Developing an annual plan for an elite shot putter
A single-case research design

by

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Útdráttur

Þróun á ársáætlun fyrir afreks kúluvarpara

Tímabilaskipt áætlun er ein af grunnstoðum í áætlunargerð fyrir íþróttamenn. Tímabilaskipti deilir þjálfun í afmarkaðri tímabil sem auðvelda stjórnun og skipulagningu þjálfunar. Hefðbundinni tímabilaskiptri áætlun er skipt í þrjú stig. Undirbúnings-, keppnis- og umskiptatímabil. Eininga tímabilaskipt áætlun hefur það að aðalmarkmiði að hafa marga keppnistoppa hjá íþróttamönnum á hverju tímabili sem eru að keppa í fremmstu röð. Markmið þessarar rannsóknar var að þróa heildstæða æfingaáætlun fyrir íþróttamann og verða niðurstöður þessa verkefnis fullkláruð ársáætlun fyrir íþróttamann sem er að æfa kúluvarp með það að markmiði að komast á Ólympíuleikana í Ríó 2016. Íþróttamaðurinn er 200 sentimetra hár og 125 kíló að þyngd. Íþróttamaðurinn var 132 kíló þegar hann náði sínum besta árangri 20,22 metrar árið 2012. Líkamleg og tæknileg geta íþróttamannsins er góð fyrir kúluvarp. Helstu frammistöðu markmiðin eru að kasta 20,50 metra eða betra og komast á Ólympíuleikana í Ríó 2016. Helstu þjálfunar markmiðin eru að bæta kasttæknina og auka styrk og kraft. Æfingaráætlunin er byggð upp með eininga tímabilaskiptri áætlun sem nær yfir eitt ár. Árinu er skipt niður í fjóra macrocycles sem er skipt niður í þrjár mescocycles einingar. Accumulation einingu, transmutation einingu og realization einingu. Fyrsti macrocyle nær yfir sautján vikur. Annar macrocyle nær yfir níu vikur. Þriðji macrocyle nær yfir tólf vikur. Fjórði macrocyle nær yfir níu vikur. Ársáætlunin stendur fyrir öflugu skipulagi sem á eftir að hjálpa íþróttamanninum að ná markmiðum sínum. Tímabilaskipt áætlun er góð leið til að setja saman og þróa ársáætlun fyrir íþróttamenn. Rannsóknir hafa sýnt fram á að tímabilaskipt þjálfun virkar.

Abstract

Developing an annual plan for an elite shot putter
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Periodization is the foundation in the training plan for athletes. Periodization divides training into smaller segments that are easy to manage and organise. Traditional periodization model is divided in three steps preparatory, competitive, and transition. Block periodization model has the main objective of multiple peaks in a season for athletes at high level of performance. The objectives of the research was to develop a concrete annual plan for an athlete and the results of the research will be a fully developed annual plan for a athlete training for shot put with a goal of qualifying for the Olympic games in Rio 2016. The athlete is 200 cm tall and his weight is 125kg. The athlete was 132 kg when he set his personal best 20.22 m in 2012. The athletes physical and technical foundations for shot put are good. The main performance objectives are to throw 20.50 m or better and qualify for the Rio Olympics in 2016. The main training objectives are to improve throwing technique and increase strength and power. The annual plan is build up with block periodization and covers one year it is divided into four macrocycles. The macrocycles are divided into three mesocycles blocks, accumulation block, transmutation block and realization block. The first macrocycle covers 17 weeks. The second macrocycle covers nine weeks. The third macrocycle covers 12 weeks and the fourth macrocycle covers nine weeks. The annual plan represents a strong structure that is going to help the athlete to achieve the objectives of the annual plan. Periodization is a good form to develop an annual plan for an athlete and studies have shown that periodization works.

Keywords: Periodization, annual plan, Shot put, volume and intensity, block periodization

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List of abbrevations

ATP	Adenosine triphosphate
ATP-PC	Adenosine Triphosphate Phosphocreatine
GAS	General Adaptation Syndrome (GAS)
IAAF	International association of athletics federations
LTAD	Long Term Athlete Development
PCr	Phosphorylated creatine
1 RM	One repetition maximum

1 Review of the literature

1.1 The sport

Shot put is a track and field event where you throw in a pushing motion a heavy shot as far as possible. The Ancient Greeks threw stones as a sport and soldiers are recorded as throwing cannon balls in the Middle Ages but a version of the modern form of the shot put can be traced to the Highland Games in Scotland during the 19th century where competitors threw a rounded cube, stone or metal weight from behind a line. The shot put competition for men has been a part of the modern Olympics since their revival in 1896, and women's competition began in 1948 (IAAF, 2015). The men's shot is a 7.26-kilogram ball of iron or brass. The diameter is between 110-130 millimeters. The women's shot weighs 4 kilograms with a diameter of 95-110 millimeters. For other age categories lighter shots are used to develop the right technique where the younger athletes are not ready to use the heavier weights because they are not matured see table 1. (IAAF, 2015).

1.1.1. Description

The shot put circle is 2.135 meters in diameter with a 10 centimeters high stop board on the outside. Competitors may touch the inside of the circle's rim or stop board during the attempt, but cannot touch the top of either the rim or stop board. The shot putter cannot touch the ground outside the throwing circle during an attempt, nor can he/she leave the circle until the shot hits the ground. The shot must touch or be in close proximity to the competitor's neck or chin as the attempt begins. The shot is put, not thrown, because it must not drop below its starting position during the attempt. In a competition where there are more than 12 people there are qualification rounds prior to the final where everybody gets 3 throws. The top 12 with the best results go on to the final. The results from the qualification rounds do not carry over into the final. In the final the 12 finalists have three attempts apiece, then the top eight competitors receive three more attempts. The longest single throw during the final wins (IAAF, 2015).

Table 1: Age categories and shot weight (IAAF, 2015).

Men		Women	
Age	Weight (kg)	Age	Weight (kg)
>19 years old	7.260	>19 years old	4
18 – 19 years old	6	18 – 19 years old	4
16 – 17 years old	5	16 – 17 years old	4
15 years old	4	15 years old	3
14 years old	4	14 years old	3
13 years old	3	13 years old	2
<13 years old	2	<13 years old	2

1.1.2. Rules

The following rules are to get a legal throw. Upon calling the athlete's name, they have sixty seconds to commence the throwing motion. The athlete may not wear a glove and also IAAF rules allow for taping of individual fingers. The athlete must rest the shot close to the neck and keep it tight to the neck throughout the motion. The shot must be released above the height of the shoulder using only one hand. The athlete may touch the inside surface of the circle or the toe board. However they are not allowed to touch the top of the toe board, outside of the circle nor the ground beyond the circle. Limbs may however extend over the lines of the circle in the air and the shot must land in the legal sector (34.92°) of the throwing area. The athlete must leave the throwing circle from the back but is allowed to enter the ring wherever they choose (IAAF, 2015).

Foul throws occur when an athlete does not pause within the circle before beginning the throwing motion also if the athlete does not complete the throwing movement within sixty seconds of having his or her name called. If the shot at any time loses contact with the athlete’s neck then it is an illegal throw. If the shot either falls outside the throwing sector or touches a sector line on the initial impact it is not a legal throw and also if the athlete leaves the circle before the shot has landed (IAAF, 2015).

1.1.3. Requirements

1.1.3.1. Kinanthropometric

Elite shot putters are powerful athletes and are often heavy athletes. Performance in the shot put is mainly determined by the height of the releas angle and velocity of the shot. To put the shot further and to get a high release velocity a high power production is required (Sing, 2012). Height and segmental lengths of the athletes body play a significant role where it increases the height of the release angle (Sing, 2012). For an athlete to achieve the best possible distance in shot put the athlete has to release the shot with the best combination of release speed, height and angle (Linthorne, 2001). Release speed is correlated with throwing distance and is a very important factor when throwing the shot put. World class shot putters have release speeds of 12.5±14.5 meter per second. The release angle is not as important as the release speed, but big deviations from the optimum release angle can affect the athletes performance and the distance of the throw. Studies of world class shot putters show release angles ranging from 26° to 45° (Linthorne, 2001). The height of release also has a big factor on shot put performance. The height of the shot above the ground when the shot is released is determined by the height of the athlete and by the angle of the athlete's arm to the horizontal (Linthorne, 2001).

In a study done on shot putters and their performance the results shows that the shot putters with higher mean body height had better performance than the shot putters with lower mean body height. Shot putters with better performance had greater lean body mass and also showed more upper arm circumference, forearm circumference, chest circumference and thigh circumference compared to shot putters with lower performance (Sing, 2012). Athletes in shot put can be of different shapes and sizes because throwers are different in heights, arm lengths, strengths, and muscular dynamic function (Hubbard, et al., 2001). Shot put throwers are often heavy athletes the, characteristics of the top 8 shot putters who participated in the final of the Beijing Olympics in 2008 the mean Body height was 192.4 cm the mean body weight was 132 kg and the mean BMI was 35.81(Pavlović, 2015). In 2015 world top 10 shot put list the mean height was 189.2 cm and the mean weight was 129.6 kg see table 2 (IAAF, 2015).

Table 2: 2015 world top 10 shot put list (IAAF, 2015)

Distance	Name	Country	Height	Weight
1. 22.56	Joe Kovacs	USA	185 cm	130 kg
2. 22.20	David Storl	GER	199 cm	122 kg
3. 21.69	O'Dayne Richards	JAM	178 cm	120 kg
4. 21.64	Christian Cantwell	USA	193 cm	154 kg
5. 21.62	Tom Walsh	NZL	186 cm	123 kg
6. 21.58	Asmir Kolašinac	SRB	185 cm	130 kg
7. 21.49	Jordan Clarke	USA	193 cm	125 kg
8. 21.37	Ryan Whiting	USA	191 cm	134 kg
9. 21.30	Reese Hoffa	USA	181 cm	133 kg
10. 21.11	Ryan Crouser	USA	201 cm	125 kg

1.1.3.2. Strength and power

Training for shot put is based on main factors, which are all essential to meet the requirements for success in the sport (Terzis, et al., 2008). Strength training and throwing are the single biggest factors in training because throwing requires a great deal of strength and power. The implement used in the shot put for men weighs 7.26 kg. To success and throw far, the implement needs to get to max speed in the shortest possible time and that requires high force, Force = mass * acceleration (Sivertsen, 1982). At the indoor World Championships in 2007, those who achieved the first three places in the shot put were studied. Their throws were broken down and analyzed by a computer. The results showed that the acceleration of the shot was most for the thrower that through the farthest and won the competition (Byun, et al., 2008).

Athletes power production is determined mainly by the muscle fibre type and muscle mass. In a study done on not technically excellent shot putters and correlation coefficient between fiber type composition and shot put performance results indicates that a high percent of type II fibers in triceps brachii should be combined with a large muscle mass to be effective in the shot put (Terzis, et al., 2003). The results in the study show that athletes with a higher percentage of type II fibers and larger muscle mass in their triceps brachii are likely to have such characteristics in other muscle groups the relationships found in the study indicates a close relationship between whole body muscle mass and fiber type distribution with shot put performance (Terzis, et al., 2003).

Training for shot put requires technical, strength, speed and power training. Power measuring of the lower extremities is a good predictor of rotational shot put performance and is more important than absolute strength in skilled athletes. Shot put training requires the athlete to get extremely powerful (Terzis and Georgiadis, 2007). Young athletes in shot put at the age of 17 – 18 have normal characteristics and start working in specialisation in strength training when their bodies are fully matured (Terzis and Georgiadis, 2007). In a study done on athletes in strengt training the results show that when sthrength training level is the most stressful biologically active unbound testosterone level and the balance between androgenic anabolic activity and the catabolizing effect of glucocorticoids may be of great importance when training muscular strength (Häkkinen,1989). The results on heavy strength and power training on the neuromuscular performance also have implications for the more accurate determination of the trainability status of an individual athlete at a given time in order to optimize the training process (Häkkinen, 1989).

In a study done to see different performance characteristics between power lifting, Olympic lifting, and sprinting the groups were measured with tests to determine their physical characteristics (Triplett, 1999). The groups performed standard one repetition maximum squat test, jump squat tests and vertical jumps with loads. The Olympic lifting group had the higest peak force, velocities, power output and jump height comper to the power lifting group in jump tests with loads. The sprinting group had higher peak velocities and jump heights than the power lifting group in jump tests with loads. The results indicates that strength and power characteristics are specific to each group and are most likely influenced by the different training protocol (Triplett, 1999). Looking at the results of this and the requirements of shot put, shot putters would probably benefit the most and get the best results from training like the Olympic lifting group.

1.1.3.3. Bioenergetics

The bioenergetics system for shot put is ATP-PC and it is stored within muscle and is available for immediate use (Hoffman, 2002). ATP is the most essential energy compound and is found in small amounts in all muscles and when the body needs to contract its muscles, it breaks one of the chemical bonds in ATP and releases a small bit of energy (Hoffman, 2002). The body needs to keep replacing ATP for muscles to keep contracting. Phosphocreatine (PCr) is another high-energy compound. Instead of powering muscle contractions, it is used to replace ATP. The ATP-

PC energy system is the simplest of the three energy systems (Hoffman, 2002). Oxygen is not required to release the energy source. However only limited amount of ATP and PC is available within the muscle and during maximal exercise the supply will be exhausted within 30 s, after that anaerobic glycolysis system takes over to renew atp. Although the ATP-PC energy system is available for a relatively short period of time there are several advantages in its use as an energy source (Hoffman, 2002). Basically it is the energy source that is readily available for immediate use. It also has a large power capacity providing the muscle with a large amount of energy within a short period of time (Hoffman, 2002). These characteristics makes the ATP-PC energy source ideal for short duration and high intensity events like shot put. Power athletes rely on the ATP and PCr that is stored in their muscles. Short bursts of energy quickly deplete energy stores. Shot put is 100% anaerobic, where only a few seconds are key to optimum performance. Reserves of ATP must be plentiful, especially if an athlete has to compete in several heats or rounds on the same day (Wilmore and Costill, 2004). A physical mechanism that increases the speed of the shot is a consecutive stretching and shortening of the muscles and tendons involved in the performance.

A physical mechanism that is important to increases the speed of the shot is consecutive stretching and shortening of the muscles, tendons that are involved in shot put performance. It is known that if a muscle shortens immediately after a stretch, force and power outputs increase (Lanka, 2000). Active muscles are typically pre-stretched to enhance force output of movements. This type of activity is called the stretch shortening cycle or reversible muscle action (Lanka, 2000). Muscle and tendon elasticity, spinal reflexes and other mechanisms play a substantial role in enhancing the motor output (Lanka, 2000). In throwing, the pre stretching of muscles is achieved through a windup movement and other mechanisms. In shot putting, in addition to the stretching and shortening of the leg muscles, two other mechanisms are important, the stretching of the muscles, tendons and ligaments of the shoulder girdle, and reversible muscle action of the wrist (Lanka, 2000). The forceful movement of the left shoulder backwards immediately before the right arm extension, as well as an accelerated movement of the chest forwards and upwards before and at the early beginning of the delivery phase, induce stretching of the shoulder girdle. As a result, during the delivery phase the shot velocity increases (Lanka, 2000).

1.2. The sport training

Training for shot put involves different types of training. The main types of training for a shot putter are technical, strength, power and speed training (Silvester, 2003). When younger athletes

are starting to train shot put the most important part of the training is to learn the right technique to be able to develop in to a good thrower. To be able to get good technique the athlete has to do a lot of throwing and throwing drills were the throw is broken down. A high level shot putter throws a round 20 to 30 throws in a training session and has between four to seven sessions per week (Silvester, 2003). Shot putters do a lot of strength training to get stronger because the sport requires the athlete to be strong (Baechle and Earle, 2008). Shot putters have between three to five sessions per week for strength training. The main exercises are for example, squats bench press, deadlift and many other exercises. Shot put requires power for performance, shot putters train power olympic weightlifting like power clean and power snatch. Other exercises for power are for example jumps and medicine ball throws (Baechle and Earle, 2008). Shot putters train power between three to six sessions per week. Speed is a big requirement for shot put and shot putters train speed by doing short sprints and also with towing lighter shot puts. Shot putters have between three to five sessions per week for speed training (Silvester, 2003).

1.2.1. Definition

Sport training theory is the idea of a planned system of training that can be put together to incorporate training activities and to target specific physiological, psychological and performance of individual sport and athletes (Bompa and Haff, 2009). When athletes are training for their sport the goal of the training is to increase the skills and the work capacity to optimize the athletes performance in both training and competition. Athletes train and prepare to achieve a specific goal through organized training focused on performance. In training the athlete learns to cope with stressful stimuli in training and competitions (Bompa and Haff, 2009). Sport training should be well organized and planned to achieve physical excellence.

1.2.2. Syndrome General of Adaptation

General Adaptation Syndrome (GAS) is the predictable way the body responses to stress as described by Hans Selye. The theory of General Adaptation Syndrome suggests that to get the best training adaptations to occur the training loads, volume and intensity have to be systematically alternated (Selye, 1946). For example the training plan has to alter high, moderate and low intensities in the training (Dick, 2007). Alternations of intensities allow recovery between training sessions and if it is planned right and the athlete gets supercompensation which

is a part of General adaptation syndrome. The body is always seeking to maintain a state of homeostasis so it will constantly adapt to the stress from its environment (Dick, 2007). Training is the manipulation of the application of stress and the body's subsequent adaptation to that stress to maintain homeostasis. The adaptation that occurs is fairly predictable. In training the desired adaptive response is called supercompensation. Every time supercompensation occurs it establishes a new increased level with positive benefits for trainining and performance. General adaptation syndrome results in body adaption with training load and results in more performance capacity (Bompa and Haff, 2009).

1.2.3. Training load

Training load is the interacting effects combined of the volume and intensity and frequency. Training load is a term used for total training in the program that the athlete follows (Bompa and Haff, 2009):

Training load = Volume + Intensity + Frequency

In preparation for a competitive sport event an athlete undergoes an organised training plan which induces adaptations in the muscle, metabolic, cardiovascular and neurological systems (Halson, 2014). Training adaptations are associated with changes in performance, such as a delayed onset of fatigue or an increase in power output. This principle of training can be reduced to a simple dose response, relationship between the physiological stress associated with the training load of exercise, training dose and the training adaptations response (Halson, 2014). The response to the training load is measured as a physiological adaptation and is rather easily measured with test in a laboratory or in a field test. It is harder and has more challenges to measure the right training dose for the training load to get the best training adaptations. The right training dose is different between athletes (Wallace, et al., 2009). A common problem for coaches is determining the appropriatetraining loads to prescribe during thecompetition phase of the season. Factorssuch as the quality of the opposition, the number of training days between competition and any travel to and from competition all influence the periodization of training loads (Vincent and Kelly, 2007).

1.2.3.1. Volume

Volume in training refers to the total quantity of work done during training. For example time used in training or metres of running, kilograms lifted during strength training, the total number of jumps or throws performed in session. Volume is the sum of work performed during a training session or phase. Volume in training has to be quantified and monitored.Volume in training seems to be important to develop lean body mass and muscular strength (Baker,1994). Assessment of training volume depends on the sport (Dick, 2007). For example, volume for shot put in one throwing practice are all the throws combined in the practice, the total number of throws in the practice is the throwing volume.

1.2.3.2. Intensity

Intensity in training indicates the quality of training, usually in reference to the athlete's maximal capability in that activity in percent of best performance. For speed training it may be time taken over a distance. In weight training the intensity is determined by the weight lifted. Intensity has to be quantified in the training program depending on what the athlete is working on (Dick, 2007). For example intensity for shot put in training is the percent the thrower is throwing at. When a thrower is throwing as far as he can he is throwing at 100% intensity but when the thrower is working on technique he is throwing at 70% to 90% of maximal capability.

1.2.3.3. Frequency

Frequency refers to how often the athlete trains for example how many training sessions are in day or a week. Frequency of training can be low or high depending on the training load or the time of year (Dick, 2007). For example there can be more frequency in training in the preparation season than in competition season. Low frequency of training can be for example 2 to 3 times per week but high frequency of training can be from 7 to 12 times per week (Bompa and Haff, 2009). The frequency of training can be can be different between sports and athletes depending on the sports requirement and the experience and training age of the athlete. For example a shotputter usually has more throwing sessions in a week in the transistion sesson than in competition season.

1.3. The periodization

Periodization is the foundation in the training plan for athletes. The word periodization comes from the word period which describes a portion of time (Bompa and Haff, 2009). Periodization divides training into smaller segments that are easy to manage and organise training. Periodization is the planned manipulation of training variables in order to maximise training adaptations and to prevent overtraining syndrome (Buford, et al., 2007). The history of periodization dates back to the ancient Olympic Games where evidence suggest that a simplified form of annual plans from periodization was used. More involved and planned periodization was used in the German program for the 1936 Olympic Games when coaches used a four year long plan composed of annual training plans (Bompa and Haff, 2009). A Russian sport scientist Lenoid P. Matveyev published in 1965 a model of periodization based on information from Russian athletes on how they trained for the 1952 Olympic Games (Bompa and Haff, 2009). The concept of periodization refers to the manipulation and sequencing of selected training variables like load, volume, intensity and exercise type within the framework of specific cycles throughout the year to optimize athletic performance (García, et al., 2010). Periodized training programs are typically structured into macro, meso, and microcycles that progress from extensive to intensive workloads as well as general to special tasks (Steven and Plisk, 2003). The aim of periodization is to reach the best possible performance at the right time of year or in a chosen competition. It involves progressive cycling of various aspects of a training program during a specific period. Sport programs can use periodization to break up the training program into different phases with different goals. With periodization, each individual training cycle is characterized by periodical adjustments in the objectives, tasks and content with the ultimate objective being to assist the athletes in reaching a peak level of performance for the main competitions of the year (Cissik, et al., 2008). Results from studies on periodization have shown increases in maximal strength for the upper and lower body for athletes that follow periodization programs in training (Prestes, et al., 2009).

1.3.1. Definition

Periodization is the overall planning and detailed plan of the available time for training, according to the fully established intermediary goals, respecting the scientific principles of sport exercise (Bompa and Haff, 2009).

1.3.2. Long term athlete development

Long term periodization is a plan for training over a long time to maximize physiological adaptions to improve performance, it can cover from one annual plan that covers 12 months to for example 4 years between Olympic Games (Bompa and Haff, 2009). The long term periodization is build up with goals along the way in the program that directs the athlete through the training. Periodization divides the year round condition program into phases of training. The goals in the Long term periodization are to induce physiological adaptations and maximize performance at specific time, usually during the main competitions of the year. A specific and well planned training, competition and recovery regime will ensure optimum development throughout an athlete's career (Bompa and Haff, 2009). Ultimately success comes from training and performing well over the long term rather than winning in the short term (Balyi, 2001). There is no short cut to success in athletic preparation (Balyi, 2001). Periodized resistance training does result in greater fitness increases than non-periodized programs (Fleck, 2011). Long-term programs of classic, linear or traditional strength/power periodization begin with high volume low intensity training and progress towards low volume high intensity training. Normally the entire training plan takes several months to complete. If training is continued the entire plan beginnings with high volume low intensity training is repeated. (Fleck, 2011). In nonlinear periodization training intensity and volume are changed much more frequently (Fleck, 2011).

A good example of long term periodization that can increase likelihood of an athlete to become a elite athlete in sports is the Long Term Athlete Development model (LTAD) from Canada, it is made to improve the quality of sport and physical activity and to improve athlete training. The LTAD is put together from information of science, research and decades of experience. Results from LTAD point to that both kids and adults will get active and stay active and possibly reach the greatest heights of sport achievement if they do the right things at the right time. The LTAD divides the athletes training carrier up to seven stages and describes the things athletes need to be doing at specific ages and stages see table 3, (LTAD Stages, 2016).

- Stage 1, is called "active start" and is for 0-6 years. Boys and girls need to be engaged in daily active play. Through play and movement, they develop the fundamental movement skills that will provide the foundation for learning fundamental sports skills at older ages.

- Stage 2, is called "Fundamentals" and is for girls 6-8 years and boys 6-9 years. In this stage children should develop fundamental movement skills like agility, balance,

coordination and speed. Children should participate in a fun and challenging multi-sport environment.

- Stage 3, is called “learn to Train” and is for girls 8-11 years and boys 9-12 years. In this stage children should be converting their fundamentalmovement skills into fundamental sport skills.

- Stage 4, is called “train to train” and is for girls 11-15 years and boys 12-16 years. In this stage young athletes need to build an aerobic base and consolidate their sport- specific skills. Towards the end of the stage, they need to focus on strength and the anaerobic alactic energy system. Increased training hours are needed at this stage to develop each athlete’s long-term potential.

- Stage 5, is called“train to compete“ and is for girls 15-21 years and boys 16-23. In this stage athletes choose one sport in which they will train to excel. Athletes will train to solidify their sport-specific and position-specific skills and all of their physical capacities. These athletes are aiming to compete in national and international events.

- Stage 6, is called “train to win” and is for girls 18+ years and boys 19+ years . The athletes are trained to peak for big competitions, the training is with high intensity and volume and the training is specific.

- Stage 7, is called“active for life” and is for any age group. In this stage, athletes and participants enjoy lifelong participation in a variety of competitive and recreational opportunities in sport and physical activity (LTAD Stages, 2016).

Table 3: Long Term Athlete Development model (LTAD).

Long Term Athlete Development model		
Stage	Boys	Girls
1. Active start	0-6 years	0-6 years
2. Fundamentals	6-9 years	6-8 years
3. Learn to Train	9-12 years	8-11 years
4. Train to train	12-16 years	11-15 years
5. Train to compete	16-23 years	15-21 years
6. Train to win	19+ years	18+ years
7. Active for life	Any age group	Any age group

1.3.3. Types

1.3.3.1. Traditional periodization

The traditional model of training timeline proposed by the Russian scientist Dr Leev Pavlovtchi Matveev in the 50's, is based on the theory of General Syndrome Adaptation. This model was characterized by the change of wave loads of training and divided in three steps: preparation period, a period of competition and transitional period (Oliveira, 2008). Traditional periodization describes a progression from high volume and low intensity work towards decreasing volume and increasing intensity during the different cycles. The basics of the traditional theory of periodization include a general concept of load and recovery in view of the super compensation concept (Bompa and Carrera, 2005). Traditional periodization theory exploits the periodic changes in all human biological and social activities. The cornerstones of periodization are made up by a hierarchical system of training units that are periodically repeated (Bompa and Carrera, 2005). The upper level of the hierarchy includes multi year periods like the Olympic Quadrennial cycle, the next level of the hierarchy is represented by the macrocycles, with a duration of one year or of months (Issurin, 2008). The macrocycles are divided into training periods that fulfill a key function in traditional theory as they divide the macrocycle into two major parts the, first for more generalized and preliminary work and the second for more event specific work and competitions. The third and shortest period is set aside for active recovery and rehabilitation. The next two levels of the hierarchy are reserved for the mesocycles and microcycles, which are the building elements of the whole training system (Bompa and Haff, 2009). The annual training program is conventionally divided into three main phases that are preparatory, competitive, and transition. The preparatory and competitive phases are divided into two sub phases because their tasks are different. (Bompa and Haff, 2009). The preparatory phase has a general and a specific phase, based on the different characteristics of training. The focus of the general phase is to develop a physiological base by using nonspecific training methods but the specific phase it is used to develop characteristics needed for the sport with sport specific training. The competitive phase has a precompetitive phase and a competitive phase. Each phase is composed of macro, meso and microcycles. Each cycle has specific objectives derived from the general objectives of the annual plan. The transition phase is used for recovery from competition. (Bompa and Haff, 2009).

Traditional training periodization, which was incorporated in the 1960s, was a breakthrough for coaching and training theory (Issurin, 2012). Many of the elements postulated during these years still remain valid today, including the hierarchical taxonomy and terminology of training cycles, differentiation between general and specific athletic preparation, seasonal trends of exercise volume and intensity, basic approaches to short term, medium term and long term planning (Issurin, 2012). Traditional periodization was proposed at a time when the number of important competitions was lower than it is now in the present times (Mujika, 2012).

1.3.3.2. Block periodization

In the 1980s, the term „training blocks“ became popular and was widely used by prominent coaches (Issurin, 2012). This model was proposed by Verchosanskij who adopted the concept of step periodization that was first introduced by Vorojeb in 1974. Verchosanskij attempted to contradict Matveev's vision and to adjust the training paradigm to meet the changing needs of athletes in the 1980s (Bartolomei, et al., 2014). As implemented, this term has usually been understood to consist of training cycles of highly concentrated specialized workloads (Issurin, 2008). Without scientific conceptualization, the concept was open to various interpretations. Increasing number of competitions and the demands of modern sport at the elite level, together with the aforementioned limitations of the traditional periodization model, led to the emergence of a new planning approach called block periodization, specialized training cycles called blocks, with a typical duration of two to six weeks are the main functional components of block periodization. The sequencing of these blocks is intended to build upon the residual training effects of previously developed abilities (García, et al., 2010). General principels of Block periodization: High concentration of training workloads, minimal number of targeted abilities within a single block, consecutive development of several athletic abilities and use of specialized mesocycel blocks (Mujika, 2012).

Further consideration of training blocks as a coaching concept leads to the following conclusion: highly concentrated training workloads cannot be managed at the same time for multiple targets and therefore, the number of abilities being developed simultaneously should be radically reduced (Issurin, 2012). Athletic performance in any sport usually demands the manifestation of many abilities, which, in the case of highly concentrated training, can be

developed only consecutively but not concurrently. Unlike the traditional mixed program, consecutive highly concentrated training leads to improvement of targeted abilities while others receive no stimuli and therefore decline, so that the sequencing of appropriate training blocks became extremely important (Issurin, 2012). Attaining morphological, organic and biochemical changes requires periods of at least two to six weeks, which correspond to the duration of mesocycles; hence, training blocks are mostly mesocycle blocks (Issurin, 2008). The main finding of one study was that a block periodized training cycle seemed to be more effective than traditional periodization for improving the performance of highly trained top level athletes (García, et al., 2010). The block periodization model has its main objectives on the achievement of multiple peaks by season and the elevation of the highest levels of performance imposed by professional athletics today (Oliveira, 2008). In a comparison study of Traditional and Block Periodized Strength Training Programs the Block Periodized model appears to cause an upward shift to the force velocity curve and resulting in greater power outputs at the lower intensity of the athlete's 1RM bench press. This training model may be superior for the training of athletes participating in sports characterized by very quick muscular contractions like the throwing events of track and field (Bartolomei, et al., 2014)

1.3.4. Macro-cycle. Definition, duration and types.

The macrocycle is used to plan for the immediate future. The macrocycle projects the structure of the training plan several weeks in advance. A macrocycle lasts two to seven weeks. The development of the macrocycle structure is based on the objectives of the training plan. The macrocycle should vary according to the training objectives for each phase of the plan for example, preparatory, competitive and transition phases (Bompa and Haff, 2009). Types of macrocycles see table 4. Developmental macrocycles are used in the preparatory stages, they are designed to improve either general or specific fitness attributes such as strength or speed (Issurin, 2008). Shock macrocycles are used primarily during preparatory phases and are designed to increase training demands suddenly. They should be followed by unloading regeneration cycle consisting of a drastically reduced training load (Plowman, and Smith, 2013). Competitive macrocycles are based on maintaining physiological fitness while optimizing performance for competitions (Issurin, 2008). Competitive macrocycles occur in the competitive phase. Tapering and unloading macrocycles involve systematic decreases in overload to facilitate a physiological fitness peak or supercompensation. Unloading cycles are used both as breks between other cycles and as active transition phase. Transition macrocycles occur during the transition phase and

involve very little overload. Transition phases are intended to remove fatigue and to prevent overtraining. These phases are just as valuable for the athlete like other phases in the training (Plowman and Smith, 2013).

Table 4: Types of macrocyclesand main characteristics

Types of macrocycles	Developmental	Shock	Competitive	Unloading	Transition
Main characteristics	Used to improve either general or specific fitness	Are designed to increase training demands suddenly	Decreases in overload to facilitate a physiological fitness peak or super-compensation	Are used both as breks between other cycles and as active transi-tion phase.	Intended to remove fatigue and to prevent overtraining

1.3.5. Meso-cycle. Definition, duration and types.

A mesocycle is a phase of training that lasts between two to six weeks or microcycles. The mesocycle is dependnt on the sport and the training requirements of the sport. Mesocycles are also defined as a number of weeks where the emphasis of the training program is the same type of physical adaptations, for example anaerobic capacity or power and strength (Issurin, 2008). In the preparatory phase a mesocycle usually consists of four to six microcycles but in the competitive phase usually a mesocycle lasts between two to four microcycles depending on the competitions in the competitive phase (Bompa and Haff,2009).

In the overall plan the mesocycles are fitted in the training program based on time and makeup of the phases of training. The mesocycles determine the workload and type of work the mesocycle is based on and where in the overall plan each mesocycle is located. The goal of the training is to make sure the body peaks in the high priority competitions by improving each mesocycle along the way in the training program (Bompa and Haff,2009). Types of traditional theory are general preparation, specific preparation, pre competitive, competitive and rest. (Bompa and Haff, 2009). Types of block mesocycles explained by Issurin are three accumulation, transmutation and realization see table 5 (Issurin, 2008).

Table 5: The main characteristics of the three types of mesocycle-blocks (Issurin, 2008).

	Mesocycle type		
Main characteristics	Accumulation	Transmutation	Realization
Targeted motor and technical abilities	Basic abilities: aerobic endurance, muscular strength,basic coordination	Sport-specific abilities: special endurance,strength endurance, proper technique.	Integrative preparedness: modeled performance, maximal speed, event specific tactics
Volume-intensity	High volume, reduced intensity	Reduced volume, increased intensity	Low-medium volume, high intensity
Fatigue-restoration	Reasonable restoration to provide morphological adaptation	No possibility to provide full restoration, fatigue accumulated	Full restoration, athletes should be well rested
Follow-up particularities	Monitoring the level of basic abilities	Monitoring the level of sport-specific abilities	Monitoring maximal speed, event specific strategy etc.

1.3.6. Micro-cycle. Definition, duration and types.

A microcycle is usually three to 15 days in duration but is typically a week because of the weekly calendar and it is more difficult to develop a training plan that is not aligned with the weekly calendar (Bompa and Haff, 2009). The microcycle is based and planned on where it is located in the overall macrocycle. A microcycle is usually defined as a number of training sessions and is built up to fit the recruitments of the training program for exemple volume and intensity are different depending on the type of the microcycle (Issurin, 2008). Length of the microcycle should correspond with the number of sessions in the microcycle. It takes a athlete often four to 16 workouts to adapt to the training program. When the athlete has adapted to the program and no longer makes progress a change to the program should be made (Bompa and Haff, 2009). There are six types of microcycles see table 6: adjustment, loading, impact, precompetitive, competitive and restoration (Issurin, 2008).

Table 6: Purpose, load level and particularities of different microcycle types (Issurin, 2008).

Type	Purpose	Load level	Particularities	Duration
Adjustment	Initial adaptation to appropriate loads	Medium	Gradual increase in workload	5-7 days
Loading	Fitness development	Substantial - high	The use of big and substantial workloads	5-9 days
Impact	Fitness development by extreme training stimuli	Very high - extreme	Use and summation of extreme workloads	4-7 days
Pre-competitive	Immediate preparation for competition	Medium	Tuning for forthcoming competition; use of event-specific means	5-7 days
Competitive	Participation in competition	High – very high	Sport and event-specific performances	2-7 days
Restoration	Active recovery	Low	Use of the wide spectrum of restoration means	3-7 days

2. Objectives of the study

The objectives of the research is to develop a concrete annual plan for an athlete and the results of the research will be a fully developed annual plan for a athlete training for shot put with a goal of qualifying for the 2016 Olympic Games in Rio de Janeiro. To develop a good annual plan all the physical and sport requirements for the training will be listed in the research. The results of the research will show a periodization annual plan, based on the training requirements for shot put training and the physical characteristics and training history of the athlete. The objective is not only to develop the annual plan but also to understand the process and the function of the periodization in an annual plan. The results will help me as an athlete and a coach in the future. The results may also help other athletes and coaches to understand and use periodization and the key elements in the process. The results of the research might be interesting because there have not been many studies done on sport periodization in Iceland.

2.1. Methods

The research is a single-case research design. The subject is a shot putter training to qualifying for the 2016 Olympic Games. A block periodized model was used to set up an annual training program for the subject. Informations about periodization, the sport and the training requirements was collected through research of books and scientific papers. The informations about the subject, like sport history and physical characteristics, was collected through result database and older training programs. When all the information was collected the annual training program was made in the best way for the subject to train according to the recruitments of shot put.

3. Annual plan

3.1. The athlete

3.1.1.Physical characteristics

The athlete that is going to be training after the annual plan is a 34 years old shot putter. The athlete is 200 cm tall and weighs 125 kg, BMI 31.3 at the start of the annual plan. The athlete was 132 kg when he set his personal best in 2012. The arm span of the athlete is 209 cm. The athletes physical and technical foundations for shot put are good.

3.1.2. Training life

The athlete has been training track and field for 19 years and has been specializing in shot put for 10 years. The best result the athlete has achieved in shot put is 20.22 m in 2012. The athlete has had good results in those 10 years, but the results for some season have been affected by injuries. See season best in table 5. The athlete has competed in shot put in international championships in track and field and also qualified for and competed in the 2012 London Olympic Games in shot put. In 2013 and 2014 the athlete did not train as much like the years before because of work and minor injuries. In the fall of 2014 the athlete went back to school and he had more time to train and was not as physically tired after work. The athlete has followed training programs through his career but never a fully organised annual plan. The coaches the athlete has had in the past are coaches that base their training on their own sport training experience but little on theory of training and research. The athlete has trained well through his shot put carrier and the physical and technical foundations for shot put are good but can be develop better with an organised annual training plan. If the athlete´s training career would have been organised with long term periodization, for example the LTAD model the athlete's performance and career most likely would have been better. The athlete is in stage 6 in the LTAD model and is trained to peak for big competitions. The training is specific with high intensity and volume.

3.1.3. Injuries

The athlete had a hand injury in 2008 and 2009 and had surgery in September 2009, and had a hand injury again in June 2011 and had surgery again in September 2011. Part of the injuries is probably related to poor planning in the athletes training for example too much intensity concerning volume in training. The athlete had a back injury in the summer of 2015 that kept him out of some competitions and the throwing volume in training had to be reduced. The injury was treated with physiotherapy and does not bother the athlete anymore.

Table 7: showing progression and season best for the athlete from 2005 to 2015

Year of season best	Month of season best	Distance of season best
2015	June	19.03 m
2014	February	18.81 m
2013	June	18.22 m
2012	March	20.22 m
2011	June	19.83 m
2010	March	19.50 m
2009	February	19.16 m
2008	June	19.20 m
2007	July	19.24 m
2006	May	18.20 m
2005	May	18.51 m

3.2. Objective of the annual plan

The main objective of the annual plan is for the athlete to rech his goal of qualifying for the Rio Olympics in 2016. To qualify the athlete has to throw a distance of 20.50 m or be in the top 32 on the IAAF world list in 2016. There is a max of three competitors per country on the list. To be able to reach the main objective the annual plan has to be well set up and organized. The athlete has to work on physical and technical training to get the main objective. Physical and technical objectives of the annual plan are to increase strength power and speed and to be able to taper at the right time of the year and in the right competitions. Technical objective in the annual plan is to work on getting the throwing technique better and more effective. With better technique the athlete will be better able to use his physical aspects to throw farther. The objective for strength is to increase the overall strength of the athlete over the annual training plan. Objective for strength training are to increase the athletes 1 RM in exercises like bench press, squats deadlift and Olympic lifts like power clean by 1 to 3 persent. Objective for speed and power are to be able to run faster and jump higher in tests like standing long jump and vertical jump.

The objectives of the annual plan are dividied in two: performance and training objectives.

The **performance objectives** are:

- To qualify for the Rio Olympics in 2016 (one of them):

  A. To qualify with a 20.50 m throw or better for the Rio Olympics in 2016.

  or

  B**.** If not 20.50 m then qualify whith a throw on the top 32 list for the Rio Olympics in 2016.

- To taper at the right time of the year and in the right competitions.

The **training objectives** are:

- To improve throwing technique, get more effective technique.
- To increase overall strength and increase the athletes 1 rm in exercises.

  1. Squats current stadus 300 kg, aim 310 kg.
  2. Bench press current stadus 210 kg, aim 215 kg.
  3. Deadlift current stadus 310 kg, aim 320 kg.
  4. Power clean current stadus 180 kg, aim 185 kg.

-To increase power by 1 to 3 present and run faster and jump longer in tests.

  1. Standing Long Jump current stadus 320 cm, aim 330 cm.
  2. Overhead shot put throw current stadus 20.24 m, aim 21m.
  3. 30 m sprint current stadus, 4.45 sek, aim 4.40 sek

3.3. Analysis of calendar

In the annual plan are 14 competitions see table 8. The competitions have different meaning for the training program and how the training program is set up in both length of mesocycles and in intensity and volume of training. The competitions are divided up into three categories: main competition, secondary competition and preparatory competition. The annual plan is setup around the competitions to have the athlete in the best physical shape in the main competitions (Bompa and Haff, 2009). The main competitions are the most important competitions for the athlete in the annual plan. Main competitions are at the end of the realization mesocycle where the athlete is most ready to compete and perform. The secondary competitions are not as important like the main competitions but are very important for the experience for the athlete as a build up for the main competitions (Bompa and Haff, 2009). Secondary competitions are also good competitions to qualify for to get a standard for main competitions. The Secondary competitions are in the realization mesocycle like the main competitions but not in the end of the realization mesocycle as the main competitions. In the Secondary competitions the athlete can be under a training load and not completely physically ready to perform at his best. The Preparatory competitions are often in the transmutation mesocycle and are often used to test the athlete and to get feedback on specific aspects of the training (Bompa and Haff, 2009). Preparatory competitions are an important part of the annual plan to see how the athlete stands in the training plan and are used to assess the training of the athlete. Many coachs use the Preparatory competitions to see the athlete‘s development in the training (Bompa and Haff, 2009). In the Preparatory competitions the athlete is often under a high training load.

Table 8: Showing the competitions in the anualplan

Main competitions	Secondary competition	Preparatorycompetition
Microcycle 17	Microcycle 15	Microcycle 21
Microcycle 26	Microcycle 25	Microcycle 34
Microcycle 38	Microcycle 48	Microcycle 38
Microcycle 50	Microcycle 49	Microcycle 45
	Microcycle 47	Microcycle 41
		Microcycle 42

In the annual plan the are four training camps. The training camps are used to focus on specific parts of the training, depending on the type of mesocycle they are in. The first training camp is in the 18th to 20th microcycle. The second training camp is in the 29th to 32nd microcycle. The

third training camp is in the 37th to 39th microcycle. The fourth training camp is in the 43rd to 44th microcycle.

3.4. Annual plan

The annual plan for the athlete covers one year in preparation for the Olympic Games. In the annual plan there are 11 competitions and four training camps. The annual plan is build up with block periodization and is based on specialized training cycles called blocks. The annual plan is build up with four marcocycles. Every marcocycle has three mesocycles blocks called accumulation, transmutation and realization, see table 9.

The first macrocycle in the annual plan starts on the seventh of September and ends on the fourth of January. The macrocycle has a competition in microcycles 15 and 17. The macrocycle covers 17 weeks in total, the accumulation mesocycle covers six microcycles, the transmutation mesocycle covers six microcycles and the realization mesocycle covers five microcycles.

The second macrocycle in the annual plan starts on the fourth of January and ends on the twenty-ninth of February. The macrocycle has a training camp in microcycles 18, 19 and 20 and competitions in microcycles 25, 26 and 27. The macrocycle covers nine weeks in total, the accumulation mesocycle covers three microcycles, the transmutation mesocycle covers three microcycles and the realization mesocycle covers three microcycles.

The third macrocycle in the annual plan starts on the first of March and ends on the twenty-second of May. The macrocycle has a training camp in microcycles 37 and 38 and a competition in microcycle 38. The macrocycle covers 12 weeks in total, the accumulation mesocycle covers 5 microcycles, the transmutation mesocycle covers four microcycles and the realization mesocycle covers three microcycles.

The fourth macrocycle in the annual plan starts on twenty-second of May and ends on the fourteenth of August. The macrocycle has a training camp in microcycles 43 and 44 and competition in microcycles 45, 47 49 and 50. The macrocycle covers 12 weeks in total. the accumulation mesocycle covers four microcycles, the transmutation mesocycle covers four microcycles and the realization mesocycle covers four microcycles. In the end of the annual plan is a rest mesocycle that starts on fifteenth of August and ends on sixth of September. There are three microcycles in the rest mesocycle.

Table 9: Macrocycles, Mesocycles and Microcycles in the Annual plan

Macrocycles	Mesocycles	Microcycles
Macrocycle 1	1 (accumulation)	6
	2 (transmutation)	6
	3 (realization)	6
Macrocycle 2	4 (accumulation)	3
	5 (transmutation)	3
	6 (realization)	3
Macrocycle 3	7 (accumulation)	5
	8 (transmutation)	4
	9 (realization)	3
Macrocycle 4	10 (accumulation)	4
	11 (transmutation)	4
	12 (realization)	4
Rest	13 (rest)	3

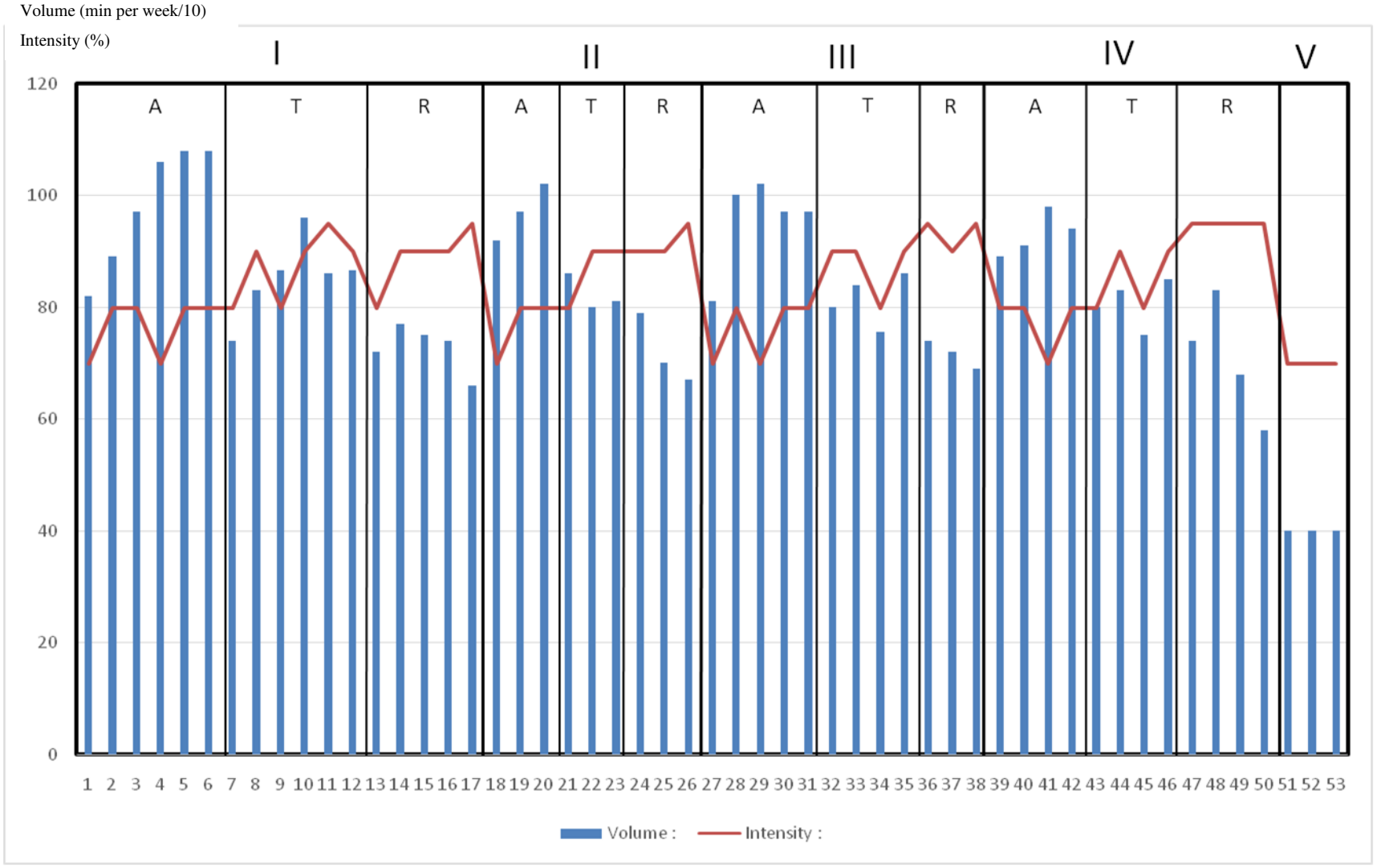

Figure 1: Showing volume and intensity in macrocycles one to five in the annual plan. A= Accumulation T= Transmutation R= Realization.

Month :	September				Oktober				November					December			
Week begins on Monday:	7.sep	14.sep	21.sep	28.sep	5. okt	12.okt	19.okt	26.okt	2.nov	9.nov	16.nov	23.nov	30.nov	7.dec	14.dec	21.dec	28.desc
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Competition :															1		2
training camps :																	
Macrocycles :	Macrocycle 1																
Mesocycle :	1. Accumulation						2 . Transmutation						3. Realization				
Microcycle :	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Type of Microcycle :	A	L	L	I	L	I	R	A	L	L	I	I	I	P	C	P	C
Volume :	M	H	H	VH	H	VH	L	M	M	H	M	M	L	M	L	L	L
Intensity :	L	M	M	L	M	M	M	H	M	H	VH	H	M	H	H	H	VH
Volume : Mn per week/10	82	89	97	106	108	108	74	83	86.5	96	86	86.5	72	77	75	74	66
Intensity : % of Max	70	80	80	70	80	80	80	90	80	90	95	90	80	90	90	90	95
Technical :																	
Volume :	M	H	H	H	VH	H	L	M	M	H	M	M	L	L	L	L	L
Intensity :	L	L	M	L	M	M	M	M	H	H	H	VH	H	VH	VH	H	M
Volume : Min per week	400	450	470	490	500	490	300	350	360	400	380	400	200	250	200	180	180
Intensity : % of Max	20	30	30	30	40	30	20	30	40	30	25	30	25	35	30	30	40
Strength :																	
Volume :	M	M	H	H	H	VH	L	L	M	M	H	M	M	M	L	L	L
Intensity :	L	L	M	M	L	M	M	H	M	H	M	H	VH	H	VH	H	M
Volume : Min per week	300	320	360	370	380	480	300	330	340	380	360	340	300	280	250	240	200
Intensity : % of Max	30	40	40	30	30	30	30	40	20	30	40	30	30	25	30	20	15
Power :																	
Volume :	M	M	H	VH	H	H	L	L	M	L	M	L	M	L	M	L	L
Intensity :	L	L	M	M	M	M	M	M	H	H	M	H	H	VH	VH	VH	H
Volume : Min per week	120	120	140	200	200	110	140	150	165	180	120	125	220	240	300	320	280
Intensity : % of Max	20	10	10	10	20	20	30	20	30	30	30	30	25	30	30	40	40

Intensity :	VH = Very high 95 %	H=high 90 %	M= medium 80%	L=low 70%
Volume :	VH = Very high 1080-970	H=high 970-866	M= medium 865-756	L=low 865-756

Type of Microcycle :	A : Adjustment	L : Loading	I : Impact	P : Pre-competitive	C : Competitive	R : Restoration

Figure 2: Showing the annual plan and and the build up and type of mesocycles and microcycles in macrocycle 1 also showing volume and intensity for microcycles and different volume and intensity for technical, strength and power.

Month :	January				February					March					April				May		
Week begins on Monday:	4.jan	11.jan	18.jan	25.jan	1.feb	8.feb	15.feb	feb.22	feb.29	mar.1	mar.7	mar.14	mar.21	mar.28	april.4	april.11	april.18	april.25	may.2	may.9	may.16
	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Competition :				3				4	5								6				7
Training camps :	1											2								3	
Macrocycles :	Macrocycle 2									Macrocycle 3											
Mesocycle :	4. Accumulation			5. Transmutation			6. Realization			7. Accumulation					8. Transmutation				9. Realization		
Microcycle :	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Type of Microcycle :	A	L	L	I	I	I	P	C	C	R	L	L	I	I	L	L	I	I	P	P	C
Volume :	H	H	VH	M	L	L	M	L	L	M	VH	VH	H	H	M	M	L	M	L	L	L
Intensity :	L	M	M	M	H	H	H	H	VH	L	M	L	M	M	H	H	M	H	VH	H	VH
Volume : Mn per week/10	92	97	102	86	80	81	79	70	67	81	100	102	97	97	80	84	75.5	86	74	72	69
Intensity : % of Max	70	80	80	80	90	90	90	90	95	70	80	70	80	80	90	90	80	90	95	90	95
Technical :																					
Volume :	H	H	VH	M	L	L	M	L	L	M	H	VH	VH	H	L	M	M	M	L	L	L
Intensity :	L	M	L	H	H	VH	M	VH	M	L	M	M	L	M	VH	VH	H	H	VH	H	H
Volume : Min per week	340	330	360	380	360	340	360	180	180	300	400	420	390	390	300	330	300	320	280	300	300
Intensity : % of Max	35	40	40	30	30	40	35	30	25	25	30	30	30	30	40	25	30	30	35	35	40
Strength :																					
Volume :	M	H	H	L	M	L	M	L	L	M	H	H	VH	H	M	M	L	M	L	L	L
Intensity :	L	M	L	M	VH	H	H	VH	H	L	M	M	M	M	H	VH	H	H	VH	VH	H
Volume : Min per week	360	400	420	280	260	250	290	230	210	320	400	410	400	410	300	340	255	300	210	200	180
Intensity : % of Max	25	20	25	30	35	30	35	20	35	25	30	20	30	30	30	35	30	30	30	30	25
Power :																					
Volume :	M	H	H	L	L	M	L	L	L	M	H	VH	H	H	M	L	M	M	L	L	L
Intensity :	L	M	L	M	VH	H	H	VH	H	L	M	L	M	M	H	VH	H	H	VH	H	H
Volume : Min per week	220	220	240	200	175	220	140	290	280	190	200	210	180	170	200	170	200	240	250	220	210
Intensity : % of Max	10	20	15	20	30	20	20	40	35	20	20	30	20	20	30	30	20	30	30	25	30

Intensity :	VH = Very high 95 %	H=high 90 %	M= medium 80%	L=low 70%
Volume :	VH = Very high 1080-970	H=high 970-866	M= medium 865-756	L=low 865-756

Type of Microcycle :	A : Adjustment	L : Loading	I : Impact	P : Pre-competitive	C : Competitive	R : Restoration

Figure 3: Showing the annual plan and and the build up and type of mesocycles and microcycles in macrocycle 2 and macrocycle 3 also showing volume and intensity for microcycles and difrent volume and intensity for technical, strength and power.

Month :	May		June				july				August				
Week begins on Monday:	may.23	may.30	jun.6	jun.14	jun.21	jun.28	jul.4	jul.11	jul..18	jul.25	aug.1	aug.8	aug.15	aug.22	aug.29
	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
Competition :			8	9			10		11	12	13	14			
Training camps :	3				4										
Macrocycles :	**Macrocycle 4**												**Rest 5**		
Mesocycle :	10. Accumulation				11. Transmutation				12. Realization				Rest		
Microcycle :	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
Type of Microcycle :	A	L	L	L	I	I	C	P	P	C	C	C	R	R	R
Volume :	H	H	VH	H	M	M	L	M	L	M	L	L	L	L	L
Intensity :	M	M	L	M	M	H	M	H	VH	VH	VH	VH	L	L	L
Volume : Mn per week/10	89	91	98	94	80	83	75	85	74	83	68	58	40	40	40
Intensity : % of Max	80	80	70	80	80	90	80	90	95	95	95	95	70	70	70
Technical :															
Volume :	H	H	H	VH	L	M	M	M	L	M	L	L	L	L	L
Intensity :	L	M	L	M	VH	VH	H	H	VH	M	VH	M	L	L	L
Volume : Min per week	350	360	380	380	300	330	300	330	270	300	250	200	100	100	100
Intensity : % of Max	30	30	20	40	35	30	30	30	45	25	35	30	20	10	20
Strength :															
Volume :	M	H	H	H	M	M	L	M	L	M	L	L	L	L	L
Intensity :	L	M	M	L	H	VH	H	H	H	H	VH	H	L	L	L
Volume : Min per week	340	350	370	370	320	320	260	320	250	300	230	200	200	200	200
Intensity : % of Max	25	30	20	20	20	30	30	30	20	35	30	35	20	20	10
Power :															
Volume :	M	H	VH	H	M	L	M	M	M	L	L	L	L	L	L
Intensity :	L	M	M	M	H	VH	H	H	H	H	VH	H	L	L	L
Volume : Min per week	200	200	230	190	190	180	190	200	220	230	200	180	100	100	100
Intensity : % of Max	25	20	30	20	25	30	20	30	25	35	30	35	10	20	20

Intensity :	VH = Very high 95 %	H=high 90 %	M= medium 80%	L=low 70%
Volume :	VH = Very high 1080-970	H=high 970-866	M= medium 865-756	L=low 865-756

Type of Microcycle :	A : Adjustment	L : Loading	I : Impact	P : Pre-competitive	C : Competitive	R : Restoration

Figure 4: Showing the annual plan and and the build up and type of mesocycles and microcycles in macrocycle 4 also showing volume and intensity for microcycles and different volume and intensity for technical, strength and power.

3.5. Development of the annual plan

The annual plan is built up and developed with block periodization. The annual plan is divided into four macrocycles, 13 mesocycles and 53 microcycles to control the training so the athlete is in top physical shape in the main competitions. The macrocycles, mesocycles and the microcycles are constructed in length to fit the annual plan in the best way to get the best set up for the training of the athlete, see figure 1 to figure 4.

3.5.1. Macrocycles

The annual plan is divided into four macrocycles to get the best set up for the training. The macrocycles are divided into three mesocycle blocks: accumulation block, transmutation block and realization block. The macrocycles end in a competition period and are set up for the training to best fit the main competitions.

3.5.1.1. Macrocycle 1

This macrocycle consists of three mesocycles and is the longest macrocycle of the annual plan as it covers in total 17 microcycles. The first mesocycles are an accumulation block where the focus is on high volume and relatively low intensity. In the mesocycle most of the training is on basic abilities like muscular strength and basic coordination. In the mesocycle there are six microcycles with different volume and intensity levels. The second mesocycle is a transmutation mesocycle block where the focus is on reduced volume and increased intensity In the mesocycle most of the training is on sportspecific abilities like proper technique, strength and power. The are six microcycels in the mesocycles with both reduced volume and increased intensity. The third mesocycle is a realization mesocycle block where the focus is on event specific work like maximal speed and sport performance. In the mesocycle there are five microcycles with both low and medium volume and the intensity is high. In this mesocycle there are two competitions so the training has to be focused on competitive performance, maximal speed and event specific work.

3.5.1.2. Macrocycle 2

This macrocycle consists of three mesocycles and is the shortest macrocycle of the annual plan. It covers in total nine microcycles. The first mesocycle is an accumulation block where the focus is on high volume and reduced intensity. In the mesocycle most of the training is on Basic abilities like muscular strength and basic coordination. In the mesocycle the are three microcycles with different volume and intensity levels. The second mesocycle is a transmutation mesocycle block where the focus is on reduced volume and increased intensity. In the mesocycle most of the training is on sportspecific abilities like proper technique, strength and power. The are three microcycles in the mesocycles with both reduced volume and increased intensity. The third mesocycle is a realization mesocycle block where the focus is on event specific work like maximal speed and sport performance. In the mesocycle there are three microcycles with both low and medium volume and the intensity is high. In this mesocycle are three competitions so the training has to be focus on competitive performance, maximal speed and event specific work.

3.5.1.3. Macrocycle 3

This macrocycle consists of three mesocycles and is the shortest macrocycle of the annual plan. It covers in total 12 microcycles. The first mesocycle is an accumulation block where the focus is on high volume and reduced intensity. In the mesocycle most of the training is on basic abilities like muscular strength and basic coordination. In the mesocycle the are three microcycles with different volume and intensity levels. The second mesocycle is a transmutation mesocycle block where the focus is on reduced volume and increased intensity. In the mesocycle most of the training is on sportspecific abilities like proper technique, strength and power. The are five microcycels in the mesocycles with both reduced volume and increased intensity. The third mesocycle is a realization mesocycle block where the focus is on event specific work like maximal speed and sport performance. In the mesocycle the are three microcycles with both low and medium volume and the intensity is high. In this mesocycle there is one competition so the training has to be focus on competitive performance, maximal speed and event specific work.

3.5.1.4. Macrocycle 4

This macrocycle consists of three mesocycles and is the shortest macrocycel of the annual plan. It covers in total nine microcycles The first mesocycles is an accumulation block where the focus is on high volume and reduced intensity. In the mesocycle most of the training is on basic abilities like muscular strength and basic coordination. In the mesocycle there are four microcycles with different volume and intensity levels. The second mesocycle is a transmutation mesocycle block where the focus is on reduced volume and increased intensity In the mesocycle most of the training is on sportspecific abilities like proper technique, strength power. The are four microcycels in the mesocycles with both reduced volume and increased intensity. The third mesocycle is a realization mesocycle block where the focus is on event specific work like maximal speed and sport performance. In the mesocycle the are four microcycles with both low and medium volume and the intensity is high. In this mesocycle are three competitions so the training has to be focus on competitive performance, maximal speed and event specific work.

3.5.1.5. Volume and intensity

The volume is highest 98.33 min per week/10 in the accumulation mesocycle in macrocycle 1 (see table 10 and figure 5). The volume goes down to 97 min per week/10 in the accumulation mesocycle in macrocycle 2. In the accumulation mesocycle in macrocycle 3 the volume goes down to 95.4 min per week/10. In macrocycle 3 the volume in the accumulation mesocycle goes down to 93 min per week/10. The volume for the accumulation mesocycle gose down because the training load is changing. The volume for the transmutation mesocycle in macrocycle 1 is 85.33 min per week/10 and goes down to 82.33 min per week/10 in transmutation mesocycle in macrocycle 2. In macrocycle 3 the volume for the transmutation mesocycle is 81.37 min per week/10 and goes down to 80.75 min per week/10. The volume is different between the transmutation mesocycles because of difference in training load. The volume for realization mesocycle in macrocycle 1 is 72.8 min per week/10 and goes down to 72 min per week/10 in the realization mesocycle in macrocycle 2. In macrocycle 3 the volume in the realization mesocycle goes down to 71.66 min per week/10. In macrocycle 4 the volume in the realization mesocycle goes down to 70.75 min per week/10. The volume gose down in the realization mesocycles because of rising intensity in the realization mesocycles.

Table 10: Volume of macrocycels

Volume of macrocycels Volume (min per week/10)			
	Accumulation	Transmutation	Realization.
Macrocycle 1	98,33	85,33	72,8
Macrocycle 2	97	82,33	72
Macrocycle 3	95,4	81,37	71,66
Macrocycle 4	93	80,75	70,75

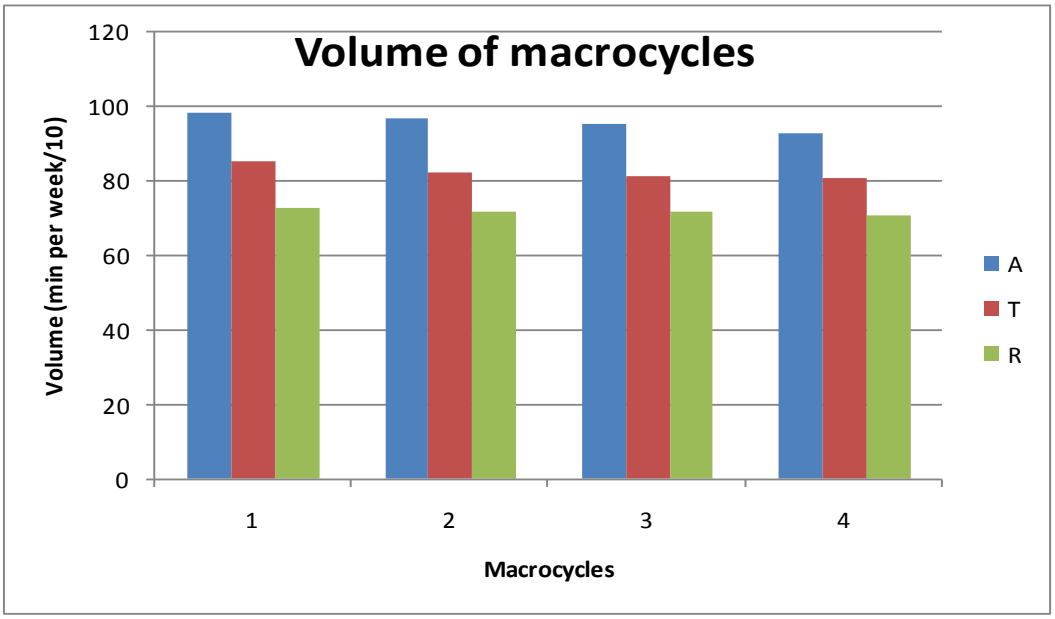

Figure 5: Showing volume in macrocycles. A= Accumulation T= Transmutation R= Realization.

The intensity is 76.66 % in the accumulation mesocycle in both macrocycle 1 and macrocycle 2, see tabel 11 and figure 6. In the accumulation mesocycle in macrocycle 3 the intensity is similar or 76 %. In the macrocycle 4 the intensity is higher at 77.5 % in the accumulation mesocycle. The intensity for the accumulation mesocycles is low because the volume is higest in the accumulation mesocycles. The intensity is 87.5 % in the transmutation mesocycle in macrocycle 1. In the transmutation mesocycle in macrocycle 2 the intensity is 86.66% and in macrocycle 3 the intensity is 87.5% in the transmutation mesocycle. In the macrocycle 4 the intensity is 85% in the transmutation mesocycle. The intensity for the transmutation mesocycles is similar but higher than in the accumulation mesocycles because the volume is lower in the transmutation mesocycles. The intensity for the the realization mesocycle in macrocycle 1 is 89 % and goes up to 91.66 % in the realization mesocycle in macrocycle 2. In the macrocycle 3 the intensity in the realization mesocycle goes up to 93.33% and in the realization mesocycle in macrocycle 4 the intensity goes up to 95 %. The intensity in the realization mesocycles is the higest because the volume is the lowest in the realization mesocycles.

Table 11: intensity of macrocycels

Intensity of macrocycels (Intensity %)			
	Accumulation	Transmutation	Realization.
Macrocycle 1	76,66	87,5	89
Macrocycle 2	76,66	86,66	91,66
Macrocycle 3	76	87,5	93,33
Macrocycle 4	77,5	85	95

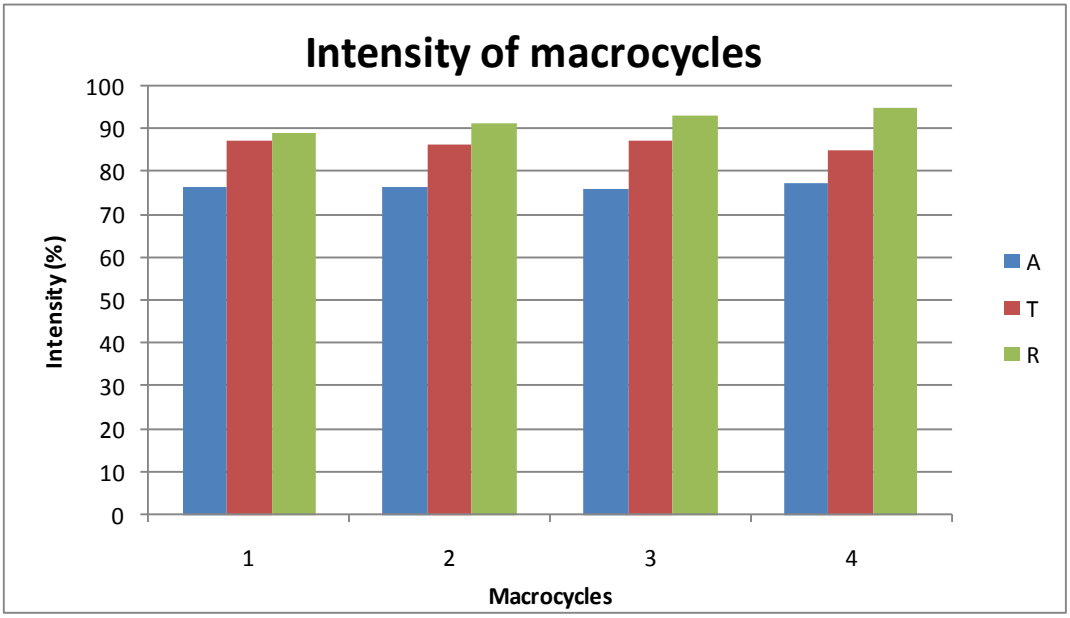

Figure 6: Showing intensity in macrocycles. A= Accumulation T= Transmutation R= Realization.

3.5.2. Mesocycles

Mesocycle 1 (Accumulation): Is an accumulation type of mesocycle and it consists of six microcycles. In the mesocycle there are three types of microcycles, one adjustment microcycle, three loading microcycles and two impact microcycles. The focus in the training is to get the athlete physically ready for further training. The training is focused on basic abilities like muscular strength and basic coordination. The volume level is medium in the first microcycle but goes up to high in the second and third and in the fourth microcycle the volume goes up to very high, in the fifth microcycle the volume level is high in the sixth microcycle the volume goes up to very high. The intensity level is low in the first microcycle but goes up to medium in the second and third microcycles, in the fourth microcycle the intensity level is low the intensity level is medium in the fifth and sixth microcycle.

Mesocycle 2 (Transmutation): Is a transmutation type of mesocycle and it consists of six microcycles. In the mesocycle the are four types of microcycles, one adjustment microcycle, one restoration, one adjustment, two loading microcycles and two impact microcycles. The focus in the training is to get the athlete better physically and technically for his sport. The training is focused on sport specific abilities like special strength, power and proper technique in the sport. The volume level is low in the first microcycles and is increased for the next 2 microcycles to medium but goes up to high in the fourth microcycle. In the fifth and sixth microcycle the volume level is medium. The intensity level is medium in the first microcycle but goes up to high in the second and goes down to medium in the third microcycles in the fourth microcycle the intensity level is high the intensity level is very high in the fifth and in the sixth microcycle it goes down to high.

Mesocycle 3 (Realization): Is a type of realization it consists of five microcycles. In the mesocycle there are three types of microcycles, one impact microcycle, two pre-competitive microcycles and two competitive microcycles. The focus in the training is preparedness work like modeled performance, maximal speed and event specific training to get the athlete ready for competition. The training in the mesocycle is competition related. The volume level is low in the first microcycles and is increased for the next microcycles to medium but goes up down to low in the third, fourth and fifth microcycle. The intensity level is high in the first microcycle but goes up to very high in the second and goes down to high in the third microcycles. In the fourth and fifth microcycles the intensity level is very high.

Mesocycle 4 (Accumulation): Is the second accumulation mesocycle in the annual plan, it consists of 3 microcycles. In the mesocycle there are two types of microcycles, one adjustment microcycle and two loading microcycles. The focus in the training is to get the athlete physically ready for further training. The training is focused on basic abilities like muscular strength and basic coordination. The volume level is medium in the first microcycle but goes up to high in the second and third and in the fourth microcycle the volume goes up to very high. The intensity level is low for the in the first microcycle but goes up to medium in the second and third microcycles.

Mesocycle 5 (Transmutation): Is the second transmutation mesocycle in the annual plan and it consists of three microcycles. In the mesocycle there is one type of microcycle, three impact microcycles. The focus in the training in is to get the athlete better physically and technically for his sport. The training is focused on sport specific abilities like special strength, power and proper technique in the sport. The volume level is medium in the first microcycles and goes down for the next two microcycles to low. The intensity level is high in the first 2 microcycle but goes up to very high in the third mesocycel.

Mesocycle 6 (Realization): Is the same type of realization mesocycle like mesocycle three but is has three microcycles. In the mesocycle the are two types of microcycles, one pre-competitive microcycle and two competitive microcycles. The training in the mesocycle mostly involves to get ready for competitions that are in this mesocycle. The volume level is medium in the first microcycle and goes down to low in the second and third microcycles. The intensity level is high the first and second microcycles but goes up to very high in the third microcycle.

Mesocycle 7 (Accumulation): Is the third accumulation mesocycle in the annual plan, it consists of five microcycles. In the mesocycle there are three types of microcycles, one restoration, two loading microcycles and two impact microcycles. The focus in the training is to get the athlete physically ready for further training. The training is focused on basic abilities like muscular strength and basic coordination. The volume level is medium in the first microcycle but goes up to very high in the second and third and in the fourth and fifth microcycles the volume goes down to high. The intensity level is low for the first microcycle but goes up to medium in the second microcycle and goes to low in the third mesocycle in the fourth and fifth microcycles the intensity level is medium.

Mesocycle 8 (Transmutation): Is the third transmutation mesocycle in the annual plan and it consists of four microcycles. In the mesocycle there are two types of microcycles, two loading microcycles and two impact microcycles. The focus in the training is to get the athlete better physically and technically for his sport. The training is focused on sport specific abilities like special strength, power and proper technique in the sport. The volume level is medium in the first and second microcycles and goes down for the third microcycles to low in the fourth microcycles

the volume goes to medium. The intensity level is high in the first microcycle but goes up to very high in the second mesocycle and goes to high in the third and fourth mesocycle.

Mesocycle 9 (Realization): Is the same type of realization mesocycle like mesocycle six but is has three microcycles. In the mesocycel there are two types of microcycles, one pre-competitive microcycle and two competitive microcycles. The training in the mesocycel mostly involves to get ready for competitions that are in this mesocycel. The volume level is low in the first, second and third microcycle. The intensity level is very high in the first microcycle but goes down to high in the second and third microcycles.

Mesocycle 10 (Accumulation): Is the third accumulation mesocycle in the annual plan, it consists of four microcycles. In the mesocycle there are two types of microcycles, one adjustment microcycle and three loading microcycles. The focus in the training is to get the athlete physically ready for further training. The training is focused on basic abilities like muscular strength and basic coordination. The volume level is high in the first and second microcycle but goes up to very high in the third and in the fourth microcycle the volume goes to high. The intensity level is medium in the first and second microcycle but goes to low in the third microcycle in the fourth microcycle the intensity level is medium.

Mesocycle 11 (Transmutation): Is the fourth transmutation mesocycel in the annual plan and it consists of 4 microcycles. In the mesocycle there are three types of microcycles, two impact microcycles, one pre-competitive microcycle and one competitive microcycle. The focus in the training in is to get the athlete better physically and technically for his sport. The training is focused on sport specific abilities like special strength, power and proper technique in the sport. The volume level is medium in the first and second microcycles and goes down for the third microcycles to low and in the fourth microcycles the volume goes to medium. The intensity level is high in the first microcycle but goes up to very high in the second microcycle and goes to high in the third and fourth microcycle.

Mesocycle 12 (Realization): Is the same type of realization mesocycle like mesocycle nine but is has 4 microcycles. In the mesocycle the are two types of microcycles, one pre-competitive

microcycle and three competitive microcycles. The training in the mesocycle mostly involves to get ready for competitions that are in this mesocycel. The volume level is low in the first microcycle and goes to medium in the second microcycle in the third and fourth microcycle the volume level is low. The intensity level is very high in the first microcycle but goes down to high in the second microcycle in the third and fourth microcycles the intensity level is very high.

Mesocycle 13 (Rest): Is a rest mesocycle and it consists of three microcycles. In the mesocycle there is one type of microcycle, three restoration microcycles. The athlete gets rest from training the volume and the intensity is low but the athlete can be physically active.

3.5.3. Microcycles and sessions

Explanations of microcycles 1-17 and the sessions in the microcycles. Microcycles 1-6 are in mesocycle one (Accumulation). Microcycles 7-12 are in mesocycle two (Transmutation). Microcycles 13-17 are in mesocycle three (Realization).

Microcycle 1: Is a type of adjustment microcycle where the focus of the training is adaptation to appropriate loads. The are 8 training sessions in this microcycle, three technical sessions, three strength sessions and two power sessions. The total volume for the microcycele is 820 min. That is devided into 400 min for technical, 300 min for strength and 120 min for power. The intensity for the microcycle is 70 %, 20 % for technical, 30 % for strength and 20 % for power, (table 12).

Table 12: Sessions in microcycle 1

Days	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
Am.	Technical		Technical	Technical		Power	
Pm.	Strength	Power	Strength		Strength		
Volume : 820 min. Intensity : 70 %							

Session in microcycle 1 : is a technical session in microcycle one, the session is the fourth session in the microcycle. The session is a am. session on a Wednesday. The focus of the training is correct technique with low intensity. The session is 120 min long, (table 13).

Table 13: Session 4 microcycles 1 (technical)

Session 4 microcycle 1			
Type of exercise	Sets/repetitions	Intensity of 1RM	Time
Warm up	12 min jog/ stretches		20 min
Technical drills	40 repetitions	70 %	30 min
Standing throws	15 repetitions	70 %	20 min
Full throws	30 repetitions	70 %	40 min
Cool down	Stretches		10 min

In table 13 above technical drills mean going through the movement of the throw without the implement. Both slow and fast, working on getting right body positions in the throw. Standing throws are throwing the shot from standing position without approach. Full throws are throwing the shot with full approach like in competition.

Microcycle 2: Is a type of loading microcycle where the focus of the training is on fitness development and technical work. The are 10 training sessions in this microcycle, four technical sessions, four strength sessions and two power sessions. The volume total for the microcycle is 890 min devided into 450 min for technical, 320 min for strength and 120 min for power. The intensity for the microcycle is 80 %, 30 % for technical, 40 % for strength and 10 % for power, (table 14).

Table 14: Sessions in microcycle 2

Days	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
Am.	Technical	Technical		Technical	Technical	Strength	
Pm.	Strength	Power	Strength	Power	Strength		
Volume : 890 min. Intensity : 80 %							

Session in microcycle 2: is a strength session in microcycle two the session is the second session in the microcycle. The session is a pm. session on a Monday. The objective is good form in the lifts and finish all the sets without failure. The session is 90 min long, (table 15).

Table 15: Session 2 microcycles 2 (strength)

Session 2 microcycle 2			
Type of exercise	Sets/repetitions	Intensity of 1RM	Time
Warm up	10 min bike		10 min
Bench press	4*5	80 %	25 min
Shoulder press	4*5	80%	25 min
Pull over	4*8		5 min
Triceps pull down	4*8		5 min
Flyies	4*8		5 min
Abdominal crunches	4*20		5 min
Cool down	Stretches		10 min

Microcycle 3: Is a type of loading microcycle where the focus of the training is on fitness development and technical work. The are 11 training sessions in this microcycle, five technical sessions, four strength sessions and two power sessions. The volume total for the microcycle is 970 min, devided into 470 min for technical, 360 min for strength and 140 min for power. The intensity for the microcycle is 80 %., 30 % for technical, 40 % for strength and 10 % for power, (table 16).

Table 16: Sessions in microcycle 3

Days	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
Am.	Technical	Technical	Power	Technical	Technical	Strength	Technical
Pm.	Strength	Strength		Power	Strength		
Volume : 970 min. Intensity : 80 %							

Session in microcycle 3: is a power session in the third microcycle, the session is the sixth session in the microcycle. The session is a pm. session on a Thursday . The objective is good technique in the exercises and and being explosive in the exercises. The session is 70 min long, (table 17).

Table 17: Session 6 microcycle 3 (power)

Session 6 microcycle 3			
Type of exercise	Sets/repetitions	Intensity	Time
Warm up	15min jog/ stretches		20 min
Overhead shot put throw	10 repetitions	90%	15 min
Short sprints	5*30m	80 %	15 min
Standing long jump	8 repetitions	80 %	10 min
Cool down	Stretches		10 min

Microcycle 4: Is a type of impact microcycle where the focus of the training is on fitness development with extreme workloads. The are 11 training sessions in this microcycle, four technical sessions, four strength sessions and three power sessions. The volume total for the microcycele is 1060 min, devided into 490 min for technical, 370 min for strength and 200 min for power. The intensity for the microcycle is 70 %, 30 % for technical, 30 % for strength and 10 % for power, (table 18).

Table 18: Sessions in microcycle 4

Days	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
Am.	Technical	Technical	Power		Technical	Strength	
Pm.	Strength	Strength	Technical	Power	Strength	Power	
Volume : 1060 min. Intensity : 70 %							

Session in microcycle 4: is a technical session in microcycle four, the session is the fifth session in the microcycle. The session is a am. session on a Friday. The focus of the training is correct technique with low intensity. The session is 120 min long, (table 19).

Table 19: Session 8 microcycles 4 (technical)

Session 8 microcycle 4			
Type of exercise	Sets/repetitions	Intensity of 1RM	Time
Warm up	10 min jog/ stretches		20 min
Technical drills	60 repetitions	70 %	40 min
Standing throws	10 repetitions	70 %	20 min
Full throws	20 repetitions	70-80 %	30 min
Cool down	Stretches		10 min

Microcycle 5: Is a type of loading microcycle table 20 where the focus of the training is on fitness development and technical work. The are 10 training sessions in this microcycle four technical sessions, four strength sessions and two power sessions. The volume total for the microcycele is 960 min, devided into 500 min for technical, 360 min for strength and 100 min for power. The intensity for the microcycle is 80 %, 40 % for technical, 30 % for strength and 20 % for power.

Table 20: Sessions in microcycle 5

Days	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
Am.	Technical	Power	Technical	Technical	Technical	Strength	
Pm.	Strength		Strength	Power	Strength		
Volume : 970 min. Intensity : 80 %							

Session in microcycle 5: is a strength session in microcycle five, the session is the fourth session in the microcycle. The session is a pm. session on a Wednesday. The objective is good form in the lifts and finish all the sets without failure. The session is 90 min long, (table 21).

Table 21: Session 4 microcycles 5 (strength)

Session 4 microcycle 5			
Type of exercise	Sets/repetitions	Intensity of 1RM	Time
Warm up	10 min bike		10 min
Clean pull	4*4	70-80%	25 min
Squat	3*7	70%	25 min
Stiff leg	4*6		5 min
Lat pulldown	4*8		5 min
Dumbbell rows	4*8		5 min
Bicep curls	4*10		5 min
Back extensions	4*10		10 min

Microcycle 6: Is a type of impact microcycle where the focus of the training is on fitness development with extreme workloads. The are 10 training sessions in this microcycle four technical sessions, four strength sessions and two power sessions. The volume total for the microcycele is 1080 min, devided into 490 min for technical, 480 min for strength and 110 min for power. The intensity for the microcycle is 80 %, 30 % for technical, 30 % for strength and 20 % for power, (table 22).

Table 22: Sessions in microcycle 6

Days	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
Am.	Technical		Power	Power	Technical	Strength	
Pm.	Strength	Strength	Technical	Technical	Strength		
Volume : 1080 min. Intensity : 80 %							

Session in microcycle 6: is a power session in microcycle six, the session is the fifth session in the microcycle. The session is a am. session on a Wednesday. The objective is good technique in the exercises and and being explosive in the exercises. The session is 65 min long, (table 23).

Table 23: Session 5 microcycles 6 (power)

Session 5 microcycle 6			
Type of exercise	Sets/repetitions	Intensity	Time
Warm up	15min jog/ stretches		20 min
Short sprints	5*40m	80%	15 min
Hurdle jumps	5*5	80%	10 min
Standing triple jump	6 repetitions	80 %	10 min
Cool down	Stretches		10 min

Microcycle 7: Is a type of restoration microcycele where the focus of the training is on lighter training and active recovery. The are five training sessions in this microcycle, two technical sessions, two strength sessions and one power session. The volume total for the microcycele is 740 min, devided into 300 min for technical, 300 min for strength and 140 min for power. The intensity for the microcycle is 80 %, 20 % for technical, 30 % for strength and 30 % for power, (table 24)

Table 24: Sessions in microcycle 7

Days	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
Am.	Technical		Power		Strength		
Pm.		Strength		Technical			
Volume : 740 min. Intensity : 80 %							

Session in microcycle 7: is a technical session in microcycle seven, the session is the eighth session in the microcycle. The session is a pm. session on a Friday. The focus of the training is correct technique and good feeling. The session is 120 min long, (table 25).

Table 25: Session 4 microcycles 7 (technical)

Session 4 microcycle 7			
Type of exercise	Sets/repetitions	Intensity of 1RM	Time
Warm up	20 min jog/ stretches		30 min
Standing throws	15 repetitions	80 %	20 min
Full throws	35 repetitions	80 %	50 min
Cool down	Stretches		20 min

Microcycle 8: Is a type of adjustment microcycle where the focus of the training is adaptation to appropriate loads. The are 8 training sessions in this microcycle three technical sessions, three strength sessions and two power sessions. The volume total for the microcycele is 830 min, devided into 350 min for technical, 330 min for strength and 140 min for power. The intensity for the microcycle is 90 %, 30 % for technical, 40 % for strength and 20 % for power, (table 26).

Table 26: Sessions in microcycle 8

Days	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
Am.	Technical		Technical	Technical		Power	
Pm.	Strength	Power	Strength		Strength		
Volume : 830 min. Intensity : 90 %							

Session in microcycle 8: is a strength session in microcycle eight, the session is the second session in the microcycle. The session is a pm. session on a Monday. The objective is to finish all the sets without failure and move the weights as fast as possible. The session is 85 min long, (table 27).

Table 27: Session 2 microcycles 8 (strength)

Session 2 microcycle 8			
Type of exercise	Sets/repetitions	Intensity of 1RM	Time
Warm up	10 min bike		10 min
Bench press	3*3	90 %	25 min
Shoulder press	3*4	90%	20 min
Pull over	4*6		5 min
Triceps pull down	4*6		5 min
Flyes	4*6		5 min
Abdominal crunches	3*20		5 min
Cool down	Stretches		10 min

Microcycle 9: Is a type of loading microcycle where the focus of the training is on fitness development and technical work. The are nine training sessions in this microcycle, three technical sessions, four strength sessions and two power sessions. The volume total for the microcycele is 865 min, devided into 360 min for technical, 340 min for strength and 165 min for power. The intensity for the microcycle is 80 %, 40 % for technical, 20 % for strength and 30 % for power, (table 28).

Table 28: Sessions in microcycle 9

Days	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Am.	Technical			Technical	Technical	Strength	
Pm.	Strength	Power	Strength	Power	Strength		
Volume : 865 min. Intensity : 80 %							

Session in microcycle 9: is a power session in microcycle nine the session is the sixth session in the microcycle. The session is a am. session on a Thursday. The objective is good technique in the exercises and and being explosive in the exercises. The session is 85 min long, (table 29).

Table 29: Session 6 microcycles 9 (power)

Session 6 microcycle 9			
Type of exercise	Sets/repetitions	Intensity	Time
Warm up	15min jog/ stretches		20 min
Short sprints	5*30m	80%	20 min
Overhead shot put throw	10 repetitions	80%	15 min
Standing long jump	10 repetitions	80 %	15 min
Cool down	Stretches		15 min

Microcycle 10: Is a type of loading microcycle where the focus of the training is on fitness development and technical work. The are 11 training sessions in this microcycle five technical sessions, four strength sessions and two power sessions. The volume total for the microcycele is 960 min, devided into 400 min for technical, 380 min for strength and 180 min for power. The intensity for the microcycle is 90 %, 30 % for technical, 30 % for strength and 30 % for power, (table 30).

Table 30: Sessions in microcycle 10

Days	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Am.	Technical	Technical	Power	Technical	Technical	Strength	
Pm.	Strength	Strength	Technical	Power	Strength		
Volume : 960 min. Intensity : 90 %							

Session in microcycle 10: is a technical session in microcycle 10, the session is the third session in the microcycle. The session is a am. session on a Tuesday. The focus of the training is correct technique and good feeling. The session is 140 min long, (table 31).

Table 31: Session 3 microcycles 10 (technical)

Session 3 microcycle 10			
Type of exercise	Sets/repetitions	Intensity of 1RM	Time
Warm up	20 min jog/ stretches		30 min
Standing throws	20 repetitions	90 %	30 min
Full throws	40 repetitions	90 %	60 min
Cool down	Stretches		20 min

Microcycle 11: Is a type of impact microcycle where the focus of the training is on fitness development with extreme workloads. The are 10 training sessions in this microcycle four technical sessions, four strength sessions and two power sessions. The volume total for the microcycele is 860 min, devided into 380 min for technical, 360 min for strength and 120 min for power. The intensity for the microcycle is 95 %, 25 % for technical, 40 % for strength and 30 % for power, (table 32).

Table 32: Sessions in microcycle 11

Days	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
Am.	Technical	Technical	Power		Technical	Strength	
Pm.	Strength	Strength	Technical		Strength	Power	
Volume : 860 min. Intensity : 95 %							

Session in microcycle 11: is a strength session in microcycle 11, the session is the eighth session in the microcycle. The session is a pm. session on a Friday. The objective is to finish the lifts strong and finish all the sets without failure. The session is 120 min long, (table 33).

Table 33: Session 8 microcycles 11 (strength)

Session 8 microcycle 11			
Type of exercise	Sets/repetitions	Intensity of 1RM	Time
Warm up	10 min bike		10 min
Clean pull	4*2	95%	30 min
Squat	4*2	95%	30 min
Stiff leg	3*6		10 min
Lat pulldown	3*8		10 min
Dumbbell rows	3*8		10 min
Bicep curls	3*10		10 min
Back extensions	3*10		10 min

Microcycle 12: Is a type of impact microcycle where the focus of the training is on fitness development with extreme workloads. The are 10 training sessions in this microcycle four technical sessions, four strength sessions and three power sessions. The volume total for the microcycele is 856 min, devided into 400 min for technical, 340 min for strength and 125 min for power. The intensity for the microcycle is 90 %, 30 % for technical, 30 % for strength and 30 % for power, (table 34).

Table 34: Sessions in microcycle 12

Days	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
Am.	Technical	Technical	Power		Technical	Strength	
Pm.	Strength	Strength	Technical		Strength	Power	
Volume : 865 min. Intensity : 90 %							

Session in microcycle 12: is a power session in microcycle nine, the session is the tenth session in the microcycle. The session is a pm. session on a Thursday. The objective is good technique in the exercises and and being very explosive in the exercises. The session is 90 min long, (table 35).

Table 35: Session 10 microcycles 12 (power)

Session 10 microcycle 12			
Type of exercise	Sets/repetitions	Intensity	Time
Warm up	15min jog/ stretches		20 min
Short sprints	10*30m	90%	20 min
Overhead shot put throw	15 repetitions	90%	20 min
Hurdle jumps	5*5	90 %	15 min
Cool down	Stretches		15 min

Microcycle 13: Is a type of impact microcycle where the focus of the training is on fitness development with extreme workloads. The are eight training sessions in this microcycle, four technical sessions, two strength sessions and two power sessions. The volume total for the microcycele is 720 min, devided into 200 min for technical, 300 min for strength and 220 min for power. The intensity for the microcycle is 80 %, 25 % for technical, 30 % for strength and 25 % for power, (table 36).

Table 36: Sessions in microcycle 13

Days	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
Am.	Technical		Power	Power	Technical	Strength	
Pm.	Strength		Technical	Technical			
Volume : 720 min. Intensity : 80 %							

Session in microcycle 13: is a strength session in microcycle 13, the session is the second session in the microcycle. The session is a pm. session on a Monday. The objective is to move the weights as fast as possible without failure. The session is 100 min long, (table 37).

Table 37: Session 2 microcycles 13 (strength)

Session 2 microcycle 13			
Type of exercise	Sets/repetitions	Intensity of 1RM	Time
Warm up	15 min bike		15 min
Bench press	3*3	80 %	25 min
Shoulder press	3*3	80%	25 min
Pull over	4*8		5 min
Triceps pull down	4*8		5 min
Flyies	4*8		5 min
Abdominal crunches	3*20		5 min
Cool down	Stretches		15 min

Microcycle 14: Is a type of pre-competitive microcycle where the focus of the training is on preparation for competition and use of event-specific means. In this microcycle is the first test batterie. The are 9 training sessions in this microcycle, three technical sessions, one strength sessions, two power sessions and three test sessions. The volume total for the microcycle is 770 min, devided into 250 min for technical, 280 min for strength and 220 min for power. The intensity for the microcycle is 90 %, 35 % for technical, 25 % for strength and 30 % for power, (table 38).

Table 38: Sessions in microcycle 14

Days	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
Am.	Technical	Technical	Technical				
Pm.	Test	Test	Test	Power	Strength	Power	
Volume : 770 min. Intensity : 90 %							

Session in microcycle 14: is a technical session in microcycle 14, the session is the third session in the microcycle. The session is a am. session on a Tuesday. The focus of the training is correct technique and to throw far. The session is 85 min long, (table 39).

Table 39: Session 3 microcycles 14 (technical)

Session 3 microcycle 14			
Type of exercise	Sets/repetitions	Intensity of 1RM	Time
Warm up	20 min jog/ stretches		30 min
Standing throws	6 repetitions	90 %	15 min
Full throws	10 repetitions	90 %	20 min
Cool down	Stretches		20 min

Microcycle 15: Is a type of competitive microcycle where the focus of the training is on competition and sport and event specific performances. The are seven training sessions and one competition in this microcycle, four technical sessions, one strength sessions and two power sessions. The volume total for the microcycele is 720 min, devided into 200 min for technical, 250 min for strength and 300 min for power. The intensity for the microcycle is 90 %, 30 % for technical, 30 % for strength and 30 % for power, (table 40)

Table 40: Sessions in microcycle 15

Days	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
Am.	Technical		Power	Power	Technical	competition	
Pm.	Strength		Technical	Technical			
Volume : 720 min. Intensity : 90 %							

Session in microcycle 15: is a power session in microcycle 15, the session is the fifth session in the microcycle. The session is a am. session on a Thursday. The objective is to be very explosive in the exercises. The session is 75 min long, (table 41).

Table 41: Session 5 microcycles 12 (power)

Session 5 microcycle 12			
Type of exercise	Sets/repetitions	Intensity	Time
Warm up	15min jog/ stretches		20 min
Short sprints	5*20m	90%	20 min
Overhead shot put throw	8 repetitions	90%	20 min
Cool down	Stretches		15 min

Microcycle 16: Is a type of pre-competitive microcycle where the focus of the training is on preparation for competition and use of event-specific means. The are 9 training sessions in this microcycle, four technical sessions, two strength sessions, three power sessions. The volume total for the microcycele is 740 min, devided into 180 min for technical, 200 min for strength and 320 min for power. The intensity for the microcycle is 95 %., 30 % for technical, 20 % for strength and 40 % for power, (table 42).

Table 42: Sessions in microcycle 14

Days	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
Am.	Technical	Technical		Technical			
Pm.	Power	Strength	Technical	Power	Strength	Power	
Volume : 740 min. Intensity : 90 %							

Session in microcycle 16: is a strength session in microcycle 16, the session is the eighth session in the microcycle. The session is a pm. session on a Friday. The objective is move the weights as fast as possible without failure. The session is 80 min long, (table 43).

Table 43: Session 8 microcycle 16 (strength)

Session 8 microcycle 16			
Type of exercise	Sets/repetitions	Intensity of 1RM	Time
Warm up	10 min bike		10 min
Clean pull	2*2	90%	30 min
Squat	1*2	90%	30 min
Back extensions	3*10		10 min

Microcycle 17: Is a type of competitive microcycle where the focus of the training is on competition and sport and event specific performances. The are six training sessions and one competition in this microcycle, three technical sessions, one strength sessions and two power sessions. The volume total for the microcycle is 660 min, devided into 180 min for technical, 200 min for strength and 280 min for power. The intensity for the microcycle is 90 %, 30 % for technical, 30 % for strength and 30 % for power, (table 44).

Table 44: Sessions in microcycle 15

Days	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
Am.	Technical	Power		Power		Competison	
Pm.	Strength	Technical		Technical			
Volume : 660 min. Intensity : 95 %							

Session in microcycle 17: is a technical session in microcycle 17, the session is the fourth session in the microcycle. The session is a pm. session on a Tuesday. The focus of the training is correct technique and to throw far. The session is 95 min long, (table 45).

Table 45: Session 4 microcycles 14 (technical)

Session 4 microcycle 14			
Type of exercise	Sets/repetitions	Intensity of 1RM	Time
Warm up	20 min jog/ stretches		30 min
Standing throws	8 repetitions	95 %	15 min
Full throws	20 repetitions	95 %	30 min
Cool down	Stretches		20 min

3.5.4. Taper

The goal of the training is to be able to achieve a good performance in the specific competitions in the annual plan. The taper happens in the realization mesocycle that is designed to have the athlete in the best physical shape for competition (Issurin, 2008). Tapering is affected by volume, intensity and freqency of training. If the tapering is implemented in the right way the athlete should get physical adaptations from the training in the annual plan and be ready for competition (Bompa and Haff, 2009). The taper for the most important competitions starts two or three weeks before the competition. The strategy of the taper is to reduce the volume week by week and increase the intensity. In the week before the competition the training frequency is decreased and the athlete gets more rest. The taper that is used in the annual plan is progressive taper where reductions in training load is systematic and progressive (Mujika, 2012). The progressive taper is classified into three types; linear taper, slow exponential taper and fast exponential taper. The linear taper contains higer loads than the slow and the fast exponential taper. The slow exponential taper has slower reduction in training load than the fast exponential taper (Bompa and Haff, 2009). The type of progressive taper used for the athlete to taper is slow exponential taper.

3.6. Control of the annual plan

To get the best results from the training in the annual plan the coach needs to have tools to control the annual plan. Things that can affect the training for the athlete are for example injuries and sickness. To control the training in the annual plan the athlete has to be able to follow the training plan and be able to complete the workouts. The volume and intensity that is set up in the workout there will be a test to monitor the training performance. The results of the tests will be used to control the training and the coach can make changes to the training program in the next mesocycles if the results of the test are for example not as expected and also if the results of the test are better than expected react according to it and he can make changes if it is necessary for example in volume and intensity.

The tests are a part of the training program and the tests may be on different days of the week. The test may be under a different training load depending on when in the annual plan they are performed and in what type of mesocycle they are performed in. Results from competitions will also be used to control and monitor the training in the annual plan. In the annual plan are five test batteries, one in every macrocycle. The first test battery is in the beginning of the annual plan microcycle three in mesocycle one (accumulation). The second test battery is in microcycle 14 in mesocycle three (realization). The third test battery is in microcycle 24 in mesocycle six (realization). The fourth test battery is in microcycle 36 in mesocycle nine (realization). The fifth test battery is in microcycle 47 in mesocycle 12 (realization). Test batteries two to five are in realization mesocycles where the volume is lower and the intensity is higher. In the realization mesocycles the athlete is ready for competitions and physically ready to do well on the tests. The first test battery is in accumulation mesocycle and is used to get a score for the athlete and see where he stands physically.

Explanations of test used in the test battery to monitor the training performance in the annual plan:

3.6.1. 30 m sprint

Objective of the test is to measure the throwers time and speed over 30m. The test induces if the thrower is getting faster and if the training program is producing the right speed to throw the shot put at maximum speed. To succeed and throw far the implement needs to get to max speeds in the shortest possible time and that requires high force (Sivertsen, 1982). The 30 m sprints are performed from a standing start with the toe of the preferred foot 30 cm behind the starting gate. This is intended to allow some forward lean and cause triggering of the timing system (omega timing system) as soon as the subject moves. The thrower is not permitted to use a rolling start and are instructed to sprint with maximum effort when they were ready. The sprint tests is performed on a mondo track floor and the thrower uses running shoes not, spikes (Specificity of Sprint and Agility Training Methods, 2015).

3.6.2. Squats with weights

The objective of the squat test is to evaluate the throwers lower body strength. Before testing the thrower performes an unloaded squat repetition, descending slowly, in order to determine the position of the 90° of the knees (Terzis, Karampatsos and Georgiadis,2007). A stool is placed under the hips at the right height in order to restrict the knee bending to no more man 90° During the 1RM measurement, the thrower starts the upward movement when his hips touches the stool. The thrower performes incremental submaximal efforts, until he is unable to lift a heavier weight. Approximately three minutes of rest is allowed between the trials. Depending on how easy the lift is, 5 to 10 kg is added for the next attempt. If the attempted weight is too heavy, the individual is allowed to decrease the weight to reach the 1RM (Terzis, Karampatsos and Georgiadis, 2007).

3.6.3. Bench press

The objective of the bench press test is to evaluate the throwers upper body strength (YMCA Bench Press Test, 2015). The test induces an increase in muscular power and also it induces an increase in the level of activation of the muscles during the actual performance, which is

probably translated to an increase in power production. Bench press is a specific strength, which can be defined as the strength produced during the actual sport event, is a good predictor for a successful shot putter (Terzis, Karampatsos & Georgiadis, 2007). The thrower is instructed to grip the bar at a comfortable position, which was typically 10–20 cm beyond shoulder width. A warm-up set is then performed at a weight that allowed 6–10 repetitions to be completed comfortably. After resting for two to five minutes, the thrower attempts to press a weight agreed by both the tester and the athlete. The bar is lowered by the individual until it touches the chest and is then immediately pressed into a full arm extension. Depending on how easy the lift is, 2.5 to 10 kg is added for the next attempt. If the attempted weight is too heavy, the individual is allowed to decrease the weight to reach the 1RM. This procedure is repeated until a maximal weight is determined. A 2-5 minutes rest is allowed between each attempt and the 1RM is usually achieved within 4 attempts (Terzis, Karampatsos and Georgiadis,2007).

3.6.4. Overhead shot put throw

The objective of the squat test is to evaluate the throwers lower and upper body strength. The thrower holds the shot put with both hands and rapidly descend into a quarter squat. As the trower starts the overhead throw he brings his arms and the shot from overhead to in front of his body. At the bottom of the movement he explodes upwards swinging his arms overhead and backwards and releases the shot put at the top of the movement sending it up and back. To success and throw far the implement needs to get max speeds in the shortest possible time and that requires high force (Sivertsen, 1982). The trower gets six throws and the longest one is measured and used as a test results.

3.6.5. Standing Long Jump

The objective of the test is to monitor the development of the throwers leg strength and to monitor power output (Almuzaini & Fleck, 2008)**.** The thrower is instructed to perform a long jump from a standing position. Standardized instructions are given to the thrower that permitted to begin the jump with bent knees and swing the arms to assist in the jump. A line drawn on a hard surface served as the starting line. The length of the jump is determined using a tape measure. The thrower is given 3 trials, and the distance of the best jump is measured from the line where he jumped to the point where the heel landeds closest to the starting line. If the

thrower falls backward, the distance where the body part closest to the starting line touched the ground is measured as the jump's length. The thrower performes 3 jumps and the longest jump is used as the test score (Almuzaini & Fleck, 2008).

3.6.5. Technical evaluation

Technical evaluation will be evaluated through a video where the videos of the athlete will be analysed for example body position, speed of the throw and contact time of the athlete when he goes through the throw. Long throws in training and competition will be analysed through computer and used for the athlete to learn from and to improve his technique.

4. Conclusion

When doing this research the objective was to develop a concrete annual plan for an athlete training to qualify for the Rio Olympics in 2016 and to throw 20.50 m or better. The annual plan that was developed addresses all the different requirements in shot put training like throwing technique, strength and power training Shot put training is based on different requirements that need to be taken into account when organizing an annual training plan for an athlete to get good results from training. When choosing from traditional periodization or block periodization in making an annual training plan for a shot putter in this research block periodization was chosen because evidence of studies show block periodized training cycle seemed to be more effective than traditional periodization when improving the performance of highly trained athletes and blocks periodization model has the main objectives on multiple peaks by season. The annual training plan is based on research and theory of sport training.

1. The annual plan is built up with block periodization and covers one year, it is divided into four macrocycles to get the best set up for the training. The mesocycles are 13 and are divided into three mesocycle blocks, accumulation block, transmutation block and realization block. The total number of microcycle in the annual plan is 53 and they are setup to fit the recruitments of the training in the best way.

2. The annual plan is set up to get the athlete in the best physical shape for shot put. To do that volume, intensity and frequency of training had to be controlled to get the best results from the annual plan. Block periodization and blocks of accumulation, transmutation and realization mesocycles systematically alternate volume and intensity to get the best results from training in this annual plan.

3. The annual plan developed in this thesis is going to help the athlete reach his goals and the process of making the annual plan has helped me understand the concept of periodization much better and will help me as a coach in the future when working with and making plans for athletes. The results may also help other athletes and coaches to understand and use periodization and the key elements in the process in sport training.

4. The annual plan is hopefully going to help the athlete reach his objective to qualify for the Rio Olympics in 2016 and to throw 20.50 m. The annual plan has had good effects and helped the athlete's training so far and hopefully the results in upcoming competitions will be good.

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