

Sixth B Course 2006 (**ISSF** Coach's License **B**)

AIRPISTOL MEN

Triggering technique

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Triggering technique – AIR PISTOL MEN

Introduction

The objective of sportshooting is to deliver a number of perfectly executed shots to a target usually within a given time limit. Concerning the discipline “AIR PISTOL MEN” it consists of sixty match shots at a target, 10 meters away, within 1 hour 45 minutes. The 10 ring has a diameter of 11,5 millimetres.

To successfully compete in this demanding sport, an intensive training of the correct technique is necessary. Once each part of the correct technique is learned and can be properly executed by the shooter, all these elements are to be used in a coordinated and systematically way, otherwise there will be no expected and wished output. Five important coordination elements are to be taken in consideration for the proper use of the technique:

- Taking the correct shooting position
- Pulling the trigger
- Coordination between triggering and aiming
- Follow through
- Breathing

In the following pages, the triggering technique and the related coordination elements will be discussed first.

A second part consists of the analyzing and intervening methods during competition season, followed by the evaluation process and adjustments of the intervening methods.

Finally some examples and their solutions will be given.

Defining the triggering technique

To deliver an accurate shot a whole scheme has to be followed. For the shooter the physical action stops once the projectile has left the barrel and there is no more interference possible on the part of the shooter. Besides the physical action there is also an intellectual and a psychological action. The intellectual action consists in the evaluation of the fired shot, both internally and relating to the result, the impact on the target. The psychological action results in the finishing of the scheme as to thoughts, and the start of the preparation of the execution of a new shot, repeating the scheme.

The triggering technique can be considered as a method to execute all the actions relating to the correct manipulation of the trigger by the shooter, helping in attaining the expected and wished output of a correct shot.

The actions related to the trigger start when the contact between the trigger finger and the trigger is made and stop when there is no more influence on the projectile possible by an action on the trigger (the end of the physical action).

Three factors are to be considered when analysing the trigger technique:

The mechanical factor who consists of the way the trigger system of the weapon is constructed and the specific demands it put on the technique.

The anatomical factor which is the way the human body is constructed and how it works. The impact on the triggering technique will be caused by the construction and working of the underarm, the hand and the fingers.

The psychological factor which places the triggering technique in relation to the aiming and the follow through.

The mechanical factor

The mechanical factor is the way the shooter has to overcome the force necessary to activate the release of gas behind the projectile in the barrel of the pistol.

The rules pertaining “air pistol men” demand an trigger pull of 500 grams.

This means that the force that must be applied to the trigger by the trigger finger in order to fire a shot, must at least be 500 gram.

The trigger needs a certain movement to work. The way the resistance of 500 grams is distributed over the movement of the trigger is not stated in the rules and regulations.

Normally it is a mechanism with an accelerator, this means that the following stages can be distinguished:

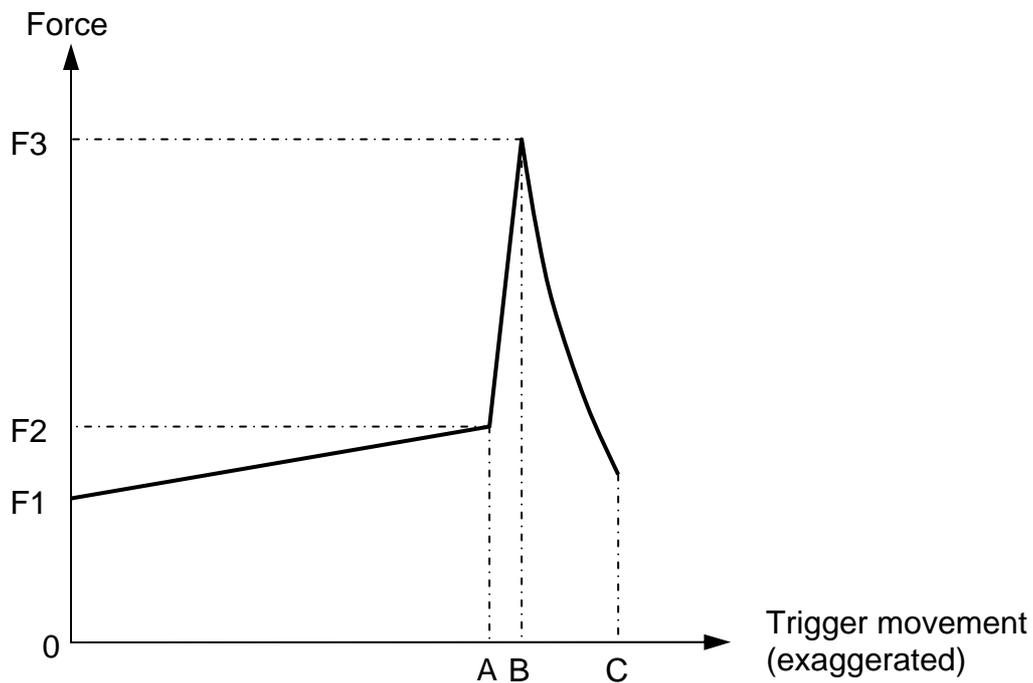


Figure 1

Pertaining to the force:

0: trigger at rest

0-F1: force that must be applied to the trigger before it starts to move

0-F2: force that is already applied to the trigger when arriving at the “hard point”, end of first stage (first leg). This force must be adjustable.

0-F3: Force by which the trigger breaks ($>$ or $=$ 500 grams), end of second stage (second leg). This force must be adjustable.

The difference between F2 and F3 has to be adjusted to get the best results.

It must be great enough to have a distinct “hard point” when the trigger reaches point A, this is a pure personal thing depending on the tactile sensitivity of the concerned shooter.

On the other hand it must be as small as possible to get the smallest interference with the aiming in the final stage of releasing the shot.

Pertaining to the trigger movement:

0: trigger at rest.

A: position of the trigger reaching the hard point, end of first leg.

B: position of the trigger when the shot breaks, end of second leg.

C: Trigger stop. Mechanical feature that blocs any further movement of the trigger.

Each position of the trigger has to be adjustable (0, A, B and C). The correct positions will be determined by the anatomical characteristics of the shooter (length of the trigger finger and of the different joints of the trigger finger).

At point A, the part of the finger acting on the trigger must be able to exert a force parallel with the barrel axis.

The distance between A and B determines if it is a “roll trigger” or not. A lot of shooters prefer a crisp, clean breaking trigger which implies that the distance between A and B has to be as small as possible without interfering with the mechanical working of the trigger.

The position of the trigger at point C, the trigger stop, is adjusted in such way that the breaking of the shot and the following decline of resistance on behalf of the trigger does not impair a sudden large displacement of the trigger due to the pressure the trigger finger is exerting. The distance between point B and C has to be minimal without interfering with the mechanical functioning of the trigger system (freedom of movement of the internal parts).

The trigger finger must not contact the pistol at any other part than the front of the trigger. The mechanical configuration of the pistol and the grip must make this possible.

All the foregoing concerns the **ADAPTABILITY** of the trigger. Besides this adaptability the construction of the pistol must be such that the trigger system works each time in a correct way (**RELIABILITY**) and that the forces (F1, F2, F3) and the position of the trigger (0, A, B and C) remain the same for each shot fired (**REPEATABILITY**).

The anatomical factor

The action on the trigger requires a certain flexing of the trigger finger in order to apply pressure on the trigger to overcome the resistance of 500 grams what results in the breaking of the shot.

The anatomical construction of the hand is rather complex. The bones are connected through ligaments and are brought and kept in a certain position by the action of muscles. Because the hand and the fingers are adapted to perform very fine and precise actions in a lot of different positions they consist of a lot of small bones and muscles.

Regarding the trigger finger and the action the trigger finger has to perform when shooting, two main observations can be made:

First: it is next to impossible to move the first phalanx (the most remote phalanx from the palm of the hand, *falanges distales*) of a finger without moving an other phalanx.

Second: The muscles needed to move a finger phalanx or a finger are on one side attached to the moving phalanx or finger and on the other side to the bones of the underarm. The tendons or leaders who connect some of the flexing muscles of the trigger finger to the bones of the underarm run under the palm of the hand. This is clearly visible when performing the test pictured in Figure 2.

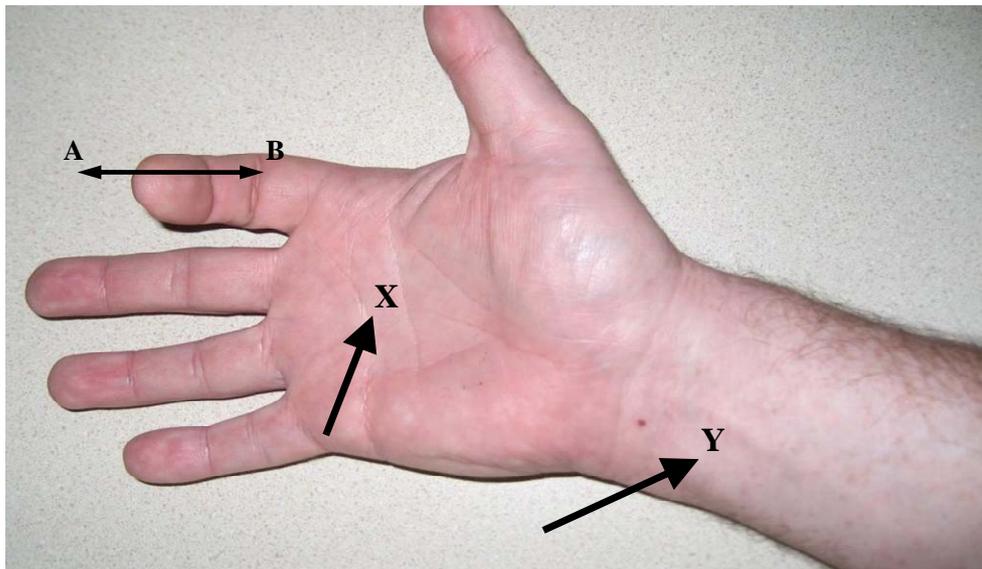


Figure 2

When moving the trigger finger between A and B you will clearly see the subcutaneous movements of the tendons at X and Y.

The consequence of these observations are important for the triggering technique.

The first observation leads to the following conclusion:

It is impossible to move the first phalanx of the trigger finger in a straight way. Each movement of a phalanx of the trigger finger is of a circular type with as hinge the joint between the second and the third phalanx of the trigger finger. This circular motion will

cause a lateral force on the trigger and a lateral deviation of the sight line. This lateral deviation can be minimal if the circular motion of the trigger finger is kept minimal. In casu if the distance between the position A and C of the trigger is minimal (see Figure 1). This doesn't mean that the complete movement of the trigger has to be minimal, but the part that really counts, the final movement as the trigger breaks en the following movement of the trigger till it is stopped by the trigger stop has to be minimal. This movement occurs from just before the breaking of the shot and stops when the projectile is still in the barrel.

The second observation leads to an even more important conclusion.

If one performs the test as pictured in Figure 2 but places the index finger of the other hand at point X, one can easily feel the subcutaneous movement of the tendons. The implications are as follow: when assuming a good grip on an air pistol, there is a good contact between the palm of the hand and the grip surface of the pistol. Any movement of the trigger finger and the consequent subcutaneous action of the tendons will exert a force on the grip. This force causes a deviation of the line of sight, because the forces are multiple and depend on the different points of contact of the palm of the hand and the anatomical characteristics of the concerned hand, the direction and amplitude of the deviation of the line of sight is not predictable. The deviation can be rendered minimal by limiting the movement of the trigger finger in the final stage of delivering a shot. This is again obtained by making the distance between the position of the trigger at A and the position of the trigger at C minimal.

The movement of the line of sight due to the movement of the trigger finger between the position of the trigger at rest and the position of the trigger at the end of the first stage (A) is corrected by the eye – hand coordination, see the triggering technique.

The movement between point A and point B can be rendered a kind of predictable and corrected by the eye – hand coordination by augmenting the pressure on the trigger in an continuous, progressive way. Every sudden movement of the trigger finger is pernicious. This continuous progressive way of augmenting the trigger pressure will also eliminate a sudden movement between Trigger position B and C, but it is important to keep this distance minimal.

The psychological factor

The psychological factor determines the coordination between the different actions. On one side we have the action on the trigger who must be performed in the best possible way, this is considering the remarks made in the paragraph concerning the mechanical and the anatomical factor. On the other side there are two psychological factors and a “red flag” to consider.

The first psychological factor is the coordination between triggering and aiming.

The second psychological factor is the coordination between triggering and timing.

Both coordinating actions are very complex and difficult to explain.

The coordination between triggering and aiming

This coordination gives the relationship between the triggering action and the visual information we get when we are aiming the pistol.

In an ideal way the breaking of the shot should happen when the sights and the aiming zone are perfectly aligned. It may not be a voluntary action, but rather an automatism.

This means that we must not make the shot break, but we must strive for a situation where the sights are as perfectly aligned as possible at the moment that, under influence of the continuing, progressive pressure on the trigger by the trigger finger, the shot breaks.

Our striving must be with the alignment of the sights and the aiming area, the breaking of the shot must come as a surprise.

The coordination between triggering and timing

The most perfect and most frequent alignment of the sights happens when we reach the period of minimal movement. That is when the shooter is taking a correct shooting position and gets all the muscles of his body in equilibrium. This balance of the muscles doesn't bring about a lateral deviation from the aiming zone. The vertical alignment is done by the action of the muscles in the shoulders and the trunk.

The period of minimal alignment can be prolonged by general and specific physical training and by a better breathing technique.

It is logic that the sequence of the trigger action ends during the optimal part of this period of minimal movement. It is possible that with an incorrect breathing technique, the shooter is still in his period of minimal movement, but the lack of oxygen makes his eyesight dwindle.

The shot must break during the optimum period, before any ill effects occur, this is the coordination between triggering and timing.

The “red flag”

That part of the psychological factor tells us not what to do when, but rather when to stop the automatic action of triggering.

Any intrusion of thoughts not related to the development of a shot, any thought at the wrong moment or any lack or losing of concentration has to rise the red flag and cause the triggering action to stop.

Because we strive to make the triggering action an automatism, that means that we don't control the action in a conscious matter. The triggering action is something that is going on when we are striving to get perfect alignment of the sights. So it can happen that the triggering action continues when we have decided to stop the development of the shot. This is one of the cases when the shot breaks at the moment we decided to lower the pistol and to restart the sequence. I'm sure every one already experienced this situation.

The rising of the red flag itself must be a reflex that happens whenever a deviation of the routine of developing a shot occurs. The rising of the red flag must trigger a conscious action to stop the triggering action in an active manner by lifting the trigger finger of the trigger, lowering the arm and pistol to the rest position and consequently restarting the sequence to deliver a perfect shot.

Triggering technique

When we take in consideration the different factors who have their influence on the triggering action then it becomes quite easy to describe the triggering technique:

Make sure that :

- The trigger finger is free from any contact with the grip or the pistol except the trigger.
- The first phalanx of the trigger finger must be placed with it's most sensitive part on the trigger so that it is at 90 degrees to the axis of the bore at the beginning of the second stage.
- The trigger of the pistol must be so adjusted that the movement of the trigger from the start of the second stage to the contact with the trigger stop is minimal.
- When the second stage starts, the pressure must be applied parallel with the barrel axis. Once the procedure is started, it should be with slowly, continuously and steadily increasing pressure till the shot breaks as a surprise.
- All hesitations or rapid violent movements with the trigger finger must be avoided.

When following these rules

- When in the rest position place the trigger finger correctly on the trigger.
- While lifting the pistol and assuming the correct shooting stance pull the first stage, so that the hard point is reached when the sights align in the aiming area.
- Start the pressure rise in the second stage while striving to perfectly align the sights in the aiming area, concentrate on the front sight.
- Continue the pressure while striving for perfect sight alignment, ignore the slight movements of the pistol, focus on the front sight until the shot is breaking by surprise.
- When the shot breaks, keep the trigger in the rearmost position and keep following through for a few seconds.
- During the whole sequence be aware of a "RED FLAG"

Analyzing and intervening methods during competition season

The training of the triggering technique must happen prior to the competition season, so that the reflexes are acquired at the start of the competition season.

There are different analyzing methods for the triggering technique:

- Observation by the shooter himself
- Observation by the coach
- Analyse of the impacts on the targets

Observation by the shooter himself

This is perhaps the most effective analyzing method if properly done by an experienced shooter.

After each shot the shooter must evaluate his action. For the analyse of the trigger action he can refer to the last picture he saw of the alignment of the sights. If the sight picture (front sight – rear sight) was correct, he is able to predict the impact on the target.

If he systematically sees a movement of the front sight to one or another sight, chances are that there is something wrong with the way he grips the pistol or with the action on the trigger.

The intervening method here is to resettle in the technique. Dry firing while concentrating on acquiring the correct grip will point out if the problem is trigger related or not.

If the breaking of the shot surprises him, usually his trigger technique is OK.

If he has the feeling that something's wrong with the trigger, the mechanical system can be checked, if the feeling persists the error lies with the triggering technique. If it feels wrong that means that the shooter is spending attention to the trigger action where it should be an automatism.

The intervening method here is to review the triggering technique during the training sessions so the shooter can resettle in his automatism.

Observations by the coach

When during competition the coach is able to observe the shooter, it is possible to detect problems with the triggering technique.

The observations can be related to:

- The time it takes to complete the triggering action
- The way the trigger finger is placed on the trigger
- The continuity in increasing the pressure
- The movements of the trigger finger on the trigger
- The follow through

It is logical that each of these observations must be considered in relation with the shooter.

The intervening method for each of the observations is to verify the observation by recreating the situation. For example the observation during another match, or the recreation of the situation during a training session.

Once the observation is confirmed the coach must compare the observations with his perception of the triggering technique.

If the coach sees a direct error linked to the observation, he can develop some exercises to remedy the error.

If the link between the observation and its origin is not clear he has to discuss his observation with the shooter in order to get some additional information.

Analyse of the impacts on the target

When superimposing the different impacts during a whole match on one enlarged target it is possible to determine some errors. Some of these errors can be due to a bad triggering technique by the shooter. These method of analyzing the impacts is called error-analyses.

Error-analyses can be conducted in two ways.

One can start by the correct shooting technique and for each detail of the technique determine by deduction what the error will be like on the target. Once the whole technique is analyzed, the faults can be grouped by part of the technique in a ISHIKAWA diagram.

This is the analyses of the impacts starting from the technique.

It must be said that some errors are shooter related (example: tightening the grip in the final stage of the development of the shot, depending on the shooter the impacts can be low or lower left or lower right), while some others will only differentiate in minor ways from one shooter to another (example: jerking the trigger for a right handed shooter: impacts to the lower left).

The diagram must be shooter specific. Once the diagram is completed it must be tested by noting the errors by observation and noting the related impacts. All this can be done by the coach without interference from the shooter.

The next step is to group the errors by impact image. This gives the coach a valuable tool to quickly determine the possible errors following the observation of the impacts on the target. By elimination the coach can determine the most probable errors and the observation of the shooter can narrow the choice.

Once the error is known a specific corrective action can be taken.

Evaluation process & adjustments of intervening methods

The evaluation process can be seen as the ongoing analyzes of the shooting during the competition season.

Once certain the errors are dealt with, analyzing the subsequent matches or training sessions will demonstrate if the intervening method was successful.

If the errors are persistent or if a new error is observed during competition season, the intervening cycle starts again.

It is important to have a constant dialogue between the shooter and the coach. In this way additional information will be gathered by the coach, sometimes information that a direct question or an observation wouldn't reveal.

This doesn't mean that the coach has to explain each and every step he takes or each exercise he orders. Sometimes it gives a better result if the shooter is unaware of the real goal of the exercise as this will eliminate some bias on the part of the shooter.

If some intervening methods are regularly needed, it can be considered to make them part of the training program for the next competition season.

Some intervening methods can be generalized and become standard part of the training sessions (example: shooting on a white target).

A great help in the evaluation process are the different electronic training systems (Rika, e.d.). With one of these it is possible to make an in depth analysis of what happens the moments just before the shot breaks.

It is possible to observe the effect of the different intervening methods and adjustments. If the electronic training and analyzing system is used with a camera, the correlation of the movements of the shooter as recorded by the camera and the movements of the sighting line as recorded by the electronic training system.

This way one can work on the triggering action and on the coordination of sighting and triggering of a shooter. This training work however is not meant to be done during the competition season. It has to take place in the preparation to the competition season, because it is not good for the development of the automatism necessary to perform during the competition season.

This method can be used for analysis, if the reason of the persisting error can not be determined any other way.

Examples

It is very difficult to single out and to determine the correct reason of an error. The following three examples are meant to illustrate errors in the triggering technique as described in the first part of the homework. It is possible that other causes than errors in the triggering technique can cause similar errors

Example 1

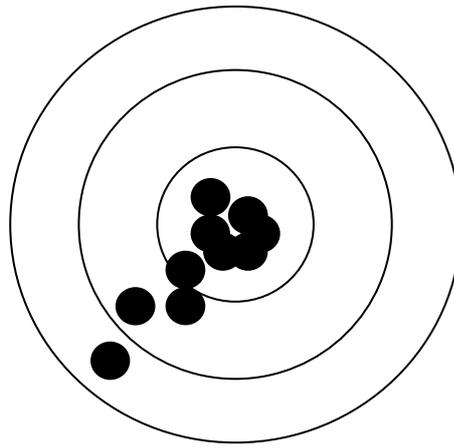


Figure 3

When the impacts are this way, it can be caused by several errors. What kind of error is prevalent can be determined by observation and dialogue with the shooter. One of the first observations to be made is to see if the shooter is right- or left-handed. And if he is not canting the weapon during the development of the shot.

This type of error is quite common with beginning shooters, but the grouping indicates that the shooter is experienced and well trained. This is confirmed by observation.

Mostly the error is not unique, this means that the picture you get from the superposed impacts is the result of multiple shots with some outside the ten due to different errors. The reason an impact is situated outside the ten, can be the result of an aiming error, a triggering error, a sudden uncontrolled movement due to a faulty stance, a lack of concentration or a psychological disturbance in general, and so on.

Seen from the triggering point of view the error is most probable due to the “psychological factor” as described in the beginning of this homework. The shooter is deliberately pulling the trigger the moment his sights are perfectly aligned (jerking). It is not pronounced because there are only two shots outside the ten, a nine and an eight, but the global picture indicates that the error was made four times out of ten shots.

When a shooter deliberately pulls the trigger when the sights are correctly aligned, the resulting impact for a right-handed shooter is normally to the lower left due to the reasons described in the “anatomical factor”.

To correct this error one has to consider the different aspects of the error. This error is due to a lack of coordination between the triggering and the aiming, between triggering and timing and a lack of automatism in the triggering action. These aspects can be related: it is possible that an experienced shooter deliberately pulls the trigger due to a real or imaginary lacking of time, or it can be caused by less stability that match that urges him to shoot when the alignment of the sights is correct.

One possible intervening method is to go back to the basics, if this is possible during the competition season.

Exercises as dry firing and shooting on a white target will improve the trigger control from the mechanical and anatomical standpoint. This gives the shooter the possibility to convince himself that he is capable of delivering a perfect shot with his pistol, this is a shot where the follow through indicates no disturbance of the line of sight when the shot breaks.

On a white target he is able to group his shots on a small surface and with a small random distribution of the impacts.

The coordination factor can be trained by visualisation techniques. This involves a mental development of a perfect shot without actual shooting. When properly and frequently done this type of exercises are a way of programming the body and the mind to correctly perform an action, in casu: delivering a perfect shot.

The previous exercises have to be supplemented by live firing. The closer one gets to the next competition the greater the amount of live firing has to be in a training session. This gives the shooter the self confidence necessary to peak at the competition.

Another point to be dealt with during the training sessions is time management. As indicated the lack of time can trigger the pictured error.

As already stated, it is very difficult to describe a cure for the pictured error without an actual interaction with the shooter. Observation and communication are a must to determine the correct cause of the error. Action has to be taken accordingly.

Example 2

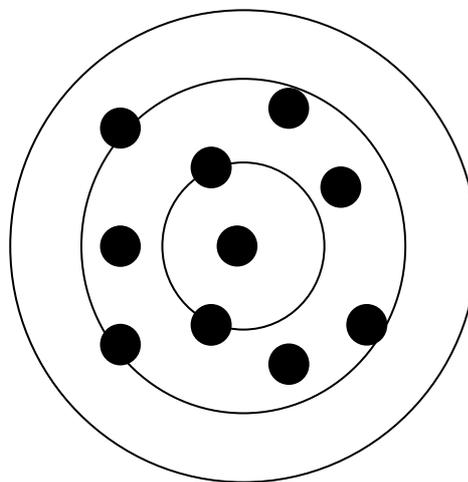


Figure 4

When considering this group the random distribution of the impacts on the target is obvious. The reasons for such a distribution can be multiple:

- Inexperienced shooter
- No correct stance, leading to a minimal movement that is larger than attainable.
- Lack of concentration
- Etc.

When considering the error from the point of view “triggering action” two possible errors come to mind:

- Mechanical inconsistent trigger
- Lack of coordination between triggering and timing.

In the case of an inconsistent mechanical trigger the adjustment is to reset the trigger adjustments to their correct position and to check the functioning. If necessary replace worn or out of specification parts and springs.

The fact is that with an inconsistent trigger it is impossible to coordinate the triggering with the aiming. The automatism leading to a surprise break of the shot can not be correctly executed when the mechanical functioning of the trigger varies from shot to shot.

A second possible error is the lack of coordination between triggering and timing. When the triggering action, even if it is automated, takes too long, the period of minimal movement will be over before the shot breaks. This results in a larger grouping with the shots randomly distributed.

To correct this error one must emphasise on the timing of the triggering.

The automatism of the triggering has to be slow enough to lessen the influence of the anatomical factor and to avoid “jerking”. It has to be positive and continuing to let the shot break during the period of minimal movement when the sights are correctly aligned in the aiming zone.

Example 3

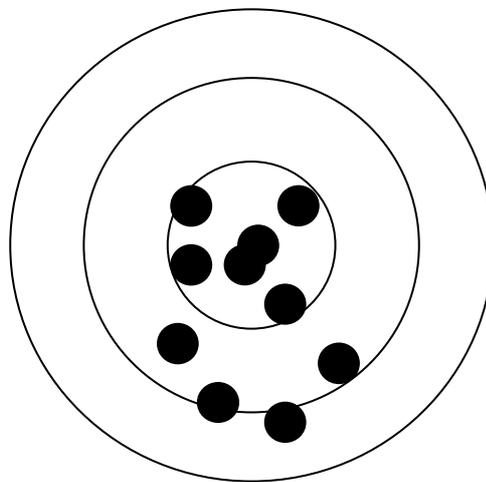


Figure 5

Again the reasons for this kind of error are multiple. Most frequently this kind of error is due to an incorrect aiming zone, tiring of the shooting arm or focusing on the target instead of focusing on the front sight.

Regarding the triggering technique this pattern of impacts can be due to an incorrectly adjusted trigger stop that makes too much travel of the trigger possible when the shot has broken.

Readjusting the trigger stop to minimal after movement will cure this problem.

Another possible error in this case is the other fingers tightening on the grip when the triggering action is happening. If the triggering action is not performed by the trigger finger alone, this pattern will result.

Exercises that focus on the correct triggering action, the positive, systematic build up of pressure on the trigger by the trigger finger alone without tightening the grip with the thumb and the other fingers, will cure this error.

REFERENCES

Zeljko TODOROVIC, Introduction to the Shooting Discipline Technique Pistol, Fifth Basic Course for UIT Coach's License, Filsbach, Switzerland, March 1997.

A.A. YUR'YEV, Competitive shooting, English translation by NRA of A, Eighth printing, Fairfax 2002.

ISSF, Official Statutes Rules and Regulations, Edition 2005, First Printing 09/2004.

Various authors, Winkler Prins Medische Encyclopedie, Elsevier, Amsterdam-Brussel 1973

L.-L. KIRCHMAN, Anatomie en fysiologie, De Tijdstroom, Lochem 1972.

Various authors, The pistol shooter's treasury, Gil Hebard, Knoxville, Illinois 1973.

NRA, The basics of pistol shooting, NRA of A, First Edition 1991.

Siegfried ARNOLD, Das training des sportschützen, Rud. Bechthold & Comp., Wiesbaden

Lanny BASSHAM, With Winning in Mind, Bassham, USA 1995.

Valery CARMONA, Le tir sportif aux armes de poing, Ed. Grancher, 1980.

Jean-Marie BRESSON, Le tir aux armes de poing, Balland, 1977.

USAMU, Pistol Marksmanship Guide, Fredonia, Amsterdam 2000.

USAMU, The Advanced Pistol Marksmanship Manual, Fredonia, Amsterdam 2002.

KLEIN & VAN DIJK, Sportschieten, Moussault, Antwerpen 1982.

http://www.nygordprecision.com/note_1001.htm , valid on 08 aug 2006.

<http://www.targetshooting.ca/docs/Intro2PS.pdf> , valid on 08 aug 2006.

http://www.geocities.com/ed_ka2fwj/ronsfunds.html#trigger, valid on 08 aug 2006.

http://www.geocities.com/ed_ka2fwj/rikatriggerwork.html , valid on 08 aug 2006.