

MODERN VOLLEYBALL ANALYSIS AND TRAINING PERIODIZATION

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Sport Coaching and
Fitness Testing
Coaching seminar
LBIA028 (VTEA008)
Spring 2018
Biology of
Physical Activity
University of Jyväskylä
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ABSTRACT

Vuorinen Kasper, 2017. Modern volleyball analysis and training periodization.

Coaching science follow-up course part 2. Coaching seminar. LBIA028 (VTEA008).

Biology of Physical Activity. 108 pages.

The purpose of this study is to clarify the scientific approach to modern volleyball at men's high-level and introduce the most influential studies, which still are not very well implemented in the world of volleyball.

On **individual** level, requirements of modern volleyball consist **psychological aspects** like **inner motivational** and **maintaining the focus during the game**, which is difficult because there are a lot of breaks and successful and unsuccessful rallies in every volleyball match. Inner motivated player can push himself easier to the limits of his capacity during the game. Good focus and team routines keep the difference between won and lost rally small so that the player and the team can perform consistently. (Liukkonen etc. 2006.)

Reading the game is the most important skill in volleyball and it can be trained with **game-like training** sessions and **stop & anticipate -video sessions**. **Motor learning** is the key for learning volleyball skills. **Game-like specific training** is the most important part to learn volleyball skills. It is also beneficial for player to see the **demonstration** of the skill and have some **images** provided by co-learner or expert coach. Correct eye-work is essential when reading the game ability is improved – what to see, when and why. (Berry & Abernethy 2003.) (McGown 2001.)

Physiologically it is necessary for modern volleyball player to be able to **produce a lot of energy in very short period of time** (explosiveness) and also to **recover** between the rallies (in 15 seconds), during the time-outs (30-60 seconds) and between the sets (3mins). Both capacities are needed: aerobic and anaerobic systems. There haven't been measured high lactate levels in modern volleyball matches, so **the most important part of volleyball training is to get better at volleyball skills**. Volleyball training session is a long exercise itself, so extra endurance training is not needed. Physical training sessions should be implemented to training plans to **prevent injuries, increase the vertical jump ability, increase the velocity of an arm-swing and power produced by body to hit and to serve ball harder and to make moving on a court more efficient**. Still physical training sessions should be supportive to main goal which is getting better at volleyball skills so it is better to improve above-mentioned physical elements in a way not to make players too tired, which means **short sessions, high intensity** safely (submaximal weights) and **low volume** (to prevent delayed-onset-muscle-soreness). Thus the aim of physical training should be to prevent injuries and to make players **stronger and faster**. (Gionet 1980, Gastin 2001.) (McGown 2001.)

On **team level**, the **leadership** matters a lot. Leader should create the trust and truly connect with the players he works with and help them grow. Also **group dynamics** is important as it is beneficial for performance to have strong binds inside the team. Team should have the **same technical base** in each volleyball skill because it makes the

playing efficient both in individual and team level and tactical elements are easy to build on it. (McGown 2001.)

The most important skills in modern volleyball are attack, serve and reception. Thus the most of the training time should be spent focusing on these skills, **offence and serve/reception**. Anyhow, this does not mean training separate sessions to these skills, but volleyball training should follow the same principles as volleyball in matches. There is being said by expert coach Marv Dunphy: “The best serving drill is serve-pass-set-hit. The best passing drill is serve-pass-set-hit. The best setting drill is serve-pass-set-hit. The best hitting drill is serve-pass-set-hit.” This describes the idea of specificity pretty well. Some conclusions can be found from the results of relevant volleyball studies, which are serving a lot of moderate (never too easy, but risk management should be considered according to the level of opponent team) serves in, keeping the ball in play when it cannot be killed and ball control in reception. All this lead to the concept of having patience on right times and balance it with being brave when there is a good chance for that. All this comes down to an ability to recognize the situations and read the game. (Fellingham & Reese 2004.)

During the game, own **servicing** has to be matched with opponent’s **modified side-out efficiency**. Risk management is required. (Burton 2008.)

Training program, optimal day rhythm and nutrition are essential parts of modern volleyball player’s everyday routines to follow. Physical training program which allows maximal improvements every day in volleyball sessions is challenge for a coach. There is an example shown in this study, which is done by the method of **non-linear periodization**.

Keywords: Modern volleyball, Analysis, Psychology, Physiology, Reading the game, Motor learning, Productive skill, Counter-productive skill, Serving, Serve/receive, Attack, Non-linear periodization

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1 INTRODUCTION

Volleyball is the most widely spread ballgame in the world, if it is measured by the number of countries which are the members of international head organization (in soccer FIFA has 209 and in volleyball FIVB has 220). FIVB statistics say that there are over 500 million people participating in organized volleyball and beach volleyball. Having such enormous popularity, there are still very few high-quality scientific research about it. Yet there are some good studies, but the new data those are offering, hasn't been implemented so well everywhere where high-level volleyball is played. Not to have such a big amount of relevant volleyball studies, whether the researchers have been working on the wrong topics, or the quality haven't been high enough. It seems that the first problem has occurred at least most of the time. Volleyball is complex, random and open game format in many point of views, so it hasn't been the easiest sport to study. Though the better scientific results could have been expected over the decades. It is beneficial for modern volleyball teams' actions on daily basis to be evidence based and rely on scientific facts which are confirmed with studies and experiences of high-level game. Even though there are a lot of different styles in volleyball world, we can say that some methods are more efficient than the others, because the best players have quite similar tendencies in every skill. This analysis study is focused on finding these methods and introducing them. At least after the findings of this study, it can be said, which cultures are close or far from these scientific facts. It is also important to highlight, that this study gathers the information from other studies as physical training periodization plan is the only experimental part done in this study.

Some of the most useful data has been found outside of the traditional way of scientific research: national volleyball organizations of some countries have ordered studies from scientists or even done those independently. In some occasions, even the coaches themselves have been gathering some relevant numbers about their team's performance and then some conclusions have been formed. This kind of self-made studies have been useful and needed to improve one's team's performance.

The lack of confirmed data from science – and mostly neglecting even the few findings - has led to the variance used in volleyball coaching during the history. The coaches

have mainly used the same methods that they have experienced during their own playing careers or in the coaching staff under some other head coach. These kind of trends, and the lack of worldwide known data about volleyball have built special kind of thinking and coaching culture to each country. Traditions have been formed. Only very few countries have actively sought for scientific data and changed their coaching culture according to that. Thus, different kind of beliefs and opinions have been proceeded to the new generation of players over and over again in many countries. Variance is large among the way of thinking in volleyball communities around the world.

Another characteristic of the history of volleyball has been, that the best ideas have been shifted by imitating others. When someone has invented something new and efficient, it has been slowly spread everywhere – but it is important to notice, that this have happened only with major trends and in one part of the game at the time. Thus, different coaching cultures have remained the same even if some big idea from others has been implemented to own thinking. As coaching cultures are relatively stable and slow to change, learning by imitation has been done also among players – when some world-star players have been creative enough to try something new and it has worked, then other players have tried to do that also. With this method things have been shaped also, sometimes even outside of coaches' influence.

One great coach has said, that there have happened three main phases of the evolution in the history of volleyball. The first said was the fast middle-attack developed by Japanese in 1960s. The second one mentioned was the new reception system created by USA in 1980s. The third described revolution of the game was the fast offence – in both side-out and break-point phases - used by Brazilians in 2000s.

Volleyball has been different what comes to the leadership culture of the international head organization - at least when it is compared to soccer. FIFA has been very conservative and not to change rules easily. Instead of that, FIVB has tested and implemented new rules rather easily. Some of the innovations have been so good, that they have stayed: rally point -system and libero -rule came 1998 and are still used. On the other hand, some of the new rules have been so poor, that they have quickly left off:

one of those were change from the best of five sets scoring system to the best of three periods scoring system. Some rules have only stayed as ideas and not been implemented, like the idea of second serve as in tennis or having a separate service line behind the back line which could have made serve less efficient. Some of the rule changings have been done in order to make rallies longer also at men's side so that volleyball would be more entertaining for spectators. In men's volleyball attack is still dominant, but luckily defense has improved also, so that modern volleyball is more than just a game of hard serve and attack.

Modern volleyball at the highest level is still rather similar from team to team, because inefficient techniques, mechanics, movements and tactics have slowly gone away – not totally though. Eventually players have realized that certain type of movement is too slow or inaccurate etc. Thus, game looks quite the same in the final tournaments of the best teams of the world. Some differences still exist for example in tactics, but also tactically teams are getting closer to each other rather than going apart.

This study represents the collection of the high-quality volleyball studies that have been made. Some serious volleyball literature has been used as a source, made by coaches who are also scientists, or scientists who are also coaches. This study describes the state of modern volleyball internationally and nationally from Finland's point of view. Requirements of high-level game are introduced in individual and team level. Also, the periodization of volleyball and physical training plan is shown from day to day examples all the way to the annual program. Volleyball player's optimal nutrition is introduced. This study gives pragmatic data ready to be applied to the coaches and players. Hopefully, some researchers will continue working with volleyball research and new ideas are raised. As volleyball is rather untouchable in the hands of high-level scientists, follow-up studies should be made in every part of the game.

In order to use phrase modern volleyball this study refers to the last period of the history of volleyball, when following parts of the game have become popular and widely used: aggressive jump serve (different spins and float), fast offence to the every positions (with back row middle attack called "pipe" being important part of the offence) in both

side-out and break-point phases, flexible reception formats and techniques according to the skills of the opponent's server and own reception players, block-defense system which is based on mostly reading strategy and high specialization of the roles – even between outside hitters, when in some teams another outside hitter can be more used in offence and another one more in reception. This study focuses on the men's high-level volleyball, even though almost all of the aspects apply to women volleyball also.

Physical training has been said to be hard task for coaches, as far as volleyball teams and players have to be in good shape almost year-round and every single training session and match matters, so none of these cannot be wasted because of too hard muscle soreness or lack of ability of neural system because of too exhausted physical training. Physical training should always support volleyball practice, never ruin it. Anyway, at the same time physical training should be efficient also, because without efficiency, it is worthless. These criteria for physical training – being enough “light” allowing full physical and mental focus on volleyball practice the same session/day/the following day depending on planning and being enough “hard” to create wanted efficient training stimulus to the body – are not easy to fill at the same time. That's why this study consists large and concrete example on this matter also to introduce one solution model to this challenge. Training periodization example of this study has been used in the men's first league team in Finland during the season 2012-2013.

2 VOLLEYBALL TODAY

2.1 International volleyball

Volleyball (in this amount beach volleyball is included) is played by 500 million players worldwide in organized games. In addition to that, there is a huge number of players playing the sport just for fun without being registered to any competitions or clubs. Total number of people playing volleyball (or beach volleyball) as a hobby or officially may be around one billion. It is one of the most popular team sports in the world, having

221 member federations in the international head organization called “The federation Internationale de Volleyball”, FIVB.

Under the FIVB, there are a lot of international competitions:

- Olympic Games: since 1964, quadrennially;
- Men's World Championship: since 1949, quadrennially;
- Women's World Championship: since 1952, quadrennially;
- World Cup: since 1965 (Men) and 1973 (Women), quadrennially;
- World Grand Champions Cup: since 1993, quadrennially;
- World League (Men): since 1990, annually; (From 2018 on, National Volleyball league)
- World Grand Prix (Women): since 1993, annually and
- Club World Championship: since 1989 (Men) and 1991 (Women), annually.

FIVB also organizes the following international under-age volleyball tournaments:

- Men's U23 World Championship: since 2013, biennially;
- Women's U23 World Championship: since 2013, biennially;
- Men's U21 World Championship (Junior): since 1977, biennially;
- Women's U20 World Championship (Junior): since 1977, biennially;
- Boys' U19 World Championship (Youth): since 1989, biennially and
- Girls' U18 World Championship (Youth): since 1989, biennially.

The FIVB also participates directly in the organization of continental volleyball events which have an attached international significance, such as Olympic and World Championship continental qualification tournaments. This organization maintains extensive special programs aimed at the advance of world volleyball and make it even more popular.

The FIVB is the ultimate international authority in volleyball, and judges (or is involved at least to some degree in the judgement) issues such as doping, regulation of player transfer, nationality changes and gender determination. It also publishes the FIVB World Rankings, used as basis for seeding in international competitions.

In FIVB, there are five continental confederations:

- Asian Volleyball Confederation (AVC) in Asia and Oceania,
- Confederación Sudamericana de Voleibol (CSV) in South America,
- African Volleyball Confederation (CAVB) in Africa,
- European Volleyball Confederation (CEV) in Europe,
- North, Central America and Caribbean Volleyball Confederation (NORCECA) in North America.

Each continental confederation, by its turn, presides over a number of national federations located in its domain of action.

The FIVB is responsible for the standardization of volleyball rules. In recent years, many changes were implemented in connection with its promotional and marketing vision, in an alleged attempt to improve public visibility and make the sport comply to the demands of sponsors and media organizations. These changes range from ingenuous, almost commonplace restrictions, such as the obligation of a "fashionable" uniform - meaning tight clothing, supposed to be more appealing to the audience because it makes players bodies salient -, to very drastic changes in the format of competitions (e.g., the rally-point system and libero rule in 1999). (FIVB)

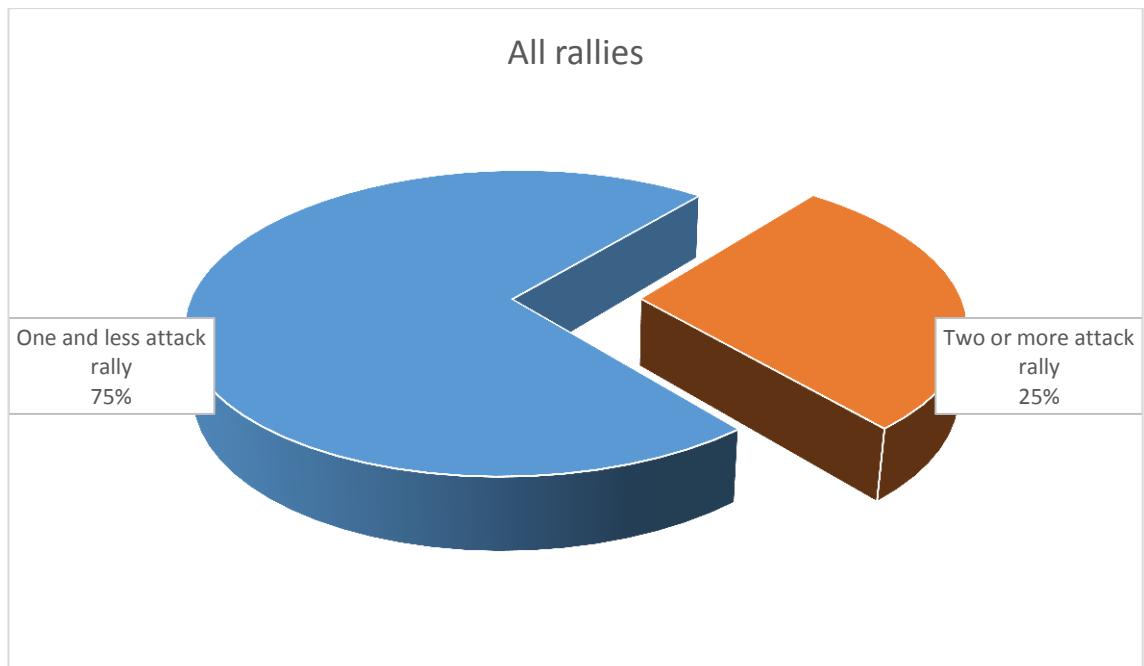
In men's volleyball, the entertainment aspect included also how the game itself is seen in audience. If rallies are very short, it may not be as entertaining as longer rallies. That is why FIVB have been concerned about attack being too dominant part of the game in men's side as it is making rallies short. Nevertheless, what comes to the durations of rallies, game have stayed quite the same. More interesting is the fact that the actual time when ball is "flying" from total match time, has decreased over the last three years from 15,3% to 13,42% in top-international men's level. And even if we take the breaks off between the sets, it has still come down from 17,6% to 14,68%. The possible reason may be the change of the net rule and "not-so-quick" challenge system. Net touch has been prohibited again in every part of the net and checking the referee's call from video have made the actual time of seeing the ball flying shorter. (PG research group 2015.)

Shortening “the flying ball time of total match time” -trend should be turned to another direction. Tools for this may be elimination the referee calls which are not beneficial for the executing team – but still stopping good rallies - such as crossing the middle line when player is leaving from the net (not attacking or blocking), touching the lower part of the net when coming down from block or attack and developing the challenge system to be much quicker or automatizing it completely.

PG research group sees that generally the biggest threat to modern volleyball is the increasing number of pseudo-rallies. Term “pseudo-rally” refers to an ace or service fault: rallies, which duration is about one second. Luckily, research group says -: “During last three years there is a trend of stabilization of this parameter around 21-23 %.” Still the most positive signal of growing the game is that the number of one attack rallies (excluding pseudo-rallies) has decreased from 2006’s 75% of all rallies to 2015’s 52,22% of all rallies.

Men’s top volleyball have become more “spectator-friendly” as the misbalance between attack and defense has decreased: attack-defense balance is 2,0 (number of rallies won on the opponent service divided on number of rallies won on own service) in 2015, as it used to be 3,0 ten years go. FIVB hopes this trend to continue, as still about two thirds of the points are made after reception and only one third is made after own serve. (PG research group 2015.)

Number of rallies where two or more touches occurs have increased. It might have happened because serve have become more efficient (at least number of aces are increasing) and also block-defence systems have developed – reducing the dominance of attack. One trend which is not shown in statistics, may be that whenever the ball is dug in defence after own serve (break-point phase) the teams tried to run as fast and varied offence as after reception (in side-out phase).



Picture 1. Even though high-level volleyball is going to the right direction, which is the game becoming more entertaining and maybe also greater for players as volleyball is more played in longer rallies, this diagram shows that there is still work to be done getting volleyball even more exciting (picture 1).

One of the possibilities to make that happen, PG research group thinks, is that the efficiency of float serve increases, so that hard risky spin serve is not so needed anymore as the damage for the reception and weakening the offence can be done less risky way. (PG research group 2015.) Other than that, tactical elements in blocking may be improved, as nowadays coaches can have a lot of data about setters and their tendencies and also (middle-)blockers could be taught better and better to read the setter's decisions about their body language combined to pre-game scouting reports.

2.2 Volleyball in Finland

There are 400 registered volleyball clubs around the country, which are the members of Finnish Volleyball Association. Volleyball is played in 5 levels, the highest called "Mestaruusliiga". There are around 118 000 volleyball players in Finland and 27 000 of

them are young. The number of registered players is 11 500 and 6 900 of them are juniors.

Finland has 8 national teams: men, women, 3 boys' teams and 3 girls' teams (with sitting volleyball and beach volley national teams, even more).

The biggest junior volleyball tournament called "Power Cup" is played annually in Finland, having around 1000 teams participating with over 10 000 players. (Finnish volleyball association 2016.)

Aittokallio pointed out in his pro graduation thesis that still in the year 2010 the situation in men's highest league, Mestaruusliiga, wasn't that glorious: all the teams didn't have professional head coaches and training was more like an hobby for most of the players. Teams had only a couple of professional players - excluding some top teams which had majority of players who did mostly volleyball for living. (Aittokallio 2010.)

After those years, the level of professionalism has risen. In the season 2015-2016, all the clubs in Mestaruusliiga had professional head coaches and the same development has happened also in seasons 2016-2018. Also the number of professional players in each team rose and the most of the players in every team played volleyball as their primary work, even though some of the younger players were studying at the same time. The best teams like Valepa raised their level closer to the level of top volleyball teams in Europe, as Valepa proceeded to Champions League 2017-2018 pool phase as a first finnish male volleyball team. (Mestaruusliiga 2017.)

Finland men's national team has stabilized their status close to the top of the volleyball world, as they reached the 9th place in the World Championship in 2014. National team has been the participant of European Championship finals many times in a row. Men's team is also participating in World Championships second time in a row held in Italy and Bulgaria in autumn 2018.

Finland has quite efficient training system for young talented players, as the best ones of each generation are selected to the national training center to study in high school and to train twice at the same time under professional coaches. This training center is located in Kuortane. The level of coaching in national teams is raising all the time, because the coaches both in junior and senior national teams are educating themselves with the scientific data about volleyball, co-operating and also organizing educational visits to the countries which are now at the top of volleyball rankings. By this method the best data and concrete experience is learnt and implemented. (Finnish Volleyball Association 2016.)

However, the coaching level in junior volleyball clubs is varied, because the coaches are typically parents of the kids playing in the team or some other people keen on volleyball, and not all of them are educating themselves on the courses provided by Finnish Volleyball Association. The lack of professional junior coaches is shown in varied teaching methods and coaching styles, which leads to the non-systematical development of junior players. Professional coaches are needed not only on the top national team level but also on the junior club level.

3 REQUIREMENTS OF MODERN VOLLEYBALL FOR THE PLAYER

3.1 Psychology

Human beings have different sources of motivation and the power of them varies. Steven Reiss' research group found out that there are 16 different motivation groups for people which are power, independent, curiosity, acceptancy, order, saving/collecting, honor, idealism, social contacts, family, status, revenge/winning, romanticism/aesthetical, eating, physical activity and calmness/peace of mind. Individual's motivation can be measured with motivational profile tool to find out one's order and intensity of motivation. (Reiss 2009.) In sport, at least winning, power, order,

social contacts, acceptancy, status, physical activity, honor, peace of mind and aesthetical aspects may be involved.

Motivational elements can also be divided according to “push-pull” -theory, where the person is “pushed” to do something because he has inner motivational power for that. If the action itself it is not rewarding, person can still be “pulled” by rewards or penalties, which come from the outside. (Pervin 2003.)

It is useful for a volleyball player to have an inner motivation, because it pushes person to make effort to get better also during that time, when there is no one supervising the training. Player with inner motivation can be more independent and interested in one’s own development. Liukkonen etc. have concluded, that the best performance cannot be reached, if player doesn’t have inner motivation, because when the action itself is rewarding, player can really push himself to the limits. Money or some other reward from outside can maintain the professional level and behavior of the player, but then the best performance is not as likely as it is by inner-motivated player. Inner motivated player is also all the time hungry to learn more. (Liukkonen etc. 2006.)

Volleyball players’ capability to play every rally mentally separately is the key to have steady performance during the set. Every rally should be played as there is no history or future. Negative plays should be forgotten and learnt from and even after the positive plays players should be able to think a bit before the next rally – for example things like serving tactic or eye-work in the next rally - rather than going only with the feelings. Still it is very important to notice that during the rallies players mostly use learned motor programs and there is very little or none time for analytical thinking. That’s why short time between the rallies should be spent emptying the head from previous play and planning the next one.

One concrete thing helping to maintain the focus during the game is, that players gather together after every point whether it was won or lost. It emphasizes forgetting the previous rally and it is the symbol of new fresh start. (Liukkonen etc. 2006)

In different volleyball roles there are a bit different psychological requirements. It is important for the setters to have good leadership, social, communicational, tolerance (for example towards the foreign players), adaptability, justice and perceptual skills. For the opposite player, it is crucial to be good at handling the pressure and to have a high self-confidence – being brave, aggressive and having capability to improve one's performance towards the end of the set are also welcome. For the outside hitters, it is beneficial to have mental skills like communication and co-operation specially in reception. Libero needs to be good in leading and organizing the back court. Middle blocker's role requires tactical thinking, specially ability to read the decisions of opponent's setter, aggressiveness in attack and maintaining the vitality while being on the bench during the back court rotations. (Liukkonen etc. 2006)

3.2 Skill

3.2.1 Reading the game

Volleyball players need to have good perceptual skills. Especially visual information is the base for the decision-making process on the court. Players need 3D-perception to understand the movement of the ball, space and the players. By playing a lot of volleyball (and thinking about it) and being taught by expert coach professional players are able to recognize the patterns during the rallies. They can recall certain types of the situation and act according to them. All the rallies are – naturally – always unique, but there are some repeatable tendencies which can be recognized.

There is a lot of sensorial information available for the players during the rally. Experienced or well-coached players know – without this capability modern volleyball cannot be played successfully – what to look at. When it comes to reading the opponent's actions after own serve, eye-work needs to follow this order: reception player's arms – ball – setter's upper body – ball (hitters mostly hit where the set takes them) – hitter's upper body. Eye-work is the same for every player on court, practically allowing defenders to look at hitters a little bit longer. When opponent is serving, the

serve reception player's observation should be targeted to server's upper body (not the ball thrown up) and after the contact focus should be removed to the ball.

About the importance of eye-work, McGown has wrote the following: "The goal is for the defense to spend as much time as possible watching the setter before he sets the ball and then as much time as possible watching the hitter before he hits the ball." By doing this, we are looking at the right things and we can start to be good readers of the game. Finally, we may sometimes be able to read players so well, that we know what is going to happen even before the ball contact of the setter or the hitter has finished. (McGown etc. 2001)

Researchers Farrow, Merrick, Abernethy etc. have identified the methods how reading the game ability can be trained: it is obvious, that playing the game a lot makes you automatically better at it and if the player gets good tips from expert coach – e.g. about the correct eye-work – one's development is faster. In addition to this, reading the game can be trained by game-based training opportunities and watching the videotape of matches. This watching should be done with the method of stopping the tape before player's ball contact and then trying to answer the questions like what is going to happen next, where the ball is going and what the player should do. Even when the player is not playing and he is on the bench, he can watch the game, trying to predict what is going to happen based on that player's body language who is going to touch the ball next and getting better at reading the game. As a summary, ability to read the game can be developed in a best way by playing a lot, having a good teaching coach who runs game-based trainings and watching a lot of games with thinking what is going to happen next. Reading the game is a skill as everything else. Developing it needs systematic approach like any other skill.

Using the all range of sight has close connection making right decisions in game. In attack, player's area of sharp sight is targeted to the ball, but it is crucial to use peripheral sight to get information what the opponent's block is doing. The hitter cannot get super clear information as he has to look the ball, but even a little sensation may be enough to make a correct decision where to hit. This emphasizes the importance of eye-

work in ability of reading the game. This is also a skill that can be developed. Studies tell us, that experience players can observe more information in the same duration of time than beginners and it can lead to anticipation and pattern recall. (Ahrabi-Fard & Huddleston 1991, Allard & Starkes 1980.)

There are at least three factors in visual perception which has influence on succeeding in decision-making and performance in volleyball. They are visual searching, targeting the attention and anticipation. The first one, visual searching happens, when player is looking at the players and the ball, which can move in all dimensions: horizontally, vertically and in depth direction – and of course almost always some kind of combination of all these three dimensions.

Targeting the attention can happen in four ways: wide internal, wide external, narrow internal and narrow external. Volleyball player uses the wide external sight to get the large general picture, for example, of the opponent's offence. It includes also searching the potential targets to really focus on. Narrow external is needed when the sight is targeted to the one specific opponent's player for example to the hitter hitting the ball. Wide internal is used, when player searches the most suitable motor response, for example, in blocking situation at hand. Narrow internal focuses on controlling the chosen motor response when the player is executing this one specific familiar motor program, for example blocking. In anticipation phase, player compares received visual perceptions to the previous corresponding situations and their outcomes and then makes the decision which he thinks it is the most beneficial for him. Thus player's experience for example about different hitting situations helps him in anticipation phase in choosing the correct motor program. Good anticipation reduces the reaction time as player knows what he is doing. (Kluka 2003.)

An important part of modern volleyball player's reading the game ability is pre-game scouting. Many aspects of the opponent's tendencies can be known already before the game by watching opponent's matches on video. It also reduces the need of certain perception during the game. Human being is capable of reacting after multiple visual stimulus – received in volleyball – in about 0,35 seconds and the flying time of the ball

set or hit can be less, so all essential information possible should be learnt beforehand, which can help player to make correct decisions. (Häyrinen etc. 2000.)

The scouted parts of the game can be, for example, opponent's blocking strategy, setter's tendencies, hitters' tendencies and the weakest receivers in each rotation etc. On the other hand, when the pre-game scouting and learning is done, player needs to remember that still he needs to play the situation at hand in the game and each rally varies always at least a little bit. This is how player can be prepared before the game (one aspect of reading the game ability and anticipation), and at the same time to be ready to read the game while playing (another part of reading the game ability and anticipation). The importance of anticipation and ability of reading the game is well described by McGown in his book Coaching volleyball: "What players do before the ball is hit is at least as important as what they do after the ball is hit."

Volleyball player is not able to predict the game all the time, so player has to be able to react also. When player doesn't know what is going to happen, then he has to be quick. The worst thing that player can do is guessing, because then in long-term player's game is based on coincidence and he cannot control the game. In reacting the fundamental factor is the duration of the time between the visual stimulus and the beginning of the motor movement. This is especially important when the player is defending on back court or receiving the hard jump service.

The pure reaction time can't really be improved much by training it. What can be reduced is the time between the visual stimulus and the processing of this information – with the help of pattern recognition and anticipation.

3.2.2 Motor learning and volleyball skills

In the research area of motor learning, the studies say the following as Veikko Eloranta and Timo Jaakkola put it in their article "Core-based motor teaching": "The major aim of teaching is to contribute to learning. In the teaching-learning process, the central

concern has been the way a teacher acts, because teaching has been considered to be the major antecedent of effective learning. Particularly during the last decade, researchers have noticed that students' own actions determine the quality of learning. In the core-based conception of motor teaching, students' motor background is the antecedent of learning. It determines how the teaching-learning process is organized. The target of the teaching is the unconscious self of the learner. - - The conception activates learners for learning by creating a motivating atmosphere which is characterized by various different practices.”

According to the new studies, in motor learning, the dominant paradigm in modern coaching is constructivism. Learning process never start from zero. There are always some images, attitudes or thoughts about how something should be done in players' head. This has to be understood. Players execute certain skill according to the schema they have about that skill. They are literally unable to do anything else. This is the base that learning has to start from. That image, schema, unconscious self of the learner, is the target of learning that player and coach start to shape better: the skill needs to be executed simpler, quicker and with better motor-control. Learning process has changed from coach-centered model to the player-centered model. (Eloranta & Jaakkola 2003.)

Coach's role is still important, as he/she can give the basic cues for start and give feedback about execution. Expert coach also knows what is the best technique used at the top of the world. The simpler movement is more efficient than the complex one, because in simple movement all the unnecessary parts are removed and that's it why it is quicker and more accurate – biomechanically simpler movement is easier to control and repeat. It is also crucially important to highlight, that even if the learner makes the learning of his/her own (with the help of expert coach), coach's critically important task is to design practice environment so that it supports learning and to give – not too much – feedback usually about one theme at the time. Practice environment should be as close as possible to the game environment, because learning is environment and state dependent. That's why players need to compete and feel the pressure also in the training – of course considering, that there are also a time for training without pressure, especially when something new skill is about to be learned or there is time for

fundamental technical rehearsal, which both have to be done with deliberate, intentional and focused mind. This is why training session can be divided into different parts, where one part is slower and learning-based which requires a lot of mental energy, as another part is competitive part – still maybe the just learnt same theme included in game-like environment. For example, if there are certain hitting skills needed to be learnt for outside-hitters, training session can follow this method:

- first needed hitting solutions are *shortly* introduced theoretically on the whiteboard with 1-2 min. talk and discussed with players why these shots are important to be learnt,

- warm-up game can already include the elements for needed hitting skills, especially the solutions without a lot of power can be a part of that,

- then these wanted new shots are trained in deliberate practice, where new skills are executed in game-like environment, firstly without pressure or counting the points and feedback is given, and

- finally there is deliberate play, where the rule is, that the first ball needs to be set to outside-hitter, and if he scores with any of the new shots, his/her team gains double point.

Generally manipulating deliberate practice/game with rules and especially with points is great tool in learning process, because it guides the performance to the wanted direction automatically. It creates the situation, where the game teaches the game, and coach doesn't need to interrupt too much. Another classic example is, that if players need to be taught, that going after every ball is essential, then while deliberate play there should be rule, that if team doesn't try their best for every situation, team loses one point. Eventually, players start trying their best with great attitude – and teammates insisting that – because they don't want to lose that point. (McGown 2001)

Motor learning is caused by changes in brain: Axon diameter gets larger, dendritic branching increases, myelination improves, doublets increases and Natrium/Kalium channels and pumps increases (DeWeese PH, 2014).

When player first sees someone executing the skill as an example and then starts doing it him/herself, he/she starts forming/shaping the schema about the skill which finally leads to action, motor program. This schema is influenced by previous experiences about the skill, images, beliefs etc. When player is seeing the demonstration, it is beneficial for learning that he can look the model whenever he feels like it and make the action. Observation is one key part of learning, especially in the beginning of learning process. For example, during the deliberate practice while learning new skills, it is important for learner not only listen coaches feedback, but also see how others are doing and learn from that. It is useful to have learning talks also on peer-to-peer -level. (Wulf & Shea 2009.)

Theoretically, Wulf and Shea have introduced the idea that the focus on effective learning should be on the effects of the action, not action itself. This has been seen working at least in closed skills and in one- and two-dimensional movements – but for open-loop skills like volleyball, there is not full certainty of this yet. It may be useful most of the time (e.g. “let the angle do the work), but as far as in volleyball there are no rackets or gloves in use but players’ arms, also some internal focuses may be efficient to add in effective learning process also (e.g. arms in passing should be straight and simple). When the basics are in place (e.g. proper platform in hands to touch the ball), then after that the development is mostly done unconsciously. Thinking about the movement effect is the best way as it facilitates automaticity in motor control and promotes movements efficiency. (Wulf & Shea 2009.)

To put this idea in practice, there is easy way to find an example from other sports, for instance in basketball, if the player throws the ball in the hoop, he/she knows that it was a good shot, because it was succeeded. If the player misses, again the feedback is instant and correct. This part of the feedback is the knowledge of the result. In addition to that, we need also the knowledge of performance, which is how efficient/smooth the actual

throw was (good learner likes to create the technique in which the probability of the next throw is also as high as possible) technically.

After a while, hopefully, if the player is honest to the motor control he/she feels, he/she can start noticing, that he/she throws more balls in when his/her hands are in certain position (This is knowledge of performance). This realizing is crucial, and it is the key for deep and permanent learning, changing the unconscious self, shaping the schema. It is beneficial, that if player finds these best techniques him/herself – and if he/she does, the learning is done beyond discovery threshold. This is called implicit learning. It is highly important to notice, that this requires a lot of intentional thinking, searching the better technique etc. It is very stable in the end (learning stays), but it may be very slow process to search the correct way (may take years) – so it may be better to get help from expert coach and speed up the learning process.

In volleyball, player can/should learn risk management in attacking game when he/she plays a lot, because in some point he/she should realize, that it is better not to hit full power all the time, instead of that, to use different kind of shots to make opponent struggling and winning points also with patience, more secure way. But again, learning beyond discovery threshold, with player's own thinking, which is more permanent and deep way of learning, requires a lot of mental energy, conscious thinking and intention to play better and smarter all the time. It is slow, but in the end very stable implicit learning. Similar results in terms of retention and stability under stress can be achieved by a method called guided discovery which means that the player and the coach find the correct way together. This will also speed up the learning curve.

If there isn't player's own intentional thinking nor the expert coach's help, learning doesn't happen, nothing is changing. It is important to notice, that this playing in meant to mean the playing in training, in deliberate practice/play, where there is chance to improve the skills with focused mind – not too much pressure of the result. Contradictory to this, as it is shown, that actually performing in real matches, just playing is the best way, as rational thinking is slow and blurred tool in the pressure of the match – meaning that making the changes to the technique, shaping the schema

should be done in trainings, not in games. Games are for performing, not for rationalizing it.

As mentioned before, only focusing on the effects of doing, the outcome, is not the best way (in some very rare cases in which the learner is exceptionally independent to self-correct). There are multiple reasons for that, for example:

-training environment doesn't replicate enough the environment of the real game,
(For example, the best technique in forearm passing, the reception, is to keep hands and arms straight down and relaxed, close to each other, so that they are easily and *quickly* connected, when opponent's jump server serves the ball 120km/h. If there isn't someone in the training, who can constantly serve 120km/h on your area so many times, that you would realize yourself – beyond the discovery threshold – that actually it is way better and efficient, if hands and arms are kept quite together and straight down already, so that there is as a little time as possible needed to put them together to form the platform for proper passing.)

-player doesn't think,
(If player doesn't think what he is doing – as told before, that in the games it is even better not to think too much, but just play and perform from unconscious action – in training, which is the place to prepare him/herself to the matches and improve skills, then there is no change. When there is no change, learning is not occurring. Schema stays somehow the same and the development of the player stops. For example, if player likes to hit hard and he hits hard every time despite the consequences, like losing the points and games, he/she doesn't think, he/she is just a victim of his/her very basic schema and opinionated images, where he/she just need to hit full power every time. In this case player is stuck and he/she is not learning, developing.)

-player doesn't understand or
(In this case, player thinks a lot and he/she wants to make learning in deep and permanent way, beyond discovery threshold, but he/she just cannot, because he/she doesn't see the big picture, he/she is thinking about wrong things, he/she doesn't

understand the logical chain of cause and effect of different actions in the field of volleyball, he/she is too emotional every time he/she plays, even in trainings etc.)

-player doesn't care, or he/she is too tired/unwilling to pay attention.

(Here player doesn't care about the his/her actions and the motivation needs to be waken up and competitiveness level raised up. Sometimes player is mentally and/or physically too tired to focus, but then – if it is not really about being tired but being lazy or just a little bit tired – it is coach's job to maintain the focus of the player with high level of demanding and insisting the best from the player.)

In all these cases, expert coach is highly needed in learning process. Player is lost and developing has stopped. This happens basically all the time. Coaching is needed. Coach is needed for the sake of learning and the sake of winning – and especially needed are educated, knowledgeable coaches, because study shows that good, educated, expert coaches win more games than not-educated ones (Bridgewater 2005). It is line drawn in water, where it can be said that the best result will come through player's own thinking or under coach's guiding. Probably most of the time it is some kind of synthesis of these two. It is also too one-sided to say, that if coach give hints or cues about learning, teaches the learner, then learning wouldn't be permanent and deep, because even if coach helps the learner to the right direction, player can still operate beyond discovery threshold, as player always acts from his/her point of view, where he/she is the subject. Thus, the best method for motor learning in volleyball is mixed model – called guided discovery (e.g. coach tells the player where to look at but doesn't tell what they should see.) - where expert coach helps the player to realize the crucial elements of each skill with just a couple main cues, giving feedback about them, and designs deliberate practice where these skills are improved with intentional thinking and focusing at one cue at the time and deliberate play in which learning occurs with the help of external focus, unconscious motor control, and with intentional thinking of player.

Coach can help the players a lot with helping what kind of things to look, observe or think at in different phases and situations of the game. After this scientific literature it

can be concluded, that coaching volleyball players of any skill level, optimal training environments requires:

- biomechanically correct examples when demonstrating skills (explicit part of training),
- clear functional goals for practice activities (explicit part of training),
- a wide range of force production variables within context of goal-directed functional activities (explicit and implicit parts of training, implicit especially in terms of controlling the power of a skill) and
- early implementation of variable practice and whole skill training (explicit and implicit parts of training with intention to shape the schema to the wanted direction intentionally and letting body to take care of motor control, the variability of the same skill).

As in volleyball as in every other sport also, there is better techniques and worse techniques which are found over the years of playing, observation and statistical evidence – and of course through biomechanical, scientific knowledge. It is known that simpler movement is better than complex, as it is easier to control, repeat and it is quicker to execute (no extra movements). This is why it is beneficial for player to be told this technique by short 4-5 cues. Following these cues the efficient technique can be found. This is important in the beginning of learning process and also time to time as fundamental rehearsal. Explicit learning is essential in the early stage of learning, whereas implicit learning – specially controlling the power production – helps the learning later and automatizes the motor skill. This is why, when performing, player should just play and trust that “body knows”, as far as performer has already trained the skill to the automation level in training. Rational thinking of one’s performance during the match is also harmful because thinking of action causes interference, slows down the processing of information (e.g. visual information for pattern recall to be able to read the game) and harms the execution of trained movement patterns.

In motor learning, mirror neuron system plays the key role. There are a lot of phases of learning: when it comes to the learning a new skill, the phases are the following: acquisition phase is the one when player gets the first quick idea about the skill. Demonstration of the skill is crucial. New stimulus starts to “form the map to the brain” and certain physiological changes occur: Axon diameter gets larger, dendritic branching

increases, myelination improves, doublets increases and Natrium/Kalium channels and pumps increases (All of these should also occur in later stages, like consolidation and stabilization phase). Acquisition phase ends when the motor program is not anymore improved rapidly.

Consolidation phase is the next phase, and during that, cortical networks re-organizes and synaptic connections changes. There are a lot of “errors” in the motor program which are essential and natural part of learning process. The doing feels strange and emotions may vary. Learning process is on even if there may not be any visible development seen outside.

The next phase of learning the new motor program is stabilization phase. The skill can be lost if it is not developed through this phase. The duration of this phase is up to the learner, how quickly he can embrace the new motor program and stabilizes it. It is typical that when the motor program is developed in this phase, the level of performance is higher in the end of previous session than the beginning of the next session. It is just important that some improvement happens in long-term. It is better to focus on one thing at the time than many. “Less is more” is good principal in motor learning cues. Player can put his/her focus on only thing at the time.

Motor learning hasn't been occurred before the schema has shaped the changes in nervous system and the night sleep after learning has been regular, deep and calm. It is also beneficial that learner doesn't have any other stress factors during the motor learning so that the focus in brain is not divided into too many different things. (Schmidt 1988.)

Motor learning is doing rather than talking. It is also specific, which means, that player has to do certain skill exactly the way it also needs to be performed. At least the following aspects should be thought about when considering if the design of the training is enough game-like: “players' positions on the court, players' movements on the court, players' orientation to the net, the sequence of events and the timing of the sequence, the stimulus to which players react (for example a coach standing on a table is not the

stimulus that a player will have to react to in a game) and the natural termination of the ball in play, which means: let most rallies come to a natural termination; don't catch the ball" (McGown etc. 2001).

Seeing the demonstration and observing others is important part of motor learning, especially combined with physical practice. Wulf also suggests that dyad practice, in which players are learning from each other and discovering together, may be efficient. It is even better, if learner can see the demonstration and good example when he/she feels like that. (Wulf & Shea 2009.)

The role of coach is still essential, and this dominant method has been scientifically introduced by professor Ph. Carl McGown. In his writings, he emphasizes, that teaching and learning the motor skills which are used in volleyball can be done the most effective way by following scientific based method: First the skill can be shortly described and told why it is important to master, then demonstration is needed, right after that player should start training the skill as whole practice (not in parts), then coach can give one cue at a time to focus on and then whole practice should be continued keeping concentration on this cue. Feedback could be followed (not too often, maximum 20% times of the performance). This kind of training where highlighting is on one cue at the time (and moving on the next one when previous is mastered) is enough simple and easy for player to follow. It is important to notice, that when focusing one cue at the time, learner is still executing the whole skill all the time. This process should be continued as long as cues are left.

Good number of cues per skill is something like four or less. Feedback can be given either verbally, visually (video) or kinesthetically (demonstration). Effective feedback is short and memorable. It means that the image remained in player's mind is more important than long technical list of requirements of the skill. That is why cues can be something from one-word depiction to succinct image. It is also important that coach can give argument about why cue is given. Player can ask this question anytime and coach should be able to give the answer. (McGown etc. 2001.)

Wulf and Shea also reminds, that “catch me when it’s good” -method works, meaning that in their review study the finding was that when learner is complimented after good performance, it’s indicates beneficial effects on learning. This points out another characteristic of feedback: good feedback can also be motivational – it is called positive reinforcement and there is a lot of research of this to work.

McGown has done a lot of meta-analysis of motor learning studies and it seems clear, that volleyball follows the same trends than other sports also. McGown’s scientific approach to volleyball has also gained a lot of success, which can be seen as an evidence of these principles. He was the main influence of head coaches, who has won Olympic Gold Medal three times (1984, 1988 and 2008).

Steven Bain and Carl McGown emphasizes in their meta-study “Motor Learning Principles and the Superiority of Whole Training in Volleyball”, that the following general laws of motor learning should be considered in volleyball also (some examples given in each principle):

-Specificity, meaning: “Training is specific. The maximum benefits of a training stimulus (i.e. acquiring functional skills as permanent behavioral changes), can only be obtained when the stimulus replicates the movements and energy systems involved in the activities of a sport. This principle may suggest that there is no better training than actually performing in the sport.”

-Example of this principle can be, that throwing the basketball has no use for hitting the volleyball. Thus learner has to play and hit volleyball in order to learn hitting – and play in as much the same environment as possible than in game. On the other hand, human beings don’t have unique motor program code for each and every version of the same skill, for example hitting cross-court or hitting high seam are the different versions of the same schema, so they can just be taught and learned pretty quickly as a new version of the same schema, without completely new skill acquisition process from starting point.

-Transfer: “Transfer is a measure of practice effectiveness as it relates to relatively permanent improvements in the execution of skilled motor behaviors. Significantly, the optimization of transfer from practice settings to competitive performance is highly dependent upon the principle of specificity.

-Literally it means, that if – as it should be – training is seen as a preparation for performance, not as preparation for training, to be able to improve volleyball skills performance, volleyball skills must be practiced the same way that they are performed. There should be as high transfer as possible from training (preparation) to the games. *It is important to notice that when this principle is followed, there may be temporarily decrease of initial performance in training, but it should be remembered, that the point of learning is to improve performance in games, which means that the slow, deep, permanent learning process on subconscious self is the main target of learning, which is many times invisible.* Thus coaches and players should look at the long run, not only the one session at hand.

-Whole versus part training: Researchers haven't found any study to support the idea of part training over whole training (Nixon & Locke 1973).

-Instead of hitting the ball against the wall and then learn how to jump without ball in order to learn to spike the volleyball, it is better to just to go and spike the volleyball. Whole training is better than part training.

-Random versus blocked practice: There are several reasons, why random practice is better than blocked practice: Even if blocked practice probably increases the initial performance of a certain skill during the blocked drill (For example setting drill where players set to each other is blocked. It is also constant. If player has many options where to set, then it is blocked but at least variable – a little bit better), it doesn't mean that the player does well in the games because game environment is open and random. There are three specific reasons why random practice should be emphasized over blocked practice: 1) Transfer is less in blocked practice. 2) With random practice, the learning is more permanent. 3) Neurological reasons for random practice superiority: random variable activities increase and strengthen the brain connections that are responsible for

learning motor skills whereas simply repeating the same activities exerts no measurable effect on these brain connections (e.g. repeating constant, blocked drill, there isn't much to think, whereas solving the problem in real game-like situation, there is a lot going on in player's brains while thinking different solutions).

-It is better not to have simple blocked drills, but open random game-like practice formats like the real game has also. For instance, to continue the setting drill example: better than creating blocked setting drill on the same side of the net, it is better to create deliberate practice game-like environment, where there comes a lot of setting situations or start deliberate play the way that after first contact there comes setting situation – and particularly the setting situation, that players don't know beforehand who is going to set and who is ready to attack that set. Players have to figure it out in that game-like situation over and over again.

There are some useful times for blocked practice though, as motor learning researcher Schmidt puts it: “Blocked practice is better for retention (learning) only for beginners. The findings seem to suggest that, blocked practice is effective until the learner can ‘just barely do it’ and that random practice is always more beneficial thereafter”.

-Appropriate regulatory stimuli, meaning, that when planning deliberate practice or play, the following aspects should be at least the same than in the real game:

-The energy systems used. In the game player are rarely completely exhausted, so they shouldn't be that in the training either. Also learning is much more effective, when players' mind is fresh and thinking clear.

-Players' positions, movements and orientation to the net. Meaning: create volleyball environment. The size of the court etc. can vary, but the fundamentals has to remain the same, so that learning for game can happen.

-Order of the rally needs to be the same in training than in the game. Rally should start as many times as possible from serve and it should terminate naturally – as in games.

-The stimulus where the players react, should be the same than in the game, which is reading the opponent's player's actions, who is the next one touching the ball. It means not reading the guy hitting from the box and not reading the coach's hand tossing. It means reading the opponent's player's body language, who is about to touch the ball next.

-Consequences: The way in which the activities are scored and performance rewarded (winners and non-winners). This means for example counting points.

-Given feedback should have the same timing, type, frequency, and amount of verbal and/or visual feedback as it is in the game, or at least close to that. There is a play and there is a break. Coach shouldn't be yelling all the time. Players cannot handle too much information, it is also important to notice that learning process is combination of explicit and implicit aspects, so verbal communication guiding cognitive thinking is only one part and learning should be let happen also subconsciously. Once awhile and straight to the point is much better, maximally 20% of all the touches should be given feedback. (Bain & McGown 2010.)

Cues for volleyball skills are given in the next chapter.

Table 1. There is a chart of recommended cues and reasons for basic skills in volleyball by McGown.

The skill	The cues	The "whys"
Forearm pass	Hands and wrists together.	Forms big surface area for the ball and gives firm, reliable grip.
	Straight and simple.	Saves the time (compared to extra hands movement) and it is easy to repeat.
	Face the ball.	Helps to form correct angle and it is easy to read

		trajectory of the opponent's serve.
	Let the angle do the work.	Gives the most motor control possible because the stand is wide and stable. Using the arm's straight platform is simple and makes controlling the ball easier. Platform should be also early in the trajectory of the ball as if it is late then it adds timing issues to the already difficult task.
	See the server, see the spin.	Be proactive, win the time when reading the server.
	Call the ball before over the net (At least when the speed of the serve is slow. If serve goes near the lines, calling "in/out" is priority over the calling who takes the ball because the reception responsibility areas should be clear already before the serve is served).	Emphasizes reading, makes decision early who takes the ball to avoid ball dropping to court between the players.
Overhead pass	Big hands.	Wide surface for the ball, better control.
	Shape early.	More time to receive ball.
	Square to the target.	Face the target, better

		accuracy.
	Extend the arms.	More power, better control.
Spiking	R-L-R-L.	These four steps, allows players to adjust and go wherever the ball is set with increased speed. It creates more momentum that can be used to jump higher.
	Arms forward (relaxed) - back-forward.	Efficient use of hands (which are relatively heavy, around 10% of player's body weight) helps players to jump higher.
	Bow & Arrow arm action.	Elbow should be rather low (about shoulder level) to make hard hit possible.
	Contact ball high and in front.	Higher hitting contact, more power to hit. Seeing the block.
Block	Ready position: Hands to ears-shoulders (depends on the height of the player) level (ready position), get loaded (legs).	Hands up to the level of ears-shoulders and legs wide and bent a bit so that players can execute the reading block jump straight up.
	B-SSS-B-H.	Eye-work, players can read the game if they can

		read the setter.
	Q2,Q3,X2,X3,X5	Use the most efficient way of moving in each situation to be as quick as possible.
	Checklist for good block: <i>location</i> (are you in the place where the ball is being hit over the net), <i>over</i> (are you penetrating your hands over the net) and <i>both hands</i> (are you pressing the both hands equally).	Helps to direct the ball to the opponent's court.

3.3 Physiology

Volleyball is considered sport with high intensity and anaerobic metabolic needs for physiology. Hard rallies and relatively long breaks varies in terms. There is a need for explosive jumps, approaches, short sprints etc. It is necessary for modern volleyball player to be able to produce a lot of energy in very short period of time (explosiveness) and also to recover between the rallies (in 15 seconds), during the time-outs (30-60 seconds) and between the sets (3mins). Both capacities are needed: aerobic and anaerobic systems.

In volleyball match, muscle cell's high-energetic phosphates aka. adenosintriphosphates (ATP) and phosphocreatine (PCr) are used. Also glycogenolysis and anaerobic glycolysis are used in working muscles. During the breaks, aerobic metabolism is used to fill the storages of ATP and PCr and to oxidize myoglobin. (Gionet 1980, Gastin 2001.)

The longer the rally, the more likely the player's body is to use anaerobic metabolism to make sure that there is enough ATP. Thus building up of the hydrogen ions used in energy output outnumbers the buffering capacity of cell, when hydrogen concentration rises and acidity increases. During the breaks the buffering of hydrogen ions gets more efficient as the role of aerobic metabolism increases. (Robergs etc. 2004.)

Relatively high aerobic performance is needed for modern volleyball player, so that as little part as possible of energy output would had to be covered with anaerobic glycolysis, which causes acidity to muscles and thus weaker performance (Gastin 2001). Player with high aerobic capacity is able to produce energy without accumulation of hydrogen ions at the higher absolute workloads. In other words, higher anaerobic threshold decreases the probability of anaerobic metabolism in volleyball. This is crucial in volleyball because acidity in muscles lowers the maximal level of explosive performance, which should remain high along the match.

By having a high aerobic ability modern volleyball player is also able to recover faster between the rallies and sets, because more oxygen is delivered quicker to muscle cells than the player with weaker aerobic ability. With good aerobic capacity the high-energetic phosphates are replaced faster, anaerobic metabolites are removed faster and acidity amends faster. (Robergs etc. 2004.)

Still it has been noticed, that despite the variation in players' aerobic capacities, that very high levels of lactate are not seen in matches. Thus the main (and almost only) aim in volleyball practice should be in improving the volleyball skills, as far as this is the sport which requires a lot of skills. And in the end, having 2-3-hour volleyball session day after day, human body will adapt it sooner or later and no extra aerobic training is needed. As McGown has put it in his book: "To improve your endurance in volleyball, play more intense and longer games in trainings."

4 REQUIREMENTS OF MODERN VOLLEYBALL FOR THE COACH AND THE TEAM

4.1. Psychology

In terms of leadership, biggest responsibility is on coach. Team is always lead by someone. Even if coach thinks he is not actively leading, he is still leading in the eyes of the players. It means that leadership matters. Leadership is a process and it is developed daily in long-term.

Leader should make a meaning. He should create intentionality to the team. Players play better – or at least try harder - if they have some meaning on it, the higher the better. If player plays to get paid, coach gets professional attitude from the players, which is good. But if excellence is looked for, then other tools are needed. Most of the time the team is a club or national team, so many times there is some kind of story behind it and thus also history. This could be one option for coach to start with. Leader should be intentional and make a meaning. One type of continuous story in club's/national team's historical culture aka. high context of the team could be described e.g. in a phrase “leave the jersey in a better place.” As it resembles the players about the long line of history of the club/country in which they are parts of. If players are truly connected to each other, they want to sacrifice their time and energy on it so that they are really playing to each other (and to the jersey they are representing) – not only for the sake of external things like money or fame. Thus excellent leadership could be described as values led and purpose driven, because higher purpose leads higher performance. (Smith 2015.)

John Maxwell has introduced the model of leadership, where it is categorized in five levels. Leadership at the level one is based on the position of the leader. There players follow the coach mainly just because of the coach happen to be in the position of a

coach. In this case the authority is based on organizational rules. This is the lowest level of leadership. So the lesson from the level one is, that if the coach gets the coaching job, it is leadership position automatically, and it means nothing itself. It should be taken as a chance for a personal growth. The leader should start to get to know the players and give up the speed. It's been said that "good leader slows down." It means that leader has to connect with people before he can lead them. Players (as people in general) are very good at observing the leader, also when coach thinks he is not actively leading: behavior tells more than the words. It is crucial to get the players to understand from the very start, that the players are not working for the coach, but "with" coach. Coach and players are working together. Maxwell describes good leadership metaphorically: "Don't be travel agency -leader just sending people to somewhere. Be tourist-guide - leader who says 'Come with me, let's do this together!'"

Leadership at the level two in Maxwell's model is being a servant leader. This type of a leader listens well, he is ready to learn and he probably loves the people he is leading. This is already a nice progress from being just a status leader (level one).

The level three leadership, Maxwell thinks, is 'producing the results' type of leading. Here the leader leads by his own example and the leadership is visual. The players follow the coach because of what he has done for the club/national team – for example winning the titles or championships (collective level). There is also a tendency that this "getting the results" -type of coaching attracts good players. So recruiting may be easier after the good results.

The next phase of this model is leadership level number four, where players follow the coach because of what he has done for them. It can be in terms of personal growth, skills as a player or even both (individual level). Leaders on this level tend to have a high social-IQ and good emotional skills, so that they know what they are looking for. Thus level four leaders are "recruiting gurus" because they are not only looking for the skills or physical elements of potential player, but also the character and how it fits to rest of the team.

The highest level of leadership in Maxwell's model is called pinnacle leadership. On that level, players simply follow the coach just because of who he is as a person and what he represents. This type of leadership is based on leader's character, which is many times built on strong values like integrity, fairness and justice etc.

Leader has to make decisions. Its simplicity, the strategy could be the following: leader should keep the things which already work and change the things which doesn't work. Leader should also be able to see beyond this day and think about the future. Maxwell emphasizes that leader shouldn't be defined by flow of life, but he should be able to define the movement of one's life itself.

Many psychologists have pointed out, that leader should be genuine, which means that leader is human and he should be comfortable enough to show the negative sides also. Hiding bad news or difficult things sends wrong message to players, as if they are treated like children. Because at the end of the day, players recognize the things anyway, and avoiding difficult tasks just make things worse or may create the culture which is based on fake positivity. (Maxwell, 2011.)

Simon Sinek has researched, that players work better when they are "inside the circle of safety". When they don't have to work under the pressure of losing the place on court or in the team, players perform better, because then players have trust and they can be independent. This style is opposite of "control freak" leader. Sinek also says that coach should give feelings also, not only instructions – keywords of great leadership could be "environment and culture" rather than "technical demands or commands".

Sinek has pointed out, that feelings of warmth (safety) consist of four different chemicals: endorphin, dopamine, serotonin and oxytocin. Leader should understand these basics. Endorphin is the one, which masks the temporarily physical pain "tolerable thing" because of higher goal. Indeed, players are ready to work hard if they find the meaning of it enough high and respected. The goal needs to be motivating enough – or in best case: action itself is the reward, if players are really into what they are doing.

Next one is extremely addicted: dopamine. It is released when player gain something; reach the goal, win, complete the training session, get the task done etc. Sinek says that “people want someone to inspire them”. That is why vision is so important. It can be imagined, visualized. It stays in player’s mind. It is easy to remember. Good vision consists also feeling – that’s why it truly connects the team. Dopamine is very useful for the coach: create the vision/goal, break it into attainable pieces and gain them one by one. It forms very powerful healthy addiction to players’ minds.

According to Sinek, serotonin is leadership chemical, and it is not caused by money issues, but energy or time that someone has put on something. Serotonin is also related to the feeling of hierarchy, as men are always unconsciously thinking who is the alpha-male in the group. So that’s why leader should always remember to let the players eat first and think about their best. Because coach is always responsible for players. Players are valuable for the coach. It is coach’s job as a leader to be smart and think ahead. This is how the group can achieve their goals and the coach can also have his share of dopamine.

Oxytocin is hormone related to physical touch. When coach and players touch each other like “high-fives” or taps to the shoulder (or when players hug each other on the court during the match), it releases oxytocin which strengthens the trust and devotion between them. It’s been studied that people follow leader with medium (knowhow) performance abilities but who is highly trustworthy rather than leader with high performance and not being trustworthy. Sinek also emphasizes that leader should lead the way he wanted to be led. He has described leadership as following: “leading front, taking hits and scarves and going back when rewards are given.”

(Sinek 2009.)

Multiple chess-master Garry Kasparov has given some ideas on leadership strategy. He has underlines that leader has to know himself and his team first before he is capable of doing right decisions under the pressure. Kasparov recommends, that player/team has to play his/their own game under the pressure. So if player/team is aggressive, he/they should play with aggressive style also under the pressure. If player’s or team’s style is

to be patient and smart (defensive), he/they should stick on that style also when it is matter of “life or death”. When one is playing his own game-style, it comes naturally, instinctively. It is good because under the pressure in tough times there is not so much time to think and analyze.

Kasparov also says, that “many great things comes to us as a side-effect. So leader should create the culture, be brave, think big and the path will bring the right ideas. Kasparov doesn’t encourage to play safe, he says it is not wise. “If we keep ourselves on a horizontal level, we stay in the comfort zone and we finally we are drag down by gravity, it is the law of physics. So we need to have encourage to jump to the path of development and growth.” (Kasparov 2007.)

One of the most successful coaches in team sports, John Wooden, has said that comparing doesn’t lead to good things: “Never try to be better than someone else, always learn from others, but try to be the best you can be, that’s under your control. You have the peace of mind when you know that you have done the best you can to become the best you are capable of becoming.” (Wooden 2015.) Shortly, it can be said that people should “win” their own story, not others’.

Group dynamics is also very important part of team cohesion, as it’s been studied, that strong social binds matter also on the court. (Smith 2015.) Thus the trust needs to be created between the players to have a great performance.

4.2 Skill

There are no two players with exactly the same schema and motor program to execute certain volleyball skill. Nevertheless, scientists have discovered and practical experiences have confirmed, that there is somehow accurate data about the most efficient way of executing every skill biomechanically. These findings are based on laws of biomechanics. Good argument also towards this theory is, that when the top international volleyball is followed, the best players have a lot of similarities in

techniques. There may be some slight variations, but the principals and main parts are the same. For example, in forearm passing, player cannot be good receiver, if he is not using the angle of the platform formed by arms. Thus it is logical to make this platform as smooth and flat as possible. To continue this example, it is the fact, that good receiver needs to be good at tracking the trajectory of the ball after the contact of the server – and even being able to read the server’s body language to anticipate where and how he is going to serve to. So player’s need two main things to be able to execute good serve reception: use of angle with the hands and good eye-work to read the server and the ball. Thus these elements need to be trained and naturally there are some technical key points to be emphasized. It all comes down to a fact that, it is beneficial for players to have efficient techniques to produce efficient performance in every skill. (McGown 2001.)

Another notable thing about skills on team level is, that when players have similar techniques, the movements of the players are quite the same which prevents players (6) to bump each other on small court (9m*9m). It makes the steps similar and moving smooth and simple. That is why moving is efficient and tactical elements can be built on this technical base. When players all have the same skill patterns, it can spread the trust among the players and sense of belonging.

4.3 Factors to predict winning or losing

One of the most important volleyball study was made by G. Fellingham and C. Reese in 2004. They found out the productive and the counter-productive skills (their impact to the outcome of the match) and their ratings. In other words, because of this study, coaches now know what skills are the most important ones, and on the other hand, which are not. There are a lot of useful ways that this data can be used. These findings were done using both binary logistic models and linear models. Productive skills are those that contribute to point scoring. Counter-productive skills are those that contribute to losing points. Importance location determined by binary logistic model.

Abbreviations are related to the basic volleyball skills and terms: serve=Srv, back row=BckR etc.

Table 2. Productive and counter-productive skills (Fellingham & Reese 2004).

Imp. BLM	Imp. LM	skill/rating	Imp. BLM	Imp. LM	skill/rating
17.51	1.36	Kill FrntR Swng	-16.25	-1.33	Error Jmp Srv
16.11	1.34	Kill Mid Qk	-16.08	-0.74	1 pt Jmp Srv
15.88	0.73	4 pt Jmp S/R	-10.24	-0.60	2 pt Jmp Srv
15.04	1.33	Kill FrntR Opp	-10.14	-0.63	1 pt FrntR Swng
14.43	0.74	4 pt Flt S/R	-10.03	-0.73	Error Jmp S/R
13.33	1.35	Kill BckR Opp	-9.59	-0.61	Error FrntR Swng
13.07	1.34	Kill Oth Attck	-8.91	-0.75	1 pt Flt Srv
12.64	0.67	3 pt Jmp S/R	-7.61	-0.63	1 pt FrntR Opp
12.36	1.29	Stuff Blk Hi	-7.50	-0.73	Error Flt S/R
11.54	0.67	Ace Jmp Srv	-7.38	-0.61	Error Oth Attck
10.44	1.35	Kill BckR Swng	-7.18	-0.63	1 pt BckR Opp
9.28	1.28	Stuff Blk Qk	-7.09	-0.61	Error BckR Opp
9.03	0.67	3 pt Flt S/R	-7.00	-0.63	Error FrntR Opp
8.51	1.29	Stuff Blk BckR	-6.94	-0.70	Error Blk Hi
8.14	0.33	1 pt Dig Hi	-6.83	-0.63	1 pt Mid Qk
5.83	0.16	4 pt Jmp Srv	-6.66	-0.63	Error Mid Qk
4.34	0.67	Ace Flt Srv	-6.52	-0.69	2 pt Flt Srv
2.57	0.33	1 pt Dig BckR	-6.17	-1.33	Error Flt Srv
2.10	0.24	4 pt Flt Srv	-5.71	-0.60	1 pt Oth Attck
1.89	-0.25	3 pt Jmp Srv	-5.28	-0.55	Error BckR Swng
1.44	0.52	2 pt Oth Attck	-4.82	-0.63	1 pt BckR Swng
1.30	0.48	3 pt FrntR Opp	-4.39	-0.70	Error Blk BckR
1.31	0.34	2 pt Jmp S/R	-3.95	-0.70	Error Blk Qk
1.18	0.61	2 pt BckR Swng	-3.71	-0.07	1 pt Jmp S/R

1.07	0.35	1 pt Blk Hi	-2.70	0.05	2 pt Flt S/R
0.91	0.40	3 pt FrntR Swng	-2.02		0 pt Dig Hi
0.82	0.37	1 pt Blk BckR	-1.70	-0.16	1 pt Flt S/R
0.66	0.40	2 pt FrntR Swng	-1.02	0.28	2 pt FrntR Opp
0.50	0.41	3 pt Mid Qk	-0.90		0 pt Dig BckR
0.41	0.40	2 pt Mid Qk	-0.85	0.27	2 pt BckR Opp
0.13	0.33	1 pt Dig Qk	-0.54	0.27	1 pt Blk Qk
0.01	0.37	3 pt BckR Swng	-0.45	-0.38	3 pt Flt Srv
			-0.36	0.33	3 pt Oth Attck
			-0.32	0.34	3 pt BckR Opp

Analyzing the study on table 2, we can make following clarifications to the table 3 and table 4.

Table 3. The most notable productive skills with importance rating are:

1. Kill pos. 4
2. Kill pos. 3
3. Perfect reception after jump service
4. Kill pos. 2
5. Perfect reception after float service
6. Kill pos.1
7. Kill other
8. Good reception after jump service.
9. Stuff block after opponent's high ball
10. Ace, jump service
11. Kill, back row
12. Stuff block, middle attack
13. Good reception after float service
14. Stuff block after opponent's back row attack
15. High defence

16. Great jump service (but not ace) that opponent cannot attack at all or only with high ball
17. Ace, float serve
18. Defence after opponent's back row attack
19. Great float service (but not ace) that opponent cannot attack at all or with only high ball
20. Good jump service that opponent's offence is limited (no middle attack)
21. This type of attack that rally continues after that
-
24. This type of back row attack that rally continues after that
-
28. This type of front row attack that rally continues after that

Skill summary could be the following: On the list, ratings number: 1, 2, 4, 6 and 7 are all about attack. Another key point is, that ratings number: 3, 5 and 8 are all about reception. Third notice is, that ratings numbers 9, 12 and 14 are all about block. This means that attack and reception are the main key factors predict to win the match. Blocking is not so important, or at least it is less important than attacking and receiving for scoring points. Several conclusions can be made. First of all, based on these numbers, attack is the most important skill in volleyball. Second important one is reception. Blocking, defense and serve are not as important as these two main factors (attack and reception).

Table 4. The most notable counter-productive skills with importance rating are:

1. Jump service error
2. Very easy jump service
3. Easy jump service
4. Hit to block from pos. 4
5. Reception error after opponent's jump service
6. Attack error from pos. 4
7. Very easy jump float

8. Attack to block from pos. 2
9. Reception error after opponent's float service
10. Other attacking error
11. Attack to block from pos. 1
12. Attack error from pos. 1
13. Attack error from pos. 2
14. Blocking error after opponent's high ball
-
24. Bad quality reception after opponent's jump service (only high ball attack)

Skill summary could be the following: On the list, ratings number: 1, 2, 3 and 7 are all about serve. Another key point is, that ratings number: 4, 6, 8 and 10 are all about attack. Third notice is, that ratings numbers 5, 9 and 24 are all about reception. Conclusions can be performed. By far the worst thing to do in order to have success in volleyball match is to make service error or serve very easy serve. Something needs to be done between these extreme options in serve.

Another notion is, that it makes huge difference to succeed in attack or not. The best things to do to win the game is attacking points and the worst things to do to lose the game is attacking errors. So wise team need balance on this and high-level players need to know when to risk and when not. Risk attacks can be chosen when the probability to succeed is high (e.g. after good set when player sees the block and knows what to try.) On the other hand when the probability to succeed is low (e.g. after poor set or when player doesn't know what he is doing), it is crucial just to keep the ball in play and not make errors. This is because of making the errors is bad and just keeping the ball in play is even slightly beneficial.

According to this data, blocking and defense are not so important (in Women's game defense has more value). Of course when two equal teams are fighting hard and the marginal are just a couple of points in each set, there are no little things. But to be able to succeed in the first place, serves needs to be on semi-level, good risk management is needed in attack and reception is required to be good. One detail about reception is, that

perfect reception is not only goal to play with, but reception error is very counter-productive, so again something between is needed. Just keeping ball alive in reception is also a bit beneficial, at least it makes huge difference to reception error. (Fellingham & Reese 2004.)

4.4 Recommendations for practice

After these conclusions (in 4.3), recommendations for practice can be made. Attack is that part of the game where the most points are produced. It is highly important. Without efficient offence it is very hard to succeed even if all the other aspects of the game would be in great shape. Attacking decisions, creating reliable side-out game is the base of successful volleyball. Risk management should be taught to players when to risk and when not while attacking. These need to be trained in game-like situations because otherwise the transfer from trainings to matches is not high enough. Learning and performing should happen as alike circumstances as possible.

As attack, serve and reception are the key factors, teams should spend their training time mostly improving their skills on these areas. When other characteristics of learning are considered (e.g. specificity and whole-practice rather than part-practice), we can assume that the best possible volleyball training consists a lot of rallies where the rally is started from serve, followed by reception and attack. High-quality reception is great because of two reasons: it forms the base for own offence, but also keep the efficiency of opponent's serve low. Naturally the team cannot train reception without serve and other way round, so it makes these as counter-parts which should be trained at the same time. To be able to win a lot of volleyball matches, team should be good in these three categories.

In terms of serve, as told earlier (4.3), the reasonable level is required. Errors destroys the chance to win almost completely, but very easy serves are not that good either. So it is crucial that players have at least decent efficiency in serve. Ace was the 10th important factor to predict winning, but service error was the first important factor to predict losing, so why to risk the whole chance to win (error is the worst thing that player can

do) to gain the 10th important thing which doesn't guarantee winning itself? Aces are nice but team shouldn't aim for them in the cost of errors. So the best thing to do is to serve a lot balls in with decent difficulty. It forces the opponent to win you by playing. So team should train serving a lot.

Reception needs to be trained a lot, but the goal of reception is important to be clarified. Good reception is the base of offence. What type of offence certain team is having, determinates the required level of reception. As errors are bad on this area also, it is better to keep the ball in play and avoid straight errors like aces and overpasses. So if team cannot handle the location of reception, it is better to play safe at least with the difficult serves and not try to push too accurately if players cannot handle it. The most important thing is to have moderate reception without errors and make it more accurate whenever the serves are easier or receiving player can handle higher accuracy. These things should be emphasized in training and also the leader of offence (setter) has to be taught how to that he has to plan and execute well also with other than perfect reception.

In attack, it seems that producing the stuff block for opponent's team is very counter-productive to winning. So it is better to hit high, as far as volleyball court is relatively long at least in deep corners, it is easier to cover if ball comes back slower or little bit upward from blockers' fingers (rather than arms), defenders can touch the ball before it goes out and out of bounds hits from blockers' hands are done with higher target. All these things can happen when hit high but if player hits low the stuff block is more likely to happen. The risk management in offence means, that team has to solve all kinds of situations. It is beneficial for the team to keep the ball in play rather than risking it too much. When the ball is kept in play, team can give the opponent team chance to make the error or to create the better attacking situation later. Playing patiently shows also trust to own block and defense.

Block and defense are not so important areas to predict winning or losing, so it means that also on the individual level some players can be great players being only good at e.g. attacking and serving, because these are the most important skills. But as winner of major international volleyball events varies lately, it means that competition is very

hard. It leads to an idea, that even not-so-important things like blocking and defense can be crucial factors in tight set. And to continue this thought, even minor skill areas like covering, setting (non-setters) or other ball handling situations can be very important. So all this emphasizes that whenever played at the highest level, there are no little things and every rally should be fought as well as possible. Coach should let the random game-like rallies to lead the player also in strange situations and see how the player figures his way out of there. If some strange rallies bring up unfamiliar situations for the player, coach can give extra ball for the player to same situation and let him re-play it.

As a summary, it is crucial to train mostly the most important aspects of the game. They are own offence and serve/reception. Closed block and defense drills are waste of time and these should be trained with the natural flow of the game with rallies that start from serve and terminates naturally. If coach wants to reduce the numbers of jumps in the mornings, then the serve/reception is the best thing to do as it is so important. (Fellingham & Reese 2004.)

4.5. Recommendations for match

Recommendations for matches have to be – of course – similar to the recommendations for practices, because what for the practices are if not for preparation for the matches? So all the same aspects are valid in games also. Serves needs to be in with at least decent difficulty. Reception needs to be free from errors, but good enough to play efficient offence. Risk management have to be considered in attack, as kills are great but hitting low to block is terrible. Block and defense are not important, but they can help team to win in tight sets, so they needed to be focused fully also.

One especial aspect involves games: there team needs to be better than the opponent to win the game. In trainings very high standards can be expected and demanded, but in the match, game needs to be played always against that certain opponent who is against one's team. It means that the requirements to win are relative. Against some team the tactic can be different than against some other team.

There is some data offered by Doctor Tristan Burton from Stanford University, which gives the team some insights what kind of tactic to choose to the game, especially what comes to a serving. Burton's study was ordered by USA volleyball and they wanted to know the answer for this question: What should be the relation between aces and serving errors to win the game? Burton found out that it depends on the opponent's modified side-out efficiency. It is the term which refers to opponent's side-out efficiency when straight errors and aces are cut off. In other words, it means the level of opponent's side-out game when the ball is in play.

Burton's error/ace study is performed in the table 5.

Table 5. Error/Ace -study. On a left side there are the modified side-out efficiencies and on a right side there are the required error/ace relations which are "enough" serving wise to win the game. (Burton 2008.)

50%	---	1.00
52%	---	1.08
54%	---	1.17
56%	---	1.27
58%	---	1.38
60%	---	1.50
62%	---	1.63
64%	---	1.77
66%	---	1.94
68%	---	2.13
70%	---	2.33

So it means that if opponent's modified (aces and serving errors excluded) side-out efficiency is very high like 70%, then the own team needs to have error/ace relation which is 2.33. It means that to gain one ace the team "is allowed" to make 2.33 serving errors. This means that the opponent's is playing very high level and own team cannot do basically anything else than serve harder because other way they would lose. In other

words, it means that opponent is better in playing volleyball so own team needs to use other tools to win.

On the other hand, if opponent's modified side-out efficiency (when ball is played) is low, it doesn't make any sense to serve very risky way. Then the own team is allowed to make only one error to each ace. There is no sense of serving hard because the own team doesn't have to. It is wise to win more easily and more likely. By just putting the ball in more, not aiming for aces, still keeping some efficiency in serving though, is the best way. Most of the high level teams have the modified side-out efficiencies lower than 70%, so it is almost always better not to risk super much with the serve but to find balance: against better team the serve needs to be a bit stronger and against weaker team the safer serves are enough. (Burton 2008.)

5 TRAINING PERIODIZATION OF VOLLEYBALL TEAM

5.1 General

The purpose of volleyball training is to get better at volleyball. Training responses are always unique and individual, and training in volleyball team is the mix of individual planning and team planning. In physical perspective, learning certain techniques and psychological aspects can be planned and trained individually, but playing the volleyball is always done with team mates. The laws of learning require that (specificity, transfer, whole-practice etc.) volleyball cannot be trained alone in effective way.

Physical training program and nutrition are the main parts that are left to each player's own responsibility. Physical training coach is helping players in planning and during the training sessions, but still a lot of work have to be done individually.

The purpose of professional physical training program is not only to be 100% condition, sharp and powerful in games, but also to make the player to become the best coach for

himself for the future. Physical coach is perfectly done his job if he is not needed anymore because the player knows already more than coach. Only the player can be the final expert of one's body and only player has the ultimate responsibility of his development. Training program is always only push for the first step. It's player's call to decide what he want to be.

5.2 Physical training example, nutrition and guidance for optimal performance

Attachment 1.

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7 Attachments

Attachment 1. Example of one season complete non-linear training program, nutrition and day/week examples.

Individual test sheet

Muurle volleyball club 2012-2013

Basic information: Player 1, xx years, xx cm, xx cm (reach without jump).

Test movement start goal in Jan. result in Jan. goal in March result in March

weight	83kg	84kg	84kg	84,5kg	84kg
fat%	13,6	12,0	11,7	9,90	9,80
jump	40	42	43	44	44

medicine ball, overhead 1kg	19,3	20	21,6	22	22,5
squad max1	130	140	150	160	155
squad index	1,57	1,67	1,79	1,90	1,85
med. ball, overhead 2kg	16	17	17,5	18	18,5
pullover max3	50	55	55	60	57,5
benchpress max1	97	100	110	115	115
attack reach	318	320	325	330	328
block reach	301	305	307	308	308
overhead press	70	80	75	80	85
chin-ups	10	12	14	16	16
hanging abs reps	18	22	22	25	27
muscle endurance total	190	200	205	210	212
squat+press	32	34	40	42	38
abs	44	46	47	50	48
block moves	32	33	34	36	38
pullover	42	43	45	48	46
agility	40	44	39	34	42

MUURLE 2012-2013

PHYSICAL TRAINING

Kasper Vuorinen

This file is physiology guideline for top male volleyball players including nutrition, optimal rhythm for the training day and individual physical training program.

Read, learn and apply the knowledge. When you study this file carefully, at the same time you prepare yourself mentally.

Mental and physical sides of preparation cannot be separated.

Keep track on your development, be aware your training tomorrow, ask, study for further information, be active, organize yourself, plan and get your foods for tomorrow, look at the training videos on youtube, call or mail to trainer, be interested, sleep enough... Doing these you keep yourself ready and motivated – these are the best psychological exercises you can do.

The final goal:

The purpose is not only to be 100% condition, sharp and powerful in games, but also to make you to become the best coach for yourself for the future. Physical coach is perfectly done his job if he is not needed anymore because the player know already more than coach. Only you can be the final expert of your body and only you have responsibility about your development. This file is only push for the first step. It's your call to decide what you want to be.

Muurle 2012-2013

Nutrition and guidance for optimal performance

Kasper Vuorinen, physical trainer

NUTRITION AND RHYTHM FOR TRAINING TWICE A DAY (USE ALSO ON GAME DAY!) Works for both preparation season and competition season.

8.30 Wake-up

-fiberous carbohydrate + liquid

EXAMPLE:

3 kinds of brans mixture + natural yoghurt + water

8.45 Light walk outside

9.00 Boost-snack 1

-proteins + quick carbohydrates (easily absorbed) + amino acids (creatine, glutamine, leucine) + liquid + antioxidants

-if you eat something non-liquid like option a), do it 1 hour before training

-if you drink something liquid like option c), do it 15-30 minutes before training

EXAMPLES:

a) omelet (2-3 egg whites, 1 egg yolk) + 1 banana + blueberries

b) shake inc. natural low-fat quark, yoghurt, different kinds of berries + organic 1,5% fat milk

c) recovery shake (proteins % more than carbohydrates %) including 5g creatine, leucine and glutamine (one teaspoon)

-hydration, mineral water, (water inc. sodium [=natrium], magnesium) spring water or coconut water

EXAMPLE: coconut water, 0,5 liters minimum before training.

10.00 Ball training + physical training

-As training starts, you should feel energetic, powerful, open-minded, ready-to-learn. Rule is: energy storages full but quite empty stomach. (Hydration is done well if urine is quite colorless when session starts.)

-Keep your work-out sheet always with you, do it correctly and mark your weights and dates in the sheet.

After training: Recovery drink (inc. proteins, carbohydrates, creatine, leucine ja glutamine, 5g, teaspoon, again.)

-Take it immediately after training or during the (work-out) session if you feel low-energetic.

12.00-12.30 Recovery lunch (lunch number 1)

-As soon as you can eat after training (and after recovery drink).

-Protein-rich, low-fat, carbohydrates (slowly absorbed and fiberous, if recovery drink is forgotten, then eat quick carbs), lots of vegetables and salad (preferably no salad dressing, only splash of olive oil and seeds), mineral/spring/cocout water. Do not overload, eat moderately.

EXAMPLES:

- Chicken fillet + curry sauce + whole grain dark rice + salad + vegetables.
- Salmon + whole grain dark rice + vegetables + salad + vegetables.
- Omelet (3-4 egg whites, 1 egg yolk) + rye bread + some slices of cheese + tomatoes.

13.00 Nap

-The duration of nap depends on your individual needs, usually it is 20min-60min for athletes. The most important thing is that the effect of the nap is more refreshing than tiring. Normally one full sleep cycle is about 45minutes long.

-The time between nap and second training session (in the evening) should be spent mostly lying (sitting is not good either for long time for athletes). Avoid unnecessary walking and standing. Remember to keep your feet up against the wall a couple of minutes also. Study or read rather in a half-sitting position or by lying than by sitting (these positions are more friendly to your back).

14.00-15.00 Snack 2

-Enjoy proteins , carbohydrates, liquid and vitamins.
Mineral/spring/coconut water.

EXAMPLES:

- 1 banana + natural low-fat quark + an apple.
- Rye bread + cheese + slice of turkey + pickle.

14.00-18.00 Studying/ reading

-Spend mostly lying, you can walk outside couple of times but do it shortly and not in a tiring way (remember warm clothes in the winter).

17.00 Charging second lunch

-Timing depends on what time the evening training begins.
Approximately 2-3 hours before training.

-Contains proteins, low-fat, slowly absorbing carbohydrates.
This lunch is energetically smaller than lunch number 1 but bigger than snack number 2. Remember to DRINK.

EXAMPLES:

- Turkey fillet with whole-wheat dark pasta + salad + vegetables.
- Salad + 2 eggs + chicken fillet + tomatoes + tuna.

18.30 Boost-snack 2

-proteins + quick carbohydrates (easily absorbed) + amino acids (creatine, glutamine, leucine) + liquid + antioxidants

-if you eat something non-liquid like option a), do it 1 hour before training

-if you drink something liquid like option c), do it 15-30 minutes before training

EXAMPLES:

- omelet (2-3 egg whites, 1 egg yolk) + 1 banana + berries

- shake inc. natural low-fat quark, yoghurt, different kinds of berries + organic 1,5% fat milk
- recovery shake (proteins % more than carbohydrates %) including 5g creatine, leucine and glutamine (one teaspoon)

-hydration, mineral water, (water inc. sodium [=natrium], magnesium), spring water or coconut water

EXAMPLE: coconut water 0,5 liters minimum before training.

Attention! This will help to make sure that your muscles won't go to a catabolic stage during the long lasting evening session (work-out 30min. + ball training 1,5h). Boost-snack ensures that the time between eating before and after session is not over 4 hours. Training hard without proper nutrition prevents your development. Value your hard work!

19.30-21.30 Evening session (work-out + ball training)

-Start with own work-out 30min. Then straight ball training. If there is no work-out before ball training (morning training + Fridays + trainings before week-matches), the optimal structure for warm-up is: Warm-up joints + core exercise 5minutes + dynamic movements (inc. balance, coordination runs etc) 5 minutes. Be ready for training volleyball fully in 10 minutes! In long term it makes HUGE impact in volleyball skills,

if you can train your skills just 15mins more. So do everything needed in warm-up, but nothing extra. 10 minutes is good, 30 minutes is too much. For individual exercises, player should come earlier so that everyone is mentally and physically ready to go fully after short warm-up together.

21.31-21.34 Cool-down

-Cool down your body (take your shoes off) in 4 minutes:

-jog around the court 6 rounds including (walk before and after 1-2):

1) 70% sprints 4*10m from defense position

2) very light (20%) jumping about 20 times

3) Slow down bit by bit, last round is only walking.

The purpose of cooling down is to recover your fast muscle cells bit by bit to normal stage.

21.34-21.42 Stretching + Recovery drink

-Stretch well approximately 2*15sec. / same muscle group.

Stretch also whole kinesthetic chains. Stretch also your feet!

-Remember to target your stretch to muscles instead of nerves! You can ensure that (you must feel yourself) by keeping your joints only 90% extended like while stretching hamstrings, keep your knee not fully extended.

-Pay attention to your whole body: when the agonist muscle (hamstring) is stretched, the antagonist muscle should be relaxed.

-Breathe normally, enjoy stretching, it should feel a bit but never hurt! Focus on the stretched muscle – the body and the mind are connected!

-Repeat your stretching with time (15-20 min) at home after training or in recovery day if needed. Muscles should recover to normal lengths by themselves but to ensure this, stretch to keep your mobility full during long season.

Attention! Do not stretch if you are exhausted (there are lactic acids in your muscles after ball training) or you have done heavy strength training (there are micro-damages in your muscle cells).

-Proteins, carbohydrates and amino acid: glutamine 5g.

21.43 Shower

22.00 Dinner

-Try to eat as soon as possible after training.

-This is the MAIN meal of the day. You should eat energetically much, but of course nutritional substance should be healthy. So eat a lot of low fat meat/fish (protein), slowly absorbing carbohydrates and vegetables etc. Remember to drink mineral/spring/coconut water (1,5litres during the evening)!

Attention! The biggest step in your development (size of muscle cells, schemas in your brains) is taken during night sleep after large meal (if there are no energy and proteins, the muscle cells cannot grow).

Attention! If you drink only water, you have to urinate quite often because only 20% of water will absorb to your body and rest comes out. Every player has dehydration stage after volleyball training and everyone has to balance it (if you don't, then you feel tired and weak the next day). Dehydration is balanced much faster by drinking mineral / coconut water because mineral water etc contains sodium (natrium) and magnesium which helps liquid to absorb much better. Also you don't have to abort your night sleep by going to urinate. The quality of your sleep is thus also better.

EXAMPLES:

- Fillet of bull, with whole-wheat dark pasta + salad + vegetables + rye bread+ cottage cheese + tomatoes.
- Whole-wheat pasta + minced meat sauce (roast ground beef) + salad

- Beef steak + whole-grain rice + low-fat sauce + salad + tomatoes.

22.30 Stretching

- If needed.

23.15 Evening snack

-Low-fat quark + suppl. (Caseine, the milk protein, is best way to ensure that there is enough proteins for muscle growth during the night because it will be absorbed slowly – for example whey protein will be absorbed faster.) That’s why sources of caseine like quark and cottage cheese are good ways to ensure the protein synthesis and development during the night.

-Take also nuts, seeds, couple spoonful of different kinds of oil (for example olive oil, cod-liver oil, avocado oil. (Everybody needs enough fat for living, but it should be unsaturated fatty, “soft fat” like oils, seeds, nuts etc.)

-Vitamin c, d, e and magnesium. (Buy tablets from pharmacy. Only vitamin D is very largely accepted to use among doctors, that’s important because you can get vitamin D mostly of sunlight but in Finland there might be quite little sunlight during winter time. Other vitamins are recommended by professors in sport sciences. According to them, vitamins help nutrient, proteins etc, to absorb effectively, help you not to feel tired and help your body to resist infections).

-EXAMPLES:

a) low-fat quark, vitamin pills: c, d, e and magnesium, wishy-water.

b) Shake: low-fat quark, low-fat yoghurt, seeds, nuts, oils.
Drink with milk and c, d, e and magnesium pills.

Do not drink that much that you have to wake up to urinate during sleep.

23.30 Go to sleep!

Attention! Because life is random, days and moods are different. On a good day, you have slept well, you eat every 2-3hours and you feel great. But development and changes in your body and muscles comes with time, so it's not about 3 days but 30 or 300 days – routines are crucial factors. Prepare for bad days! Those come for sure... It helps if you have planned and bought meals for many days. You have always wishy-water bottle and protein bar with you just in case etc. Training according these instructions help you to feel stronger, jump higher, attack harder, think sharply and not to get sick easily. Enjoy the journey!

GAMEDAY EXTRAS:

-EAT ONLY FAT-FREE OR LIGHT FOODS BEFORE MATCH, USE SUGAR ONLY IF NECESSARY (FOR EXAMPLE IN QUARKS).

- GAMES: BE AWAKE IN THE BUS (HOME GAMES AT HOME) MINIMUM 3 HOURS BEFORE GAME AND STAY AWAKE ALSO. REMEMBER VISUALIZATION – SEE YOURSELF DOING GREAT JOB IN THE GAME!
- DRINK MINERAL WATER IN THE BUS BEFORE AND AFTER THE GAME!
- BE THE BEST YOU CAN BE CAPABLE OF BECOMING. BEST VERSION OF YOURSELF.

Muurle volleyball / Physical trainer, Kasper Vuorinen

Physical training program for season 2012-2013

Read carefully all the instructions, also “Nutrition...” –sheet, follow and ask help if needed. It’s **important** that player not only execute this program, but also understand why we do these exercises. Thus you can always ask more details and purpose of different exercises. Player himself has the biggest responsibility everything he does or doesn’t, listen to your body when you need hard or light training. The key point is that on the game day, everybody is fully fit: legs sharp, feeling energetic and mind focused. Mark the weights and the dates so we (player & coach) can easily follow the development.

- Whole season is called macrocycle. Macrocycle is divided into two mesocycles. First mesocycle is 22.10.-6.1. and second one is 7.1.-until end of the season. Periodization principle model is non-linear. Training idea: out of 7 trainings: develop one capacity 4/7, maintain the rest 3, including

always speed power (explosive/fast power) at least 2 times/ week.

Periodization model is wavy, so that every time when microcycle changes, the intensity and volume of exercises changes also (change the target of capacity development).

Inside the microcycle, training weights should be a little bit progressive.

Exercises changes when mesocycle changes. Fitness testing takes place before the start of first mesocycle, in the end of the first mesocycle and in the end of the second mesocycle. In one mesocycle there are 3-4

microcycles, and the target of capacity development changes aka.

intensity and volume changes. The whole point of this training program is to train often with high efficiency but also shortly at a time (only 1-3 exercises per session). This is how the bodies are not too exhausted to learn volleyball skills afterwards, but to get them even more sharp to be ready to learn new things and train hard.

These physical training sessions should be done always in the beginning of the training or as a own session, so that physical trainings are always done as "fresh" as possible. The idea is, that after the training player feels to be faster and sharper (body "shouts" to jump and work hard in volleyball court).

Because of the high frequency of trainings (many times a week), the working load of one single session is moderate or light. Every rep should be enjoyable and executed with good technique, never failures in lifting. The resting day (or super light) before and after the game guarantees the recovery for the body and giving the maximum sharpness to the games.

Exercises and weekly planning are done to take into consideration that volleyball trainings and of course matches are priority number one and physical trainings don't harm the volleyball session at all, but services them as after short physical exercise the body is more sharp and ready to receive volleyball responses and to perform right away in high level (good and sharp bodies ready for full jumps etc. right at the start of training/game.)

-Tests are held on weeks 43-44 and week 1 and after the season. Tests are weight, fat%, jump, medicine ball, overhead 1kg, squad max1, squad index, med. ball, overhead 2kg, pullover max3, bench press max1, attack reach, block reach, overhead press, chin-ups, hanging abs reps, muscle endurance total, squat + press, abs, block moves pullover, agility and of course anthropometry: height, fat% and reach without jump.

The following part of the program explains the targets of each capacity developments:

-Proactive/Maintaining Training (PMT), is the session which prevents the injuries, improves the muscle balance and proprioceptive balance, nerve-muscle coordination and aerobic capacity. This session consists aerobic training part in the beginning. It is mainly hypertrophical or endurance power type of training for the body. The number of repetitions are 6-25 in each series. Intensity is mainly low and the required technique is well controlled and calm. This training should be done the next day after the game or in parts after the evening volleyball session – at least once a week.

-Neural maximal power training (NMP), is the session, which develops the neural maximal power (done safely without extreme repetitions or failures) and explosiveness. The aim is to increase the conscious and reflectory nerve conduction – in other words: the aim is to recruit as many motor units as possible and fire them as soon as possible

and as same time as possible. Thus the explosive acts like vertical jump ability increases. The number of repetitions in series are 1-5 and intensity is very high (the percentages out of maximum one repetitions is 85-100%) and the way to execute the exercise is as fast as possible, explosive one.

-Hypertrophic maximal power (HMP), is the session, where the training response is meant to make the muscle cells bigger by expanding the muscle's cross-area. The number of repetitions in series is 6-12 and the intensity is moderate (percentages from maximum 1 record is 60-85%), the speed of movement should be fast and controlled (the eccentric part can be a bit slower in some exercises – very well controlled – but concentric part, “push”, should be always fast). In this training program the volume for lower body is six reps, because the emphasizing is on neural-hypertrophic part of hypertrophic training, but for upper body the “full” hypertrophic training is used which means volume also over six repetitions.

-Speed power (SP), is the training session, in which the training response is focused on elasticity and getting the muscle-nerve system commands faster. The point is on recruiting part of the slow and as many fast motor units as possible and to increase the firing frequency of recruited ones. The instant energy resources are used which means that the work series has to be done in less than 10 seconds. The tendons and elastic parts of muscle tissue are loaded. A small portions of lactic acid is produced. Speed power training can be trained the focus on power or on speed depending on the work loads used (the heavier the loads the more power is trained and the lighter the loads the more speed is trained). The number of repetitions in series is 5-10. Intensity is moderate (20-70% and as told it varies according to the wanted impact). The way to execute each repetition is as fast as possible (maximal speed) and the style should be continuous from rep. to rep.

-Explosive power (EP), is the training session, where reflectory and neural nerve system is focused on in addition to reactivity. The aim is to release the speed power elements of muscles and produce as high (short) power peak as possible. The point is to recruit as many motor units as possible, fire all them as simultaneously and rapidly as possible.

Exercises are changed when the mesocycle changes. Week 1 is time for physical tests and there are no jumps other than test jumps.

Mesocycle 2 / microcycle 1: 2,3,4	HMP-priority	EP	SP	HMP	H MP	HMP	NM P	HM P
Mesocycle 2 / microcycle 2: 5,6,7	recovery-SP- ja EP-priority	HMP	HMP	NMP	SP	EP	EP	SP
Mesocycle 2 / microcycle 3: 8,9	recovery- and tapering-priority	SP	SP	SP	SP	SP	SP	SP
Mesocycle 2 / microcycle 4: 10,11	NMP-priority	NMP	HMP	NMP	SP	NMP	EP	NM P

(*There are translated instructions of some parts for the players who doesn't speak English – e.g. Spanish/Finnish.)

***MONDAYS (if game is on weekday, do this exercise always the day after, if game is on Saturday, you can do this already on Sunday if you feel you don't need the day off.)**

Choose everytime at least A option, B is recommended and C is voluntary.

A) PROACTIVE/MAINTAINING TRAINING SESSION

-Increase the weights in every or every second session in exercises (1.-6.) where the tables are attached! So start lightly, put more weights progressively session after session.

-During this training session, keep the breaks as short as possible (0-30 seconds, excluding number 2. chin ups and number 4. bench press where breaks are ~2-3min.)!

1. Cardio 10-20minutes, running mainly, sometimes cycling, swimming or rowing. / bike, remade, corrida....10minutes.

Example: 11.9. 10 min. running.			

2. Chin ups, narrow grip, 3*maximum reps (if you can do more than 3*10 reps, then every second week: use extra weights tied up around the hip with the rope, 3*5-8*5-25kg) / leuanveto/ barra livre

Example: 9.10 5+7+9			
4*max			
5*max			

3. Upper back pull (behind (B) or front (F) of your head), wide grip OR Lower back pull with one hand 3*12*heavy reps, change every week / ylätalja (eteen tai taakse) tai alatalja yhdellä kädellä, vaihtelee viikoittain. / puxada aberta frontal

Example: 11.9. 3*12*50kg upper F			
4*8			

5*6			
3*15			
6*5			

4. Bench press, normal grip + narrow grip, pick up one of the series, change. / penkkipunnerrus, normaali, suhteellisen leveä ote + kapea ote (tässä kevyempi paino), valitse jokin sarja, vaihtelee. / supino reto + arremesso medicine ball

AFTER EVERY SET, DO 3*JUMP PUSH UP OR THROW MEDICINE BALL*3 TO WALL!

3*10 + 3*10	10+8+6+4+4+8 + 3*8	8+5+5+3+3+5+8 + 3*6

6. Calves without shoes, sitting in the machine 3-5*12*heavy OR standing with 1 leg 20+20sec + 15+15sec + 10+10sec (increase the time 5secs every week for every series) / pohkeet istuen koneella tai seisten 1 jalalla. / panturilha sem tênis

example: 11.9. 3*12*25kg sitting	example: 12.9. 20sec+15sec+10sec standing 1 leg		

7. Rotator cuff with the band or light weight 4*4*25 (two times external and two times internal rotation with elbow down and same series with elbow up 90 degrees) / kiertäjäkalvosimet eri kulmissa nauhalla tai kevyellä painolla. / fortalecimento de ombro

8. The back of the shoulder pull with the rope, aka face-pull 3*12*medium / takaolat köysitaljassa. / escapulacão

9. Adductors standing with one leg with pulley 3*10+10*very light / lähentäjät 1 jalalla taljassa. Keep your balance! / adutor

10. Abductors standing with one leg with pulley 3*10+10*medium / loitontajat 1 jalalla taljassa. Keep your balance! / abductor

11. Quadriceps isometric stability 3*8+8*5sec (keep stable 5sec when leg is straight up). / Eturaidet istuen jalka kerrallaan, pidä pito kun jalka suorassa / isometria extensora

12. Hamstrings with machine 3*10*medium/heavy OR 4*6. Change every week, when 4*6 more weights. / Takaraidet koneella, vaihtele sarjoja. / flexora

13. Abdominals 3-5*8 + sides 2*15+15 with own exercise. / Voimapyörä tangolla + kyljet omaavalintaisella liikkeellä / abdominales

14. 1 leg squat & 1 arm pull (cross) with pulley 3*10 / Ristikkäisveto, 1 jalalla 1 kädellä, pieni kyykky mukana / agachamento com elevação e ombro

15. Vertical row with bar 3*10*medium/heavy / pystysoutu tangolla / trapezio com barra no peito

16. Side lift with weights 3*12* 2,5kg-10kg / vipunostot käsipainoin / elevação frontal e lateral

17. Triceps brachii with pulley 3*12*heavy / ojentajatalja / triceps pulley

18. Reverse hyper 3*10*0-10kg OR Full pull with pulley 3*10*heavy / pakaranoistot ylävartalo tuettuna päinmakuulla tai läpiveto taljalla / dorsal reverso

B) SWIMMING POOL & STRETCHING 20 min. / alongamento

C) MASSAGE

WARM-UP

DO THIS WARM UP ALWAYS BEFORE SESSIONS 2-7 WITHOUT ANY

BREAK:

-JOINT (KNEES, ANKLES, ELBOWS, SHOULDERS) WARM UP 5MINS INC.

1MIN BALANCE STANDING WITH ONE LEG EYES SHUT

-DYNAMIC MOVEMENTS 5MINS LIKE ANY KINDS OF RUNS: BACKWARDS, SIDEWAYS, SWING YOUR ARMS ON YOUR SIDES ETC. (IN THE WRESTLING ROOM OR IN THE HALL.)

-EXECUTE WITH BAR (20KG):

-GOOD MORNING*10

-GOOD MORNING IN ZERCHER SQUAD POS.*10

-PRESS UP (BEHIND AND FRONT OF YOUR HEAD) *10

-DEEP SQUADS*10

-CLEAN*10

-CALVES*10

YOU SHOULD BE A LITTLE BIT OF OUT OF BREATH NOW, READY TO START FULL STRENGTH SESSION! IF YOU STILL FEEL TIRED ETC, CHECK “Nutrition and guidance for optimal performance” –SHEET AGAIN AND FIND OUT WHAT YOU CAN DO BETTER BEFORE TRAINING STARTS (like go to bed earlier last night, wake up earlier, have a morning walk, eat proper breakfast etc.)! TAKE A SIP OF WATER AND START YOUR INDIVIDUAL SESSION!

-Increase the weights according to percentages. Estimate your load from maximum 1 repetition or take it from test results. Pay attention that during the program your strengths will develop so your estimated maximum 1 repetition is better later than at the beginning of the program. Thus you may use a bit higher weights with same percentages during program.

The idea of this program is to make you stronger and faster – without making your muscle-nerve -system tired (if the physical session is before morning volleyball) so mainly each set of reps consists 1) power element 2) explosive element and 3) plyometric element. This is how we can make sure, that the stimulus stresses your body the way that 1) we can recruit as many motor units (both slow and fast ones) as possible by a couple of maximal / submaximal reps in the first phase e.g. squat, then IMMEDIATELY after we should grab the bar to execute some reps of 2) explosive element , e.g. snatch, to command the motor units to fire as same time as possible with great synchronization and then finalize the set of reps with 3) plyometric reps like jump on the box to get it as close as volleyball requirements (vertical jump) as possible. This combination should be done safely and efficiently of course – but also as quickly as possible, so that we would use immediate energy sources (ATP&CrP), so try to keep the set in the area of 7-20 seconds depending on what kind of exercise you are doing. You should feel energetic, fast, powerful and explosive – simply great afterwards! Ready to react and jump like crazy in volleyball session! This method is one type of contrast power -exercise, in which the phosphorylation of myosin chains increases so that central nerve-system and motor units get activated greatly given faster and

stronger output power in the movements needed in volleyball, such as vertical jump.

TUESDAYS (some exceptions)

BEFORE MORNING VOLLEYBALL TRAINING (come to hall at least 30mins before volleyball time starts):

-WARM UP (CHECK ABOVE)

Mesocycle 1:

1. Leg press with one leg + press up + jumps on the box/

Jalkaprässi yhdellä jalalla+ saksityöntö + hyppy boxille

First week is reserved just to get used with movements and exercises. Chart has divided into 3 parts. Left one tells when the training session will be done. The middle part of the chart tells the volume (number reps. & series) and intensity (100% = maximal 1 repetition). Breaks between the sets have been told like "2mins." Inside the "()" is one set which should be done non-stop. Outside of "()" is the number of how many times the whole set is done, like "3 (...)" which means that this time it should be done three times. To the right part of the chart player should mark the weights used and short comment how the feeling of exercise. So this program is the training diary at the same time.*

Ensimmäinen viikko on totuttelua suoritettaviin liikkeisiin. Taulukko on jaettu kolmeen sarakeeseen. Vasen sarake kertoo harjoitteen suoritusajankohdan. Keskimmäinen palkki kertoo harjoitteen volyymin eli sarjat ja toistot ja intensiteetin eli kuorman suuruuden (100%=max 1 toisto). Sulkujen ulkopuolella oleva numero, tässä tapauksessa "3" –merkintä, tarkoittaa että koko sulussa oleva setti tehdään kolme kertaa. Sulkujen takana oleva merkintä "pal. x min" tarkoittaa palautusta SETTIEN*

välissä. Sulkujen sisällä oleva sarja tehdään aina kaikki heti peräjälkeen ilman mitään lepoja, vain tarvittava nopea siirtyminen suorituspaikalta toiselle. Esimerkiksi ensimmäisen tiistain sarja on siis 5 kertaa maastaveto 50%:lla maksimista ja heti perään yhden kerran rinnalleveto 40%:lla maksimista ja heti perään yksi iskutushyppy korokkeelle ja TÄMÄ KOKO SETTI KOLME KERTAA. Oikealla olevaan sarakkeeseen pelaaja merkitsee käyttämänsä painot sekä mahdolliset kommentit ja tuntemukset, eli esim. "60kg + 40kg, helppo ja terävä" joka tarkoittaa että maastavedossa on käytetty (50%) 60:tä kiloa ja rinnallevedossa 40 :tä kiloa.

Keywords in Finnish because it is shorter!

Translations: before morning volleyball training = ennen aamulajia

pal.=recovery / break

ti 30.10.ennen aamulajia	3*(5*50%+1*40%+1) pal.2min	
<i>Next 3 weeks neural maximal power + weightlifting + jump. Seuraavat 3 viikkoa tehdään tässä liikkeessä hermostollista maksimivoimaa ja kontrastivoimana painonnostoliike ja hyppy.</i>		
ti 6.11. ennen aamulajia	3*(2*85%+2*50%+2) pal.3min	
ti 13.11.ennen aamulajia	3*(3*80%+2*60%+1) pal.4min	
ti 20.11.ennen aamulajia	3*(1*90%+2*70%+3) pal.4min	
<i>Next week is light. Recover. Speed power. Seuraava viikko on kevyt viikko, jolloin tarkoituksena on palautua. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
ti 27.11.ennen aamulajia	3* (5*50%+0+0) pal.2min	

<i>Next 3 week is speed power.</i>		
ti 4.12. ennen aamulajia	$3*(6*30\%+1*80\%+1)$ pal.4min	
ti 11.12.ennen aamulajia	$3*(6*40\%+1*85\%+1)$ pal.4min	
ti 17.12.ennen aamulajia	$3*(6*50\%+1*90\%+1)$ pal.5min	
<i>Light, recover.Seuraava viikko on kevyt viikko, jolloin tarkoituksena on palautua. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
ti 25.12. omalla ajalla	$4*(3*50\%+2*50\%+1)$ pal.2min	

2. Throw medicine ball 3-5kg from squad to above your head 3*3 /
kuntopallonheitto ylös.

First week of January is for tests.

Tammikuun ensimmäinen viikko on testiviikko, mutta muuten hyppyä ja kehoa rasittamatonta. Hermoston on tarkoitus levätä ja kuntoutua kevään tiukkaan ohjelmaan.

Change of exercises as mesocycle changes. Liikkeet vaihtuvat mesosyklin vaihtuessa.

Mesocycle 2:

1. Back squat + jumps with bar up high + reading block jump

Takakyökky (90 astetta) + saksaushyppely tanko suorilla käsillä +lukeva torjunta hyppy (kädet ylhäällä korvien tasolla jo valmiiksi)

<i>Explosive power.</i>		
ti 8.1.ennen aamulajia	3*(2*75%+3sec*20kg+1) pal.3m.	
ti 15.1. ennen aamulajia	3*(2*80%+3sec*30kg+2) pal.4min	
ti 22.1.ennen aamulajia	3*(2*90%+3sec*40kg+2) pal.4min	
<i>Hypertrophic power.</i>		
ti 29.1.ennen aamulajia	3*(6*75%+5sec*40kg+1) pal.2m.	
ti 5.2. ennen aamulajia	3*(6*78%+5sec*40kg+1) pal.4min	
ti 12.2.ennen aamulajia	3*(6*80%+5sec*40kg+1) pal.4min	
<i>Recover.</i>		
<i>Seuraavat 2 kaksi harjoitusta ovat kevyitä, jolloin tarkoituksena on palautua, mutta toisaalta pitää hermosto aktiivisena. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
ma 18.2. omalla ajalla	4*(3*50%+3sec*20kg+1) pal.2min	
ti 26.2. ennen aamulajia	3*(2*40%+3sec*20kg+1) pal.2min	
<i>Neural maximal power.</i>		
<i>Seuraavat 2 harjoitusta ovat hermostollista maksimivoimaa, jossa säilytetään hankitut maksimivoimatasot kauden loppuvaihetta varten.</i>		

la 2.3. omalla ajalla	3*(3*90%+3sec*50kg+2) pal.4min	
ti 12.3. omalla ajalla	3*(2*92%+3sec*50sec+2) pal.4min	

2. Throw medicine ball 3-5kg from squad to above your head 3*3 /
kuntopallonheitto ylös.

VOLLEYBALL SESSION

AFTER MORNING VOLLEYBALL TRAINING:

Mesocycle 1:

3. Military press with bar / dumbbells (table) + throw basketball up using
only hands*3 (same position than in press) after every set /
pystypunnerrus edestä tangolla/ pystypunnerrus käsipainoin +
koripallonheitto

<i>Get familiar with the exercise. Totuttelua liikkeeseen.</i>		
ti 30.10.aamulajin jälkeen	3*(5*50%+3) pal.2min	
<i>Neural maximal power. Seuraavat 3 viikkoa tehdään tässä liikkeessä hermostollista maksimivoimaa.</i>		
ti 6.11. aamulajin jälkeen	3*(5*85%+3) pal.3min	
ti 13.11. aamulajin jälkeen	4*(4*90%+3) pal.3min	
ti 20.11. aamulajin jälkeen	5*(3*95%+3) pal.3min	
<i>Light week. Seuraava viikko on kevyt viikko, jolloin tarkoituksena on palautua. Tee</i>		

<i>toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
ti 27.11. aamulajin jälkeen	3* (5*50%+2) pal.2min	
<i>Speed power.Seuraavat 3 viikkoa tehdään pikavoimaa.</i>		
ti 4.12. aamulajin jälkeen	3*(6*30%+3) pal.2min	
ti 11.12. aamulajin jälkeen	3*(6*40%+2) pal.2min	
ti 17.12. aamulajin jälkeen	3*(6*50%+1) pal.2min	
<i>Light. Seuraava viikko on kevyt viikko, jolloin tarkoituksena on palautua. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
ti 25.12. omalla ajalla	4*(3*50%+1) pal.2min	

Mesocycle 2:

3. Overhead press behind the neck + throw of basketball/ Punnerrus

niskan takaa tangolla tai pystypunnerrus käsipainoin + koripallonheitto*3

<i>Speed power.</i>		
ti 8.1.aamulajin jälkeen	3*(2*75%+2) pal.3m.	
ti 15.1. aamulajin jälkeen	3*(2*80%+2) pal.3min	
ti 22.1.aamulajin jälkeen	3*(2*85%+2) pal.3min	

<i>Hypertrophic.</i>		
ti 29.1. aamulajin jälkeen	3*(6*80%+2) pal.2,5m.	
ti 5.2. aamulajin jälkeen	3*(6*83%+2) pal.2,5min	
ti 12.2.aamulajin jälkeen	3*(6*86%+2) pal.2,5min	
<i>Light. Seuraavat 2 kaksi harjoitusta ovat kevyitä, jolloin tarkoituksena on palautua, mutta toisaalta pitää hermosto aktiivisena. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
ma 18.2. omalla ajalla	4*(5*50%+2) pal.2min	
ti 26.2. aamulajin jälkeen	3*(5*40%+2) pal.2min	
<i>Neural Maximal power. Seuraavat 2 harjoitusta ovat hermostollista maksimivoimaa, jossa säilytetään hankitut maksimivoimatasot kauden loppuvaihetta varten.</i>		
la 2.3. omalla ajalla	3*(3*90%+2) pal.4min	
ti 12.3. omalla ajalla	3*(2*95%+2) pal.4min	

BEFORE EVENING VOLLEYBALL TRAINING:

WARM-UP

Mesocycle 1:

1. Leg press with 2 legs + press up + jumps with the bar / Prässi 2 jalalla + tasatyöntö + hyppy tangolla

<i>Easy start. Ensimmäinen viikko on totuttelua suoritettaviin liikkeisiin.</i>		
ti 30.10.ennen iltalajia	3*(5*50%+1*40%+1*20kg) pal.2min	

<i>Neural max power. Seuraavat 3 viikkoa tehdään tässä liikkeessä hermostollista maksimivoimaa ja kontrastivoimana painonnostoliike ja hyppy.</i>		
ti 6.11. ennen iltalajia	3*(2*85%+2*50%+2) pal.3min	
ti 13.11.ennen iltalajia	3*(3*80%+2*60%+1) pal.4min	
ti 20.11.ennen iltalajia	3*(2*90%+2*70%+3) pal.4min	
<i>Light. Seuraava viikko on kevyt viikko, jolloin tarkoituksena on palautua. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
ti 27.11.ennen iltalajia	3* (5*50%+0+0) pal.2min	
<i>Hyper+neural+speed. Seuraavat 3 viikkoa tehdään hypertrofis-hermostollista maksimivoimaa ja lyhyt kontrastivoima.</i>		
ti 4.12. ennen iltalajia	3*(6*72%+1*80%+1) pal.4min	
ti 11.12.ennen iltalajia	3*(6*75%+1*85%+1) pal.4min	
ti 17.12.ennen iltalajia	3*(6*78%+1*90%+1) pal.5min	
<i>Light. Seuraava viikko on kevyt viikko, jolloin tarkoituksena on palautua. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
ti 25.12. omalla ajalla	4*(3*50%+2*50%+1) pal.2min	

2. Throw the medicine ball / Kuntopallonheitto pään yli eteen*5kg

<i>As fast throws as possible. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
ti 30.10.ennen iltalajia	3*5 pal.1min	

ti 6.11. ennen iltalajia	3*5 pal.1min	
ti 13.11. ennen iltalajia	4*6 pal.1min	
ti 20.11. ennen iltalajia	5*5 pal.1min	
ti 27.11. ennen iltalajia	3*8 pal.1min	
ti 4.12. ennen iltalajia	3*8 pal.1min	
ti 11.12. ennen iltalajia	3*8 pal.1min	
ti 17.12. ennen iltalajia	3*8 pal.1min	
ti 25.12. omalla ajalla	4*6 pal.1min	

3. Abs hanging. Almost max reps. / Vatsat roikkuen 2*80%toistomax, eli pari toistoa voi jäädä säästöön.

example: 12+10									

e

Change the movements as mesocycle changes.

Mesocycle 2:

Step up to the bench with bar + block jump / penkille nousu tanko
niskassa + torjuntahyppy ristiaskelleella

<i>Speed power 3 weeks. Seuraavan 3 viikon ajan tehdään tässä liikkeessä pikavoimaa.</i>		
ti 8.1.ennen iltalajia	$3*(3+3*40\%+2)$ pal.2m.	
ti 15.1. ennen iltalajia	$3*(3+3*50\%+2)$ pal.3min	
ti 22.1.ennen iltalajia	$3*(3+3*55\%+2)$ pal.3min	
<i>Hyper+Neural. Seuraava 3 viikkoa tehdään hypertrofis-hermostollista maksimivoimaa.</i>		
ti 29.1. ennen iltalajia	$3*(6+6*80\%+1)$ pal.3m.	
ma 4.2. oma aika	$3*(6+6*83\%+1)$ pal.3min	
ti 12.2.ennen iltalajia	$3*(6+6*86\%+1)$ pal.3min	
<i>Light. Seuraava harjoitus on kevyt, jolloin tarkoituksena on palautua, mutta toisaalta pitää hermosto aktiivisena. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
ma 18.2. omalla ajalla	$2*(5+5*50\%+1)$ pal.2min	
<i>Neural max. Seuraavat 2 harjoitusta ovat hermostollista maksimivoimaa, jossa säilytetään hankitut maksimivoimatasot kauden loppuvaihetta varten.</i>		
la 2.3. omalla ajalla	$3*(3+3*90\%+1)$ pal.4min	
ti 12.3. omalla ajalla	$3*(2+2*95\%+1)$ pal.4min	

2. Overhead press. + Medicine ball throws over the head. /

Pystypunnerrus + Kuntopallonheitto pään yli eteen 3kg

<i>Explosive. Seuraavan 3 viikkoa tehdään tässä liikkeessä räjähtävää voimaa.</i>		
ti 8.1.ennen iltalajia	$3*(2*75\%+3)$ pal.2m.	
ti 15.1. ennen iltalajia	$3*(2*80\%+3)$ pal.2min	
ti 22.1.ennen iltalajia	$3*(2*85\%+3)$ pal.2min	
<i>Hyper+ neural. Seuraava 4 viikkoa tehdään hypertrofis-hermostollista maksimivoimaa.</i>		
ti 29.1. ennen iltalajia	$3*(6*80\%+2)$ pal.2,5m.	

ma 4.2. oma aika	3*(6*83%+2) pal.2,5min	
ti 12.2.ennen iltalajia	3*(6*86%+2) pal.2,5min	
<i>Light. Seuraava harjoitus on kevyt, jolloin tarkoituksena on palautua, mutta toisaalta pitää hermosto aktiivisena. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
ma 18.2. omalla ajalla	4*(5*50%+2) pal.2min	
<i>Neural. Seuraavat 2 harjoitusta ovat hermostollista maksimivoimaa, jossa säilytetään hankitut maksimivoimatasot kauden loppuvaihetta varten.</i>		
la 2.3. omalla ajalla	3*(3*90%+2) pal.4min	
ti 12.3. omalla ajalla	3*(3*95%+2) pal.4min	

3. Abs hanging. / Vatsat roikkuen 2*80%toistomax, eli pari toistoa voi jäädä säästöön.

esim.									
12+10									

WEDNESDAYS (SOME EXCEPTIONS)

MORNING, OWN TIME

WARM-UP

Mesocycle1:

1. Wide squad + push behind with bar + attack jump /

Leveä kyykky + tasatyöntö niskasta + iskulyöntihyppy / leveässä kyykyssä, leveä asento (lähes "sumo"), jalkaterät selvästi ulospäin, paino korostetusti kantapäillä ja jalkaterän ulkosivuilla -> jalan takaosat (pakarot ja takareidet) töihin

<i>Easy. Totuttelua liikkeeseen.</i>		
ke 31.10. oma aika aamulla	$3*(5*50\%+3*40\%+2)$ pal.2min	
<i>Speed power. Seuraavat 3 viikkoa tehdään tässä liikkeessä pikavoimaa.</i>		
ke 7.11. oma aika aamulla	$3*(5*30\%+2*50\%+1)$ pal.3min	
ke 14.11. oma aika aamulla	$3*(5*40\%+2*55\%+1)$ pal.3min	
ke 21.11. oma aika aamulla	$3*(5*50\%+2*60\%+1)$ pal.3min	
<i>Light. Seuraava viikko on kevyt viikko, jolloin tarkoituksena on palautua. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
ke 28.11. oma aika aamulla	$3*(5*30\%+2*30\%+2)$ pal.2min	
<i>Hyper + neural. Seuraavat 3 viikkoa tehdään hypertrofis-hermostollista maksimivoimaa.</i>		
ke 5.12. oma aika aamulla	$3*(6*75\%+1*65\%+1)$ pal.3min	
ke 12.12. oma aika aamulla	$3*(6*78\%+1*70\%+1)$ pal.3min	

ke 18.12. oma aika aamulla	$3*(6*81\%+1*75\%+1)$ pal.3min	
<i>Seuraava viikko on kevyt viikko, jolloin tarkoituksena on palautua. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
ke 26.12. omalla ajalla	$4*(3*50\%+2*50\%+2)$ pal.2min	

2. Overhead press with pace from legs + push back with snatch grip + medicine ball to the roof with almost straight legs (more with hands)

Vauhtipunnerrus + takatyöntö tempausotteella + kuntopallonheitto seisten suoraan ylös käsillä, jaloilla vain pieni ojennus suurella polvikulmalla

<i>Totuttelua liikkeeseen.</i>		
ke 31.10.oma aika aamulla	$3*(5*50\% + 3+3*40\%+2+2)$ pal.2min	
<i>Seuraavat 3 viikkoa tehdään tässä liikkeessä hermostollista maksimivoimaa.</i>		
ke 7.11. oma aika aamulla	$3*(3*85\%+ 2+2*70\% + 1+1)$ pal.4min	
ke 14.11. oma aika aamulla	$3*(3*87\%+ 2+2*75\%+ 1+1)$ pal.4min	
ke 21.11. oma aika aamulla	$3*(3*90\%+ 2+2*80\%+ 1+1)$ pal.4min	
<i>Seuraava viikko on kevyt viikko, jolloin tarkoituksena on palautua. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		

ke 28.11. oma aika aamulla	$3*(5*30%+ 2+2*30% + 2+2)$ pal.2min	
<i>Seuraavat 3 viikkoa tehdään pikavoimaa.</i>		
ke 5.12. oma aika aamulla	$3*(3*40%+ 2+2*40%+ 2+2)$ pal.3min	
ke 12.12. oma aika aamulla	$3*(4*40% + 2+2*45% +2+2)$ pal.3min	
ke 18.12. oma aika aamulla	$3*(5*40%+ 2+2*50% +2+2)$ pal.3min	
<i>Seuraava viikko on kevyt viikko, jolloin tarkoituksena on palautua. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
ke 26.12. omalla ajalla	$4*(6*30%+ 2+2*50%+ 2+2)$ pal.2min	

3. Incline bench press with dumbbells + medicine ball to wall / Vinopenkki käsipainoin + kuntopallon (3-5kg) heitto edestä seinään

<i>Totuttelua liikkeeseen.</i>		
ke 31.10. oma aika aamulla	$3*(5*50% + 3)$ pal.2min	
<i>Seuraavat 3 viikkoa tehdään tässä liikkeessä hermostollista maksimivoimaa.</i>		
ke 7.11. oma aika aamulla	$3*(5*85%+ 3)$ pal.4min	
ke 14.11. oma aika aamulla	$3*(5*90%+ 3)$ pal.4min	
ke 21.11. oma aika aamulla	$3*(4*92,5%+ 3)$ pal.4min	

<i>Seuraava viikko on kevyt viikko, jolloin tarkoituksena on palautua. Tee toistot nopeana ja jatkuvana eli pikavoimaa. Tee tämä vinopenkki tangolla.</i>		
ke 28.11. oma aika aamulla	$3*(5*30%+ 4)$ pal.2min	
<i>Seuraavat 3 viikkoa tehdään pikavoimaa, tee vinopenkki tangolla.</i>		
ke 5.12. oma aika aamulla	$3*(4*40%+ 4)$ pal.2min	
ke 12.12. oma aika aamulla	$3*(4*45% + 4)$ pal.3min	
ke 18.12. oma aika aamulla	$3*(4*50%+ 4)$ pal.2min	
<i>Seuraava viikko on kevyt viikko, jolloin tarkoituksena on palautua. Tee toistot nopeana ja jatkuvana eli pikavoimaa ,tee tangolla.</i>		
ke 26.12. omalla ajalla	$4*(6*30%+ 4)$ pal.2min	

Mesocycle 2:

1. Front squat + jump over the barrier / etukyykky + aitahyppy

<i>Seuraavan 3 viikon ajan tehdään tässä liikkeessä hypertrofis-hermostollista maksimivoimaa.</i>		
ke 9.1.oma aika aamulla	$3*(5*80% + 2)$ pal.2m.	
ke 16.1.oma aika, aamu	$3*(5*85% + 2)$ pal.3min	
ke 23.1.oma aika, aamu	$3*(4*90% +2)$ pal.3min	
<i>Seuraava 3 viikkoa tehdään hermostollista maksimivoimaa.</i>		

ke 30.1. oma aika aamu	$3*(3*92,5% + 2)$ pal.4m.	
ti 5.2. ennen aamulajia	$3*(2*95% + 2)$ pal.4min	
ke 13.2.oma aika aamu	$3*(2*97,5%+2)$ pal.4min	
<i>Seuraava harjoitus on kevyt, jolloin tarkoituksena on palautua, mutta toisaalta pitää hermosto aktiivisena. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
ti 19.2. ennen iltalajia	$2*(3*30% + 1)$ pal.2min	
<i>Seuraavat 2 harjoitusta ovat hermostollista maksimivoimaa, jossa säilytetään hankitut maksimivoimatasot kauden loppuvaihetta varten.</i>		
su 3.3. omalla ajalla	$3*(1*100%+1)$ pal.4min	
ke 13.3. omalla ajalla	$3*(2*90%+1)$ pal.4min	
<i>Play off –vaiheen fyysinen harjoittelu toteutetaan kokonaisuudessaan joukkueen yhteisharjoituksina, joihin ohjeet tulevat erillisinä fysiikkavalmentajalta ryhmittäin. Kauden jälkeen testataan ominaisuudet vielä kerran.</i>		

2.Incline bench press + medicine ball / Vinopenkki tangolla +
kuntopallonheitto edestä seinään

<i>Seuraavan 3 viikon ajan tehdään tässä liikkeessä hypertrofista maksimivoimaa.</i>		
ke 9.1. oma aika aamulla	$3*(8*75%+ 3)$ pal.3m.	
ke 16.1.oma aika, aamu	$3*(8*80% + 3)$ pal.3min	
ke 23.1.oma aika, aamu	$3*(8*85% +3)$ pal.3min	
<i>Seuraava 3 viikkoa tehdään hermostollista maksimivoimaa.</i>		

ke 30.1. oma aika aamu	$3*(6*87,5\%+3)$ pal.4m.	
ti 5.2. ennen aamulajia	$3*(4*90\% +3)$ pal.4min	
ke 13.2.oma aika aamu	$3*(2*97,5\%+3)$ pal.4min	
<i>Seuraava harjoitus on kevyt, jolloin tarkoituksena on palautua, mutta toisaalta pitää hermosto aktiivisena. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
ti 19.2. ennen iltalajia	$2*(4*30\% + 4)$ pal.2min	
<i>Seuraavat 2 harjoitusta ovat hermostollista maksimivoimaa, jossa säilytetään hankitut maksimivoimatasot kauden loppuvaihetta varten.</i>		
su 3.3. omalla ajalla	$3*(3*95\%+3)$ pal.4min	
ke 13.3. omalla ajalla	$3*(3*97\%+3)$ pal.4min	

BEFORE EVENING VOLLEYBALL TRAINING

WARM-UP

Mesocycle 1:

1. Back squat + push + drop jump /

Takakyykky + saksityöntö+ pudotushyppy seisaaltaan

<i>Ensimmäinen viikko lepo testien jälkeen.</i>		
ke 31.10.lepo		
<i>Seuraavat 3 viikkoa tehdään tässä liikkeessä hermostollista maksimivoimaa.</i>		
ke 7.11. ennen iltalajia	$3*(3*87\%+2*60\%+2)$ pal.3min	

ke 14.11. ennen iltalajia	$3*(2*90\%+2*70\%+1)$ pal.3min	
ke 21.11. ennen iltalaji	$3*(1*93\%+2*80\%+1)$ pal.4min	
<i>Seuraava viikko on kevyt viikko, jolloin tarkoituksena on palautua. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
ke 28.11. ennen iltalajia	$3*(5*30\%+2*30\%+1)$ pal.2min	
<i>Seuraavat 3 viikkoa tehdään hypertrofis-hermostollista maksimivoimaa.</i>		
ke 5.12. ennen iltalajia	$3*(6*75\%+2*65\%+1)$ pal.3min	
ke 12.12. ennen iltalajia	$3*(6*78\%+2*70\%+1)$ pal.3min	
ke 18.12. ennen iltalajia	$3*(6*81\%+2*75\%+1)$ pal.3min	
<i>Seuraava viikko on kevyt viikko, jolloin tarkoituksena on palautua. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
ke 26.12. omalla ajalla	$4*(3*50\%+2*50\%+2)$ pal.2min	

2. Calves / Pohkeet tangolla (smith jos käytössä) 3*8*60kg TAI 3*6*100kg
+ pohjehyppy*3, vaihtelee viikoittain

3. Abs / Vatsa taljassa RASKAITA TOISTOJA 3*8*MAX LISÄPAINO TAI 4*6
MAX LISÄPAINO, vaihtelee viikoittain

Mesocycle 2:

1. Lunges walk with dumbbells + one leg jump & careful landing to same one leg / askelkyykkävely (käsipainot lisäpainoksi) + yhden jalan hyppy ja alastulo huolellisesti joutaen myös yhdelle jalalle

<i>Seuraavan 3 viikon ajan tehdään tässä liikkeessä hypertrofis-hermostollista maksimivoimaa.</i>		
ke 9.1.ennen iltalajia	3*(6+6*80% + 6+6) pal.3m.	
ke 16.1. ennen iltalajia	3*(6+6*83% + 6+6) pal.3min	
ke 23.1. ennen iltalajia	2*(6+6*85% + 6+6) pal.3min	
<i>Seuraava 3 viikkoa tehdään räjähtävää voimaa.</i>		
ke 30.1. ennen iltalajia	3*(2+2*60% + 3+3) pal.3m.	
ti 5.2. ennen aamulajia	3*(2+2*70% + 2+2) pal.3min	
ke 13.2.oma aika aamu	3*(2+2*80% + 2+2) pal.3min	
<i>Seuraava harjoitus on kevyt, jolloin tarkoituksena on palautua, mutta toisaalta pitää hermosto aktiivisena. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
ti 19.2. ennen iltalajia	2*(3+3*30% + 2+2) pal.2min	
<i>Seuraavat 2 harjoitusta ovat hermostollista maksimivoimaa, jossa säilytetään hankitut maksimivoimatasot kauden loppuvaihetta varten.</i>		
su 3.3. omalla ajalla	3*(2+2*90% + 2+2) pal.4min	
ke 13.3. ennen iltalajia	3*(2+2*95% + 2+2)	

	pal.4min	
<p><i>Play off –vaiheen fyysinen harjoittelu toteutetaan kokonaisuudessaan joukkueen yhteisharjoituksina, joihin ohjeet tulevat erillisinä fysiikkavalmentajalta ryhmittäin. Kauden jälkeen testataan ominaisuudet vielä kerran.</i></p>		

2. Calves / Pohkeet tangolla (smith jos käytössä) YHDELLÄ JALALLA
 3*8+8*40kg TAI 3*6+6*80kg + pohjehyppy yhdellä jalalla*3, vaihtelee viikoittain

3. Abs / Vatsaliike istumaannousu-asennossa: pelkät pakarot koskee lattiaan, levypaino käsissä, mahdollisimman suorin käsivarsin kosketus sivulle lattiaan 3*10+10*10kg TAI 4*6+6*20kg, vaihtelee viikoittain

THURSDAYS (some exceptions)

BEFORE MORNING VOLLEYBALL TRAINING

WARM-UP

1. Stable Lunges with bar + 1 leg jump to box / Askelkyykky tangolla etujalkaa vaihtamatta eli koko sarjan ajan “pumpataan” toistot yhdellä jalalla täyteen ja sitten toisella jalalla, eli yksi ‘vaihto’ vain + 1 jalan hyppy korokkeelle

Totuttelua liikkeeseen. Työnnä jalalla alhaalta KANTAPÄÄN KAUTTA jotta liikkeen kohdistus osuu takareidelle ja pakaraan. Pidä kontrolli alasmenossa (pikavoimassa nopeasti myös alas), mutta ylös terävästi kantapään kautta täysillä. Hypyissä kädet mukana torjuntalähtöasennosta ja alastulo pehmeästi.

to 1.11. ennen aamulajia	3* (3+3*30% + 2+2) pal.2min.	
<i>Seuraavat 3 viikkoa tehdään tässä liikkeessä hypertrofis-hermostollista maksimivoimaa</i>		
to 8.11. ennen aamulajia	3*(5+5*80%+ 3+3) pal.3min	
to 15.11. ennen aamulajia	3*(5+5*82%+ 3+3) pal.3min	
to 22.11. ennen aamulajia	2*(5+5*84%+ 3+3) pal.3min	
<i>Seuraava viikko on kevyt viikko, jolloin tarkoituksena on palautua. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
to 29.11. ennen aamulajia	2*(3+3*30%+ 2+2) pal.2min	
<i>Seuraavat 3 viikkoa tehdään räjähtävää voimaa.</i>		
to 6.12. ennen aamulajia	3*(2+2*50%+ 2+2) pal.3min	
to 13.12. ennen aamulajia	3*(2+2*55% + 3+3) pal.3min	
to 20.12. ennen aamulajia	3*(2+2*60% + 3+3) pal.3min	
<i>Seuraava viikko on kevyt viikko, jolloin tarkoituksena on palautua. Tee toistot nopeana ja jatkuvana eli pikavoimaa. Jatkuva dynaaminen liike.</i>		
to 27.12. ennen aamulajia	2*(4+4*30%+ 2+2) pal.2min	

Mesocycle 2:

1. Lunges with leg up in back + push front + jump with dumbbells /

Pakaraliike tangolla niin (askelkyykymäinen) että takajalka on korokkeella + tasatyöntö edestä + hyppy käsipainoin korokkeelle

<i>Seuraavan 3 viikon ajan tehdään tässä liikkeessä hermostollista maksimivoimaa.</i>		
to 10.1.ennen aamulajia	$3*(3+3*80% + 2*60% + 2*80%)$ pal.3m.	
to 17.1. ennen aamulajia	$3*(3+3*85%+2*70%+2*85%)$ 3min	
to 24.1. ennen aamulajia	$2*(2+2*87% + 2*75% +2*80%)$ pal.3min	
<i>Seuraava 3 viikkoa tehdään räjähtävää voimaa.</i>		
to 31.1. ennen aamulajia	$3*(2+2*60% + 2*77,5% + 2*50%)$ pal.3m.	
ke 6.2. omalla ajalla	$3*(2+2*70% + 2*80% +2*60%)$ pal.3min	
to 14.2.ennen aamulajia	$3*(2+2*80% + 2*82,5% +2*70%)$ pal.3min	
<i>Seuraava viikko on lepo tästä liikkeestä.</i>		
20.2. ottelu. 21.2. huoltovoima, 22.2. valmistelu otteluun.		
<i>Seuraavat 2 harjoitusta ovat räjähtävää voimaa.</i>		
ma 4.3. omalla ajalla	$3*(2+2*50% + 3*75% + 2*20%)$ pal.4min	
to 14.3. ennen aamulajia	$3*(2+2*60% + 2*80% + 2*30%)$ pal.4min	
<i>Play off –vaiheen fyysinen harjoittelu toteutetaan kokonaisuudessaan joukkueen yhteisharjoituksina, joihin ohjeet tulevat erillisinä fysiikkavalmentajalta ryhmittäin. Kauden jälkeen testataan ominaisuudet vielä kerran.</i>		

AFTER MORNING VOLLEYBALL TRAINING

Mesocycle 1:

2. Bench press + medicine ball / Penkki käsipainoin + kuntopallon (1-3kg) heitto seinään rinnan päältä

<i>Totuttelua liikkeeseen.</i>		
to 1.11. aamulajin jälkeen	3* (5*30% + 2) pal.2min.	
<i>Seuraavat 3 viikkoa tehdään tässä liikkeessä hypertrofis-hermostollista maksimivoimaa</i>		
to 8.11. aamulajin jälkeen	3*(8*70% + 3) pal.3min	
to 15.11. aamulajin jälkeen	3*(8*75% + 3) pal.3min	
to 22.11. aamulajin jälkeen	3*(8*78% + 3) pal.3min	
<i>Seuraava viikko on kevyt viikko, jolloin tarkoituksena on palautua. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
to 29.11. aamulajin jälkeen	2*(6*30% +4) pal.2min	
<i>Seuraavat 3 viikkoa tehdään räjähtävää voimaa.</i>		
to 6.12. aamulajin jälkeen	3*(4*50% + 3) pal.3min	
to 13.12. aamulajin jälkeen	3*(4*60% + 3) pal.3min	
to 20.12. aamulajin	3*(3*70% +3) pal.3min	

jälkeen		
<i>Seuraava viikko on kevyt viikko, jolloin tarkoituksena on palautua. Tee toistot nopeana ja jatkuvana eli pikavoimaa. Jatkuva dynaaminen liike.</i>		
to 27.12. aamulajin jälkeen	$2*(4+4*30%+ 2+2)$ pal.2min	

Mesocycle 2:

2. Bench press + medicine ball / Penkki tangolla + kuntopallon (1-3kg) heitto seinään rinnan päältä

<i>Seuraavan 3 viikon ajan tehdään tässä liikkeessä hermostollista maksimivoimaa.</i>		
to 10.1. aamulajin jälkeen	$3*(5*80% + 3)$ pal.3m.	
to 17.1. aamulajin jälkeen	$3*(3*90% + 3)$ pal.3min	
to 24.1. aamulajin jälkeen	$3*(2*95% + 3)$ pal.3min	
<i>Seuraava 3 viikkoa tehdään räjähtävää voimaa.</i>		
to 31.1. aamulajin jälkeen	$3*(3*60% + 3)$ pal.3m.	
ke 6.2. omalla ajalla	$3*(2*70% + 3)$ pal.3min	
to 14.2. aamulajin jälkeen	$4*(1*80% + 3)$ pal.3min	
<i>Seuraava viikko on lepo tästä liikkeestä.</i>		
20.2. ottelu. 21.2. huoltovoima, 22.2. valmistelu otteluun.		
<i>Seuraavat 2 harjoitusta ovat räjähtävää voimaa.</i>		

ma 4.3. omalla ajalla	3*(3*40% + 3) pal.2min	
to 14.3. aamulajin jälkeen	3*(3*50% + 3) pal.2min	
<i>Play off –vaiheen fyysinen harjoittelu toteutetaan kokonaisuudessaan joukkueen yhteisharjoituksina, joihin ohjeet tulevat erillisinä fysiikkavalmentajalta ryhmittäin. Kauden jälkeen testataan ominaisuudet vielä kerran.</i>		

BEFORE EVENING VOLLEYBALL TRAINING

WARM-UP

Mesocycle 1:

1. Squat (halfway) + block jump / Puolikyykky + torjuntahyppy paikaltaan

<i>Totuttelua liikkeeseen. Kannattaa käyttää eri kenkiä kuin salissa jotta kengät eivät kulu vaimennuksista puhki kun on paljon painoa tangossa. Myös mahdollinen tukivyön käyttö tässä suositeltavaa.</i>		
to 1.11. ennen iltalajia	3* (3*60% + 2) pal.2min.	
<i>Seuraavat 3 viikkoa tehdään tässä liikkeessä hermostollista maksimivoimaa</i>		
to 8.11. ennen iltalajia	3*(3*85% + 2) pal.3min	
to 15.11. ennen iltalajia	3*(3*87% + 2) pal.3min	
to 22.11. ennen iltalajia	2*(3*90% + 3) pal.3min	
<i>Seuraava viikko on kevyt viikko, jolloin tarkoituksena on palautua. Tee toistot nopeana ja jatkuvana eli pikavoimaa.</i>		
to 29.11. ennen iltalajia	2*(5*30% + 2) pal.2min	
<i>Seuraavat 3 viikkoa tehdään hypertrofis-hermostollista voimaa.</i>		
to 6.12. ennen aamulajia	3*(6*75% +2) pal.3min	

to 13.12. ennen aamulajia	3*(6*78% +2) pal.3min	
to 20.12. ennen aamulajia	3*(6*85% +3) pal.3min	
<i>Seuraava viikko on kevyt viikko, jolloin tarkoituksena on palautua. Tee toistot nopeana ja jatkuvana eli pikavoimaa. Jatkuva dynaaminen liike.</i>		
to 27.12. ennen aamulajia	2*(4*40% + 2) pal.2min	

2.Abs eccentric / Vatsaliike: jalkojen eksenttrinen lasku hartianojasta hitaasti 3*5-8

Mesocycle 2:

1. Halfway front squat + agility with bar + block steps and jump /

Puolietukyykky (muurame gym) + saksausliike jaloilla mahd.nopeasti tanko suorilla käsillä + nopea torjuntaliike ja hyppy laitatorjunnassa sivulaukka- askeleilla

<i>Seuraavan 3 viikon ajan tehdään tässä liikkeessä hypertrofis-hermostollista maksimivoimaa.</i>		
to 10.1. ennen iltalajia	3*(6*75% + 3sek*20kg + 2) pal.3m.	
to 17.1. ennen iltalajia	3*(6*80%+4sek*20kg+2)3min	
to 24.1. ennen	2*(6*82% + 3sek*20kg +2)	

iltalajia	pal.3min	
<i>Seuraava 3 viikkoa tehdään pikavoimaa.</i>		
to 31.1. ennen iltalajia	3*(3*60% + 4sek*30kg + 2) pal.2m.	
ke 6.2. omalla ajalla	3*(4*50% + 4sek*30kg +2) pal.2min	
to 14.2. ennen iltalajia	3*(5*40% + 4sek*30kg +2) pal.3min	
<i>Seuraava viikko on lepo tästä liikkeestä.</i>		
20.2. ottelu. 21.2. huoltovoima, 22.2. valmistelu otteluun.		
<i>Seuraavat 2 harjoitusta ovat hermostollista voimaa.</i>		
ma 4.3. omalla ajalla	3*(2*90% + 4sek*40kg + 2) pal.4min	
to 14.3. ennen iltalajia	3*(2*92% + 4sek*40kg + 2) pal.4min	
<i>Play off –vaiheen fyysinen harjoittelu toteutetaan kokonaisuudessaan joukkueen yhteisharjoituksina, joihin ohjeet tulevat erillisinä fysiikkavalmentajalta ryhmittäin. Kauden jälkeen testataan ominaisuudet vielä kerran.</i>		

2. Abs / Istumaannousu lentopallo reisien välissä lisäpaino niskan takana 4*8*10-25kg

FRIDAYS (or one day before game)

- before short volleyball session starts, you can do:

Mesocycle 1: push light / työntö kevyt 3*2*40%

Mesocycle 2: squat / kyykky 3*2*50%

This for slower players. Tämä sopii erityisesti hitaille ja "diesel" -tyypeille joille on hyvä pitää hermosto aktiivisena päivää ennen peliä.

GAMEDAYS (home games especially)

This exercise is optional. It is suitable for slow players, who needs to "wake up" their body and muscle-nerve system well before explosive performance.

55 mins before game starts:

-halfway squat / puolikyykky 2*3*70% or

-push up / työntö 2*2*40%

Weekly program (game on Saturday or Sunday):

Exercises for time: 29.10.-27.12 2012	Before morning volleyball training:	After morning volleyball training:	Anytime during this day:	Before evening volleyball training:	After the eve. volley. train.
mondays	-	-	1)Pro-active/maintain. training	-	-
tuesdays	-warm-up (check instr.) + own individual lower body exercises + core (1,2)	-own individual upper body exercise (3)		-warm-up + own individual lower body exercises + core (1,2,3)	Cool- down Check the instruction
wednesdays	Own whole body	individual power	whole training!	-warm-up + own individual lower body exercises + core (1,2,3)	Cool- down
thursdays	-warm-up + own individual lower body	-own individual upper body		-warm-up + own individual lower body	Cool- down

	exercises + core (1,2)	exercise (3)		exercises + core (1,2,3)	
fridays	-	-	walking outside (check. Nutrition)	-warm-up + own individual speed power exercise if needed	-Cool- down