



PLYOMETRICS AND CALISTHENICS – PHYSICAL TRAINING METHODS SPECIFIC TO THE PHYSICAL TRAINING OF THE MILITARY

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The physical training of the military must be extremely hard, as it is a support for military training programs. Moreover, he must prepare the military to deal with any situation they may encounter on the battlefield: from climbing a 3-meter-high wall under enemy fire to running on the varied ground, with a 30 kg backpack and individual weapons in his hands. In addition, maintaining or improving the physical performance of professional military personnel in various military settings is crucial to general military training. When we start a military-specific training program, we are confident that we are on the fastest track to serious results. The military will become stronger, with great physical strength, having a robust and harmonious physical constitution. In this article, we will briefly present two of the physical training methods specific to military training (plyometrics and calisthenics), which military physical education specialists should use on a permanent basis, so that fighters reach a higher level of physical training.

Keywords: plyometrics; calisthenics; physical training; training; military physical education; physical exercises.

Plyometry is a term that is not found in the Explanatory Dictionary of the Romanian language, but it is widely used among professional athletes or fitness enthusiasts. Although the term plyometrics is relatively new, the basics are old. It comes from the English word "plyometrics"¹ coined in 1975 by athletics coach Fred Wilt, after he noticed Soviet athletes performing a warm-up program consisting of various types of jumps at a competition, in the end winning numerous medals for that competition. Collaborating with biomechanics expert Dr. Michael Yessis and translating from Russian the research of Professor Yuri Verhoshansky² (considered the inventor of plyometrics training, the Russian researcher was a prominent figure in explosive force training and one of the greatest experts in sports training theory), whose ideas were later implemented and expanded), the two Americans introduced this concept to the United States to pass this information to American coaches³.

Calisthenics is a method of physical training that uses gravitational force and body weight to increase the level of physical training of the military. The term "calisthenics" comes from the

Greek words "kalos" which translates to beauty (to emphasize the aesthetic pleasure that derives from the perfection of the human body, the beauty of the moving body) and "sthenos", which expresses strength, mental strength, courage and determination. It is the art of using body weight as a resistance to physical development.

For hundreds of years, calisthenics has been the main way people improve and maintain their fitness. Even though the term has been used since antiquity to describe one of the methods of maintaining health or was used as the main source of physical training of soldiers, and later (in the nineteenth century) included in various courses/educational programs Women's gymnastics or a branch of gymnastics, the first calisthenics programs appeared in the 1960s in the Canadian Air Force, helping to launch the modern fitness culture.

During military physical education sessions held in military units, field professionals often conduct calisthenics with military subunits as a method of synchronized physical training to increase group cohesion and educate the military in the spirit of discipline. In addition, two of the calisthenics exercises (floats and abs) are used as assessment tests in the mid-year checks on the level of physical training of military personnel.

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Plyometrics – jump training

The concrete definition of plyometrics is a movement performed quickly and forcefully, which involves a pre-stretching of the muscle, thus activating its stretching-shortening mechanism.

Plyometrics training, abbreviated as "plyometrics", is a form of training that often requires the military to jump. This is why plyometrics is often referred to as jump training (or "shock training"), as much of the plyometrics exercises are based on the jumping technique (for example: bending kneeling, rope jumping, jumping back to 180°, platform jumping, "burpees" exercise, etc.). It is a technique that can be practiced in many ways, so it is important to remember that plyometrics does not only mean jumping, but also includes activities that require explosive movements (for example: throwing the medicine ball, sprints, various types of floats, etc.).

Plyometrics exercises are those that allow the muscles to perform and develop intense and fast movements, in the shortest possible time, with the greatest power and strength. After performing a jump, the muscles are stressed each time they touch the ground, which gives the next jump even more strength. This combination of stretching and shortening/contracting the muscles leads to a better toning of the body. This cycle causes the muscle to initially stretch (eccentric activation) and then contract (concentric activation). The movements that follow this pattern cause the muscles to contract, involving a much greater force and power.⁴

Included in military training programs and performed systematically, plyometrics exercises improve their physical performance, but in addition, they have many other benefits, as they:

- *increase the agility of the body.* We refer to the ease with which the military performs the movements and their ability to move quickly, due to the fact that the plyometrics exercises train the main muscles of the lower limbs, generating an explosiveness that determines the performance of a specific movement. On the battlefield, agility makes the difference between a fall or just a simple stumbling block or imbalance;

- *improve cardiovascular health.* Physical workouts that contain plyometrics exercises are considered cardio workouts because all the major muscle groups in the body are required. This, together with the diversification of the intensity and

speed of the execution of each movement, causes a heart rate similar to that during running or rowing;

- *develops proprioception.* Proprioception is an important component of balance, coordination and agility, and is necessary for the safe performance of plyometrics exercises. This refers to the orientation of the body and the movements of the military in space, in relation to other objects around, the ability of the muscles to contract and relax to stabilize the body according to the given situation. With this well-established and trained connection, the military gains better stability and control over its own corps. By including plyometrics exercises in the military training program, they will learn how to move more efficiently, develop a better awareness of where they are, while improving their reaction speed;⁵

- *diversify training,* when developing a training routine. The body's body quickly adapts to the stress and stimuli to which it is subjected, and if its challenge is not continued in new ways, then the physical performance will become static and unchanging. The introduction of these new plyometrics exercises is excellent because it manages to keep the mind and body occupied in a state of agility;

- *increases the anabolic effect,* which consists of increasing muscle mass and strength. The introduction of plyometrics exercises in the weekly military training program, when muscle growth has slowed down and regular strength training does not bring the expected results, will help to overcome the stagnation caused by the adaptation of the body, because the explosive load will slightly affect muscle growth. The muscles will be more toned, the strength of the whole body will improve, and the muscle mass will increase. At the same time, it is not recommended to do these plyometrics exercises every day, because after a session of explosive movements, the muscles of the body need a break to recover⁶;

- *prevent the occurrence of some forms of injury.* By constantly practicing such exercises, the body will learn to respond to different levels of impact. Given that repeated jumps will have a continuous impact on the joints, we must keep in mind the principle of progressivity and use appropriate sports shoes that cushion the impact with the ground (so that the ankles and knees suffer less). The muscles of the military will develop, the



strength and elasticity of the tendons and ligaments will increase, which will reduce the likelihood of injuries during military actions (muscle strains or ruptures, micro trauma or trauma to the ligaments and tendons);

- *promotes rapid weight loss.* Plyometrics exercises activate almost all muscle groups, being very intense and requiring high energy consumption (burning a large amount of calories in a workout), so it is an excellent tool for weight loss and muscle mass definition. Pliometric workouts are considered to be the most effective way to burn fat in the lower torso and lower limbs (for the upper body, exercise should be used using the medicine ball);

- *improve balance and coordination,* if the exercises are performed with good concentration and attention. At first, these exercises may seem difficult to the military, but by working constantly, they will become much easier to do, and the movements will become more efficient and agile, at which point, under the guidance of a military physical education specialist, it is recommended to gradually increase the number of repetitions;

- *allow training without the need for additional equipment.* Pliometric exercises are an excellent, but also fun, alternative to weight training. In order to perform plyometrics exercises, the military only need their own body weight and a free space in which they can move. Using minimal equipment, a truly effective plyometrics workout can be done anywhere in just 15-30 minutes (including at home), which is perfect when time is running out. After a while, various weights or a stepped platform can be used to perform the jumps, but at the beginning, for most plyometrics exercises, the equipment is not necessary.

These exercises are not recommended for the military that have a low level of physical training or are in the recovery period after suffering an injury, because their execution requires a certain level of coordination, balance and strength. The reason why plyometrics exercises are quite popular among the military is that they allow a muscle to reach its maximum strength in a very short time.

The extremely wide range of plyometrics exercises includes any motor action that includes jumping and dynamism. We will further present the most used plyometrics exercises by military physical education specialists, which do not require the use of expensive equipment and which we often see in gyms. These are⁷:

- squats: with side jump, with one leg raised, front with shoulder thrust, using two weights kettle bell / Olympic bar, with dumbbell resting on shoulders;

- lunges: lateral, forward with jump, walking with dumbbells, back from deficit;

- „Burpees” (an exercise that includes a push-up, a jump from a supine position with a palm rest in a squat and a jump with the arms up);

- plyometrics push-ups (with jump) with the detachment of the palms from the ground. They can also be performed with a slap in the face;

- jumping on the spot: like a "ball", in one leg, from one foot to the other, from one foot with landing on both legs, with the knees raised to the chest (simultaneously/alternately), with the legs swinging back by touching the buttocks with the heels (simultaneously/unilaterally), with shears (also known as "Jumping Jacks" – from the standing position – jumping far to the side with the arms raised side by side – returning to the initial position), with the bar in the back, with the rope;

- the „Plank Jumping Jacks” exercise – from the supine position with palm/forearm support (flat position) – moving the legs apart and closer by jumping;

- jumps from the spot: landing on an aerobic stepper or a box, in height from a squatting position, touching higher objects (head, hand or foot), sideways over certain obstacles or various platforms;

- long jumps from the ground: in linear depth, with landing in the sand pit or on mattresses, landing after signs drawn on the ground, over low obstacles (fences), of the "hopscotch type" (using materials such as: circles, stairs or even drawing on the ground certain geometric figures), swinging a medicine ball with both hands, preceded by a jump down from a box, preceded by a jump back;

- jumping on the steps of the stairs on both legs or in one leg (on each step, in two steps, etc.) or short sprints on an inclined plane;

- zigzag side jumps from one leg to the other;
- jumping on a sitting platform (box, crate) with a dumbbell on the chest (difficult exercise, not recommended for beginners, because it requires good physical condition, mobility and coordination).

As can be seen from these examples of plyometrics exercises, all this requires knowledge

of the technique of performing all phases of a jump, especially landing (shock damping in contact with the ground by the mechanism of triple flexion). Being more intense, these types of movements will increase the heart rate, which means that more calories will be burned, thus obtaining a more efficient cardiovascular training.

The main purpose of plyometrics training is to increase the excitability of neurological receptors for improved reactivity of the neuromuscular system. A plyometrics exercise consists of three phases, which are the basic mechanism of plyometrics training, as follows⁸:

- the eccentric phase (landing phase) which involves the preloading (energy is stored) of the agonist muscle groups. The maximum force that a muscle can develop is reached during a rapid eccentric contraction;

- the damping phase (transition phase) is represented by the time elapsed between the two phases (eccentric and concentric). This time must be as short as possible, so that the energy stored during the eccentric phase is dissipated as little as possible so as not to reduce the plyometrics effect;

- the concentric phase (take-off phase) uses the stored energy to increase the force of the movement. When a concentric isotonic contraction occurs (involves shortening the length of the muscle) immediately after an eccentric (or negative, isotonic contraction in the muscle, it elongates, bringing it back to its starting position), then the force generated can increase dramatically.

These plyometrics exercises can be integrated in a lot of ways in the content of training programs for the development of strength in the military or you can create a circuit (or a classic training Tabata) consisting only of plyometrics exercises, depending on the training objectives and the level of physical training of the military. The basis of this training method (shock method) is the principle of progression and the rule of patience, because the plyometrics exercises must be performed for a longer time until the expected results are seen⁹. It is important that the plyometrics exercises that are performed are as close as possible to the movements that the military could make on the battlefield, in order to considerably increase strength and performance.

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Weight training and plyometrics exercises can be combined into complex training sessions to develop explosive power. Pliometry can be combined with strength training (never with aerobic / cardio training), as it consists of mostly anaerobic exercises, as are strength exercises¹⁰. Before starting a plyometrics program, as a precondition, it is recommended that Klatt tests¹¹ be administered to the military in order to initially assess the degree of balance and stability of the jump. Tests include basic plyometrics movements, so if these cannot be performed, it can be assumed that the military is not yet physically prepared to complete a plyometrics program.

Calisthenics – body weight training

In the beginning, calisthenics was a way to promote the normal physical and physiological state of a healthy body, but over time, it has evolved into a training method that has many aspects in common with gymnastics. In contrast, calisthenics can be practiced outdoors (anywhere, anytime), and is also known as "street training". It is one of the few ways in which you can build muscle mass and develop physical strength without using weights.

A good thing about calisthenics is that you do not need the latest equipment to start a specific workout. Most of the equipment needed is in almost all military units, namely: a fixed bar and two parallel bars. Over time, in order to diversify your exercise and move to an advanced level, you can buy some elastic bands for fitness (on different levels of endurance) and a set of gymnastic rings designed for cross-training.

The principles of calisthenics evolved greatly in the nineteenth century, based on studies in



the fields of physiology, anatomy and classical mechanics, and the greatest influences for performing a calisthenics physical training came from the Swedish method of gymnastics. It was divided into four parts (pedagogical and educational gymnastics, medical and orthopedic gymnastics, aesthetic gymnastics and military gymnastics) and had very similar objectives to calisthenics, created in order to be accessible to all people, to improve health and to develop harmonious body. The following principles have been adopted to structure the calisthenics¹²:

- *the principle of selection* – refers to the fact that the exercises must be chosen carefully, and the series of exercises performed must not only be a group of repetitions performed one after the other, but also to develop in the military the ability to know notions related to health education; prevention, recreation or the environment, natural and social;

- *the principle of precision* – implies that the exercises must be performed perfectly according to the instructions, after receiving the best explanations regarding the correct execution technique, in order to achieve the agility and suppleness proposed by the calisthenics;

- *the principle of totality* – is highlighted in the daily calisthenics training program, which is designed to produce a general effect on both large muscle mass and to educate elegance / balance in motion and correct posture (essential for good health);

- *the principle of progression* – refers to the intensity of the effort which must be increased gradually, both by the number of exercises performed and by the increase in the speed of execution and the complexity of each exercise, while avoiding the occurrence of excessive overload;

- *the principle of adaptation* – which will take into account the age, sex and speciality of the military.

A study conducted in 2017 at an Italian university for research in the sciences of sport and exercise found that calisthenics training is an effective training solution to improve strength, posture and body mass, without using major equipment training¹³.

The choice of the best calisthenics exercises that the military can perform depends primarily on their level of experience. Beginners will need to start

with the basics, and those who have been training for some time can move on to more complex and challenging calisthenics exercises. The most well-known and most frequently performed calisthenics exercises (each with different execution variants) are: push-ups, crunches, squats, "Burpees", forward bends, "Plank", rope jumps, rope lifts, "Jumping Jacks", traction at the fixed bar, floating at the parallel bars, standing on the hands, lumbar hyperextension, lifting the legs from the supine position, climbing by turning / straightening at the fixed bar, hanging on the fixed bar with the body parallel to the ground, with "Front/Back lever", from the ring support position – shift to the square position – hold and return, "Beep" endurance test, etc.

Collaborative calisthenics refers to those calisthenics exercises that involve two or more soldiers helping each other to perform a motor action. Such physical exercises are also known as partner exercises, consisting of transporting the partner or performing movements that are hampered by the weight or resistance of the partner, being used as a way to develop motor skills. A disadvantage of such exercises is that the resistance of the partner is difficult to measure compared to the multifunctional equipment in the gyms, but on the other hand, they can be just as easily performed outdoors or in a gym and are versatile enough to allow them to be used for other training purposes than simply strength training.

By practicing calisthenics, after a while you will reach a maximum point of muscle growth, because the muscle mass comes from the progressive resistance offered by your own body weight. In order to increase the percentage of body weight that needs to be lifted, creativity is needed in terms of the progressive increase of the difficulty, duration and intensity of the exercises.

Calisthenics is the perfect way to functionally train movement, as most calisthenics exercises are compound muscle movements, which means that several muscle groups work at the same time. Functional training involves training in a way that directly improves the way daily tasks or physical requirements specific to the battlefield are to be fulfilled (*Train as you will fight!*). With these functional movements, the military becomes stronger and more flexible, loses weight and gets optimal fitness in the most natural way possible, without affecting their joints through gyms.



When performed incorrectly or too often, absolute strength training ("refers to the greatest force that the neuromuscular system can generate in the body through maximum voluntary contraction"¹⁴), in which too much weight is used, can create some imbalances that they will put extra stress on the tendons and ligaments. On the other hand, calisthenics develops physical strength only in proportion to the military system of the military, with its authentic and natural movements, significantly reducing this risk of injury that may occur. The beauty of body weight exercises is that the overall risk of injury is low and your workouts are safer.

Calisthenics training develops those fine motor skills that require the body and brain to work hard, thus improving the connection between the brain and the body. Almost all forms of manifestation of basic motor qualities are educated at a high level in a body trained in the art of calisthenics. "The development of strength programs, based on exercises considered calisthenics (...) can lead to improved military effort capacity, as well as the development of physical skills necessary for situations during missions – patrol with heavy equipment, climbing with combat equipment, equipped swimming, transporting the wounded"¹⁵.

Due to its complexity, the field of physical education seems to be full of trends and methodological guidelines, as well as advice on revising the diet or restoring the capacity for effort. All of these issues can cause confusion among military physical education specialists. Very similar and often confused with each other, calisthenics and plyometrics are two popular methods of physical training specific to the physical training of the military. However, there are differences between them and it is beneficial to understand what they are, in order to be able to choose the type that best suits the proposed objectives.

Calisthenics and plyometrics are performed without any equipment and only body weight is used. The difference between them is defined by the action of one object that comes in contact with the other, by the "impact" of the body with the objects in the environment (floor, facilities and sports equipment, etc.). Calisthenics has a low impact and focuses on the basic movements for strength development. Pliometry is one step above it; it has a high impact by incorporating these basic movements with training to improve jumping and

increase agility. At the beginning, you need to prepare using the calisthenics exercises and once you feel comfortable, you will start to add jumps and fast movements.

Calisthenics are basic and build a solid foundation for more advanced exercises. At this level, learning the correct form of execution and developing strength are the main goals for a general physical training. If the military is a beginner, if they are recovering from an injury, or if they are returning to training after a longer break, then it is ideal to begin physical training at this point. Also, knowing how to perform basic exercises correctly helps prevent injuries and severe pain caused by damage to muscle fibers (muscle fever).

Pliometry is the building block of physical training that adds to the calisthenics, making it more challenging and interesting to do basic exercises. A calisthenics exercise, such as knee bends, can be transformed into a plyometrics one by adding a jump, and turning it into a jump knee. Once calisthenics is mastered, advanced plyometric movements can be performed, thus obtaining a much better defined training, because plyometry has the additional advantage of supporting the proper functioning of the cardiovascular system.

Finally, plyometrics is about jumps and explosive movements that consume a lot of energy, and calisthenics focuses on the technique of performing basic movements. Therefore, it is advisable to start with calisthenics exercises and gradually incorporate plyometrics movements, in order to quickly gain strength and endurance.

Conclusions

Being in the military often means staying away from the peace and security of your home, and most of the time, you do not have access to all the facilities that a fitness room or gym has. Despite the fact that they work in inhospitable places, the military must be and stay in shape at all times. The performance of plyometrics and calisthenics exercises is not conditioned by the possession of any equipment (these can be performed anywhere and anytime), which makes them ideal for their inclusion in the physical training programs of military personnel.

The calisthenics training fits perfectly with the daily activities carried out by the military on the training ground. In this situation, it is not just about



using body weight to develop motor skills and increase physical fitness, but also to teach the military how to be more agile, coordinated and balanced in their movements, physical skills which, will certainly, be needed in concrete combat situations.

Pliometric training provides modern methods and means of developing the motor skills of the military. Punctual knowledge of plyometrics, understanding how plyometrics movements should be performed correctly, and compliance with safety measures while performing plyometrics exercises will increase the level of physical training in the military. Pliometric exercises are an excellent way to improve the athletic performance of the military and their level of physical training by developing basic motor skills (strength, speed, flexibility). Such a plyometrics workout (which aims to reduce the gap between strength and power) can be a real plus for any fitness program, if it is performed correctly and is focused on technique and accuracy. It is obvious that pliometric training offers significant benefits to the military, as most of the movements they perform, to be successful during military action, are based on fast and strong movements.

A favorable result obtained due to performing a physical training specific to the physical training of the military, in which the methods of plyometrics and / or calisthenics are used, is to provide a space for them to develop their thinking skills and feel free to share his/her personal beliefs and opinions with the rest of the comrades, as well as with the military physical education specialist who leads the activity. While the military is famous for indoctrinating troops to remain disciplined and obedient and simply carry out orders, I believe that both orders issued and responses to them should always be well thought out and contribute to the objectives specific to the military system.

The two methods of training (plyometrics and calisthenics) should not be considered as goals in themselves, but as part of a general program of physical training (in addition to the development of motor skills, recovery after exercise and adequate nutrition). Soldiers who possess adequate levels of physical qualities will perform more successfully pliometric and calisthenics exercises. In addition, combining these types of exercises with others allows the military to optimize performance, regardless of the physical requirements they are subjected to or the activity they have to perform.

NOTES:

1 *Plyo* – comes from the Greek word *plythein*, which means "to increase" (*Plio* in Greek means "more"), and *metric* literally means "to measure".

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