect all information you gather about your own shooting. If you would sit down today and write down everything you learned over the years, you have a big task ahead of you. If you instead write a little after each training session, slowly adding and making the journal more comprehensive you will with time have collected everything important here. The idea is that if you stay away from training a few years it should be possible to read through it and then be back at the same knowledge level as you left off. Training is hard enough without reinventing the wheel after every break.

A journal should have a different section for all of this: training plans, goals, ranges and competition venues, daily progression and training sessions, evaluations, equipment setups, score tracking and so on. In case you use a notebook, be careful that you keep a section for each topic and not mix them up. It should be easy to find where to write what to find anything you might be looking for. Another way is to separate some sections from each other. For example, I keep my physical training progression separate from my shooting tracking. They are different in nature and usually don't interfere with each other. As long as you have control over where everything is and it's easy to find, you can use as many different systems as you like.

## Training journals I use



The two binders, calendar and the notebook for physical training tracking

I have had a few different versions over the years, starting with just a plain notebook. The next step was slightly more structured: a print-out with tables to add specific information in. Then I had an electronic one for a short while and am now using a manual system with a page for each day, summaries over periods and years as well as a different one for deeper information and equipment information. The journal has become more comprehensive over the years. I am also a fan of statistics and keep different charts running at all times.

As you see, I don't just use one single book or binder, but several simultaneous ones. Different information needs different storing systems. I have a binder for the everyday tracking where my goals, plan and competition results can be found. I make summaries over periods (four weeks combined) and insert them here as well. Usually this means the binder is full after a year so everything is moved to an archive. For deeper information and equipment setup I have another binder with sections for Rifle, Equipment, Position, Training and Ranges. For planning I use a small calendar which combines work hours, appointments and a quick overview of that week's training.

For physical training and stretching I have a separate notebook where my progression and exactly what I do during the sessions can be found. On top of this I also use the comment section in the Scatt file to write a few things. This system has evolved over time which is a good thing. If someone would have handed this to me the first day I would have been very confused and almost afraid to write in it. It works in the same way as equipment. In the beginning you don't really need any fancy stuff. Meet the basics and learn about position building from the ground. As you grow and learn more, upgrade the equipment slowly and learn how to use it properly. In case you are new to training journals, start easy and add sections when you feel something is missing.

This was an introduction to the topic. In the next part I will go a little deeper where I will use my own journal as an example and explain how I think while filling it out. There are a few things I find important which I will mention there.

## Training Journal Part 2 – Daily Tracking

In this section, I will continue the topic but instead of keeping it general I will use my own journal as an example. I will explain how I think and what kind of information goes into it. I hope that this approach will make it a bit clearer instead of speaking in general terms.

### Binder

I have used an electronic journal before but usually ended up writing my thoughts on a piece of paper first and then transferring them to the journal. After a while I had a whole bunch of papers lying around. I like paper journals, the freedom of not sticking to the structure, drawing pictures or add notes where needed. I still use excel for making charts, training plans, hourly tracking and similar things but not as the major system anymore.

So, yes, I use a binder where I can add a page for each day. I print them out from an excel spread sheet I made for the first time two years ago. Since then I have changed it multiple times, usually by condensing the page and adding more information. I am quite happy with the setup right now, I haven't changed anything in a while meaning it works well (normally I make changes all the time, always trying to improve everything). What might be odd is the paper size I use which is A5. It is half the size of A4 which is the standard paper size where I come from, I just cut an A4 in half. Letter size is about 20 mm shorter, meaning if you cut it in half it becomes a bit small. But since Letter is the standard around here I have to use it anyway (would preferably have A5 but am not complaining too much). With this a binder made for A5, perfect size for bringing with me to competitions or the range.

The Letter pages are printed on both sides, cut in half and stamped a hole into. I use one page per shooting session or other training I've done. Even with several types of training in a day I still use one page (i.e., shooting, stretching and weight lifting all go into the same sheet). In case of two shooting sessions a day I add a page since they can only manage one such a session a day.

## Front page

Name \_\_\_\_\_
**Training Journal**
Air Rifle 2012

Period \_\_\_\_ Week \_\_\_\_ Date \_\_\_\_ Day \_\_\_\_ Session \_\_\_\_ # \_\_\_\_

---

Time in the day \_\_\_\_\_
Time \_\_\_\_\_
Shots \_\_\_\_\_

---

**Shooting**

Balance   
 Trig

Points   
 Comp

Build up   
 Position

Thought   
 Load

Rel   
 Mov

**Physical**

Strength

Aerob

Balance

Stretch

**Mentally**

Visualization

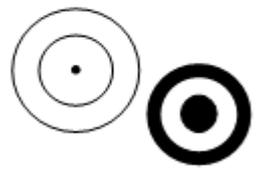
Relaxation

Plan/evaluation

---

Total   
 Outer   
 Inner   
 Rel   
 NPA   
 Bal   
 Trig   
 Hold   
 Back   
 Focus   
 Quality

f   
 10a0   
 10a5   
 10.0   
 10.5   
 L 1s   
 L 0.2   
 Speed   
 Time   
 Res




**Positive phrase**

**Result**

10\* Page 1

Version 2.7 of my current training journal. The numbering on the side is only added for clarity and is not part of the original document.

## Header/Footer

Fixed information (good to have when looking back on old journal pages). Name of the journal owner, sport, year and version of the document and page.

## Front Page – Section 1

General information of where the training session (journal page) took place in time.

Which period/week/date/day/training session/scatt training it is. Scatt number correlates with a note in the info section of the Scatt file.

The second row is which time of day it is, what you trained on, how many hours and number of pellets fired. Time of day is to see whether I perform differently at different times of the day, or before/after any physical or mental training. The middle part is for what the sessions was about (competition or balance for example). Hours and pellets are for statistics reasons.

## **Front Page – Section 2**

This section contains the different training types in minutes.

Shooting (left to right): Balance, Triggering, Points (training comp or going for a specific score goal), Competition, Build up (the procedure up to the point the muzzle points towards the target – mounting, lift and settle down), Position (position building), Thought (training on what to think about), Load (load training, meaning lots of shots during extended periods of time for the purpose of maintaining quality over time), Relaxation and Movement

Physical training: Strength/Aerobic/balance/Stretch (the letters refers to a few standard programs I usually do but it's also possible to add minutes separately in the last box). Add the time of day under the box to compare with shooting time (Section 1 above). The idea is in case performance changes over the course of a day to maybe find a pattern here.

Mental: Same system as for Physical above. Visualization and Relaxation is done through the help of CD-programs. Planning refers to both macro planning and micro planning and the weekly one usually happens the Sunday preceding the week.

## **Front Page - Section 3**

Here I add information about the shooting session.

Left column is an evaluation of my position. Total (how was the overall feel?), Outer, Inner (as it sounds), Relaxation, NPA, Balance, Triggering, Hold (how I perceived it), Back (pain level), Focus, Quality (the quality of the training session, did I behave and executed the tasks as planned?). They are filled out in a six-grade system from “- - -” to “+ + +”, the goal is of course to grade everything +++, happens very rarely though.

Right column is the relevant values from a Scatt session (pretty self-explanatory), f is the f-coefficient and PB is personal best for series of 10 or the whole session (just to feed my statistics interest). The little stick figure is in case I have a pain somewhere (muscle soreness or other pain that affects shooting) and the thermometer is how I perceive the temperature or actual degree. To the right is a target and sight picture for any necessary information. In all these I write or draw a picture, whatever works. In the middle there is a horizontal arrow pointing to a vertical line which symbolizes the line through the target. It's for drawing in feet placement. The rifle is for changes in setup or any issues I might have.

At the bottom we have a box named “Positive phrase” which is for writing my phrase. Preferably this should be done every day to make me really believe it but at least after every training session. To the right there is a box for competition scores. The six small boxes inside the big one is for filling out in case any

100 points were fired that competition. Above is a line for adding the time it took (maximum 105 minutes) and under we find the inner tens with “10\*”

## Back page

Name	<b>Training Journal</b>	Ait Rjfe 2012
<hr/>		
	<b>Positive</b>	
4		
<hr/> <hr/>		
	<b>Problem - Solution</b>	
5		
<hr/> <hr/>		
	<b>To think about</b>	
6		
ver 2.7		Page 2

Version 2.7 of my current training journal. The numbering on the side is only added for clarity and is not part of the original document.

The second page is for writing and here we find three different sections. “Positive” is anything positive I take away from the training session. There should always be something positive to take away from every session. Section 4 is for any problems I have found and if possible, its solution. The last section is for the next session. Maybe I wasn’t focused enough during this session and want to remind myself of this until the next one. The last few training notes should be read before the start of any new session.

For more non structured writing, for example a training session plan, I take loose pages from an A5 notebook and insert them into the binder. In the back of the binder I have a page for competition score tracking which is a Letter size chart from a spreadsheet. I keep track of my scores in two ways, a standard timeline chart and a bar chart based on how many times I shoot specific scores. The idea is to see where the majority of scores end up (the mode value).

## Thoughts on What Goes in the Journal

So that was how it actually looks like. But why does it look the way it does? For the first page I try to collect as much information as possible for future evaluation. The idea is that I don't really know what I might find important later on and therefore adding everything now instead of being sorry that it's not there. A universal idea with the journal is to always stay positive. Focus on the positive part and make it mine instead of thinking negative thoughts and let that influence me. The "Positive phrase" comes in here. Mention the phrase often to start believing in it. It can be anything ("I always shoot good finals" for example) that means something to you and that you need to change in your mind. The phrase should change as you become better and fulfils the current one. Instead of using negative words I try to write any problems in my shooting as just that, problems. A problem is something specific in nature and has a solution. A much more positive approach than just saying it didn't work today. This is also shown in Section 6 with forming something to work on for next training session. The alternative would be to say the same thing as something which didn't work today. That statement is something in the past that I can't do anything about it and is therefore not interesting. However, I can change the next session and that is where focus should lie.

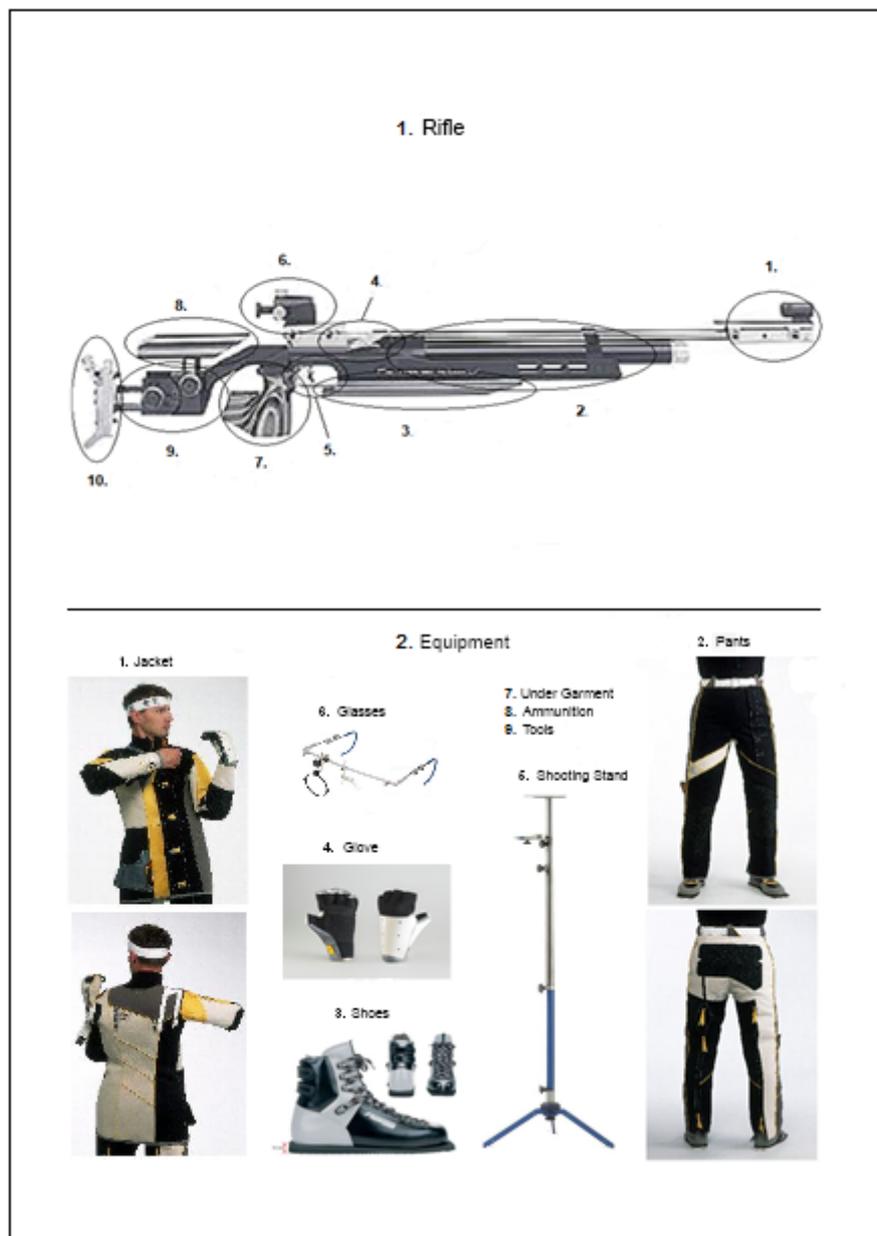
Something that is missing at the moment, and I don't really know how to incorporate, is where to write my thoughts and feelings during shooting. This usually tends to be a lot of words and adding another section in the back might make the page too condensed. At the moment I add a loose page with this information but don't really like the solution. A cleaner look would be to have everything in one place so I probably will change the second page in the future.

In short; stay positive, form improvement areas as problems which has a solution and collect as much information as possible.

This way of thinking about my journal is adopted from the book "With Winning in Mind" by Lanny Bassham. His approach is broader than the one I have portrayed here so read his book in case you are interested. I have also used information from both "Air Rifle Shooting" and "Ways of the Rifle" and finally my past journals and discussions with fellow shooters.

## Training Journal, Part 3 – Rifle Setup, Position, Equipment and Physical Training Tracking

In this part I will mainly talk about the second binder that I keep for more solid information. By that I mean a rifle setup or a position that I know works, so I have something to fall back on in case of future problems. So I put in only those things I know I can trust and are well-tested. It's kind of a safety binder for me. Other things that go into it are training methods and how different shooting ranges look like. It is built up around a loose page system where I take pages from a notebook and insert them where they are needed. The different sections and pages are numbered (plus the date) to keep track of the latest update. All previous pages are kept, you never know what information. The only pages I throw away are those that despite several trials have been proven not to work.



The page is cut in two at the line and used as a front page in each section

## Section 1: Rifle Setup

Any change is written down in the appropriate section, everything regarding butt plates is written under section 10, and the diopter in section 6. They are numbered after the section and in which order they have been added. Meaning the first time I write under section “butt plate” will be numbered 1.10.1 and the second time 1.10.2 and so forth. Any setups are written in a manner so to make it easy to find again. That means all measurements are taken against fixed points on the rifle as much as possible. If not a fixed point is used, that measurement might have change in a later setup and it will be a lot harder to find it again.

## Section 2: Equipment

What kind of equipment I use, the most recent update and any eventual changes I’ve made to it.

### 3. Position



1. Head/Cheek piece
2. Left hand
3. Right hand
4. Right shoulder/arm
6. Left shoulder/arm
8. Hip
7. Legs
8. Feet
  
9. Balance
10. Relaxation





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### 4. Training

1. Shooting
  - 1.1 Position
  - 1.2 Balance
  - 1.3 Build Up
  - 1.4 Relaxation
  - 1.6 Triggering
  - 1.8 Thought
  - 1.7 Marching
  - 1.8 Competition
  - 1.8 Scott

2. Weight Lifting
3. Aerobic Training
4. Balance
6. Stretch
  
8. Relaxation
  
7. Visualization
8. Mental training/Affirmations
9. Planning/Evaluation

The page is cut in two at the line and used as a front page in each section

### **Section 3: Position**

All important aspects of the shooting position are written down in the same manner as for the rifle. Only the position I use when in form and performing well goes here because it acts like a key to find the correct position when lost. I keep the changes I'm not convinced about away and only write them down when I've decided they work. Of course this section will change over time when a part is refined or changed but all older versions are kept. There might come a time when I need to revise my position and reverse to an older variant that worked well. You just never know.

### **Section 4: Training Methods**

It contains different training methods and sessions. The list pretty much follows the same list in the daily tracking journal.

### **Section 5: Shooting Ranges**

The last section contains information on shooting ranges. Light, temperature, location, how the range is built, and any tactics I might have to use and in general; anything important I have to remember or keep in mind while shooting there. How long does it take to get there? It's always good to have a read-through before going to a venue where you have been before. Getting familiar with the specifics of that range and to know what to expect is always better than the opposite.

### **Other journals**

On top of this I keep a calendar where work hours and training hours go. This is the tool I use to plan the upcoming week and make sure sessions don't collide. Especially weight training sessions have to be planned so they don't interfere with each other or shooting. Lately I have also started to write the plan here in the blog. The reason is less to plan it and more for motivation, other people see it and I therefore have to acknowledge and honour it. Or so is the plan anyway.

The final thing is a small notebook for the sole purpose of keeping track of the physical training. In here I write date/time and what kind of training, weight progression and personal bests and length of sessions. What type of cardio and stretching is also written down? I don't move this information anywhere except for length of exercise and time of day (to the daily tracking) which will later be compared to the plan. I keep it for comparing with a possible goal and for my own amusement; I like stats (might have mention that before...).

### **Summary**

That was everything I use for tracking my training in three posts. I hope it gave you an idea of what kind of information that might be necessary to store and how to do it. Of course I am not implying that this is the best way or even close to the best way, it is just one of all the different ones out there. It might fit you, or not, and it's not really important if it does. As long as the general idea came across, what kind of information that might be of interest while evaluating, keeping statistics and checking progress is stored somewhere. In case you got an idea and want to use a specific part of the journal, be my guest. Improve it too if you like; I do it all the time!

## Performance Journal

Most of us take a lesson from a teaching pro at some time in our life and we are all self-coached every time we play or practice. Has this ever happened to you? Your golf pro asks you “How have you been playing?” and you say something like “OK, I guess!” You say that because you cannot with precision remember what you have been doing because you have no record of it. I believe that the primary reason people do not keep a record in a performance journal is that they have never been given a really good reason to do it and because they have never been taught how to do it.

OK! Here is why you MUST record your progress in a Performance Journal. I'll give you three reasons. First, because you cannot manage what you do not measure. Simply put, you cannot afford to be in the dark as you progress. You need to have a plan to reach your goals. So, you set a goal, make a plan and go to a competition. Let's say you do not reach your goal at that event. If you have a well-documented performance journal you can easily determine if your plan failed or you just failed to work your plan. Winning is not an accident. You must plan your work, work your plan and be accountable.

Secondly, I will not coach an individual without a performance journal and if you are a coach you should demand it of your players. Why, because without one you are wasting a lot of time when you try to coach someone. I know, by referring to the performance journal of my players, how often they are practicing, how long the practice lasts, what went on in the training session or competition, what worked and what did not work, what the objective of each session was and if it was accomplished. I know what equipment was used, when a change in equipment occurred and the reason for the change. I know what the competition results were, what the weather was like on the course and the start time of the player. And what is even more important is that if I can determine this level of information from the journal then the performer can as well. How does a coach know this amount of detail if someone does not record it? I am not willing to trust my memory or that of the player on these critical issues. You can't manage what you can't measure.

Finally, if you are using the journal only to record information you are not maximizing the use of a performance journal. I believe that the primary benefit of a performance journal is to build Self-Image. Self-Image is built primarily by imprinting both real and rehearsed images. Every time we think about something it imprints and shapes our Self-Image. I believe that when we talk about something it imprints with greater power than just thinking about it. Talking about a bad golf shot is a fine way to cause it to become a habit. We become what we think and talk about. Want to have bad shots frequently, just talk about your failures to everyone. It also seems that mental images that are written down have a greater impact on the Self-Image than those that we simply talk about. If you really want to change your Self-Image make it a habit of writing down what you wish to have happen. You tend to become what you write about. But, be careful, do not write about anything that you do not want to have happen or you risk disaster.

So, if keeping a performance journal is such a good idea why do so few competitors take the time to keep

one. Again, I'll give you three reasons. First, they keep a diary not a journal. My definition of a diary is to record your impressions, good and bad, of what happened today. Recording the statistics can be helpful and we will do this as well in a Performance Journal but if you record your mistakes you are making a huge mental error and the Self-Image suffers. Let's say you have a bad day on the course and you record all of your failures and just how you performed them. The Principle of Reinforcement works against you big time. You have just improved the chance of performing poorly again in the future by writing them down in your diary. A Performance Journal, by my definition, has no references to bad experiences or poor performances. It is a performance journal not a "lack of performance" journal. People who keep diaries often find their performance suffers. When this happens they do the correct thing. They throw the diary away. Diaries don't work but Performance Journals do and are essential if you really want to improve your performance in competition.

Secondly, competitors do not know how to keep a performance journal and are rarely taught to do so by those who coach them. If they are taught anything they are taught to keep a diary and we have already covered that issue. OK, so what should be in a Performance Journal? I recommend that you record critical information in a journal every day at the end of practice. You should record the date, location, time started and total time spent, weather conditions, what you did (no negative here, just record what you practiced), what you did well, what you need to find solutions for and your goals for the future. You should have an equipment page that is constantly updated every time you change anything. You need a competition page to record your scores in competition and an easy way to relate them to the performance analysis pages. Keep your performance analysis journal where you can record this information immediately after a day of practice or competition. You can remember things only so long, so do your recording before you leave to head home.

Finally, most competitors will not keep a journal because they are just lazy. Look, if you are playing just to have fun this section may not be for you but if you want to win you must separate yourself from the others in your dedication. I understand, I do not like to document things either but I do it because not doing it is just not acceptable. It is not acceptable to be unable to remember what I have or have not done. It is not acceptable to make the same mistakes over and over because I did not record the solutions the first time. It is not acceptable to not know if my plan is correct or if it is working at all. It is not acceptable to be defeated by someone keeping a Performance Journal. It is not acceptable to beat myself. It is not acceptable to lose because I'm just too lazy to do what is needed to win!

A Performance Journal will yield great benefits to you if you are a competitor or a coach and have your players on the system. This is a painless way to keep players accountable to themselves and for you to document what you have done for them. Ask any competitor who keeps a Performance Journal "How is it going?" and see if he pulls out his Performance Journal and show you.

## **Competition Training – A Training Session**



Picture from globaltimes.cn

## Introduction

Even though the bulk of training should be done to overcome certain obstacles or with a particular goal in mind (non-performance related), there's a place for competition training. By this I mean the type of training which will help you become better at shooting competitions. The absolutely best kind is to participate in as many competitions as you can. The bigger the competition the better the training will be. You'll be forced to apply all aspects of training into one smooth task (to produce high scores) while being under pressure (both from yourself and perceived from other people, real or not). Of course the priority in an actual competition isn't to become better at shooting competitions, but to perform well. But despite the priority being different, it doesn't take away the added bonus of you becoming better at handling this particular situation. What affects you and what doesn't, as well as what was done to help the situation, all comes out of shooting competitions. Always use your training journal to track what happened, performance and all other important parameters.

Competitions cost money and time to go to and can in some parts of the world/country or during the year be scarce, so we need something else to get the needed training. This can again be dealt with in several ways (a different method for each part of a competition) but I'll just talk about the whole task of shooting 40/60 shots plus the final here. Start a league with some fellow shooters or yourself to make it closer to the real thing. Set up a price; pride, money, a new bike etc., and fight for it. If you are alone in this, it will be harder but a bit of imagination can go a long way.

A very important thing to think about at this point in time is the change in competition formats coming up in just a few months. Some parts are very different from before and it's an excellent idea to train on this before participating in the first competition. Allowed time frames are changing, which could affect a slower shooter, and the final is completely re-done, so your approach will be different (maybe not by a lot, but still).

## The Session

What you do is to treat the training session exactly as you would the real competition. You should preferably not be alone as to get sound levels correct (a recording of an actual competition is somewhat ok in case you're alone) and how other shooters interfere with your position (someone standing close to you), shooting pace or anything different compared with you being alone. Mark targets appropriately and have the correct number of sighting targets (or set up the electronic scoring system accordingly). Show up to the training session with the preferred amount of time (as in a competition) and the same equipment in case there's a difference to how you train. Have someone act as the head of competition to get times correct and add up scores.

Use the correct competition format with up to date time frames and rules, which means this will change soon (2013). Do not aim or fire before it's announced you can do so (preparation and sighting time), adhere to all rules to make it as close to the real thing as possible. Announce 10 and 5 min before the end of shooting time (again, as is done in a competition). Leave all finished targets behind you on a chair or similar for correcting and adding up scores. When finished, leave the rifle on the bench until it's safe to take away.

Finish with a final if there's enough shooters present. Again, use the correct format and follow any instructions from the competition lead. Make sure all scores are called out when they're supposed to, to add stress for participants. If all shooters are of a similar standard it's easy to get good training out of this. Problems occur when the score range between the first and last position is greater than a few points (less than 10). It can be hard for shooters far off in scores (high or low) to get the correct feeling and thus lower quality of training. Sometimes having a handicap system in place could help this. There are many ways of dealing with handicap systems so I won't specify it here. Without such a system, training is still valuable when it comes to approach and allowed time frames.

## Changes to the Session



London WC. Picture from bssb.de

Even if you don't have the preferred situation (other shooters, a head of competition etc.) try to still get it as close to the real thing as possible. Put yourself in the same state of mind and adhere to all rules.

There's no point in trying to cut corners (cheat or skip a step in preparation or shooting) since you won't

be able to do so in the real situation anyway, and, of course, it's wrong. If uncertain, count scores as the lower value to not get any "free points".

It might be nice at that moment to get a higher score than normal, but the problem is you might start expecting the same level in competitions. When it doesn't happen, disappointment and a disrupted performance increase might very well be what happens. Instead of other shooters being present, you can use a recording of a competition to get the correct sound and feeling of being there. Another change to make it more realistic is to use a different firing point than normal, or stand a bit off-center (to simulate a different or awkward range). This forces you to be more careful in setting up your shooting position and equipment to have everything within a comfortable distance. Finals are tricky to train on without someone else keeping track of time frames and scores. Even a person not familiar with all the correct procedures is better than nothing, just write down everything they need to know and tell him or her to follow the instructions – it'll work. Another idea is to think up a scenario (or pick a real one) with how much the other shooters (non-existing) scores and then use that as your goal. Did you beat your imaginary opponents? Hopefully it gets your heart rate up and some quality finals training out of it. It won't be perfect, but again, better than not doing it in the first place.

## **After the Session**

- Write in the training journal
- Stretch if necessary
- Keep track of important performance parameters to see how training is going.

## **Ammunition Testing**

This is a topic that has been explored well in multiple places before. Especially the bench shooters are good at finding a rifle and ammunition combination that works perfectly together. The general sense of how testing is done will be similar between firing a bullet and a pellet. But a few things are different and worth pointing out. Muzzle vibrations are bigger when firing a bullet and it can also be changed to suit a particular brand or batch of ammunition by changing the action screws torque setting. On the same note, most rifles have tuner tubes attached to them for both extending the sight radius and changing muzzle vibrations by adding and taking away weights. Another variable is wind which affects ammunition in different ways. All these variables don't exist in air rifle shooting but what you can do in some air rifles is change the pellet speed. It is done by changing how much air is used to push the pellet out; more air and the speed will be greater. This will to some degree affect the recoil, but with the modern day recoil absorbers used in all high end rifles, this won't really be noticed. So with some things being the same and others being different, how does one find a good pellet – rifle combination?

## Pellets



Picture from [cheapairriflepellets.co.uk](http://cheapairriflepellets.co.uk)

There are several different kinds of pellets out there. Some are solely focused on competition and precision shooting, others more towards recreational shooting. You want something that are consistent in performance and will hit the exact same spot each time. Consistency here means that all pellets in a tin performs the same way and will stay within the outer lines of the hit area. There will always be some spread in hit area when looking at a bigger group which is hard to get around. What you don't want are outliers. An unexplainable 8 here and there is a big no-no. The second criteria is that the hit area is as small as possible so you can trust the pellet to hit where you're aiming. By going for a pellet that is focused towards precision shooting you are already on your way in picking good ammunition. The main ones are H&N, RWS and Vogel. Recreational ammunition can be of any varying quality, some might be good, others not so much. Yes, they are cheaper, but the added doubt of where the mistakes come from will not aid in your training. Usually supplier carries more than one brand so there's a selection, but even if they don't, the variance within the brand is usually large enough to find something suitable. You can choose between model, size (diameter), weight and batch number. If you change only one variable, the result will be different so you can't trust that the next box of pellets will perform the same way without testing it. Personally I can't say any variable is more important than the other. I haven't found any consistency between them. I tend to stick with the same model from time to time but the rest will be whatever works best. The idea is to test everything the supplier has in stock and then buy as much as possible when a pellet performs well. With prices being relatively low (compared to smallbore or fullbore) there is no need to separate competition and training ammunition. Just find the best one and get as much as possible. Pellets won't go bad over time either, so don't worry about buying too many. Two important things to keep in mind are price and shipping. Usually it gets cheaper (per tin) the more you buy. But at the opposite side we have shipping, which can be tricky sometimes. Different shipping companies have different rules and you have to look into this before the purchase. I have picked up my ammunition at competitions when I know the company will be there, used a shipping company or friends that are travelling that way.

## Availability

So shipping, price and testing for the best pellet is just the first part, but what's missing is availability. There is a cap to how many different pellets the suppliers can keep in stock and what they need to sell to make money. What this means is after testing out the tin that works the best for you, you'd like to buy more of this one. So how to be sure the supplier will have more of the same for you to buy? In short, there is no way to be sure, it all comes down to availability, how many other shooter are looking to buy, how much you want and how long between you bought the first few tins and the second bigger purchase. I know approximately how many I want/need (20-25000 if it's a good batch, which will give me two years of training) and ask the supplier if they can hold that amount for me. Sometimes they say no (usually due to high demand at that point in time) but often they give me a time frame. I.e. "I can hold that amount for 10 days, after that I can't promise anything". So I have to work fast and be done with testing early to make sure I get what I want. Of course no-one can promise they will do this, but the companies I've used have been ok with it. Another way is to go directly there, do the testing on site and go home with what you need. Some companies have the facility for this and, if convenient, is an excellent variant.

## What and how much to order?

You have your amount you're looking to buy (in my case, 20-25000 pellets) and a company that carries what you want (precision shooting pellets). Then what you do is give them a call, ask how many different tins they have with enough in stock for your later purchase. Either you know exactly what you are looking for or you do as me, take everything within certain parameters (specific model and size < 4.52). Buy a tin of each, then ship, test and buy more of the best one. Yes, this will cost more than just buying the pellets directly and you'll end up with unwanted tins. One way of lower the cost can be to find more shooters who are looking for pellets and get together and share the cost of the test tins. Another way of looking at it is as training pellets. You won't be throwing them away so use them when performance is of no interest. Buying more (as a group) will also lower the price/tin in your later big purchase so the total cost might not be all that different in the end.

Now that you know a little more about pellets and have decided on how much you need, we have to get down to the actual testing. The next post will dig deeper into this topic.

## Pellet Testing

In the first post, I talked a bit about what to expect from pellets and suppliers. What the different aspects of a pellet are and how to proceed when buying test tins. In this post we have all the pellets we want to test and it's time to find the best one. How does this work? Are there any ways to do this without any fancy equipment?

## Equipment

Equipment that is good to have around is:

- Shooting vice. A shooting vice is, if not mandatory, at least the best way to keep the affecting variables to a minimum.
- Electronic trainers like Scatt, RIKA or Noptel are great for checking aiming consistency.

- Chronograph for testing pellet velocity consistency.
- A pillow rest for shooting from the shoulder if a shooting vise is nowhere to find.
- Measuring device like a measuring rod or a scale for measuring the groups fired.
- Bore cleaning supplies.

## Procedure

The optimum procedure for testing pellets will be the first one I'll describe. It requires a bit of equipment and if you don't have access to it, I'll describe two others that will also work. Not as good but still a lot better than just buying pellets and hoping for the best.

## Pellet Groups

The idea in all of them is to fire enough shots at the same target or piece of paper that you can measure the spread. If you shoot two shots in the same place, they should preferably land in the exact same place too. Now, if these two form one hole you don't know what it means. It could be that this is a very good pellet and you should buy it. It could also be luck, you happen to shoot the two best pellets in the tin and they are not representative for all of them. Another explanation is that the aim was slightly off and they really should have hit different places. The more pellets fired the less this becomes a factor. If you shoot 10 pellets, you've covered 2 % of all pellets in the tin and in case of a 50 shot group it's 10 %. The more shots the more likely you are to have found at least one bad pellet (which could point towards there being more bad ones). If you want to know how well they all perform, use up the whole tin. Time consuming and unnecessary, but you'll know for a fact how it went.

The tricky part comes when we have to calculate with the degrading of performance due to the barrel clogging up of residues left behind from pellets. This becomes a factor much earlier in smallbore where you usually clean the bore after every use. In air rifle a more standard approach is to clean once a week, month or when finishing a tin. The decrease in performance isn't nearly as strong as when using bullets (gun powder is to blame here). So shooting 500 pellets in a row might show this in an increased shot group over time.

So the ideal is to find something in between. You can for example start by shooting small groups (5 pellets) of all tins and weed out the worst ones. Then do the second test with 10 pellets. Once you are down to the final few tins, shoot 20 – 50 pellet groups with each tin and find the best one.

## Measuring and Grouping

After having gone through a few tins you usually end up with different looking shot groups. Some are round; others have an outlier or are pointy. There are numerous different groupings, so how should they look to pass?

As mentioned in the previous post, outliers are a big no-no. We don't want to shoot 9 deep tens just to finish with a 7 due to ammunition failing. Any shots lying outside of the rest, like a "mickey mouse head" should be discarded directly. Any shape that isn't round should also be discarded. Ideally, a group should be completely round and as small as possible (4.5 mm), though that small a group will be impossible to find. Anything under 6 mm in outer diameter is extremely good but yours will more likely be bigger than

that. Don't worry though, it'll be you making the errors and shooting a nine, not the ammunition at this point... But as a start, weed out anything that isn't round and then later in testing you can start measuring them and find the smallest group.

Make sure you mark all groups well by circulating to make sure no stray pellets from another batch affect the result. Write down model, size and batch number (or just batch# if they are all different) so you can find the best one again.

## Testing

When it comes to the actual testing there are a few different ways to proceed. We can go the technological route with using an electronic trainer and electronic target and the rifle strapped to a vise. We can still use the vise but with a standard paper target or have the rifle resting on a rest of some sort and then obviously with or without the electronic aids. The best approach would be the first one. There's no need to worry about negative effects from clamping down the rifle like in smallbore ammunition testing. There the barrel will vibrate and clamping it down unnaturally (different from what is used in shooting) might change the result. Usually this means having to shoulder test the selected batch to verify it working outside of the vise. Some factory testing facilities have a vise where you clamp the rifle differently to accommodate this (by the hand stop rail). As mentioned earlier, torque setting and tuner tubes will change the results, but this is not present in air rifle shooting. The only thing that can be changed on (some) air rifles is the pellet speed. You change how much air the regulator takes in and that in turn affects outgoing speed. Not all rifles have this option (FWB 700 doesn't unless you know what you're doing) and I won't go into this because of that. So, the only variable here is the pellet.

### #1 – The Fancy Procedure

If you have access to a shooting vise, use it. Make sure the rifle is clamped down securely and won't move during loading or any accidents that may happen. Usually, the tricky part is to find the correct height and does require some tries before it's pointing correctly. To make sure the rifle is actually pointing in the correct place at all time, an electronic trainer can be used. By adding one of these you can check the location from shot to shot and know whether a shift in grouping comes from the pellet or the vise. By adding an electronic target the need for changing paper targets becomes obsolete. Also, an initial group measuring can be done quickly by looking at group spread and decimals. A final gadget that can be used is a chronograph. It either attaches to the barrel or is free-standing. With this you can see how consistent the pellets are in speed (assuming you know the rifle is working correctly). Reset all equipment between batches or make sure you know exactly how they correspond to each other. There should be no question of what batch goes with what group. If that's the case, re-do the grouping.

### #2 – Standard Procedure

Using a shooting vise is the best way (and almost necessary if no electronic aids are nearby) to make sure the muzzle is pointing in the same place at all times. Shoot at a target and leave enough room between

different groups that no stray pellet can affect the result. An easy way is to use a standard 5 bull strip and move it sideways between batches, exactly as you'd do in normal shooting.

### **#3 – Without a Vice**

When you can't borrow or use a vise it gets slightly trickier. Now you need to test from the shoulder and this means adding a variable that affects results. A good way of controlling this new variable is by using an electronic trainer. You don't actually have to aim by looking through the sights, instead look at the screen and only pull the trigger when aiming in the same place every time. Use a rest of some sort (kneeling roll, bench rest or anything that will be stable enough) and try keeping the rifle unaffected as much as possible. Of course you can still use an electronic target and chronograph if available or a plain paper target.

When no electronic trainer is available the task gets even trickier. Now, you'll have to trust yourself to shoot in the same place every time. Still use a rest of some sort but this time you'll have to aim normally. Of course this will increase movements and errors are more likely to occur. One way of working around this is to shoot larger groups and keeping track of poorly executed shots. Group sizes will probably be bigger and it'll be harder to compare between batches and previous testing's. But it's still a much better method than just buying pellets and hope for the best.

### **Picking a Batch**

Sometimes you have several excellent tins to choose from, other times there's only one or not even that. What you consider good will also vary over time and how good you are yourself. Don't get me wrong here, everyone should use a pellet that's as good as possible, but the better you are, the more important it gets. As a start the pellet should be able to hold the 10 by itself (10 mm outer diameter) but better than this is preferable. If you yourself can hold the ten consistently, aim for closer to 6 mm. You don't want to buy many of a batch that isn't up to this standard, but sometimes the best one isn't always that good. Get less this time and have a new testing session. At other times if the best pellet is really good, then consider buying more than you intended. It'll cost more initially but a great pellet doesn't come around every year. I have personally such an example from smallbore where a pellet performed excellent. I saved that one as long as possible, only used it in competitions and later, only important competitions.

### **Summary**

Hopefully I've made some sense in explaining how finding a good pellet works. You can read a little about this in the book "Air Rifle Shooting" and most sites directed towards bench rest shooting will have extensive articles about this topic. I have tried keeping this to only air rifle shooting and explaining why a certain method can be used.

Use a method that diminishes as many variables as possible. A shooting vice should preferably be used, but after that it's not as important what kind of equipment you add. In case you live close to a factory or a testing facility, go there. They usually have the best possible equipment and you can go through more batches than normally. Availability should also be enough! Always to the testing before you run out of the

current pellet and not too close to that date. It happens quite often that no pellet is good enough and you don't want to be standing there without ammunition you trust.

## The Shooting Stand

What is it good for, who should use one and who shouldn't?

The primary idea of a shooting stand is to be a rest for the rifle between shots. It also carries pellets, tools and maybe a towel for easy access while in position. They look a bit different depending on who's using it, but the basic idea is the same. It normally consists of three legs supporting a metal pole which has a flat surface at the top. An arm of some sort protrudes out the side for tools and pellets to sit on. The stand normally sits very close to the shooter so the movement from being on aim to resting the rifle is as short as possible. Almost everyone in the top uses one, but does that also mean you should use one?



Tec-Hro, picture from 10pt9.com

## Positives

The stand is usually located as close to the shooter as possible. The height is restricted to just under shoulder height while standing in shooting position. This means that the movement from being on aim to resting the rifle can be made with minimal effort. The shooting position can be held constantly and only the rifle moving, along with both arms and shoulder between shots. So, hip and legs are constantly aligned, fixed in position, butt plate sitting in the shoulder and the right hand on the pistol grip. From the stand, left arm lifts the rifle up and into position while the rest of the body stays still. There are variants though, like moving hips between shots or not keeping the butt fixed in the shoulder at all times. Reasons can be numerous, but it all comes down to more movement. This isn't necessarily bad, but it depends on the situation and it's more to keep in mind (technique-wise). The shooter uses it as a table, resting the rifle on it between shots instead of using the table or bench in front of them. The stand then sits at just under shoulder height and the rifle is put down on to it between shots.

Besides from minimizing movements, there are a few other positive aspects. All equipment you use during training or a competition is always within reach. You don't have to stretch or get into an unusual position to reach whatever you're looking for. Pellets are the important aspects since you pick one up with every shot fired. By reaching further than necessary, you put extra strain on the position and the risk of misaligning the feet increases. By keeping tools nearby, the chance of forgetting them decreases as well. Granted, you normally don't need the tools, but when you do, it's crucial that they weren't left in the shooting bag.

One of the major upsides of having a shooting stand is the consistency it brings. You train on a range (or at home) with a specific bench height, floor, and monitor etc., making this setup the most familiar to you. When going to another range, all these small differences will affect you in one way or another. Benches, for example, are allowed to be within 70 and 100 cm, making every range unique (not to mention all other differences). By using a stand instead of the bench, you affectively take control over that variable, leaving less up to chance. The stand becomes a small piece of the range that moves with you. You can set up a shooting range anywhere (using an electronic trainer) and still feel comfortable with the surroundings.



MEC Pellet tray, picture from 10pt9.com

A shooting stand can also be altered to suit your specific needs in a way a fixed bench can't. For example, where you want the pellets for best possible reach, tools, towel, the control for electric target carriers and similar target systems and the shape of the platform itself.

## Negatives

In circumstances when the shooting position and technique isn't fixed yet (like for a novice), having a shooting stand can even work against progress. A stand is equipment that needs skill to operate, like every piece of equipment. The idea of the stand is to set it up around the shooting position to aid it. If that position isn't finalized yet, or changes slightly from shot to shot, a stand can take away focus from building the position correctly. It can allow you to cut corners which won't be noticed with the stand blocking focus from the position. A small tweak here and there to fit the position to the stand could very well be the "solution" to a problem that wouldn't exist without the stand in the first place. When you're new to the sport, setting up a position correctly from shot to shot has to be learned. Feet position, hip alignment, finding the correct place for the butt plate etc., are all important and necessary to know how

to do consistently. These things are still important when using a stand, but this time you set the position maybe once in five shots (or ten). Any problems at this point in time and all those shots will be affected.

Adding another piece of equipment will cost more money. It might not be the most expensive one, but expenses do add up and become significant in the end. It also weights a certain amount which is a problem when it comes to air planes and going to bigger competitions. It takes up space and weight in an already tight weight budget. The rifle, jacket, pants and pellets all weigh a lot. Wait until you start travel by flight and you'll notice how tight it all really is.



An arm for the shooting stand I made myself (as the careful viewer might notice!). It's a clipboard clip with an attached metal arm and magnets holding the pellets in place. It holds a towel, pellets and tools with style.

## Summary

For a novice, a shooting stand isn't the right way to go. Start by learning the basics of how to set up a shooting position correctly every time before adding any aiding equipment. There are so many different things, big and small to keep in mind when starting up a new sport that keeping it simple is the best idea. After reaching a level of around 560-570 (380), a stand is starting to become a good idea. At this point, the shooting position is settling down with an increased level of understanding of technique. It becomes easier to separate where a specific movement or tension starts (what is caused by the shooting stand for example). But before this level has reached, it's more likely to hamper shooting progress than what it's supposed to do.

An expert, on the other hand, has learned all the basics with how to properly attach the butt plate in the shoulder and how foot position affects balance and so on. For him/her, a shooting stand is nothing but positive and will help in overall performance. Some stands are lighter than others, making them a better choice in the case of frequent traveling. Don't underestimate the consistency they give you by letting you control your close surroundings (not relying on different ranges specific bench heights) and the familiarity it gives you while shooting in a stressful situation like a big competition.