



ISSF TRAINING ACADEMY

»D« COACHES COURSE

PHYSICAL TRAINING

In Shooting Sports

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1. INTRODUCTION

The physical preparation of our shooters to compete should be seen by coaches as an equally important component in the overall preparation of the shooter. To neglect or to incorrectly train for the physical requirements of shooting and competition will have a direct impact on performance and the result.

Physical training for shooting should not be seen as a separate activity within the shooters training programme, to be suffered and put up with. The importance of being fit to compete, fit to travel and fit to sustain the activities of training should not be underestimated.

The proper use and planning of physical preparation within the overall performance plan can make the difference between success and failure.

Before starting a programme of physical activity it is essential that your shooters receive a full medical check and clearance from a doctor before commencing any physical activities. Where underlying health conditions exist, medical advice should be sought as to the suitability and intensity of training that the athlete can sustain.



2. THE ANALYSIS OF THE BASICS

WHAT ARE WE TRYING TO ACHIEVE

Before we embark on a programme of training we must first evaluate what we require to achieve the performance improvement in our athletes and to determine what role physical conditioning can play in that part.

Are we looking for short-term improvements or long-term improvements? These questions will open up the scale and type of activities that we will undertake.

THE SHOOTERS CAPABILITIES

Before we can set out a programme of activities we must analyze the shooters own physical capabilities and their level to accept the training levels that may be required. During this period we can also evaluate what impact that their physical conditioning may have on their overall performance.

The best method to achieve this is through the performance of a series of standardized physical tests that can be repeated at periodic intervals to establish the progress of the athlete.

These tests can measure the cardio-vascular capacity, the muscle endurance and overall mobility of the athlete.

Test strength

Do as many classic pushups as you can without stopping, but use this precise execution: Take 2 seconds to lower your body until your upper arms dip below your elbows; pause for 1 second; then take 1 second to push your body up. This ensures that you'll perform the test identically each time you take it.

Test mobility

Place a yardstick on the floor and put a foot-long piece of masking tape across the 15-inch mark. Sit down with your legs out in front of you and your heels at the edge of the tape, one on each side of the yardstick. Put one hand on top of the other and reach forward over the yardstick as far as you can by bending at your hips. The number your fingertips touch is your benchmark.

Test endurance

On a treadmill or on a flat course outdoors, run or walk 1.5 miles as fast as you can, and record your time. (Warm up first by walking or jogging at an easy pace for 5 minutes.)

3. EXERCISE & RECOVERY

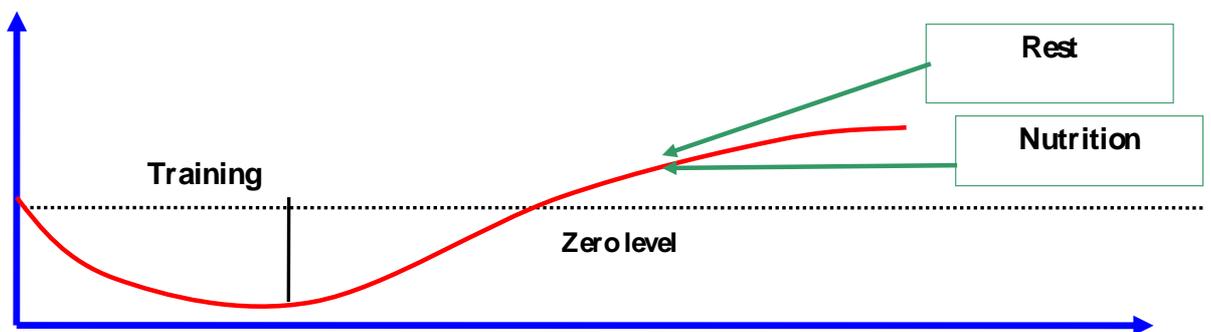
The purpose of training is to disturb the homeostasis of the whole body, which will recover and improve during **rest!**

The statement above highlights the importance of recovery during physical training. It is also the basis for the introduction of overcompensation theory in physical training.

For the purposes of this course we will limit ourselves to the basic principles of training.

When we exercise we are creating stress within our body, muscle is damaged, energy is lost through exertion. Where the improvement comes from is during the recovery period. As muscle is repaired and strengthened, new blood vessels grow. During the rest and recovery period we must also ensure that the body is nourished and properly hydrated to ensure the maximum gain from our exercise. In the chart below you can see the dip in performance that exercise creates and how the increase in performance appears during the rest and recovery phase.

Performance level



ACTIVE RECOVERY

Underlying the principle of improving physical performance is active recovery. After athletic competition or a hard workout, it would seem that complete rest would be the best way to encourage recovery. However, research is beginning to find some advantages in active recovery. Active recovery refers to engaging in low-intensity exercise after workouts. There are two forms of active recovery. One is during the cool-down phase immediately after a hard effort or workout. The second form of active recovery includes the days following a competition or other intense workout.



Recovery after exercise is essential to muscle and tissue repair and strength building. This is even more critical after a heavy weight training session. A muscle needs anywhere from 24 to 48 hours to repair and rebuild, and working it again too soon simply leads to tissue breakdown instead of building. For weight training routines, never work the same muscles groups two days in a row.

Some examples of active recovery are:

Rest

Time is one of the best ways to recover (or heal) from just about any illness or injury and this also works after a hard workout. Your body has an amazing capacity to take care of itself if you allow it some time. Resting and waiting after a hard workout allows the repair and recovery process to happen at a natural pace. It's not the only thing you can or should do to promote recovery, but sometimes doing nothing is the easiest thing to do.

Stretching

If you only do one thing after a tough workout, consider gentle stretching. This is a simple and fast way to help your muscles recover.

Cooling Down

Cooling down simply means slowing down (not stopping completely) after exercise. Continuing to move around at a very low intensity for 5 to 10 minutes after a workout helps remove lactic acid from your muscles and may reduce muscles stiffness. warming up and cooling down are more helpful in cooler temperatures or when you have another exercise session or an event later the same day.

Nutrition

After depleting your energy stores with exercise, you need to refuel if you expect your body to recover, repair tissues, get stronger and be ready for the next challenge. This is even more important if you are performing endurance exercise day after day or trying to build muscle. Ideally, you should try to eat within 60 minutes of the end of your workout and make sure you include some high-quality protein and complex carbohydrate.

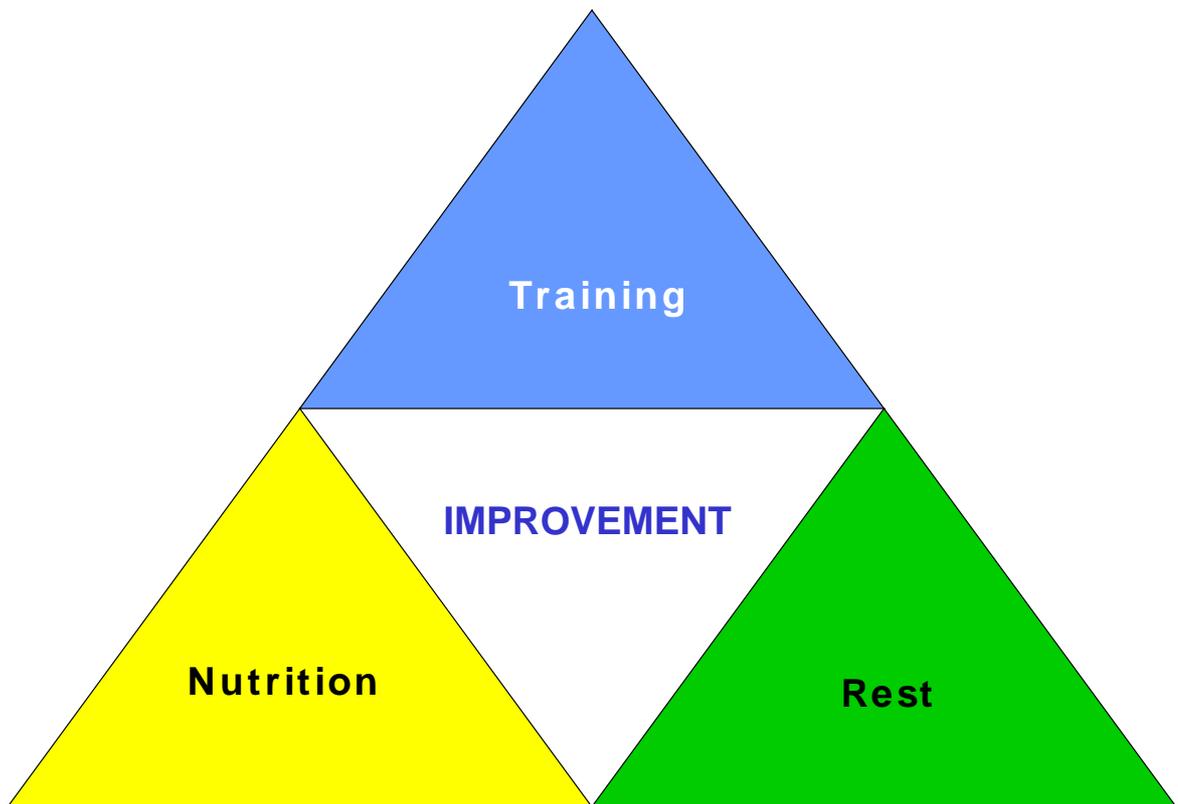
Hydration

You lose a lot of fluid during exercise and ideally, you should be replacing it during exercise, but filling up after exercise is an easy way to boost your recovery. Water supports every metabolic function and nutrient transfer in the body and having plenty of water will improve every bodily function. Adequate fluid replacement is even more important for endurance athletes who lose large amounts of water during hours of sweating.

Sleep

While you sleep, amazing things are taking place in your body. Optimal sleep is essential for anyone who exercises regularly. During sleep, your body produces growth hormone, which is largely responsible for tissue growth and repair.

Remember that the three cornerstones of physical improvement are Training, Rest and Nutrition. All three must be included in the correct quantities for the process to work effectively.



PRACTICAL PROBLEMS OF TRAINING

Some of the problems we encounter when introducing a physical training programme to shooters are:

Not enough physical training during the competition period

We cannot spend all our time performing physical training; we must balance physical training with technical training. However, we must not stop performing physical training and especially during periods of competition when our minds might be more focused on the competitive aspects of training.



Shooters are not aware of the benefits of physical training

We must also ensure that our athletes are aware of the benefits of physical training to their overall performance. Spend the time to explain why exercises are performed and how they will benefit the shooter.

Not enough Active Recovery

The temptation to skip the recovery period and not perform cool downs and stretching will limit the benefits of the training session. The shooter also runs the risk of predisposing to injury and setting back their overall progress.

Wrong intensity of training

Training must be balanced and if too much emphasis is placed on certain aspects of training such as weight training it can lead to the wrong physical qualities being developed. The training programme must be balanced based on the requirements of the shooter for their performance.

Training is too stressful

The shooter may find the training too much and find themselves demotivated and not prepared to continue. Again the training must be tailored to the shooter, their current levels of fitness and their ability to perform the activities safely.

Overtraining

The tendency to over train is just as big a problem as under training. Damage can occur which can be acute and seriously affect the shooter's ability to perform. Care must be taken to ensure that the quantity of physical training being undertaken is commensurate with the level of fitness required to perform the shooting activity.



4. THE GOAL OF PHYSICAL TRAINING

Why do shooters need physical training? Surely shooting is a sport that does not require aerobic or anaerobic fitness!

These statements are unfortunately mentioned too often by shooters who believe that shooting is a skill only sport with no requirements for the physical component.

Let us examine how the need for physical training can be explained by looking at the demands that shooting places on the body.

TO SUPPORT TECHNICAL TRAINING

When we shoot and perform technical training we are conducting a high volume of shots in a repetitive fashion. To train for a long period of time in such a fashion requires the shooter to be physically capable of performing the activities without degrading their technical performance of the shot.

To increase our ability to perform more technical training we must also have the physical capability to do so.

We also need to be able to recover quickly between training sessions so that we can increase the number of sessions we can perform.

TO OVERCOME COMPETITION STRESS

The time of competition is stressful and difficult for shooters as it involves travel and high levels of emotion and intense activity.

The better conditioned the shooter is physically; the better they will be able to cope with these situations. Recovery from travel is quicker, the affects of climate and heat are moderated, the ability of the shooter to mentally focus on the competition is reinforced.

THE SELF-IMAGE OF THE SHOOTER

Being physically conditioned is a tremendous psychological advantage to a shooter. It allows self-confidence to build. It also facilitates the shooter in maintain their blood sugar levels efficiently and to adapt quickly to new environmental situations.



5. STRENGTH & ENDURANCE TRAINING

PHYSIOLOGY OF ENDURANCE TRAINING

There are two basic energy systems you use when training; anaerobic and aerobic. Unfortunately, you cannot build both your aerobic and anaerobic systems at the same time very well. The idea behind base training is to train your aerobic energy system specifically and solely. Why is this important? The more work you perform aerobically, or in the presence of oxygen, the more efficient you are. Prolonged aerobic training produces muscular adaptations that improves oxygen transport to the muscles, reduces the rate of lactate formation, improves the rate of lactate removal, and increases energy production and utilization. These adaptations occur slowly over time.

Fat is a primary fuel source for the aerobic energy system. Over the course of a base period your body learns to more readily break down and utilize fat as an energy source. As an added bonus this adaptation helps post exercise fat metabolism as well. This is an important factor, especially for long distance athletes. The fat we have in our bodies could provide enough energy to perform many distance events back to back, whereas muscle glycogen depletion can occur in as little as one hour. The less muscle glycogen you utilize, the more efficient you are. Contrary to the aerobic system, the anaerobic system consumes carbohydrate rapidly and the byproduct is lactic acid.

Other adaptations of aerobic training include increased stroke volume of the heart, capillary density, and mitochondrial density. Stroke volume increase simply means that your heart pumps more blood per beat. Mitochondria are structures within muscle cells that produce energy from fat and carbohydrate oxidation. Think of them as tiny batteries for muscle contractions. Regular endurance training can double these structures. By increasing capillary density we can effectively transport more blood to the working muscles. The process of building capillaries occurs gradually. Because high stress training breaks down capillaries, base training is best for allowing the slow growth of capillaries.

AEROBIC & ANAEROBIC ENDURANCE

The key characteristic of aerobic activity is *rhythmical, continuous movement*. Thus, in order to enhance aerobic endurance, a given activity must exhibit this key characteristic. For example, though bicycling may be an aerobic activity, coasting long distances ceases to become aerobic since you are not utilizing your muscles in a continuous fashion.

Regular aerobic training produces a more efficient cardiovascular system including the heart, lungs and blood vessels. From a practical point of view, you will experience more energy and a decreased perception of effort with any given workload.



The duration of a typical aerobic training would be:

- Minimum of 30 minutes to begin with
- Juniors 30 – 60 minutes
- Adults 1 – 4 hours

The optimal way to train any physiological system is to create and frequently repeat a stress that precisely targets the system. When it comes to the aerobic system that target is the *aerobic threshold* (AeT). When training at the aerobic threshold, all of the key aerobic systems are stressed and the stress can be maintained for relatively long periods of time

So how do you know the level of intensity that targets the AeT? There are several ways; depending on what technology you have available. Perhaps the most common these days and the easiest to use is heart rate. Your pulse during exercise has always been a good indicator of how the body is relating to the stress being applied by running, cycling, swimming, cross-country skiing or whatever it is you do. Most athletes wear a heart rate monitor (HRM) for this reason.

Your heart rate is the number of times your heart beats in one minute. Subtract your age from 220 if you're a man, and 226 if you're a woman to find your maximum heart rate. All heart rate calculations are based upon this number. Take your pulse on your wrist or the side of your neck, and count the number of beats in six seconds. Multiply that number by 10 to get a rough idea of your heart rate.

AEROBIC THRESHOLD

Multiply your maximum heart rate by 0.65 to find your aerobic threshold. This is the point where your body begins using stored fuel instead of oxygen to power your muscles. Below that rate, your body takes in oxygen, uses the energy, and produces water and carbon dioxide as waste. Once you get your heart rate up to 65 percent of your max, you cannot take in enough oxygen to meet your body's demands, so it must supplement it with stored energy, producing lactic acid as waste. You are still working aerobically, but you are beginning to move into anaerobic territory.

ANAEROBIC THRESHOLD

Your anaerobic threshold is between 80 and 90 percent of your maximum heart rate. Only a lab measurement can give you an accurate reading, but athletes tend to have higher anaerobic thresholds than non-athletes. The anaerobic threshold is the point where your body is working almost entirely from stored energy, because your intake simply cannot match the demand. Lactic acid begins to accumulate in your muscles, helping you burn fat. Athletes train to increase their maximum oxygen intake capacity, so they are able to meet their body's oxygen needs for a longer period of time.

VO2 MAX AND AEROBIC ENDURANCE

VO2 max or maximal oxygen uptake is one factor that can determine an athlete's capacity to perform sustained exercise and is linked to aerobic endurance. VO2 max refers to the maximum amount of oxygen that an individual can utilize during maximal or exhaustive exercise. It is



measured as milliliters of oxygen used in one minute per kilogram of body weight. It is generally considered the best indicator of cardiorespiratory endurance and aerobic fitness. Elite endurance athletes typically have a high VO₂ max. And some studies indicate that it is largely due to genetics, although training has been shown to increase VO₂ max up to 20 percent. A major goal of most endurance training programs is to increase this number.

STRENGTH TRAINING

Strength training is an essential element of fitness. Long gone are the days when coaches believed resistance exercises only added unnecessary bulk to the athlete, hindering their ability to execute the shooting skill.

Maximal Strength

Maximal strength is the highest level of force an athlete can possibly generate. The greater an athlete's maximal strength to begin with, the more of it can be converted into specific strength endurance or explosive power.

Maximal strength training can improve exercise economy and endurance performance. Interestingly, it does not appear to lead to a significant increase in muscle hypertrophy.

Explosive Power

The shooting sports, particularly clay target, require movements that are much more rapid and demand a higher power output than is generated during maximal lifts.

An athlete can be exceptionally strong but lack substantial power due to an inability to contract muscle quickly. Power training is used to improve the rate of force production and a range of methods such as plyometrics can be employed to convert maximal strength into explosive power.

Strength Endurance

Explosive power is not always the predominant goal of a strength-training program. For the shooting events as a whole, strength endurance is of most benefit. Again, the greater amount of starting maximal strength, the more of it can be maintained for a prolonged period.

Strength endurance can be developed through circuit training or the use of low weights and high repetitions. However, many strength endurance programs are inadequate for endurance-based sports - a set of 15-20 repetitions for example does not condition the neuromuscular system in the same way as a long distance event.

CORE STABILITY

“Core stability” describes the ability to control the position and movement of the central portion of the body. Core stability training targets the muscles deep within the abdomen which connect to the spine, pelvis and shoulders, which assist in the maintenance of good posture and provide the foundation for all arm and leg movements.

What are the benefits of core stability training?



Good core stability can help maximise running performance and prevent injury. Power is derived from the trunk region of the body and a properly conditioned core helps to control that power, allowing for smoother, more efficient and better co-ordinated movement in the limbs. Moreover, well-conditioned core muscles help to reduce the risk of injury resulting from bad posture. The ability to maintain good posture while running helps to protect the spine and skeletal structure from extreme ranges of movement and from the excessive or abnormal forces acting on the body.



6. PRACTICAL PHYSICAL TRAINING

The basis of our physical training programmes will feature all of the elements we have previously described. But before we delve into the specifics of the activities that we will undertake it is important to set from the outset the scope of the activities.

We will be concentrating on the basic qualities of training; a general level of overall conditioning is better for shooting than overt specific training in one area.

We must also be realistic in the level of planning we undertake. We do not wish to overload the shooter with too much activity. Time must be set aside for sufficient recovery and the intensity of the activities must be suitable for the condition of the shooter.

The training programme must be easy to do; it must be simple in construct and execution. It must also not take too much time to complete.

BASIC AEROBIC ENDURANCE

The level of activity should be:

- Long duration and Low intensity (HR 110 -140 bpm)

Typical activities would include fast walking, jogging, cycling and swimming. Remember to include periods of recovery at the end of each session.

STRENGTH ENDURANCE

The level of activity should be:

- High repetition with Low weight
- Duration of 20 minutes

This can be achieved using hand weights or just even your own body weight. It has the benefit of being able to be completed at home but the best method is to use circuit training. Do not forget to use active recovery here also.

General strength training examples

We will now describe some activities we can perform to target specific areas of the body for strength endurance.

Abdominal Muscles: sit ups without ankle support (straight, rotation), always activate the inner abs first.



Back: "good morning", angle row.

Legs: one leg squats, step-squat, side-squat.

Hands: bench press with dumbbells, biceps with dumbbells, chin-ups.

Upper body and Scapula: different rows (start the movement with scapula area muscles, not with hands), push-ups.

Specific strength training examples

Looking specifically at the shooting disciplines what follows are some examples tailored for each discipline.

Pistol

Hands: one hand lifts, number 8, in/out –turns, cross, wings, breast stroke (remember both sides)

Rifle & Clay Target

Upper body & rotators: stabilisation, weight turns, bar rotation, use bar as a rifle or shotgun (up-down, left-right)



6. SAMPLE TRAINING PLANS

What follows is a sample plan for the three periods of the annual training plan. For each period the physical activity is tailored to produce a level of conditioning applicable to the technical training that is being conducted at that time.

GENERAL PREPARATION PERIOD

- Aerobic basic endurance
 - Heartbeat under aerobic threshold
 - Duration 45 min- 1hours
 - Sometimes long walks in the woods (hunting)
 - At least two times a week
- Muscle endurance (circuit training)
 - A lot of slow repetitions, min. 20 or more
 - Duration 45 min – 1 h
 - At least two times a week

GENERAL PREPARATION (END PERIOD)

- Aerobic basic endurance
 - A little more intensity (> aerobic threshold)
 - Duration at least 1h (2-3 times/week)
- Strength endurance
 - A little less repetitions (15-20)
 - Slightly heavier load/weights
 - Duration 1h (1-2 times/week)



COMPETITION PREPARATION PERIOD

- Basic endurance
 - Long & slow (1-1.5 hours), once a week
- Speed endurance
 - Shorter (30-45 min) once a week
- Strength endurance
 - Like on the previous period
- Specific strength
 - 1-2 times a week

COMPETITION PERIOD

- Maintain the qualities!
- Aerobic basic endurance
 - Recovery once a week
 - Maintenance session once a week
- Muscle recovery
 - Light, once a week
- Specific strength
 - Light, once a week