The Training of the Weightlifter

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ТРЕНИРОВКА ТЯЖЕЛОАТЛЕТА

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Foreward

This text is a revised, up-dated version of Roman's "The Training of the Weightlifter", published in 1974. The 1974 text was one of the earliest attempts at defining the requirements of training in the biathlon era. I spoke with Roman in Moscow during the 1983 Spartakiade. He told me that he was in the process of writing a "new" book and revealed to me some of its contents. This text is that book. During our conversation he said that he believed the top weightlifters in the future would do only three exercises in training: the snatch, the clean and jerk and squats. I have included the article from the Theory and Practice journal as a supplement to this text for two reasons. One, it updates some of the material of this text. Two, it presents some evidence for Roman's theory about three exercises in training.

In my humble opinion, one of the most important concepts one can glean from not only this text but from the Soviet sport-training literature as a whole, is as follows. Sport training is an educational process, analogous to school studies. One progresses through stages just as one is passed from grade to grade in school upon acquisition of the requisite skills and knowledge. One does not ask a 3rd grader who has not yet studied long division, to attempt calculus. Likewise one does not arbitrarily follow a training program David Rigert used, if one is a Class II middleweight, living and training without a coach, in Tulsa, Oklahoma. Unfortunately, it seems that lifters are looking for some mystical, East-bloc "routine", which is guaranteed to make us great lifters. It simply does not exist. Quite simply, one has to devise lessons which are tailored to each athlete's specific requirements and psycho-physiological capabilities; not to mention the athlete's living, work and training conditions.

Andrew Charniga Jr.
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Introduction

Weightlifting records are constantly rising; becoming all the more fantastic. Featherweights can clean and jerk three-times their bodyweight; superheavyweights have exceeded 210 kg in the snatch.

What sort of training methods are necessary to storm records? That is the purpose of this work. The information is based on experimental research and practical experience; the contents of a weightlifter's training, at all stages of his multi-year preparation -- from novice to high class athlete, are disclosed.

The training methods of junior weightlifters (12-15 year olds) are covered in L. S. Dvorkin's book "The Junior Weightlifter" (M, Fis, 1982) and in a number of other texts. This book is designed for those who begin training at 16-17 years and older (as well as for those who began training at 12-15 years, and at this age continued lifting), lower classified athletes (III and II) and qualified athletes (Class I, CMS, MS). The book describes the technique of the snatch and the clean and jerk and the method of using the simplest devices and adaptors for perfectioning technique. The latest data on the spatial and time characteristics of lifting is the basis for this section. The first description of the technique of the push-jerk appears in this book. Up until the present time, the training methods described in the literature have not considered the variations in sportsmen's preparation in different weight classes. The section "Method of training a weightlifter" for the first time, discusses the peculiarities of training weightlifters in different weight classes; taking into account age, stage and sport classification. The most essential and distinguishing peculiarities of a weightlifter's trainng are shown, with respect to such characteristics as: a list of barbell exercises utilized and their quantity; the volume of the training loads; the quantity of high-intensity work in the various exercises; the resistance and the number of repetitions per set.

New material appears in the section "Planning the training of a weightlifter." Likewise the lifter's qualification, weight class, age and stage of training, as-well-as special-physical and technical preparedness are taken into account for planning training. The year, month, week's planning and planning the educational-training sessions with respect to the volume and intensity, loading variations; a sample plan of training for the month, week and training session for beginners, lower classified and qualified athletes are discussed.

An athlete's training also includes moral-volitional or psychological preparation, theoretical, hygiene, nutrition and restoration, weight control and so forth. These aspects of a lifter's preparation likewise are covered in weightlifting text-books. This text is recommended for those who wish to devote themselves to weightlifting and achieve high results.

Chapter 1

The Technique of the Weightlifting Exercises

At the present time, it is difficult to achieve high results without serious work on perfectioning technique. A weightlifter can develop the necessary qualities -- strength, speed, flexi-ability, endurance. But if he does not have good technique; the insufficient technical mastery will limit the utilization of his physical potential -- inhibiting the growth of achievements.

There are key phases and elements in each classic exercise which comprise its technical foundation. These phases and elements need to be executed as precisely as possible -- then barbell trajectory will be optimal, and the force the athlete develops, directed to lifing the barbell, will be utilized to the maximum. Consequently, in order to perfect the snatch and the clean and jerk, the athlete needs to know not only the rational movement of the body's links, but rational barbell trajectory and the skill to impart specific force at the necessary moments. Let's look at the chief regularities the athlete should be aware of when perfectioning the technique of the classic exercises.

The Snatch and the Clean

The Start

In the starting position, prior to lifting the barbell, the athlete places his feet at pelvis width or slightly narrower, that is to say, in the most comfortable, stable and natural position; the feet are turned slightly to the side. The vertical projection of the bar is at the metatarso-phalangeal joints or an insignificant deviation from them (figure 1). The shins are turned slightly to the side and are inclined such that they are almost or fully touching the bar. The vertical projection of the body's center of gravity (CGB) -- is at the middle of the feet or close to the heels. The lumbar area of the back is arched and torso inclination to the platform is 25-50°. Knee angle is 45-90°; the pelvis can be at knee level, above or below them.

The hand spacing in the clean and jerk is approximately shoulder width. The hand spacing in the snatch is wide -- seldom medium; the grip is a "hook". It is most difficult to hold the barbell with a wide hand spacing, therefore the width of the hand spacing in the snatch should be optimal, so that the athlete will be able to comfortably hold the bar and impart the maximum force to the barbell during the lift. The hand spacing in the snatch depends on the angle between the arms and the bar: the smaller this angle, the wider the hand spacing and vice versa. Research (A. P. Bykov and E. I. Smagli) shows that the angle between the arms and the bar should be a mean of 56° (from 49-63°).

One should bear in mind that decreasing this angle, i.e., widening the hand spacing, in the snatch requires that the barbell be lifted less distance to fix it overhead. For example, with each degree decrease in arm angle, an athlete who is 170 cm in height can lift the barbell approximately 1 cm lower.

The arms should be straight at the start. The shoulders are "taut" and are over the bar or in front of it (or behind). The head is in a natrual position; the line of sight is forward and down. The starting position for the snatch and the clean and jerk are different: in the snatch the hip angle is less and the knee angle is greater (the torso is inclined more and the pelvis

is raised).

However not all lifters begin to lift from the just described position. Many execute a preliminary movement -- moving the hips down-up or up-down, after which they return to the starting position for lifting. This movement contributes to preliminary stretching of the muscles taking part in the subsequent lifting, and to overcoming the resting inertia of the athlete's body (pre-stretched muscles contract with greater force).

The athlete's position at the start depends on his height, body proportions and the hand spacing. However, one should not forget the primary and obligatory condition: at the last moment, prior to tearing the barbell from the platform, the athlete should assume a position, such that his shoulders are in the same vertical plane as the bar or a minimal deviation from it. The knee angle is 80-110° at the instant of barbell separation. A smaller angle is usually observed in athletes with short extremities and a long torso; a larger angle is observed in athletes with long extremities and a short torso.

The Lift Up to the "Squat Under" (the Pull)

The first phase (the preliminary acceleration). The first phase of the pull begins with the active extension of the legs. The knee and hip joints straighten while the ankles bend. The hip joints move almost vertically during this phase. The torso shifts upward, begins to incline forward and then maintains approximately this same position. The shoulder joints move in an arc, in a forward direction (in front of the bar). The head gradually tilts back and assumes a vertical position. The shifting of the upper part of the torso forward occurs simultaneously, along with the movement of the barbell toward the body -- this creates the optimal conditions for equilibrium.

The barbell is separated smoothly from the platform, but it should be subsequently accelerated, i.e., the lift should proceed with gradually increasing force.

The extension of the legs ceases when the knee angle is: approximately 145-150° in the snatch and 150-155° in the clean

and jerk. The shins assume a vertical position. In the snatch, torso inclination to the platform is approximately 30° and in the clean and jerk 32°. Hip angles are: in the snatch -- 85-90° and in the clean and jerk 92-97° (figure 2).

The majority of athletes straighten the legs: in approximately 0.4-0.55 seconds for the snatch; and 0.4-0.6 seconds for the clean. The taller the athlete, the greater the height the barbell is raised; consequently, the more time taken to lift the barbell. At this instant, the bar is usually: for the snatch -- at the lower third of the thigh; and for the clean -- at knee level. With a wider hand spacing the bar will be somewhat higher and with a narrower hand spacing it will be slightly lower.

Then, rising slightly higher (by approximately 3-5 cm), the barbell reaches maximum (for the first phase) speed of the lift, which is: in the snatch, for athletes who are 150 cm in height, an average of 1.3 m/sec; 170 cm -- 1.45 m/sec; 190 cm -- 1.6 m/sec; in the clean the figures are 1, 1.15 and 1.3 m/sec, respectively. It's obvious that the speed of the lift depends on the athlete's height. This is natural: the taller the athlete, the greater the height it is necessary for him to lift the barbell; the greater the speed one needs to impart to it.

Subsequently, barbell speed decreases somewhat as a result of the bending of the knees and their movement forward: by an average of 0.08 m/sec in the snatch and 0.1 m/sec in the clean.

How should the barbell shift in the first phase of the pull? Since the CGB is at some distance from the bar at the start, a "toppling over" of the moment force of gravity of the barbell occurs, relative to the large joints. The barbell should shift towards the athlete during the extension of the legs. This direction of the barbell's movement has a big advantage over a strictly vertical trajectory. The shifting of the bar towards the torso (during the knee extension) reduces the "toppling over" of the moment force of gravity of the barbell. The degree of barbell shift towards the athlete depends on the position of the CGB and the barbell's center of gravity (CGBa) at the start. The closer they are, the less shifting, and vice versa.

The contraction of the horizontal projection between the general center of gravity of the athlete-barbell system (CGA-B) and the working joints results in a decrease in the resistance moment, which enables one to realize the strength of the thigh extensors more completely.

At the end of the first phase of the pull (when the barbell is: at a height which is 35% of the athlete's height in the snatch and 31% in the clean and jerk) the barbell has shifted towards the athlete the greatest distance. The larger the weight class, the greater the athlete's height (usually) the further the CGB and the CGBa are away from each other at the start, and consequently, the greater the shifting of the barbell towards the athlete. Well then, in the snatch, the barbell shifts an average of 4 cm towards the athlete who is 150 cm in height, 8 cm for a 170 cm and 12 cm for an athlete 190 cm in height.

The barbell's shift towards the athlete is somewhat less in the clean than in the snatch: for an athlete of 150 cm -- 3 cm; 190 cm by 10 cm. The fact is that during the pull for the clean, the athlete straightens the legs slightly more than in the snatch -- consequently, the torso shifts forward more. The CGB shifts slightly more towards the barbell, and with respect to this, it (the barbell) shifts towards the athlete less (figure 3).

The Second Phase (the "explosion"). Having stopped straightening the legs, the sportsman continues to lift the barbell by further straightening the torso (it has already begun straightening towards the end of the first phase). The head begins to tilt in the same direction as the torso.

Due to the action of the torso energetically straightening in a upward-backward direction, the intensity of the pressure grows in opposite directions. The pressure spreads along the thighs, as a result of which the knee and hip joints shift forward and down. The bending of the knees and their shifting forward under the bar reduces the toppling-over of the moment force of gravity of the barbell and increases the effectiveness of the muscles extending the hip joints.

Figure 1. The start.

Figure 2. The first phase. The preliminary acceleration.

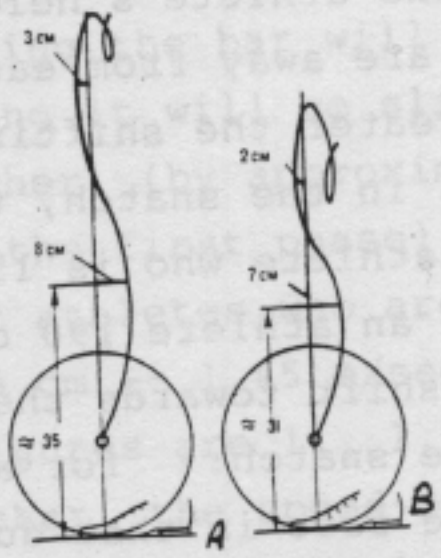


Figure 3. barbell Trajectory: a) the snatch, b) the clean.

Figure 4. The second phase. Bending the kness and shifting them forward.

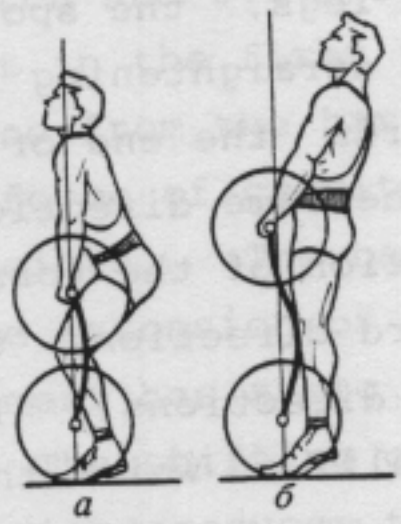


Figure 5. The second phase. the final acceleration: a) the beginning; b) the final acceleration

When the knee angles reach: in the snatch -- approximately 120-125° and in the clean -- approximately 125-130°, the knee bending and shifting forward under the bar ceases. The shins incline towards the platform at an angle of 70-75°. Torso inclination relative to the platform: in the snatch is about 58°; in the clean and jerk about 60°. The hip angles are: in the snatch approximately 105-110°; in the clean and jerk -- 112-117° (figure 4).

The bending of the knees and their shifting forward continues, for the majority of athletes: in the snatch -- approximately 0.1-0.15 seconds; in the clean -- 0.1-0.2 seconds and takes place with the feet flat on the floor. At this instant the bar is usually: in the snatch -- at mid-thigh level; in the clean -- at the lower third of the thigh. The vertical projection of the bar is at the middle of the foot; however, in the snatch, it is a little closer to the ankle joints. The shoulders are slightly in front of the bar: in the snatch -- approximately 4% of the athlete's height; in the clean and jerk -- 3%.*

Now the final acceleration of the barbell is executed (the "explosion" proper). It is executed by the simultaneous effort of the leg and torso muscles. The direction of the barbell's movement and the CGB should coincide at the instant force is applied to the bar (at the beginning of the acceleration).

The athlete straightens the legs and torso and raises up on the toes, from the position depicted in figure 4. The shoulder girdle, bar and metatarso-phalangeal joints should lie in one vertical plane (figure 5, a), at the instant of rising up on the toes. This position creates the optimal conditions for the maximum application of force to the barbell and its subsequent vertical elevation. If the shoulder girdle, at this instant, is forward or behind the metatarso-phalangeal joints, full realization of the muscular effort, directed at lifting the barbell, will be impossible.

* Here and subsequent references to the shifting of the shoulders is in reference to the center of the shoulder joints.

The final acceleration (the "explosion" proper) should be of an "explosive" character. There is a rapid straightening of the legs and torso with a subsequent lifting onto the toes and raising of the shoulder joints up and back during the "explosion". Bringing in the arms and raising up on the toes too soon, reduces the degree of strength utilization.

The majority of athletes execute the final part of the "explosion": in the snatch -- from 0.15-0.25 seconds; in the clean -- from 0.1-0.2 seconds.

During the second phase the barbell begins to move in an arc in front of the sportsman, in connection with which the entire athlete-barbell system shifts in the direction of the new support -- limited to the toes (see figure 5, a), and then almost vertically. The body straightens and leans backward slightly at the end of the "explosion" (figure 5, b). At the end of the final acceleration the vertical speed of the barbell should be: in the snatch for athletes who are 150 cm in height -- 1.65-1.8 m/s; 170 cm -- 1.78-1.93 m/s; 190 cm -- 1.9-2.05 m/s; in the clean -- 1.2-1.3 m/s; 1.35-1.45 m/s and 1.5-1.6 m/s, respectively.

At the concluding instant of the "explosion", when the athlete rises onto the toes, the CGB shifts upward-backward; however, because the barbell shifts forward, the general center of gravity of the system (GCGS) remains over the support. The barbell shifts forward relative to the metatarso-phalangeal joints during the second phase: for athletes 150 cm in height -- up to 2 cm; 170 cm -- up to 3 cm and 190 cm -- up to 4 cm. The trajectory of the barbell during the pull is different for the snatch and the clean. Barbell trajectory at the beginning of the clean is steeper than in the snatch.

The just described pull technique is the optimal for athletes of normal body-proportions (mesomorphic type); for whom the vertical projection of the bar at the start is at the metatarso-phalangeal joints, and the barbell is lifted with a normal hand-spacing. Naturally, everyone does not assume such a position at the start. They grasp the barbell differently -- one uses a wider hand-spacing, another uses a narrower; which result

in variations of the movements of the athlete and the barbell.

If for example, the feet are placed at the start such that the metatarso-phalangeal joints are further from the bar than is normal, then CGB and the CGBa will be further from each other more than is usual and the barbell will shift towards the athlete more significantly (figure 6). When the feet are placed further away from the bar, the barbell-shift towards the athlete will increase approximately as much as the distance the metatarso-phalangeal joints are from the bar. Such a starting position places a greater load on the plantar flexors and the thigh extensor muscles. This is due to the extraordinarily large rotational moment-force of gravity of the athlete-barbell system, relative to the aforementioned joints; likewise, the moment-force of resistance of this system relative to the hip joints is least. However, since the final acceleration is always executed with a rising up on to the toes, and consequently, with the support at the matatarso-phalangeal joints, the barbell will shift forward of the vertical during the second phase of the pull (the "explosion"), relative to the metatarso-phalangeal joints, the same as in the usual position of the feet (see figure 6).

If the feet are placed at the start such that the metatarso-phalangeal joints are in front of the bar, then the CGB and the CGBa will be closer to each other than usual and the barbell will shift towards the athlete significantly less during the first phase.

The barbell shift towards the athlete decreases approximately two-fold, relative to the increasing distance of the metatarso-phalangeal joints from the bar. For example, an athlete of 170 cm in height assuming a normal starting position shifts the barbell an average of 8 cm towards the body. Moving the feet 2 cm forward, causes the barbell to shift approximately 4 cm less in the first phase. The barbell will also shift towards the athlete at the beginning of the first phase.

If the metatarso-phalangeal joints are placed 4 cm in front of the bar, then for the given athlete, at the end of the first phase of the pull (at the instant of the barbell's greatest

approach towards the athlete); the barbell will shift vertically relative to its initial position at the start (figure 7). And, since the CGB and the CGBa are closest at the start; and in the beginning of the first phase (during the straightening of the legs) the CGB shifts forward, then the barbell itself shifts forward somewhat.

When the metatarso-phalangeal joints are in front of the bar at the start, the athlete has to position the shins more vertically, and consequently, the hips are higher than usual. The knee and ankle joint angles are more obtuse, which significantly reduces the amplitude of movement of the working links in the first phase of the pull. At the same time an excessively sharp angle appears in the hip joints. The athlete must lean back significantly more during the final acceleration in order that the barbell travel relatively vertical in the second phase; which also reduces the force directed at lifting the barbell. If the feet are placed in front to the maximum, the barbell will shift significantly away from the athlete (see figure 7, broken line).

Consequently, a starting position in which the metatarso-phalangeal joints are significantly in front of the bar is inappropriate. The further the feet are in front of the bar the poorer the conditions for preserving equilibrium and the realization of strength potential. One must take into consideration that athletes have an unequal ratio of leg to back strength, which also affects the execution of the pull. Athletes who have a stronger back accentuate these muscles in the final acceleration. They incline the torso more in the first phase of the pull with respect to this. For example, with the torso inclined at an angle of 20° relative to the platform after the legs have straightened (after the preliminary acceleration) the barbell is 6-7 cm lower.

Athletes who have stronger legs usually accentuate these muscles in lifting, which is associated with a premature and somewhat greater straightening of the torso. And, if the athlete simultaneously straightens the legs and torso during the first phase of the pull, then, after the legs have ceased straightening

(for example, when the torso is inclined at an angle of 40°) the bar is 5-6 cm higher. The hip-joint angles will be somewhat different: in the first case (the stronger back) -- less than average, in the second (stronger legs) -- more than average. In the first case, the final acceleration of the barbell will proceed through a larger arc (the distance of influence on it, Ed.), as a result of which conditions are created for a greater barbell velocity (an increase in impulse strength). In the second case, the final acceleration will be executed over a shorter segment, which is less advantageous.

After some decrease in barbell velocity (during the moving of the knees under) it once again increases during the final acceleration over a segment which comprises (on the average) for the snatch: athletes 150 cm -- 18 cm, 170 cm -- 22 cm, 190 cm -- 26 cm; in the clean the figures are 10, 15 and 20 cm respectively. Consequently, the above noted changes in the position of the links and barbell undergo essential corrections during the execution of the second phase of the pull.

A large inclination of the torso is inappropriate and a significant straightening in the first phase decreases the effectiveness of the final effort. The fact is that, as a result of an excessive straightening of the torso at the beginning of the second phase, the final part (the "explosion") is executed in different parameters: the torso straightens faster than the legs (the angular velocity in the hip joints is greater than in the knees); and as a consequence of this, the shoulder girdle is thrown backwards significantly. As a result the torso is leaning backward more at the end of the "explosion" and the barbell shifts behind the vertical line relative to the metatarso-phalangeal joints (figure 8), which reduces the vertical force on it. The lesser the inclination of the torso relative to the platform at the beginning of the second phase, the more significant the shifting of the barbell towards the athlete (see broken line in figure 8).

So, the barbell can be raised within different parameters. However, one can recognize an optimal lifting zone (and

subsequent fixation in the squat position); when the barbell's path is strictly vertical relative to the metatarso-phalangeal joints or up to 3 cm in front of them after the final acceleration (for example, athletes whose height is 165-175 cm). When the zone of shift is towards the sportsman and behind the vertical line, relative to the metatarso-phalangeal joints, by approximately 5 cm, it is considered less advantageous. When barbell deviation is beyond the indicated limits it is all the more difficult to fix it in the squat position; the barbell is dropped or its fixation is by chance. Naturally, the range of the optimal and less advantageous zones for the pull and "squat under" is somewhat narrower for shorter athletes and wider for taller athletes (figure 9).

Dynamics of the Force Developed During the Pull. The differences in the dynamics of the force developed are very significant with respect to the pull for the snatch and the clean. One athlete accentuates the first phase, another -- the second and a third distributes the force more uniformly. The latter variant is the most widespread. In this case, the dynamics of the velocity in the first and second phases is expressed: in the snatch -- by approximately this ratio 100:125 (for example, the speed in the first phase is 1.45 m/s, and in the second 1.81 m/s); in the clean the figures are -- 100:120 (1.15 m/s in the first phase and 1.38 m/s in the second).

When the accent is on the first phase the speed dynamics of the first and second phases can be expressed: in the snatch -- 100:105 or 100:110 (example, 1.55 and 1.63 m/s or 1.52 and 1.67 m/s); in the clean -- 100:105 or 100:110 (example, 1.23 and 1.29 m/s or 1.2 and 1.32 m/s).

When the accent is on the second phase the speed dynamics of the first and second phases can be expressed: in the snatch 100:145 or 100:150 (example, 1.35 and 1.96 m/s or 1.32 and 1.98 m/s); in the clean -- 100:135 or 100:140 (example, 1.05 and 1.42 m/s or 1 and 1.4 m/s).

When the accent is on the first phase, the speed in the second phase is usually less than when there is a uniform

distribution of force. If force is accentuated in the second phase, then the speed in the second phase of the snatch is significantly larger, and in the clean a little larger than with a uniform distribution of force. When the speed in the first phase of the clean is insignificant, it is very difficult to accelerate the barbell in the second phase.

The question arises as to what sort of dynamics are best? In the snatch, it is preferable to exert little and moderate effort in the first phase. In the clean, the most preferable dynamics are moderate and higher effort in the first phase. The athlete should develop maximum effort in the second phase for both the clean and the snatch.

The "Squat Under" and Recovery

After executing the second phase the barbell can travel by its own inertia to a height: of 65±3.8% of the athlete's height in the snatch and 52±4% of the athlete's height in the clean. In reality, the barbell is raised to a mean height of: 73.5% of the athlete's height in the snatch and 60% in the clean. So, after the final acceleration, up to the maximum height of the lift, the barbell travels, on the average: 8.5% of the athlete's height in the snatch and 8.0% of the athlete's height in the clean. This is 12.7 cm for a 150 cm athlete, 14.5 cm for a 170 cm and 16.1 cm for an athlete 190 cm in height. The corresponding figures for the clean are 12, 13.6, and 15.2 cm. This is because the barbell must continue to rise for some time after the "explosion", for a successful "squat under".

What action raises the barbell over this segment?

1. The active interaction of the arms with the barbell after the final effort, during the lowering of the body, while the athlete's feet are in contact with the support (we call this the support phase).

The "squat under" begins, not only under gravity's influence on the body, but as a result of the sportsman's active interaction with the barbell. For some time, immediately after the "explosion", the athlete (in the snatch, approximately 0.0-5-0.1 sec; 0.1-0.15 sec in the clean) keeps his feet on the platform.

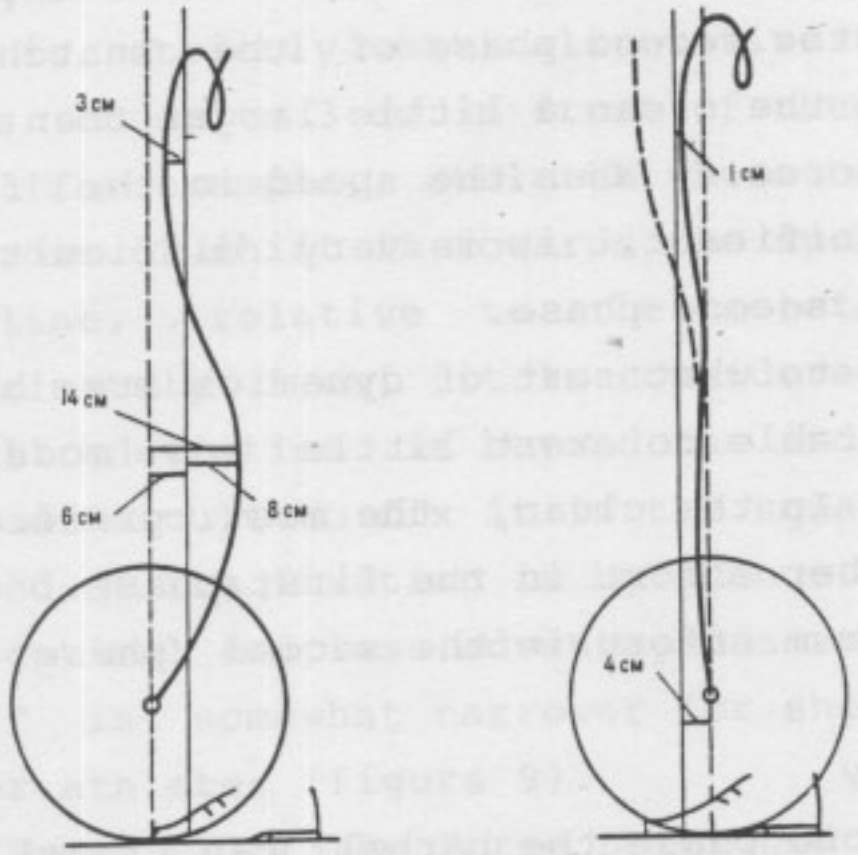


Figure 6. Parameters of the bar's movement(the metatarso-Phalangeal J+S. are not under the bar at the start)

Figure 7. Parameters of the barbell's movement (the metatarso-phalangeal Joi are in front of the bar at the start).

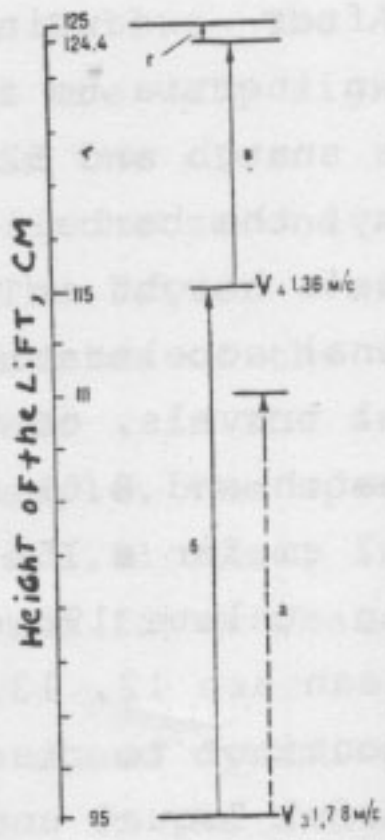


Figure 10. Structure of the snatch, after the final acceleration:a-possible lift from inertia;b-actual, at the instant the feet are thrust from the platform;c-the action of thrusting the feet; d-from the active interaction of the arms, in the non-supp

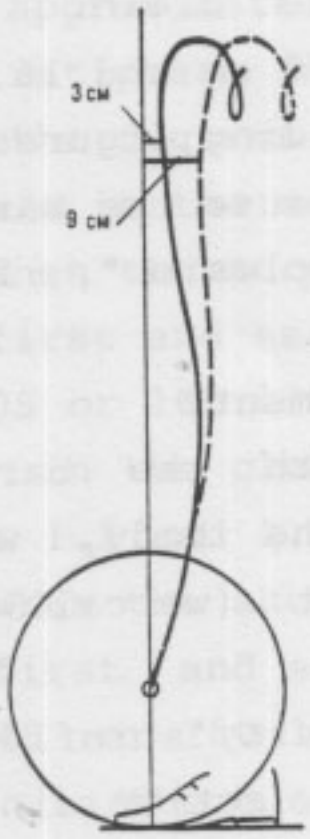


Figure 8. Parameters of the barbell's movement (the torso is too straight at the beginning of the second phase)

Figure 9. Zones of the baebell's movement: 1- optimal; 2- less advantageous; 3- fixation with great difficulty;4- a miss or a success by chance

Barbell velocity, prior to the "squat under" (before the legs are rearranged), significantly exceeds the speed it could have achieved after the final acceleration, due solely to its own inertia; as a result of the athlete's interaction with the barbell. So, the athlete imparts additional acceleration to the barbell during the support phase; it rises to a significantly greater height, than it would have, as a result of inertia.

A barbell velocity of 1.78 m/s in the snatch (figure 10), should elevate it 16 cm (figure 10, a), and ultimately to a height of 111 cm (95+16). In actuality, at the instant the feet are thrust from the platform, the barbell is at a height of 115 cm; having risen 20 cm (figure 10, b).

2. The thrusting of feet from the platform during the "squat under". During this thrusting (jumping from the floor, Ed.), an additional acceleration is created, as a result of which barbell velocity increases. After the feet leave the platform, barbell velocity in the snatch is (for athletes of 170 cm, for example) an average of 1.36 m/s, i.e., higher than before the thrusting of the feet. Now the barbell can be lifted to a height of 124.4. cm (figure 10, c).

3. The active and rapid interaction of the arms in the non-support phase. When the athlete's force is insufficient (during the pull or thrusting of the feet from the platform) and the height of the lift is low; the athlete can raise it another 2.5 cm in the snatch and up to 1.5 cm in the clean during the non-support phase; (10, d) in order to subsequently fix it in the squat position.

After executing the second phase (the "explosion"), the athlete pulls his torso under the barbell and enters the squat position (figure 11). The "squat under" should not be executed prematurely (before the end of the "explosion"), because this diminishes one's strength realization.

The movement of the torso under the bar and the squatting-down should be executed as fast as possible. The arm muscles are actively working during the "squat under". Utilizing first the flexors (in the support part of the "squat under") and then the

extensors (immediately in the squat position), the athlete pushes against the bar and pulls the torso under the barbell. So, as the barbell gets heavier, when its velocity lessens all the more, the mastery of executing the "squat under" acquires all the more significance.

The CGB shifts forward slightly during the "squat under", provoking a compensatory upward-backward curve in the barbell's trajectory.

Thrusting the feet from the platform, the athlete rearranges the legs. The non-support part of the "squat under" lasts: in the snatch -- 0.15-0.33 seconds, in the clean -- 0.1-0.2 seconds. Then the feet are placed on the platform. The following position in the squat position is optimal: the heels are under the hip joints and the toes are turned to the side (figure 11, a). The lower back is arched in the squat position and the torso is tilted slightly forward (the torso tilt is greater in the snatch than in the clean); the general center of gravity of the system (GCGS) -- is over the middle of the foot. The shoulder blades are flat for the snatch, the arms are straight and the head is tilted forward. The elbows are in front of the bar as far as possible in the clean; the bar is resting on the upper part of the chest and the deltoid muscles (11, b).

If the first and second phases of the pull are executed correctly, the CGB shifts forward slightly, and consequently, the feet are also placed forward during the "squat under". When the barbell shifts towards the athlete insignificantly during the pull, he should rearrange his feet to the side. When barbell shift towards the athlete is greater, the feet should be placed backward. The greater the barbell shift towards the athlete, the further the feet are placed backwards and the less likely their placement is precise. Furthermore, as a result of the significant shifting of the barbell towards the athlete during the "squat under", the CGBa shifts down and towards the athlete which also makes it difficult to fix the barbell in the squat position.

With the "split" style, the leg thrust forward is flexed at the knee to the maximum and is placed forward (relative to its

initial position) by one and a half-foot lengths; the thigh is touching the shins. The leg placed backward is almost straight and all of the toes are resting on the platform; the foot is inclined at an angle of 45°, relative to the platform. The feet should not be placed parallel for the best stability; on the contrary the heels are turned slightly out. The vertical projection of the bar is at the hip joints; the torso is vertical and arched in the low back (figure 11, c).

The athlete does not assume the aforementioned position immediately -- he begins by slightly bending and lowering the torso from a higher position. The amortization part of the entry into the squat position begins the instant the barbell stops rising. In the squat style this usually coincides with the rearrangement of the legs on the platform after the non-support phase; in the "split" style -- when the foot placed forward touches the platform or when the bar contacts the chest. The growing, downward pressure is in opposition to the strength of the legs. The amortization part of the "squat under" lasts: in the snatch -- 0.15-0.35 seconds and in the clean -- 0.3-0.6 seconds. The height of the lift in the snatch is 68-78% of the athlete's height (an average of 73.5%); in the clean -- 55-65% (an average of 60%)[figure 12]. During the entry into the squat position the trajectory of the barbell curves (in a backwards direction) and ends in a downward loop (see figure 12). The barbell's downward shift describes a "hook". The downward trajectory of the barbell depends on the athlete's height, the peculiarities of his body structure, the hand spacing (in the snatch) and the "squat under" method (split or squat style, Ed.). So, during the amortization of the "squat under", (for the squat style method) the bar descends: 5-9% of the athlete's height (a mean of 7.5%) in the snatch; and 14-18% of the athlete's height (an average of 16%) in the clean. With the "split" style, the amortization part of the "squat under" in the snatch is approximately one third and in the clean two-times less, than with the squat style method.

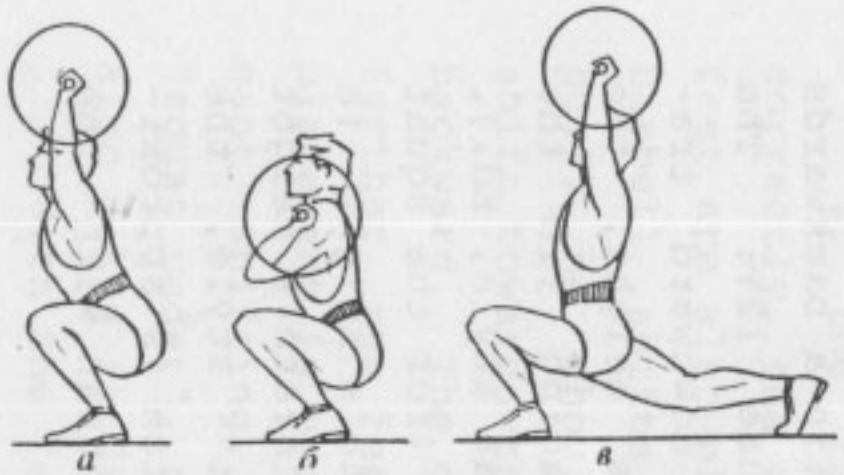


Figure 11. Fixation of the barbell in the "squat under": squat style, a) in the snatch; b) in the clean; c) split style snatch

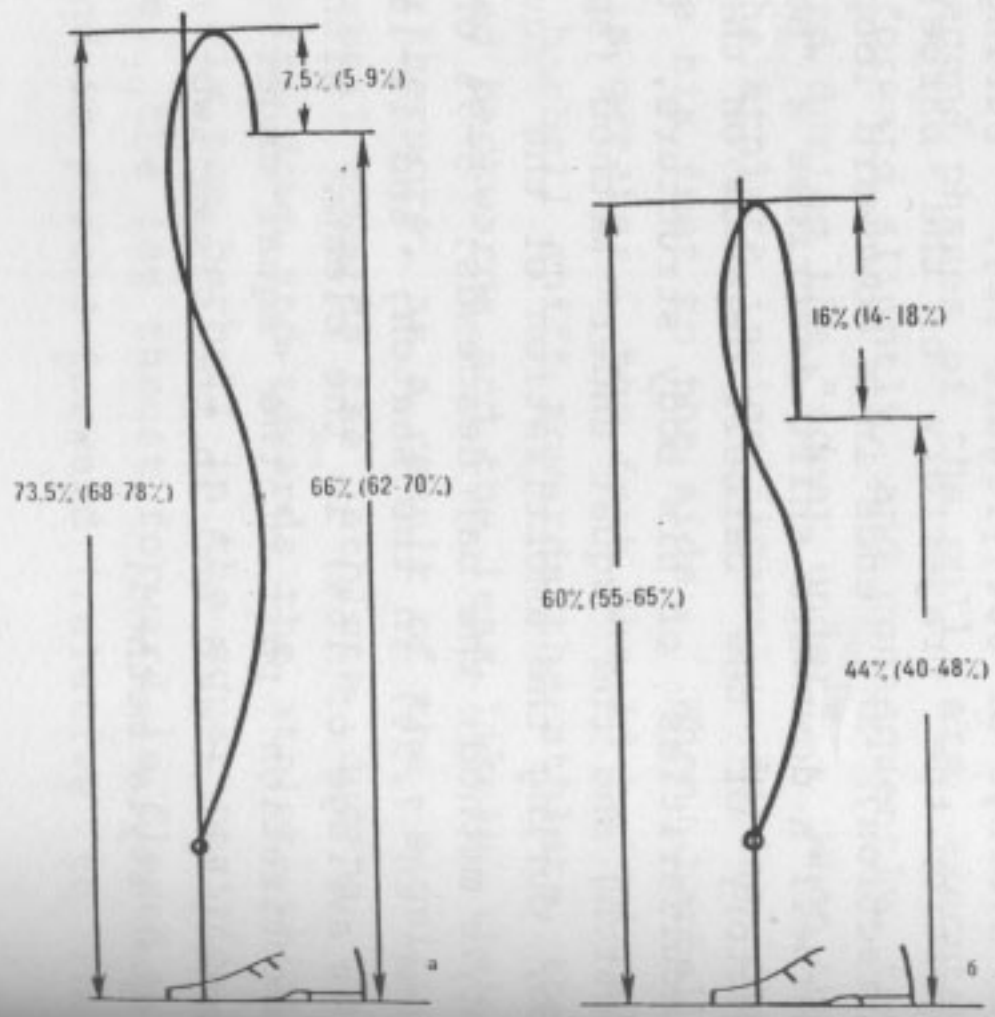


Figure 12. Height of the lift, magnitude of the amortization part of the "squat under": a) in the snatch; b) in the clean

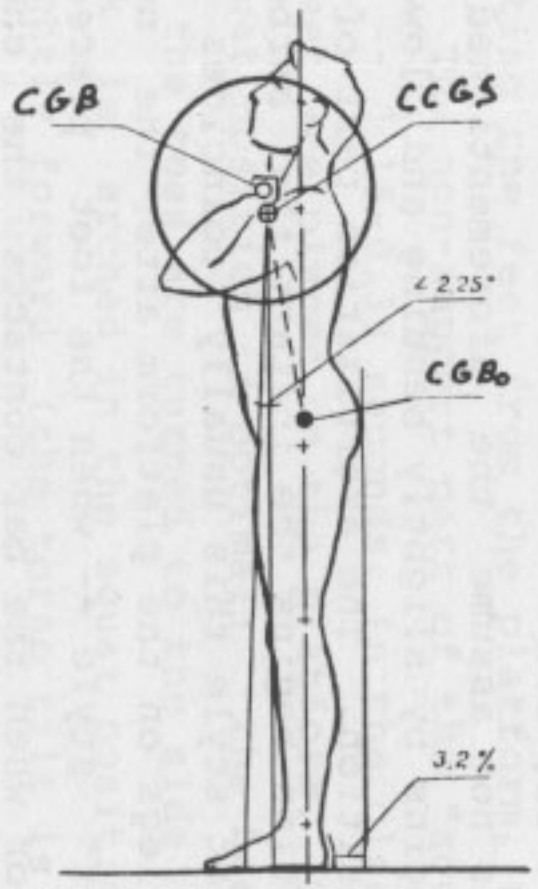


Figure 13. Starting position for the jerk

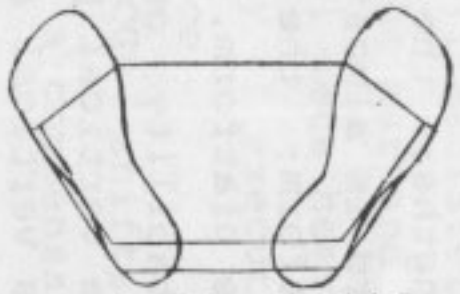


Figure 14. a lifter's area of support: large with a small weight; small with 275%.

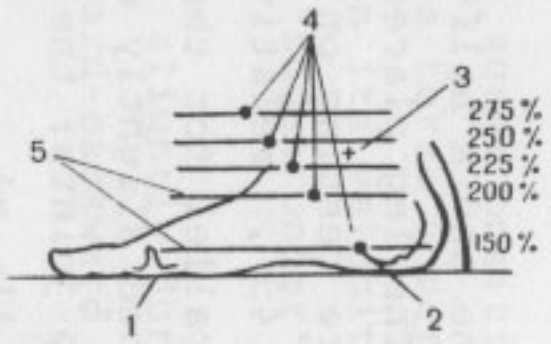


Figure 15. A lifter's zones of stability with different weights: 1- head of the first meta-tarsal bone; 2- fifth tubercle; 3- ankle joint; 4- projection of the CCGS; 5- magnitude of support

The height of barbell fixation: with the squat style snatch is: 62-70% (mean of 66%) of the athlete's height; in the clean -- 40-48% (mean of 44%). The barbell is fixed at a somewhat greater height in both the "split" style snatch and clean.

The height of the lift for athletes of the same height (stature, Ed.) depends on their qualification. The parameters just described, apply to highly-qualified athletes. Novices and lower class athletes lift the barbell: in the snatch to a height of 80% of their height, and to 68% in the clean. This is due to the fact that the barbell is lifted with significantly greater velocity; since the force exerted is essentially greater than the amount of weight lifted. Along with the rise in mastery and consequently, more weight that is lifted, the speed of lifting decreases; and the height of the lift gradually decreases.

With the rise in qualification, the height of the lift changes significantly, but the height of fixation in the squat position undergoes insignificant alteration. As a result of the increased flexibility that accompanies the rise in mastery, it is possible to fix the barbell at a lower height in the squat position. But this height changes very insiginficantly, and further, the height of barbell fixation in the squat position almost does not change for qualified athletes. On the other hand, the downward movement of the barbell during the amortization part of the squat under changes significantly. The recovery from the squat position is realized primarily by the extensors of the legs. The arch in the lumbar area is preserved. The pelvis is raised and shifted backwards slightly to maintain balance; the shoulders are shifted forward, which facilitates the work of the leg muscles, especially in the clean.

The recovery from the split position (from the "split" style, Ed.) begins with the straightening of the forward leg. The athlete shifts the upper part of the torso and the barbell towards the rear leg. Shifting the CCGS backwards significantly facilitates the straightening of the front leg. After it is straightened, the forward leg is returned to its initial position at the start. Then the rear leg is brought forward. Tne entire

movement should be executed smoothly. The torso remains vertical. At the end of the recovery the athlete fixes the bar overhead (in the snatch) or on the chest (in the clean).

The Jerk from the Chest

The Start

After recovering from the squat position and fully straightening up, the athlete should assume the so-called normal position; where the vertical CGB is in the frontal plane, through the transverse axis of the hip joints. In this position the pelvis is tilted backwards slightly such that it is 3.2±0.3% of the athlete's height (figure 13) beyond the heel of the boots. For athletes who are 150 cm this will be about 5 cm; 170 cm -- approximately 5.5 cm and 190 cm -- 6 cm. In this position the vertical projection of the center of gravity of the system (athlete-barbell) and the center of gravity of the barbell is a minimal distance from the center of the ankle joints and is almost at the middle of the foot; which is advantageous for the jerk. The barbell is lying across the chest, the arms are not tense; the elbows are under and in front of the bar. The head is tilted backward slightly and the line of sight is directed slightly up.

It is necessary to point out that as the amount of weight one lifts increases, the difficulty of jerking the barbell is due to the fact that the possibility of a stable support and balance, are more limited. The fact is that, with a weight on the chest the lifter's area of support consists only of the surface of his feet, inclusive of the area of the platform between them (figure 14). The fundamental portions of the feet through which the weight of the body is borne, against the support, in the standing position, are the fifth tubercle and the head of the first tarsal bone. With respect to this, the heavier the barbell, the smaller the area of support; when holding a weight on the chest, in comparison to the usual standing position (figure 20).

The zone of stable-equilibrium averages 68% of the area of the feet, with a weight 150% of the athlete's bodyweight; 60% with 200%; 55% with 250% and 51.6% with 275%. The degree of

stability towards the toes diminishes significantly as the weight increases. So, the arc of stability with 150% is 6.5°; with 275%-2.25° (see figure 13). While at the same time the zone of stability, towards the heels, increases. With 150% of bodyweight the arc of stability is 1.8°; with 275% -- 3.7°. The general stability in the fore-aft direction decreases. The sum of the arc of stabilities is 8.3°, with 150% of bodyweight (6.5+1.8); and is 5.95° (2.25+3.7) with 275%.

When 275% of bodyweight is held on the chest, the vertical projection of GCGS (general center of gravity of the system) is 28% of the length of the foot in front of the center of the ankle joints and 52% from the heel of the boot. The vertical projection of the GCGS is about 20% of the length of the foot from the edge of the support (towards the toes); which, for example, is 4.5 cm for a 150 cm athlete. The vertical projection of the bar is even closer to the toes. The athlete's degree of stability is only about 2°. One must execute the half-squat and subsequent straightening up with great precision, so as not to shift the GCGS forward and lose one's equilibrium.

Weightlifters' feet are of different lengths -- 14.5-16.5% of their height (a mean 15.3%), and consequently, it is more advantageous for those whose feet are larger, relative to their height, because this gives them a larger area of support.

The Lift up to the "Squat Under" (Split, Ed.)

The Half-Squat. A precise "thrusting" of the barbell, with the maximum utilization of the athlete's strength potential, depends on the athlete's precise and correct execution of preliminary half-squat (figure 16 a).

If the torso shifts strictly vertical during the half-squat, the GCGS will shift forward slightly. The fact is that the knees bend and shift forward and down, during the half-squat. If some part of the body moves forward then the GCGS shifts in the same direction. It is desirable for the GCGS to shift strictly vertical for the jerk. In order for this to occur it is necessary for another part of the body (in opposition to the knees) to shift backward. The pelvis can be the body part that shifts

in opposition during the half-squat.

So, if the pelvis moves backward slightly during the half-squat, then the GCGS will shift strictly vertical and even shift backward. Consequently, the barbell shifts strictly vertical or arcs down and somewhat backward. The rearward shifting of the pelvis in this instance is 1.5±0.7% of the athlete's height (figure 17, a, b).

If the torso shifts strictly vertical during the "half-squat", the barbell will shift 1-2 cm forward. This is not a mistake, just less advantageous for "thrusting" the barbell, because the muscles around the ankle joints are utilized to lesser degree (figure 17, c). It has already been noted that the vertical projection of the GCGS is 4.5 cm from the forward edge of the support when a 150 cm athlete holds 275% on the chest. If the barbell shifts yet another 1.5 cm forward during the half-squat, then only 3 cm remain; and, consequently, the slightest imprecision (for example, an insignificant tilting forward of the torso) can cause the GCGS to move outside the area of support. Well then, a vertical shifting of the torso is even less advantageous, because this could cause the athlete to lose his balance.

Barbell shift towards the athlete is the most preferable trajectory during the half-squat. The conditions of the support and balance are significantly better in this case and the athlete can more fully utilize the strength of the ankle muscles.

When the vertical projection of the bar is over the toes in the starting position, and not at the middle of the foot, the execution of the jerk becomes significantly harder, because the arc of stability is minimal in the forward direction. The moment force of gravity is rather significant in such a position, since the vertical line of the weight is close to the edge of the support; and, consequently, the athlete can quickly lose his balance during the half-squat. One must bear in mind that the heels (of the boots) are approximately 2-3 cm higher than the toes, which also makes it somewhat more difficult to maintain balance.

The half-squat consists of two parts: the relatively smooth squating portion and the braking part. The first part is

executed in an average of 0.28 seconds; the second in 0.12 seconds. The time of execution of the half-squat, does not depend on the athlete's height or weight class. The first part is approximately 62%; and the second -- 38% of the half-squat depth. At the beginning of the braking portion, i.e., the instant the half-squat reaches maximum speed, the knee angle is an average of 123° (from 114 to 132°; figure 17, b).

The speed of the half-squat is of no small importance for a successful jerk. The optimal depth of the half-squat is 8.3-11.5% of the athlete's height (a mean of 10%). This would correspond to a knee angle of 99-111° (a mean of 104°).

The speed of the half-squat depends on the athlete's height: approximately 0.85 m/sec for 150 cm athletes; 0.93 for 160 cm; 0.98 for 170 cm; 1.0 for 180 cm and 1.1 m/sec for 190 cm athletes (a non-linear dependence). Athletes in all weight classes and of any height begin braking the barbell during the half-squat by bending the knees at the same angle and at the same time -- consequently, their mean angles are equivalent. However, the absolute path of the barbell is greater for the taller athletes -- consequently, the speed of their half-squat is greater. If one does not resist the barbell's downward movement, barbell velocity (the speed of free-fall) at the instant of braking will be approximately 1.5 times greater. For example, a middleweight who is 164 cm tall would have a barbell speed of not 0.95, but approximately 1.5 m/sec. The half-squat must be executed smoothly, at a moderate tempo; slightly resisting the pressure of the barbell, in order to obtain an optimal half-squat velocity.

If the braking begins at an optimal half-squat speed and at the optimal knee angles, the braking path becomes minimal -- but the acceleration is greatest. The shorter the breaking path, the faster the barbell is stopped, the greater the effect of the subsequent vertical thrust. The fact is that, having completed the half-squat, and consequently, stopped the barbell's downward movement, the lifter should then jerk it. Under these conditions the force of muscle pull is developed during the yielding, amortization type of work; and subsequently during the active

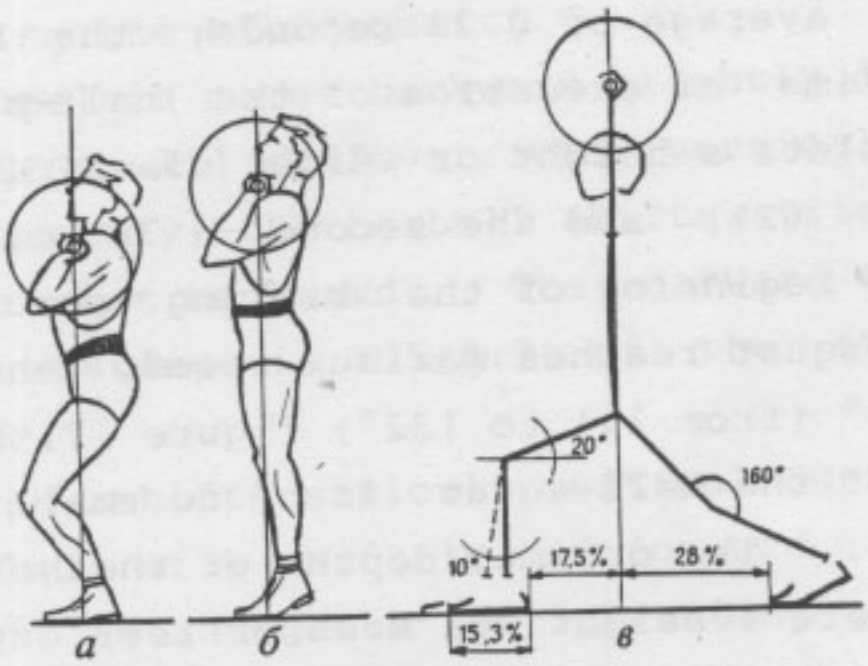


Figure 16. Technique of the jerk:
a) the half-squat; b) the "thrust";
c) the "squat under"

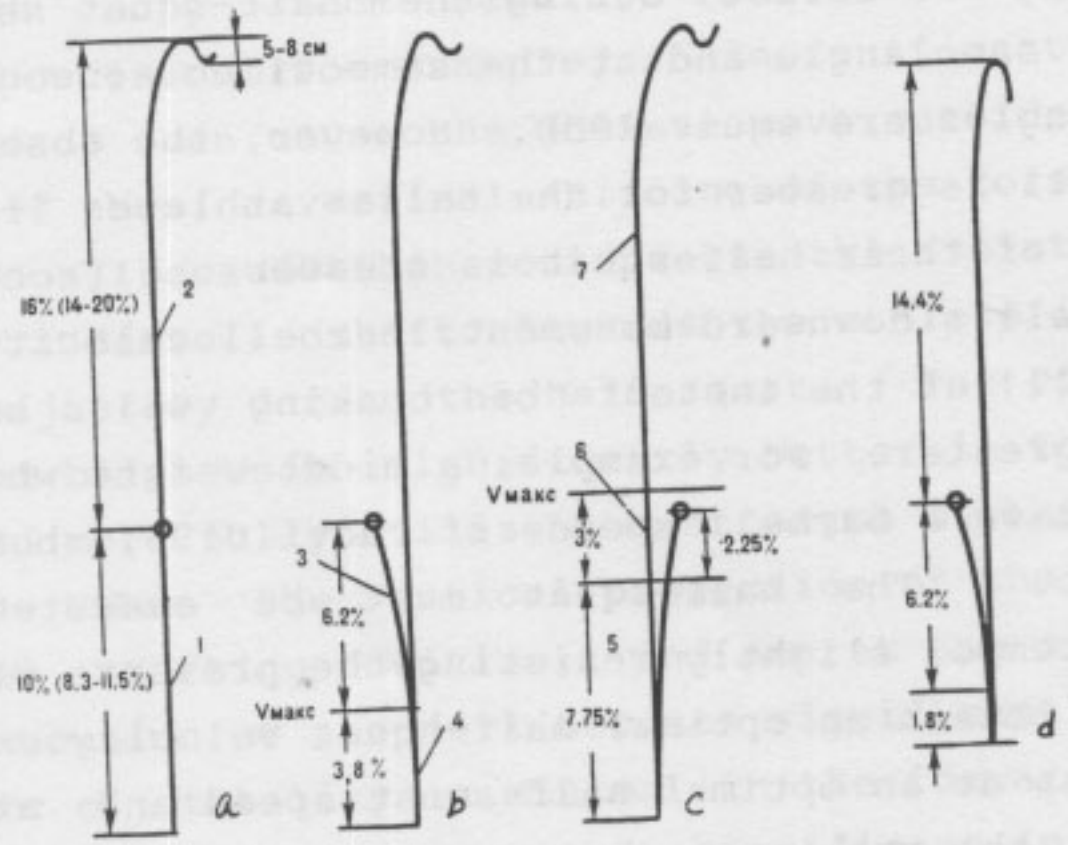


Figure 17. Barbell trajectory in the jerk (a,b,c) and the Push-jerk(d): 1) in the half-squat; 2) during the "thrust"; 3) during the relatively smooth squating; 4) during the "braking"; 5) during the acceleration; 6) during the "thrust"; 7) during the rearranging of the legs in the split.
The degree of barbell shift is given as a percentage of the athlete's height.

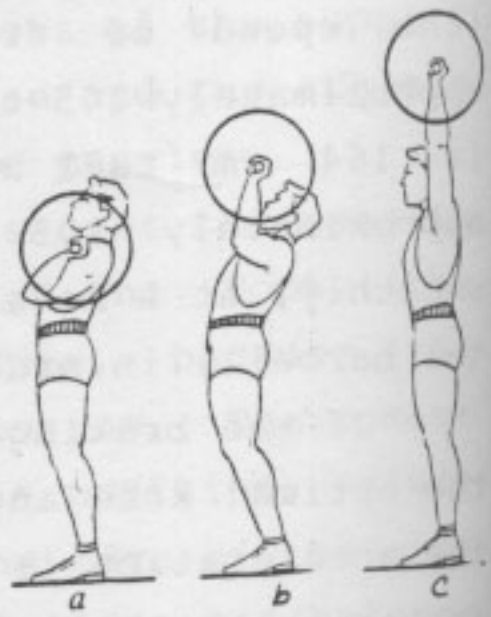


Figure 18. Technique of the press

thrusting. In this instance, the kinetic energy of the body's movement with the barbell, in the amortization phase, is transformed into some potential tension, which is then utilized in the jerk. The magnitude of this potential is equal to the kinetic energy of the body and the barbell at the instant of stopping, but the absolute force of muscle pull is larger the shorter the amortization path and the braking time.

If the maximum speed during the preliminary squatting is large, then the braking will be concluded at a lower level, when the knee angle is sharper. In this instance, the athlete simply "extinguishes" the kinetic energy of the body and barbell's movement, does not utilize the potential tension developed, and the latter quickly diminishes to a level close to the weight of the body and the barbell. In this case, the conditions for executing the "thrust" are approximately the same as if the athlete began from a dead stop in the half-squat. With a deep half-squat, when the flexion angles of the knee and ankle joints become excessively sharp (associated with increasing the force arm of the resistance), the moment tension of the working muscles increases, which also makes the thrusting difficult. A significantly shallower half-squat is irrational: an excessively obtuse knee angle does not allow sufficient force to accelerate the barbell.

The "Thrust". Without pausing in the half-squat (the pause is 0.01-0.04 sec), the athlete thrusts the barbell upward (figure 16, b). One must lift the barbell to a specific height, (from 14 to 20% of the athlete's height, or an average of 16%) in order to fix the barbell in the split position after the jerk (see figure 17, a). Taller athletes raise the barbell not only to a greater absolute height, but to a greater height, expressed as a percentage of their height. This is associated with the fact that the weight of the barbell, expressed as a percentage of bodyweight, is less for taller athletes. For example, athletes who are 150-160 cm (in the 52, 56, 60 and 67.5 kg classes) lift the barbell to an average of 15% of their height; 164-169 cm (75 and 82.5 kg) to 16%; 172 cm and above (90 kg class and above) to 17%.

The recovery from the half-squat up to the initial position is executed in an average of 0.19 sec, i.e., it is one-half the time-span of the half-squat (0.4 sec). The time of active influence on the barbell (acceleration time) is an average of 0.16 sec, and the acceleration path is approximately 3/4 of the distance to the initial position. The knee angle at the end of the acceleration is an average of 145°. Well then, the braking occurs at average knee angles from 123-104° and barbell acceleration from 104 to 145°. When the acceleration path is insufficient, the barbell will attain a lesser velocity (figure 17, c). In accelerating the barbell, the athlete should remain flat-footed and apply maximum force by extending the legs. The barbell is lying on the chest and is approximately 2-2.5% of the athlete's height below its initial position, at the end of the acceleration. Premature raising up on the toes as well as extending the arms and separating the bar from the chest (before completing the acceleration) "softens" the upward movement of the barbell and diminishes the effect of the jerk.

The barbell reaches maximum velocity when it is an average of 0.72% of the athlete's height above its initial position. Cyclographic analysis established that the maximum speed of the lift is achieved when the athlete changes the area of support -- from the entire foot to raising up onto the toes. At this point, the knees have not fully straightened and the angle in these joints is somewhat less than 180°. The taller the athlete the greater the barbell velocity, which averages: 1.45 m/sec for 150 cm; 1.54 m/sec -- 160 cm; 1.62 m/sec -- 170 cm; 1.71 m/sec -- 180 cm and 1.8 m/sec -- 190 cm. During the "thrust" the barbell moves recti-linearly over approximately 70-80% of its path, and then it shifts upward and back (see figure 17) when the athlete rearranges the feet (the body's center of gravity shifts down-forward).

However the speed imparted by the "thrust" does not send the apparatus to the height necessary to fix it overhead. A velocity of from 2 m/sec (for a 142 cm athlete) to 2.5 m/sec (for a 186 cm athlete) is needed. For example, the barbell will be raised to a

height of only 13.3 cm with an optimal velocity of 1.6 m/sec by a 164 cm middleweight, as a result of inertia; and an athlete of 186 cm with a velocity of 1.8 m/sec can raise it to 16.7 cm. In order to fix the barbell, it should be raised to heights of 26.5 and 31.8 cm respectively, i.e., 13.2 and 15.1 cm higher. Athletes in the light weight classes do not even lift the barbell to one-half the necessary height for fixation (solely through acceleration).

How can one lift the barbell to the necessary height? By the active influence of the arms on the barbell and the additional acceleration created by rearranging the feet in the split position.

The "Squat Under" (Split), the Recovery from the "Squat Under" amd Fixation of the Barbell

After the athlete achieves maximum barbell velocity, he pushes against the bar, sending his torso down, and enters the split position. The pressure applied by the arms maintains the barbell's upward movement in the split position. When the athlete enters the split position quickly, the body's force of inertia is directed upward and is transmitted totally to the barbell. The force with which the foot thrust backward and especially the leg placed forward, the action of which produces additional acceleration, renders a significant influence on the speed of the lift. So, the athlete should rearrange the feet as quickly and energetically as possible.

The knee of the leg placed forward is flexed up to an obtuse or straight angle and the foot is flat. The knee of the leg placed backward is flexed slightly; all the toes are on the platform and the heel is turned slightly outward. This foot is returned to the platform somewhat earlier and owing to this interaction with the support, creates the possibility for shifting torso forward and down. The entire weight of the barbell is borne by the athlete. The pressure restraining the barbell is strengthened by the legs. The barbell descends 3-8 cm, describing a "hook", during the athlete's amortization.

The barbell is held on straight arms over the shoulder

blades (slightly behind the head); the wrist, elbow and shoulder joints and the bar are arranged in one vertical plane. The athlete's head is straight and is jutting forward; the back is arched and in this position, the ilio-femoral joints should be under the bar (figure 16, c).

In recent years with respect to the heavier weights being lifted, athletes in different weight classes rearrange the feet differently.

The legs are rearranged such that, the leg placed forward, relative to the vertical projection of the hip-joints, is at a distance of slightly greater than the length of the foot; and the rear leg, at a distance of almost two feet. The shin of the forward leg is vertical or tilted slightly (80°) towards the athlete; and the angle between the thigh and the horizontal is 20°. The knee angle in the rear leg is approximately 160° (see figure 16, c). The sportsman's torso is lowered approximately 15% of his height in such a position.

A somewhat further shifting forward of the front foot, and consequently, a more inclined position of the shin -- is a sign that the feet were pushed off the platform more powerfully and that there was a greater influence on the barbell during the "squat under". This foot placement is more stable and does not alter the depth of the "squat under" (an inclination of the shin to 10° from the vertical lowers the torso 3.5-4.5 mm). It has already been noted that athletes in the light weight classes thrust the barbell somewhat lower. And, since they lift significantly heavier weights, as expressed by a percentage of their bodyweight, the amortization part of the "squat under" (expressed as a percentage of their height) is larger for them. Thus, for these athletes the torso is lower -- approximately 20% of the athlete's height; the angle between the thigh and the horizontal diminishes to approximately 10° and the legs are rearranged in the fore-aft position somewhat further.

Heavyweights thrust the barbell higher and the amortization part of the "squat under" is less; therefore, the torso is lowered by 12% of the athlete's height, the angle between the

thigh and the horizontal is about 30° and the legs are placed in the fore-aft position closer together. The recovery from the split is the same as the "split" clean. After recovering from the "split" the athlete fixes the barbell overhead, and becomes motionless.

The "pendulum" method of executing the jerk as recommended by V. A. Nechepurenko (1972 Weightlifting Yearbook) merits attention. Essentially it consists of this; after assuming the starting position, the athlete slowly shifts the torso forward (naturally, the GCGS does not go beyond the limits of the support). Then the athlete tilts the torso backward and executes the half-squat when the GCGS is at the ankle joints. This significantly improves the lifter's stability.

The Push-Jerk (or Squat-Style Jerk, Ed.)

Recently some athletes have been employing the squat-style jerk. In this instance, the half-squat and "thrust" are performed about the same as in the classic jerk, but instead of splitting, the athlete executes a half-squat.

The technique of V. Sots (figure 17, d), who set a world record in the clean and jerk with 230 kg (bodyweight 100 kg, height 174 cm), is used as an example. The athlete lowers the torso 14 cm in the preliminary squatting, which is 8% of his height. This is somewhat less than the average (17.4 cm or 10% of height), which is characteristic of the classic jerk. The dynamics of the preliminary half-squat are somewhat different for him.

The first part of the half-squat is a relatively smooth squat -- the athlete executes this within the range inherent to the classic jerk. The bar is lowered by 10.8 cm, up to the beginning of the "braking". This is approximately the same distance of a normal half-squat for athletes of the same height. The maximum speed of the half-squat (0.81 m/sec) is within the average range. The athlete tilts the torso significantly backwards, as a result of which the barbell shifts 2 cm towards him.

The second part of the half-squat -- the "braking" -- is executed by the athlete, over one-half the distance (3.2 cm),

than is average for the classic jerk (6.5 cm) and is concluded at a more obtuse knee angle (113°). The athlete pauses 0.08 sec in the half-squat, and when the bending of the bar reaches maximum (the bend reaches 8 cm at this instant), he begins the upward "thrust". Thus, the athlete makes maximum utilization of the additional force, created by the bending of the bar. This contributes to a more obtuse knee angle. The athlete jerks the barbell strictly vertical. The barbell reaches maximum speed at the instant it is 9 cm above its initial position. Barbell speed is 1.45 m/sec and conforms to that of other athletes. The barbell, with this velocity (by inertia) can be raised another 10.5 cm and reach a height of 19.5 cm. The athlete raised the barbell to a height of 25 cm.

In the classic jerk, athletes execute the "squat under" immediately after the barbell achieves maximum velocity; V. Sots continues to energetically push against the barbell for a period of 0.08 sec. The knees begin to bend and when the angle in these joints is 170°, the athlete thrusts his feet from the platform and rearranges them to the side. The barbell receives additional acceleration; the speed of the lift (at a height of 16 cm, relative to its initial position) is 1.3 m/sec. It is necessary to point out, that the effect of the additional acceleration, created by thrusting both feet simultaneously, is approximately equivalent to the effect of the split-style "squat under" (when the legs are rearranged one at a time). Now the barbell can be raised, by its own inertia, another 8.6 cm and achieve a height of 24.6 cm, relative to its initial position. And, since the athlete interacts with the barbell during the non-support phase, it reaches its maximum height of 25 cm.

The knee angle is approximately 97° when the feet are placed on the platform, but the arms are still bent. The athlete lowers the pelvis and bends his knees further in order to straighten his arms; the torso is arched and the pelvis tilted backward slightly. The barbell drops 5 cm during this amortization part of the "squat under"; the knee angle is approximately 87°. The athlete stops the barbell with the arms straight in this posi-

tion. If the athlete had executed the jerk "split" style, and raised the barbell to the same height, the position he would have taken, would have the thigh of the forward leg inclined at 30° relative to the horizontal and the knee (with the shin vertical) would be 120°. Naturally this position would be considerably more stabile.

So, one of the insufficiencies of the squat-style jerk is the extreme instability in the fore-aft direction, which is approximately 53% of the length of the foot. One needs to execute not only the lift upward with great precision, but also the subsequent "squat under", in order to keep the GCGS within the area of the support and hold the barbell overhead. The athlete then recovers from the half-squat, bringing first the left then the right foot to the initial position and fixes the barbell.

The Press

The press is a special-assistance exercise which contributes to strengthening the muscles that take part in the jerk. The starting position for the press and the width of the grip are the same as for the jerk. The most comfortable grip is the -- simple. The barbell is usually raised by the power clean method, without moving the feet. One can also lift the barbell to the chest with the "split" style.

The athlete places the feet in a position that is comfortable for him (at approximately shoulder width, toes turned slightly to the side) and assumes the initial position for the press. The pelvis is set slightly forward, such that the vertical projection of the iliofemoral joints is close to the heels (figure 18, a), the waist is taut, and the shoulder girdle is elevated. The elbows are slightly in front of the bar, the head is tilted backwards slightly. There is only enough tension in the arms to hold the bar on the chest. The athlete presses the bar from this position.

The elbows are energetically thrust upward as the barbell is lifted from the chest. The initial lifting is realized chiefly by the shoulder muscles. The angle in the elbows increases

insignificantly. For the most part, the athlete subsequently straightens the arms. The head tilts backwards slightly during the arm straightening (this has a tonic affect on the extensor muscles). It is not recommended to turn the elbows to the side until the barbell reaches the upper part of the head, since this weakens the effort directed at lifting the barbell. The forearms should be held in a slightly inclined position. The further straightening (and consequently lifting) of the arms is made difficult when the forearms are in a horizontal position. In order to overcome this difficult position, the athlete leans back a little. The abdominal muscles are tense, the shoulder and elbow angles become obtuse, which contributes to the further straightening of the arms, and consequently, lifting the barbell (figure 18, b). When the elbows are almost straight, the athlete moves the head and torso forward, and the pelvis backward; having completed the straightening of the arms and the torso, the athlete fixes the barbell (figure 18, c).

Perfectioning Technique using Methods of Crucial Information and by Closing the Eyes

It is impossible to improve technique without the skill of precise sensation -- analyzing one's movement. The athlete executes the lifting exercises without visual control: he can see neither what's happening to the parts of his body nor the barbell.

In weightlifting, as in many other types of sports, the motor analyzer is the key, upon which the preciseness of movement depends. Consequently, perfectioning technique should proceed first of all by way of developing muscle joint sensation; to educate one's ability to precisely analyze one's movements. The most important condition of precision muscular work and control of movement is the receipt of information in the central nervous system from the motor apparatus, as well as from various external sensory organs; concerning the execution of the movement, with respect to its effectiveness.

As is known, an important quality of information is quantitative assessment of movement (the possibility of a quantitative

measurement). This information enables one to percieve details of technique, inaccessible to the sensory organs and serves as a prerequisite for success in perfectioning the technique of the classic exercises. Unfortunately, the coach is unable to perceive the quantitative characteristics of the exercise -- the spatial shifting of the barbell and links of the body, the force the athlete generates, the speed of execution of the phases, and so forth. However, this is possible with special devices and adaptations. What are the most accessible methods of crucial information which can be utilized in training? Barbell trajectory can be obtained with a piece of chalk attached to the end of the bar. A trajectory curve is enscribed on a blackboard which has squares 10 cm in width.

One can analyze the pull technique of the snatch and clean by the movement trajectory of the end of the bar. For example, one can determine the optimal shift towards the athlete in the first phase and movement away in the "explosion"; and whether the height of the lift was sufficient. Barbell trajectory in the snatch and the clean is recorded with 80-90% weights, where the parameters are not significantly different from the competition parameters. Barbell trajectory for the snatch and the clean pull is recorded with 95-100% of the snatch and clean, respectively.

The aforementioned technique parameters of the snatch and clean should serve as criteria for correcting the execution of these exercises. When one is using the snatch and the clean pull to perfect the pull, one should bear in mind that the "explosion" is executed within different parameters, in these exercises. When the pull is executed correctly, the barbell shifts (relative to its initial position at the start) forward by approximately 2 cm further in the "explosion", than in the snatch or the clean. Besides this, barbell trajectory in the "explosion" is more vertical than in the classic exercises. If one compares the height of the lift for the same limit weight in the snatch and snatch pull, the clean and the clean pull, then the results will be as follows: in the snatch pull the height will be 5% of the athlete's height lower than in the snatch for low classified

athletes and 3% for masters of sport; in the clean pull, the corresponding figures are 3% and 1% lower, than in the clean. The discrepancy in barbell trajectory in the second phase of the pull is explained by the fact that the athlete does not squat under the barbell in this exercise; consequently the additional influence on the barbell, inherent to the "squat under" phase, is lacking.

The barbell's movement in the first phase is somewhat different than usual if the athlete slows (or accelerates) the lift after barbell separation. In the first case, the barbell will shift significantly towards the athlete and in the second, it will be lifted more vertically. With the aforementioned trajectories, the coach should notice deviations from the model characteristics, and in subsequent lifts give the athlete concrete tasks, for example: shift the barbell 8 cm towards you in the first phase and in the second lift it 2 cm forward, relative to its initial position, in the second phase, etc.

The athlete executes the exercise and then based on his sensations (he is unable to see the results, recorded on the board) gives his quantitative assessment, in this order: he begins by indicating how the barbell shifted towards him in the first phase -- to a greater or lesser extent than the task called for; then he expresses the barbell's movement in concrete terms -- centimeters and even millimeters. After assessing the second phase in the same way, the athlete is shown the actual barbell trajectory and informed of the actual results. All three figures (the task, the results of the subjective assessment of the movement and the actual results) are compared; then the margin of error is determined. Repetition of the lift enables one to make the necessary corrections and to precisely execute the exercise.

If less weight is used than indicated, one must bear in mind that barbell trajectory is affected when less weight is lifted; the barbell moves further away from the athlete in the first and second phases. For example, if the barbell shifts 6 cm towards the athlete in the first phase with a 100% weight, it will shift approximately 4 cm with a 75% weight; and 2.5 cm with a 50%

weight. In the second phase or the "explosion", a 75% weight will be raised at approximately 2 cm and a 50% weight at 5 cm further away from the athlete, than a 100% weight.

When recording barbell trajectory in the jerk it is necessary to verify the depth and precision of the preliminary squatting (half-squat) and the "thrust".

Calculate the necessary depth of the half-squat, in accordance with the athlete's height, which as indicated, should be an average of 10% of his height. Then trace the depth of the half-squat during the jerk, the thrust and trajectory deviations (relative to the barbell's initial position). When correcting the depth of the half-squat one must bear in mind that the bar bends somewhat more in the half-squat than in the initial position. It is known that the body is structured asymmetrically. Therefore, in lifting the barbell, the athlete turns slightly to the side, and does not lift it strictly parallel to the platform. One must take this into account when correcting barbell trajectory. It is necessary to begin by recording trajectory several times (2-3) from the right and then from the left side; and based on this, determine the true path of the barbell, i.e., trajectory of the center of the bar, which can be significantly different from that which appears on the board (see 1978 Weightlifting Yearbook).

By comparing the trajectory described on the board with the actual, the degree of correction in asymmetry is determined. Further control of the barbell trajectory, described on the board, with respect to correction, and a number of true barbell paths with respect to the center of the bar, are drawn.

In order to achieve higher results, the lifter needs to lift a heavier weight to a height which ensures that it will be fixed. Therefore, for example, when working on the snatch and the clean pull the lifter needs to lift a 105% weight to the same height to which he lifts 100%. Only then can one assume that the athlete can lift such a weight in the classic exercise (in the snatch or clean). It is known that training on precision has a positive affect on results; therefore, the lifter should learn to

precisely lift the barbell to a given height. In order to achieve this quickly, a centimeter tape attached to the bar and to the platform is utilized.

There are essentially two methods of perfectioning the preciseness of lifting: lifting different weights (85-100%) to the same height; lifting the same weight to different (up to 10 cm below the limit) heights. In the first case, the athlete begins by lifting 100% 3 times (with a rest interval between lifts) to a maximum height; the mean height of the lift is determined. Then he lifts 85, 90, 95 and 100% to this same height. In the second case, after the three lifts with 100% and the mean height of the lift is determined the athlete alternately lifts the barbell to that same height, then at 10, 7, 5 and 2 cm lower. The preciseness of each lift is then checked. The athlete should execute not less than 10 lifts, with voluntary rest intervals (according to feel). The first method (lifting different weights to the same height) yields the greatest effect on lifting precision.

After 10-12 workouts, lifting precision has significantly improved, the athlete is confronted with a new task -- to develop the ability to mobilize his effort to the maximum. The following method is utilized for this: the coach informs the athlete about the height of the lift during the first set. In the next 2-3 sets, the athlete (with respect to the effort expended) himself assesses the height of the lift; then the coach tells him the actual result. The effort expended is compared with the height of the lift. Then the athlete lifts the barbell to a height which is 5-8 cm below the preceding. If he executes this task with relative precision (no more than 0.5 cm error), then he should lift the weight close to the maximum height (established earlier) and then 1-3 cm above it. One can use the same weight or a different weight.

One of the simplest methods of crucial information is to demonstrate the exercise on a model person, made-up, for example, out of plastic. One can demonstrate errors in the working of the links during the lifts and ways of eliminating them, with such a

model, i.e., show the correct position the athlete should assume in the individual phases. The model should be 50-100 cm in height.

Apart from the simple methods of crucial information, one can utilize more complex technical means: dynamographic, cyclographic, loop-films, video-cassette recordings, etc.

One method of improving a lifter's muscle-joint sense is to lift blind-folded. Considerable research shows that muscle-joint sense improves when the lifter is blind-folded; this confirms the necessity to partially or fully blind-fold the athlete in order to develop motor sensation. Research shows that blind-folding the lifter does not disrupt motor activities. Exercises are executed with more precision and stability with the eyes closed or in darkness. The lifter remembers the joint angles best with the eyes closed and reproduces them easier, and he remembers the degree of muscular tension and the amplitude of movement in the joints. Subsequently, when the exercises are done with the eyes open, the athlete's motor sensation is preserved with great clarity, contributing to improvement in technique.

For example, it is necessary for the lifter to assume the starting position for the jerk 2-3 times with the eyes closed in order to remember the correct position at the start; upon which the effectiveness of the lift depends. The coach should make the necessary corrections each time. All of the lifting exercises should be practiced with the eyes closed (blind-folded) or in the dark, for specification of spatial and time parameters. Here one needs to alternate movements with the eyes open and closed.

The most frequent errors are committed in the jerk. Training with the eyes closed is very effective for perfecting jerk technique. Initially (2-3 workouts) the atlhete learns the jerk with small weights (the barbell is taken from stands). Then he switches to moderate weights, executing the exercise with the eyes open and closed. The athlete's main task in the exercises with small weights is the realization (sensing) of his actions. He needs to feel how and what he does during the preliminary squatting and the "thrust". The athlete trains with large

weights with the eyes open and blind-folded (in the dark) after mastering the jerk with small and medium weights.

One perfects snatch and clean technique in the same way. However, in all cases the athlete should himself assess the preciseness of the exercise and then verify the result with the data obtained with instruments or adaptors. If the crucial information method is not used, the coach should assess the movement to the best of his ability. In practice, the athlete is unaware of his errors -- he feels that the exercise is done correctly. When the exercises are done blind-folded, sensation is enhanced, which in the end result, makes it possible to understand and correct errors. The blind-fold used should be of a soft dark material. The eyes should be covered lightly, with no tension on the eyelids.

Execution of the exercises in complete darkness is even more effective (with the eyes open, no blind-fold). The lights are turned-off after the athlete takes the starting position. However with this method it is necessary to have a device for recording the movement of the athlete and the barbell, so that afterwards the coach can assess the preciseness of the exercise. It is undesirable to merely close one's eyes, since the eye muscles are tense and this does not enable one to fully concentrate on muscle-joint sensation.

One should always work on perfectioning technique. However, if one does not develop muscle-joint sense specifically, and the ability to correctly assess movement in space and time, then one cannot learn to control one's movements, even after training for many years. The aforementioned methods make it possible to shorten the period of mastering rational technique, avoid incorrect movements, and therefore, should assume a key role in a lifter's daily training.

Chapter 2

The Method of Training a Weightlifter

Fundamentals of Training Methods

It is known that strength is a lifter's fundamental quality, upon which to the greatest extent, results are dependent. However, a weightlifter's muscles need to develop not only great tension but significant speed, because the classic exercises are executed at full strength, as well as at full speed. There is no correlation between the ability to display great strength and the ability to display it quickly. One can possess great strength, but at the same time, not have the skill to realize it quickly. For example, during the triathlon period one would often see lifters who were very strong and very successful in the press (primarily a strength exercise) but could not achieve high results in the snatch and the clean and jerk. And, at the present time, some athletes who have high results in the front and back squat (i.e., have greater leg strength than other athletes) snatch and clean less weight.

In speed-strength exercises like the snatch and the clean and jerk, strength does not always determine sport results. The most important indicator in these exercises is the ability to display strength in the classic exercises; that is -- the skill to lift a large weight with significant speed. Well then, for a weightlifter, speed is an equally important quality. He should be quick -- possessing the so-called explosive-strength. Good technique is of no less an important factor in a lifter's preparation.

So, a weightlifter's training should be structured such that different physical qualities are perfected -- giving preference to strength, speed and technique. Even minimal* loads are effective for developing strength in beginners.

* Less than 60% weights are referred to as minimal, 60-69.9% -- small, 70-79.9% -- medium, 80-89.9% -- large, 90-97.5% -- submaximum and 100% -- maximum.

Lower class athletes can develop strength with small and medium weights. They should not lift large and especially, submaximum and maximum weights, frequently. However, it necessary for the highly-qualified athlete to systematically display significant muscular tension, and the higher the qualification the more often; otherwise there will be no strength development; and it can even decrease with minimal tension. Research shows that training weights of 90-100% yield the highest increase in strength.

Quickness in the execution of the competition *exercises is developed with slightly lighter weights. These weights should not exceed loads which would significantly disturb the structure of the exercise, inherent to a maximum weight in the classic exercises. These are 80-95% weights.

In the beginning, to successfully execute the classic exercises, requiring the display of speed and strength, it is sufficient to increase absolute strength. Later on, with the rise in sport mastery, the ability to quickly (explosively) display force, acquires key significance. The structure of the exercise -- the trajectory and speed, change along with the change in the amount of weight lifted. The muscular tension and the character of the effort, varies along with the change in the structure of the exercise. The greater the discrepancy in the weight, with respect to the maximum, the more significant the distortion in the motor habits of the competition exercises. Consequently, despite what seems to be an external similarity, the exercises, executed with different weights, are essentially different. The most precise and stabile exercises are executed with 85-95%, therefore, it is best for the athlete to perfect technique with these weights.

It is necessary to develop strength, speed and technique in a complex manner (at the same time, Ed.). Therefore, it is natural that a large part of the training work be done with 80-

* The competition exercises are understood to mean the snatch and the clean and jerk with 95-100%.

95% of maximum. Such weights develop strength and speed, while simultaneously effectively improving technique. However, from a practical standpoint, it is not possible to do this, because systematic training sessions with large weights (especially in the classic exercises) fatigues the central nervous system; and ultimately the athlete is unable to lift them. Besides this, one must constantly strive to develop great strength and speed of lifting -- so, it is necessary to constantly depart from the 80-95% range. Then one can selectively influence the speed-strength qualities -- the strength or the speed component. In this case, one can avoid working-out a monotonous stereotype to any of the weights lifted. Consequently, the lifter should train with a variety of weights, comprising 40-120% of maximum. This type of training has been proven effective experimentally and in practice.

Lifting speed is developed with weights which can be lifted faster than competition weights. Such exercises are the special-assistance exercises where the amplitude of the movement, and consequently the speed of lifting, is greater than the competition (for example, the power snatch and power clean, snatch and clean pulls, push-jerk, etc.). One can develop strength further, only by increasing the amount of weight. It is known that maximum effort is the strongest irritant, creating the prerequisites for the full mobilization of the motor elements and all of the organism's systems; in order to obtain the effect of "compensation through extremes". This kind of effort renders a training influence on the central nervous system and provokes significant accommodative reconstruction within the organism. Hence, one needs other than the classic exercises to complete this task. A lifter also needs to develop the ability to create maximum effort with the special-assistance exercises, such as the snatch and the clean pull, squats and others. The value of these exercises is that they (in comparison with the classic exercises) can be executed with larger weights, more times and with less nervous expenditure. Furthermore, they are part of the classic exercises and therefore, develop not only strength, but they

contribute to the improvement of technique. Strength also, to a significant extent, determines speed and enables one to lift maximum weights with greater speed, which ultimately contributes to the uninterrupted increase in results.

However one should bear in mind, that prolonged repetition of exercises with very large or small effort can lead to a monotonous fixation, relative to slow movements and movements with small tension, inhibiting the display of limit effort during the lifting of submaximum and maximum (95-100%) weights, under competition conditions. Ultimately, this can hamper the growth of results.

The number of repetitions per set has essential significance in training. How many repetitions per set should one do with different weights? Let's look at how the given factors (the weight of the barbell and the number of repetitions) affect the growth of strength and muscle mass, in order to fully disclose this important question. A strength increase is maximum with brief effort (1-3 repetitions per set), at a high intensity. This type of muscular work (1-3 RM*) almost does not provoke the working hypertrophy of the skeletal muscles, i.e., the growth of muscle mass. The strength increase is achieved through the perfectioning of the neuro-coordination connections.

Multiple repetitions cause functional hypertrophy, and the increase in muscle mass contributes to increased strength. Thus, 4-6 repetitions per set (4-6 RM) already increases muscle mass and the strength increase is only slightly less than the 1-3 high-intensity repetitions. 7-10 repetitions per set (7-10 RM) increase muscle mass even more, but the strength increase is less than the 4-6 RM. So, the amount of strength improvement decreases as the number of repetitions per set increases (from 1-10 RM); and, consequently along with the decrease in the amount of weight; however, the growth of muscle mass increases. Differ-

* RM (repetition maximum) -- is the amount of weight that can be lifted: only once -- (1 RM), 3 times (3 RM), 6 times (6 RM), etc. -- and not one more time.

ences in the ways of increasing muscle mass are due to the number of reptitions per set and the qualification of the athlete.

So, the training of beginners and low-class athletes should promote, first and foremost, an increase in muscle mass and a strengthening of the motor-support apparatus. This is associated with the fact that the weight-height data of beginners and low-class athletes does not correspond to the weight class they are in. For example, a 164 cm, 16-17 year old beginner can weigh approximately 60 kg. At this height he should become a middle-weight later-on, and weigh 75 kg. This is why beginners and low-class lifters should emphasize multiple repetitions with minimal, small and medium weights. One should emphasize 3-6 repetitions per set and up to 10 for individual muscle groups. One can avoid injury employing these weights with the multiple repetition method.

It is necessary to point out that beginners and low-class lifters do not utilize the maximum possible number repetition when doing multiple repetitions, but 2-3 times less. In other words, one lifts a weight which can be lifted 12 times, 4-6 times. Research indicates that this tension is quite sufficient for the uninterrupted rise in results for these athletes. If beginners or low-class athletes utilize the limit number of lifts per set (RM), they would become fatigued after several such sets and be unable to train further at a sufficient volume. Besides this, even a small number of sets with the maximum number of repetitions per set can cause injury and inhibit regular training. An example of the number of repetitions employed for various weights in the different exercises, utilized by beginners and low class athletes, is shown in table 1.

Naturally, lifters become accustomed to more significant muscular tension, with the rise in sport mastery. It is necessary to utilize significant muscular tension all the more, to subsequently achieve the maximum effect of a strength increase. Therefore, qualified athletes (Class I, CMS, MS) need to utilize the multiple repetition method along with the method of brief (1-3 repetitions) effort of maximum intensity. If the

lifter's bodyweight is near the limit of his weight class a large portion of his training is devoted to the second and less to the first method. If the lifter is light in his class, a large portion of training is devoted to the first method. The qualified lifter needs to use the maximum possible and close to it, number of repetitions per set.

Higher qualified athletes (MSIC) need to use the brief-effort (1-3 repetitions) method frequently. This is because a decrease in the usual training weight leads to a halt in strength improvement. Besides this, at this point in time, the athlete has already "found his weight class" and does not need a further increase in muscle mass. In order to maintain the achieved level of muscle mass, athletes in the 100, 110 and 110+ kg classes need to do multiple lifts (4 and up) frequently, at the maximum or near maximum number of repetitions per set. So, weightlifters at all stages of training, from novice to high class athletes, need to employ the optimal combination of different strength-development methods.

One should devote special attention to the quality of "explosive" single-effort work. This is a key quality for a weightlifter, since he has to lift a limit weight in competition one time. Sometimes, and unfortunately, one sees an athlete lift, for example 100 kg in the snatch 3-4 times in succession; and be unable to lift 105 kg once. The fact is that the athlete developed strength-endurance by using the multiple-repetition method in training, which did not develop the necessary ability for "explosive", single-effort work. This is why the "explosive", single-effort work should be educated daily, at all stages of a lifter's preparation. The single-maximum-tension method develops the ability to concentrate neuro-muscular effort and produces a larger effect in the development of absolute-strength, than the other methods. This method of training does not exhaust the amount of weight utilized and the number of repetitions per set. It includes many other components, which will be covered in the appropriate sections.

Training in the Weightlifting Exercises

The Snatch

Training the snatch consists not only of the classic snatch but other special-assistance exercises for the snatch -- the power snatch, the snatch without squatting-under, the snatch from the hang, and so forth. Snatching makes up 20 ± 5% of the general monthly volume of exercises. In the preparatory period the portion of the classic snatch comprises: 50% for low-class athletes; 45% for classified and CMS and 40% of all snatch exercises for the MS; the figures in the competition period are 50, 43 and 38% respectively. The remaining lifts are in the other snatch exercises.

The mean volume and intensity of the snatch and other snatch exercises is presented in table 2. In this table, as well as in the following tables, the intensity and the distribution of the training load (by zones of intensity) in the light weight classes are represented by the 60 kg weight class. 52 and 56 kg lifters can increase the number of lifts with high intensity (70% and more) slightly, and 67.5 kg lifters can curtail slightly, the number of these lifts; but they should not do less than the middle weight classes. The number of high intensity lifts in the middleheavyweight and first heavyweight classes is represented by the 100 kg class. The 90 kg lifters can increase this slightly, but the 110 kg lifters -- can reduce the number of these lifts; however, in the first case, it should be more than in the 82.5 kg class and in the second, less than in the 110+ class. The data given for the middle weight classes is representative of the 75 and 82.5 kg lifters.

The number of lifts in the snatch can be somewhat different, depending on the athlete. Thus, athletes who are good in the snatch include more special-assistance snatch exercises; likewise, one who needs to perfect snatch technique should do the same. However, one should bear in mind, that a significant decrease in snatch lifts and a significant increase in the other snatch exercises inhibits the improvement of snatch results. The quantity of snatch lifts and lifts in the other snatch exercises

Table 1.

Exercise	% of maximum in each Exercise					
	40—49,9	50—59,9	60—69,9	70—79,9	80—89,9	90—100
	# of Repetitions per Set					
Snatch, clean, Jerk		4—6	3—4	2—3	1—2	1
Power snatch			4—6	3—4	1—2	1
Power clean Push-Jerk		4—5	3—4	2—3	1—2	1
Front and Back squats		6—10	4—6	3—4	1—2	1
Bench press	6—10	5—8	4—6	3—4		

Table 2.

Mean-monthly Loading in the snatch and the other snatch exercises

Athlete Qualification	weight Class	Snatch		Other Snatch Exercises		all	Distribution by zones			
		# of Lifts	Mean wght. %	# of Lifts	Mean wght. %		Less менее 70%	70—79,9%	80—89,9%	90% и более and more
		Preparatory Period								
Class III—II p. (1250)[3]	Light[2]	125		125		250	149	51	37	13
	Middle						159	50	31	10
	Mid-heavy and heavy						169	49	25	7
I p., кмс CMS (1650)	Light		72		64		148	101	55	26
	Middle	150	71	180	61,5	330	167	96	46	21
	Mid-heavy and 1rst Heavy wt.		70		60,5		182	93	37	18
	2nd Heavy wt.		67,5		57		211	88	21	10
мс MS (I)[4] (1900)	Light		71,5		64		219	88	48	25
	Middle	152	70,5	228	61,5	380	240	80	40	20
	Mid-heavy and 1rst Heavy wt.		69,5		60,5		260	73	32	15
	2nd Heavy wt.		66,5		56		293	62	18	7
мс MS (2) (2100)	Light		72		65		206	116	66	32
	Middle	168	71	252	62,5	420	232	107	53	28
	Mid-heavy and 1rst heavy wt.		70		61,5		255	96	45	24
	2nd Heavy wt.		67,5		58		290	94	23	13
		Competition Period								
Class II—III p. (900)	Light	90		90		180	89	38	29	24
	Middle						99	37	24	20
	Mid-heavy and Heavy wt.						107	35	21	17
I p., кмс CMS (1200)	Light		73		67		89	80	52	31
	Middle	108	72	144	65,5	252	107	75	43	27
	Mid-heavy and 1rst Heavy wt.		71		64		122	70	37	23
	2nd Heavy wt.		69,5		61,5		146	71	23	12
мс MS (1500)	Light		72,5		66,5		139	86	56	34
	Middle	120	71,5	195	65	315	160	81	46	28
	Mid-heavy and 1rst heavy wt.		70,5		63,5		172	78	40	25
	2nd heavy wt		69		61		195	80	25	15

1- The intensity is expressed as a percentage of the limit snatch (made in training or competition). 2- light weight classes- 52,56,60 and 67.5k Middle- 75 & 82.5kg; Middle-heavy- 90, 100 and 110kg; 2nd-heavy- 110kg+. 3- General number of lifts for month, all exercises. 4- I-first, 2- seco preparatory period.

should be equivalent for all weight classes, for an athlete of a given qualification.

The intensity (the training weight) in the snatch exercises should not be the same for athletes in different weight classes. The heavier the weight class, the lighter the training weight (expressed as a percentage of the maximum snatch). Therefore, the heavier the athlete, the less lifts he does with 70-79.9%, 80-89.9% and 90% and above. However, this lesser training weight and fewer number of lifts with 70% and above yields the same effect for athletes in the heavy weight classes, with respect to improvement of results.

There is an insignificant correlation between the intensity of the load and results for beginners and low-class athletes; therefore, it is not necessary for them to increase the number of lifts with 70% and above (achievements rise under the influence of lighter weights). The number of lifts with 70% and above weights affects improvement in the snatch of qualified athletes: the more of these lifts, the greater the improvement (figure 19). It is with respect to this that it is natural for lifters to try and increase the quantity of these lifts; however, it should be within reasonable limits and individualized for each athlete. The main thing is that the athlete should recuperate after such loading.

The quantity of lifts in snatch exercises, indicated in figure 19, should be approximately 44% in the light weight classes, 45% in the middle classes, 46% in the middleheavyweight and 1st heavyweight classes and 48% in the 2nd heavyweight class -- all for MS; for Class I and CMS -- the figures are 43, 44, 45 and 48% respectively. The data on qualified athletes presented in tables 2-6 refer to athletes 21.5 years of age.

Younger athletes are able to cope with a higher intensity loading. Thus, the number of lifts with 70% and above in snatch exercises, indicated in table 2, can increase for each group of weight classes of younger athletes and decrease for older athletes. The number of such lifts increases by approximately 20 per month for 18 year olds; by 10 for 20 year olds; and decrease

by 10 and 20 lifts respectively for 23 and 25 year olds (figure 20). It is necessary that this peculiarity be taken into account when planning.

Even minimal weights are utilized in the snatch and other snatch exercises. For example, individual athletes begin training sessions in the preparatory period with 35% of maximum in the snatch and with 45% in the competition period; employing these weights for warmup. Snatch "stretches" are begun with 25% (of the limit snatch) in the preparatory period and with 30% in the competition period. Training in the stiff-leg snatch (no squat under) and the power snatch usually begins with 50% of the classic snatch.

The snatch is done basically in one snatch workout; the power snatch at almost each workout and the other snatch exercises in 1-2 workouts. The athlete needs to change the method of executing the snatch. Thus, it is necessary for a "squat" style lifter to periodically use the "split" style and vice versa.

The quantity of the lifts of varying weight in a workout depends on the number of lifts planned for the month and the amount of weight used in the workout. One can do 10-30 lifts in the snatch and in the other snatch exercises. If one includes submaximum and maximum weights in a workout, then the number of lifts decreases.

Lower classified athletes can do 5-6 lifts (in one workout) in the snatch with submaximum and maximum weights; in this instance 95% is not lifted more than 3 times. Limit lifts (100%) can be planned for 1-2 sets in a workout and only once every 7-10 days.

Qualified athletes in the middle weight classes lift submaximum and maximum weights approximately 10 times in one workout. Athletes in the light weight classes do more lifts with this much weight and the athletes in the heavy weight classes do less. 95-100% weights are basically lifted over 2-3 days; 90% weights -- over one day and when there is a small number of lifts even 2-3 days in a row. The following variants are possible if the snatch is planned to be the first exercise in training.

For Beginners:

$\frac{32.5\ (55)}{4}\ 1 \qquad \frac{40\ (65)}{4}\ 1 \qquad \frac{45\ (75)}{3}\ 5 \qquad (60)*;$

$\frac{30\ (50)}{3}\ 1 \qquad \frac{35\ (60)}{3}\ 1 \qquad \frac{42.5\ (70)}{4}\ 5 \qquad (60)$

For Low-Class Athletes:

$\frac{50\ (55)}{3}\ 2 \qquad \frac{57.5\ (65)}{4}\ 1 \qquad \frac{62.5\ (70)}{4}\ 5 \qquad (90);$

$\frac{40\ (50)}{4}\ 1 \qquad \frac{47.5\ (60)}{5}\ 1 \qquad \frac{55\ (70)}{4}\ 1 \qquad \frac{60\ (75)}{3}\ 2$

$\frac{65\ (80)}{2}\ 2 \qquad \frac{70\ (85)}{1}\ 2 \qquad (80).$

For Qualified Athletes (Class I, CMS, MS):

$\frac{72.5\ (60)}{2}\ 2 \qquad \frac{77.5\ (65)}{2}\ 1 \qquad \frac{85\ (70)}{2}\ 1 \qquad \frac{95\ (80)}{5}\ 2$

$\frac{100\ (85)}{4}\ 2 \qquad (120);$

$\frac{55\ (55)}{3}\ 2 \qquad \frac{70\ (70)}{2}\ 2 \qquad \frac{80\ (80)}{2}\ 2 \qquad \frac{85\ (85)}{1}\ 5 \qquad 100;$

$\frac{55\ (50)}{3}\ 1 \qquad \frac{72.5\ (60)}{3}\ 1 \qquad \frac{77.5\ (70)}{4,\ 5,\ 2,\ 4,\ 1,\ 5}\ 1 \qquad (110).$

* The first number in the numerator is the amount of weight; the second (in parenthesis) is the percentage of the maximum in this exercise; the number in the denominator represents the number of repetitions; the number to the right of the fraction is the number of sets; and the number to the far right of the fractions, in parenthesis represents the maximum result in this exercise.

In all of the aforementioned variants one should do 2-3 over-head squats in the first two sets (after snatching) -- either by squatting or lunging, depending on which method one uses for the snatch. Low-class athletes should periodically utilize the variants designated for qualified athletes, in addition to the ones designated for them. The power snatch is done frequently before the snatch. The athlete does not lift a minimal or small weight after doing the power snatch, but goes immediately to the fundamental training weights. However, he should do 2-3 overhead squats in the last two sets of power snatches. The training will look like this:

Power Snatch: $\frac{60\ (55)}{5}\ 2 \quad \frac{70\ (65)}{4}\ 2 \quad \frac{77.5\ (70)}{2}\ 1$.

Snatch: $\frac{82.5\ (75)}{3}\ 2 \quad \frac{87.5\ (80)}{2}\ 4$ (110).

When one is planning "working" (lifting submaximum and maximum) weights for athletes of all qualification, the training method should be the same. For example:

$\frac{55\ (55)}{4}\ 2 \quad \frac{65\ (65)}{2}\ 2 \quad \frac{75\ (75)}{2}\ 1 \quad \frac{80\ (80)}{1}\ 1 \quad \frac{90\ (90)}{1}\ 1$

$\frac{95\ (95)}{1}\ 1 \quad \frac{100\ (100)}{1}\ 1 \quad \frac{102.5\text{-}105\ (102.5\text{-}105)}{1}\ 1\text{-}2 \quad 100;$

$\frac{60\ (50)}{3}\ 2 \quad \frac{72.5\ (60)}{2}\ 2 \quad \frac{85\ (70)}{1}\ 2 \quad \frac{95\ (80)}{1}\ 2 \quad \frac{102.5\ (85)}{1}\ 1$

$\frac{110\ (92.5)}{1}\ 1 \quad \frac{117.5\ (97.5)}{1}\ 1 \quad \frac{120\ (100)}{1}\ 1\text{-}2 \quad (120).$

Snatch: $\frac{65\ (60)}{2}\ 2 \quad \frac{77.5\ (70)}{2}\ 1 \quad \frac{90\ (82.5)}{1}\ 1$

Snatch Pull $\frac{102.5\ (92.5)}{1}\ 2$, Snatch $\frac{102.5\ (92.5)}{1}\ 1$

$\frac{107.5\ (97.5)}{1}\ 1$ $\frac{110\ (100)}{1}\ 3$ (110).

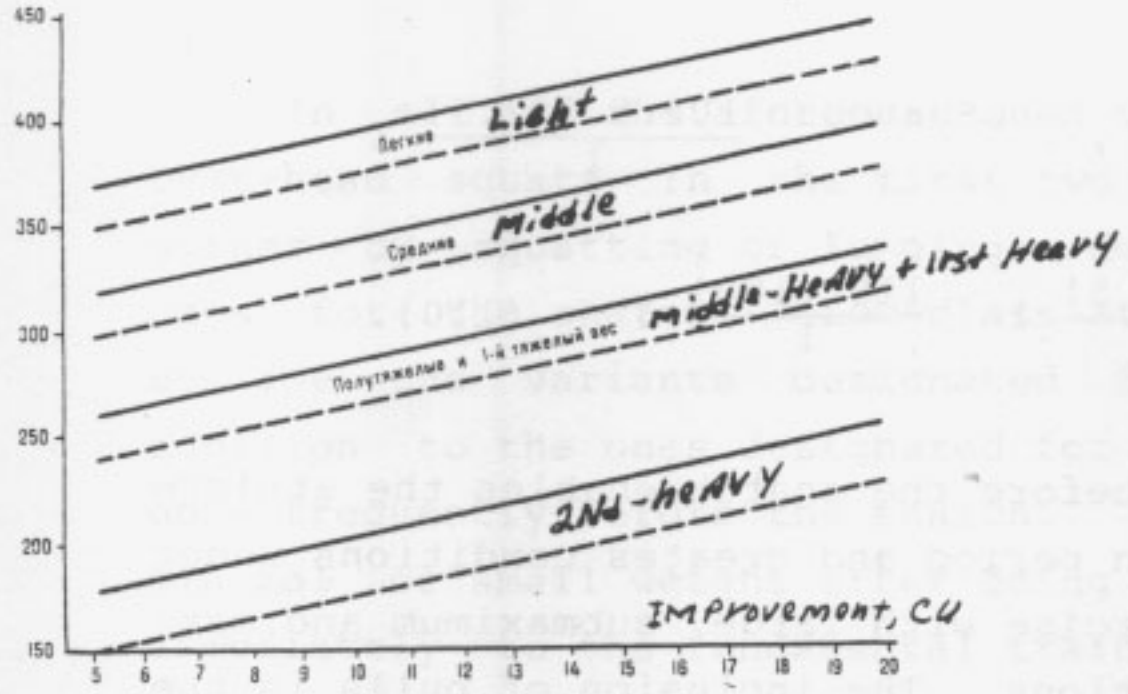
The execution of pulls before the snatch enables the athlete to shorten the accommodation period and creates conditions under which he can execute the exercise with large, submaximum and maximum weights for more repetitions. The inclusion of pulls in the warmup has other advantages: making it possible to control the exercise, that is to say, to trace the barbell's trajectory, the height of the lift (with the use of recording devices) and the forces generated.

When the snatch is done in the middle or end of workouts, after exercises of similar structure (cleans, clean or snatch pulls), one excludes minimal and small weights. The athlete proceeds to snatch with moderate weights. For example: Power Cleans.

Snatch $\frac{57.5\ (72.5)}{4}\ 4$ (80).

Lifts with submaximum and maximum weights in the snatch are seldom done in the middle of a workout, and are not planned at the end of workouts. Low-class athletes and qualified sportsmen can do the power snatch at the beginning, middle and at the end of training sessions.

Plan 10-20 lifts when the power snatch is done first and the snatch or the clean and jerk is done second. If one is to lift large, submaximum and maximum weights in the snatch or in the clean and jerk (after doing power snatches) then one should use small or moderate weights in the power snatch. If one has not planned to lift heavy weights in the snatch or the clean and jerk, then small, moderate, large and submaximum weights are lifted in the power snatch; and, the number of lifts can be increased to 25-30. The lifts planned can be done in 2 series



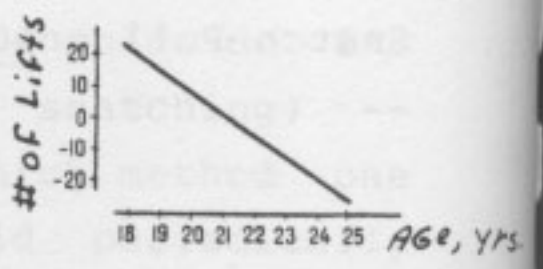


Figure 20. Changes in the number of lifts with 70%-and-more (in the snatch or the clean and jerk exercises) of qualified athletes; depending on age.

Figure 19. Dependence of improvement on the number of lifts with 70%-and-more in the snatch and the clean and jerk exercises (in the competition period). Designations: MS ——— ; CMS----

Table 3.

Mean-monthly volume and intensity in the classic and other cleans*

Qualification	Weight class	Classic Clean		Other Cleans		All Lifts	Distribution by Zones			
		# of Lifts	Avg. wt., %	# of Lifts	Avg. wt., %		less than 70%	70—79%	80—89%	90% and more
		Preparatory Period								
CLASS III—II p. (1250)	Light						120	48	36	8
	Middle	93		119		212	134	42	30	6
	Mid-heavy and Heavy						148	36	24	4
CMS I p., kmc (1650)	Light		71		65		108	91	37	11
	Middle	99	69	148	62,5	247	127	80	31	9
	Mid-heavy and 1st-Heavy wt.		68		60		143	72	25	7
MS мс (1) (1900)	2nd-Heavy wt.		65		58		169	59	16	3
	Light		71,5		65		148	58	29	12
	Middle	95	69	152	62,5	247	163	50	24	10
	Mid-heavy and 1st-heavy weight		68		60		178	43	19	7
MS мс (2) (2100)	2nd-heavy wt.		64		56		199	33	12	3
	Light		72		67,5		103	115	40	15
	Middle	105	69,5	168	64,5	273	133	94	34	12
	Mid-heavy and 1st-heavy wt.		68,5		63		159	77	28	9
	2nd-heavy wt.		64,5		61,5		199	51	19	4
		Competition Period								
Class III—II p. (900)	Light						76	41	23	13
	Middle	68		85		153	87	38	18	10
	Mid-Heavy and Heavy						96	35	15	7
CMS I p., kmc (1200)	Light		73		69,5		66	64	32	18
	Middle	72	70,5	108	66,5	180	84	57	25	14
	Mid-heavy and 1st-heavy wt.		69,5		65		95	54	21	10
MS мс (1500)	2nd-heavy wt.		66		63,5		125	32	17	6
	Light		72,5		69		78	64	33	20
	Middle	74	70	121	66	195	97	56	26	16
	Mid-Heavy and 1st-Heavy wt.		69		64,5		108	53	22	12
	2nd-Heavy wt.		65		63		128	42	18	7

* The intensity is expressed as a percentage of the limit C&J, achieved earlier in training or competition. The other designations are the same as in table 2.

-- at the beginning and end or in the middle and at the end of the workout. When doing this, the amount of weight used is larger in the middle (likewise at the beginning) of the workout, than at the end.

Beginners should only do power snatches at the beginning and in the middle of workouts, in the first 2-3 months. One plans the other special-assistance snatch exercises (snatch from the hang or from plinths, power snatch from the hang, straight leg snatch and so forth) in the same way.

The Clean and Jerk

Training on the clean and jerk consists of the classic clean and jerk and other special-assistance exercises -- the power clean, the push-jerk and the push-press, the jerk from-behind-the-head, etc. The volume of jerk exercises in the preparatory period should be: for low-class athletes -- an average of 28%; for Class I and CMS -- 27%; and for MS -- 26% of the general monthly volume; in the competition period the figures are 28, 28 and 27%, respectively. Of these lifts, cleans comprise an average of 17% for low-class athletes, 15% for Class I and CMS and 13% for MS. The remaining portion of the load are jerks. The classic clean comprises: 44% of all the clean lifts of low-class athletes; 40% of Class I and CMS and 38% of MS. Of all of the jerks in the preparatory period, the classic jerk comprises: 68% for low-class athletes, 58% for Class I and CMS and 46% for MS; the corresponding figures in the competition period are 68, 54 and 43%, respectively. The mean data of the volume and intensity in the aforementioned exercises for athletes of different qualification and weight class is presented in tables 3 and 4.

The push-jerk helps the classic jerk of qualified athletes, therefore it is necessary to achieve specific results in this exercise. On the average the push-jerk results for Class I athletes are: 89.7% in the light weight classes, 90% in the middle, 90.3% in the middle heavyweight, 90.5% in the first heavyweight and 90.8% of the maximum jerk in the 2nd heavyweight class. The push-jerk results of CMS are approximately 2%; MS --

3% and MSIC -- 7% higher than Class I lifters. However, one needs to bear in mind that the correlation between the push-jerk and the jerk is a weak one; consequently, the jerk is the fundamental exercise for qualified lifters.

The number of classic and other cleans for athletes of a specific qualification should be equivalent for all the weight classes. However, in the preparatory period (in each weight class) the younger athletes do slightly more other cleans, and the older -- less.

Technique analysis of the weightlifting exercises revealed that athletes in the light weight class have particular difficulty in the "thrust" portion of the jerk. This difficulty begins to appear by the time the athletes become Class I and CMS. It is with respect to this that the quantity of classic jerks in each weight class are different. There are more classic jerks, the lighter the weight class. This data, presented in table 4, is for each weight class group. The quantity of other jerks are identical for all the weight classes. So, the heavier the weight class, the fewer the general number of jerks. But one should note that the athletes in the heavier weight classes compensate for the fewer jerks by doing pressing exercises; this will be discussed in more detail later.

The number of jerks in each weight class, during the competition period, depends on the sportsman's age: the younger athlete can do more lifts and the older -- less. Beginners need to do an identidal quantity of cleans and jerks; therefore, the quantity of these lifts will be identical for them.

When determining the number of lifts in a certain jerk exercise one needs to take into account the individual athlete, the positive and negative aspects of his technical and physical preparedness. The intensity of the load (the training weight) in the jerk exercises is higher, the lighter the athlete. Athletes in the lighter weight classes do more lifts with 70-79%, 80-89%, and 90%-and-above weights. As in the snatch, the athletes in the heavier weight classes obtain an identical effect (with respect to the improvement of results) in jerk exercises with less weight

and fewer lifts with 70-and-above. As in the snatch, the number of lifts in the jerk exercises with 70%-and-above affects the improvement in the clean and jerk for qualified athletes (see figure 19). This is why it is necessary to try and increase the number of lifts with these weights in training.

The number of lifts in the jerk exercises, out of the general quantity, depicted in figure 19, should be: approximately 56% for MS in the light weight classes, 55% in the middle, 54% in the middleheavyweight and first heavyweight classes and 52% of the lifts in the 2nd heavyweight class; for Class I and CMS the corresponding figures are 57, 56, 55 and 52% respectively. The young athlete is able to cope with a large intensity of loading in the jerk exercises, therefore, as indicated in tables 3 and 4, the number of lifts with 70% and above can be increased for them and decreased for the older athletes (see figure 20). 35% of the limit clean and jerk is the minimum weight used in the jerk exercises. In the preparation period, athletes in the heavy weight classes use 25-30% weights in the clean and jerk.

The clean and jerk is a very difficult exercise, therefore even a small quantity of lifts with a moderate (a heavier) weight is fatiguing. It is with respect to this that in recent years training on the clean and jerk is divided -- athletes train the clean separate from the jerk. This division of work, ultimately enables one to execute a larger volume of work. Naturally, this does not exclude the necessity of doing the clean and jerk, as a whole, in training.

Doing the complete clean and jerk is especially important for beginners and low-class athletes; therefore, they should do the complete exercise frequently. Qualified athletes can get by with doing the clean and jerk infrequently and frequently do it in parts. All athletes should periodically change the method of squatting under the bar when doing cleans.

The complete, classic clean and jerk can be included every 7-10 days, but frequently it is done at almost every workout by doing it in parts (cleans or jerks). The clean and jerk is either the first or second exercise in a workout (for example,

Mean-monthly volume and intensity in the classic and other cleans*

Table 4.

QUALIFICATION	weight class	CLASSIC CLEAN		OTHER CLEANS		ALL LIFTS	DISTRIBUTION BY ZONES			
		# OF LIFTS	AVG. WT. %	# OF LIFTS	AVG. WT. %		LESS Менее 70%	70—79%	80—89%	90% и более AND MORE
CLASS		PREPARATORY PERIOD								
III—II p. (1250)	Light Middle Mid-Heavy and Heavy	94		44		138	78 87 96	32 28 24	23 19 15	5 4 3
I p., кмс (1650) CMS	Light Middle Mid-HEAVY and 1st-Heavy wt. 2ND-HEAVY wt.	126 116 107 93	71 69,5 68 66	82	63,5 61,5 60 57	208 198 189 175	88 99 101 123	82 67 62 37	26 22 18 11	12 10 8 4
мс (1) (1900) MS	Light Middle Mid-heavy and 1st-heavy wt. 2ND-Heavy wt	124 114 105 91	70,5 69 67 65	133	62,5 60,5 59 55	257 247 238 224	160 164 169 174	55 48 41 32	30 25 20 13	12 10 8 5
мс (2) (2100) MS	Light Middle Mid-HEAVY and 1st-Heavy wt. 2ND-Heavy wt.	145 131 118 98	71 69,5 69 67,5	147	63,5 61,5 60 56	292 278 265 245	153 163 172 184	89 74 60 41	34 28 23 15	16 13 10 5
CLASS		COMPETITION PERIOD								
III—II p. (900)	Light Middle Mid-HEAVY and Heavy	68		31		99	44 53 61	25 23 20	17 13 11	13 10 7
I p., кмс (1200) CMS	Light Middle Mid-Heavy and 1st-Heavy wt. 2ND-Heavy wt.	99 84 73 54	72 70,5 70 69	72	65 63 61,5 59	171 156 145 126	68 69 70 60	55 50 45 40	30 23 20 14	18 14 10 6
мс (1500) MS	Light Middle Mid-HEAVY and 1st-Heavy wt. 2ND-Heavy wt.	104 90 82 70	71,5 70 69,5 68,5	120	64,5 62.5 61 58	224 210 202 190	118 121 123 127	56 50 46 41	31 24 21 15	19 15 12 7

The intensity (the mean weight) is expressed as a percentage of the limit clean and jerk; made either in training or in competition.

after the snatch, the power snatch or jerk "stretches"). The sequence of execution, of the separate parts of the clean and jerk or the other special-assistance jerk exercises can be quite different. One can do several jerk exercises right away, in one workout: for example, the clean and jerk and the power clean; the clean, the jerk and the power clean; jerk "stretches", then the clean and push-jerk, etc.

The number of lifts in the jerk exercises for one workout depends on the general number planned for the month, as well as the amount of weight, and can be approximately 10-30. When submaximum and maximum weights are included the quantity of lifts in the jerk exercises usually decreases.

The push-press is done separately and also after the press, with the same weight with which one concluded the press or somewhat heavier; then the weight is increased. The fewer lifts that one does in the press the more push-presses one can do, and vice versa. Usually, no more than 5-10 lifts are done in the push-press after the press at -- 50-80% of the limit clean and jerk.

Low-class athletes do no more than 5 lifts with 90% in the clean and jerk and no more than 3 with 95%, in one workout. Lifts with 100% can be planned once every 10-14 days. The number of submaximum and maximum lifts in one workout is approximately 10 for qualified athletes in the middle weight classes -- when this load is in one of the jerk exercises. Athletes in the lighter classes execute more lifts with submaximum weights, and athletes in the heavier class do fewer.

One can repeat lifts of 95-100% in one jerk exercise, basically after 2-3 days, but 90% lifts can be repeated the next day. If one employs a different jerk exercise in each subsequent workout, then 90% weights can be lifted 2-3 days in a row.

The following training methods can be done if the workout begins with the clean and jerk:

For Beginners:

$\frac{45\ (50)}{3/3}\ 2 \quad \frac{55\ (60)}{3/3}\ 1 \quad \frac{62.5\ (70)}{3/2}\ 3 \quad \frac{62.5\ (70)}{2/3}\ 2 \quad (90).$

For Low-Class Athletes:

$\frac{60\ (50)}{4/2}\ 1 \quad \frac{72.5\ (60)}{4/2}\ 1 \quad \frac{85\ (70)}{3/1}\ 2 \quad \frac{90\ (75)}{1/3}\ 2 \quad \frac{95\ (80)}{2/1}\ 1$

$\frac{95\ (80)}{1/2}\ 1 \quad (120).$

For Qualified Athletes:

$\frac{70\ (50)}{4/2}\ 1 \quad \frac{85\ (60)}{4/2}\ 1 \quad \frac{105\ (75)}{3/1}\ 2 \quad \frac{112.5\ (80)}{1/3}\ 2 \quad \frac{120\ (85)}{1/2}\ 1$

(140).

* 4/2 -- signifies four cleans and two jerks.

In the clean and jerk the number of repetitions per set is somewhat fewer than in the snatch. This is because the clean and jerk takes longer to execute and more weight is lifted. The method of training the clean (from the floor, from the hang, from plinths) is the same as shown. However, when the jerk is excluded (cleans only, Ed.) the number of repetitions per set can be increased slightly. For example:

$\frac{50\ (50)}{3}\ 1 \quad \frac{60\ (60)}{3}\ 1 \quad \frac{70\ (70)}{4}\ 2 \quad \frac{75\ (75)}{4}\ 2 \quad (100)$

Training in the jerk can appear as follows --
For Beginners and Low-Class Athletes:

$\frac{60\ (60)}{4}\ 2 \quad \frac{70\ (70)}{3}\ 4 \quad (100)$

For Qualified Athletes:

$\frac{97.5\ (65)}{3}\ 2 \quad \frac{112.5\ (75)}{2}\ 1 \quad \frac{120\ (80)}{2}\ 1 \quad \frac{127.5\ (85)}{2}\ 3 \quad (150);$

$\frac{105\ (65)}{2}\ 1 \quad \frac{120\ (75)}{2}\ 1 \quad \frac{135\ (85)}{1}\ 2 \quad \frac{145\ (90)}{1}\ 1$

$\frac{152.5\ (95)}{1}\ 1 \quad \frac{160\ (100)}{1}\ 2 \quad (160).$

The barbell is usually taken from stands when one is training the jerk. If the athlete executes the jerk poorly, with errors, then the weight is increased by no more than 5% from set to set. The number of repetitions per set increases with minimum and small weights; and decreases with moderate and large weights. For example:

$\frac{60\ (50)}{4}\ 2$ $\frac{65\ (55)}{4}\ 2$ $\frac{72.5\ (60)}{4}\ 4$ $\frac{77.5\ (65)}{3}\ 3$

$\frac{85\ (70)}{3}\ 1$ $\frac{90\ (75)}{2}\ 1$ $\frac{95\ (80)}{1}\ 2$ (120)

When submaximum or maximum weights are employed, the training method for low-class athletes and qualified athletes will appear as such:

$\frac{70\ (50)}{3/1}\ 2$ $\frac{90\ (65)}{2/2}\ 2$ $\frac{105\ (75)}{2/1}\ 2$ $\frac{120\ (85)}{1/1}\ 1$ $\frac{125\ (90)}{1/1}\ 2$

$\frac{132.5\ (95)}{1/1}\ 2$ (140);

$\frac{85\ (52.5)}{2/1}\ 2$ $\frac{105\ (65)}{1/2}\ 2$ $\frac{115\ (72.5)}{2/1}\ 2$ $\frac{130\ (80)}{1/2}\ 1$ $\frac{145\ (90)}{1/1}\ 1$

$\frac{152.5\ (95)}{1/1}\ 1$ $\frac{160\ (100)}{1/1}\ 1$ $\frac{165\text{-}167.5\ (102.5\text{-}105)}{1/1}\ 2$ (160)

In order to best prepare the organism for the forthcoming work, one often plans several lifts (6-15) of the power snatch or the power clean before the clean and jerk or the clean. In this instance, the clean and jerk or the clean should begin with a weight that exceeds the weight of the preceeding exercise by 5-15 kg. However, the athlete should prepare the legs ahead of time. To do this the athlete should execute squats in the same manner in which the barbell will be lifted, in the last two sets of the power snatch or the power clean. When one does jerk exercises in the middle or at the end of a workout after exercises of similar

structure, the athlete begins lifting moderate and even heavy weights. For example, after doing the push-jerk, the jerk can be executed in the following manner: push-jerk (from stands)

$\frac{120}{2}$ 1 , jerk from stands $\frac{130\ (80)}{2}$ 2 $\frac{140\ (87.5)}{1}$ 4 (160)

The jerk exercises are done basically for strength when they are done in the middle of a workout; when they are done at the end of a workout, they are for strength and endurance. For this purpose, as an example, the power clean can be done in the following manner:

in the middle of a workout -- $\frac{90\ (75)}{4}$ 1 $\frac{95\ (80)}{3}$ 1

$\frac{102.5\ (85)}{2}$ 3 (120);

at the end of a workout -- $\frac{77.5\ (65)}{6}$ 3-4 (120)

In the latter variant, the athlete lifts the weight while standing on plinths, in order to further complicate the exercise. Jerk exercises executed periodically at the end of workouts (4-6 sets) can be recommended for working on special-endurance. For this, one should use no more than 85% of maximum. For example:

$\frac{112.5\ (75)}{4}$ 1 $\frac{120\ (80)}{3}$ 1 $\frac{127.5\ (85)}{2}$ 2 (150);

$\frac{105\ (75)}{4,\ 2,\ 6,\ 1,\ 5}$ (140).

Combination exercises contribute to the development of strength-endurance. For example, the athlete begins by doing a front squat then a push-jerk or jerk; or cleans the barbell, then does a front squat and finally a push-jerk or jerk, and so forth. For example:

Front squat + push jerk $\frac{140\ (70)}{2+2}$ 1 $\frac{160\ (80)}{2+2}$ 3 $\frac{150\ (75)}{2+2}$ 2

(200);

squat clean + front squat + jerk: $\frac{90\ (45)}{1+2+1}$ 1 $\frac{120\ (60)}{1+2+1}$ 1

$\frac{140\ (70)}{1+2+1}$ 2 $\frac{150\ (75)}{1+2+1}$ 2 (200)

The push-press can be done so: $\frac{60\ (50)}{3}$ 1 $\frac{70\ (60)}{3}$ 1

$\frac{85\ (70)}{3}$ 2 $\frac{90\ (75)}{2}$ 2 (120);

or: $\frac{80\ (55)}{4}$ 2 $\frac{90\ (60)}{3}$ 1 $\frac{105\ (70)}{2}$ 1 $\frac{115\ (77.5)}{1}$ 1 (150);

or: $\frac{120\ (65)}{5}$ 3 (185); or $\frac{150\ (75)}{2}$ 3 (200)

It has already been mentioned that the heaviest weights are lifted in the clean and jerk; therefore, the lumbar vertebrae are subjected to a large loading. It is necessary to hang from stall-bars or a hirozontal bar as a prophylactic after each set with submaximum and maximum weights (in the jerk or the push-jerk) -- beginning passively and then swinging, lifting the legs and pelvis as high as possible. One should not inhale-exhale rapidly and deeply (before lifting submaximum and maximum weights) in order to avoid loss of consciousness (A. N. Vorobeyev, Tyazhelaya Atletika, Uchebnik, 1981, p. 213).

The Snatch and the Clean Pull

It is appropriate to include the snatch and the clean pull in training when an athlete has achieved the status of Class I. Exercises such as the power snatch and the power clean will develop strength sufficiently for low-class athletes, therefore, it is not necessary to include pulls in their workouts. The snatch and the clean pull are utilized for perfectioning the technique of the pull (of the snatch and the clean) and the development of speed-strength. The volume of snatch pulls should be approximately 7% and clean pulls 5% of the general month's

volume in the preparatory period for Class I and CMS; in the competition period the corresponding figures are 5 and 6%. In the preparatory period, the volume of snatch pulls for the MS should be approximately 8.5% and 10% in clean pulls; whereas the figures for the competition period are 5 and 12% respectively.

The minimum weight used in the snatch and the clean pull is approximately 60% and the maximum is 120% of the limit snatch and the clean and jerk. The amount of weight affects the perfectioning of technique and the development of strength differently. To illustrate this let's look at the use of 100% and more weights in the snatch and the clean pull. So, when one is doing multiple lifts per set with same weight (for example, 100% in the snatch or the clean pull) the height of the second lift is usually 0.5 - 1 cm lower, and the third is 1.5 - 2.5 cm lower. There is even a greater difference in height between the first and third lifts with 110%; it reaches 5 cm for some athletes. The height of the lift is 3-4 cm with 110% and 5-7 cm lower with 120% weights, than with 100%.

In competition the athlete is fresh and lifts the barbell once; in training the pulls are usually done in the middle or at the end of workouts when the athlete is fatigued. Naturally, he is unable to lift the weight as high in training as he can in competition. Consequently, lifts with 100% and more in training either for one repetition or multiple repetitions are different, with respect to the barbell's movement parameters, than the same amount of weight lifted once in competition. The barbell is raised to a lesser height in pulls, and consequently, with a different rhythm and less speed. So, the lifter who lifts very large weights in pulls not only does not perfect the pull for the snatch and the clean, but the systematic use of such loads in large quantity, forms and strengthens an incorrect habit. This habit then appears at a competition during the lifting of 95 and 100% weights. Obviously, it is best to utilize 90-95% weights in pulls to perfect the snatch and the clean and jerk.

There is a weak correlation between the training weight of snatch pulls and achievements in the snatch, and in the biathlon

total. This correlation is greater -- with the results of the clean pull, the more lifts with 100%-weights-and-more, the greater the improvements in the clean and jerk results and the biathlon total. Consequently, it is necessary to utilize 100% and more weights in clean pulls for strength development. Snatch pulls with 100% and more can only be utilized effectively for strength development in the first stage of sport training; subsequently its effect diminishes significantly. This is why even Class I athletes should utilize the clean pull more in the competition period.

In principle, it would be appropriate to exclude the snatch pull from training altogether, and in its place increase, for example, the number of lifts in the power snatch with moderate and heavy weights. There are many examples in practice where individual athletes, in general, did not employ the snatch and even the clean pull in their training; and despite this, became world record holders.

The training weights in the snatch and the clean pull should not be the same for Class I athletes and CMS in different weight classes. The heavier the weight class the lighter the training weight in pulls and the fewer lifts with 100% weights and more (table 5).

The average training weight in the snatch pull and the number of lifts with 100% and more are the same in all weight classes for MS. However, the mean weight and the number of lifts with 100% and more are fewer, the heavier the weight class. The number of lifts with 100% and more in the clean pull should be reduced slightly for athletes of age 23 and older.

The remaining lifts are distributed so that approximately 50% of the lifts in clean pulls are with 90-99%, 80-89% -- 17%; and the rest with less than 80%. Approximately 45% of the lifts in snatch pulls are with 90-99%; the remaining are with less weight. The number of repetitions per set in the preparatory period (in both snatch and clean pulls) is: chiefly 2-6 with 80-89% and 90-99%; and 2-5 with 100-109%. The number of repetitions per set (in snatch and clean pulls) during the competition period, with

80-89%, 90-99% and 100-109% should be chiefly 2-4. Athletes in the light weight classes frequently do 2-3 repetitions and heavyweights -- 4-6 repetitions per set. Athletes in the middle weight classes utilize 2-3 as well as 4-6 repetitions per set. If the amount of weight employed is greater or less than indicated, the number of repetitions per set usually decreases to 1-3. During the competition period it is necessary to execute pulls with 100%-and-more for one repetition per set, as often as possible.

Pulls are done in almost every workout; consequently, it is customary to do snatch pulls in one workout and clean pulls in the next. Both types of pulls can be planned for one workout. They are usually done in the middle or at the end of workouts. When doing 2-4 repetitions per set in a workout, one usually does 15-30 pulls; with 5-6 repetitions per set, 35-50 pulls.

The most diverse variants of training pulls are possible. For example: $\frac{95\%}{3}$ 8; or: $\frac{95\%}{4}$ 7; or: $\frac{95\%}{5}$ 6; or: $\frac{85\%}{6}$ 5; $\frac{85\%}{5}$ 5 $\frac{90\%}{3}$ 4; or $\frac{75\%}{3}$ 1 $\frac{85\%}{6}$ 1 $\frac{95\%}{5}$ 1 $\frac{105\%}{3}$ 2 $\frac{115\%}{2}$ 3.

It is necessary to periodically do snatch and clean pulls from a lower (the athlete stands on a 15 cm high platform) or higher barbell position (the barbell is placed on plinths of 15 cm or more); to alter the width of the hand spacing, and to execute them slowly.

Squats

Weightlifters do front and back squats (by squatting or lunging) in training, overhead squats (by squatting or lunging) and other types of squats. Results in the snatch and the clean and jerk depend upon results in the squat; therefore, weightlifters give this special-assistance exercise the most emphasis. Results in the squat vary by weight class (A. T. Ivanov, 1976). However, they differ among athletes of different qualification and the mean squat results are as follows for all ten weight classes: Class III -- 125.5% of the maximum clean and jerk;

II -- 126%; I -- 127%; CMS -- 127.7%; MS -- 128.7% and MSIC -- 133%. Squat results are even higher for world record holders.

Back squat results, by weight class, are as follows: MSIC 52.56 and 60 kg -- 137±7%, 67.5 kg -- 135.5±6.5%, 75 and 82.5 kg -- 128.7±6%, 90, 100, 110 kg -- 130.3±6% and over 110 Kg -- 135.5 ±5.5%; for the MS the corresponding figures are: 130.2±7%, 129.7±6.5%, 126.8±6%, 127.5±6% and 129.7±5.5%; CMS: 129±7%, 128.5±6.5%, 126.3±6%, 127±6%, and 128.5±5.5%; Class I -- 127.3±7%, 127.1±6.5%, 125.8±6%, 126.2±6% and 127.1±5.5%; Low-class athletes -- 126.2±7%, 126.1±6.5%, 125.1±6%, 125.4±6% and 126.1±5.5%.

The volume of squats (front and back) in both the preparatory and the competition periods is an average of 27% for low class athletes, 23% for Class I and CMS, and 20% of the general volume for the MS. Low-class athletes, in both the preparatory and competition periods, do approximately 15% of the month's volume in other types of squats; Class I and CMS: approximately 6% in the preparatory period and 4% in the competition period. The volume of the other types of squats for the MS is significantly different with respect to weight class; not all athletes include these exercises in their training. However, the heavier the weight class, the more the other types of squats are done. Thus, in the preparatory period, athletes in the light weight classes do an average of 30 lifts, the middle -- 90, middleheavyweights -- 140 and the heavyweights -- 260 lifts. Athletes in the light weight classes do practically no other types of squats in the competition period; the middle weight class and the middleheavyweights do approximately 30-50 and the heavyweights -- 80-140.

The mean data of the volume and intensity in both front and back squats, for athletes of different qualification and weight class, is presented in table 6. The intensity of the loading (the average weight) in squats is different, according to the athlete's weight class: the heavier the weight class, the lighter the training weight.

Mean-monthly volume and intensity in snatch and clean pulls.*

Table 5.

Qualification	Weight Class	Snatch Pull			Clean Pull		
		# of Lifts	Avg. Wt., %	With 100% and more	# of Lifts	Avg. Wt., %	With 100% and more
		Preparatory Period					
I p., КМС CMS (1650)	Light		94	34		94,5	24
	Middle	116	92,5	30	82	92,5	20
	Mid-heavy and 1rst-heavy wt.		91	26		90	16
	2nd-heavy wt.	93	89	22		87	9
MS МС (1) (1900)	Light					93,5	28
	Middle	161	94	40	190	92	23
	Mid-heavy and 1rst-heavy wt.					90	18
	2nd-heavy wt.	104				86	10
MS МС (2) (2100)	Light					95	49
	Middle	178	95,5	60	210	93	42
	Mid-heavy and 1rst-heavy wt.					91	37
	2nd-heavy wt.	115				87	31
		Competition Period					
I p., КМС CMS (1200)	Light			36		95	26
	Middle	60	95	32	72	93	22
	Mid-heavy and 1rst-heavy wt.			28		91	18
	2nd-heavy wt.	58		23		88	13
МС MS (1500)	Light					97	36
	Middle	75	96	35	180	95	32
	Mid-heavy and 1rst-heavy wt.					93	28
	2nd-heavy wt.	64				89	23

*The intensity is expressed as the limit snatch and the limit clean and jerk.

Mean-monthly volume and intensity in front and back squats*

Table 6.

Qualification	Weight Class	Preparatory Period			Competition Period		
		# of squats	Avg. Wt., %	With 100% and more	# of squats	Avg. Wt., %	With 100% and more
III—II p. Class	Light			45			40
	Middle	337		36	243		36
	Mid-heavy and heavy			28			33
I p. КМС CMS	Light		92,5	87		95	79
	Middle	380	90	71	276	92,5	72
	Mid-heavy and 1rst-heavy wt.		88,5	56		91	66
	2nd-heavy wt.		83,5	37		86	56
МС MS (1)	Light		86,5	69			
	Middle	380	84	57			
	Mid-heavy and 1rst-heavy wt.		82,5	45			
	2nd-heavy wt.		78	28			
МС MS (2)	Light		88	97		90,5	84
	Middle	420	85,5	76	300	88	70
	Mid-heavy and 1rst-heavy wt.		84	58		86,5	63
	2nd-heavy wt.		79,5	37		82	41

* The intensity is expressed as a percentage of the limit clean and jerk.

The number of squats with 100%-and-more is given in table 6. The remaining lifts are distributed in the following way: approximately 25% with 90-99% weights, 20% with 80-89%, 20% with 70-79%; the remaining squats are done with no less than 70%. Older athletes who are usually at a later training stage, already, are sufficiently strong in the legs; therefore, they can employ a somewhat lighter training weight and fewer squats with 100%-and-more, than indicated in table 6. Young athletes can do slightly more squats with 100%-and-more.

Since results in the snatch (and especially the clean and jerk) depend on the quantity of squats executed with 100%-and-more during the competition period, one needs to try and increase this number by reducing the number of squats with minimal and small weights. The amount of weight used in both the back and the front squat is approximately 45-125%; in other squats -- 35-55% of the maximum clean and jerk. Heavyweights (in such exercises as lunges, squatting alternately on the right and left leg with the legs spread apart) use weights that are 15-25% of the limit clean and jerk. The fundamental training weight in squats should be 75-105% of the limit clean and jerk.

Squats not only contribute to the development of strength and speed, but also to the perfectioning of technique. When an athlete cleans a limit weight, jerks it or snatches it, he squats under the barbell (or does a preliminary half-squat for the jerk) and rises with a certain speed inherent to the given exercise; at a certain rhythm. Naturally, one strives to execute squats within the same (or close) parameters, that are inherent to lifting a limit weight in the classic exercises. For example, one needs to squat with a weight that is close to the limit snatch and the clean and jerk relatively smoothly, and recover from the squat position quickly; perdically it is necessary to raise up on the toes (after straightening the torso) when rising from the squat position; it is also necessary to do lunges; and in some instances, the feet should be placed in the same position as they are found in the squat position of the snatch and the clean and jerk, etc. All of this is conditioned by the fundamental

training weight in squats, which should be close to the maximum snatch and the clean and jerk, and comprise, as already indicated, 75-105% of the limit clean and jerk.

The weight in squats increases significantly, relative to the athlete's bodyweight; and with the rise in the athlete's qualification. Thus, Class III athletes lift only about twice their bodyweight, whereas the high-class-lifter lifts almost four times his bodyweight. It is with respect to this that low-class athletes frequently do limit squats, Class I and CMS seldom, and MS very seldom. The fact is that squats with such heavy weights can cause injury. Besides this, it is not necessary to squat with limit weights -- it is sufficient to train with weights close to the limit clean and jerk and not with the limit weight in squats. Beginners should not employ maximum weights in squats.

During both the preparatory and competition periods the number of repetitions per set in both the front and the back squat is: 2-6 with 45-85%, 1-6 with 95-105%, 1-5 with 115% and 1-2 with 125% of the limit clean and jerk. Lightweights frequently do 1-3 repetitions per set and lifters in the middle weight classes do 1-4 repetitions. 6-10 repetitions per set are employed primarily in the other types of squats. Usually, more repetitions per set are done during the preparatory period and fewer in the competition period.

Squats are included in almost every workout. About 60 squats can be done in one workout, but it is appropriate to do about 20-30 squats in one workout. Squats can be divided into two series when a large number of squats are done in one workout.

Training in the back or the front squat can be done as follows:

$$\frac{60\%}{3}\ 1 \quad \frac{85\%}{3}\ 1 \quad \frac{95\%}{3}\ 1 \quad \frac{102.5\%}{3}\ 1 \quad \frac{110\%}{3}\ 5$$

$$\frac{90\%}{6}\ 1 \quad \frac{105\%}{5}\ 1 \quad \frac{115\%}{4}\ 1 \quad \frac{120\%}{1}\ 3$$

$$\frac{90\%}{5} \quad \frac{100\%}{5}\ 5\ ; \quad \frac{80\%}{6}\ 6\ ; \quad \frac{100\%}{3,6,5,6,4,6}\ .$$

Pressing Exercises

Pressing exercises are special-assistance exercises for strengthening the arms and the shoulder girdle -- the muscles which take part in the jerk and the fixation of the barbell in the snatch. During the triathlon period, when the press was one of the competition exercises, the barbell velocity in the jerk was, for the top lifters in the world, 0.2-0.25 M/S greater than at the present time. Therefore, it is expeditious to utilize pressing exercises for a more successful jerk.

From the large number of pressing exercises, the most frequently included are: standing press (from the chest and from behind the neck) normal, narrow and wide hand spacing; bench press (horizontal and incline) with various hand spacings; seated press (from the chest or behind the neck). Presses comprise 10% of the general volume of the monthly load of low-class athletes (in both the preparatory and the competition periods); a large portion of them (about 70%) should be in the press-behind-the-neck, with a snatch hand spacing; the remaining should be in the bench press with a clean hand spacing.

The amount of presses in the monthly volume of qualified athletes can be quite different. There is considerable diversity in the utilization of pressing exercises in the training arsenal: one athlete does standing, seated and bench presses; another utilizes only a part of these exercises; a third does no presses.

The nature of the pressing exercises and their quantity depend on individual peculiarities, as well as the physical and technical preparedness of the lifter. When the bench press is included in training, lifters of differing qualification and weight class do 50-150 and more lifts. The amount of weight utilized in the bench press is 35-75% of the limit clean and jerk, and is on the average: 49% in the preparatory period and 51% in the competition period.

It has already been stated that athletes in the heavy weight classes do fewer jerks, therefore (in order to have sufficient strength for the "thrust") they compensate by doing more pressing exercises. The mean number of lifts in the standing and seated

press, executed by athletes in different weight classes, during the preparatory and competition periods, are presented in figure 21 (for the month). The amount of weight employed in the seated and the standing press is 25-65% of the limit clean and jerk; is an average of 37% during the preparatory period and 40% during the competition period. The amount of weight in the standing and the seated press employed by athletes in all of the weight classes is approximately equivalent, during the preparatory period; it is higher, the heavier the weight class, in the competition period.

Results in pressing exercises do not have a direct affect on the results in the snatch and the clean and jerk (they have an indirect influence); therefore, it is not necessary to achieve maximum results in the standing press or the bench press. Besides this, one can injure the lower back, lifting a heavy weight in the standing press; because it subjects this area to a large loading (the press is done with some backwards leaning). The number of repetitions per set in the press depends on the amount of weight and is primarily 3-6 lifts. Heavyweights increase the number of repetitions per set to 8.

Approximately 6-30 lifts are done in pressing exercises in one workout. The number of lifts basically depends on the objectives and contents of the workout. For example, if one does jerks or push-jerks, then pressing exercises are excluded from the workout or planned in a small quantity (6-18) lifts. When the aforementioned exercises are lacking in the training sessions or done in small quantities, the amount of pressing is increased.

It is undesirable to lift a heavy weight in pressing exercises when submaximum or maximum weights in the clean and jerk are planned for the next workout. Pressing exercises should be done in the middle or at the end of workouts; when it is necessary to change the working muscle groups. Here are some training variants in the pressing exercises (the amount of weight is a % of the limit clean and jerk):

Standing Press: $\frac{40\%}{6}$ 6; or: $\frac{45\%}{5}$ 5; or: $\frac{50\%}{4}$ 4; or: $\frac{40\%}{6}$ 2 $\frac{45\%}{4}$ 3.

Seated Press: $\frac{35\%}{5}$ 5; or: $\frac{35\%}{6}$ 1 $\frac{40\%}{5}$ 6.

Bench Press: $\frac{45\%}{5}$ 1 $\frac{55\%}{5}$ 2; or: $\frac{40\%}{5}$ 1 $\frac{50\%}{5}$ 1 $\frac{60\%}{5}$ 1

$\frac{70\%}{5}$ 1; or: $\frac{70\%}{4}$ 4.

Press-Behind-Neck, Wide Grip (Standing): $\frac{25\%}{6}$ 5.

Good mornings and hyperextensions strengthen the muscles which straighten the back. Already, beginners and low-class athletes utilize bend-overs (a collective term for good mornings and hyperextensions, Ed.). Initially, hyperextensions are done without weight, then hyperextensions and good mornings are done with barbell discs or other loads of light weight. Qualified athletes include good mornings and hyperextensions with a barbell on the shoulders. The amount of weight used in bend-overs varies considerably. For example, athletes do about 15-150 lifts per month in the good morning and 20-600 lifts of the hyperextension. Athletes in the lighter weight classes frequently include good mornings and the heavier athletes -- hyperextensions.

The lumbar area is subjected to a very large load when doing bend-overs; therefore, in order to avoid injury, the weights should not be large. The training weights should be: good mornings -- approximately 25-60% (an average of 50%); hyperextensions -- 15-35% (an average of 20%) of the limit clean and jerk. One should bear in mind that the large loading, resulting from the use of bend-overs during the competition period, can have a negative affect on results in the snatch and the clean and jerk. Athletes who are older and at a more advanced training stage employ bend-overs less, because their back strength is, by that time, developed sufficiently. Bend-overs are executed from 3-10 repetitions per set, depending on the amount of weight used; in both preparatory and competition periods.

A kettle-bell held behind the neck is utilized for strengthening the back muscles. In these instances, the amount of weight used is 15-20% of the limit clean and jerk. The number of repetitions is 6-10.. Qualified athletes do sit-ups over a horse with a weight held behind the head, to develop the abdominal muscles. The amount of weight is 5-20% of the limit clean and jerk. 4-10 repetitions per set are done, depending on the amount of weight.

Weightlifters can employ these exercises to strengthen the shoulder girdle and the arms: 1) starting position (SP) -- barbell is held overhead. Without lowering the shoulders, bend the arms backward and raise them. Beginners and low-class athletes do this exerise with barbell discs of 5-10 kg, and qualified athletes use a barbell which is 10-25% of the maximum clean and jerk. The number of repetitions is 3-10 (depending on the amount of weight). 2) Parallel bar dips. Beginners do this exercise without weight. Low-class athletes with small weights (attached to the waist or legs) and qualified athletes execute this exercise with 5-25% of the limit clean and jerk. The number of repetitions per set is 3-10 (depending on the amount of weight). Qualified sportsmen can do this exercise without fully flexing the arms; then the amount of weight can be increased to 40-50% of the limit clean and jerk. The number of repetitions is 3-5 (depending on the amount of weight).

It has already been pointed out that it is necessary to display force quickly when executing the clean (and especially in the snatch and the jerk). If one compares results in the clean and jerk with results in jumping (without weight), then one finds that there is no correlation whatsoever, between them. However, a comparison of results in the clean and jerk with results in jumping with 50% of bodyweight reveals: that athletes who jump the highest, generally jerk more. In other words, there is a correlation (moderate) between jumping height and results in the clean and jerk. Furthermore, not all athletes who have stronger legs (higher results in the back squat), have higher results in jumping with 50% of bodyweight, i.e., the correlation between the

jumping and the squat is weak. So, with two athletes of the same leg strength, the one with the higher results in jumping with 50% of bodyweight almost always cleans and jerks more weight; because he has a greater ability to quickly display strength.

In order to successfully jerk the barbell, the minimal jumping height (with 50% of bodyweight) should be: in the 75-100 kg classes for Class III lifters -- 44 cm, Class II -- 45 cm, Class I -- 46 cm, CMS -- 47 cm, MS -- 48 cm, MSIC -- 50 cm, world record holders -- 51 cm; for the athletes in the lighter and heavier classes -- approximately 2 cm lower. For example, David Rigert (90-100 kg class) jumped 59 cm with 50% of bodyweight; Pavel Kuznyetsov (100 kg) -- 62 cm; Yuri Vardanyan (82.5 kg) -- 65 cm.

Depth-jumps can be one of the means for developing the explosive-strength of weightlifters (V. N. Deniskin, Y. V. Verkhoshansky, A. S. Medvedev, 1982). The athlete jumps up after first jumping down from a certain height. It is advisable to include depth-jumps in the first three-weeks (3 times in each) of the competition period. The first two workouts consist of 2 series of 10 jumps from 0.5 meters, the third workout -- 3 series of 10 from 0.5 m, the fourth -- 4 series of 10 from 0.5 m and the subsequent five workouts -- 4 series of 10 from 0.7 m. Naturally, approximately the same dosage of depth-jumps per week can be employed during the preparatory period. If the lifter "leaps" and not simply jumps up, for example, to a gymnastic horse of a certain height; then the dynamics of the force developed in the take-off will be closer to those which are inherent to the "explosion" or the jerk.

Vertical jumps with a barbell on the shoulders is another method of developing explosive-strength. The amount of weight should be 20% of the limit clean and jerk. The athlete does approximately 12-18 jumps for a workout; 3-6 jumps per set. Jumps with a barbell can be done 2-3 times per week. If depth jumps are employed, barbell jumps are not included.

The Use of Isometric Exercises, Exercises Executed Slowly and Exercises of a Mixed Character

In recent years weightlifters have employed more frequently isometric (static) exercises, exercises executed slowly, and exercises of a mixed character. They are utilized as additional means for developing strength. One of the advantages of isometrics is the possibility to direct the influence to any muscle group at the required joint angle. The fact is that, maximum force (at the necessary joint angle) in dynamic work can only be displayed for a fraction of a second. This is impossible in some exercises because the apparatus quickly passes through that position (by its own inertia) at which muscular tension would yield the greatest effect. With isometrics one can train the precise joint angle at which it is necessary to display maximum effort. The influence-range of isometric exercises is approximately 20°, relative to the angles at which they are executed; therefore, in order to work the muscle throughout its entire amplitude, one executes isometrics in 3-5 positions. If one does an exercise in 1-2 positions, strength will be developed through the entire amplitude, but to a significantly lesser degree, outside the 20° ranges. This is one of the insufficiencies of isometrics. Exercises done slowly render a positive effect only when one employs large weights. One should also take into account that neuro-muscular regulation during slow exercises and isometrics is quite different from that of dynamic effort, therefore such training has an insignificant affect on the strength displayed in the dynamic regime (it is not intended to be displayed quickly). A large volume of isometric training at high intensity fatigues the nervous system, decreases coordination and speed of movement.

The positive aspect of isometric tension is that it has a positive, strengthening affect on the ligaments, joints and vertabrae. Taking all of this into account, isometrics and eccentrics should be used cautiously and in small quantity, with the correct sequence of work and rest, taking time for a pause with relaxation exercises and adherence to the optimal contrac-

tion time. Isometrics and exercises executed slowly can be used primarily by highly-qualified athletes.

Weightlifters utilize primarily the holding type of isometric exercises (holding the barbell during the execution of the snatch, the clean, the snatch and the clean pull, squats, etc.) at certain positions. These poses can be the initial position at the start (the barbell has been lifted slightly off the platform). The athlete's position after the first phase of the pull; prior to the final effort, after moving the knees under; after fully straightening the legs and torso, and lifting up onto the toes; fixation of the barbell overhead in the snatch and the clean and jerk; in the half-squat position when the knee angle is 90°; in the horizontal position when executing bend overs, and so-forth. The isometric holding of the barbell usually occurs at the parts of an exercise where it is interrupted at a certain position during its execution. The same exercise is executed in the mixed regime of muscular work, as a whole.

In the mixed regime, the combination of muscular work regimes occurs when the barbell is lifted slowly (for example, up to knee level), held at this point, then lifted further. Or when the athlete begins a back squat by lowering slowly, stops in the half-squat position and then continues the exercise. Passive muscular tension has a place in all of these exercises. Weightlifters seldom utilize isometric exercises with active muscular tension (for example, the athlete pulls against a bar that is fixed or pushes against it).

One can raïse a barbell slowly while executing the snatch or the jerk "stretches", in the snatch or the clean pull, in pressing exercises, bend-overs, squats, etc. The work regime can be overcoming, yielding or mixed. The overcoming type of work occurs when the athlete lifts the barbell slowly (for example, up to knee level, or up to the fully straightened legs and torso, then rises onto the toes; or when slowly rising from a squat). The yielding regime is displayed when the athlete lowers the barbell slowly (after executing the "explosion" in the pulls; during the back squat; while lowering the barbell from overhead

after the snatch or the jerk, etc.). The mixed regime occurs when the athlete lifts and lowers the barbell slowly.

The volume of holding and slow lifts is an average of 10% of the general volume for the month in both the preparatory and the competition periods; approximately one-half of it is in the "stretches". The duration of each tension should be 5-6 sec in holding work; a shorter or longer duration of effort yields a lesser effect. The duration of slowly lifting can be 8-15 sec; slowly lowering -- 6-10 sec; and lifting and lowering together -- 15-30 sec. If one executes holding during a slow movement the time period is slightly shorter. The amount of weight can vary considerably; from approximately 25% in the snatch "stretches", to 105% in pulls and squats.

Isometric exercises, slow exercises and mixed, during both the preparatory and competition periods (in the first three weeks), are executed at approximately 50 lifts per week and can be included in almost every workout. Heavyweights (especially in the preparatory period) can increase the quantity of isometric and slow exerises. Musular tension is maintained significantly longer than in the dynamic exercises, which contributes to preserving muscle mass at the achieved level and even increasing it, i.e., ultimately having a positive affect on results.

However, athletes in the light weight classes need to be very careful with respect to isometric and slow exercises, because the use of such exercises in a large quantity can render a negative affect on their results. Lightweights should include primarily the snatch and the clean "stretches" in order to perfect the technique of the "squat under".

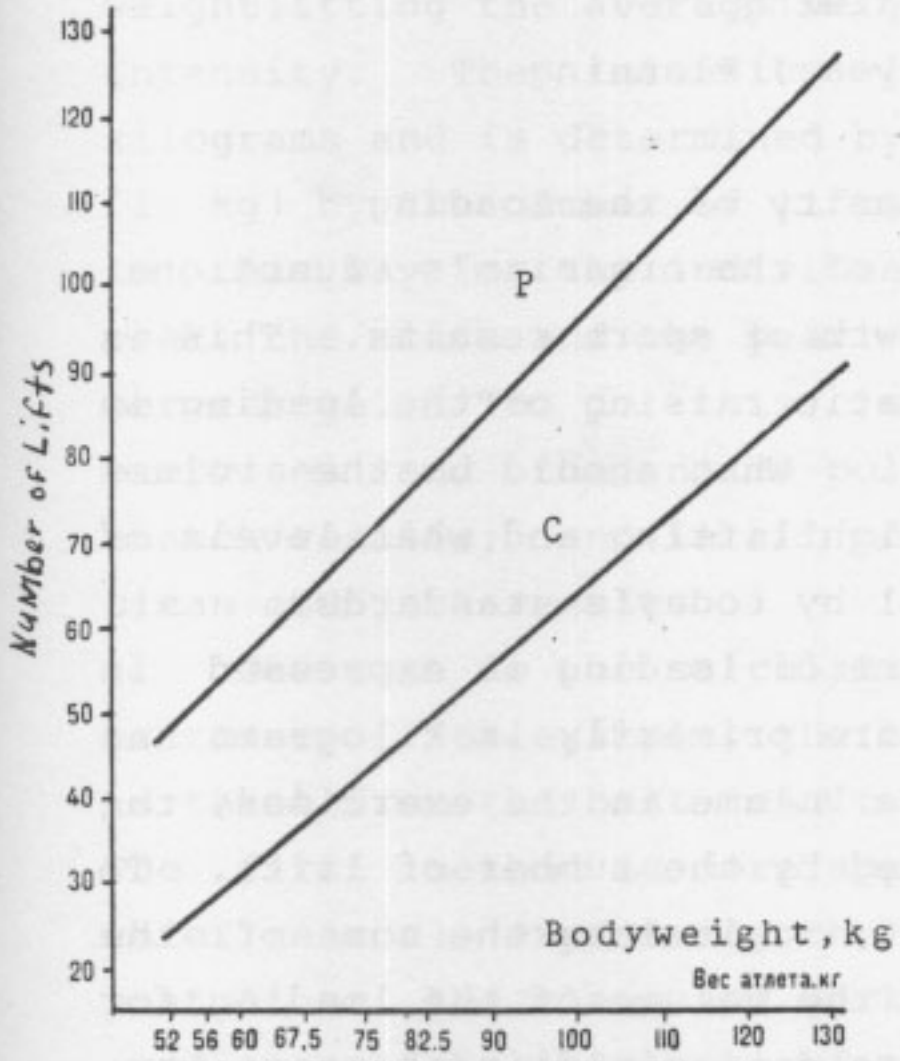


Figure 21. Mean number of lifts in the pressing exercises for the preparatory (P) and competition (C) periods.

Mean improvement of MSIC, beginnig training at 16 years. Table 7.

Year of Training	Weight Class									
	52	56	60	67,5	75	82,5	90	100	110	св. 110
1*	140	152,5	165	182,5	192,5	207,5	205	215	220	230
2	167,5	182,5	197,5	220	232,5	247,5	250	260	270	282,5
3	187,5	205	220	245	262,5	280	285	297,5	307,5	320
4	205	225	240	267,5	287,5	307,5	315	330	340	355
5	220	240	257,5	287,5	307,5	330	337,5	352,5	362,5	380
6	230	252,5	270	302,5	322,5	345	355	370	382,5	400
7	237,5	260	280	312,5	335	357,5	367,5	385	397,5	415
8	242,5	265	285	320	345	367,5	377,5	395	407,5	425
9							385	402,5	415	430

* The results shown were at the end o each year of training.

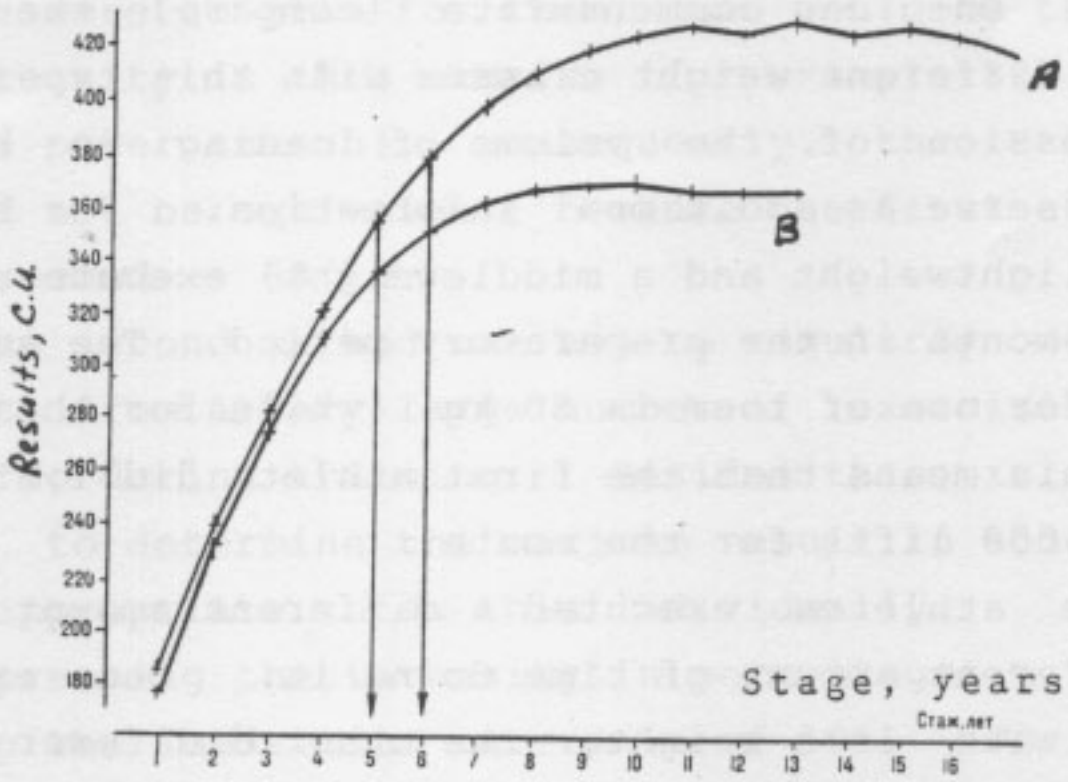


Figure 22. Dynamics of athletes' results, beginning training at 15.6 years: A- MSIC B- A lower class athlete

Chapter 3
Planning Training
Prospective (Multi-year) Planning

The Dynamics of the Volume and Intensity of the Loading

The uninterrupted development of the organism's functional potential is fundamental to the growth of sport results. This is achieved by the constant and systematic raising of the loading in year-round and multi-year training. What should be the volume and intensity of the loading in weightlifting and what levels of loading should be considered optimal by today's standards?

At the present time, the volume of loading is expressed in the educational-methodical literature primarily in kilograms and tonnage. In order to determine the volume in the exercises, the amount of weight lifted is multiplied by the number of lifts. To determine the loading for a workout, calculate the sum of the kilos lifted in all the exercises; the volume of the loading for the week, the month and the year are determined in the same way. In weightlifting, the volume of the loading in general physical preparation is expressed in hours and minutes. However, a weightlifter's loading can be expressed by lifts: calculating the loading in these units (especially when planning) is obviously simpler. One can commensurate (compare) the loading of athletes in different weight classes with this type of calculation. Expression of the volume of loading in kilograms or tonnage can serve as additional information. For example, two athletes (a lightweight and a middleweight) execute a load of 100 tons for the month in the preparatory period. The average training weight for one of them is 80 kg, while for the other it is 100 kg. This means that the first athlete did 1,250 lifts and the second 1,000 lifts for the month.

So, the athletes executed a different amount of work and spent a different amount of time doing it. One executed more lifts, but with less weight; the other did fewer lifts, but lifted heavier weights. Currently it is recommended that one plan the training load by the number of lifts.

The intensity is the difficulty of the training work. In weightlifting the average weight, conditionally, serves as the intensity. The intensity (the average weight) is assessed in kilograms and is determined by dividing the volume of the loading (in kg) by the number of lifts. The average weight is determined in this way for the individual exercises, for a workout, the week, the month and the year. The intensity can be expressed as a percentage. To do this, the training weight in the snatch exercises and the snatch pull must be divided by the maximum snatch results; and in all of the other exerises, by the maximum clean and jerk results.

One can do the calculations from the best results in each exercise: for example, the training weight for the power snatch is taken from the best result in the power snatch, and so forth. The first method is more appropriate because (and this is the chief reason) expressing the weight as a percentage of the limit snatch or the clean and jerk, enables one to compare training conditions (the intensity of the loading) of athletes in different weight classes and qualifiation. This is not possible if one calculates the best results in each exercise. For example, one athlete whose best snatch is 100 kg may have a power snatch result of 80 kg; whereas another may have a result of 85 kg. And, if one were to plan for them, one would be thinking of a different intensity in this exerise (for example 80% of the limit snatch in the power snatch), consequently, the intensity of the loading would not be equivalent; because the first should lift 64 kg, and the second -- 68 kg.

With the second method one has to regularly determine the limit weight from a very large number of exercises, which is difficult to do during training. Besides this, it is impossible (in general) to determine the maximum result in some exercises, and it is inappropriate to do this individually.

When expressing the intensity in percentages, it is necessary to group the loads into intervals of 10%. For example, in the first group one can include all of the loads less than 10%; from 10-19.9% in the second; 20-29.9% in the 3rd; 60-69.9% in the

7th; 70-79.9% in the 8th; 80-89.9% in the 9th; 90-99.9% in the 10th; 100-109.9% in the 11th; 110-119.9% in the 12th; 130-139.9% in the 14th. It is very convenient to plan the loading with this way of grouping the loads.

What should be the volume of the loading? The volume of the load for beginners can be 10,000 lifts for the year. Low-class athletes can do approximately 12,000 lifts in one year. Class I athletes should plan 15,000 lifts; MS should plan 18,000 lifts; the load is less for MSIC. An increase in the loading from year to year is accomplished by first, increasing the mean number of lifts per workout; second, by increasing the number of workouts (while preserving the mean number of lifts per session) and third, by increasing the first and second parameters simultaneously.

The intensity is not the same for athletes in different weight classes. The intensity is approximately 36-41% of the biathlon total (an average of 38.5%) in the light weight classes; 35-40% in the middle classes and approximately 34-39% (an average of 36.5%) in the heavy weight classes.

The main feature of the multi-year planning of a lifter's training is the continuous rise (from year to year) in the intensity of the loading. The largest increase in the intensity of the loading occurs during the first year. For example, at the end of the first year of training the intensity of the load is approximately 72 kg for a middleweight; 87 kg at the end of the second year; 98.5 kg at the end of the third year and 108 kg at the end of the fourth year. In effect, the average training weight increased: by 15 kg in the second year, 11.5 kg in the third and 9.5 kg in the fourth. By the seventh year of training the intensity has risen 4.7 kg and by the eighth -- 3.8 kg. The subsequent rise in the intensity is insignificant.

The Dynamics of Results and the Athlete's Bodyweight.

If one looks at the dynamics of a weightlifter's sport results over a period of multi-year training (figure 22), then one can see that the largest increase occurs in the first 5-6 years; then this increase slows and ceases, on the average, after

11 years of training. For some athletes, in the 100 kg and above classes, the growth of results continues for 13-14 years. Results continued to increase for some athletes in the light weight classes, who began training after the age of 17, for a period of 12-14 years.

Athletes who do not inhibit the rise in their bodyweight have a more prolonged increase in results (14-15 years). When the athlete drops weight significantly, the increase in results ceases earlier. These are the general regularities of the rise in a weightlifter's results.

Future MSIC and world record holders who begin training at 16 years of age, execute the Class III norms (on the average) at the end of the first year of training; Class II -- at 1.75 years; Class I at 2.5 years; CMS at 3.5 years; MS at 4 years and MSIC at 8 years.

The fundamental physical qualities strength, speed and endurance, develop at a more rapid rate in the first year of sport training. The later the athlete's training stage, the more the organism is accustomed to the training influences, the lesser the effect on the development of physical qualities. It is necessary to add with respect to this, that in the first 5-6 years of training the rates of improvement in the biathlon total were maximum. If the improvement of results are less in these years, then later on, when improvement decreases significantly (and it is necessary for the athlete to still improve); he will be unable to achieve record results. The mean improvement of results in the first 8-9 years of training, for athletes who began training at age 16, is presented in table 7.

When one is using the data for planning weightlifters' achievements over a multi-year period of training, one needs to bear in mind, that one lifter's continuous progress from year to year will not be the same as shown in the table. The table shows the potential growth in individual years; in reality, an athlete's improvement can coincide for 2-3 years in succession, and then drop below the average. Improvement of results in certain years exceed the mean, significantly (see table 9).

The dynamics of the results depend on the age at which the lifter began training. When weightlifting training begins before the age of 16; in the first year, the results are lower, the younger the athlete. If the training begins after the age of 16, results are higher in the first year, the older the athlete. For example, by the eighth year of training, results level-out, because the younger athlete's rate of improve-ment is higher in the first year and the older athlete's is lower.

The dynamics of results in the heavyweight classes are somewhat different: for example, the MSIC norms are executed approximately 1-1.5 years later than the other athletes. All of this needs to be taken into account when planning training over a multi-year period.

The bodyweight at which athletes begin weightlifting training is essentially different from the bodyweight that is typical of high-class athletes. For example, 16 year old athletes, who are 149 cm in height, can weigh approximately 42 kg; 168 cm -- 59 kg; 177 cm -- 75 kg and 187 cm -- 80 kg. This height data conforms to the mean heights of high class athletes in the following weight classes: 56, 82.5, 110 and 110+ kg. This means that lightweights (according to the mastery achieved) put on an average of 14 kg; middleweights -- 23.5 kg; 1st heavyweights -- 35 kg and second heavyweights -- 60 kg. It stands to reason that the more weight that has to be gained (and consequently, muscle mass), the more time required. Therefore, having begun training at 16 years, the athlete will switch to the weight class that conforms to his height: lightweights, on the average after 4 years of training; middleweights -- after 4.5 years and heavyweights -- after 6.5 years (I. S. Kudyukov, 1981). Only athletes who are of a definite height can attain high record results within a corresponding weight class. Thus, one can achieve high results in the lightest weight class at a height of 149±3 cm. It is difficult to achieve record results in the lightweight class at a height of 164 cm, since this height is characteristic of the half-middleweight class (75 kg, Ed.). In this instance, the

weight-height ratio is 412 g/cm (versus 422 g/cm for lightweights at 160 cm); consequently, the muscle mass per centimeter will be less than is necessary. This is the reason why a lifter should opportunely switch to "his" weight class. Artifically reducing bodyweight (by more than 3 kg in the light weight classes and by more than 4 kg in the heavy) inhibits the further increase in results.

The optimal heights for MSIC are:

52 kg	145±3 cm	82.5 kg	168 ±2 cm
56 kg	149±3 cm	90 kg	171 ±2 cm
60 kg	155±2.5 cm	100 kg	174.5±2 cm
67.5 kg	160±2 cm	110 kg	177.5±2 cm
75 kg	164±2 cm	110+ kg	186 ±6 cm

The switch to "his own" weight class is one of the objectives of a lifter's multi-year preparation. The alterations in the weight-height index are, in this case, conditioned by the differences in the training methods of athletes of different weight classes -- selection of the exercises, the amount of weight, the number of repetitions per set, and so forth.

Sequentialness in the use of Exercises for Special-Physical-Preparation

We have alrady spoken of the exercises utilized for the special-physical-preparation of weightlifters. The sequence of applying these exercises in the multi-year plan comes about in the following way: the primary objective of the beginner is to learn the technique of the weightlifting exercises; therefore, they should utilize a narrow range of exercises -- the snatch and the clean and jerk, squats and a small quantity of bench presses. Approximately 1/3 of the load is devoted to executing the snatch and the clean and jerk in the classic manner (full squat snatch, full squat clean and jerk, Ed.).

The low-class athletes should perfect their technical mastery. Therefore they, like the beginners, should utilize the snatch and the clean and jerk exercises, squats and a small

quantity of pressing exercises. These athletes devote approximately 1/4 of the entire load to the classic snatch and the classic clean and jerk. Snatch-grip-presses-behind-the-head are included in place of the bench press. The aforementioned exercises are quite sufficient for that level of special-physical-preparedness, which is necessary for beginners and low-class athletes. The use of other exercises in training will not enable one to effectively master the technique of the snatch and the clean and jerk; and insufficient technique training will invariably inhibit the further growth of results.

A period ensues where new objectives in an athlete's preparation are undertaken, after the sportsman has mastered technique to perfection. The main task in this phase is to expand the base of special-physical-preparation. Class I athletes include the snatch and the clean pull, standing and lying bending-overs, and all types of pressing exercises. The classic snatch and the classic clean and jerk now make-up approximately 1/5 of the general volume of training. CMS and MS utilize the entire arsenal of special-assistance exercises. When an athlete has achieved the results of a MSIC, his special-physical-preparedness is at a very high level, and therefore it is not necessary to utilize a large quantity of special-assistance exercises. During this period, high-class athletes basically use the snatch and the clean and jerk exercises, clean pulls and squats; from which results are to a great extent dependent, and reduce the quantity of the other exercises.

Barbell exercises alone do not determine the entire volume and contents of a weightlifter's training; general physical preparation should be a significant part of a weightlifter's training at all stages of sport perfectioning (from novice to high class athlete). However, one should bear in mind that along with the growth of mastery, the athlete's specialization unavoidably narrows; therefore, the portion of general-physical-preparation exercises (especially for qualified athletes) must decrease, and the training should be specialized and develop those qualities which directly or closely affect the rise in the athlete's

special-physical-preparedness, trainability or work-capacity. In the first case, one uses gymnastics, acrobatics and elements of track and field (jogging, sprinting, standing long-jump, vertical jump, throwing, etc.); in the second, one does skiing, swimming and sport games. This means of physical preparation develops speed, endurance, dexterity, flexibility and expands the lifter's range of motor habits and skills.

Year Planning

The Length of the Preparatory, Competition and Transition Periods; their Objectives

The year plan stipulates: the general volume of loading for the year with respect to general and special-physical-preparation, and its monthly distribution; the intensity of the loading and its monthly variability; the volume of the various exercises; the quantity and dates of competitions, their gradation; the results the athlete should achieve in the classic exercises at separate stages of the year's training; control norms in the special-assistance exercises; the system of medical-control; the necessary information on the theory and methods of training, hygiene and self-control.

A weightlifter's training is structured in the form of training cycles, the object of which is to achieve high sport results by a definite time. Each training cycle consists of periods of developing sporting form, its stabilization and brief loss. These periods are customarily called the preparatory, competition and transitional periods, respectivley. Altogether these three periods make up a training cycle, or as it's still called, a large cycle. The large training cycle is divided into month-cycles, and the latter -- into week-cycles. One should bear in mind with respect to this, that a month-cycle implies four weeks of training, and that the month's training load is planned by distributing it over four weeks. Plan brief transition periods after each training cycle with the remaining 2-3 days (this is about 25 days for 11 months of training).

The objective of the preparatory period (the fundamental training period) is to create a base of sporting form and secure

its direct formation. The organism accommodates to the training influences during this period and the athlete achieves a specific (necessary at the given stage) level of preparedness. A weightlifter usually achieves this in 1-2 months; therefore, the length of the preparatory period should not exceed this time span.

In the preparatory period the athlete perfects technique in the classic and special-assistance exercises and adjusts to sporting form (by lifting large, submaximum and even maximum weights in the classic and special-assistance exercises). The preparatory period is usually distinguished by the largest volume of loading and the gradual increase in the intensity.

The aim of the competition period is to achieve a high level of sporting form and to secure its realization in sport achievements. Four-weeks are usually used as the immediate preparation for competition in weightlifting; it is customary to consider this period of preparation the competition period. One does not designate the training stage as a competition stage, if the athlete enters a competition not preceded by special preparation. The competition period is characterized by a lower volume and a maximum intensity. The preparatory and competition periods should not be limited to some definite periods, but switch from one to the other gradually. The aim of the transition period is to avoid over-training, rest up for the new training cycle and to preserve trainability at a sufficiently high level. By decreasing the portion of special exercises, the amount of weight and by using a diversity of exercises the athlete provides himself with active rest. It is undesirable to sharply reduce the training load or to curtail workouts for a long period of time. The length of the transition period is 5-days after the first; 7-days after the second; 10-14 days after the third and fourth training cycles; and 30-days after the conclusion of the last competition season.

The length of each training cycle in weightlifting is usually 2-3 months; although, in individual cases it can be different.

So, if the first month is the preparatory and the second -- the competition period, the training cycle comprises 2-months. If the preparatory period is 2-months and the competition period is 1-month or vice versa (when there are two important competitions that follow each other by approximately one month), the training cycle is 3-months. Here is another example: the preparatory period in the first cycle is usually longer than in the subsequent cycles and is approximately 3-months. If one has two important competitions after this (within a 30-40 day interval), then the length of the training cycle is already about 5-months.

The year-plan should stipulate that quantity of competitions which will ensure the lifter's growth of sport mastery; while at the same time, not overload the competition calendar. The intervals between competitions should provide for the preservation and the development of sporting form. Well then, in order to correctly structure the yearly training it is necessary to plan carefully the competition calendar; such that it contributes to the normal course of training and the maximum growth of sport results.

A weightlifter should take part in no less than 5-large-scale competitions per year, of which 2-3 are designated as the most important for him. The quantity of competitions is conditioned by the number of training cycles in the year's preparation; the interval between the competitions is determined by the length of the training cycles. How should the year's training plan look? The year-cycle of training does not necessarily begin with the beginning of the calendar year. The regime of work and study, the competition calendar of sportsmen of various qualification significantly changes the beginning and the end of the sport season. It is appropriate when planning the year's training to designate the months in numerical order.

The Distribution of the General Volume of Loading

The variability of the loading is one of the stipulations for planning training. Months with a large volume of loading should be combined with months where the volume of work is less. A gradual increase in the volume of loading is only appropriate

for beginners and low-class athletes; it is also appropriate for qualified athletes, after a prolonged transition period, when a new training-cycle is begun.

The volume of loading in the year-cycle fluctuates from about 1,100-1,300 lifts for beginners in the preparatory period and from 900 to 1,000 in the competition period. Low-class athletes do 1,000-1,500 lifts in the preparatory month and 750-1,050 lifts in the competition month. The load varies from 1,300 to 2,000 lifts in the preparatory period and from 950-1,450 in the competition period for Class I and CMS; for MS the figures are 1,500-2,700 and 1,100-1,900 lifts respectively. MSIC execute approximately 200 fewer lifts in the preparatory period and 150 fewer lifts in the competition period than the MS; the variability of the loading is less for these athletes.

It is most convenient to distribute the year's volume of loading for the beginning athlete in the following way. It is appropriate to begin workouts on September 1. The initial study period should be 3-4 months; therefore, the first training cycle can last from September to December. Weightlifting workouts are done three times a week; with one additional day per week for special sessions of general-physical-preparation.

The basic task of the first training cycle is to learn the classic and special-assistance exercises. Therefore, primarily minimal, small and moderate weights are used during this period. A large number of repetitions per set are done with the minimal and small weights. With respect to this, the largest number of lifts in the month's training (an average of 1,150) and in individual workouts (an average of 110) are planned for the first four months. The monthly loading can be distributed in the following way: September -- 1,150 lifts, October -- 1,250, November -- 1,200 and December -- 1,000. The first three months can be considered (conditionally) preparatory and the fourth month -- the competition.

It is necessary to rest after four-months of training; therefore, in January, one needs to do general-physical-preparation twice a week (including skiing) and weightlifting only once

a week. The volume of loading should be about 500 lifts (125 lifts per week), which are done with minimal and small weights.

It is appropriate to divide the next four-months of training into two training cycles, each of which includes preparatory and competition months. The athlete enters a competition at the end of each training cycle (at the end of March and May). Like before, there are three weightlifting and one general-physical-preparation workouts per week. The amount of weight is increased slightly -- by including lifts with large weights. Plan approximately 1,100 lifts for the preparatory month and 900 for the competition month. The mean number of lifts per workout decreases to about 90 in the preparatory month and to 75 in the competition month.

The volume is decreased once again in June and July. The athlete should do general-physical-preparation twice-a-week and weightlifting only once: with minimal and small weights (with a large number of repetitions per set). Plan an average of 450 lifts per month and 110 per workout. The athlete excludes weightlifting in August and switches to general-physical-preparation.

One does not plan the intensity of the load for beginners. They should not lift submaximum and maximum weights in training -- this is done only in competition. This structuring of the year's training provides for the athlete's multi-sided preparation and prepares him for the complex GTD (Ready for Work and Defense, Ed.) norms. Low-class athletes compete in no fewer than five competitions; therefore, the number of competitions, conditions the number of training cycles and the intervals between the cycles determines their length.

How can one distribute the volume of loading for low-class athletes? It is permissible for the athlete to compete at the end of months 3, 5, 7, 9 and 11; of these competitions, the ones at the end of months 5, 9 and 11 are the most important. In this case, the volume of the loading (for example, 12,000 lifts) can be distributed in the following way. The year's training consists of five training cycles: the duration of the first is

3-months, the remaining are 2-months in length; one month is devoted to special workouts of general-physical-preparation. Since the athlete begins training after a month off, a preparation period of two-months is planned for the first training cycle; the loading is gradually increased. The load can be 1,100 lifts in the first month and 1,300 lifts in the second. One can reduce the load in the competition month (the 3rd month) to approximately 900 lifts.

On the average, low-class athletes do 1,250 lifts in the preparatory month and 900 lifts in the competition month. This can be considered the optimal number of lifts; therefore, while preparing for more crucial competitions (in the 2nd, 4th and 5th months cycles) one can plan these same numbers. The load in the preparation month (4th month) of the 2nd training cycle now becomes 1,250 lifts and in the competition month (5th month) it is 900 lifts.

The largest volume of loading (1,500 lifts) is planned for the sixth month. This increase is necessary in order to reach a higher level of special preparation; because the athlete still has two important competitions left. It is natural after such a significant volume that the loading in the competition month should be reduced significantly more than in the preceding cycles. Therefore, plan only 750 lifts for the seventh month (competition). So, after a maximum volume of loading in the preparatory month of the third training cycle, there is a minimal number of lifts in the competition month. This reduction in loading for the seventh month allows the organism to recuperate and qualitatively prepare for crucial competitions in the last two (4th and 5th) training cycles. As indicated, the following loading will be appropriate for these months: 1,250 lifts in the preparatory month and 900 lifts in the competition month.

When distributing the year's volume of loading by months, one should take into account that during the second half of the year, the athlete manifests a certain background of fatigue. This is why the average monthly volume in this period should be slightly lower than in the first half of the year. Of the 12,000

lifts planned for the year, 6,950 are planned for the first six months and the remaining 5,050 lifts for the second six months.

The year plan of the Class I athlete and the CMS is usually a little different, as is their competition calendar. For example, the first important competition is planned for the end of the fourth month, the second for the tenth and the third for the eleventh month. Two more crucial competitions are planned for the end of the fifth and seventh months. This competition calendar enables one to divide the athlete's training into three training cycles. The year's loading of 15,000 lifts for example, can be distributed in the following way: a prolonged first cycle -- 5 months (3 - preparatory and 2 - competition months with 1,350, 1,500, 1,650, 1,200 and 1,000 lifts); the second cycle is 2-months (1 - preparatory and 1 - competition month with 2,000 and 950 lifts) and the 3rd cycle -- is 4-months (2 - preparatory and 2 - competition months with 1,500, 1,650, 1,200 and 1,000 lifts). The last month is active rest.

Class I athletes and CMS execute an average of 1,650 lifts in the preparatory month and 1,200 lifts in the competition month; this takes into account the training for the most important competitions. The largest volume of loading in the year-plan (8,700 lifts) takes plae in the first half of the year and the remaining (6,300 lifts) occurs in the second half.

The distribution of the year's loading for a MS (for example, 18,000 lifts), who plans to enter five important competitions (at the end of months 3, 5, 6, 9 and 11) and three of which (at the end of months 3, 5 and 9) are for him, the most important, can look like this. The competition calendar stipulates the distribution of the year's training into four training cycles: 1-3 -- for a duration of three months, 4th -- two months.

The optimal number of lifts for a MS training for the most important competitions is considered to be: 2,100 in the preparatory month and 1,500 in the competition month. Therefore, this monthly distribution of lifts will be considered appropriate for the first training cycle: 1st (preparatory) month -- 1,900

(training after a lay-off), 2nd (preparatory) -- 2,100 and 3rd (competition) -- 1,500 lifts. The athlete should compete twice (in one month) during the second training cycle; the first one is the most important. Taking into account that the athlete has already executed a significant amount of work in the preceding cycle, it is still necessary for him to maintain a high intensity of loading during the two competition months; yet it is necessary to reduce the loading in this cycle slightly. The loading in the second cycle will appear as follows: the 4th-month (preparatory) -- 2,000 lifts, 5th (competition) -- 1,400 and 6th (competition) -- 1,200.

The training for an important competition in the 3rd training cycle provides a two-month preparatory period. Therefore, one needs to reduce the loading slightly in the first month (the 7th month), in order for the athlete to recuperate and prepare for the subsequent work with a larger volume and intensity in the last two months (8th and 9th) of this cycle -- prior to the competition. This plan will be appropriate: 1,600 and 2,100 lifts in the preparatory months and 1,500 in the competition month. In the final, 4th cycle, when the athlete already has a definite background of fatigue, one can plan 1,600 lifts in the preparatory month (the 10th month) and 1,100 lifts in the competition month (11th-month). The last month is active rest.

In addition to five important competitions, qualified athletes usually take part in another 4-5 competitions of lesser significance. The athlete's participation in other competitions should not detract from his training for important competitions; they should be a means of training the athlete's readiness.

The intensity of the loading is small for beginners and low-class athletes; therefore, for them, execution of the assigned volume of loading presents no special difficulty. In order to achieve a continuous increase in results, qualified athletes should execute a significant volume of work with high intensity. Individual peculiarities begin to be more pronounced for qualified athletes at this time; one of which is strength-endurance (the ability to execute a large volume of work) which

is the first consideration when determining the monthly loading. The principle of individualization is very important and one should not forget it. Consequently, the month's and year's loading will not be the same for all qualified athletes, as indicated, the loading can be higher for one and less for another.

All things being equal (the intensity of the loading, the muscles' work regime, etc.), an increase in the volume of loading contributes to an increase in a lifter's muscle mass. Therefore, the athlete's height/weight data is of greater importance for planning the loading. For example, the volume of the month's loading reaches maximum when it becomes necessary to increase muscle mass. Younger athletes cope well with large volumes and intensities of loading; therefore, their loading can be increased slightly in the competition period. And, vice versa, it is necessary to reduce slightly the volume and intensity of the loading (in both the preparatory and competition months) for older athletes and athletes who are at a later training stage.

One needs to trace the volume of loading in the competition month with special care. The assimilation of large loadings is associated with prolonged reconstruction of the organism. One can achieve high results only after reducing the volume of loading and increasing (or maintaining) the intensity. During the competition period the loading is reduced such that, by the end of the month (i.e., at the beginning of the competition) the lifter, as they say, is "liberated" from the volumes.

The reduction of loading in the competition month, in comparison with the preceding month, can be 20-40% (an average of 30%) and will be greater, the heavier the lifter. For example, athletes in the 52 kg class reduce the loading by 27.5%, whereas athletes in the 110+ kg class reduce it by 33.5%. A reduction of 17-18% in the loading during the competition month is quite sufficient for beginners, since their intensity is insignificant.

The Distribution of the Intensity of Loading

What should be the intensity of the loading; how is it planned? Assume that at the end of the year the athlete achieves a

result of 270 kg. The average training weight is 100 kg, which is 37% of the biathlon total $\frac{100 \text{ kg} \times 100}{270}$. The same percentages should be used to calculate the average weight from the planned results (290 kg, for example) of the next year. This figure should be 107.3 kg $\frac{290 \text{ kg} \times 37\%}{100}$. The fact is that the athlete needs to plan on increasing the average weight for the year from 100 kg to 107.3 kg.

Assuming that the intensity is increased gradually, then 0.66 kg (7.3 kg: 11-months of training) should be added each month. The intensity should be about 100.7 kg in the 1st-month, 102 in the second and 103.3 kg in the fifth, and so forth.

In this instance the increase in the intensity up to the planned level assumes that the contents of the loading will be identical. It is necessary to change the volume of certain exercises, which naturally leads to a change in the average weight; with respect to the planned. It can be greater or less; consequently, the execution of planned intensity can be quite difficult.

So, in order to determine the average monthly weight, one needs to know the training weight in each of the exercises used. However, the intensity of the load in each exercise, expressed in kilograms, conceals the contents of training and does not represent the amount of weight the athlete actually trained with. For example, if the average weight over four sets of snatches is 80 kg, this does not mean that the athlete executed all of the lifts with this weight. He could, for example, have lifted 70 kg twice, 90 kg twice or 100 kg once and 80 kg twice and 70 kg twice and so forth. Here is another example: one can do five snatch pulls with 80 kg and 110 kg. The average weight for the 10 lifts (with a snatch of 100 kg) would conform to the optimal weight for perfectioning snatch technique -- 95 kg; however, in actuality this is far from true.

So, the aforementioned way of planning a lifter's intensity of loading has a number of deficiencies, and is therefore, seldom

used in practice. Naturally one needs a simpler, more accessible and at the same time, a more precise method of planning the intensity of loading. This book presents such a method.

Begin by ascertaining the biathlon total which the athlete should make by the end of the year. There are specific (potential) norms for the improvement of results, for each weight class (during a specific training year and depending on the age one began training), which can be used for planning.

The biathlon total dynamics for the MSIC beginning training at the age 16, is presented in table 7. The dynamics of the MSIC results, beginning training at 13.6-17.6 years of age are presented in table 8.

The results given are in conditional units (according to M. V. Starodubtsev's table). In order to obtain the possible achievement in kilograms (in the 5th year of training, for example) of a middleweight, beginning training at age 15.6 years; the results in conditional units (in this case 355) ascertained with the table (see supplement) are converted to kilograms; and one obtains a result of 327.5 kg.

The use of tables 7 or 8 helps one to determine the results an athlete should achieve for the year, in the following way. It is simple to do this when the athlete's results for a year of training conform to the data in the table. For example a lightweight, 160 cm in height who began training at age 16, will have results of 267.5 kg at the end of the 4th year. One can expect his results to be 287.5 kg (see table 7) at the end of the 5th year. Another example: a middleweight, 168 cm in height, who began training at 15.6 years, achieves a result of 277.5 kg at the end of the 3rd year. The result one can expect at the end of the 3rd year can be ascertained with table 8. This result is 282 CU, which is 277.5 kg. When the athlete's improvement conforms to that of the MSIC a result of 320 CU or 305 kg can be planned for the end of the 4th year. When calculating the possible results for heavyweights, take into account the fact that their results are approximately the same for the first two years; but beginning with years 3-4 it is necessaray to plan for their

achievements to be about 8 CU less.

If the athlete's results are different from the mean data presented in tables 7 and 8, table 9 can be used to give the expected achievements by year of training. For example, a lightweight 160 cm in height, beginning training at 16 years of age, achieves a biathlon total of 255 kg at the end of the 4th year (instead of the possible 267.5 kg). According to table 9 he can potentially add 34 CU to his results in the 5th year of training (the mean for beginning at 15.6-16.6 years of age). 34 CU are added to a result of 307 CU (which is equal to 255 kg) to obtain a possible result of 341 CU or 275 kg at the end of the 5th year.

It is necessary to determine the biathlon results the athlete should achieve for the year in the future weight class he will compete in (which conforms to his height and not the class he performs in at the given time). The mean and maximum possible increase in results, by year of training, are presented in table 9. Naturally, the question arises: can one plan for the maximum increase in results for the year and not the mean? The fact is that the largest improvement occurs during the first 5-6 years of training (even at the moderate rate of improvement shown in tables 7 and 8); therefore, it's not necessary to plan the maximum possible results. Naturally, after 5-6 years, when the yearly improvement begins to slow down, there will be an effort to add as much as possible to the year results.

After determining the potential improvement in the biathlon-total for the year, determine the potential achievements in the snatch and the clean and jerk. Plan, for example, the possible results of the 4th year of training for an athlete whose results at the end of the 3rd year are 287.5 kg. A total of 315 kg is planned for him in the 4th year (an increase of 27.5 kg). Assuming that the results in the biathlon will increase gradually, then each month he should add 2.5 kg (27.5 kg: in 11 months of training). So, the biathlon achievements can look this way: 290 kg at the end of the 1st month, 292.5 kg at the end of the 2nd, 295 kg at the end of the 3rd, 305 kg at the end of the 6th, and so forth. The monthly additions will be 1-8 kg, when the year-

Dynamics of biathlon results depending on the age training began.

Table 8.

Age began training	Results by training years, CU									
	1-a	2-a	3-a	4-a	5-a	6-a	7-a	8-a	9-a	10-a
13,6	147	220	267	309	346	373	392	407	417	424
14,6	165	230	274	314	350	376	394	409	418	425
15,6	183	240	282	320	355	380	397	411	420	426
16,6	201	250	289	325	359	383	399	413	421	427
17,6	219	260	297	331	364	387	402	415	423	428

* The results were tabulated at the end of each year.

Mean and maximum improvement in bisthlon results for athletes beginning training at 13.6-17.6 years.

Table 9.

Age began training	Training stage, yr.													
	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Mean improvement, CU													
13,6	64	54	46	39	33	28	22,5	18	13,5	9	5	2	0	
14,6	60,5	51,5	44	37	31,5	27	21,7	17,5	13,3	9	5	2	0	
15,6	57	49	42	35	30	26	21	17	13	9	5	2	0	
16,6	53,5	46,5	40	33	28,5	25	20,3	16,5	12,7	9	5	2	0	
17,6	50	44	38	31	27	24	19,5	16	12,5	9	5	2	0	
	Maximum possible improvement													
	80	71	63	56	48	42	36	30	25	20	16	12	9	5

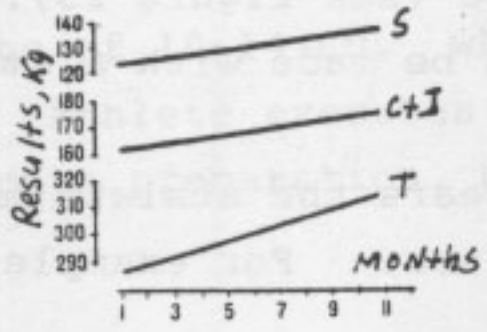


Figure 23. A graphic method of determining results in the snatch (S), the clean and jerk (c+j) and the total (T) by months

end results increase from 267.5 kg to 287.5 kg. Consequently, the biathlon achievements can be: 272.9 kg at the end of the 3rd month and 278.3 kg at the end of the 6th. Subsequent calculations of these results are not rounded off in increments of 2.5 kg.

It is even simpler to determine results with a monthly graph. The initial data (287.5 kg or 267.5 kg) and the planned (315 kg or 287.5 kg) are marked on the graph at the beginning of the 1st and at the end of the 11th month; then they are connected with a straight line. The biathlon results, which can be achieved each month, are shown in figure 23. The possible achievements in the snatch and the clean and jerk are determined by the biathlon results; the optimal ratio of the snatch to the clean and jerk, as expressed by this ratio 100:128, is used to determine these results. In the first example, the potential results in the 1st month are 290 kg. If the total (290 kg) is 228 CU (100+128), then the snatch will be 127.2 kg $\frac{290 \text{ kg} \times 100}{228}$ and the clean and jerk -- 162.8 kg (290 kg - 127.2 kg). The same method is used to determine results in the snatch and the clean and jerk for the subsequent months. They are: 128.3 kg and 164.2 (total 292.5) in the 2nd month and 129.4 and 165.6 kg (total 295 kg) in the 3rd month.

In the second example, the results in the snatch and the clean and jerk of the 3rd month are 119.7 and 153.2 kg (total 272.9 kg), respectively; and 122.1 and 156.2 kg (total 278.3 kg) in the 6th month. One can determine the snatch and the clean and jerk results graphically, for each month of the year; the initial results are recorded at the beginning of the 1st month and the final results at the end of the 11th. In this case, the achievements in the snatch and the clean and jerk are calculated from the biathlon total only twice (see figure 23). All of the aforementioned calculations can be made with a small calculator or slide-rule in 2-3 minutes.

Over a period of 4-5 years the athlete may become stronger in one of the classic exercises. For example, a 285 kg total is

composed of a 120 kg snatch and a 165 kg clean and jerk (a ratio of 100:137.5). If this ratio remains constant for this athlete, the potential achievements in the snatch and the clean and jerk are determined according to this ratio.

Now when the initial results in the snatch and the clean and jerk are known for each month of the year, one can plan the corresponding intensity for achievement of the planned results. It is convenient to plan separately for each training cycle.

Since the relative improvement in the snatch and the clean and jerk basically depend on the volume and the intensity of the snatch and the clean and jerk exercises, clean pulls and squats; one needs to plan the appropriate intensity for these exercises. The necessary volume and intensity in these exercises (the distribution of the lifts in zones of high intensity) is presented in tables 2-6. It remains only to select the amount of weight (in kg) for each zone of intensity, by months.

For example, let's plan the intensity in the snatch exercises for a master of sport (75 kg weight class) in a training cycle which includes two preparatory (with volumes of 1,900 and 2,100 lifts) and one competition month (1,500 lifts). The planned results for the athlete in the first three months are 127.2, 128.3 and 129.4 kg. After rounding off the results into 2.5 kg increments, they are placed in the corresponding zones. One obtains a precise picture of the intensity of the loading in the snatch exercises for the whole training cycle (table 10).

The intensity in the clean and jerk exercises, pulls and squats are planned in the same manner. If the lifter uses the recomended loading (see Chapter 2) for the other exercises (presses, bend overs, etc.), the intensity will be optimal. It is not necessary to distribute the lifts in these exercises into zones of intensity, although such a distribution is possible, in principle. Planning the load in this manner provides a minimum increase in results of 10-14 CU, which is 7.5-10 kg for middleweights. If the athlete executes more high intensity lifts during the three-month preparation, his results will be higher.

The initial data used for determining the training weight can be the results that have already been done in the snatch and the clean and jerk; because the difference is insignificant (1-1.5 kg) from the results planned at the end of each month and the intensity of the loading is practically unchanged. Besides this, the athlete, ultimately should always strive to lift more weight in training.

When the athlete achieves a higher result in the snatch or the clean and jerk than was planned for that month or cycle (which is quite possible), calculation of the intensity of the loading in each of the following months can be based on the already achieved results. However, as already indicated, the volume of the month's training in the preparatory and competition months can differ from the average; it may be significantly greater or less. In those instances where it is necessary to maintain the appropriate intensity of loading, approximately the same number of lifts are employed in the snatch and the clean and jerk exercises (with 70% weights and-above), in the clean pulls and squats with 90%-and-more, as indicated in tables 2-6.

The intensity of the loading should not be constant in either the preparatory or competition months -- during one month it is slightly lower, in another -- it is slightly higher. To raise the intensity of the loading, increase the number of lifts with 70%-and-more in the snatch and the clean and jerk exercises, and also in the clean pulls and squats with 90% and more. Reduce the number of lifts at these weights in order to lower the intensity. However, one needs to bear in mind that a reduction in the intensity over a long term, leads to a decrease in trainability. It is undesirable to increase significantly, the number of high intensity lifts for a prolonged period of time (especially in the snatch and the clean and jerk); because this can fatigue the central nervous system, and consequently lower results.

The volume of the various weights employed during a month's training, characterize its general emphasis -- strength, speed-strength and speed. It has been suggested (see tables 2-6) that the contents of the loading in the preparatory and competition

periods provide a uniform development of the lifter's speed-strength qualities. If one needs to change the emphasis of the training to accentuate strength development, increase the portion of special-assistance exercises and the training weight; and decrease the portion of classic exercises with minimal and small weights. When one needs to accentuate speed, reduce the training weight in the special-assistance exercises. The year's loading can be altered by: increasing (or decreasing) the volume and intensity; increasing (or decreasing) the volume and maintaining the intensity; increasing (or decreasing) the volume and decreasing the intensity; preserving the volume and increasing (or decreasing) the intensity.

The Contents of Training

When the results in the snatch and the clean and jerk rise uniformly, the distribution of the various exercises employed can be approximately the same for athletes of different qualification (table 11). An optimal snatch to the clean and jerk ratio is 78% and the clean and jerk to snatch is 128%, for qualified athletes. The clean and jerk is an average of 127% for MSIC and 126% for world record holders. The optimal ratio for a qualified athlete will be, for example: snatch 125 kg, clean and jerk 160 kg. If the athlete's snatch results are lagging (for example a 120 kg snatch and a 160 kg clean and jerk), then the portion of snatch exercises is increased. Furthermore, determine the reason for the lag -- poor technique or insufficient strength preparedness.

So, the power-snatch results should be no less than 87-90% of the classic snatch. An athlete who can snatch 125 kg should be able to power snatch 110 kg. If he is able to power snatch such a weight, but is unable to snatch 125 kg; his technical mastery is lagging. If the power snatch is less (105 kg, for example), the athlete's strength preparedness is insufficient. In the first case -- increase the portion of classic snatches and in the second -- increase the special-assistance snatch exercises. When the clean and jerk is lagging (for example, a snatch of 125 kg and a clean and jerk of 155 kg), the portion of the

Table 10. Volume and intensity in the snatch exercises for a 3-month cycle of the MS (75kg)

Months	Number of Lifts		Distribution of Lifts by Zones			
	in classic Exer.	in other Exer.	менее 70% Less	70–79%	80–89%	90% и более And more
1rst- prep			Менее 90 кг	90–100 кг	102,5–112,5 кг	115 кг и более And more
	152	228	240	80	40	20
2nd- prep			Менее 90 кг	90–102,5 кг	105–112,5 кг	115 кг и более And more
	168	252	232	107	53	28
Competition			Менее 90 кг	90–102,5 кг	105–115 кг	117,5 кг и более And more
	120	195	160	81	46	28

Exercise	Periods					
	Prep.	Comp.	Prep.	Comp.	Prep.	Comp.
	III–II p.		I p., кмс		мс	
Snatch	10	10	9	9	8	8
Other Snatch Exercises	10	10	11	12	12	13
classic clean	7,5	7,5	6	6	5	5
other cleans	9,5	9,5	9	9	8	8
Classic C+J	7,5	7,5	7	7	6	6
Other Jerks	3,5	3,5	5	6	7	8
Front and Back Squats	27	27	23	23	20	20
Other Squats	15	15				
Snatch Pulls			7	5	8,5	5
Clean Pulls			5	6	10	12
Pressing Exercises	10	10				
Pressing Exercises, Barbell overs and Other Exercises			18	17	15,5	15
Average Number of Lifts for Month	1250	900	1650	1200	2100	1500

Exercise	Initial Data	Planned Results, Kg		
		End of 3rd month	End of 8th month	End of 11th month
Snatch	115	120	125	130
C+J	147,5	152,5	160	165
Power Snatch (87% of Limit Snatch)	100	105	110	112,5–115
Power clean (87% of Limit C+J)	127,5	132,5	140	142,5–145
Push-Jerk (initial - 90% Final - 92% of Limit C+J)	132,5	137,5	147,5	150–152,5
Back Squat (initial - 125.8%, Final - 126.3% of Limit C+J)	185	192,5	205	210
Vertical Jump (50% of Bodyweight)	43,5 см	44 см	45 см	45,5 см
Snatch Pull. Height of Lift from Platform (to 71% of height)	to на 119 см 115 кг	to на 119 см 120 кг	to на 119 см 125 кг	to на 119 см 130 кг

various exerises to be increased depends on the part of the movement that requires improvement. Thus, the power clean results are 87-90% of the squat clean and the back squat (for example, for CMS in the 75 kg class) is 126.3±6% of the clean and jerk results. Consequently, in order to clean and jerk 160 kg the athlete should power clean 142.5-145 kg and back squat approximately 202.5 kg.

Lagging results in the clean and jerk can be caused by the following:

1. The athlete cleans the weight but cannot jerk it. In this case, he needs to increase the amount of special-assistance jerk exercises.

2. The athlete has difficulty recovering from the clean and hasn't enough strength left to make the jerk. In this case, increase the number of squats.

3. The athlete cannot pull 160 kg high enough, but is able to squat with very heavy weights (his power clean result is less than 142.5 kg). His speed-strength preparedness is low. It is necessary to increase the portion of special-assistance clean exercises -- clean pulls and other exercises which develop this quality.

4. The athlete is unable to rise from a clean of 160 kg. Naturally, it is necessary for him to increase the portion of squats, even if his result is 202.5 kg. In this case (because of individual differences), his squat should be slightly higher -- up to 210 kg (126.3+6%).

The portion of squats in the general volume of training is increased when the results in this exercise lags behind the optimum (see Chapter 2). The loading in squats is reduced when the achievements in this exercise exceed the optimum. One should not achieve very significant results in squats. Leg-strength should be such, that the athlete is able to recover from the clean rather easily. It is necessary to plan for a constant increase in the special-assistance exercises in order for the snatch and the clean and jerk results to increase continuously, and uniformly. These strength indicators characterize the ath-

lete's level of special-physical-preparedness at certain stages and are fundamental for achievement of the projected results in the classic exercises. It is appropriate to plan for these indicators at those three training cycles, when the athlete is preparing for the most important competitions. Plan for achievements at the end of the year which conform to the athlete's future qualification.

An example of the improvement in a middleweight's (height -- 168 cm) results is shown in table 12. A Class I athlete plans for results of 130 kg in the snatch and 165 kg in the clean and jerk, at the end of the year. Looking at the table: in order to clean and jerk 165 kg at the end of the year, it is necessary for the athlete to power clean 142.5-145 kg, squat 210 kg and lift 150-152.5 in the push-jerk. The athlete should be able to clean and jerk 165 kg if he can do these lifts.

In order to snatch 130 kg, the athlete needs to power snatch 112.5-115 kg. An improvement in the special-assistance exercises enables one to correct the contents of training at specific stages -- by increasing or reducing the necessary portion of an exercise for a uniform improvement in the snatch and the clean and jerk.

One plans for general-physical-preparation in the year's training. General-physical-preparation sessions should be obligatory in both the preparatory and competition periods; but the volume of the loading is gradually decreased at the end of the competition period. It is necessary to strictly dose the general-physical-preparation so that it will not have a negative affect on the regular workouts, but contribute to the development of the qualities a weightlifter needs. In his general-physical-preparation the lifter does: track and field and other exercises (15-20 min); the introductory and concluding parts of weightlifting workouts; including general-developmental exercises (an average of 30 min); swimming, sport games, skiing, track and field, depending on the season, 3-4 times a week (for about one hour) in the preparatory period and 2-3 times (for about one hour) in the competition period. If the general-physical-preparation sessions

in the transition periods are counted, there will be approximately 350-400 hours a year of general-physical-preparation. In conclusion it is necessary to point out that planning is oriented (at each stage) to alteration of the training program, depending on the athlete's potential, during the course of training.

Month and Week Planning

The Distribution of the General Volume of Loading

The month's plan should stipulate: the volume and intensity of the weekly loading; the weekly volume in the various exercises and the general-physical-preparation; the competition dates. The objective of the week's plan is the optimal distribution of the volume and intensity of the exercises within the individual workouts. The month's plan is distributed non-uniformly: weeks with a large volume should be alternated with weeks with small and moderate volumes. There is less variation in the weekly loading and in the individual workouts, when the month's volume of loading is significant. A relatively uniform distribution of the month and the week volumes can be appropriate for beginners or after a prolonged lay-off from training. There is a typical reduction of the loading in the final week -- 11-14% of the general month's volume, during the competition period.

The distribution of the week-loading in both the competition and the preparatory periods can be quite different; however, in the preparatory period the most frequent variant is: 1; 2; 3-1; 1-3; 2-4; 4-2; and the second most frequent -- 1; 2; 1-3; 3-1; (A. V. Chernyak, N. S. Atanasov, A. D. Ermakov).

The variants designated by one figure (1, 2, 3) signify that the maximum loading occurs during that week of the month. Up to this point the loading has gradually increased, and after this point, it is gradually reduced. If the variant is designated by two figures (3-1), the first figure indicates the week with the maximum loading; the second figure indicates the week with a slight reduction in loading. For example, variant 1-3 means that the maximum loading occurs in the first week, it's decreased in the second, subsequently raised in the thrid week (but still slightly less than in the 1st week) and reduced in the fourth

week. Several examples of the distribution of the month loading into week-cycles are presented in table 13.

When one is selecting the week-cycle distribution of loading variant, one needs to take into consideration the volume of work (large, medium or small) the athlete executed in the previous month. If the volume was large, these variants can be used: 2; 3-1; 2-4; 4-2. If the volume was moderate or small, any variant is possible. One also takes into account the additional competitions the athlete should take part in, without special preparation. Moderate or small loading is usually executed the week preceding a competition. Small, moderate and large loading are utilized in separate workouts, executed at the limit of one's functional potential. Large loading has the greatest affect on the organism and it creates the conditions for the further increase in sport results. Moderate loading maintains the level of trainability. Small loading is employed for active rest (restoration) and preserving the level of trainability. However, small loading also contributes to super-restoration, thereby creating the organism's highest level of functional possibilities. Only a sequence of loading and rest can contribute to the continuous increase in results. 50-lifts in a workout is considered small, 51-100 -- moderate, and over 100 lifts is considered large. The recuperation period after a workout depends on the volume and intensity of the loading. A particularly long recuperation time is required after competitions and loading with great emotional excitation; this needs to be taken into account when planning the workouts of the weekly cycle.

The distribution of the week-loading into the individual workouts varies also. The following combinations of week-cycle loading (excluding Sunday) are possible, depending upon the number of workouts. Three workouts per week: S (small loading) - R (rest), L (large loading) - R, S - R; M (medium loading) - R, L - R, M - R; L - R, S - R, L - R; L - R, M - R, L - R. Four workouts per week: S - R, L - R, M, S; L - R, M - R, L, M; L - R, M - R; L, S; L - R, S - R, R, L, S; S - R, M - R, M, S; M - R, L - R, M, S. Five workouts per week: M, S, L - R, M, S; M, S, L

- R, M, M; S, L, S - R, L, S; L, S, M - R, M, L, S - R, L, M; M, S, M - R, M, S. Six workouts per week: S, M, S, M, S, M; M, S, L, S, M, S; M, L, S, M, S, M; M, M, S, M, S, M; M, S, L, S, M, M; S, L, S, L, S, M. The more workouts there are in a week, the larger the volume of the week's loading.

The Distribution of the Intensity of the Loading

The intensity of the loading (the average weight of the barbell) varies, like the volume, in both the month and the week-cycles. A week of high intensity training is followed by weeks of moderate or small intensity. In addition to those presented in table 13, one can employ the following variants of intensity distribution during the competition month: 3; 2-3; 3-2. The nature of the variation of the intensity by weeks and within a week (in both preparatory and competition periods) can concur or not concur with the nature of the distribution of the volume; however, it does concur in the preparatory period.

Presented in tables 2-6 is the mean monthly loading for the various exercises of athletes in different weight classes; high intensity work is included. For example, the volume of high intensity work (weights of 70% and more in the snatch and the clean and jerk exercises for a MS, in the middleweight class, comprises: 443 lifts in the 2nd preparatory month and 342 lifts during the competition month.

Well then, in this case, there will be a moderate intensity when the snatch and the clean and jerk exercises are executed with high intensity for the week: 111 lifts in the preparatory period and 86 lifts in the competition period; small -- when there are fewer lifts in the week-cycle; large -- when there are more lifts in the week-cycle. So, in order to change the intensity of the week's loading, it is sufficient to change the number of lifts with high intensity in the fundamental exercises (the snatch and the clean and jerk exercises, clean pulls and squats). The intensity of the loading in the individual exercises is regulated in the same way.

As already mentioned, the more the athlete executes the snatch and the clean and jerk exercises (with 70% weights and

more), the greater the increase in results. The number of lifts with 80% and more has an even closer connection with results, and finally, the quantity of lifts with 90% and more has the greatest connection with results. Therefore, one should pay particular attention to planning lifts of submaximum and maximum (90% and more) weights in the snatch and the clean and jerk exercises.

So, it is sufficient for low-class athletes (along with lifts of moderate and large weights) to do a small quantity of lifts of submaximum and maximum weights in the snatch and the clean and jerk exercises, for continuous improvement in results. It is necessary for the qualified athlete to execute as many of these lifts as possible, in order to make constant improvement. This is why it is necessary, already in the preparatory period, to model forthcoming competition activities; and consequently, to include the snatch and the clean and jerk exercises not only with large, but with submaximum and maximum weights (figure 24). It is necessary to remember, that the primary objective of training is to lift as much weight in the snatch and the clean and jerk as one can.

The number of lifts of submaximum and maximum weights in the individual exercises, for each weight class, are presented in tables 2-4. The heavier the weight class, the fewer the average number of these lifts in the snatch and the clean and jerk exercises. However, the fewer lifts by athletes in the heavier weight classes yields the same effect on the improvement of results.

Naturally, if the athlete is able to cope easily with the loading presented in figure 24, the quantity of lifts with submaximum and maximum weights can be increased; and vice versa, decreased somewhat if the athlete is unable to cope with the loading; but the number of lifts should remain the same, so that improvement will take place. Consequently, the number of lifts of submaximum and maximum weights should be optimal for each athlete at each stage of his training. Significantly exceeding the optimal number of lifts of submaximum and maximum weights in the snatch and the clean and jerk exercises can lead to over-

fatigue and a decrease in results. In this instance, even if the athlete has achieved excellent sporting form, he cannot demonstrate high results in competition because his body has not had time to recuperate after a large amount of high intensity work. The athlete will not achieve the necessary sporting form if he executes an insufficient quantity of such lifts.

How should one distribute the submaximum and maximum lifts in the snatch and the clean and jerk exercises? The general quantity of the snatch and the clean and jerk exercises are distributed up to weeks 4 or 3 (if one is planned as a recuperation week) in the preparatory month. Submaximum and maximum lifts basically are planned for the first 3 weeks of the competition month. If the athlete competed in the last week of the preceding month then the number of such lifts in the month's training is decreased somewhat and are included in a small quantity in the first week or excluded altogether. Up to 35% of the submaximum and maximum lifts planned for the month in the snatch and the clean and jerk exercises can be executed during the third week. A further increase in these lifts during this week is permissible, only in the snatch exercises. An increase in the clean and jerk exercises can be planned for no later than the second week.

When planning submaximum and maximum lifts in the snatch and the clean ad jerk exercises one needs to take into account, that not all athletes (especially heavyweights) can lift 97.5-100% weights in training; although they can lift over 100% in competition. One has to plan lifts of 90-95% for these athletes. The time lag after which one last executes submaximum and maximum lifts, depends on the athlete's weight class and his individual ideosyncracies. So, the lighter athlete lifts these weights later. All athletes require more time to recuperate after the clean and jerk than after the snatch.

90-92.5% weights are lifted in the snatch exercises from 5-9 days, 95-97% -- from 6-12 days and 100%-and-more from 7-15 days before a competition. 90-92.5% weights are lifted in the clean and jerk exercises from 5-13 days, 95-97% from 7-15 days and 100%

and more from 9-18 days before a competition.

An increase in the intensity of the physical and psychological loading, implemented by the execution of a large quantity of large, submaximum and maximum lifts, can cause overtraining. It is necessary to include lifts with only moderate and small weights in each week-cycle, in order to avoid overtraining. It is desirable that the "shock" training (a large volume and intensity of loading) in the competition month be executed on the same day as the competition, during the week-cycle. Of no small importance to a successful performance in competition is how the athlete distributes the lifts with maximum weights in squats and clean pulls. The number of lifts in squats and pulls is given in tables 5 and 6.

Plan for the general quantity of maximum lifts in squats and clean pulls to be distributed in weeks 4 or 3 (if one of them is planned as recuperation) of the preparatory month. Approximately 94% of squats planned with maximum weights are executed in the first 3-weeks; and 6% during the last week of the competition period. The number of maximum lifts in clean pulls is gradually decreased from the 1st to the 3rd week (but this number does not vary by weeks, as in the other exercises): approximately 36% in the 1st week, 33% in the 2nd, and 31% of the number planned for the month, in the 3rd week. No clean pulls with maximum weights are executed in the 4th week.

Squats with 100-107.5% are executed from 6-10 days; 110-117.5% from 8-12 days and 120% and more from 10-16 days before a competition. Clean pulls with 100-107.5% are done 8-12 days, 110-117.5% from 9-15 days and 120% and more from 11-19 days before a competition. Athletes in the lighter weight classes lift maximum weights in squats and clean pulls later (closer to the day of competition, Ed.) than athletes in the heavier weight classes.

Planning the Training of Beginners

The beginner should only do the snatch and the clean and jerk exercises, squats and the bench press in training. The ratio of the exercises is the same for both the preparatory and

Variants	Loading								
	% of month Vol.				# of Lifts				
	Weeks								Month's Loading
	1-я	2-я	3-я	4-я	1-я	2-я	3-я	4-я	
Preparatory Period									
4—2	21	28	17	34	210	280	170	340	1000
3—1	27	18	32	23	338	225	400	287	1250
2	20	35	27	18	300	525	405	270	1500
1—3	32	19	27	22	528	314	445	363	1650
2—4	22	33	18	27	418	627	342	513	1900
2	23	32	26	19	483	672	546	399	2100
1	31	27	23	19	775	675	575	475	2500
Competition Period									
1	36	28	24	12	270	210	180	90	750
3—1	29	25	35	11	261	225	315	99	900
2	28	33	26	13	336	396	312	156	1200
1—3	32	26	29	13	480	390	435	195	1500

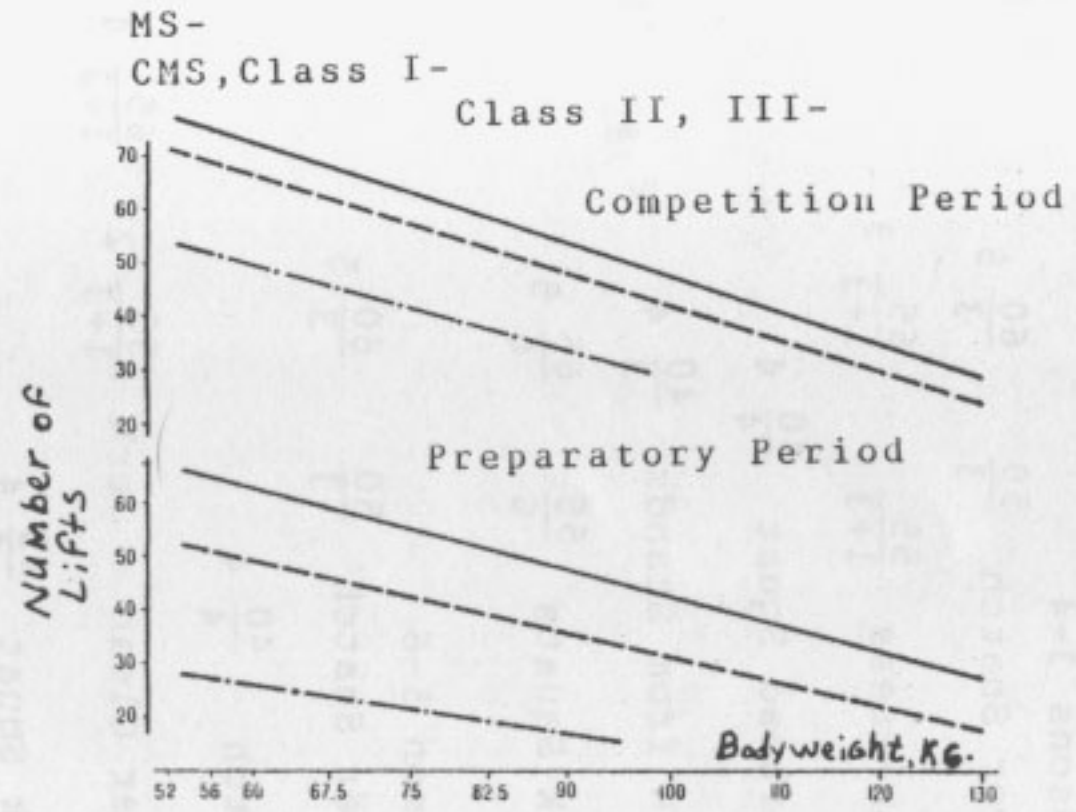


Figure 24. The mean number of submaximum and maximum lifts for the month in the snatch and the clean and jerk exercises:

Table 13. The distribution of the month's loading, by week-cycles

Initial results (taken from 100%) in the fundamental exercises, for determining the amount of weight for beginners*

Table 14.

Bodyweight kg.	Age, yrs.	Results, kg — Exercise: Snatch	C+J	Push Jerk	Bench Press	Squat
52	16	42	52,5	44,6	36,7	65,6
	17	45	56,2	47,8	39,3	70,2
56	16	45,5	57,7	49	40,4	72,1
	17	48,7	61,9	52,6	43,3	77,4
60	16	49	63	53,5	44,1	78,7
	17	52,5	67,5	57,4	47,2	84,4
67,5	16	54,2	70	59,9	49	87,5
	17	58,1	75	63,7	52,5	93,7
75	16	59,5	75,2	63,9	52,6	94
	17	63,7	80,6	68,5	56,4	100,7
82,5	16	63	80,5	68,4	56,3	100,6
	17	67,5	86,2	73,3	60,3	107,7
90 и and More	16	66,5	84	71,4	58,8	105
	17	71,2	90	76,5	63	112,5

*Use the best clean and jerk for the 100% of the overhead squat and the lunge with the barbell on the chest.

competition periods, and is approximately: snatch - 20%, cleans - 13, jerks - 12, front and back squats - 30, other squats - 18% and bench press - 7% of the total volume.

The workouts of the 1st training cycle can look like this:

September

Lessons 1-2

Power Clean $\frac{55}{3}$* $\frac{65}{3}$ 5

Push-Press $\frac{55}{1+3}$** $\frac{65}{1+3}$ 5

Back Squat $\frac{50}{5}$ $\frac{60}{4}$ 5

Lunge (Bar on chest) $\frac{40}{5}$ 3

* - the numerator is the weight in %; the denominator is the number of repetitions and the multiplier of the fraction signifies the number of sets.

** - 1+3 in the denominator signifies 1 clean plus 3 push-presses.

Lessons 3-4

Power Snatch $\frac{50}{3}$ $\frac{60}{3}$ 5

Push-Press $\frac{55}{1+3}$ $\frac{65}{1+3}$ 3

Overhead Squat $\frac{40}{4}$ 4

Jerk from Stands $\frac{40}{3}$ 4

Back Squats $\frac{55}{6}$ $\frac{65}{6}$ 5

Lesson 5-6

Power Snatch $\frac{50}{3}$ $\frac{60}{3}$ 5

Snatch $\frac{40}{4}$ 4

Power Clean + Jerk $\frac{55}{1+3}$ 2 $\frac{65}{1+3}$ 4

Back Squat $\frac{65}{6}$ 4

Bench Press (wide hand spacing) $\frac{60}{5}$ 3

Lunge (bar on chest) $\frac{40}{4}$ 4

Lessons 7-8
Power Clean $\frac{65}{4}$ 4

Snatch $\frac{55}{3}$ 2 $\frac{60}{3}$ 5

Back Squat $\frac{70}{5}$ 6

Jerk from Stands $\frac{40}{3}$ 3

Overhead Squats $\frac{40}{4}$ 4

Lessons 9-10
Power Snatch $\frac{65}{4}$ 5

Clean (Squat or Split) $\frac{55}{3}$ $\frac{65}{3}$ 3

Power Clean + Jerk $\frac{70}{1+3}$ 3

Back Squats $\frac{70}{5}$ 4

Bench Press (Narrow hand spacing) $\frac{65}{5}$ 5

Lunge (Bar on chest) $\frac{50}{5}$ 3

Lessons 11-12
Snatch $\frac{55}{2}$ $\frac{60}{3}$ $\frac{65}{4}$ 5

Overhead Squat $\frac{50}{5}$ 4

Jerk from Stands $\frac{60}{2}$ $\frac{70}{2}$ 4

Front Squat $\frac{50}{7}$ $\frac{60}{6}$ 4

Include exercises employing a metal pole which imitates the snatch and the clean and jerk technique, at the end of each work-out. If the beginner cannot execute a squat snatch or a squat clean, he should learn the "split" style. Afterwards (from 6-months to a year) if the athlete can do the squat style, he should switch to this method.

The distribution of the loading in September (1,150 lifts), by weeks, will be as follows: 1st week -- 262 lifts, 2nd -- 324, 3rd -- 288, 4th -- 276 lifts.

October

One has to repeat lessons 7, 8 and 9 in the first week and 10, 11 and 12 (this will be lessons 13-18) in the second. A new cycle can begin starting with the third week.

Lessons 19-20

Power Snatch $\frac{60}{3}$ $\frac{65}{3}$ 5

Lunge (bar on chest) $\frac{60}{6}$ 4

Clean and Jerk $\frac{60}{3+1}$ 3 $\frac{70}{1+3}$ 3

Back Squat $\frac{70}{6}$ 6

Bench Press (wide hand spacing) $\frac{65}{6}$ 4

Lessons 21-22

Power Clean $\frac{65}{5}$ 4

Snatch $\frac{50}{3}$ $\frac{60}{3}$ $\frac{65}{3}$ 6

Overhead Squat $\frac{50}{6}$ 3

Push-Jerk (from stands) $\frac{60}{5}$ 4

Front Squat $\frac{60}{6}$ 5

Lessons 23-24

Power Snatch $\frac{60}{4}$ $\frac{70}{4}$ 4

Clean (Squat or Split) $\frac{60}{4}$ 4

Overhead Squat $\frac{50}{6}$ 3

Jerk from Stands $\frac{55}{3}$ $\frac{65}{3}$ 3

Back Squat $\frac{60}{4}$ $\frac{70}{5}$ 7

The distribution of loading in October is: 288 lifts in the 1st-week, 276 -- 2nd, 364 -- 3rd and 322 in the 4th-week.

November

October's training cycle needs to be repeated, but the loading in weeks one and three are reduced by 25 lifts. The distribution of the months loading (1,200 lifts) now will be: 263 lifts in the 1st week, 276 -- 2nd, 339 -- 3rd and 322 lifts in the 4th.

December

The athlete should enter a competition at the end of the month and in order to do this, it is necessary to ascertain his readiness. Additional lifts (a small quantity) with large weights are included in the snatch and the clean and jerk. This is now a sample plan of how a week-cycle will look:

Monday

Snatch $\frac{60}{3}$ $\frac{70}{3}$ 2 $\frac{80}{2}$ 2 $\frac{85}{1}$ 2

Overhead Squats $\frac{50}{5}$ 4

Power Clean $\frac{60}{3}$ $\frac{70}{3}$ $\frac{80}{3}$

Back Squats $\frac{65}{4}$ $\frac{75}{5}$ 5 (75 lifts for the whole workout)

Wednesday

Power Snatch $\frac{55}{4}$ $\frac{65}{4}$ $\frac{75}{4}$

Clean and Jerk $\frac{55}{2+2}$ $\frac{65}{2+2}$ $\frac{75}{2+2}$ $\frac{85}{2+2}$ 3

Back Squats $\frac{65}{4}$ $\frac{75}{4}$ 4

Bench press (narrow hand spacing) $\frac{70}{5}$ 4

Lunge (bar on chest) $\frac{60}{6}$ 3 (94 lifts for the whole workout)

Friday

Power Clean $\frac{60}{4}$ $\frac{75}{4}$ 3

Overhead Squat $\frac{50}{4}$ 4

Push-Jerk (from Stands) $\frac{65}{4}$ $\frac{75}{3}$ 3

Front Squat $\frac{60}{6}$ $\frac{70}{6}$ 5 (81 lifts in the workout)

This training cycle can be employed during the month; but the exercises are modified and the volume of loading are varied somewhat. The volume of the month's loading can be distributed, by weeks, in the following way: 250 lifts in the 1st-week, 300 -- 2nd, 250 -- 3rd and 200 lifts in the 4th. Later-on (in the 2nd and 3rd training cycles) the volume of loading in the preparatory and competition months can be distributed into week-cycles like this: preparatory month (1,100 lifts), 275 -- 1st, 310 -- 2nd, 250 -- 3rd and 265 lifts -- 4th; competition month (900 lifts) -- 240, 300, 210 and 150 lifts respectively.

It is not difficult to plan a week's training for a beginner, during this period. The volume of loading is distributed such that the maximum number of lifts occur in the first workout (which usually begins after a two-week lay-off) and the minimum loading is in the second workout -- after the large loading. For

example, the distribution of the loading (275 lifts) in the first week of the preparatory month can be: Monday -- 110, Wednesday -- 75 and Friday -- 90. The figures for the second week (310 lifts) are 120, 90, 100 respectively.

It is very important to select the optimum training weight for beginners. However, a beginner's maximum results are as yet unknown, because the athlete does not possess proper technique. One can determine the amount of weight with which the beginning lifter should train during the first 3-4 months, in the following way (table 14).

The results given in the table are calculated with the assumption that the strength potential of 16-year-old beginners is approximately 70% and that of 17 year olds is 75% of the Class III norms. Since the athlete initially does not lift large weights but trains with minimal, small and moderate weights, the loads will always be within his abilities. After the first competition, the maximum results in the snatch and the clean and jerk are calculated from the competition results. Use the same data for calculating the other exercises. It has already been mentioned that the main objective of the beginner is to learn and to perfect technique; therefore, the aforementioned plan can be employed for beginners of any preparedness.

Planning the Training of Low-Class Athletes

In practice, an aresnal of means and methods, normally employed by qualified athletes, is often used for the preparation of low-class athletes. However, the level of functional preparedness and the physical development of even 17-18 year old low-class weightlifters is significantly different from that of the qualified lifter. Therefore, the objectives and the training methods of the low-class athlete should also be different.

The low-class athlete should elevate his technical mastery to perfection and prepare the support-motor apparatus for the specifics of lifting a barbell in the snatch and the clean and jerk. The fundamental task during this period is to develop flexibility (mobility) in the shoulder, knee and ankle joints. The athlete must have a coordinated and stable squat position; he

should strengthen the elbow and shoulder joints in those positions which are characteristic of the snatch and the clean and jerk. Therefore, the snatch and the clean and jerk exercises, the front and the back squat, overhead squats and the wide-grip-press-behind-the-head, are the fundamental exercises for the low-class athlete.

It is known, that out of all the barbell exercises which are employed in training, maximum loading in pulls (especially clean pulls) can have a negative influence on the support-motor apparatus. Furthermore, since pulling strength is developed sufficiently in the low-class athlete, from the power snatch and the power clean, it is not necessary to include pulls in the workouts of the low-class athlete.

Let's look at planning the training of the low-class athlete. The training for the 2nd cycle is planned such that 1,250 lifts are planned for the preparatory period (the 4th month) and 900 for the competition period (the 5th month). An athlete in the 75 kg class has the following results: 90 kg snatch and 115 kg clean and jerk. The results planned for the end of the 4th month are: 92 kg in the snatch and 117 kg in the clean and jerk; while the figures for the 5th month are: 94 and 119 kg respectively. It is not difficult to distribute the volume of loading into weekly cycles. The variant selected (see table 13) determines the number of lifts that should be executed in each of the four weeks.

Since the athlete begins training in the 2nd-cycle, after a competition, the variant with a small volume in the first week, will be appropriate for him. The second variant (20, 35, 27 and 18%) is selected (see table 13). The loading is small at the end of the preparatory month, therefore, one can employ any variant in the competition month. If the 1st variant (36, 28, 24, and 12%) is selected, the loading will be distributed so: in the preparatory month -- 250 lifts - 1st week, 437 - 2nd, 338 - 3rd and 255 - 4th; in the competition period -- 324, 252, 216 and 108 lifts respectively.

Improvements in the snatch and the clean and jerk are uniform, therefore, the distribution of the exercises in training can be the same as shown in table 11. The number of lifts in the individual exercises, during the preparatory month, will be: snatch -- 125 lifts, other snatch exercises -- 125, classic clean -- 94, other cleans -- 119, classic jerk -- 94, other jerks -- 44, front and back squats -- 337, other squats -- 187 and pressing exercises -- 125; in the competition month the figures are 90, 90, 68, 85, 68, 31, 243, 135 and 90 lifts.

Now, in order to plan the intensity, the training weight in the fundamental intensity zones and the number of lifts in each of the fundamental exercises (table 15), remains to be determined. The planned snatch result at the end of the preparatory period (taken from 100%), is 92 kg. Consequently, in the snatch exercises the athlete should lift: 65-70 kg in the 70-79% zone of intensity, 72.5-80 kg in the 80-89% zone and 82.5 kg and more in the 90% and more zone. The planned result in the clean and jerk at the end of the preparatory month (taken from 100%), is 117 kg. Consequently, in the clean and jerk exercises, the front and back squat, the athlete should lift: 82.5-90 kg in the 70-79% zone, 92.5-102.5 kg in the 80-89% zone 105-115 kg in the 90%-and-above and 117.5 and more in the 100%-and-above zone.

Calculate the amount of weight for each zone of intensity, then enter the necessary number of lifts in these zones for the snatch, the clean and jerk exercises, the front and the back squat (this data is available in tables 2-4 and 6). The training weight for low-class athletes in the wide-grip press-behind-the-head and in other types of squats is 35-55% of the limit clean and jerk; furthermore 50-70% of the limit clean and jerk is employed in the clean-grip bench press. After planning the program for the month, plan the training by week-cycles.

Plan 20% of the month's loading for the first week of the preparatory month, 35% for the 2nd, 27% - 3rd and 18% for the 4th. Well then, of the 159 lifts in the snatch exercises with less than 65 kg, planned for the month, 32 can be planned for the 1st week, 56 - 2nd, 43 - 3rd and 28 lifts for the 4th (see table

15). Lifts with 90%-and-more in the snatch, the clean and jerk exercises, and 100%-and-above in squats are not planned for the 1st week; because the athlete competed in the last week of the preceding month. They can be included in the second week where there is a large volume and intensity of loading. Now the number of lifts with 90%-and-above in the snatch exercises will be 5 in the 2nd week, 3 - 3rd and 2 in the 2nd. The distribution of loading in the week-cycles is the same for the other exercises. The athlete can execute 38, 65, 50 and 34 lifts in other types of squats (20, 35, 27 and 18% of the month's loading) and 25, 44, 34 and 22 lifts in press exercises.

This type of plan ensures variability, not only in the volume, but also in the intensity of the loading. For example, the loading in the 3rd week will be moderate for the given month (27%) in both the volume and intensity; since the loading includes approximately 1/4 of all the lifts, lifts of high intensity, with weights of 70-79%, 80-89%, 90%-and-more in the snatch and the clean and jerk exercises; and weights of 100%-and-above in squats. Naturally, the more one executes such weights, the higher the intensity. Plan 40 of these lifts in the first week, 101 in the 2nd and 47 in the 4th. Well then, the loading in the 1st week will be of a small intensity, large in the 2nd, 3rd -- moderate and small in the 4th.

So, with the selection of the weekly distribution variant of the month's loading and the determination of its percentage ratio, one can determine the variability of the intensity for each week. The variation of the weekly intensity in the aforementioned preparatory month is expressed by the ratio 20:35:27:18; with the additions (the maximum lifts from the 1st week are transferred to the 2nd) the ratio is 16:39:27:18.

The month's volume of loading and the number of high intensity lifts is relatively small for the low-class athletes. Therefore, for these athletes, even with a significant variability of loading (when the distribution of the intensity coincides with the distribution of the volume), the number of high-intensity lifts will always be feasible. With respect to this,

it is not necessary to plan the intensity of the month's loading by week-cycles in different directions. After planning the distribution by weeks, plan the individual workouts. The week's loading for the low-class athlete can be planned differently; however, there should not be more than two large volume workouts (over 100 lifts) in one week. Consider the loading in the 2nd week which is maximum in volume and intensity.

The 450 lifts planned for the week (with additions) can be distributed in the following way: Monday -- 130 (large loading), Tuesday -- 40 (small), Wednesday -- 95 (moderate), Friday -- 135 (large) and Saturday 50 lifts (small). It is this "shock" training (130 lifts on Monday and 135 on Friday) that secures the further development of the organism, its trainability; and, consequently, the improvement of results. The spasmodic character of the training load gives the athlete the opportunity to rest and recuperate after a significant amount of work. It is with respect to this that the general loading in the 2nd week-cycle is rather significant in both volume and intensity, so the last workout of the first week and the first workout of the 3rd should be small.

After distributing the volume by days of the week, ascertain the contents of each workout, select the necessary exercises and determine their quantity (table 16). In doing this, take into consideration that half of the general number of lifts in the snatch exercises should be in the snatch; approximately 44% of the cleans and 68% of the jerks should be executed in the classic style.

When the loading for each exercise in each workout has been designated, distribute the high intensity lifts which have been planned for this week. Now one has a complete representation of the contents of each workout in the week's training plan. It is necessary to bear in mind when planning training that the largest training weight for low-class athletes in the preparatory period should be 90-95% in the snatch exercises and 90-92.5% in the clean and jerk exercises.

The distribution of lifts by zones in the fundamental exercises; class III, 75kg class. Table 15.

Exercise / week. of month	Zones of intensity				
	менее 70%	70—79%	80—89%	90% и более	100% и более and more
	(kg) Weight of the barbell				
	менее 65 Less	65—70	72,5—80	82,5 и более and more	
Snatches	159	50	31	10	
1-я (20%)*	32	10	6		
2-я (35%)	56	18	11	5	
3-я (27%)	43	13	8	3	
4-я (18%)	28	9	6	2	
	менее 82,5	82,5—90	92,5—102,5	105 и более	117,5 и более
Cleans	135	42	30	6	
1-я (20%)	27	8	6		
2-я (35%)	48	15	10	3	
3-я (27%)	36	11	8	2	
4-я (18%)	24	8	6	1	
Jerks	87	28	19	4	
1-я (20%)	17	6	4		
2-я (35%)	30	10	7	2	
3-я (27%)	24	7	5	1	
4-я (18%)	16	5	3	1	
Front and Back Squats	83	67	67	84	36
1-я (20%)	17	13	13	17	
2-я (35%)	29	24	24	29	20
3-я (27%)	22	18	18	23	10
4-я (18%)	15	12	12	15	6

* The distribution of the loading, by week-cycles, is indicated in the parentheses.

The distribution of the week-loading by workouts; Class III, 75kg weight class. Table 16.

Exercise	Number of lifts by week-days					whole week
	Mon.	Tues.	Wed.	Fri.	Sat.	
	130	40	95	135	50	450
Snatch		20 (4—9—0)*		25 (6—2—5)		45
Power Snatch	12		11 (8—0—0)	13	9	45

In this and the following tables the figures in parentheses indicate the number of lifts in the snatch and c + j exercises with 70-79%, 80-89%, 90%-and more; and 100%-and-more in Squats.

Table 16 Cont.

Exercise	Number of lifts by week-days Mon.	Tues.	Wed.	Fri.	Sat.	whole week
	130	40	95	135	50	450
Classic Clean	20 (4—4—2)		14 (3—6—1)			34
Other Cleans				16 (4—0—0)	26 (4—0—0)	42
Classic Jerks	20 (4—4—2)				14 (3—3—0)	34
Other Jerks			15 (3—0—0)			15
Front and Back Squats	29 (10)	21	35 (5)	41 (5)		126
Other Squats	25		20	20		65
Pressing Exercises	24			20		44

Table 17.
Distribution of lifts by zones of intensity in the fundamental exer.; Compet. month; class III, 75kg class

Exercise / Month	Zones of Intensity: менее 70%	70—79%	80—89%	90% и более	100% и более
	Weight of Barbell (kg): менее 65	65—72,5	75—82,5	85 и более	
Snatches	99	37	24	20	
1-я (36%)	36	13	9	7	
2-я (28%)	27	10	7	6	
3-я (24%)	24	9	5	2	
4-я (12%)	12	5	3	2	
	менее 82,5	82,5—92,5	95—105	107,5 и более	120 и более
Cleans	87	38	18	10	
1-я (36%)	31	14	6	4	
2-я (28%)	24	11	5	3	
3-я (24%)	21	9	4	3	
4-я (12%)	11	4	3		
Jerks	53	23	13	10	
1-я (36%)	19	8	5	4	
2-я (28%)	15	6	4	3	
3-я (24%)	13	5	3	3	
4-я (12%)	6	4	1		
Squats	48	49	49	61	36
1-я (36%)	17	17	17	22	13
2-я (28%)	13	14	14	17	10
3-я (24%)	12	12	12	15	9
4-я (12%)	6	6	6	7	4

It isn't necessary to execute exercises like the overhead squat and the press-behind-the-head separately; they can be combined with the power snatch or with the snatch; executed sequentially (without lowering the barbell) -- snatch, press-behind-the-head and squat.

Now let's turn to planning the training for the competition month. The number of lifts for the month, in the various exercises, has already been determined. The volume of loading by week-cycles has been determined. The training weights in the fundamental intensity zones have as yet to be determined. The planned results in the snatch at the end of the competition month is 94 kg (which is considered 100%). Consequently, in the snatch exercises the athlete should lift: 65-72.5 kg in the 70-79% zone of intensity, 75-82.5 kg -- 80-89%, 85 kg-and-more in the 90%-and-more zone. The planned result in the clean and jerk is 119 kg at the end of the month. Consequently, in the clean and jerk exercises and squats the athlete should lift: 82.5-92.5 kg in the 70-79% zone, 95-105 kg -- 80-89%, 107.5-117.5 kg -- 90%-and-more, 120 kg-and-more in the 100%-and-more zone.

Now let's see how many lifts the athlete should do in each of these zones for each of the fundamental exercises (table 17), with respect to the data in tables 2-4 and 6; the lifts are distributed into week-cycles according to the same variant as the volume of loading (36, 28, 24% and 12%). The first week will have a high intensity where 36% of the general quantity are high intensity lifts (83 lifts); fewer in the 2nd week (28%, 65 lifts), moderate in the 3rd (24%, 55 lifts) and small in the 4th (12%, 26 lifts).

Let's turn to planning the loading in the 3rd and 4th weeks. The volume of loading in these weeks (216 and 108 lifts) can be distributed in the following way: 3rd-week, Monday - 36, Wednesday - 70, Friday - 25, Saturday - 85 lifts; 4th-week, Monday - 60, Wednesday - 30 and Friday - 18 lifts; Sunday -- competition. Now we can designate the exercises to be done in each workout, the general quantity of lifts and the high intensity lifts (table 18).

The athlete should completely verify his readiness for competition. During the last two weeks, he should execute maximum lifts in the snatch and the clean and jerk. After these "control" lifts, it is necessary for him to recuperate for the competition so that he can exceed his training results. Therefore, it is obligatory that one execute a small volume (approximately 11-14% of the month's volume) of a low intensity, the last week preceeding the competition.

In order to correctly plan the loading for the final weeks, begin by designating when the athlete executes the maximum lifts in the snatch and the clean and jerk (full lifts). One can do this in the 3rd week: in the clean and jerk -- on Wednesday (11-days before the competition) and in the snatch -- on Saturday (8-days before the competition). All of the 90%-and-more lifts in the clean and jerk exercises the 3rd-week are switched to Wednesday and those planned for the snatch are done on Saturday. The two 90%-and-more lifts planned for the 4th-week (when the high intensity loading is distributed, see table 17) can be switched to the 3rd-week and they can be done on Monday with the 90% (85 kg) lifts.

It is easy to plan the workouts for each week when one designates "full lifts". Approximately one-half of the snatch exercises, 44% of the cleans and 68% of the jerks should be executed in the classic style during the preparatory month. This, of course, is not to say that such a ratio of classic and other exercises should be maintained with absolute precision in each week-cycle. The proportion of "classic" lifts can be somewhat larger one week, and somewhat less than the aforementioned magnitudes another week; but on the whole, this ratio should be maintained throughout the month's training.

The plan for the workouts in the 3rd and 4th weeks can appear so:

3rd-Week

Monday

Snatch -- *50x3x1; 60x3x1; 70x3x1; 80x2x1; 85x1x2; 80x1x1.

* - Designates weight in kilos.

Distribution of week-loading by workouts in the Competition Month; Class III, 75kg Class.

Table 18.

Exercise	Number of lifts by days				Whole Week
	Mon.	Wed.	Fri.	Sat.	
3rd-week	36	70	25	85	216
Snatch	14 (3—3—2)			13 (3—2—5)	27
Oth. Snat.		7		9	16
Classic Cleans		19 (4—3—3)			19
Other Cleans	8 (1—0—0)			10 (4—1—0)	18
Classic Jerks		19 (4—3—3)			19
Other Jerks	5 (1—0—0)				5

Table 18. cont.

Exercise	Number of lifts by days				Whole Week
	Mon.	Wed.	Fri.	Sat.	
3rd-week	36	70	25	85	216
Front and Back Squats	9	11	15 (3)	23 (6)	58
Other Squats		14		18	32
Presses			10	12	22
4th-week	60	30	18		108
Snatch		11 (5—3—0)			11
Oth. Snatch	3		8		11
Classic Cleans	14 (4—3—0)				14
Oth. Cleans			4		4
Classic Jerks	11 (4—1—0)				11
Squats	15 (4)	8	6		29
Oth. Squats	16				16
Presses		11			11

3rd-Week (con't)

Monday

Power Clean Plus Push-Jerk - $\frac{70}{4+2}$ $\frac{80}{3+2}$ $\frac{90}{1+1}$

Back Squat - 80x3x1; 90x3x1; 100x3x1.

Wednesday

Power Snatch + Overhead Squat - $\frac{55}{2+5}$ 2 $\frac{60}{3+4}$

Clean and Jerk - $\frac{60}{3+3}$ $\frac{70}{3+3}$ $\frac{80}{3+3}$ $\frac{85}{2+2}$ $\frac{90}{2+2}$ $\frac{95}{2+1}$ $\frac{105}{1+2}$

$\frac{115}{1+1}$ $\frac{120}{1+1}$

Back Squat - 80x3x1; 90x3x1; 100x3x1; 110x3x1.

Friday

Bench Press (clean grip) -- 60x3x1; 70x3x1; 80x2x2.

Front Squat - 80x3x1; 90x3x1; 100x3x1; 110x3x1; 120x3x1.

Saturday

Power Snatch + Press-Behind-Head + Overhead-Squat - $\frac{50}{3+4+6}$ $\frac{55}{3+4+6}$ 2

Snatch - 60x3x1; 70x3x1; 80x2x1; 85x1x2; 90x1x1; 95x1x2.

Power Clean - 75x5x1; 85x4x1; 100x1x1.

Back Squat - 75x3x1; 90x3x1; 105x3x1; 115x5x2; 125x3x2.

4th Week

Monday

Power Snatch + Overhead-Squat - $\frac{50}{1+6}$ $\frac{55}{1+5}$ 2

Clean and jerk - $\frac{75}{1+3}$ $\frac{80}{1+3}$ $\frac{85}{1+2}$ 2 $\frac{95}{1+1}$

Power Clean - 80x5x1; 90x2x1; 100x2x1.

Back Squat - 85x3x1; 95x3x1; 110x3x1; 115x2x1; 120x2x2.

Wednesday

Snatch + Press-Behind-Head - $\frac{50}{1+4}$ 2 $\frac{55}{1+3}$

Snatch - 65x3x1; 70x2x1; 80x1x3.

Back Squat - 80x3x1; 90x3x1; 105x2x1.

Friday

Power Snatch - 50x2x1; 60x2x3.

Power Clean - 80x2x2.

Front Squat - 80x3x1; 95x2x1; 105x1x1.

Planning the Training of Qualified Athletes

The Training of Class I and Candidates to Master of Sport

The loading planned for the preparatory and competition periods in the first training cycle, will be for a 56 kg athlete, whose results are: snatch -- 90 kg, clean and jerk -- 117.5 kg. The first training cycle consists of a three-month (1st-3rd) preparatory period, where the loading is sequentially raised -- 1,350, 1,500 and 1,650 lifts; and a two-month competition period (4th and 5th) with loadings of 1,200 and 1,000 lifts. The most important competition occurs at the end of the 4th-month; one of lesser importance is planned at the end of the 5th month. In addition to this, the athlete should compete in two competitions without special preparation -- at the end of the 3rd-week of the 2nd-month and in the middle of the 2nd-week of the 3rd-month.

Since the athlete begins training for competition after a transition month, it is appropriate to distribute the month's loading relatively uniformly by week-cycles. Variant 4-2 will be convenient for this month; here the loading increases from the 1st to the 2nd-week, then decreases. The maximum loading occurs in the 4th-week. In order to keep the loading more uniform, do not distribute it according to table 13 (21, 28, 17 and 34%); use less fluctuation (for example, 24, 26, 22 and 28%). Now the loading will be: 1st week -- 324 lifts, 2nd -- 351, 3rd -- 297 and 4th -- 378.

The maximum loading is planned for the last week of the first month; therefore, it needs to be distributed such that it is reduced in the first week-cycle. Besides this, the athlete should lift in a competition at the end of the 3rd-week. With respect to this, variant 2-4 will be the most appropriate; here the loading in the 3rd-week is minimal (22, 33, 18 and 27%). The loading in the 2nd-preparatory month will be: 1st week -- 330, 2nd -- 495, 3rd -- 270 and 4th -- 405 lifts. The month concludes with a moderate loading in the 4th-week (27%); therefore, one can select any week-cycle distribution variant of monthly loading.

The athlete should enter a competition at the end of the 2nd-week of the 3rd-preparatory month. Furthermore, it is desirable to conclude the rather prolonged preparatory period with a small loading in the last week of the 3rd-month. This will allow the sportsman to rest and recuperate, a little. Taking this into consideration, variant 3-1 (27, 18, 32 and 23%) will be the most appropriate variant. In this instance, the loading is: 1st week -- 446, 2nd -- 297, 3rd -- 528 and 4th -- 397 lifts. One can employ variant 2 (28, 33, 36 and 13%) in the competition period (while preparing for the most important competition and those following it). The monthly loading will be distributed so: 4th month, 1st week -- 336, 2nd -- 396, 3rd -- 312 and 4th -- 156 lifts; 5th month -- 280, 330, 260 and 130 lifts respectively.

Afterwards, the loading is planned sequentially for each month. Plan 1,350 lifts for the 1st-preparatory month. Let's assume that the athlete has difficulty recovering from the clean. Consequently he needs to do more squats in training. Increase the portion of squats (from 23% to 28%) by reducing the portion of snatch and clean pulls by 3 and 4% respectively (see table 11). Now the number of lifts for the month can be: 121 (9%) in the snatch, 149 (11%) in the other snatch exercises, 81 (6%) in the classic clean, 121 (9%) in the other cleans, 95 (7%) in the classic jerk, 68 (5%) in the other jerks, 378 (28%) in front and back squats, 40 (3%) in snatch pulls, 54 (4%) in clean pulls and 243 (18%) in other exercises (pressing, bend overs, other types of squats).

The athlete needs to devote more time to the jerk; therefore an additional 23 lifts can be added to this exercise, leaving 220 lifts for presses, bend overs and other types of squats. In order to plan further the loading in the week-cycles and the workouts it is necessary to determine the number of high intensity lifts (70%-and-more) in the fundamental exercises, which the athlete should execute during the given month.

The maximum number of high intensity lifts in each training cycle should occur in the last preparatory month. For example, this is an average of 378 lifts in the snatch and the clean and jerk exercises for Class I and CMS: of which 227 lifts are with 70-79%, 106 -- 80-89%, and 45 are with 90%-and-more. The volume of high intensity work is usually 30% less in the preceding preparatory month, comprising approximately 265 lifts (by zones of intensity -- 159, 74 and 32 lifts respectively). When the preparatory period is even longer (three instead of two months) the intensity of loading in the first month is approximately 40% less and averages 227 lifts; of which approximately 136 lifts (60%) are done with 70-79% and 91 lifts (40%) with 80-89%.

One can use tables 2-6 to determine the number of high intensity lifts for the 1st-preparatory month. The volume of high intensity loading in the last preparatory month is shown in these tables for Class I and CMS. For example, in the snatch exercises, athletes in the light weight classes (see table 2) will do 101 lifts with 70-79%, 55 lifts with 80-89% and 26 with 90%-and-more. If this quantity is taken as 100%, there can be an average of 61 lifts (60%) with 70-79% in the 1st-preparatory-month, 33 (60%) with 80-89% and 16 (60%) with 90%-and-more. Furthermore, since there are no 90%-and-more lifts planned for this month, there will be 49 (33 + 16) lifts in the 80-89% zone. There should be 55 cleans with 70-79% in the 1st-preparatory-month (tables 3 and 4) and 29 with 80-89%; the corresponding figures for the jerk are 49 and 23 respectively. The same calculations are done for high intensity work (100%-and-more) in squats and clean pulls; there should be approximately 47 and 14 lifts respectively.

Afterwards, calculate the training weight in the fundamental zones of intensity to determine the high intensity work; proceed

to the final planning of the week-cycles, then the individual workouts. Since the variability of the volume between the week-cycles is insignificant, the intensity can be distributed by weeks according to the same variant as the volume (24, 26, 22 and 28%).

One has to bear in mind the following when planning training. The number of lifts in the classic and the other snatch and the clean and jerk exercises are designated separately in tables 2-4. The quantity of classic lifts indicated (or close to it) is obligatory for the further improvement of results. At the same time, qualified lifters, owing to their individual peculiarities, employ the specific special-assistance snatch and the clean and jerk exercises. It is with respect to this that only the necessary number of the other snatch and the other clean and jerk exercises are shown in the tables. Each athlete, regardless of weight class, should do the number of lifts shown. The question as to what exercises are done at which stage in the athlete's preparation, should be decided by the coach. Therefore, the general quantity of pulls and squats are given in tables 5 and 6; the method of execution is determined individually for each athlete, by the coach.

Plan 1,500 lifts for the end of the 2nd preparatory month. The volume of loading is distributed according to variant 2-4 (22, 33, 18 and 27%). The loading was maximum in the last week of the 1-st month, that is why it is reduced in the 1st-week of the 2-nd month. Plan a moderate intensity for this week, in order to give the athlete a chance to recuperate. The maximum volume of loading for this month is employed in the 2nd-week, therefore a small intensity is appropriate for this period. The athlete is to compete in a competition at the end of the 3rd-week (on Sunday, for example), without special preparation, therefore one can plan a moderate intensity of loading for this week. The moderate volume of loading in the 4th-week can be combined with a high intensity. Well then, we see an opposite-directed planning of the volume and the intensity of the loading in the week-cycles. The volume of loading is distributed according to variant 2-4 (22, 33, 18 and 27%); and the intensity according to variant 4-1 (27, 15, 25 and 33%).

How should one plan in this instance? The volume of loading in the week-cycles is already known. Now one needs to determine the number of lifts in the exercises. It is possible for the athlete to make the same exercise distribution in this month as is the average for other athletes (see table 11), even without altering the number of classic jerks. This being the case, he should execute 300 lifts (20%) in the snatch exercises, 225 (15%) cleans, 180 (12%) jerks, 345 (23%) front and back squats, 105 (7%) snatch pulls, 75 (5%) clean pulls, and 270 (18%) lifts in the other exercises (presses, bend overs, other types of squats).

Now distribute the high intensity lifts in the fundamental exercises into week-cycles, by zones of intensity. Begin by determining the general number of lifts. As already indicated, it should be 70% of the lifts in the last preparatory month. Calculate this number from the tables 2-6. For example, the high intensity loading in the snatch exercises (see table 2) are 71 lifts with 70-79%, 38 -- 80-89% and 18 lifts with 90%-and-more. Now, without factoring in the weight class, determine the numbers by week-cycles. Since the volume of loading is distributed into week-cycles according to one variant and the intensity by a different variant -- the number of lifts with less than 70% is distributed according to the first, and the weights of 70%-and-higher -- according to the second (table 19).

The number of lifts with less than 70% weights in a month's training is determined by deducting the number of lifts with high intensity (71+38+18) from the general volume of loading in the snatch exercises (300). The athlete should execute 173 (300-127) lifts with less than 70% weights in the snatch exercises. The number of lifts in the clean and jerk exercises is determined in the same manner.

The number of lifts, by zones of intensity, in the squat exercises are determined in the following way. Since 20% of the general volume of squats (345) should be executed in the 70-79% and 80-89% zones, and 25% in the 90-99% zone; calculate the necessary quantity of lifts in these zones (69, 69, and 86 lifts respectively). Then determine (with table 6) the number of lifts

with 100%-and-more (it comes out to 61 lifts). All of the remaining lifts are done with less-than-70%.

Approximately 17% of the general number of clean pulls are done with 80-89% weights and 50% with 90-99%. With respect to this, begin by determining the number of lifts in these zones, then (using table 5) the number of lifts with 100%-and-more weights; finally, calculate the remaining lifts to be done with less-than-80%-weights. The maximum lifts (100%-and-more) in squats and clean pulls are determined for the week-cycles in the same way as the intensity; the remaining lifts in the same way as the volume.

The athlete can plan to snatch 100 kg and to clean and jerk 125 kg for that year (see table 7). His potential achievements in the snatch can be: 91.8 kg at the end of the 2nd month, 92.7 -- 3rd, 93.6 -- 4th, 94.5 -- 5th; the corresponding figures for the clean and jerk are 118.2, 119.5, 120.2 and 120.9 kg respectively.

Consequently, the athlete should lift in the snatch exercises (during the 2nd-month): 65-70 kg -- in the 70-79% zone, 72.5-80 kg -- 80-89%, 82.5 kg-and-more -- 90%-and-more zone; the corresponding figures for the clean and jerk exercises, squats and clean pulls are: 82.5-92.5 kg, 95-102.5, 105-115 and 117.5-and-more respectively. Proceed to plan each workout when the loading has been distributed by weeks. For example, the planned loading in the 2nd and 3rd weeks will be 495 and 270 lifts respectively (these are the maximum and minimum volumes in the given months).

The volume and intensity of the loading are different-directional in this month, the general number of lifts in the week-cycles (in each of the exercises, presented in table 19) will not conform to the prescribed distribution variant of the week-loading: in those weeks where there is a large portion of exercises with high intensity there will be more lifts and vice-versa. However, the general number of lifts in each exercise for the month, will on the whole, conform to the prescribed. Therefore, designate the contents of each week before planning each

workout. The following number of lifts is possible for the 2nd-week; in which there should be 33% of the month's volume of exercises (with a unidirectional distribution of the volume and intensity of the loading): 99 lifts in snatches, 74 -- cleans, 59 -- jerks, 114 -- front and back squats, 25 -- clean pulls, 35 -- snatch pulls and 89 lifts in the other exercises (presses, bend overs, other squats). The corresponding figures for the 3rd week (18% of the month's volume) are 54, 40, 32, 62, 14, 19 and 49 lifts, respectively. In actuality (see table 19) the 2nd-week's designations are: 77 lifts in the snatch exercises, 57 -- cleans, 45 -- jerks, 104 -- squats, 21 -- clean pulls; and for the 3rd-week -- 62, 47, 38, 65 and 15 lifts, respectively.

Since there are 67 fewer lifts in the fundamental exercises planned for the 2nd-week, how many lifts should one add to the other exercises? There are 25 more lifts in the fundamental exercises of the 3rd-week -- while there are 25 fewer lifts in the other exercises. There will be 35 lifts in snatch pulls, in the 2nd-week, 156 lifts (89+67) in pressing exercises, bend overs and others; the corresponding figures for the 3rd-week are 19 and 24 (49-25) lifts respectively. 70 lifts in pressing exercises are planned for the 2nd-week, 50 bend overs and 36 lifts in other types of squats; 24 lifts in push-presses (instead of the press) are planned for the 3rd-week.

The loading for the 2nd-week can be distributed: Monday -- 130, Tuesday -- 80, Wednesday -- 120, Friday -- 90 and 75 lifts on Saturday. The athlete competes at the end of the 3rd-week (on Sunday); therefore, 40 lifts are planned for Sunday and the remaining are expeditiously distributed in the following way: Monday -- 100, Wednesday -- 80 and Friday -- 50 lifts. The gradual reduction in the loading up until Sunday, enables the athlete to perform successfully in the competition. Submaximum and maximum lifts are planned for the Sunday competition.

Now the training exercises can be designated (the general number and the number of high intensity lifts) and each workout planned. One should adhere to those recommendations which are given in table 11 when determining the distribution of the classic

lifts.

Plan 1,650 lifts for the 3rd (the last) preparatory month; distribute the lifts by week-cycles, employing variant 3-1 (27, 18, 32 and 23%), or 446, 297, 528 and 379 lifts respectively. This volume of loading in the prepatory month should precede the competition month during which one is training for the most important competition. The volume and intensity of the loading in the fundamental exercises (for this period) is presented in tables 2-6 for Class I and CMS.

The intensity of the loading in the 3rd-month is distributed by week-cycles in the same way as the volume. Therefore, the loading in the fundamental exercises and snatch pulls (presented in these tables) as well as the month's loading planned for the other exercises (presses bend overs, etc.), of which there are 297 (18%) lifts, are distributed such that: in the lst-week the loading is 27%, 18% --2nd, 32% -- 3rd and 23% of the general volume in the 4th-week. Now the week's loading is distributed into workouts. The athlete enters a competition in the middle of the 3rd-week (on Thursday), without special preparation. To ensure a successful performance, the dynamics of the loading in the first two-weeks should be: lst-week, Monday -- 130 lifts, Tuesday -- 50, Wednesday -- 120, Friday -- 90, Saturday -- 56 lifts; 2nd-week, Monday -- 87, Tuesday -- 50, Thursday -- 40 (competition), Saturday -- 120 lifts. It is appropriate with this distribution of the volume, to include lifts with submaximum and maximum weights, only at the beginning of the lst-week -- on Monday and Wednesday; furthermore, it is desirable to exclude heavy lifts at the beginning of the 2nd-week.

The maximum volume and intensity of the 3rd-preparatory month, (32%), occurs in the 3rd-week. The athlete should execute 148 high-intensity lifts out of the 463 planned (with corrections for weight class). However, one can plan even a larger month's loading for Class I and CMS athletes -- up to 2,000 lifts, for the preparatory period. Consequently, this variant of week-loading distribution can contain up to 640 lifts (32%) in a week-cycle. If one plans to do 148-high-intensity-lifts in this week; the week's loading will present great difficulty.

How should one proceed in such instances?

First, tone it down somewhat by evening out the loading in the week-cycles according to variant 3-1: 520, 440, 560 and 480 lifts. In this instance the loading is not distributed as is shown in table 13 (27, 18, 32 and 23% of the month's volume); it is more uniform (26, 22, 28 and 24%). In unidirectional planning, the maximum week-volume for a 56 kg athlete, which is already 560 (instead of 640) lifts, will contain 130 (instead of 148) high-intensity lifts.

Second, the significant toning down of the volume between week-cycles, is in opposition to the alteration of the distribution variant of the intensity. This alteration is appropriate for all of the weeks. For example, the 2,000-lifts are distributed in week-cycles according to variant 3-1: 540, 360, 640 and 260 lifts (27, 18, 32 and 23%). Then the intensity (the number of high-intensity-lifts) is distributed according to the contrasting variant (1-3), in the following way: 23, 32, 18 and 27%.

As a result, there will be a minimum number of high intensity lifts (83) when the volume of loading for the week is maximum (640 lifts). Furthermore, the number of high intensity lifts is maximum (148), when the volume is minimal (360 lifts). The influence of the volume and intensity of the loading in the remaining week-cycles is toned down with this distribution. One can, for example, contrast the volume and intensity of the loading, only in the 2nd and 3rd weeks; they are unidirectional in the 1st and 4th weeks.

The high intensity lifts can be planned by making corrections for each weight class. For example, the data in tables 2-6, as already indicated, is calculated for the 60 kg weight class -- therefore, the athletes in the 67.5 kg class reduce the number of lifts, while those in the 52 and 56 kg classes increase the number of high intensity lifts. Naturally, there will be an intermediate number for light and middleweight lifters (also plan an intermediate number for the 90 and 110 kg classes). For example, it is necessary to reduce the number of lifts in the snatch exercises by 2-3 lifts in the 70-79% zone, for 67.5 kg athletes, by 4-5 in the 80-89% and by 2-3 lifts in the 90%-and-more zone (see table 2). The 67.5 kg athlete's bodyweight is 7.5 kg greater than the 60 kg; while the athlete in the lightest class is 8 kg lighter. Well then, the 52 kg athletes need to do the same amount, but the number of lifts in these zones is increased by one-half for the 56 kg lifters.

Now let's examine the training in the competition months. Class I and CMS execute an average of 328 high intensity lifts in the snatch and the clean and jerk exercises, during the competition month. This is 50 (13%) fewer lifts than are done in the preparatory month, which precedes the competition month. The figures, by zones of intensity will look like this: an average of 187 lifts with 70-79% weights (instead of 227 lifts), 91 (instead of 106) -- 80-89%, and 50 (instead of 45) with 90%-and-more.

One would think that the general quantity of work and the number of high intensity lifts is reduced. What can be done to increase results in the snatch and the clean and jerk in competition? If we examine the contents of training in the competition month, we can observe the following. Approximately 10% of a highly-qualified lifter's volume for the month are high intensity lifts, in the last week of the competition month (in the snatch and the clean and jerk exercises). On the average this means 22 lifts are with 70-79%, 10 -- 80-89% and 2-lifts with 90%-and-more. On the average, 4 squats with 100%-and-more (of the limit clean and jerk) are done in the last week of the competition month; which is about 6% of the month's loading of high intensity squats.

Well then, the fundamental, high intensity loading, is executed during the first three weeks of the competition month. For example, in the snatch and the clean and jerk exercises, the mean number of high intensity lifts a week (for Class I and CMS) would be: 55 lifts with 70-79%, 27 -- 80-89% and 16 lifts with 90%-and-more. The mean number of lifts for a week, during the preparatory month, by zones of intensity are: 59, 27 and 11 lifts respectively. So, the high-intensity loading is not reduced during the first three-week-cycles of the competition month. The high intensity loading is even increased slightly, because of a reduction in the number of lifts in the snatch and the clean and jerk exercises in the 70-79% zone of intensity (by an average of 4). Furthermore, the number of lifts in the 90%-and-more zone is increased (by an average of 5); while the same number of high-intensity lifts in clean pulls and squats are not planned for the 4th week, but appear in the 3rd week. If one takes into account that the amount of weight lifted in each zone of intensity is somewhat greater during the competition month, than in the preceding preparatory month; the athlete tries to lift not only 100% but

Distribution of lifts by zones of intensity in the fundamental exercises (prep. month); class I, 56kg class.

Table 19.

Exercise / Week of month	Zones of Intensity: менее 70% Less	70—79%	80—89%	90% и более	100% и более and more
	Weight of Barbell (kg)				
	менее 65	65—70	72,5—80	82,5 и более	
Snatches	173	71	38	18	
1-я (22,27%)*	38	19	10	5	
2-я (33,15%)	57	11	6	3	
3-я (18,25%)	31	18	9	4	
4-я (27,33%)	47	23	13	6	
	менее 82,5	82,5—92,5	95—102,5	105 и более	117,5 и более
Cleans	127	64	26	8	
1-я (22,27%)	28	17	7	2	
2-я (33,15%)	42	10	4	1	
3-я (18,25%)	23	16	6	2	
4-я (27,33%)	34	21	9	3	
Jerks	97	57	18	8	
1-я (22,27%)	21	15	5	2	
2-я (33,15%)	32	9	3	1	
3-я (18,25%)	18	14	4	2	
4-я (27,33%)	26	19	6	3	
Front and Back Squats	60	69	69	86	61
1-я (22,27%)	13	15	15	19	17
2-я (33,15%)	20	23	23	29	9
3-я (18,25%)	11	12	12	15	15
4-я (27,33%)	16	19	19	23	20
Clean Pulls			13	38	24
1-я (22,27%)			3	8	6
2-я (33,15%)			4	13	4
3-я (18,25%)			2	7	6
4-я (27,33%)			4	10	8

Distribution of lifts by zones of intensity in the fundamental exercises (competition month); class I, 56kg class

Table 20

Exercise / Week of month	Zones of intensity: менее 70% Less	70—79%	80—89%	90% и более	100% и более and more
	Weight of Barbell (kg)				
	менее 65	65—72,5	75—82,5	85 и более	
Snatches	89	80	52	31	
1-я (28%)	25	22	15	9	
2-я (33%)	29	27	17	10	
3-я (26%)	23	21	13	8	
4-я (13%)	12	10	7	4	
	менее 85	85—92,5	95—105	107,5 и более	120 и более
Cleans	66	64	32	18	
1-я (28%)	18	18	9	5	
2-я (33%)	22	21	11	6	
3-я (26%)	17	17	8	5	
4-я (13%)	9	8	4	2	
Jerks	68	55	30	18	
1-я (28%)	19	16	8	5	
2-я (33%)	22	18	10	6	
3-я (26%)	18	14	8	5	
4-я (13%)	9	7	4	2	
Squats	18	55	55	69	79
1-я (28%)	5	16	16	19	22
2-я (33%)	6	18	18	23	27
3-я (26%)	5	14	14	18	20
4-я (13%)	2	7	7	9	10
Clean Pulls			10	36	26
1-я (28%)			3	10	7
2-я (33%)			3	12	9
3-я (26%)			3	9	7
4-я (13%)			1	5	3

even heavier weights during the course of training; then obviously, the maximum intensity of loading takes place in the first three weeks of the competition month.

It has already been noted, that high results can only be achieved after a reduction in the volume of the loading and an increase (or maintenance) of the intensity. This is why the loading is reduced (from a mean 1,650 to 1,200 lifts) in the competition month. Basically, the exercises (presses, snatch pulls bend overs) are reduced, which do not have a direct affect on the results in the snatch and the clean and jerk. The number of lifts in the snatch and the clean and jerk exercises with less than 70% weights, are reduced. A reduction in the volume makes it possible to further improve speed-strength and other qualities, to preserve sporting form, to raise it, and to display the special-trainability to lift submaximum and maximum weights in the competition exercises. The minimum volume and intensity of the last week enables the athlete to fully recuperate and to realize the sport achievements in competition that were attained during the training period.

Plan 1,200 lifts for the competition month of the most important competition. This will be 450 (approximately 27%) fewer lifts than in the preceding preparatory month. The loading is distributed by week-cycles according to variant 2: 336, 396, 312 and 156 lifts; which is 28, 33, 26 and 13% of the month's loading. Since the loading in the week-cycles is reduced significantly (by comparison with the preparatory month), one can use the same variant, for distributing the high-intensity lifts. A moderate number of exercises (see table 11) is planned for the athlete; therefore, the general number of lifts in the fundamental exercises and the number of high-intensity lifts from the various zones of intensity can be calculated from table 2-6. Use: 93.6 kg for the snatch and 120.2 kg for the clean and jerk, as 100%, when distributing the weights by zones of intensity.

10% (an average) of the month's loading should be high-intensity-lifts in the snatch and the clean and jerk exercises, and 6% of the month's loading in squats; which works out to be: 16-lifts in the snatch exercises, 11 in cleans, 10 in jerks and 5-lifts in squats. If you look at table 20, you can see that these figures are: 5 more lifts in the snatch exercises, 3 in

cleans, 3 in jerks and 5 more lifts in squats. This is natural, because calculations showed 13% of the loading was high-intensity-lifts. Since there should not be an overloading of high-intensity lifts in the last week before a competition, the excess is transferred to the other weeks. Clean pulls with 100%-and-more are also excluded from the 4th-week.

There are 951-lifts in the fundamental exercises during the competition month. The remaining lifts (249) are distributed among exercises which are determined individually, for each athlete. For example, one can plan 30-lifts in pressing exercises, 60 snatch pulls, 60 hyperextensions and 99 other-types-of-squats. These exercises are distributed according to the same variant as the fundamental exercises (28, 33, 26 and 13%). The volume of loading in the week-cycles is already known. It is necessary now, to distribute the loading into workouts. It can look like this: 1st-week, Monday -- 80, Wednesday -- 110, Friday -- 90 and Saturday -- 56 lifts; 2nd-week (here it is appropriate to distribute the maximum volume and intensity into 5 workouts): Monday -- 85, Tuesday -- 50, Wednesday -- 105, Friday -- 90 and Saturday 66 lifts; 3rd-week, Monday -- 60, Wednesday -- 105, Friday -- 90 and Saturday -- 57 lifts; 4th-week, Monday -- 70, Wednesday -- 50 and Friday -- 36 lifts. One day is carried-over from the end of the 3rd week. The last workout before the competition is on Friday. The athlete competes two days (on Monday) later. One needs to plan correctly the times when the submaximum and maximum weights are lifted in the snatch and the clean and jerk exercises (especially during the last two weeks).

Four-lifts with 90-95% in the snatch can be planned during the 4th week; for an athlete in the 56 kg class. It is best to exclude cleans, and jerks with 90%-and-more (see table 20). It is better to do them in the 1st and 3rd weeks, instead. Now, the submaximum and maximum lifts in each week-cycle can be distributed in the following way: 1st-week, Monday -- 9 lifts in the snatch, Friday -- 6 cleans, and jerks; 2nd-week, Monday -- 4 lifts in the snatch (90-95%), Wednesday -- 6 lifts in cleans, and jerks, Saturday -- 6 lifts in the snatch; 3rd-week, Monday -- 3

lifts in the snatch (90%), Wednesday (12 days before the competition) -- 6 lifts in cleans, and jerks, Saturday (9 days before the competition) -- 6 lifts in the snatch; 4th-week, Monday -- 4 lifts in the snatch (90-95%). With this type of planning, maximum lifts are executed only on the 3rd or 4th day.

When the contents in each week-cycle are known, determine the dynamics of the loading in the workouts. Designate the times when submaximum and maximum lifts are done, and then plan each workout. Adhere to those recommendations given in table 11 when determining the portions of the classic lifts; just as in the preparatory month.

It is necessary for qualified athletes to plan the loading in the final week before a competition with more care, in order to ensure complete recuperation; and even, super-restoration of work-capacity on the competition day. Light-weights usually do the maximum intensity workout on the 3rd-day of the week. Their loading can be distributed so (for example, a Class I or CMS): 1st-day of the week -- the maximum volume (70 lifts), the intensity is below average; 3rd-day -- a moderate volume (50 lifts), maximum intensity; 5th-day -- minimum volume (36 lifts), moderate intensity; 6th and 7th days -- rest, 8th-day -- competition.

The middleheavyweights and the heavyweights frequently do the maximum intensity workout on the 1st-day of the week. Their loading can be distributed in the following way: 1st-day of the week -- a moderate volume (50 lifts), maximum intensity; 3rd-day -- maximum volume (65 lifts), below average intensity; 5th-day -- minimum volume (40 lifts), moderate intensity; 7-th day -- minimum volume (35 lifts), minimum intensity; 8th-day -- competition. This type of contrast-directional planning of the volume and the intensity is most appropriate; although other variants are possible. Each athlete should select the variant in the last week of training for a competition which works best for him.

Let's assume that at the end of the preceding month (April, for example) the sportsman enters a competition and has the following results: 95 kg -- snatch, 120 kg -- clean and jerk (the anticipated results were 92-95 kg and 120 kg). The most important competition is scheduled for the end of the next month (May, for example) and the athlete once again must perform in an

important competition. It is necessary to know how to best prepare for this competition. What are the contents of training so that the athlete is able to perform well.

The athlete should take an obligatory, brief 3-day rest after the competition (April 30, May 1-2); he can resume training only on the 4th day (May 3). Since the athlete has spent 4-months in training, the culmination of which is a competition; plan 1,000 lifts for May and distribute them into week-cycles according to variant 2 (28, 33, 26 and 13%). This comes-out to 280, 330, 260 and 130 lifts. Naturally, the volume (280 lifts) in the first week after the competition should increase gradually. The most appropriate distribution will be as follows: Monday -- 50, Wednesday -- 70, Friday -- 90, Saturday -- 70 lifts. It is necessary to exclude submaximum and maximum lifts in the snatch and the clean and jerk exercises during the 1st-week; since the athlete continues to train after the competition. According to variant 2, the lifter should do 19 (28%) lifts. So, instead of the 67 submaximum and maximum lifts in the snatch and the clean and jerk exercises, which the athlete did in the preceding competition month, the sportsman does 48 lifts for the month. Coupled with the lifts of 70-79% and 80-89%, this will be quite sufficient not only to maintain sporting form, but to increase one's results in the next competition. The rest of the planning should be the same as in the preceding month. Since the athlete exceeded slightly, the anticipated results, use the following weights as 100% in determining the zones of intensity: 95.9 kg for the snatch, (the mean-month's increase in the snatch was -- 0.9 kg) and 120.9 kg for the clean and jerk (the anticipated result at the end of the 5th-month).

The Training of the Master of Sport

Let's suppose that a 90 kg lifter (height -- 171 cm, age -- 21) achieves the following results after five years of training: 140 kg -- snatch; 190 kg -- clean and jerk (330 kg total). The clean and jerk results are 135.7% of the snatch results, i.e., the snatch results are lagging slightly behind the clean and jerk. The maximum possible improvements in results -- 48 CU (see

table 9) are planned for him at the end of the 6th year, i.e., a biathlon total of 365 kg (157.5 kg -- snatch, 207.5 kg -- clean and jerk). The clean and jerk results should be 131.7% of the snatch, i.e., the snatch achievements should be "pulled up", while at the same time, the clean and jerk should not be neglected.

Let's look at planning the 1st-training cycle, which consists of a two-month preparatory period (1,900 and 2,100 lifts) and a one-month competition period (1,500 lifts). This training cycle concludes with the athlete's most important competition. The planned results for this competition are: 145 kg snatch and 195 kg in the clean and jerk (340 kg total). The possible snatch results: 141.6 kg at the end of the 1st month and 143.2 kg -- 2nd; the corresponding figures for the clean and jerk are 191.6 and 193.2 kg respectively. The athlete begins training after a transition period. Therefore, the distribution of the loading in the 1st-month can be relatively uniform, with a relatively gradual increase. The variant 4-2 distribution of a month's loading (23, 36, 21 and 30%) will be most appropriate. 437 lifts will be executed the 1st-week, 494 the 2nd, 399 -- 3rd and 570 lifts in the 4th week.

It is desirable that the intensity be increased gradually. Therefore, the number of high-intensity lifts are best distributed according to variant 4 (22, 24, 26 and 28%). Before designating the distribution of the various exercises, it is necessary to examine the positive and negative aspects of the athlete's special-physical and technical preparedness. For example, the athlete cleans the barbell well, but his jerk is flawed. His snatch results are lagging slightly, but his power snatch (130 kg) is sufficient, because it is 92.8% of the limit snatch (instead of the mean of 90% which is normal for other athletes). The height of the lift in the snatch pull with 100% is 125 cm, which is slightly higher than the norm (121.5 cm), inherent to athletes of the same height. So, the special-physical-preparedness is sufficient, but there are technique defects in the execution of the snatch. The squat results are 255 kg (instead of the

242.5 kg average for other athletes in the same weight class).

Well then, it is appropriate to increase the number of lifts in the snatch and the jerk for this athlete. The number of lifts in the cleans, front squats, back squats and clean pulls can be reduced. The distribution can now look like this: snatches -- 23%, (instead of an average of 20%), 17% of the lifts can be snatches (instead of 8), and 6% of the lifts in the other snatch exercises (instead of 12); 8% -- cleans (instead of 13), of which 3% is the classic clean and 5% is in other cleans; 18% -- jerks (instead of 13) of which 6% are classic jerks and 12% (instead of 7) are other jerks; 15% -- front and back squats (instead of 20); 5% -- other types of squats; 5% -- clean pulls (instead of 10); 8.5% -- snatch pulls; 7% -- presses (instead of 4.5); 10.5% -- bend-overs.

One can determine the number of lifts in the week-cycles and distribute them into the fundamental zones of intensity in the same way as the contents of the month. The numbers of high intensity lifts in the fundamental exercises, the athlete should execute in the 1st-preparatory month, are given in tables 2-6. Since the planned volume and intensity are not unidirectional, the general number of lifts in the week-cycles (in each of the fundamental exercises) is slightly different from the designated distribution variant for the week-cycles. However, this discrepancy is very insignificant, because the number of lifts in the week-cycles is taken from the fundamental, in the subsequent planning.

The fundamental exercises are distributed by week-cycles in the following way. Snatches (437 lifts): 1st-week -- 99 (instead of 100), 23%; 2nd -- 112 (instead of 114), 26%; 3rd -- 98 (instead of 92), 21%; 4th -- 128 (instead of 131), 30%. Cleans (152 lifts): 1st-week -- 34, 2nd -- 39, 3rd -- 35 and 4th -- 44; Jerks (342 lifts): 78, 88, 75 and 101 lifts, respectively. Front and back squats (285 lifts) -- 65, 74, 62 and 84. Clean pulls (95 lifts) -- 22, 24, 21 and 28. The remaining exercises are distributed so: Snatch pulls (161 lifts): 1st-week -- 37, 2nd -- 42, 3rd -- 34 and 4th -- 48; presses (131 lifts) -- 3, 35,

28 and 40; bend overs (200 lifts) -- 46, 52, 42 and 60; other types of squats (95 lifts) -- 22, 25, 20 and 28.

It is desirable to distribute the loading by workouts (in the week-cycles) such that it (the loading) gradually increases in the first two weeks. Now the loading will look like this: 1st-week, Monday -- 90, Tuesday -- 60, Wednesday -- 100, Friday -- 110 and Saturday -- 77 lifts; 2nd-week, Monday -- 100, Tuesday -- 80, Wednesday -- 120, Friday -- 130 and Saturday -- 64 lifts; 3rd-week, Monday -- 110, Tuesday -- 59, Wednesday -- 90, Friday -- 80 and Saturday -- 60 lifts. Two moderate loadings -- on Friday and Saturday -- allows the athlete to recuperate somewhat before the next week, in which there will be a maximum volume and intensity. It is advisable to exclude submaximum and maximum lifts on these days. The loading for the 4th-week is: Monday -- 130, Tuesday -- 60, Wednesday -- 140, Thursday -- 40, Friday -- 120 and Saturday -- 80 lifts.

When the contents and the dynamics of the volume of the loading in each week-cycle has been determined, one can plan each workout. It is desirable to do two workouts when there are more than 100 lifts planned for one workout.

One can do approximately 200 lifts in one day (when divided into two workouts), during the preparatory period and 180 lifts during the competition period. Plan an average of 10 more lifts in the morning workout during the preparatory period and 15 more lifts during the competition period, than in the evening workout.

During the preparatory period the snatch is done primarily in the morning. The other snatch exercises are divided about equally in the morning and evening workouts. Plan twice as many lifts in the clean and jerk for the morning than in the evening; the other clean and jerk exercises are employed more in the evening. The largest number of high-intensity-lifts (70%-and-more) in both the snatch and the clean and jerk exercises are executed in the morning.

Plan approximately twice as many lifts for the morning in both the snatch and the other snatch exercises, during the competition period. The number of high-intensity-lifts are distributed uniformly between the morning and the evening. The classic cleans, the classic jerks and the other cleans are also

distributed almost uniformly; the other jerks as well as high-intensity-lifts in the clean and jerk exercises, are executed, chiefly in the morning.

Plan approximately twice as many squats (front and back, including maximum lifts of 100%-and-more) in the evening during the preparatory month, than in the morning. The amount of squats is about the same for the morning and the evening, during the competition period, however, there are slightly more maximum lifts in the evening. Lightweights and middleweights do the other types of squats (during both periods), primarily in the morning; middle-heavyweights and heavyweights do the other types of squats in the evening. Plan more snatch pulls in the morning (including maximum weights) in both the preparatory and competition periods; plan more clean pulls in the evening. Both standing and bench presses, are done in the morning and evening during both periods; good mornings and hyperextensions are done in the morning.

It is appropriate to use variant 2 (23, 29, 26 and 22%) in the 2nd-preparatory month, for distributing the loading into week-cycles. The distribution will appear so: 1st-week -- 483, 2nd -- 609, 3rd -- 546 and 4th -- 462 lifts. In this instance, there will be a reduction of the loading in the 1st-week (483 lifts) after the large loading of the last week of the preceding month (570 lifts). The loading is minimal in the 4th-week, preceding the competition month.

Taking into account the positive aspects and the insufficiencies of the athlete's special-physical and technical-preparedness, it is advisable to employ approximately the same quantity of barbell exercises which were employed in the 1st-preparatory month; and, reduce the portion of snatch pulls (from 8.5% to 5%) and increase the portion of clean pulls (from 5 to 8.5%). Now, the loading will be: snatches -- 483 (23%), cleans -- 168 (8%), jerks -- 378 (18%), front and back squats -- 315 (15%), other types of squats -- 105 (5%), clean pulls -- 179 (8.5%), snatch pulls -- 105 (5%), presses -- 147 (7%), bend overs -- 220 (10.5%).

It is appropriate for the MS to execute the maximum number of high-intensity-lifts in the last preparatory month. For example, this would be an average of 420 lifts in the snatch and the clean and jerk exercises, of which 254 are with 70-79%, 116 -- 80-89% and 50 -- 90%-and-more. The high-inten-

sity-loading in the preceding preparatory month was about 70% of the volume, and 83% in the following competition month. The mean number of lifts in the competition month are: 195 -- 70-79%, 97 -- 80-89%, 56 -- 90% and more.

During the preparatory month, preceding the competition month, 90 kg athletes execute an average of 372 high-intensity-lifts in the snatch and the clean and jerk exercises; of which 165 are in the snatch exercises, 114 -- cleans and 93 jerks. There are 309 of these lifts in the competition month (143, 87 and 79 lifts by exercise, respectively).

Significant improvement is planned for the athlete. Therefore, the number of high intensity lifts should be increased. His result should improve from 330 kg to 340 kg at the end of the 3rd-month of training. This improvement of 10 kg is equal to 14 CU. In order to make this amount of improvement, it is necessary to execute approximately 340 high-intensity-lifts (see figure 19) during the competition month. Taking into account that the athlete can easily execute the suggested loading, plan 350 lifts for him. Now he should execute 161 lifts (46%) in the snatch exercises and 189 lifts in the clean and jerk exercises.

It has already been noted that a maximum, high-intensity-loading is appropriate in the last preparatory month. This loading is considered 100%. The loading in the competition month is 83% of the loading in the preparatory month. So, the athlete needs to plan approximately 422 high-intensity-lifts in the snatch and the clean and jerk exercises, which is approximately 13.5% greater than indicated for the preparatory month in tables 2-4. Consequently, the number of high-intensity-lifts should be: 109 (instead of 96) lifts with 70-79% in the snatch exercises, 51 (instead of 45) -- 80-89% and 27 (instead of 24) with 90%-and-more; in cleans 87 (instead of 77) with 70-79%, 32 (instead of 28) -- 80-89% and 10 (instead of 9) with 90%-and-more. The athlete should do 66 lifts (instead of 58) with 100%-and-more in squats and 45 lifts (instead of 40) in clean pulls.

Taking into account that the athlete should execute a larger than usual quantity of high-intensity-lifts, it is appropriate to distribute the lifts relatively uniformly (where there is a large

volume, plan fewer high-intensity-lifts, and vice versa) into week-cycles. In this instance, select variant 1-4 (27, 23, 24 and 26%) where the high-intensity-loading in the snatch exercises, the clean and jerk exercises, clean pulls and squats is (by weeks): 144, 123, 128 and 138 lifts, respectively.

Now, when one has stipulated the contents of the month's loading by exercise, and the number of high-intensity-lifts in the fundamental exercises is determined; determine the number of lifts in the week-cycles and distribute them into zones of intensity (table 21). If the number of high-intensity-lifts and the lifts with 70%-and-less (in the week-cycles) are found to be different than the aforementioned distribution variant; the general quantity of the lifts in the fundamental exercises will be slightly different from the designated distribution variant of the weeks' loading. This difference is insignificant. If it becomes necessary to calculate the number of lifts more precisely, it can be done in the following way.

Begin by determining the number of lifts in each exercise, in the week-cycles -- according to the designated distribution variant of the volume (23, 29, 26 and 22%), and enter the results obtained in a table (in the far right hand column). For example, there should be 111 lifts in the snatch exercises, in the first week. Now, calculate the number of high-intensity-lifts in the week-cycles according to the designated variant (27, 23, 24 and 26%) [for example, this number is 52 in the snatch exercises during the first week] and subtract this number from the general number of lifts. The remaining lifts in the snatch exercises for the first week -- 59 (111-52) are done with less-than-70%-weights; these lifts are entered in the appropriate zones of intensity.

The other exercises are distributed by week-cycles: snatch pulls -- 24 (23%), 31 (29%), 27 (26%) and 23 (22%) lifts; presses and push-presses -- 34, 43, 38 and 32 lifts; bend overs -- 51, 64, 57 and 48 lifts; other types of squats -- 24, 31, 27 and 23 lifts. The volume of the loading, by workouts, can be distributed in this way: 1st-week, Monday -- 50 (the preceding week's

loading was maximum), Tuesday -- 90, Wednesday -- 130, Friday -- 150 and Saturday -- 63 lifts; 2nd-week, Monday -- 140, Tuesday 70, Wednesday -- 130, Thursday -- 50, Friday -- 140 and Saturday -- 79 lifts; 3rd-week, Monday -- 135, Tuesday -- 60, Wednesday -- 125, Friday -- 140 and Saturday -- 86 lifts; 4th-week, Monday -- 140, Tuesday -- 70, Wednesday -- 120, Friday --80 and Saturday -- 52 lifts (two moderate loadings -- on Friday and Saturday -- are planned so that the athlete recuperates somewhat after a month's training; lifts with large, submaximum and maximum weights are excluded on these days).

After the contents of each week-cycle are known and the dynamics of the loading determined, one proceeds to plan each workout. A 90 kg lifter reduces the volume of loading in the competition month (in comparison to the preceding preparatory month) by an average of 30%; consequently, the volume is 1,470 lifts. This can be distributed by week-cycles according to variant 1-3 (32, 26, 29 and 13%). So, there will be 471 lifts in the 1st-week, 382 -- 2nd, 426 -- 3rd and 191 lifts in the 4th week.

The athlete has practically corrected all of his insufficiencies in the technique of the snatch and the jerk; therefore, the exercise distribution is based on the mean data, inherent to all athletes in the given (90 kg) weight class (see table 11). Now, the number of lifts are: snatches -- 309 (21%) lifts, cleans -- 191 (13%), jerks -- 206 (14%), front and back squats -- 294 (20%), clean pulls -- 176 (12%), snatch pulls -- 74 (5%), and the other exercises -- 220 (15%) lifts.

It has already been mentioned that it is appropriate for the athlete to execute 350 high-intensity-lifts, instead of 309, in the snatch and the clean and jerk exercises, during the competition month, i.e., 13.3% greater than indicated in tables 2-4. Now, the number of high-intensity-lifts will be: in the snatch exercises with 70-79% -- 88 (instead of 78), 80-89% -- 45 (instead of 40) and 90%-and-more -- 28 (instead of 25); the figures for the clean are 60 (instead of 53), 25 (instead of 22) and 14 (instead of 12) respectively; in jerks -- 52 (instead of

46), 24 (instead of 21) and 14 (instead of 12); in squats with 100%-and-more -- 71 (instead of 63) and in clean pulls -- 34 lifts (instead of 30).

If the intensity is distributed according to the same variant as is the volume, the number of high-intensity-lifts in the snatch and the clean and jerk exercises will be: 1st-week -- 112, 2nd-week -- 91, 3rd -- 101 and 45 lifts in the 4th. The number of high-intensity-lifts in squats, by weeks, are 23, 18, 21 and 9 respectively; in clean pulls -- 11, 9, 10 and 4 lifts.

It has already been stated that 10% of the month's volume of high-intensity-lifts should be in the snatch and clean and jerk exercises during the last week of the competition month; and 6% of the month's volume in squats, 35 and 4 lifts respectively. Consequently it becomes necessary to transfer 10 lifts in the snatch and the clean and jerk exercises and 5 lifts in squats, to the other weeks.

In order to achieve high results in competition, the most favorable conditions occur when the largest number of lifts with submaximum and maximum weights executed in the snatch exercises are done in the 3rd-week, cleans -- 2nd-week, jerks -- 1st and 2nd and clean pulls in the 1st-week. During the competition month, the number of high-intensity clean pulls are distributed: 1st-week -- 36%, 2nd -- 33 and 3rd -- 31%.

It is necessary to take into account the following, when planning lifts with submaximum and maximum weights. Athletes in the heavy weight classes (including the 90 kg class) seldom include lifts with submaximum, and especially maximum weights in the snatch and the clean and jerk during the last week. Therefore, it is desirable to exclude these lifts in the last week. After determining the contents of the month's loading (by exercises) and the number of high-intensity-lifts in the fundamental exercises, they (the high intensity lifts) are distributed into week-cycles and by zones of intensity (table 22).

It is necessary to utilize the lifts in the other exercises (294) such that they yield the maximum effect, with respect to the athlete's special-physical-preparation. For example, it is desirable that the given athlete include the bench presses, the

Distribution of lifts by zones of intensity in the fundamental exercises (2nd-prep. month) MS, 90kg class

Table 21.

Exercise / Weeks	Zones of Intensity: менее 70%	70—79%	80—89%	90% и более	100% и более	Whole Week
	Weight of Barbell (kg): менее 100	100—112,5	115—125	127,5 и более		
Snatches	296	109	51	27		
1-я (23,27%)	59	30	14	8		111
2-я (29,23%)	97	25	12	6		140
3-я (26,24%)	82	26	12	6		126
4-я (22,26%)	58	28	13	7		106
	менее 135	135—152,5	155—172,5	175 и более	192,5 и более	
Cleans	39	87	32	10		
1-я (23,27%)	4	23	9	3		39
2-я (29,23%)	20	20	7	2		49
3-я (26,24%)	12	21	8	2		43
4-я (22,26%)	3	23	8	3		37
Jerks	272	68	26	12		
1-я (23,27%)	59	18	7	3		87
2-я (29,23%)	85	16	6	3		110
3-я (26,24%)	73	16	6	3		98
4-я (22,26%)	55	18	7	3		83
Squats	44	63	63	79	66	
1-я (23,27%)	7	15	15	18	18	73
2-я (29,23%)	17	18	18	23	15	91
3-я (26,24%)	13	16	16	21	16	82
4-я (22,26%)	7	14	14	17	17	69
Clean Pulls		14	30	90	45	
1-я (23,27%)		1	7	21	12	41
2-я (29,23%)		7	9	26	10	52
3-я (26,24%)		5	8	23	11	47
4-я (22,26%)		1	6	20	12	39

Distribution of lifts by zones of intensity in the fundamental exercises (Competition Month); MS, 90kg class

Table 22.

Exercise / Weeks	Zones of Intensity: менее 70%	70—79%	80—89%	90% и более	100% и более	Whole Week
	Weight of Barbell (kg): менее 102,5	102,5—112,5	115—127,5	130 и более		
Snatches	148	88	45	28		
1-я (32%)	47	28	15	9		99
2-я (26%)	38	23	12	7		80
3-я (29%)	43—6*	26	13+2	8+4		90
4-я (13%)	20+6	11	5—2	4—4		40
	менее 137,5	137,5—152,5	155—172,5	175 и более	195 и более	
Cleans	92	60	25	14		
1-я (32%)	29	19	8	4		61
2-я (26%)	24—2	16	7	4+2		50
3-я (29%)	27	17	7	4		55
4-я (13%)	12+2	8	3	2—2		25
Jerks	116	52	24	14		
1-я (32%)	37	17	8	4		66
2-я (26%)	30—2	13	6	4+2		53
3-я (29%)	34	15	7	4		60
4-я (13%)	15+2	7	3	2—2		27
Squats	31	59	59	74	71	
1-я (32%)	10	19	19	24	23	95
2-я (26%)	8—5	15	15	19	18+5	75
3-я (29%)	9	17	17	21	21	85
4-я (13%)	4+5	8	8	10	9—5	39
Clean Pulls		24	30	88	34	
1-я (32%)		5	10	28	13	56
2-я (26%)		5	7	23	11	46
3-я (29%)		6	9	26	10	51
4-я (13%)		8	4	11	0	23

standing press, snatch pulls and other types of squats. It is permissible to designate 60, 60, 74 and 100 lifts respectively, in these exercises. They are then distributed by week-cycles: standing press and bench press -- 19, 16, 17 and 8 lifts; snatch pull -- 24, 19, 21 and 10 lifts; other squats -- 32, 26, 29 and 13 lifts.

Subsequently, the weeks' loading has to be distributed by workouts and the contents of each workout determined. We have already discussed, in detail, how this is done. It is important that one take into account the athlete's weight class when determining the time span of the final lifts with submaximum and maximum weights. The heavier athletes need to rest a longer time before a competition; therefore, they should exclude lifts with submaximum and maximum weights earlier than athletes in the light weight classes. In conclusion, it is necessary to point out that eccentric, isometric and mixed types of exercises are recommended for masters of sport.

Peculiarities of the Training of Athletes in the Over 110 Kg Class

Athletes in the over-110 kg class are not restricted by bodyweight; therefore, their absolute bodyweight (and consequently, muscle mass) -- is an essential factor in the achievement of high results. Future over-110 kg athletes, beginning training at 16 years of age, usually weight 70-80 kg. After about 6.5 years of training, they switch to "their" weight class; and weigh an average of 130 kg -- that is to say, their bodyweight (and consequently, muscle mass) frequently increases by more than 70%. Such a significant increase in muscle mass requires significantly more time and a larger volume of loading, because these magnitudes are interdependent. This interdependence represents the fundamental difficulty of preparing athletes in the heaviest weight class.

These athletes have difficulty maintaining their muscle mass, since muscle mass decreases when the volume of loading is reduced. Well then, one requirement for a superheavyweight to improve his results, involves the execution of a significant

volume of loading; which should be greater than the average for other athletes. A rather significant increase in bodyweight is appropriate for qualified athletes, therefore, they should increase the volume of their loading as much as possible. The mean monthly training load should be: 1,850 lifts for Class I and CMS during the preparatory period and 1,280 lifts in the competition period; the corresponding figures for MS are 2,300 and 1,600 lifts respectively.

The volumes the athletes in the over-110 kg class employ during the preparatory and competition periods are presented in table 23. It is obvious from the table that the number of lifts in the fundamental exercises is approximately the same as it is for other athletes (see tables 2-6). A peculiarity of the training of superheavyweights is that they employ fewer jerks. They do fewer classic jerks (in comparison with athletes in the other weight classes), but do more pressing exercises; they also do fewer snatch pulls. The large volume of loading is the result of an increased number of lifts in the pressing exercises, bendovers and other types of squats; that is to say -- exercises which have a local affect.

Superheavyweights should devote more time to strengthening the abdominal muscles than the other lifters; sit-ups over a gymnastic horse, with a barbell on the shoulders, is suitable for this purpose. They should employ a large volume of leaps with a barbell and depth jumps, as well as other types of exercises which have a local affect. The volume can be increased even more, basically by an increase in the number of lifts in the snatch and the clean and jerk exercises with minimum and small weights and exercises with a local affect. This is necessary in order to strengthen the individual muscle groups, joint mobility and flexibility; and also for preserving the already achieved level of muscle mass.

Superheavyweights do fewer high-intensity-lifts than other athletes: in the snatch and the clean and jerk exercises with 70%-and-more; in pulls and squats with 100%-and-more (see tables 2-6). However, this does not mean that the quantities of high-

TABLE 23

The Volume of Barbell Exercises for Lifters
in the Over-110 Kg Weight Class
(Monthly Average)

Exercise	Number of Lifts			
	Class I and CMS		MS	
	Prep. Period	Comp. Period	Prep. Period	Comp. Period
Snatch	333 (18)*	256 (20)	414 (18)	320 (20)
Cleans	240 (13)	179 (14)	276 (12)	192 (12)
Jerks	176 (9.5)	128 (10)	244 (10.6)	192 (12)
Front and Back Squats	370 (20)	269 (21)	414 (18)	304 (19)
Clean Pulls	83 (4.5)	72 (5.6)	207 (9)	180 (11.2)
Total in Fundamental Exercises	1,202 (65)	904 (70.6)	1,555 (67.6)	1,188 (74.2)
Snatch Pull	93 (5)	58 (4.5)	115 (5)	64 (4)
Bend Overs	222 (12)	96 (7.5)	253 (11)	112 (7)
Pressing Exercises	130 (7)	102 (8)	138 (6)	112 (7)
Other Squats	203 (11)	120 (9.4)	239 (10.4)	124 (7.8)

* Indicates Percentage of the Month's General Volume.

intensity-lifts listed in the tables are obligatory for all superheavyweights. It is necessary for these lifters, as it is for the athletes in the other weight classes, to endeavor to increase the quantity of such lifts as much as possible; because this will lead to a large increase in results. A significant reduction of the intensity in the snatch and the clean and jerk exercises, where a lesser training weight (expressed as a percentage of the maximum) and fewer high-intensity-lifts are employed, should be compensated for in the following manner.

1. It is necessary to increase the number of repetitions per set: up to 6 -- in the fundamental exercises and up to 10 -- in the local exercises; frequently employ multiple repetitions with maximum and close to the maximum number of repetitions. The more multiple-repetition lifts executed during the preparatory period, the larger the increase in results.

2. It is obligatory for one to include: exercises executed slowly, static, yielding and mixed types of exercises. These exercises significantly increase the time span of muscular tension, and consequently -- the intensity of the training.

Superheavyweights, in contrast to other lifters, execute lifts with submaximum and maximum weights in the snatch and the clean and jerk exercises earlier (i.e., further from the date of a competition). All of the lifts with the aforemetioned weights (in these exercises) are executed in the first 3-weeks of the competition month; furthermore, lifts with 100%-and-more in clean pulls are also done at this time. Good mornings (standing or seated) are only done in the first 2-weeks; and hyperextensions -- during the first 3-weeks of the competition month; one can plan them in the 4th-week, but only for one day and in a small quantity (16-20).

Weightlifting Workouts

Training sessions consist of three parts: preparatory, fundamental and conclusion. The purpose of the preparatory part is to ready the organism for the workout with the barbell; general-developmental exercises for all of the muscle groups are employed, first at a slow tempo, then at a fast tempo. A special

warmup is done at the end of the preparatory part with a metal pole, an empty bar or a minimal weight; imitating the forthcoming barbell exercise.

Barbell exercises are done during the fundamental part of the workout. The workout begins chiefly, with speed exercises, such as, the power snatch, the power clean, the snatch. These exercises are followed by strength exercises and at the end of the workout, the athlete employs endurance exercises and exercises which have a local affect. If one wants the best conditions for strength development, the strength exercises are done first. A rational sequence of exercises involves mixing the work of muscle groups, for example: pulls, bench press, squats; which also eliminates the potential for the negative transfer of habits. In order to keep the organsm from adapting, (which leads to a reduction of the reciprocal reaction) to the exercise which is frequently done first, it is necessary to periodically begin the workout with different exercises, such as, pulls, squats, presses, and-so-forth. A special warmup should be done when a barbell exercise is significantly different in structure from the one preceding it, otherwise the athlete could be injured. Do 2-3 exercises if the volume of loading is small, and 5-8 exercises if the volume is large. The rest interval is 2-5 minutes between sets. The athlete is ready for the next set, usually when he feels well. The athlete should breathe as necessary during the lift.

General-developmental exercises, long jumps, vertical jumps, depth jumps, relaxation exercises, as well as prophylactic exercises -- various hanging, swinging (on bars, rings) are employed in the final part of the workout.

Appendix

M. V. Staroduptsev's table of comparable values for assessing the results of weightlifters

	Units, kg			
	0	2,5	5	7,5
Weight class, 52 кг				
13	178	182	187	192
14	196	201	206	211
15	215	220	225	230
16	235	240	245	250
17	255	260	265	271
18	276	281	286	291
19	297	302	307	313
20	318	323	329	334
21	340	345	351	356
22	362	367	373	379
23	384	390	395	401
24	407	413	418	424
Весовая категория 56 кг				
14	174	179	183	187
15	191	196	200	204
16	209	213	218	222
17	227	231	236	240
18	245	250	254	259
19	263	268	273	278
20	282	287	292	297
21	302	307	311	316
22	321	326	331	336
23	341	346	351	356
24	361	366	372	377
25	382	387	392	397
26	403	408	413	418
27	424	429	434	440
Весовая категория 60 кг				
16	189	193	197	202
17	206	210	214	218
18	222	226	230	235
19	239	243	247	252
20	256	260	265	269
21	274	278	282	287
22	291	296	300	305
23	309	314	318	323
24	328	332	337	342
25	346	351	356	360
26	365	370	375	379
27	384	389	394	399
28	404	408	413	418
29	423	428	433	438
Весовая категория 67,5 кг				
17	178	181	185	188
18	192	195	199	203
19	206	210	214	217
20	221	225	229	232
21	236	240	244	248
22	251	255	259	263
23	267	271	275	279
24	283	287	291	295
25	299	303	307	311
26	315	319	323	327
27	332	336	340	344
28	348	352	357	361
29	365	369	374	378
30	382	387	391	395
31	400	404	408	413
32	417	421	426	430
Весовая категория 75 кг				
19	185	188	192	195
20	198	202	205	208
21	212	215	219	222
22	226	229	232	236
23	239	243	247	250
24	254	257	261	264
25	268	272	275	279
26	283	286	290	294
27	297	301	305	309
28	312	316	320	324
29	328	331	335	339
30	343	347	351	355
31	359	362	366	370
32	374	378	382	386
33	390	394	398	402
34	406	410	414	418
35	422	426	431	435
Весовая категория 82,5 кг				
20	182	185	188	191
21	194	197	200	203
22	207	210	213	216
23	219	223	226	229
24	232	236	239	242
25	246	249	252	256
26	259	262	266	269
27	273	276	279	283
28	286	290	293	297
29	300	304	307	311
30	314	318	321	325
31	328	332	336	339
32	343	347	350	354
33	357	361	365	368
34	372	376	380	383
35	387	391	395	398
36	402	406	410	413
37	417	421	425	429
Весовая категория 90 кг				
21	182	185	188	191
22	194	197	200	203
23	206	209	212	215
24	218	221	224	227
25	230	233	236	239
26	243	246	249	252
27	255	258	262	265
28	268	271	275	278
29	281	284	288	291
30	294	298	301	304
31	308	311	314	318
32	321	325	328	331
33	335	338	342	345
34	349	352	356	359
35	363	366	370	373
36	377	380	384	387
37	391	394	398	402
38	405	409	412	416
39	420	423	427	431
Весовая категория 100 кг				
22	182	185	188	191
23	194	197	199	202
24	205	208	211	214
25	217	220	223	226
26	229	232	235	238
27	241	244	247	250
28	253	256	259	262
29	265	268	271	274
30	277	281	284	287
31	290	293	296	300
32	303	306	309	312
33	316	319	322	325
34	329	332	335	338
35	342	345	348	352
36	355	358	362	365
37	368	372	375	379
38	382	385	389	392
39	396	399	402	406
40	409	413	416	420
41	423	427	430	434
Весовая категория 110 кг				
23	186	188	191	194
24	197	200	202	205
25	208	211	214	216
26	219	222	225	228
27	231	234	236	239
28	242	245	248	251
29	254	257	260	263
30	266	269	272	275
31	278	281	284	287
32	290	293	296	299
33	302	306	309	312
34	315	318	321	324
35	328	331	334	337
36	340	344	347	350
37	353	356	359	363
38	366	369	373	376
39	379	383	386	389
40	392	396	399	402
41	406	409	412	416
42	419	423	426	429
Весовая категория свыше 110 кг				
24	185	188	191	193
25	196	199	201	204
26	207	209	212	215
27	217	220	223	225
28	228	231	234	237
29	239	242	245	248
30	251	253	256	259
31	262	265	268	271
32	274	276	279	282
33	285	288	291	294
34	297	300	303	306
35	309	312	315	318
36	321	324	327	330
37	333	336	339	342
38	345	348	351	354
39	357	360	364	367
40	370	373	376	379
41	382	386	389	392
42	395	398	401	405
43	408	411	414	417
44	421	424	427	430

Peculiarities in the Training of Weightlifters of Different Qualification

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At the present time, it is very important to review many of the main principles of the system of training qualified athletes; and to elucidate the most important, central principles of the organization of training and the regularities in the growth of sport mastery. The results of our research (and a number of others in recent years) has produced the training means and methods as well as the volume and intensity of the weightlifter's loading at all stages of training -- from novice to world record setter (WR); which has aided in elucidating the specifics of the formation of a weightlifter's sport mastery.

The special preparatory exercises were divided ito two groups. The correlation between the average weight of the exercises placed in the first group and results in the snatch, the clean and jerk or the total was 0.381 to 0.478 (the number of observations was between 75 and 93), i.e., those exercises on which a lifter's results are the most dependent. These exercises are the snatch and the clean and jerk exercises, front and back squats and clean pulls. The remaining exercises were placed in the 2nd group; the correlation between these exercises and the snatch and the clean and jerk results, was 0.229 to 0.253. These exercises are snatch pulls, presses, good mornings and hyper-extensions (collectively referred to as "bend overs", Ed.), different methods of squatting, etc. These exercises develop the necessary qualities and habits and create a base of special-physical-preparedness. The only exercises which have a moderate correlation with the snatch, the clean and jerk and the total results (a correlation coefficient of 0.518 - 0.528) are the snatch, the clean and jerk and the snatch and the clean and jerk exercises with 90%-and-more. Taking into account that, recently, the most discussed topic in many types of sports is the expedi-

ency of further increasing the volume of loading at the high sport mastery stage; we researched further the contents of the loading of 93 of the country's strongest lifters in 1983, 1984 and 1985. We studied 63 different parameters of the training load (volume, intensity, exercises employed, the volume of high intesity work, etc.) with a computer. We studied correlation of these parameters with weight class, age, stage of training, mastery and results in the snatch, the clean ad jerk and the total. The athletes' mastery and results were expressed in conditional units (CU), according to M. V. Starodubtsev's table (1981). Research on the loading of athletes of different qualification has shown that the contents are largest, the last two months preceding the most important (for them) competitions. In the other periods, the loading is a reflection of the individual peculiarities of the athlete's training; however, the general regularities of the loading are clearly maifested in these two months. At this time, the loading is most stable, with respect to both the volume and intensity (the month-volume in the preparatory period is an average of 9% of the year-volume). Since a month-volume is a portion of the year-volume, the peculiarities in the dynamics of the exercises employed are obtained based on the contents of one-month of training in the preparatory period.

The general volume of loading increases as the athlete progresses from novice to mastery of sport; from 10,000 to 20,000 (average) lifts per year. Subsequently, the loading decreases; becomes an average of 18,000 lifts for masters of sport international class (MSIC) and 16,200 lifts for world record holders (WR). This changes the month-loading (see figure). The peculiarities in the dynamics of the exercises employed, are as follows:

The number of lifts in the snatch and the clean and jerk increase along with the rise in qualification: 300 lifts per month for the novice, 330 for Class I and CMS, 340 -- MC, 375 -- MSIC and 400 lifts for world record holders. The number of special-assistance exercises in the first group also increases continuously along with the rise in qualification (from novice to

master of sport); then decreaase slightly for the MSIC and the WR. The number of lifts in this group averages 650 lifts per month for beginners, 738 for the Class III and II, 910 -- Class I and CMS, 1,215 -- MS, 1,180 -- MSIC and 1,080 lifts for the WR.

The volume of special-assistance exercises in the 2nd-group increases from novice to master to an average of 150 to 675 lifts per month; then decreases to 445 -- MSIC and 320 --WR. The absolute intensity also increases continuously throughout the "journey" from novice to world record holder. The relative intensity (the training weight, expressed as a % of the limit result in the competition exercises) gradually increases in the snatch, the clean and jerk and in the first group of exercises for the low-class athletes. Subsequently, the relative intensity stabilizes for all athletes, beginning with Class I and is an average of 70% in the competition exercises.

The volume of high intensity work (weights of 70%-and-more) in the snatch, the snatch exercises, the clean and jerk, the clean and jerk exercises and with 100%-and-more weights (relative to the limit clean and jerk) in clean pulls and squats, all increase along with the growth of qualification. The maximum volume of high intensity work is executed by the master of sport; it decreases for the MSIC and WR (in the snatch, the clean and jerk and the snatch and the clean and jerk exercises the number of lifts with 70-79% decrease, while the lifts with 80-89% and 90%-and-more stabilize).

The relative intensity of the 2nd-group of exercises rises for Class I, CMS and MS and decreases for MSIC and WR. We have determined three stages of training, each of which has its own peculiarites.

1st-stage -- The Beginning of Specialization. This is the training of beginners and low-class (II and III) athletes. This stage is 2.5 years in length, if the athlete begins training at age 15.5 years (the average age for a beginner). The length of this stage increases somewhat if workouts have begun at a younger age. The main objective of the beginner is to learn the technique of the snatch and the clean and jerk; therefore, the

beginner employs a small range of weightlifting exercises -- the snatch, the clean and jerk, the snatch and the clean and jerk exercises, squats and a small quantity of presses -- bench press and standing-press-behind-the neck. The goal of the low-class athlete is aimed at perfecting technical mastery (like the beginner), therefore, he uses the same exercises as the beginner. The aforementioned exercises are quite sufficient to obtain the special-physical-preparedness necessary for beginners and low-class athletes. The use of other resistance exercises does not permit them to master the technique of the snatch and the clean and jerk. As a result, insufficient technique becomes a constant inhibitor to the further increase in results. So, the formation of technical mastery is the fundamental task of the 1st stage. General-physical-preparation is employed during the 1st-stage as a means of raising the functional possibilities of the organism and the expansion of the necessary range of motor habits and skills.

2nd-stage -- The In-Depth Specialization of the Base Training. This is the training of the Class I, the candidates and the masters of sport. The 2nd-stage is an average of four years duration. This stage begins when results reach an average of 250 CU (if the athlete's mastery is expressed in conditional units). The athlete has mastered technique to perfection, consequently, this period involves the tackling of new tasks. The main task of the 2nd-stage, characterized by the largest volume of loading, is the expansion of the base of special-physical-preparation and the creation of the prerequisites for the achievement of high results. The athletes now include special-physical-preparation exercises from the 2nd-group, the quantity of which is almost one-fourth times greater than in the 1st-stage. So, the entire arsenal of special-preparatory-barbell-exercises are employed during the 2nd-stage.

The general-physical training is not unidirectional in nature; because it does not determine the lifter's success in his sport specialization. The means of raising the organism's functional potential are always employed at this stage of barbell

exercises; because the organism should be ready for definite, specific work with a barbell and not general work.

3rd-stage -- The Stage of High Sport Mastery and Maintenance of Achieved Results. This stage begins when the lifter's results reach an average of 380 CU; it has an average length of 6.5 years. The results of the MSIC are achieved after approximately 1.5 years at this stage; then, after roughly 3-years, record results are achieved. These results are maintained on the average for the next 2 years. By the 3rd-stage the athlete has achieved a very high level of special-physical-preparedness; therefore, it is not necessary to utilize a large volume of loading of the special-assistance exercises in group two. The volume of these exercises is reduced by approximately one-half, relative to the 2nd-stage. The volume of exercises in the second group has a negative correlation with the biathlon total in the pre-competition month, during the 3rd-stage.

One can single-out the following most characteristic features of the training which accompanies the achievement of high, record results:

1. The increase in the volume of work on the competition exercises.

2. The realtive stabilization (in the first 1.5 years), and then decrease in the volume of exercises from the 1st-group. The reduction of the number of lifts in the snatch, the clean and jerk, the snatch and the clean and jerk exercises with 70-79% weights and a stabilization of the loading with 80-89% and 90%-and-more weights. A reduction in the number of lifts in clean pulls and squats with 100%-and-more weights.

3. A significant reduction in the volume of exercises in the 2nd-group. A reduction in the relative intensity of these exercises.

4. A reduction in the general volume of loading.

Well then, the 3rd-stage of training becomes very specialized. At this time, general-physical-preparation is a means of active rest. Athletes achieve high-sport-mastery when the total

volume and intensity of the loading reaches maximum. Our data indicates that athletes achieve record results during a reduction in the volume, when they employ chiefly the snatch, the clean and jerk and the special-physical-preparation exercises of the 1st-group -- the snatch, the clean and jerk exercises, clean pulls and squats; from which results are directly dependent.

The material presented shows that the multi-year training of a weightlifter (especially, its individual stages) has its own specific regularities. It can be assumed that the continuous increase in the volume of loading in some other types of sports, at the high-sport-mastery-stage, is not the sole means to achieve record results. We propose that these stages of training reflect more completely their peculiarities and tasks as distinguished from those accepted at the present time. (L. P. Matveyev, 1976).