

Strength training & Olympic weightlifting for children aged 12-15

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<p>The objective of this project is to help adolescent's children to learn and understand the very basics of Olympic weightlifting and the correct techniques to keep them healthy and safe during their training sessions at the gym.</p> <p>The weightlifting manual consists from 17 small chapters, which will guide the athlete through the world of weightlifting. Some of the chapters are divided into subcategories to make the information more clearly for the young athletes. The manual includes total of ten movements, which are divided in to three separate categories: warm up, Olympic lifting and strengthening lifting.</p> <p>Exercises follow the order from Olympic lifts to strengthening lifts in order to present the importance of mastering the technique which is involved with classical weightlifting. In this matter, it is logical and crucial to start the learning process backwards from most advanced to very basics. This order gives the athlete all the tools to execute the movements included in the manual.</p> <p>Classical weightlifting and the strengthening movements included are one of the most complicated full body exercises in the world. The challenge is mastering every single detail within the technique and learning how your body functions during these movements. Weightlifting develops all the athletic qualities needed in almost every sport, because of the variety of the movements and the muscle work which is needed to execute them. Because of the complexity and nature of the weightlifting, there is always something new to learn when you step in the gym.</p> <p>The manual was made for children between 12-15 years old, so they have enough information and the correct tools to start lifting weights safely and protected.</p>	
<p>Keywords Weightlifting, Technique, Safety, Information</p>	

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1 Introduction

Weightlifting has ancient origins and the first competitive documents are from ancient Egyptian and Greek societies. It developed as an international sport primarily in the 19th century and is one of the few sports to have featured at the 1896 Athens Olympic Games. Olympic weightlifting is the competitive style of weightlifting, in which athletes compete to lift the greatest amount of weight overhead within the athlete's weight category. The competition lifts are the snatch and the clean and jerk. (Olympic 2014).

Why choose Olympic weightlifting and the multiple variations from it over other training methods, which can be practiced at the gym? Strength training is essential in order to make human body function, because without constant strain and workload our muscles and bones will atrophy. When taking a closer look to strength training and especially Olympic lifts, it is essential to comprehend how all-encompassing these movements are to our musculoskeletal, when training with open weights and barbell. This can be demonstrated with the muscle balance triangle, which includes: Mobility- action of joints, power- action of muscles and coordination- combined action of nervous system and muscles. Olympic weightlifting, variations and the strengthening movements develop all the three sectors in muscle balance at the same time. (Kononen & Paananen, 2010).

When starting weight training and making the decision to concentrate on Olympic lifting techniques and the strengthening techniques, it is crucial to have simple goals and understanding why these are the exact training methods you should use as an adolescent. When aiming for good and strong posture and muscle balance and learning the correct lifting technique it creates you the requirements for healthy lifestyle and prevents injuries in the future in your everyday life. Weightlifting techniques are also excellent for muscle maintenance and bone training and it increases the bones thickness and mass. The motoric control, which is improved with weight lifting, is the key to efficient and safe training and it leads you to maximum achievements in sports. (Seppänen, Aalto & Tapio 2010, 62).

This weight lifting manual concentrates mainly on the correct Olympic lifting techniques, the motions which are created while moving with the barbell and benefits of full body exercises. The correct techniques and mastering the movements are not enough for adolescent children to understand what else is required to be a healthy athlete. In order to comprehend the healthy life style of an athlete, the manual contains information about importance of warm up and cool down, healthy eating, quality of sleep and explanation of power and how your body works and reacts during weight training. This manual was designed to guide young athletes towards safe and fun, but challenging training environment, but all the active athletes around other sports can also use it to help them to become better at their respective areas.

2 Growing to be an athlete

It is commonly approved, that children are not miniatures from adults, but it is yet to be unsolved how child's physical abilities differ from adults. When comparing a child's ability to recover from short anaerobic performances to adults, the children's recovery is significantly efficient than adults. It is studied that children are capable of performing over ten maximal few second sprints with only short recovery time (15-30 seconds). The adults body demands more recovery time compared to the exact same performance and the top athletes are usually capable of executing their performances with maximum capacity less than ten times. (Hakkarainen et al 2009, 73).

Is the main factor behind this phenomenon the child's better non lactic acid anaerobic metabolism, or are the children incapable of wearing their bodies down, or does the child's body protect itself from the greatest strain by holding back. Apparently this effect is the sum of different factors, which are yet to be discovered. (Hakkarainen et al. 2009, 73).

2.1 General features of physical growing, biological maturation and physiological development

The development of performance strain and physical ability of the preadolescents and adolescents is based on the size of body's different systems, functions and regulation effectiveness such as hearts cylinder capacity, muscle mass size, length of limbs and hormonal activity. These factors are greatly affected by three interdependent, but still independent developmental biological phenomenon's; Physical growth, biological maturation and physiological development. (Hakkarainen et al. 2009, 74).

Physical growth means the growth of body's structure and dimension. For example the growth of sitting and standing length, muscle and body mass and surface area of skin are pure physical growth. The physical growth is dependent of three modifications in the cell level; the reproduction of the amount of cells (hyperplasia), the growth of sin-

gle cells size (hypertrophy) and the reproduction of liquid in the interstitium and structure. (Hakkarainen et al. 2009, 74).

Biological maturation means the body's maturation towards an adult's maturation level. There are two factors which are connected with maturation; timetable and speed. Timetable describes when the maturation of genitals starts, when the growth spurts top is reached and when height growth ends. Speed describes how fast the height growth is and how fast the individual's sexual maturation reaches to the ultimate maturity. Maturation is an on-going process throughout the whole growing, but the speed of different systems maturity timetable fluctuates. (Hakkarainen et al. 2009, 74-75).

Physiological development means the body's systems and structures differentiation and their functional development such as; differentiation of muscle cells into fast direction and the reproduction of aerobic enzyme activities. The physiological development is mainly dependent on growth and maturation, but the environment and especially pre-adolescent exercise have major effects on functional changes during this process. The other factors which are connected with physiological development are; intellectual, social, emotional and moral development levels. (Hakkarainen et al. 2009, 75).

The neuromuscular system consists of nervous system (brains, spinal cord etc.) and muscles. Muscles can be described as a tissue which fulfils commands and which actions are greatly dependent on the received nervous system commands type and quality. (Hakkarainen et al. 2009, 91).

The maturation of nervous system during a foetus age is mainly guided by the genes inherited from the parents, but the childhood age development is also guided by stimulus created by the environment. The reproduction of the nervous cells takes place mainly in the beginning of the foetus growth and the natural development of the nervous cells network slows down significantly during the first two years. When reaching six years, the nervous system has developed up to 80-90 % of the size of an adult's nervous system. Still the size of the brains keeps growing till puberty. Because the nervous system matures strongly during preadolescent, the versatile motoric stimulus

(skill, balance, mobility, speed and muscle control) should be included with every exercise until the puberty. (Hakkarainen et al. 2009, 91).

Muscle mass and strength depend on environmental factors, such as physical activity, health and nutrition, and on genetic factors. Genetic factors means that people inherit different alleles or variants of the genes that affect a trait such as muscle strength. Several studies indicate that approximately half of the variation in human muscle strength is inherited. (Cardinale, Newton & Nosaka, 2011).

The amount of muscle cells is mainly genetically inherited feature and there is no significant increasing of the amount of muscle cells after the birth. The mass of the cells increases during the reproduction of the functional structures. Because of this, the muscle cells cross surface area grows, so the hypertrophy is taking place in the muscle cells. (Hakkarainen et al. 2009, 91).

During the natural growth of the body, the reproduction of the child's surface area in the muscle depends on the strain and it can multiply up to 5-10 times at the end of the growth spurt. The lower body muscles tend to grow faster, because they receive more strain than the upper body. The muscles cross surface area reaches to its natural adult size approximately at the age of 10 with the girls and by 14 with the boys. The difference between the girls and the boys can be explained by the date of puberty. Girls reach the puberty usually earlier because of their hormone changes. All the childhood games and exercises should be as much as versatile it could be, so all the inherited potential muscle cell types develop. (Hakkarainen et al. 2009, 91-92).

Ossification takes place usually in body's lower and upper limbs (first legs, then arms and then torso). There is a slight difference in the skeletons maturity between boys and the girls after the birth and during the puberty the difference grows approximately to two years. The changes in the bones thickness and bones mass are strictly connected with the strain which is applied to the bone, nutrition and hormone activity. The bone mass increases strongly during the strain which is applied to the bone from longitudi-

nal direction at the end of preadolescent and just before puberty. (Hakkarainen et al. 2009, 94).

The articular cartilages need constant motion to get stronger and it has been discovered that regular exercising would benefit the development of the articular cartilages strain endurance. Although biomechanically incorrect range of motions can cause cartilage damage in the early stages of growth. The joints and connective tissues mobility development is at its best between 11 and 14 years of age. (Hakkarainen et al. 2009, 94).

Like a bone, the tendons thickness seems to be dependent from the strain targeted to it. Tendons and ligaments take part in the strength output by stretching according the motion and returning to their resting length at the end of the motion. This allows them to reserve elastic energy and release it during the muscle contraction after the actual stretch. Elastic energy increases the motions speed and makes physical performances more economic. During the growth phase, low tempo jumping drills and elasticity exercises can slightly increase the development of the muscles and tendons elastic structures. (Hakkarainen et al. 2009, 94-95).

The basic structure of our lungs is completed when we born, but its structural size, performance and the replacement ability of gases changes during our whole growth phase. The lungs structural length and depth measure changes during the growth of our upper body, all the way till our growth stops. The volume of our lungs increases up to six times larger during our first year and twenty times larger when we reach adulthood. Our lungs supporting structure elasticity increases during the growth phase, which allows more effective exhaling. This leads to a better lung ventilation and oxygen intake and enhances the exhale of carbon dioxide. (Hakkarainen et al. 2009, 96-97).

Our hearts volume and size grows during our natural growth, the changes are necessary because of the constant strain. Right after our birth, the hearts volume is 40cm³, it doubles in first six months, quadruples when we reach 2 years and reaches 600-600cm³ size when we reach 18 years old. The hearts left ventricle is responsible for pumping

the blood in to our muscles and tissues. That is why its growth is dependent from the body's strain. (Hakkarainen et al. 2009, 97-98).

Our haemoglobin values and the quantity of red cells decrease immediately after we born, but start to increase quite fast. The increases of haemoglobin values between the genders are quite equal till reaching puberty. In the middle of puberty, boy's haemoglobin values increases at the level of grown man. The differences between the genders are caused by the size of our body (muscle mass), hormone actions and the menstrual cycle which causes blood lose. (Hakkarainen et al. 2009, 98).

It is studied that the amount of non-active peoples type I (slow & durable) muscle cells decrease and type II (fast) muscle cells increase between the age of 10 and 35. Active children do not possess that kind of strong changes, but it all depends on the childhood's active physical activity and the type of the activity (endurance or speed emphasized). Children seem to have relatively more effective oxidative metabolism compared to adults, but relatively weaker glycolytic energy metabolism. So the children's muscles contain more the enzymes which are used to aerobic metabolism and cauterizing fat and adults have the enzymes to resist the lactic acids. That's why the children's performances are slightly more uneconomic than adults. (Hakkarainen et al. 2009, 99).

It is studied that the effectiveness anaerobic performance develops slowly during the growth of the child. There seems to be no differences between the genders until reaching the puberty, when the boys' anaerobic effectiveness develops faster than the girls'. The muscles direct energy reserves increase from birth till adulthood up to five times larger, but the exact timetable is yet to be solved. (Hakkarainen et al. 2009, 100).

Exercising has been discovered to have a positive effect on the previously mentioned energy reserve. The recovery of creatine phosphate reserves seems to be more effective with children than adults. Because of this, children recover faster from short high volume performances than adults. (Hakkarainen et al. 2009, 100).

Aerobic performance (Vo₂max) develops equally between the genders during their natural growth. The boys' natural development continues approximately till they reach 16 and girls reach up to their natural maximum at the age of 13. The oxygen intake is strongly influenced by muscle mass, the body's full weight and the changes happening in our body's dimension. When comparing the anaerobic effectiveness to aerobic effectiveness, we can see that anaerobic develops faster than aerobic during puberty. (Hakkarainen et al. 2009, 100-101).

The sensitive periods should be taken in to consideration, when planning a long term goals for young athletes. The sensitive period means a certain time span when learning or understanding a certain skill or method becomes through natural growing. During this time span, the development is the most easiest and effective. We have to remember that sensitive periods only give us the right direction where to lead the athlete; we have to take in to consideration the athletes' physical level, amount of exercise, individual development level and training background. (Hakkarainen et al. 2009, 140).

Motoric development means the process and constant changes when the child absorbs motoric skills. The changes during motoric development happen in a certain order because of the inherited genes. The previous social and physical environmental experiences also modify constantly the child's motoric development. The basic motoric skills (balance, handling tools and different movements) develop approximately from the age of two till the age of seven. (Hakkarainen et al. 2009, 140-141).

After learning the basic motoric skills, the child moves to the specific motoric skills phase. This is the time when most of the children start to take interests about different sports and they are eager to learn and study new sport specific skills. We have to remember that a certain skill is very slowly stabilizing quality and the development demands several years. (Hakkarainen et al. 2009, 141).

Speed is a strongly inherited quality, but it can be developed if the specific exercising is started early enough by using the sensitive periods. Speed is strictly connected with innervation, skill and strength level. These qualities should be exercised and empha-

sized before puberty. The exercises with preadolescent and adolescent should concentrate on developing versatile motion thickness, reaction time and rhythm. Developing these qualities after puberty is extremely difficult, sometimes even impossible. (Liikuntavammojen valtakunnallinen ehkäisyohjelma LiVE. 2009).

The muscles strength output is mainly dependent on the muscle cells innervation ability, muscle cells cross surface area and their energy metabolism. Before puberty, the main objective should be to exercise muscle coordination, strength training techniques and speed strength. By creating a versatile muscle coordination basis, it allows the usage of muscle strength in different sports. Besides innervation, the strength training should concentrate on muscle endurance and especially the muscles aerobic capability before puberty. By using our own body weight when performing long repetitions, it enhances the recovery of our muscles, prevents us from injuries and creates our body a stable basis to harder exercises in the future. (Liikuntavammojen valtakunnallinen ehkäisyohjelma LiVE. 2009).

It is studied that a child's body is adaptable to aerobic strain from very early stages. Preadolescent and adolescent endurance training creates a stable basis for later exercises, no matter what the specific sport might be. For example our hearts performance develops smoothly from the birth till puberty. This development occurs especially through the strengthening of hearts muscle cells and cylinder capacity. The thickness of capillaries, the amount of aerobic enzymes and performance of the lungs are essential factors, but only if the body receives enough aerobic strain stimulus. (Hakkarainen et al. 2009, 142).

The child's body is capable of functioning and recovering extremely well from ten second anaerobic exercises, but the lactic acid metabolism, acidity tolerance and lactic acid removal are not developed enough yet. This means that the speed endurance training before puberty should be mainly concentrated on non-lactic acid exercises. Most of the lactic acid exercises come through playing around and it is not harmful. (Liikuntavammojen valtakunnallinen ehkäisyohjelma LiVE. 2009).

Mobility has positive effects on strength output, relaxedness, endurance and speed. Mobility can be passive which means that it is caused by external power or active which means that it is caused by our own muscle strength. The mobility exercises should be started from the early age and the amount of exercises should be added equally, so the maximal mobility level could be reached between 11 and 14 years old. This is the actual sensitive period for flexibility exercising. The puberty's growth spurt can temporarily cause stiffness and this is the exact time when we should concentrate on versatile mobility exercises so we can maintain our motion motoric skills and prevent injuries. (Hakkarainen et al. 2009, 142-143).

3 The basics of strength training during preadolescent and adolescent

The main principles of physical training can be divided into five categories. These categories apply with adults, but also with preadolescent and adolescent. (Hakkarainen et al. 2009, 195).

First one is the stimulus and development principle which is also known as the super compensation. According to this principle the development of physical performance is based on the stimulus caused by the exercise and the recovery process which takes place afterwards. (Hakkarainen et al. 2009, 195).

Second one is the specificity. According to this principle, only those tissues and systems in the body develop which are exposed to stimulus during exercise. Practically this means that if we exercise our legs, they get stronger, if speed, then speed gets better. (Hakkarainen et al. 2009, 195).

Third one is the ability to recover. According to this principle our physical performance level drops back to starting level if the exercises of our tissues and body systems are stopped. Especially strength and endurance levels drop if they are not exercised constantly. (Hakkarainen et al. 2009, 195).

Fourth one is individuality. According to this principle, the development from training is individual between every person. This appears very often among preadolescents and adolescents because of their biological development level are very different. The difference can also be seen between genders, especially during puberty. (Hakkarainen et al. 2009, 195).

Fifth and the last principle is progressiveness. According to this principle, the exercise stimulus should be increased gradually. Increasing too fast can cause the tissues to be-

come overloaded, and too slow can slow down the development. (Hakkarainen et al. 2009, 195).

3.1 Factors effecting strength output

The energy systems which are used to create strength output are; Phosphocreatine system, Glycolytic system and Oxidative system. These three systems provide ATP (adenosine triphosphate) for muscular work. (Chandler & Brown 2008).

The usage of energy system can be defined by measuring the duration of the specific performance. For example; Phosphocreatine system 0-10 seconds, phosphocreatine and glycolytic system (slow) 10-30 seconds, glycolytic system (fast) 30 seconds- 2 minutes, glycolytic system (fast) and oxidative system 2-3 minutes and oxidative system < 3 minutes. (Chandler & Brown 2008).

The term strength can be described as; the greatness of muscles contraction force, the powers transfer trough joint chain or the strength output of body part or torque which is targeted into external target. (Sandström, Ahonen, 2011. 122.) Producing strength is the basis of all the movements and different sports, because without power, no motion can be created. Strength output is affected by several structural and functional factors such as; amount of muscle cells, cell relationship in the muscle cells, ability of the motoric nervous system to activate and adjust the contraction of the muscle cells, elasticity of the muscles structures and tendons, length of the leverages, factors in the muscles energy metabolism, several hormonal regulations, exercising, gender and age. (Hakkarainen et al. 2009, 195-196).

Another physiological mechanism underlying the variation in strength may be related to the proportion of different fibre types in skeletal muscle. Slow twitch (type I) and fast twitch (type II) fibres differ in force, power, velocity, rate of relaxation and fatigability. There is a wide degree of variation in the proportion of fibre types in specific skeletal muscles. Also another physiological mechanism that affects muscle strength and size is the number of fibres within a given muscle. (Cardinale et al. 2011).

When thinking about motion, the most optimal strength output is created by the combination of nervous system, muscles and supportive structures. In this chain the muscles which cause the motion contract just at the right time, the muscles that slow down the motion give up temporarily and the supportive muscles create an optimal counterforce for the muscles which caused the motion in the beginning. Strength training is very versatile development of the neuromuscular system, and it can be started already at very early age. (Hakkarainen et al. 2009, 196).

3.2 Natural development of strength output during adolescence

The development of strength output during preadolescent is connected with physical growth and it is a natural happening, which can be affected by exercise and training. When measuring the development of strength by using isometric or isokinetic methods with the boys, the absolute strength level develops from the age of six to age between 12 and 14 in linear. After this, the strength develops strongly till reaching 20 years old. This is caused especially by the growth spurt and anabolic hormone activations. There are also a few other factors that affect the speed of development such as; the strength output caused by the body's growth, increased motivation towards strength training, the changes in leverages during growth and the motoric learning caused by exercise. (Hakkarainen et al. 2009, 197).

The girls' development during pre-puberty goes the same way with the boys', but the development during puberty is a lot weaker. The few reasons for this are; girls' lower anabolic hormone levels, lower muscle and body mass, on average shorter leverages and lower adrenalin levels. With both genders the natural development of strength is at its peak approximately a year after the growth spurt peak, which is 11.4-12.2 years old with girls and 13.4-14.4 with the boys. The best period for starting to gain mass for both genders is about 1-3 years after the growth spurts peak. (Hakkarainen et al. 2009, 197).

3.3 General features of strength training

The main objective of strength training is to enhance the needed strength output essential to the sports. Because of this, strength training should be long term and versatile process where different forms of strengths are exercised at the optimal time for each quality. To make the strength training programming easier, the strengths are categorized into three different forms. The first form is maximum strength which can be divided into neural and hypertrophy. Second form is endurance strength which can be divided into muscle endurance and strength endurance. Third form is speed strength which can be divided into instant strength and explosive strength. (Hakkarainen et al. 2009, 203).

When programming strength training, periodization should also be taken into consideration. The most common method of developing a periodization is to divide a competitive season into three levels of cycles: macrocycles (several months in duration up to a year or slightly more, mesocycles (from approximately two to eight weeks in duration and microcycles (usually 7 to 14 days in duration). (Stone, Stone & Sands 2007).

Macrocycles are usually described based on common-sense understanding of the nature of the competitions within the macrocycle. The mesocycles can be linked to form an annual plan, or a specific macrocycle. Microcycles are periods of training lasting between 7 and 14 days and they are the smallest basic unit of training planning that has strictly applied objectives. (Stone et al. 2007).

3.4 Strength training during adolescence

Muscle mass has a major effect when talking about the absolute strength output of a muscle or muscle groups and gaining enough mass is often essential in most sports. The strength training with the objective to gain more mass should be emphasized to the phase after growth spurt, but the barbell techniques and body motions should be learned way before this. (Hakkarainen et al. 2009, 206).

The muscle coordination can be started to develop from early ages by exercising different motoric skills, strength training techniques and body control. It is essential to concentrate on middle body muscles such as abdominals, upper and lower back, sides, buttocks and iliopsoas and their cooperation during strength output.

The muscle metabolism is also a part of strength output. A child's aerobic metabolism is relatively good and it should be supported with muscle endurance and strength endurance training. (Hakkarainen et al. 2009, 206).

Speed strength training such as jumps and fitness ball exercises are excellent when thinking about strength training what enhances nervous system and elasticity. These exercises can be started from the early ages, but the amount of training sessions should be taken into consideration because there is a risk of injury. Injuries might occur if the performance techniques are incorrect from the very beginning. It is crucial to learn the techniques before starting the exercises. (Hakkarainen et al. 2009, 206, 208).

3.5 Different forms of strength

“Load refers to the amount of weight assigned to an exercise set. Training volume is prescribed in terms of the number of repetitions per set, number of sets per session and the number of sessions per week.” (Bird, Tarpenning & Marino 2005, 844).

Strength can also be defined as maximal force or torque generated during a maximal voluntary contraction under a given set of conditions. Key parameters include posture, nature of the movement employed, and contraction type and movement velocity. So, the strength qualities can be categorized in terms of static, concentric and eccentric modes of contraction (Gamble, P. 2013). Muscle contraction is the basis for human movement. (Stone et al. 2007).

Like mentioned earlier the different forms of strengths can be divided into three categories and two subcategories. The main categories are maximum strength, endurance strength and speed strength. (Hakkarainen et al. 2009, 204).

Maximum strength can be divided into neural and hypertrophy. Neural develops the nervous systems ability to activate muscle cells and the main affect is focused on fast motoric units. Hypertrophy's aim is to increase the cross surface area of the muscle and from thereon grow the muscles maximum contraction ability. (Hakkarainen et al. 2009, 204).

Endurance strength can be divided into muscle endurance and strength endurance. Muscle endurance's aim is to develop the aerobic-anaerobic energy production of the muscles and develop the ligaments tenacity. Strength endurance aim is to develop the anaerobic energy production of the muscles and the muscles local lactic acid exit mechanisms. (Hakkarainen et al. 2009, 204).

Speed strength can be divided into instant strength and explosive strength. Instant strengths aim is to develop the nervous systems ability to activate muscle cells. It also develops the muscles inner strength, reflexes and the elasticity of muscle-ligament complex. Explosive strength develops the nervous systems ability to activate muscle cells as fast as possible and at the same time the maximum strength enhances a little. (Hakkarainen et al. 2009, 204).

4 Teaching a skill

4.1 What is learning a skill

Learning a skill is any particular permanent change in our behaviour, knowledge, understanding, point of view, skills and abilities, which cannot be explained by the cause of physical growth or development. Memory is the result from learning, or in other words stored changes in our neural circuit's abilities. (Sandström & Ahonen 2011, 65). During learning process, our body deals with several events which occur at the same time. Those events are based on neurology and cognition. (Hakkarainen et al. 2009, 237).

Learning takes place at the same time with practicing. Learning is also usually permanent. Humans tend to recognize and remember certain skills learned in the past and execute it without constant practicing. (Hakkarainen et al. 2009, 237).

Learning a skill is connected with enhancing performance, the conformity of motions, permanence and the ability to perform the learned skill in a new environment. Athletes' learn unconsciously things during supervised training situations. The aim might be learning a new technique, but the athlete might learn something new about group dynamics. This learning style is called hidden syllabus. (Hakkarainen et al. 2009, 237-238).

4.2 The modern style of learning a skill

The modern style of learning says that the learning develops through three factors and their cooperative actions which are the learner, the learning environment and the actual skill or task. The qualities of the learner affect the progress of the learning process. These qualities are for example character, motivation, previous experience about the learned task/skill, body's qualities and dimensions, innate abilities and condition abilities. We all have different observing motoric skills, which might be essential to learn-

ing. Feelings and sociocultural factors also contribute the learning. (Hakkarainen et al. 2009, 238).

The environment creates also its own demands for the learning process. The environment might have other people present during the performance, which can cause either positive or negative effects on the athletes' performance. The environment can also be very different by its physical and psychological presence which also affects the athlete. (Hakkarainen et al. 2009, 238).

Motoric skills (the task which is learned) contains very different demands, which can be related for example to observe motoric skills, fulfilling the task and the decision process. (Hakkarainen et al. 2009, 238).

4.3 The support of instructions during teaching

Instruction means a style, which is used when guiding an athlete to perform a skill. Usually the supervisor or coach leads the athlete through the drill by talking, sometimes other methods are used like writing notes. Instruction usually include the most necessary information about the subject which is practiced and it can focus on several different objectives, for example team work, technique, tactics or result. (Hakkarainen et al. 2009, 339).

We have to keep in mind that, when giving instructions, what should be the main objectives which must be passed to the athlete. All the unnecessary information towards the athlete are harmful and can distract the main objectives. The coaches should first tell briefly what they are going to say, then keep the actual speech with main objectives and then repeat what they just said so the message is clear. (Hakkarainen et al. 2009, 339).

The biggest challenge for coaches is to keep the given instructions short and simple enough. Our short lasting memory has a very limited capacity to receive information. That's why the given instructions should only include few main objectives and the

speech should be given just before the athletes' performance. (Hakkarainen et al. 2009, 339-340).

When the athlete reaches the final stage of learning, his/hers performance is automatic. The athlete executes the performance unconsciously. During this learning stage the body's inner instruction is harmful for the athlete, because it removes the performance into analytic or conscious level. This increases the risk of making mistakes during the performance. The automatic motions remain better, if the athlete concentrates on body's external targets. (Hakkarainen et al. 2009, 341).

4.4 Demonstration during teaching

Besides instructions, coaches enhance the athletes' learning by using different demonstrations. The visual picture teaches the athlete usually more than a thousand words. Demonstration can be handed out by the coach, pictures or even videos, and during the practice sessions, the athletes' gain plenty of demonstration from each other. (Hakkarainen et al. 2009, 341).

During the demonstration, it is essential that the coach is placed correct. The coach must be certain, that all the athletes' can see and hear the demonstration. The body positioning should be also figured out, should the athletes' be the opposite side or look from the side view. (Hakkarainen et al. 2009, 341).

When using pictures or videos as a demonstration, the coach should pick world class athletes' so the main objectives are as close as perfect as possible. If watching the athlete him/herself, the most efficient way to learn is by watching the best pictures or videos. If the athlete cannot locate the errors in the performance, the coach should advice the athlete verbally and ask questions about the main objectives. This increases the athletes' observation skills. Demonstrations have been noticed to be the most effective in the beginning of the learning and at the later phases also. (Hakkarainen et al. 2009, 341).

5 Safety procedures and preventing injuries

Before starting barbell technique, the motions and proper grips must be practiced with stick gymnastics. The stick is much lighter and narrower, so it fits perfectly for children, advanced weight lifters and adults use it also before starting barbell training. Injuries occur all the time in every aspect of sport and weight lifting is no difference. Proper stick technique and knowledge about the movements prevents injuries and helps you to get started. It is time to move to the barbell, after mastering the movements with the stick.

Using free-weight barbells requires higher levels of motor coordination than using machines. The freedom of movement allowed by free weights easily translates to potential injury when correct loading, lifting and spotting techniques are not used. However, free weight training is not dangerous; when reasonable precautions are taken, it is very safe and usually more effective than machines in strengthening the body. (Baechle & Earle 2012, 7).

5.1 Footwear

Use weight lifting shoes because they possess straps, which allows you to push out against the side of the shoe with your feet, this increases your hip activation. The increased hip activation will lead to a stronger pull and squat. More stability means that you will have a very consistent platform from which to push. (Stadtfeld 2012).

Weight lifting shoes have a wooden sole, which means your foot is going to consistently be on a stable surface. The wooden sole raises the heel up usually between 1.8- 2.5 cm, depending on your shoes. This allows you to utilize every aspect of your musculature for the lift you are practicing. The higher heel also allows you to squat deeper position due to the increased range of motion for the ankle joint. (Stadtfeld 2012).

5.2 Training environment and clothing

Make sure that you have enough space for yourself and the barbell. There are usually specific areas where Olympic weightlifting is practiced at the gym. These areas have special floor which is built from wood with rubber carpet on top of it so it is stable but still a little flexible, so you can drop the weights on it.

Wear comfortable clothes, so they will not inhibit the range of motion. Make also sure that the clothes you wear are not too hot or cold, because this affects your training. T-Shirt and shorts are excellent choices to begin with.

5.3 Breathing and pressure intake

“Breathing control is critical for increasing and maintaining the structural integrity of the spine while under heavy loads.” (Everett 2008, 30.) Learn to breathe through your diaphragm, do not hold the air and pressure in your cheeks. During the inhale phase, your diaphragm expands and fills up with air and during the exhale phase it flattens and releases the pressure. When filling your lungs with air and inhaling the pressure, your abdomen is forced to expand, this keeps your posture together and prevents your back getting round. Remember to inhale and take new pressures before every new repetition. The pressure should be held inside throughout most of the movement, so your technique stays clean and you get the most out of your lift. When you hit the highest pressure during the movement, release the air from your diaphragm slowly by hissing or similar action. This helps you to release the pressure and gives you an extra boost for your lift, but still maintains your abdominals activated and your back secured. Remember not to release too much air during the lift, because it will decrease the support of your abdominal and back muscles, and takes away the extra boost from the lift. (Vestman, K. 25 Mar 2014).

5.4 Muscle imbalance

Muscles can be divided into three subcategories by their development and functioning: tonic muscles, phasic muscles and hybrid muscles. In the beginning, the mission of

tonic muscles was only to maintain the body's position, whereas phasic muscles target was to create motion. Muscles which have both functions are called hybrid muscles. Today people do not have correctly only tonic or phasic muscles. Some muscles can still be categorised between the two by seeing how they react to incorrect loading or overwork. (Spring et al. 1986, 120-124).

Muscle imbalance means the state, where tonic and phasic muscles are imbalanced: tonic muscles maintain their strength while shortening and phasic antagonist and synergist muscles maintain their normal length, but loosen their strength. Muscle imbalance also weakens our musculoskeletal strain tolerance. Versatile weight lifting identifies and strengthens all the possible weak muscles in your body and helps you to get your muscle balance in harmony. (Spring et al. 1986, 120-124).

6 Warm up and cool down

6.1 Physiological effects of warm up

Warming up is exercises, movements or full body rotations, which help the athletes' body to reach the most optimal standby before the actual exercise or competition. Proper and well executed warm up also prevents injuries effectively. Remember that warm up is always a part of your exercise. (Saari, Lumio, Asmussen & Montag 2009, 3).

At dormancy your body's entrails blood circulation is very busy, but when muscle activation occurs these blood storages (spleen, liver etc.) deliver the blood to muscles. When the muscles activate during the warm up, capillaries open and stays that way and the blood circulation increases. Increased blood circulation and the activated muscles create heath inside of the muscles and inside your body. Because of this, your muscles get more oxygen, energy and hormones, and the metabolic waste exits from your muscles. All these combined improve the performance and recovery of your muscles. (Saari et al. 2009, 3).

During the muscle activation when warming up, your respiration rate and respiration depth increases, so the respiratory system is able to satisfy the oxygen needs of your muscles and exit effectively carbon dioxide. The created carbon dioxide exits the blood circulation when exhaling, and when inhaling the oxygen goes through your air cells to your blood circulation. (Saari et al. 2009, 3).

When the exercised part of your body heathens up, the speed of the nervous impulses which transfer in and out the information speeds up. This way the production of strength from your muscles increases and your position and motion sense intensifies. Because of the speeding of nervous impulses, your speed, reaction time, balance, explosiveness and the economics of the movement get better significantly. (Saari et al. 2009, 4).

While the temperature in your body rises, the elasticity of your muscles also increases. During the warm up, it is important also to stretch your muscles and joints. These stretches should be short-term and functional. During the functional stretching your muscles get alternately contraction and lengthen movement, which generates stronger and faster contracting muscle. (Saari et al. 2009, 4).

Well executed warm up has been studied to enhance vigilance. Warm up activates vision and the cooperation of different parts in your central nervous system. These two elements raise your alertness and alertness increases your motoric skills, coordination and precision. (Saari et al. 2009, 4).

6.2 Physiological effects of cool down

Cool down is the instant series of movements you perform right after your original exercise. The aim is to help the athlete's body to recover from the strain as fast as possible after the exercise. The cool downs objective is to enhance the exit of metabolic waste such as lactic acid from the muscles and restore the participated muscles close to their original resting length. (Saari et al. 2009, 31).

After the exercise, the athlete's heart rate is typically high and the muscles involved with the exercise are filled with lactic acid or other metabolic waste. The lactate increases the muscles sourness and complicates for example the movement of nervous impulses and contraction of the muscles. (Saari et al. 2009, 31).

It is recommended to perform the cool down with decreasing intensity and versatile movement of different muscles, because then the slow muscle fibres, less active and resting muscles stay activated during the exit of metabolic waste. (Saari et al. 2009, 31).

The motoric nervous system recovers during the efficient metabolism. The sensory nervous system recovers best through stretching and variations of movements, because then your body's position and motion senses normalize. Gradual lowering of resistance during cool down enhances your hormonal action to get back to its normal level.

Correct and accurate cool down also effects positively to the quality of sleep which helps your body fully to recover from the exercise. (Saari et al. 2009, 32).

Stretching is the most important part of the cool down. The aim is to relax your muscles and restoring them back to their resting length, increase the elasticity of the tissues around the joints and prevent injuries. It is crucial to make sure, that the metabolic waste has exited to body before the stretching; otherwise the recovery process can slow down. (Saari et al. 2009, 32-33).

Restoring the muscles back to their resting length primarily goes through short-term stretches. 5-10 or 10-30 seconds are the most typical lengths of stretching during cool down. (Saari et al. 2009, 32-33).

The more high-powered the workload is the mightier the anaerobic energy supply is. This is strictly connected with the decrease of lactic acid and the muscles oxygen debt. (Saari et al. 2009, 33).

After the exercise the body often suffers from dehydration. With effective hydration the body's fluid balance can be restored back to the normal level within few hours. Restoring almost completely drained energy reserve takes often 24 hours with proper eating. The muscles complete recovery can take several days, if the strain has been extremely exhausting. (Saari et al. 2009, 33).

7 Empirical part

7.1 Project planning

Weightlifting is very common in almost every sport we can imagine, especially in those sports where you need some kind of strength training. I started doing the classic weightlifting and the multiple variations from it eight months ago. During this time I travelled across several gyms and health clubs both exercising and searching for information. As my knowledge about the sport and technique increased, I soon discovered that the information and knowledge about correct weightlifting techniques and the most important principles of the sport were totally gone among the others at the gym.

I am an active ice hockey coach for adolescent children in KJT (Keskiuudenmaan jääkiekko tuki) 99-borns and the same problem obviously occurred there. The lack of knowledge and technique did not cover any specific age group, but almost the whole population at the gym whom I encountered. I asked myself what can be done to help young athletes who are curious about strength training and weightlifting. The solution was a weightlifting manual for children aged 12-15, because this age group usually starts to take interest about their body and especially weight training.

There are the two Olympic lifts (snatch and clean and jerk) and the variation of strengthening movements which are needed to perform those two with maximum effort. I had a meeting with Katariina Vestman, one of the most successful female classic weightlifters in Finland, and asked her advice about the manual and the exercises which should be introduced to adolescents. We came to a conclusion that there should be the two Olympic lifts, six strengthening lifts and stick gymnastics involved with the manual, so it covers the most important parts for the beginner and for advanced weight lifter.

After I was aware of the most of the lifts, I interviewed Katariina Vestman, searched information about Olympic weight lifting and the strengthening movements. I had

several meetings with Katariina concerning the techniques of weight lifting, borrowed a lot of literature and read articles about weight lifting from the internet.

After gathering all the necessary information, I needed to find a gym where I could take pictures for the manual, so it would be easier for the athlete to comprehend how to perform the movements safe and with correct technique. I chose the gym which is mainly used by weight lifters, because it was familiar for me and it had the proper facilities and the equipment for the lifts. After collecting the information and taking the pictures, I had to consider how to adjust them into the manual so it would be clear, logical and reasonable.

7.2 Project implementation

The manual starts with introduction about the contents inside of it, which gives the athlete a simple understanding what the manual actually consists. After introduction comes the table of contents, which informs the reader with complete view about the manual, so the athlete can choose which techniques or lifts they want to concentrate on.

The first chapter covers importance of the warm up, because it crucial to perform before any weightlifting, either barbell technique or actual weight training. Warm up is connected with the first movement, which was stick gymnastics and the different variations of it. These chapters include the safety procedures and the correct clothing and food wear can be seen from the pictures. The main objectives are getting the athlete a proper warm up and reminding the athlete how to prevent himself from getting injured.

Because the weightlifting manual purely concentrates only on techniques and correct movements, I did not add any irrelevant information to it. My employer for this project was Kalle Kettunkangas from KJT (Keskiuudenmaan jääkiekko tuki) and we came to a conclusion that it should strictly include only weightlifting techniques and the main principles which help our young athletes. I also had a meeting with Katariina

Vestman, and we together decided the most important information included with the manual which are connected with weightlifting and adolescent children.

After all the correct lifting techniques and movements are covered, the written part of the manual starts. The written part is divided into chapters which include important information about cooling down, stretching, healthy eating and quality sleeping. I also decided that it is important for adolescent children to know what strength actually means, what type of strengths exists and how weightlifting affects to their body and muscle balance.

The athletes seen in the manual are I and Kimmo Korvenoja, who is one of Katariina Vestman's weightlifting students. I picked Kimmo to perform some of the movements, because I am not able to execute them with perfect technique. There are total of ten movements and I am featuring in five of them and Kimmo the other five. The safety procedures are mentioned before every technique and the movement is gone through step by step before the pictures. All the lifts are shown from the side-view, because side-view shows the body's movement best.

7.3 Project assessment

I was very pleased with the outcome of my manual. I felt that I succeeded gathering the most important lifts and techniques and present them the way I wanted. I wanted to present the material in the most logical order, which was the movements and techniques first, then the written part and extra information. When I think about adolescent children and the information in my manual, I think that they will fully understand the importance of training and technique. I also wanted that all the athletes from different sports can use this weightlifting manual as a guide to help them to get started with pure classic weightlifting training.

The main concern of this project was building the manual. The manual is booklet type of paper document which includes all the text and pictures. The problem was how to build it with my IT skills and knowledge. I did a research from internet how to create a

booklet and which software should I use. I chose Adobe readers InDesign software which mainly concentrates on booklets and it had all the tools what I needed. I already had all the information and the pictures, so I was ready to put it all together. I asked my fellow student and friend Mauri Pulkkinen to design the manuals outfit and to create it with me. With the help of Mauri we were able to put all the information and pictures together and create the final version of the weightlifting manual. I was very pleased with this cooperation, because I learned the basics of new software and the result of the manual was better than I expected.

8 Exercises

I have chosen these ten exercises together with Katariina Vestman. There is stick gymnastics, two Olympic lifts (Clean and jerk separated) and six strengthening lifts, which are often used to build up our body balanced and gaining strength. I will go through the lifts from stick gymnastics to advanced lifts, and from advanced to the strengthening lifts. It is important to cover the demanding techniques before the strengthening techniques, because of their complexity and importance. After controlling the basics of the two Olympic lifts, it is time to start exercising the strengthening movements.

8.1 Stick gymnastics

Stick gymnastics is used during warm up and the objective is to activate and warm up your muscles by using versatile and useful movements. While practicing the techniques with the stick, your muscles and joints open up because of the continuous rotations and trajectory's made with your body. You can also practice the correct lifting techniques and movements safe, because there is no resistance at all. While you practice the optional techniques, your mobility and motoric skills develop and your trajectory's become smooth and technical. (Vestman, K. 25 Mar 2014).

8.2 Mechanics of the snatch

1. Take a stand in front of the barbell and spread your feet approximately to your hip width while your toes point outwards 30-45 degrees. The barbell should be touching your shins.
2. Bend over, bend your knees and keep your back straight while reaching the barbell. Keep your heels on the ground all the time.
3. Grab the barbell with closed fists, the width of your hands should make 90 degree angle compared to the barbell. You can find the correct hand width by ex-

tending your other hand straight towards the ceiling next to your ear and extending the other hand at the same level as your shoulders.

4. While grabbing the barbell use the finger lock by putting your thumbs under your index and middle fingers. This procedure relaxes your arms muscles, keeps the wrist angle straight and prevents the barbell from slipping.
5. Keep your back straight and maintain good posture while looking forward.
6. Remember that your knees are pointing always the same direction with your big toes. (Arvonen & Kailjärvi 2002; Vestman, K. 25 Mar 2014).

8.3 Mechanics of the Clean and jerk

1. Take a stand in front of the barbell and spread your feet approximately to your hip width while your toes point outwards 30-45 degrees. The barbell should be touching your shins.
2. Bend over, bend your knees and keep your back straight while reaching the barbell. Keep your heels on the ground all the time.
3. Grab the barbell with closed fists, your hands should be approximately your shoulder width or narrower.
4. While grabbing the barbell use the finger lock by putting your thumbs under your index and middle fingers. This procedure relaxes your arms muscles, keeps the wrist angle straight and prevents the barbell from slipping.
5. Keep your back straight and maintain good posture while looking forward.
6. Remember that your knees are pointing always the same direction with your big toes. (Arvonen & Kailjärvi 2002; Vestman, K. 25 Mar 2014).

8.4 Mechanics of Back squat

1. Place the barbell behind your head, on your trapezius. Pull your shoulder blades together so you can get a comfortable and stable platform for the barbell.
2. The barbell should be placed under your lowest cervical vertebra so the weight is equally divided for your whole body, not on your spine or hands.

3. Keep the barbell balanced with your hands and hold it with open or closed palms.
4. Keep your back straight and create a good posture while looking forward or slightly upward.
5. Spread your feet approximately to your hip width while your toes point outwards 30-45 degrees. Remember that your knees are pointing always the same direction with your big toes. (Arvonen & Kailajärvi 2002; Vestman, K. 25 Mar 2014).

8.5 Mechanics of Front squat

1. Place the barbell on your shoulders, under your thyroid cartilage and keep it balanced with open palms.
2. Push your elbows out so you can create a stable and comfortable platform for the barbell and the whole weight is on your body, not on your hands.
3. Keep your posture good and push your chest outward, look forward or slightly upward so you can maintain your balance and your back straight.
4. Spread your feet approximately to your hip width while your toes point outwards 30-45 degrees. Remember that your knees are pointing always the same direction with your big toes. (Arvonen & Kailajärvi 2002; Vestman, K. 25 Mar 2014).

8.6 Mechanics of Deadlift

1. Take a stand in front of the barbell and spread your feet approximately to your hip width while your toes point outwards 30-45 degrees. The barbell should be touching your shins.
2. Bend over, bend your knees and keep your back straight while reaching the barbell. Keep your heels on the ground all the time.
3. Grab the barbell with overhand grip or mixed grip, your hands should be approximately your shoulder width or narrower.

4. While grabbing the barbell use the finger lock by putting your thumbs under your index and middle fingers. This procedure relaxes your arms muscles, keeps the wrist angle straight and prevents the barbell from slipping.
5. Keep your back straight and maintain good posture while looking forward.
6. Remember that your knees are pointing always the same direction with your big toes. (Vestman, K. 25 Mar 2014).

8.7 Mechanics of Overhead squat

1. Grab the barbell with closed fists, the width of your hands should make 90 degree angle compared to the barbell. You can find the correct hand width by extending your other hand straight towards the ceiling next to your ear and extending the other hand at the same level as your shoulders.
2. Push the barbell upwards so your hands are straight.
3. The barbell should be located slightly behind your head at the same level compared to your heels. When your hands are fully extended an active shoulder lock should take place, this means that the weight is resting on your whole body, not on your hands.
4. Keep your back straight and posture good, look forward to maintain your balance.
5. Spread your feet approximately to your hip width while your toes point outwards 30-45 degrees. Remember that your knees are pointing always the same direction with your big toes. (Vestman, K. 25 Mar 2014).

8.8 Mechanics of Bent-over row

1. Take a stand in front of the barbell and spread your feet approximately to your hip width while your toes point outwards 30-45 degrees.
2. Bend over, bend your knees and keep your back straight while reaching the barbell. Keep your heels on the ground all the time.

3. Grab the barbell with overhand grip, your hands should be approximately your shoulder width or wider.
4. While grabbing the barbell use the finger lock by putting your thumbs under your index and middle fingers. This procedure relaxes your arms muscles, keeps the wrist angle straight and prevents the barbell from slipping.
5. Pull the barbell and rise up wards, the angle of your body should be approximately 90 degrees compared to your lower body to your upper body. Keep your back straight and bend your knees slightly. Look forward.
6. The barbell should hang loose away from your body at the same level with your knees, flex your abdominals and back muscles to prevent your back getting rounded. (Vestman, K. 25 Mar 2014).

8.9 Mechanics of Chin up

1. Take a stand under the bar and grab it with underhand grip.
2. The width of your grip should be shoulder width or narrower.
3. Hang loose from the floor with both of your arms extended and keep your whole body straight. (Vestman, K. 25 Mar 2014).

9 Performing the exercises

The mechanics of each lift has been introduced so the next step is to describe what happens after taking the starting position. The movements are chopped carefully throughout from starting position to finishing the lift. It is important to go through the lifts and phases step by step, so the technique stays clean from the beginning till the end. Concentrate to each repetition always with full intensity.

9.1 Snatch

1. Before performing the lift, inhale strongly and take pressure inside your body. This activates your whole body for the movement and prevents your muscles to get loose. Remember, do not to leave the air inside your cheeks, but transfer it to your diaphragm.
2. Start pushing the platform with your feet and at the same time start pulling the barbell upwards. The barbell should be attached to your shins while moving upwards.
3. The speed of the barbell should be accelerating when your pull is getting closet to your pelvic area.
4. When the barbell has passed your knees and reached to quadriceps, straighten your whole back explosively. This gives the barbell the acceleration which is needed.
5. After straightening your back fully with explosive motion, finish the pull by ascending to the ball of the feet and pulling your shoulders and trapezius towards your ears.
6. While finishing the pull, pull your shoulders backwards and pull the barbell explosively from your pelvis towards the ceiling. Try to keep your elbows above the barbell as long as you can before getting under.
7. While the barbell is moving upwards after the pull phase, drop forcefully and explosively into deep squat under the barbell, so you can straighten your arms and get an active shoulder lock to prevent the barbell from moving. The barbell

should stop behind your head, at the same level with your heels. Arms should be straightened, back straight and look forward.

8. After you have the barbell under control, avoid losing balance and unnecessary movement and start squatting upwards.
9. During the upward squat release the pressure from your diaphragm slowly, so you can get an extra push for your lift. Push your knees outwards to prevent them from bending inside. This prevents injuries and keeps the technique clean. (Arvonen & Kailajärvi 2002; Vestman, K. 25 Mar 2014).

9.1.1 Working muscles

The main muscles which are working; Quadriceps, Gluteus maximus, Hamstrings, Calves, Trapezius, Abdominals, Upper/lower back and Deltoids. (Delavier 2006.)

9.2 Clean

1. Before performing the lift, inhale strongly and take pressure inside your body. This activates your whole body for the movement and prevents your muscles to get loose. Remember, do not to leave the air inside your cheeks, but transfer it to your diaphragm.
2. Start pushing the platform with your feet and at the same time start pulling the barbell upwards. The barbell should be attached to your shins while moving upwards.
3. The speed of the barbell should be accelerating when your pull is getting closet to your pelvic area.
4. When the barbell has passed your knees and reached to quadriceps, straighten your whole back explosively. This gives the barbell the acceleration which is needed.
5. After straightening your back fully with explosive motion, finish the pull by ascending to the ball of the feet and pulling your shoulders and trapezius towards your ears.

6. While the barbell is moving upwards after the pull phase, drop forcefully and explosively under the barbell and spread your legs a little wider, big toes pointing the same direction with your knees. At the same time roll over your elbows under the barbell in front of you to the same level with your jaw and push your elbows outwards. The barbell should land on your shoulders, not on your hands.
7. Descend controlled into deep squat and by using the counterforce start immediately pushing upwards with your back straight.
8. During the upward squat release the pressure from your diaphragm slowly, so you can get an extra push for your lift. Push your knees outwards to prevent them from bending inside. This prevents injuries and keeps the technique clean. (Arvonen & Kailajärvi 2002; Vestman, K. 25 Mar 2014).

9.2.1 Jerk

1. Adjust your grip if necessary after you have squat the barbell up and prepare for jerking.
2. Inhale strongly and take fresh pressure inside your diaphragm.
3. Keep the whole weight on your soles, descent slightly by bending your knees and ankles.
4. After piquant accelerating push explosively upwards with your legs.
5. While the barbell is moving upwards, explosively drop below the barbell into a scissor position and land with your stronger leg bent in front of you and other leg almost fully extended behind you. At the same time push the barbell upwards with your hands. The barbell should be resting on straight hands and at the same line with your body's central point. This way you maintain your balance and the whole weight is resting on your full body.
6. After the barbell is controlled and the balance maintained, move your stronger (front) leg close to your body's central point and after that the posterior leg next to the stronger leg, so both of your legs are right under the weight.

7. Avoid any body movement and keep the barbell a few seconds above your head, back straight, active shoulder lock and looking forward. (Arvonen & Kailajärvi 2002; Vestman, K. 25 Mar 2014).

9.2.2 Working muscles

The main muscles which are working; Quadriceps, Gluteus maximus, Hamstrings, Calves, Deltoids, Lower/upper back and abdominals. (Delavier 2006.)

9.3 Back squat

1. Before performing the lift, inhale strongly and take pressure inside your body. This activates your whole body for the movement and prevents your muscles to get loose. Remember, do not to leave the air inside your cheeks, but transfer it to your diaphragm.
2. Start ascending downwards, keep your heels on the ground, back straight and look forward.
3. Ascend till your knees are making a 90 degree angle or your hip joint is lower than your knee joint.
4. During the upward squat release the pressure from your diaphragm slowly, so you can get an extra push for your lift. Push your knees outwards to prevent them from bending inside. This prevents injuries and keeps the technique clean. (Arvonen & Kailajärvi 2002; Vestman, K. 25 Mar 2014).

9.3.1 Working muscles

The main muscles which are working; Quadriceps, Gluteus maximus, Hamstrings, Calves, Lower/upper back and abdominals. (Delavier 2006.)

9.4 Front squat

1. Before performing the lift, inhale strongly and take pressure inside your body. This activates your whole body for the movement and prevents your muscles to get loose. Remember, do not to leave the air inside your cheeks, but transfer it to your diaphragm.
2. Start ascending downwards, keep your heels on the ground, back straight and look forward.
3. Ascend till your knees are making a 90 degree angle or your hip joint is lower than your knee joint.
4. During the upward squat release the pressure from your diaphragm slowly, so you can get an extra push for your lift. Push your knees outwards to prevent them from bending inside. This prevents injuries and keeps the technique clean. (Arvonen & Kailajärvi 2002; Vestman, K. 25 Mar 2014).

9.4.1 Working muscles

The main muscles which are working; Quadriceps, Gluteus maximus, Hamstrings, Calves, Lower/upper back and abdominals. (Delavier 2006.)

9.5 Deadlift

1. Before performing the lift, inhale strongly and take pressure inside your body. This activates your whole body for the movement and prevents your muscles to get loose. Remember, do not to leave the air inside your cheeks, but transfer it to your diaphragm.
2. Start pulling the barbell upwards. The barbell should be in touching your shins during the movement.
3. Push with your feet and push your hips forward at the same time.
4. Keep your back straight and look forward. When the barbell passes your knees, finish the pull phase by extending your whole body and lean backwards slightly.

5. Set down the barbell with same motion back on the platform. (Vestman, K. 25 Mar 2014).

9.5.1 Working muscles

The main muscles which are working; Quadriceps, Gluteus maximus, Soleus, Adductor magnus, Lower back and Abdominals. (Delavier 2006).

9.6 Overhead squat

1. Before performing the lift, inhale strongly and take pressure inside your body. This activates your whole body for the movement and prevents your muscles to get loose. Remember, do not to leave the air inside your cheeks, but transfer it to your diaphragm.
2. Start ascending downwards, keep your heels on the ground, back straight and look forward.
3. Ascend till your knees are making a 90 degree angle or your hip joint is lower than your knee joint.
4. Concentrate that the barbell does not move backward or forward during the squat phase, the centre of gravity should be on your heels all the time.
5. During the upward squat release the pressure from your diaphragm slowly, so you can get an extra push for your lift. Push your knees outwards to prevent them from bending inside. This prevents injuries and keeps the technique clean. (Vestman, K. 25 Mar 2014).

9.6.1 Working muscles

The main muscles which are working; Quadriceps, Gluteus maximus, Hamstrings, Calves, Deltoids, Triceps, Lower back and Abdominals. (Delavier 2006.)

9.7 Bent-over row

1. Before performing the lift, inhale strongly and take pressure inside your body. This activates your whole body for the movement and prevents your muscles to get loose. Remember, do not to leave the air inside your cheeks, but transfer it to your diaphragm.
2. Start pulling the barbell towards your chest by pulling your shoulder blades together from the starting position.
3. Activate your upper back muscles, deltoids and triceps to get an extra power for the pull. Remember to keep your elbows close to your body.
4. When the barbell reaches and touches your chest, hold it in place for a second and let it slowly return to the starting position.
5. Remember to keep your back straight and look forward. (Vestman, K. 25 Mar 2014).

9.7.1 Working muscles

The main muscles which are working; Lower back, Teres major, Biceps and Deltoids. (Delavier 2006.)

9.8 Chin up

1. Before performing the lift, inhale strongly and take pressure inside your body. This activates your whole body for the movement and prevents your muscles to get loose. Remember, do not to leave the air inside your cheeks, but transfer it to your diaphragm.
2. Start pulling yourself towards the bar, flex your whole back and push your chest outwards, so your body slightly curves.
3. By using your biceps, pull up until your chin is higher than the bar. Keep your elbows close to your body and avoid kicking or any unnecessary movement.

4. The same motion takes place when descending from above the bar. Descends until both of your arms are fully extended. (Vestman, K. 25 Mar 2014).

9.8.1 Working muscles

The main muscles which are working; Latissimus dorsi, Trapezius, Teres major, Deltoids, Biceps, Upper back and Abdominals. (Delavier 2006.)

10 Conclusion

In this project the main idea was to create a technical and safe weightlifting manual for adolescent children.

I have presented the most important and useful lifts for the beginners and even an advanced weightlifter can rehearse his skills by reading the manual. The athlete should first learn the basics of the two Olympic lifts through stick gymnastics, so the movements become smooth and technical. After mastering the basics of the Olympic lifts the athlete should start the strengthening movements which allow him to gain more mobility, motoric skills, flexibility and most importantly strength. As the body adapts to the movements, the athlete can start adding light weights to the barbell.

I chose the lifts together with Katariina Vestman and they are used in almost every sport where strength training exists.

When talking about strength training among athletes, they are often being shy about weightlifting and especially the Olympic techniques. My goal is to get the athletes and coaches in different sports more open minded for classic weightlifting techniques, because they build up and strengthen our body balanced. Another important goal for me is to gather more adolescent children towards weightlifting, because the once great Finnish weightlifting culture is almost gone. By spreading the positive, safe and fun information and knowledge about the sport, the children are more opening minded for a new hobby. It is crucial to move enough while you are growing during puberty, and what better way there is to maintain your whole body than weightlifting and stick gymnastics.

After I took a few pure classic weightlifting lessons from Kimmo Korvenoja, I was immediately hooked. The motion, movement and technique look so easy to perform, but when taking a closer look, you understand that the Olympic weightlifting techniques are one of the most demanding and technical performances that exists. That

fact fascinated me and I immediately wanted adolescent children and other athletes to recognize this. I knew exactly what movements I wanted to introduce, but the main focus behind was to guide athletes towards weightlifting safely. Like I mentioned earlier, nowadays the knowledge and information about safety procedures and correct lifting technique has perished, not only weightlifting, but all the movements and techniques which are possible to perform in the gym. I wanted to change that as soon as possible with my manual.

Athletes and coaches should use this weightlifting manual as guidance for their next step in strength training, no matter what the sport is.

It is impossible to reach perfection, but it is not about the distance and destination, it is all about the journey. The healthier and better lifestyle begins immediately when you start practicing classic weightlifting. The results will come as you practice and exercise enough. Demand more from yourself and for the athletes you may coach. Always remember that technique beats power every time, and weightlifting is all about technique.

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