International Tennis Federation

COACHING & SPORT SCIENCE REVIEW

The Official Coaching and Sport Science Publication of the International Tennis Federation

Editorial

Welcome to issue 47 of ITF Coaching and Sport Science Review, which is the first edition of 2009. This issue includes articles on a range of topics including vibration and periodized training methods, an overview of ethics in tennis, and an article which discusses the various advantages and health benefits of tennis in the adult population.

The ITF is pleased to announce that the 16th ITF Worldwide Coaches Conference 2009 will take place at the Velódromo Lluis Puig, Valencia, Spain from Friday 30th October to Tuesday 3rd November 2009. The event will be organised by the ITF in conjunction with the Real Federación Española de Tenis and Tennis Europe. It is the second time the event has been held in Spain and the theme of the Conference is 'Developing Competencies for Elite Players and Coaches'.

Confirmed speakers for the Conference include:

- Albert Costa, Spanish Davis Cup Captain and former French Open Champion
- Alex Corretja, former World No.2 and Davis Cup Champion
- Bruce Elliott, Professor of Biomechanics, University of Western Australia, Australia
- José Higueras, Director of Player Development, USTA
- Machar Reid Ph.D, Head of Sport Science, Tennis Australia
- Steven Martens, Player Director, LTA

Velódromo Lluis Puig, Valencia, Spain

More details about Conference can be found on the ITF Coaching website (http://www.itftennis.com/coaching/) or on the dedicated conference website (http://www.itfcoachesconference.com/2009/). Furthermore, the ITF is calling for the submission of abstracts to be presented as part of the Free Communication Applied/Scientific sessions. They will be in the lecture room and the duration of each presentation will be 15 minutes maximum including time for questions. For more information on the Free Communications and instructions for authors please visit: http://www.itfcoachesconference.com/2009/node/16.

The ITF website www.tennisicoach.com continues to grow and include articles and presentations from tennis conferences worldwide. The latests additions include: The 2008 ITF Play and Stay Seminar, the 2008 Central American and Caribbean Coaches Conference, plus player footage from the 2009 Davis Cup ties in USA and Spain.

Finally, we hope you enjoy edition 47 of Coaching and Sport Science Review.

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Vibration training in elite tennis

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ITF Coaching and Sport Science Review 2009; 15 (47): 2 - 4

ABSTRACT

Vibration is a modern means of strength training to be used in different areas of sport performance, such as strength training, stretching, relaxation and massage. In order to use it properly it is essential to know the fundamental mechanism behind and to consider safety considerations esp. in case of an intensive strength training. Carefully planned, vibration training can serve an important role in tennis conditioning by improving pre-activation of muscles, jumping and stroke performance as well as supporting a faster regeneration. Hints for a successful training practice are given and illustrated in the article.

Key words: Vibration training, conditioning training, tennis performance.

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INTRODUCTION

In nowadays strength training there is a clear tendency for shorter training times and at the same time a most effective output. There are different possibilities to reach this goal. Various stategies of intensification such as exhaustive 1 set training with weights, electromyostimulation and vibration training are examples for modern strength training methods. In this article the focus shall be on the vibration stimulus and its practical use in tennis. Many different investigations show good results with regard to strength dependent parameters such as maximal force, speed strength, power and speed (Kleinöder et al. 2005). Moreover, preactivation before a training unit, coordination, massage and relaxation after it are other fields of use in sport performance. However, in order to use the vibration stimulus properly the training design should be based on results of scientific investigations (Cardinale & Wakeling 2005). Consequently, in the focus of this article shall be the transfer of empirical results into a training conception. This includes a preparation period with safety guidelines and leads to various training suggestions for the use of vibration in tennis.

Mechanism of vibration training

Vibration training is based on a rhythmic, neuromuscular stimulation of muscles and its connected elements such as bones, ligaments, tendons etc. Most often, vibrations are induced over a platform into the whole or parts of the body. With a certain amplitude (e.g. 1-5mm) and a certain frequency (e.g. 20-50Hz) the body or a part of it is accelerated up and down. The oscillations result in continuous length changes of the trained muscles and accordingly cause reflex activities called the tonic vibration reflex. The special conditions of loading allow various possibilities of training dependent on the muscle length and stiffness. Spitzenpfeil (2000) suggests a medium pretension in strength training, a stretched muscle for flexibility training and a low tension for all kinds of relaxation with vibration. Improvement of maximal force and speed are most often produced under the condition of dynamic movement with an additional load of approx. 50% of maximal force up to approx. 80%. This results in the combination of two mechanical stimuli, namely the traditional weight training with masses and the additional vibration. The advantage lies in a short and at the same time intensive training due to the innervation of more motor units with a higher frequency compared to traditional weight training alone (Mester et al. 2003). Without additional weights, the vibration stimulus can be considered as a neuronal warm-up of muscles when used over a very short period of time (approx. 30s).

If the vibration stimulus falls on stretched muscles vibration leads to a reduction of muscle tone due to a domination of the Golgi tendon organs which reduce muscle stiffness reflectory (Goebel et al.). An improved blood flow and warm up effect through constant muscle massage are other explanations for better stretching performance. Moreover, a reduced pain sensitivity also supports a greater range of motion and a better stretching performance since it makes practice less painful. With regard to the cool down the vibration stimulus put on exhausted muscles has a relaxing effect comparable to a muscle massage.

Safety considerations

Safety considerations are a basic condition in order to minimize the risk potential of acceleration training. Although widely used in medical areas (e.g. osteoporosis, physiotherapy) everybody should have a medical check before vibration training. As a general rule it can be said that noone should perform intensive vibration training when seriously ill (e.g. infections, tumors). Contraindications given in literature are (cp. Griffin 1994): bad immune status, thrombosis, cardiovascular illnesses, pacemaker, epilepsy, pregnancy, artificial limbs.

In the context of training performance, it is of main importance to avoid high transmission factors to the head. This means that the acceleration induced into the body should not reach the head and brain (Kleinöder et al. 2003). This can cause a sensory mismatch and result in symptoms like nausea.

Therefore, please note the following advice:

- Do not stand stiff on the vibration platform.
- Do not lie with you whole back/abdominals on the vibration platform.
- Do not perform each exercise over a long time interval (greater 1 min.)

High transmission factors e.g. occur when standing with stiff legs and fixed upper body on a platform. In this case the head is moving up and down in a very fast way and athletes are thus unable to see clearly; training practice should be stopped immediately. However, it is easy to avoid this by just bending the legs and raising the heels a bit at the same time. Dampening of acceleration to the head becomes more difficult when big segments of the body like the back are in continuous contact with the platform. Therefore, at the beginning certain exercises which stimulate muscles near the head or big parts of the torso should also be avoided since damping becomes more difficult then.

In summary it may be said that it is very important to have a competent introduction in the safety guidelines when starting with vibration strength training.

Training conception

Vibration training is discussed controversely in literature and many factors are responsible for strongly diverging results. Different vibration generators, different forms of vibration (whole body and local), different amplitudes and frequencies, different training plans as well as different length of studies and different tests which more or less fit to the chosen training design deliver an explanation for this. Moreover, own investigations have shown that a retest after 2 or more weeks

after a vibration training period is important in order to find out late training effects (Mester, Kleinöder & Yue 2006). Since vibration training in the sense of strength training is a very intensive training form athletes should only spend short intervals of time on a platform. A whole body training with classic training design (3 sets, 15 repetitions) using different vibration generators can cause overtraining symptoms and a dramatic loss of maximal force temporarily. Using high amplitudes (e.g. 4mm amplitude) at the beginning also resulted in a loss of speed and jumping performance (Mester, Kleinöder & Yue 2006). Frequency is another important factor controversely discussed in literature. Lower frequencies (20 Hz) may be more effective for the muscle stimulation but at the same time mean more stress for other inner organs. As a training consequence we recommend not to use frequencies lower than 20 Hz esp. when performing whole body vibration. An exemplary strength training plan for tennis (see illustrations below) should involve exercises for the leg muscles standing on a platform, proprioceptive training (standing on 1 leg), dynamic leg work like tapping and jumping, local vibration (lunges) and whole body vibration (e.g. squats).

In addition to this, own investigations offered highly individual adaptations with identical training designs (Kleinöder et al. 2005). Therefore in the following there will be a general framework for vibration training and suggestions for individual training. Key factors for successful vibration training are:

1. Learn technique of whole body and local vibration.

2. Use different fields of vibration training: strength training, stretching, coordination, relaxation.

3. Find static and dynamic exercises for each field with reference to tennis.

4. Vibration strength training is of short duration (e.g. 10-15 min.)

5. Start vibration strength training with low amplitude (e.g. 2mm)/high frequency (e.g. 40Hz),

6. Progress later (e.g. after 1 month) to high amplitude/high frequency to the very intensive combination high amplitude/low frequency.

7. When advanced, try progressive vibration training with additional weights.

8. Find out the individual best mixture.

Vibration can easily be used for warm-up using short training times (e.g. 1 set 30 s as a neuronal stimulation and preparation for fast leg work and strokes.

Fig. 1 and 2: Preactivation legs and arms

Reactivity can also be supported by additional stimulation through the platform. Examples for this can be seen in pictures 3 and 4.

Fig. 3: Plyometrics intensified by vibration (Left)

Fig. 4: Coordination and proprioception training (Right)

Coordination in the sense of proprioception can be trained as well. Here the benefit is the high demand on the receptors due to the fast moving platform. This can be seen in fig. 4.

Another field of vibration is strength training. Here the vibrations are either used in combination with the own body weight or with additional loading. Since both forms are very intensive no more than two units/week should be performed. If doing push-ups the one-handed variation is recommended since transmission factors to the head are easy to deal with.

Fig. 5-7: Vibration strength training (above)

After a hard training unit on the court stretching gets supported due to the constant vibration stimulus which improves circulation and loosens muscles up. The pain threshold goes up due to stimulation of the nociceptors, too.

Massage also is a good possibility for a better cool down since it helps to support relaxation of muscles as well.

Fig. 8 and 9: Stretching with vibration

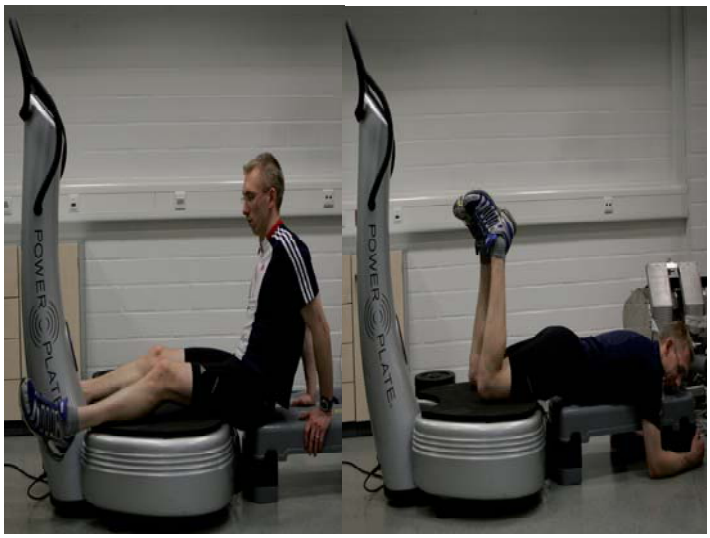

Fig. 10 and 11: Massage of leg muscles

Due to training intensity and purpose, vibration can easily be integrated in daily training practice in the sense of relaxation, warm-up or cool down. However, we can conclude so far that strength training with vibrations is very intensive, can be very effective but needs meticulous planning. In general, athletes should not implement vibration strength training as a new training method in the competition phase since the adaptational response of each athlete is still unknown and most often must be individually adjusted. Therefore it is recommended to start early in preparation phase first learning all safety considerations, the correct movement technique and many exercises. For the start it is useful to implement vibration as 1 set training within a traditional strength training unit or doing short strength vibration training units (max. 20 minutes) with 1 or 2 sets for each muscle group 2 times a week. All exercises should be performed with moderate acceleration and operated with low amplitudes (e.g. 2mm) and moderate frequencies (e.g. 30-40 Hz). Athletes should evaluate their training protocol using the Borg scala.

SUMMARY

There are many fields of vibration use in tennis, such as strength training, stretching, coordination and relaxation. On the basis of safety instructions and correct exercise technique it can be integrated alone or in combination with other training methods. The big advantages of vibration training can be seen in the short training time, the attractivity and the high effectivity when used properly. The reader must understand that vibration as an intensive strength training method needs careful integration in the periodization of tennis players. Therefore it is important to start in the preparation period in order to find out the individually best loading. Tennis players should use a training frequency of 2 training units/week in order to have enough regeneration intervals. Although everybody has to find out the optimal amplitude/frequency pattern and training time, constant testing helps to diagnose overtraining phases due to vibration training or the general structure of tennis and conditioning training. When used as a warm-up, cool-down, stretching or relaxation method, it is less difficult to use and to integrate vibrations into daily training practice. Last but not least it can be concluded that vibration training should find a proper and constant place within the periodization of tennis.

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Progressive tennis: 5-7 year old development

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ABSTRACT

This article outlines the initial steps of development for 5-7 year olds on a 'Red' 1/2 Court. The starter skill of rallying has many components that can be systematically grouped into 'Skill Blocks'. These blocks can be used by coaches to ensure a solid foundation is built tactically and technically. To maintain a Game-based Approach, coaches can move back and forth from skill block activities to rallying (called the 'accordion') .

Key words: Rally, projection, reception, skill blocks, 1/2 Court (36 foot court).

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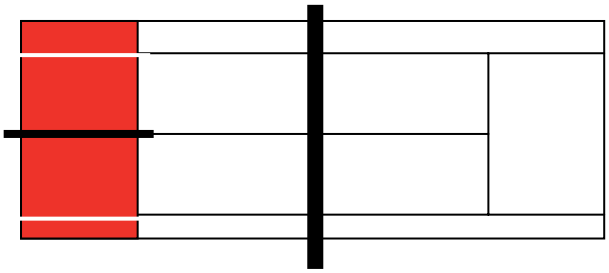
INTRODUCTION

In Canada, the 'Red, Orange, and Green' progression of development is called Progressive Tennis. The system of scale appropriate racquets, courts, balls, and competition, gives tremendous advantages for developing the technical and tactical foundations of tennis. This article will focus on developing 5-7 year olds on a ½ Court (36 foot court).



½ Court / 36 foot court (above)

Even though this article is in reference to ½ Court players, the same philosophy and methodology would be used with starter ¾ Court players (or a starter adult).

Before starting the development process, it is important for a coach to decide the methodology they intend to use. Why is this significant? Because, every path a coach takes has different consequences on the learner. Most coaches realize that the game has changed. This has lead to the 'stuff' they coach being different (e.g. modern techniques). What is less known is the process of coaching has also evolved as the ways people learn and process information is researched.

Traditional tennis instruction started with the philosophy of 'teach the basic strokes'. The first lesson would start with an idealized model of the forehand that the coach demonstrated and everyone copied. The goal of the lesson was to conform students to the model of the stroke.

All the new information, coming from the best coaching practices, from the top tennis nations, point to another method that is far more effective (in contrast to the one described above). The Game-based Approach (GBA) comes at learning tennis from another angle. It is not about strokes, but rather connecting the tactics and techniques of play.

The philosophy is not 'teach the basic strokes' but 'play the game', and help players learn the tactics and techniques to play more successfully (which includes strokes).

We will outline the basic steps beginning players would perform to learn tennis in a GBA and contrast that with a typical traditional lesson process.

COORDINATION IS THE FOUNDATION

The rule for the best long-term development (that is the best perspective to have when developing a 5-7 year old player) is, "develop and athlete first, a tennis player second". A solid foundation of coordination skills that include running, throwing, catching, jumping, etc. is invaluable for future success in tennis.

There is plenty of literature and videos on this kind of development. It should be included at the beginning of every child's training sessions. However, this article will focus on tactical/technical development.

What are the First Steps in Learning to Rally?

In traditional coaching, the first step is to learn the forehand. In a GBA, tactics come first, and the first tactic a player needs for success in tennis is to keep the ball in play consistently. Tennis is a game of errors.

Traditional coaches would typically use basket feeding to introduce the forehand technique. In a GBA, players are most often in 'live ball' situations exchanging with each other. Basket feeding is used in a GBA but not for developing beginner rally skills.

A traditional coach might modify the feeding (feed by hand) to simplify the skill if the students were having trouble (the students would be on the baseline). As a further simplification, some coaches may place them on the service line (commonly however, they would still aim for sending their strokes to the opposite baseline).

The main points of emphasis would be the stroke techniques involved in performing the whole swing shape. The techniques would be 'chained' together in sequence (first preparation, contact, then follow-through).

By contrast in a GBA, the game would be scaled down to whatever level is required for the players to experience success. To develop the tactic of consistency, the first step in a GBA would be to learn to "Rally" (groundstroke exchange).

Skill Blocks for Rallying

To develop solid rally skills, the elements that improve play come in 3 main 'Skill Blocks'. The coach chooses which skills from each block are required to improve the player.

Block #1: Tracking Catching and Throwing Skills:

For improving perception, reception, and understanding how to feed the ball to a partner for future practice (If players learn to send the ball to each other, they dramatically increase the potential repetition for practice). Overhand throwing is also developed as a foundation for the serve.

Block #2: Racquet Skills:

For improving centering and creating a good impact point in relation to their body as well as having a stable racquet through the hitting zone and controlling the ball.

Block #3: Body Coordination Skills:

For improving the linkage of using the legs, body and arm together (Players typically start with an, 'arm-only' style of play).

An astute coach or parent may say, "Hold on, isn't there a missing block? Shouldn't footwork be a block as well?" The answer is footwork isn't a separate skill development block. It is so important that it is in every block. All skills progress from 'static' (not much movement) to 'dynamic' (done with movement).

Self Rally to Develop Technique

The secret to rally development is to understand that a rally is an equation:

Br = Bs (Ball Received equals Ball Sent)

It is a neutral exchange. There is a reception and a projection that are both of equal importance.

The 'glitch' that occurs in traditional coaching is the inequality of the reception compared to the projection. Typically, the coach sends an easy to receive ball (sometimes being so accurate with their feed that they actually hit the player's racquet). The player, on the other hand, is encouraged to whack the ball anywhere into the court.

The challenge is, this inequality transfers poorly when the player goes into the 'real world' and tries to rally with partners. In reality, the starter players should develop their reception skills more than their projection to truly gain consistency.

To ease into learning how to rally, players need to exchange the ball in the lowest pressure and simplest situation available. This would be for a player to rally with themselves (Self-rally).

The task of self-rallying is used to help players learn how to organize themselves around the most important moment of any tennis shot, the Impact Point. Self-rally allows for easier development of:

• An 'ideal' Impact Point (waist level, slightly out front, comfortable distance from the body)

• Body position (sideways with a neutral stance is recommended for starter players)

• Adjustment steps to maneuver around to create the ideal Impact Point

• Racquet work to control the ball's height, direction and speed

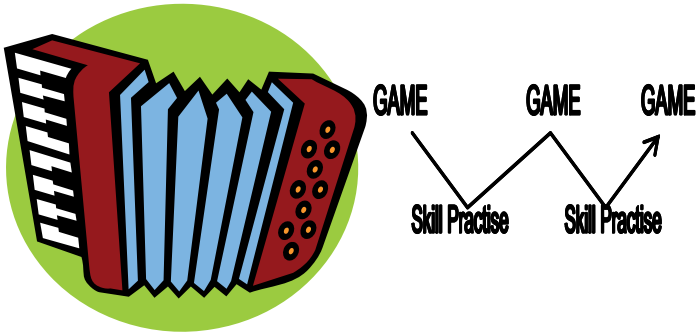
A groundstroke self-rally drill would consist of the player continuously tapping the ball up after it bounces on the ground (usually sending it just above head level to anticipate the future skill of sending the ball up and over the net). Rather than 'chaining' the skill in sequence (preparation, hit, follow-through), the groundstroke skills (both FH & BH) would be 'shaped' from the impact point. (e.g. "Here is how you must adjust your feet to organize yourself around a good impact that is at waist level, slightly out front, and a comfortable distance from your body".)

Technical fundamentals being demonstrated in this self-rally

The 'Accordion' Method of Skill Building

The Skill blocks build on each other however, coaches should avoid doing the first block completely then the next, then the next, etc. The goal is to have players engage in play quickly.

Coaches should 'flip-flop' back and forth between having players play the game (serve, rally, score or simply exchanging at the initial levels), improving skills by applying Skill Block activities, and return to playing. This going in and out from play, to practice, to play, is what I call the 'Accordion' method.



'Accordion' method

For example, in a training session for groundstrokes, players would be paired for rallying together. The coach would see the quality of their technique during their exchanges.

If they had difficulties with a stable, laid-back wrist (Racquet Skills Block #2), the coach would then gather the players for an exercise to improve that aspect of their technique (e.g. rolling the ball along the ground). After the exercise, they would return to exchanging and incorporate the improved technique.

Using this method speeds a players' progress by maintaining the fun of play. It also speeds learning by 'Chunking' skills into bit-sized pieces that are easily assimilated. Chunking is a way of sequencing skills in harmony with the way children learn. If a skill is learned, practiced a little, and then left (to do other things), the skill is like a seed that germinates in a child's body. This is more effective than spending a long period on one skill.

CONCLUSION

We have explored the first steps and practice activities required to get 5-7 year olds on a firm tennis foundation. This process is quite different from the traditional 'ball feeding' method coaches have commonly employed however, it is much more effective at developing rally fundamentals. This method is in total harmony with the ITF Tennis… Play and Stay initiative.

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The right thing to do

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ABSTRACT

This article reviews ethical principles and conduct for tennis coaches. Key terms are defined and the aim and elements of the ITF Code of Ethics for Coaches discussed. Suggestions for coaches as to how they might be role models and mentors in positively shaping players' characters are highlighted.

Key words: Ethics, ethical principles and conduct, coaches code of ethics.

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INTRODUCTION

The moment of victory is much too short to live for that and nothing else (Martina Navratilova).

While the influence of coaches on an athlete's performance is well documented (Martens, 2004), the potential for coaches to shape an athlete's character is less well recognised and understood. An athlete's character has become increasingly of critical significance in tennis in light of recent extensive media coverage of allegations of unethical conduct that includes match fixing, gambling, abuse of officials, sexual misconduct, cheating and doping. In order to explore the role of the tennis coach in shaping a player's character, it is important to first define relevant key terms.

WHAT ARE ETHICS?

The word ethics comes from the Greek word, 'ethos', which means the essence of one's character. Accordingly, ethics refers to the ultimate values, convictions and principles one holds and is about respect, sportsmanship, responsibility, honesty, safety, professionalism, integrity, justice, fairness, equity and 'doing the right thing' (Australian Sports Commission, 2005).

The focus of ethics is on what we ought to do in a particular situation and how we ought to live our life in general. The fundamental ethical question is therefore 'What should I do?". The answer to this question is often far from simple! It may often involve individuals investing considerable time considering, soul-searching, researching and/or discussing issues. Further, individuals are thought to vary in their ability, willingness and commitment to make ethical decisions and conduct themselves ethically.

What is Ethical Conduct?

Building on the definition of ethics, 'ethical conduct' refers to behaving respectfully, responsibly and with integrity when considering all issues or matters. As such, the important elements of ethical conduct include developing trust, integrity, fairness and equal opportunity for all (Australian Sports Commission, 2005).

Given the position of power, control and trust held by coaches, it is not difficult to understand why coaches must be beyond reproach in the execution of their coaching responsibilities. To this end, international and national sporting associations support, and actively encourage, the adoption of a code of ethics for coaches.

What is a Code of Ethics for Coaches?

A Code of Ethics for Coaches defines what is considered good, proper and right conduct for coaches. It formalises a set of core values and, as such, is designed to help coaches evaluate issues by providing guidelines as to what constitutes "the good and right thing to do". Further, a Code of Ethics for Coaches can also be used as a benchmark to assess whether certain conduct by coaches is acceptable (Coaching Association of Canada, 2005).

The International Tennis Federation (ITF) has developed a Code of Ethics for Coaches that has been adopted (and in some case adapted such as Tennis Australia Coaches Code of Conduct) by its affiliated National and Regional Tennis Associations. It has as its primary goal the welfare and protection of the individuals and groups with whom coaches work and, accordingly, the code is designed to provide coaches with:

- A framework and set of values within which to build a professional career
- Guidelines to adopt in everyday conduct, thinking and planning and for the resolution of ethical dilemmas

In reviewing the ITF Code of Ethics for Coaches it is apparent that the contents of the code are consistent with those of a number of well recognised codes for coaches (e.g., Coaching Association of Canada; United States Olympic Committee Coaching Ethics Code) in embracing the fundamental values of safety, responsible coaching, engaging in relations with integrity, respecting players and honouring sport. These values can be expressed as five core ethical principles as illustrated in Tables 1 and 2.

Table 1. General Ethical Coaching Principles

Ethical Principle	Brief Description
Safety & Well-being of Players	Coach expected to optimise safe and fun learning/competitive environment and protect player(s) from harassment, discrimination and abuse.
Responsible Coaching	Coach's teaching expected to benefit players, and society in general, and to do no harm. Coach expected to be competent, responsible and strive to maintain high standards of excellence in his/her work
Respect for Players	Coach expected to respect the fundament rights, dignity and worth of player(s)
Integrity in Relationships	Coach expected to be honest, sincere and honorable in relationships with others
Honouring Sport	Coach expected to recognise, act on and promote value of his/her sport to individuals, teams and society in general

Table 2. Ethical Principles Underpinning the ITF Code of Ethics for Coaches and Corresponding Coach Conduct/Expectations

Principle	Standards of Conduct Expected of Coaches (noting specific item in ITF Code of Ethics for Coaches)
1. Safety & Well-being of Players	• Use appropriate training methods [10] • Set tasks appropriate to age, skill level etc [11] • Avoid sexual intimacy [12] • Avoid compromising situations [13] • Discourage drugs, alcohol, tobacco and illegal substances [14] • Do not exploit coaching relationship for personal gain against player's best interests [19]
2. Responsible Coaching	• Treat all players with respect at all times. Be honest and consistent. Honour promises and commitments [1] • Provide feedback being sensitive to player needs and avoid overly negative feedback [2] • Recognise player's right to consult with other coaches/advisors. Co-operate fully with specialists [3] • Encourage player independence and taking own responsibility [5] • Recognise individual differences and focus on player's long-term interests [16]Set challenges that are achievable and motivating [17] • When asked to coach player, ensure any previous coaching arrangement has ended [22]
3. Respect for Players	• Treat all players fairly regardless of gender, race, religion, culture etc [4] • Involve in decision-making [6] • Respect player's goals & set realistic goals [15] • Respect confidentiality [7] • Encourage climate of mutual support [8] • Encourage player's respect of others and self [9]
4. Integrity in Relations with Others	• Respect other coaches and act accordingly [21] • Be honest and ensure qualifications are not misrepresented [25] • Be open to other's opinion and willing to learn and develop [26]
5. Honouring Tennis	• Act as role model to promote game with highest standard of personal conduct and project favorable image [18] • Accept and respect role of officials to ensure competition is fair and in accord with rules [23] • Know and abide by tennis rules, regulations and standards and encourage players to do so. Accept both letter and spirit of the rules [24]

The Ethical Decision-Making Process

Coaches are required to make a myriad of decisions on a daily basis. Some of these decisions will require little or no time. Others, and particularly in the case of those with ethical implications, may require deliberation and courage to resolve. These can be emotionally stressful for a coach. However, regardless of the complexity of the issue or matter at hand, the following basic steps (Table 3) typify the approach a coach might adopt to reach an ethical outcome.

Table 3. Ethical Decision-Making Model for Coaches (adapted from Daly, 2005)

Ethical Decision-Making Process
1. Define issue/dilemma
2. Identify players, support persons, teams, clubs, officials etc involved and affected by decision(s) that may be made
3. List all possible solutions
4. Evaluate alternative solutions to determine if one or a combination of solutions stands out as being respectful, honest, responsible, fair and safe. Take into account short and long term risks and consequences
5. Apply the 'Sunlight' test – i.e., "Can the ethical decision about to be made stand scrutiny by anyone, particularly those most affected by the decision". All decisions should be transparent – e.g., how would you feel if someone who you highly respected knew about your decision?
6. Make decision taking responsibility for consequences and determine best way to communicate decision to relevant stakeholders
7. Take appropriate action, as warranted and feasible, to prevent or minimise risk of future occurrences of problem issue/dilemma (e.g., communicate and problem solve with other coaches; changes in procedures)

Table 3 (point 5) highlights the 'Sunlight' test (i.e. proposes decision should be able to stand scrutiny by anyone) as a good guide to ethical decision making. Another popular guide to ethical decision making is the 'Golden Rule' which appears to have universal appeal and application. This rule proposes that one always treats others as you would like them to treat you. It is of little difference if coaches adopt the 'Sunlight' test or 'Golden Rule'. The adoption of either, or both, reflects an ethical approach to ethical decision-making!

Rewards for Ethical Conduct

Coaches are continually challenged to make tough decisions in an environment that frequently focuses on 'winning' ('by any means or at any cost'). For example, should a coach insist on an injured player competing in order to attempt to secure a tournament or team victory? Should a coach encourage a player to accept apparent incorrect umpiring decisions?

Paradoxically, in committing to a code of ethics, and making ethical choices, coaches and their players can always be winners irrespective of match outcomes. How is this so? This short poem suggests an answer:

You may fool the whole world down the pathway of life

And get pats on your back as you pass

But your final reward will be heartaches and tears

If you have cheated the man in the glass

(Dale Winsbora cited in Josephson Institute, 1998)

Most importantly for coaches, the ultimate reward for ethical conduct is a reputation for integrity, trust and character. One only needs to look at some of our sport's legend coaches – for example Tony Roche, Billie

Jean King and Darren Cahill – to appreciate the enviable reputation coaches can achieve in recognition of a lifelong commitment to ethical practices. As noted by Billie Jean King (2008) in her recently published book.

When it comes to issues of integrity, it is most important that you can be at peace with yourself when your head hits the pillow every night. For me, that means living true to my principles and being responsible for my own actions. Do not worry about what everyone else thinks: focus on what you believe to be good and right. As my mother (and Shakespeare) always says, 'To thine own self be true'". (p. 156-156)

And what about players: do players benefit from working with an ethical coach? Unquestionably the answer is again a positive one. In providing an ethical environment – one that is fair, safe, fun and inclusive - to learn and play the game, a coach provides a player with the best chance of becoming a well-rounded, self-confident, competent and productive individual with an enduring love for the game. Surely this is the ultimate victory for both player and coach!

WHAT CAN COACHES DO TO BECOME ETHICAL ROLE MODELS AND MENTORS?

There is enormous potential for coaches to act as positive role models and mentors in helping to shape a player's character and instill precious values (King, 2008). Granted coaches are not the only influence on players, but they can be significant ones in the tennis community together with other influences including parents, peers, support persons, media and player agents. So what can coaches do to embrace this opportunity and responsibility to become ethical role models? Here are several suggestions:

1. Commit to the ITF Code of Ethics for Coaches (or adapted version developed by your tennis club or National Association)

2. Create an 'Ethical Success' list – at the end of each day write down three decisions/actions you are most proud of or pleased with

3. Embrace a passion for self-improvement – What can you do to be a better coach today than you were yesterday? Consider attending regular coach seminars and other professional development activities

4. Seek out opinions, advice and publications from respected leaders including colleagues, coaches in other sports and business leaders

5. Undertake a self-awareness 'stock-taking' exercise to identify your ethical strengths and weaknesses – act on the results to build on your strengths and address deficiencies

6. Choose friends and colleagues wisely - associate with other ethical individuals in pursuing your interests and activities in life (As below with Spanish Davis Cup 2009 support team Captain, player, Conditioner, Doctor, Press Officer etc.)

7. Adopt the approach, 'what is in the best interests of my player(s)', to guide your actions/decisions

8. Design a plaque, sign or memo/note stating your coaching philosophy and place it in a visible place for you (and perhaps others) to see. Consider adopting the well-known philosophy of renowned US basketball coach John Wooden, namely 'To teach and mentor players so that they learn to develop their full potential on and off the court' (Wooden & Jamison, 1997)

9. Be patient, organized, diligent to detail and work hard – good things take time to happen

10. Live the motto that 'winning' is 'playing hard but fair' and 'giving of one's best at all times' – adopt this mantra in all of life's endeavours

CONCLUSIONS

The profession of coaching is more than one of teaching backhands and forehands and tactics. Granted players rely on their coaches for this as well as other tennis knowledge, guidance, inspiration and motivation to perform at their best without risking injury or harm. However, perhaps the most important contribution a coach can make is in shaping a player's character and teaching values such as honesty, fair play, respect and integrity.

Coaches achieve this through their own teaching, actions and words both on and off the court, albeit generally over a period of time.

As Martina Navratilova reminds us (in the quote in the Introduction above), winning matches is transient. But the positive feelings and sheer joy that comes from knowing you have conducted yourself in a manner that brings credit to you and the game can last a lifetime. The role, and indeed responsibility, of a coach is consequently not limited to teaching the game of tennis but is also one of facilitating a player's enduring enjoyment and success in tennis and life. To this end, conducting oneself ethically at all times is the only way for a coach to achieve more success and satisfaction than can ever be achieved on a match scoreboard!

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Periodization training

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ABSTRACT

Periodization is the systematic process of structuring training and competition into phases to maximize an athlete's chances of achieving peak performances. Periodization typically involves a training plan that includes specified periods devoted to building general fitness and muscular endurance, high intensity training, competition, and rest. When structured appropriately, a periodized training program can optimize a player's performance gains and help a tennis player peak at the most important times of the season. Most important, incorporating active rest into the periodized training model helps to prevent the injury, burnout, and fatigue that can lead to impaired performance.

Key words: Program design, training schedule, periodization, planning.

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INTRODUCTION

Several factors make periodized training more difficult in tennis compared to other sports. It is important to recognize these obstacles and acknowledge that they exist before identifying ways to get around them.

• Lenght of season: Tennis is a year-round sport, which for most players has no well-defined preseason or off-season. Tennis players do not have the luxury of peaking once every four years, like athletes in Olympic sports, or even several times per year, like players in many other sports. Tennis players feel the need to be ready to compete at a high level week in and week out. How do you incorporate preseason and off-season training into a training plan if such seasons don't exist in tennis?

• Knowing when the tournament will end: A player competing in a tournament does not know when he or she is going to lose. A player can lose in the first round or advance to the finals. This makes it difficult to plan a training schedule in advance.

• Lack of rest for players chasing money or ranking points: Tennis tends to reward more successful players, allowing them more time to recover between peak performances. Top professional play ers have the luxury of being able to skip events and still win enough money to make a living or earn ranking points. Similarly, top junior players do not have to chase points across the country or around the world. The players who are trying to make it to the next level feel they have to play more to earn ranking points and consequently have little or no downtime between events.

Even in light of these factors, periodization is still important for tennis players. However, training must be approached a bit differently than it is by football players, swimmers, or soccer players.

Sample periodized plan for tennis

A player could structure a season in many ways in terms of the number of tournaments to play and the times at which he or she wants to peak during the year. Keep in mind the guidelines set forth earlier for how much time to dedicate to each phase of training and the ability to peak.

The periodized training program shown in Figure 1 is designed for a player who wants to peak twice in a yeat Maybe it is an elite junior player who wants to peak for the International Spring Championships in the spring and the U.S. Open Junior Tennis Championships in late summer. Maybe it is an adult league player who hopes to perform his or her best at the country club spring and summer championships. Although the specific exercises and weights used may differ between these two players, the overall structure of their plans will be similar. Pay attention to the following:

• Training volume should be high in the preparation phase, and inten sity should be low to moderate.

• In the precompetition phase, the training shifts to lower volumes, but higher intensity.

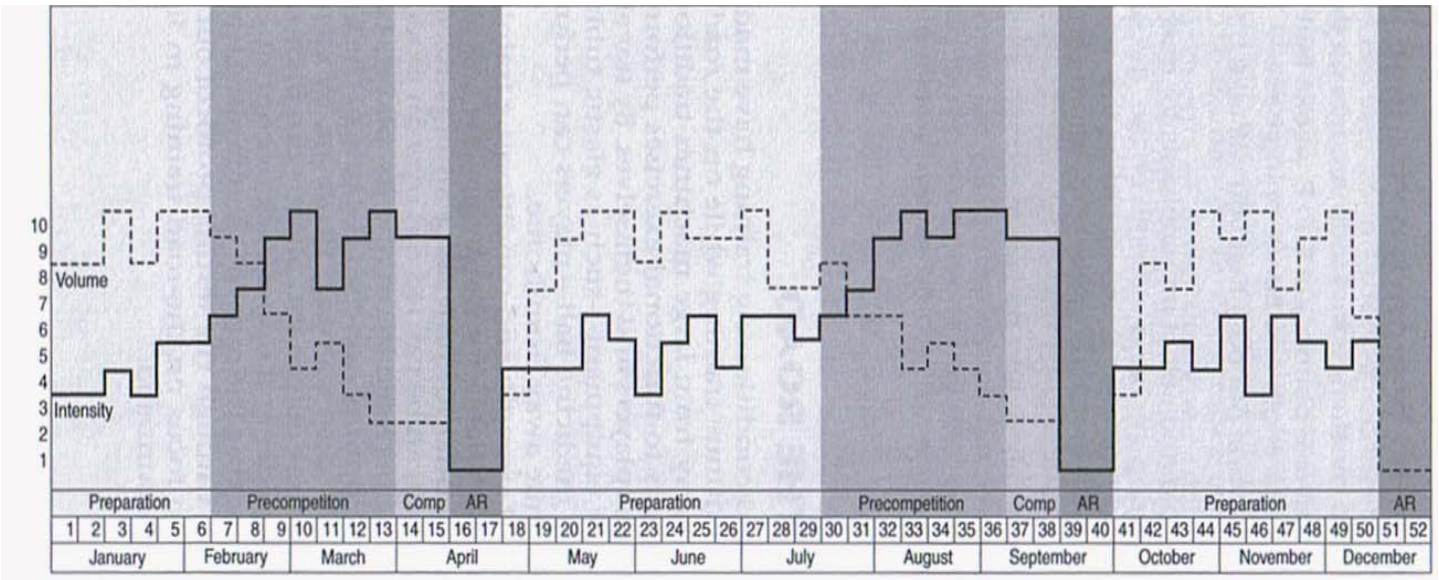

Figure 1. Sample periodization training program for a tennis player who wants to peak once in the spring and once in the summer.

• During competition, the volume should be very low, but the intensity should be high. Matches count as high-intensity exercise. Also, players should not be afraid to train during a tournament.

• During the active rest phase, volume and intensity decrease.

Figure 1 shows one possibility for structuring the season; however, it is not the only way. Even within a phase, the volume and intensity fluctuate somewhat to provide varied stimuli to the body while also allowing times to recover.

Plan your schedule by first identifying the main tournaments you want to peak for, identifying preparation and precompetition phases, and then varying the volume and intensity of the work within each phase.

Building your periodized training plan

1. Start by identifying the most important tournaments on the calendar.

2. Identify a period (or several periods) of 6 to 8 weeks that you are willing to devote to building a strength and conditioning base.

3. Identify a period (or several periods) that you will take off from tennis for an active rest phase.

4. Develop a chart or table and select an emphasis for each week of the year. For example, during the base-strength phase, the emphasis may be on building endurance. However, 2 weeks before the main competition, the emphasis may be on maximizing power or improving on-court movement.

5. Become even more detailed, and outline exercises, sets, and repetitions for each day. You do not have to lay out every day of the year on January 1, but some foresight should go into your planning, and you should know what you are going to do several weeks or months down the line.

"Outline exercises, sets, and repetitions for each day"

CONCLUSION

Although tennis is a year-round sport, the concept of periodization training is no less important for tennis players than it is for other athletes. In fact, by properly structuring training and competition into phases, players maximize their chances of peaking at the desired times. A solid program design should focus on the long-term benefits of training, not just immediate results.

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Coaching in adverse weather conditions

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ABSTRACT

Tennis coaching involves working with students of all ages and levels. Most tennis facilities around the world are situated outdoors. Tennis coaches outdoors are faced with all types of weather conditions. Adverse weather conditions can be harmful to the tennis coaches' business. The tennis coach has tools and facilities available to make sure tennis lessons do take place. These facilities and tools can help in the consistent development of the tennis student despite adverse weather conditions. All four aspects of tennis, technique, tactics, mental and physical can be worked with a student off court.

Key words: Adverse weather conditions, technique, tactics, physical and mental.

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INTRODUCTION

Playing a trade as a tennis coach involves trying to adapt to various situations. Environment forms a big part of tennis coaching. The environment or weather can be very unpredictable. Bad weather has the potential to cancel tennis lessons. Without access to indoor tennis courts alternative methods can be used to make sure coaching takes place. Having the ability to conduct lessons even in adverse conditions will also help you from financial side of being able to charge for that lesson. This article will give some suggestions on what to do with your tennis lesson when faced with adverse weather conditions and tennis play is not possible.

The number and variety of activities depends on the facilities available to the tennis coach. Facilities will be recommended and should be considered to make sure of activities in light of adverse weather conditions. For the benefits of simplicity this article will be divided into the four aspects of tennis namely technique, tactics, mental, and physical.

Technique

The easiest however, the most difficult and costly activity to do with your children in light of adverse weather conditions is doing technique/biomechanical analysis. This can be achieved by taping your children and then showing them through a computer or television. It would be advised to try and tape your pupils on a consistent basis. The reason for this is not only to have the clips ready to use when the weather prevents play, but also to compare and contrast how technique has improved over time. It is sometimes not possible to all of a sudden to take clips as inclement weather approaches filming needs to have been done prior. To enhance the sit down process with player and coach, and this is where the costly part comes in, one must have access is to computer software package (for example Dartfish) that is conducive to biomechanical analysis. Having that ability to stop and reply in slow motion will help the student with improvement, self assessment and self check. It also helps the coach identify the specific areas that need improving.

In addition to the above activity technique can be done if one has availability to an indoor facility. Even a squash court would suffice. A small mini-tennis court could be set up for technical analysis and improvement.

Tactics

Tactics development can also take place off court if weather does not permit tennis play. This can be achieved also through either a computer or television. Tennis matches filmed at local tournament or from the professional game can be played. The coach can use a Q and A technique to get the students involved. What tactics was used in the point just shown? This is an example of a sample question. The technique of showing local matches (either from tournament play or the student themselves) and then showing professional matches will be more effective as this will facilitate a compare and contrast situation. Tactics can also be done through the aid of a flip chart or black board. Through a lecturing technique the coach can facilitate a statement to start the student's tactical thinking. Visual confirmations can be done through drawings on the flipchart or blackboard. Tactical patterns can also be drawn on the flip chart. This will hopefully simplify and improve the tactical understanding of the students.

Physical

With access to an indoor facility physical training exercises can be done. As mentioned above even a small enclosed area such as a squash court can be used. Space can even be made inside a clubhouse to do exercises. Format of physical exercises could be in the form coordination exercises, circuit training anaerobic or aerobic, or playing other sporting codes. Coordination exercises can be done without a racket and ball, with a ball only, with racket only, and with racket and ball. These exercises if in a group situation could be done in a relay format to create a competition environment and make it more fun. With the availability of equipment such as soccer ball, hockey stick and ball, volley ball, and basketball these sporting codes can be played in your indoor facility. If possible activities can also take place in a gym. Physical exercises can range from spinning (riding bicycle), swimming, using light weights, and use of nautilus machines.

Mental

Mental training can take place at this time. Usually with the weekly training and competition coaches do not get time to do mental training. Mental training is important part of player development and should take place from a beginner player all the way to advance player. The mental techniques that can be developed could be motivation. Goal setting can be done with each student this will in turn improve their motivation towards their tennis training. In addition to goal setting, tournament planner/periodization can be filled out. Concentration can also be covered by going through between point routines and preparing the state of mind of the players. Establishing a proper state of mind of the player towards their tennis development will improve their focus. Matches can be played through the aid of a TV and the coach can point out the professional players mental techniques. Areas that can be covered could be motivation, emotional control, concentration, and control of thoughts. Through the knowledge of these aspects the coach can point out how well the professional players practice these techniques. Making the students through mental imagery know and how they can improve their 'mental toughness'

CONCLUSION

In conclusion we hope you find these methods useful. But above all make sure you have a plan in light of adverse conditions where you lesson will be cancelled. Planning is half the battle.

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Health benefits of tennis in adult population

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ABSTRACT

The aim of the study was to examine whether differences in playing level influence the activity profile and physiological demands of advanced and recreational veteran male tennis players during an hour of tennis match-play. Ten advanced (International Tennis Number (ITN) 3-5, 45.3±5.1 years) and 10 recreational (ITN 7-9, 44.8±4.7 years) veteran male tennis players participated in a study conducted in Barcelona (Spain). Physiological demands (i.e., Oxygen uptake (VO2) and heart rate (HR)) during an incremental laboratory test, an hour simulated match play, and a half an hour simulated match play using a portable gas analyser, did not differ significantly ($p > 0.05$) between advanced and recreational players. The advanced players covered significantly more meters than the recreational players during their one hour tennis match. The results obtained indicate that tennis match play satisfies, independently of the playing ability of the players, the ACSM recommendations for quantity and quality of exercise for the development and maintenance of cardiovascular fitness in healthy adults and seems to be a viable and highly popular mode of healthy activity.

Key words: Racquet sports, oxygen uptake, heart rate, fitness, energy expenditure.

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INTRODUCTION

Tennis is one of the most popular sports worldwide, however relatively few studies have investigated the activity profile and physical demands during play (3,5,7,28,31). A better understanding of the physiological demands and movement profile of tennis is important, in order to develop optimal practice drills and to give sound training recommendations. In addition, knowledge of the intensity, volume of work involved and estimation of energy expenditure in playing tennis enables a comparison to be made between tennis and other forms of physical activity from a health perspective, which may lead professional tennis organizations (e.g., International Tennis Federation (ITF)) to espouse health benefits of tennis participation based upon based upon experimental interventions (2, 24).

Recently, the American College of Sports Medicine (ACSM), in order to promote and maintain health in healthy adults, recommends to engage in moderate-intensity aerobic physical activity (i.e., intensities of 40% to 60% of maximum oxygen uptake (VO2max) (60–75% of HRmax) for a minimum of 30 min.d-1 on 5 d.wk-1 or vigorous-intensity aerobic activity (i.e., 60% of VO2max (75% HRmax)) for a minimum of 20 min.d-1 on 3 d.wk-1 (1,2). Previous studies on the physiological demands of tennis have focused on activity profile (3,9,15,19,20,23,26,28), heart rate (HR) (3,9,15,15,20) blood lactate concentrations (3,5,9,24,28) and oxygen consumption (VO2) (10, 28) during tennis play. Mean HR during singles play ranged from 140 to 180 b.min-1, equating to 70%-90% of maximum HR (HRmax), and mean VO2 during play ranged from 23 ml.kg-1.min-1 to 40 ml.kg-1.min-1, reflecting 50%-80% of maximum VO2 (VO2max) (9,15,16). Thus, exercise intensity during singles tennis play seems to be high enough to categorize it as a moderate to vigorous intensity sport. However, most of the previous studies investigated young, regular tennis practitioners exclusively (3,5,7,9,19,20,23,26,28), who usually carry out intensive tennis practice with the goal of mastering sport-specific skills. It is likely that many of the adults that can choose tennis as the preferred physical activity to promote and maintain health have lower skill levels than their younger and more dedicated counterparts. As tennis has an important technical component, poor sport-specific skills can prevent less skilled practitioners to derive sufficient health benefits out of tennis match-play (18). Therefore, the aim of this study was to examine physiological parameters (HR, VO2), energy expenditure and activity profile of advanced (high skill level) and recreational (low-to-average skill level) tennis players during match play. In addition, this study investigated whether the physical demands of tennis meet the criteria laid down by the ACSM for improving and maintaining cardiovascular fitness in healthy adults (1,2).

METHODS

Subjects

The study population consisted of 20 male tennis players, divided into two groups according to standard of play based on the International Tennis Number (ITN) test, which represents a player's general level of play (14). The subjects in the first group (Group A) were advanced tennis players (ITN level 3-5), and the subjects in the second group (Group B) were recreational tennis players (ITN level 7-9) (Figure 1).

Figure 1. Participants of the study

Study design

Four experimental sessions were conducted during a 30-day testing period:

(A) the ITN on court-assessment, performed following the instructions provided by the International Tennis Federation (www.internationaltennisnumber.com) (14).

(B) A laboratory incremental treadmill test to identify HRmax and VO2max.

(C) An hour of simulated tennis match-play (i.e., with all players (groups A and B) played a singles match of 1 hour (in pairs), resulting in ten matches (5 matches for players of group A and 5 matches for players of group B)) with video-analysis to record the activity profile (i.e., duration of rallies (DR in s); rest times (RT in s); work:rest ratio (W:R) (the ratio of duration of rallies to rest times); effective playing time (effective playing time (EPT) expressed in percent of the total time of play in a game); and strokes per rally (SR)), and HR monitoring (Suunto T6, Suunto Oy, Finland). Moreover, distance covered (in m) during the entire match by each individual player was measured using the software Winanalyze V1.4 (Mikromak, Berlin, Germany) (7,24).

(D) 13 players (Group A, n=7, group B, n=6) played singles for 30 min, using a portable gas analyzer (Cosmed, K4, Italy) to determine VO2 and energy expenditure during play (31).

RESULTS

Subject's characteristics and the results of the laboratory treadmill test are shown in Table 1. Both groups were comparable with regard to age, height, weight and fat percentage, as well as in the means of the VO2max (p=0.64) and HRmax (p=0.25).

Table 1. Subject characteristics. Values are mean ± SD.

Variables	Advanced players (n=10)	Recreational players (n=10)
Age (yrs)	44.3 ± 5.1	44.8 ± 4.7
Weight (kg)	75.9 ± 7.9	79 ± 3.9
Height (cm)	176.1 ± 4	177 ± 3.6
Fat (%)	21.6 ± 3.2	21.9 ± 4.8
HRmax (b.min-1)	180.3 ± 6.5	185.3 ± 5.3
VO2max (ml.kg-1. min-1)	44.9± 4.3	44.1 ± 3

HRmax , maximum heart rate; VO2max, maximum oxygen consumption

Activity profile

The variables describing the characteristics of the matches for both groups are shown in Table 2. The results showed that differences between the advanced and recreational players in DR (p = 0.98), RT (p = 0.94), SR (p = 1.00) and EPT (p = 0.80) were not statistically significant. Figure 1 shows the mean distribution of work (i.e., DR) and recovery (i.e., RT) periods at given time intervals during the 166 games analysed. Regarding distance covered, the advanced players covered significantly more meters than the recreational players during their one-hour of tennis match-play (3568.8 ± 532.2 m vs. 3173.8 ± 226 m, p = 0.04, Table 2).

Table 2. Movement pattern and associated physiological responses during one hour of tennis match play. Values are means ± SD.

Variables	Advanced players	Recreational players
DR (s)	6.3 ± 4.1	7.6 ± 5.5
RT (s)	14.5 ± 5.2	13.9 ± 5.5
W:R	1:2.3	1:1.8
EPT (%)	21.7 ± 5	23.6 ± 5.4
SR (n)	2.1 ± 1.3	2.3 ± 1.6
Distance covered (m)	3568.8 ± 532.2*	3173.8 ± 226.0
HR (beats.min-1)	148.3 ± 11.5	149 ± 8.4
%HRmax	80.4 ± 5.1	80.7 ± 3.5

DR: duration of rallies; RT: resting time between rallies; W:R: work to rest ratio; EPT: effective playing time; SR: indicates strokes per rally; HR: heart rate; %HRmax: percentage of maximal heart rate obtained in the laboratory;

** Significant difference between groups (p = 0.04)*

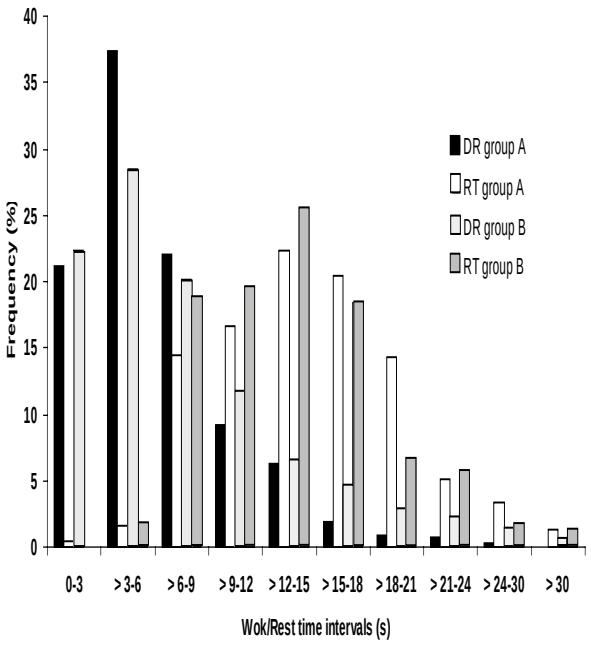

Figure 1. Mean percentage of playing time and rest intervals during an hour of simulated match play. Black and white bars represent the duration of rallies (DR) and rest time (RT), respectively, for group A. Dotted and stripped bars represent the DR and RT, respectively, for group B.

Physiological demands during on court assessment

The physiological responses of the on-court assessment (i.e., one hour of tennis match play and 30 min of play wearing the portable gas analyser) are displayed in Table 2 and Table 3, respectively. During one hour of tennis match play differences in HR (p = 0.61) and %HR (p = 0.52) were not significantly difference between advanced and recreational players. The results also showed no significant differences between the advanced and recreational players in HR (p = 0.39), HRmax (p = 0.79) and VO2 (p = 0.54) percentage of laboratory VO2max (%VO2max) (p = 0.55), percentage of laboratory HRmax (%HRmax) (p = 0.90), and energy expenditure (p = 0.18). during the 30 min of play wearing the portable gas analyser.

Table 4. Physiological responses during 30 min of tennis match play. Values are means ± SD.

Variables	Advanced players (n=7)	Recreational players (n=6)
HR (beats.min-1)	150.5 ± 7.8	148 ± 7
%HRmax	83.5 ± 3.5	79.8 ± 2.8
VO2 (ml.Kg-1.min-1)	24.5± 4.1	23.3 ± 3
%VO2max	54.9 ± 9.5	53.0± 7.1
Energy expenditure (Kcal.min-1)	263.1 ± 49.4	281.3 ± 61.8

HR: heart rate; %HRmax: percentage of maximal heart rate obtained in the laboratory; VO2: oxygen uptake; % VO2: percentage of laboratory VO2 max

DISCUSSION

The purpose of this study was to provide a physiological basis on which to recommend regular tennis play as a healthy exercise modality in middle age individuals. Accordingly, this study investigated the movement patterns, physiological responses and energy cost during tennis match play. The main finding of the present study was that singles tennis match play can satisfy the ACSM recommendations for quantity and quality of exercise for the development and maintenance of cardiovascular fitness in healthy adults (1,2), regardless of the playing ability of the participants (i.e., recreational vs advanced players).

Time motion analysis is important to quantify the physiological responses and requirements of a particular sport (28). The present motion analysis characteristics (see Table 2) showed average values (DR = ~7 s; RT = ~14 s; SR = ~2) in agreement with previous studies (9,16,17), and interestingly, playing level (i.e., advanced vs recreational) did not influence activity patterns during tennis match play (see Table 2). We have previously shown that physiological responses during tennis match play are influenced by movement patterns (10,20). Thus, as can be expected, none of the measured physiological responses were significantly affected by the playing level of the subjects in the present study.

During one hour match of tennis match-play, players covered a distance of around 3 to 3.5 km at different running speeds. Advanced players covered a greater distance than recreational players, which can be explained by the higher skill level of the advanced players, enabling them to hit sharper angles, and resulting in full use of the court and longer running distances. Distance values found in this study were much higher than those reported by Murias et al. (21) who reported 1447 ± 143 m for nationally ranked players on a clay court during 90 minutes of play, probably due to a different methodology (i.e., less accurate than the used in the current study).

Physiological values (VO2max; HR) are interesting variables from which to glean information about intensity of play during a match and may also serve as a reference from which to provide practical information about suitable conditioning for different players (9). The mean VO2max of players involved in our study was 44.9 and 44.1 ml.kg-1.min-1 for advanced and recreational players, respectively. Normative VO2max values for sedentary adults range between 30 and 40 ml.kg-1.min-1 and the mean VO2max reported for regular tennis players ranged from 35 to 65 ml.kg-1.min-1, depending on age, gender and training level (9,16,17). According to the ACSM, the minimal training intensity threshold for cardiovascular exercise is approximately 50% of VO2max. Studies using portable gas analysers have reported VO2 levels during tennis play ranging from 23 to 29 ml.kg-1.min-1 (3,9,23,31). This corresponds to about 50% of VO2max, with values ranging from 46% to 56% of VO2max (9,16,17). In our study, both groups achieved the recommended stimulus for effective initiation of cardiovascular adaptations and conditioning as expressed by the percentage of VO2max (50–85%), with exercise intensities ranging from 53 to 55% VO2max. Regarding HR, the mean HR in trained players aged 20–30 years ranges between 140–160 b.min-1 during singles tennis competitions, rising to 190–200 b.min-1 during long and fast rallies, reflecting phases of high activity (9,16,17). The average HR values in this study were close to 150 b.min-1 for both advanced and recreational players, which represented approximately the 80% of HRmax. Therefore, in our study both groups achieved the recommended stimulus for effective initiation of cardiovascular adaptations and conditioning as expressed by the percentage of HRmax (60-90%) and VO2max (50-85%), which is above of the minimum intensity recommended by the ACSM (1,2). Moreover, results show no significant differences between groups, suggesting that a lower technical level (i.e., in the recreational group) did not prevent these players to obtain a positive cardiovascular stimulus.

The ACSM guidelines recommend that that the exercise routine should elicit an expenditure of 300 kcal and be performed for a minimum of 3 days per week for total body mass and fat weight loss (1,2). Data in this study indicate a moderate caloric expenditure for this mode of exercise (i.e., ~265 and ~280 Kcal.min-1 for 30 min of match play in advanced and recreational players, respectively) (Figure 3) which supports the notion that tennis is an exercise modality that can be appropriately prescribed for enhancing weight control and fat weight loss (11,12,23). Thus, during one hour of singles tennis play, a recreational tennis player would be expected to burn approximately 500-600 kcals., which it would represent a energy expenditure of extra 1500-3000 kcals by playing tennis three times a week, contributing to long term weight management (22). This has important ramifications because weight loss and fat reduction are reasons that often motivate people to exercise (33). The Cardio-TennisTM programme being promoted by the United States Tennis Association (USTA), seems to be the latest trend and activity widely utilised by the adult population in the US as a fitness activity. Therefore, tennis match play would be a good way to achieve the aforementioned goals (i.e., weight loss and fat reduction), but more research is needed to support this idea.

Figure 3. Player using a portable gas analyser during a simulated tennis match play.

CONCLUSION

In conclusion, we reported physiological (i.e., cardiorespiratory responses and energy cost) and movement pattern responses during tennis match play and compared these responses in two groups of veteran tennis practitioners with different playing levels (i.e., recreational vs. advanced players). No significant differences between the groups were found in any of the parameters investigated. The results obtained also suggest that regular tennis play (i.e., 2 to 3 times per week) exercise can satisfy the ACSM recommendations for quantity and quality of exercise for the development and maintenance of cardiovascular fitness in healthy adults, regardless of the playing ability of the participants (i.e., recreational vs advanced players).

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The roles of group learning, language and their application to junior tennis

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ABSTRACT

This article describes some principles taken from the work of developmental/educational psychologist L. S. Vygotsky and contains some ideas for using them to get the most from group coaching with juniors.

Key words: Juniors, language, interaction, group learning.

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INTRODUCTION

A common perception among coaches, players and parents, is that a high degree of personal attention from a teacher or coach, the kind a player gets from private tuition, is the most productive learning interaction in individual sports like tennis. This may be true in some respects, but it can lead to the assumption that group coaching, especially in larger numbers, has an inevitably weaker positive effect on players' development. Coaching programmes may advertise maximum numbers of players per coach, and use these numbers to sell their product. This encourages people to think that the higher the player-to-coach ratio, the less better off the junior player will be, but this is not necessarily so. It will be argued that coaches working with higher player-to-coach ratios can utilise some forms of learning equally well or better than when in low-ratio or one-on-one settings.

"Higher player-to-coach ratios"

Modern educational culture already reflects an appreciation of the benefits of group learning and a simple example of this can be found in any typical primary school classroom. Whereas in the past desks were likely to have been set out in orderly rows, all facing the teacher or blackboard, nowadays you are much more likely to see desks organised in groups of five or six with children sitting facing each other. Group learning applications are informed by theories that are widely endorsed in educational psychology. One of the most influential theorists and proponents of the learning benefits of social situations was L. S. Vygotsky, a prominent Russian psychologist of the 20th century. He was a prolific researcher and commentator on the development of thought and language in children, and he posited a number of ideas that have changed how people think of education and schooling.

Vygotsky saw a fundamental relationship between thought and language, and between language and social interaction. Unlike some developmental theories of language, he saw all speech as social in nature and suggested that learning and development originate in social processes. For Vygotsky, language is a significant means for children of conceptualizing the world and attaining independence and ownership over their future learning. Speech and language play vitally important parts in obtaining goals and solving problems, and are dependent on the complexity of the problems themselves. "… Words can shape an activity into a structure… that structure may be changed or reshaped when children learn to use language in ways that allow them to go beyond previous experiences..." (Vygotsky, 1978, p. 28). Vygotsky argued that observation and imitation, mediated by language, allow children to internalize actions and behaviours after viewing them in others, "Children can imitate a variety of actions that go well beyond the limits of their own capabilities. Using imitation, children are capable of doing much more in collective activity or under the guidance of adults." (Vygotsky, 1978, p. 88).

Vygotsky separated what we might call 'actual' development from the zone of proximal development (ZPD, Vygotsky, 1978, p. 84). While actual development is the level to which a child can perform or achieve independently, the ZPD effectively refers to a child's potential: that which they can currently achieve with the help of a teacher or experienced peers. This is likely to be beyond what they can achieve on their own and may separate them from others of similar 'actual' ability. The ZPD taps into the as yet unrealised abilities of children, and what children can achieve with a group of peers or the guidance of a teacher is an indicator of what they will be able to achieve independently in the near future. Vygotsky saw this as a vital concept in predicting a child's prospective development, one consistently overlooked by traditional methods of evaluation. "The actual developmental level characterizes mental development retrospectively, while the zone of proximal development characterizes mental development prospectively." (Vygotsky, 1978, p. 86).

COACHING STYLES

So what are the implications for tennis coaching? The central principles described above are firstly that learning is a social process- group learning is qualitatively different from independent learning, not just a quantitative function of the player-to-coach ratio. Secondly, children's development can be accelerated and their potential optimized through verbal and social interaction with the coach and other players of similar and higher ability.

It is suggest that some teaching styles may be particularly useful for groups with higher player-to-coach ratios. Situations where directive, command-style methods may be impractical for generating interaction between coach and player, and between players themselves, are where these more interactive and non-directive styles can get the best out of social learning processes. The ITF's Advanced Coaches Manual (Crespo & Miley, 1998) section "Teaching Styles Applied to Tennis" (pp. 29-30) outlines the categories of coaching methods available to teaching professionals in their work. Many of the principles mentioned above are notably reflected in the manual's description of various approaches to teaching. As Crespo, & Miley (1998) summarise; 'Peer/buddy' learning provides the opportunities:

• To engage students in social situations

• To develop communication skills

• To develop skills of observing listening and analysing

• To develop co-operative group atmosphere

Similarly the 'problem-solving' method helps:

• To develop insights into the structure of an activity through the search for a solution

• To promote learners' confidence in their own ideas and responses

Thirdly, 'guided discovery' can assist:

• To engage learners in a convergent process of discovery

• To develop the ability to find solutions without a coach

All of these teaching styles contain some of the elements necessary to create environments that facilitate the social processes of learning. These teaching methods can be extremely useful in creating interactive surroundings through which it is possible to access ZPD and help the realisation of players' prospective abilities.

PROPOSALS

It is therefore proposed that there are a number of options available to the coach who wants to get the most out of sessions when working with groups of junior players, options that will help him or her to utilise opportunities for social learning:

• Utilise players' problem-solving abilities by getting them to work on problems together in pairs or in groups (after all successful tennis players need to be effective problem-solvers)

• Keep opportunities for verbal communication optimal with players of similar age and ability in the same group (at least 1 person of the same gender helps also)

"Encourage verbal fluency, optimal communication and peer learning."

• Schedule younger groups on adjacent courts to older ones, they will imitate what will come to be internalized in the future

• Encourage verbal fluency in tactics and tennis terminology (e.g. the five phases of play: starting the point, building the point, finishing the point, staying in the point, turning the point around; the five ball controls, depth, height, spin, speed, direction).

• Get players to explain drills to each other, lead each other in warming-up or movement preparation and encourage them to give verbal input into the coaching process

• Use peer learning to pair the more experienced with the less experienced: children can identify areas where they are more confident and where they are less confident. Coaches can then pair the more confident players with the less confident in practices. A junior who is a confident volleyer can act as the experienced peer in a buddy-learning situation when volleying, but the same player may not be so confident on their serve and will need a more confident partner in a drill based on a serving theme.

• Use older juniors and leaders where available to help and guide younger players in doing drills and solving problems during group sessions

CONCLUSION

It is very unlikely Vygotsky was thinking about tennis when he was developing his psychological theories, but teachers and educators have broadly applied them in schools with great success, much as tennis coaching has already applied cognitive and behavioural theories to learning. Why not these as well? Low player-to-coach ratios certainly have great benefits for junior players, and many will see one-on-one and low-ratio situations as indispensable in developing juniors, but when these low ratios are not possible, coaches should appreciate the unique learning opportunities that group interaction offers. Children's learning can ultimately be enhanced through helping them to become verbally articulate and good communicators. If coaches become more aware of learning opportunities in social interaction and their role in accessing ZPD, then players will get a richer, more varied and enjoyable experience from tennis. Furthermore, if awareness of ZPD helps coaches to view ability as more dynamic and multifaceted, then perhaps more ethical and inclusive talent identification schemes could be implemented to reap the talents of ever-greater numbers of players.

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The importance of physical and mental regeneration: Tips for the holidays

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ABSTRACT

This article discusses some principles and characteristics of the process of physical and mental recovery for tennis players. It mainly focuses on the individual regeneration strategies for tennis players at the end of the season. It discusses the importance of this process and provides tips and guidelines to do it in the most efficient way.

Key words: Regeneration, physical, mental, balance.

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INTRODUCTION

At the end of the year many tennis players reach their physical and mental exhaustion limits. Particularly, due to the number of competitions they are involved in, they are in constant risk of being over-trained or burnt out (emotional exhaustion, lack of motivation). So, the regeneration period between tournaments, at the end of the season, is fundamental to put mind and body at rest and to generate the energy and motivation for the next training sessions and matches.

Regeneration is a complex and interdisciplinary process that involves several levels (psychological, physiologic, social, recreational, mood, behaviour and regeneration). The regeneration includes action driven components, action taken by the athlete (proactive regeneration) that may be systematically used to return balance to the individual.

Important: the regeneration strategies are totally individual and demand an active participation of the athlete. According to Kellmann & Kallus (2001) "the regeneration process cannot be considered as a simple elimination of stress. Regeneration is mainly a personal and active process that must lead to psychological and physical recovery".

Main Characteristics of the Regeneration Process (Adapted from Kellmann & Kallus, 2001; 210)
It is an ongoing process.
It depends on the type and the duration of the stressful event.
It is an individual and specific procedure.
It ends when the psychological state and the homeostatic balance are recovered.
It includes intentional actions (active regeneration) and automatic psychological and biologic processes, which facilitate the return to a certain state and its initial levels (passive regeneration).
It can be described in various levels (somatic, psychic, behavioural, social, socio-cultural and contextual).
The regeneration process involves various organic subsystems.
Various regeneration sub-processes can be dissociated.
It is closely connected to the situational conditions (for ex.: sleep, contact with team members, etc).

Tips for the end of the season rest and regeneration (see book by the same author: Tennis: psychological tips for winning.)
• Take holidays and forget tennis temporarily, take on recreational activities (walking on the beach or in the park, swimming, riding a bicycle, etc).
• Get involved in intellectual and cultural activities such as reading a good book, going to the movies or learning a foreign language, etc.
• Learn relaxation and meditation techniques (yoga, pilates) in order to improve mental health and emotional balance.
• Make good use of this time to spend more time with family and friends since a good relationship with them is fundamental for success.
• Control your diet and take care of your body so as to keep fit.

To be on holiday does not mean to be totally inactive. It is possible to recover energy through other physical activities (cross-training), for ex.: squash, football, basketball, volleyball, swimming, hydro gym, capoeira, cycling, etc. The holiday time is also good to reflect upon life, values and the relationship with others. Many athletes return from their holidays totally renewed, with new ideas and projects and what is more important, with more energy to train!

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Overview of Beach Tennis

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ABSTRACT

This article is an overview of Beach Tennis through its background, its main rules and the organization of the ITF Beach Tennis Tour. In addition to a general overview of the sport, the article underlines the interesting teaching qualities for learning the net game and achieving proficiency. Lastly, it examines the potential for growth, promotion and development

Key Words: Beach Tennis, background, rules, organization, teaching methods, net.

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INTRODUCTION

Beach tennis is a blend of lawn tennis and beach volleyball (a sport that emerged in 1947 with bylaws drafted by the International Volleyball Federation in 1986 and recognized by the IOC in 1994).

Beach tennis took off in 1978 in Ravenna, Italy, as a recreational and social game before then being introduced in nations further afield, like Brazil and the US. But it was not until 1996 that the modern game with its rules and court boundaries was introduced and competitions were organized.

Today, some twenty-five or more countries have actively launched Beach Tennis for an estimated number of 300,100 players in Italy and 10 million worldwide.

In 2006, the International Tennis Federation (ITF) took an interest in beach tennis and drafted international rules for the game. In August 2008, the second European Beach Tennis Championship was attended by eleven countries and organized by Tennis Europe with the ITF's rules. As was the case for its first edition in 2007, the 2008 Championship was won by Italy, the host country. Then, after just one year of preparation, the ITF launched the Beach Tennis Tour 2008. One year on from the inaugural tournament on the Tour the first ITF Beach Tennis World Championship will also be held in Rome, in May 2009, alongside the WTA Tour Premier event.

At the FFT General Meeting on February 2 & 3, 2008, André de Saint-Martin, Deputy general secretary, in charge of legal affairs, by-laws and regulations, the initiator professional qualification contract, unions and CoSMoS, proposed the incorporation of beach tennis into the sports developed by the FFT, a decision that won unanimous approval.

On the 28th of November 2008, the Bureau Federal decided to create the French Beach Tennis Championships. Qualification stages start with 36 leagues, from the 1st of April till the 19th of July 2009, the teams which then qualify will be participating in the finals on the 4, 5 and 6 of September at Calvi Corse's League. The championships comprise of two competitions : the female doubles and the male doubles.

What are the rules of beach tennis? What does the ITF's Beach Tennis Tour entail and how is it organized? Is beach tennis complementary to the learning of lawn tennis? Does beach tennis help to promote tennis?

To answer these questions, we will consider the development and growth potential of beach tennis, based on what we know and what already exists…

THE MAIN RULES OF BEACH TENNIS

Beach tennis is played in doubles but can also be played in singles (on a smaller court).

It is played on a standard beach volleyball court (16 m long on 8 m wide), on sand and with a 1.70 m to 1.85 m high net.

It is played with paddle racquets without strings, maximum length of 50 cm and 26 cm wide, and with slightly depressurized tennis balls. Points are counted like in tennis (to the winner of 3 or 5 sets) with the application of "No-Ad", "No-Let" and "No-2nd serve".

Service order is the same as lawn tennis. But there are no service boxes and each player can return the opponent's serve.

A point is won if the ball goes over the net and hits the ground within

'*Service order is the same as lawn tennis*'

the limits of the opponent's area. The point is lost if the ball goes into the net, under the net or is sent outside the limits of the opponent's area

THE ITF'S BEACH TENNIS TOUR 2009

With a membership of 205 national federations and 6 continental confederations, the ITF hopes for a huge development potential for beach tennis.

ITF Beach Tennis Tour is an International tour of men and women doubles tournaments. For its 2nd year in 2009, it will be played in Italy , Spain, Portugal , Poland, Germany and Japan (with applications from other nations still pending) under the ITF's supervision, responsibility and administration. In 2008, an Italian stage comprised the 2nd European Championship attended by 11 nations: Italy (winner), Belgium, Cyprus, Czech Republic, San Marino, Germany, Netherlands, Russia, Slovenia, Bulgaria and Belarus. At the end of the tournaments, the 4 best doubles results are taken into account for the player's individual classification. Each tournament gives a number of points that depends on the league table ranking and the tournament status.

The Beach Tennis Tour has therefore become comparable to the tours organized by the ITF for junior players, men, women, senior players and disabled players. The sports, administration and organizational regulations of the Beach Tennis Tour are similar to those of Professional tennis tours with a comparable international ranking goal. World classification has been changing. Before the last European Championship, the game was considerably dominated by the Italians, but we are beginning to see the emergence of other leaders, such as the Portuguese, Belgians, Cypriots, Dutch, mostly women players.

According to its President, Francesco Ricci Bitti, beach tennis will help the ITF in its overall goal to develop tennis and increase its appeal to the general public: "It's a unique fun way of practicing sports and we hope that it will attract players of all ages".

According to Jackie Nesbitt, head of the Pro Circuit at ITF, the most gifted and seasoned players will be able to express their talent and bloom in an organized competitive environment. Will beach tennis truly become complementary to tennis and boost its development or will it compete against tennis and hinder its progress?

TEACHING VIEWPOINTS

If we analyze the activity, we can assert that beach tennis is conducive to net games (volleying/rallying); the use of the appropriate rules and gear make it a kind of progressive tennis: no rebound allowed, short racquet, depressurized ball, high net, small court, etc.

It could therefore be an interesting teaching medium, varied and fun, used to reinforce the net game of beginner and proficient-level players, as well as competitors.

We could certainly help to improve the technical, tactical and physical qualities of our players by using beach tennis rules and gear in our junior clubs in a recreational and original way. We need to use different racquets (paddle, with velcro, pom'do, plastic or wooden pallets, mini-tennis racquets, etc.), balls (in straw, foam, soft, depressurized, rubber), court size (12 m, 18 m), net height (1 m to 1.85 m), rules (no-ad, no-let and no-2nd serve, game formats) depending on the age, the level and the target goal.

We should be able to play beach tennis in our clubs even if we are not at the sea front. The standard sports field will suffice but a lawn will allow dives and a multi-sport indoor stadium will allow the use of a volleyball net.

We could conceive junior club sessions focused on the net game and emphasize technique and tactics (scrimmage) on the court for 75 minutes and 45 minutes of sports play devoted to a modified beach tennis to work on the qualities of net game in a new, unusual, different and highly recreational manner with a clear physical impact.

At the same time, in our society where people are looking for a casual sports activity, beach tennis could be a great way of discovering tennis differently and attracting new players or potential registered members; just like beach volleyball which attracts 3,500 new registered members and millions of occasional players.

But what will be the other development potentials of beach tennis?

DEVELOPMENT AND PROMOTION POTENTIAL OF BEACH TENNIS

The popularity of beach racquets in the summer makes us optimistic about the future of this new sport and its potentially positive impact on tennis.

The promotion will inevitably include the organization of exhibitions, tournaments and a French stage for the ITF Beach Tennis Tour. The support of a few tennis stars should be a considerable advantage. For example, the 2nd European Championship boasted the participation of former tennis champions such as Natasha Zvereva (former No. 8) and Olga Barabanshikova (former No. 49) for Belarus and Els Callens (former No. 43) and Sabine Appelmans (former No. 16) for Belgium (defeated in the semi finals).

This new discipline could be an opportunity for partners interested by its seasonal aspect and for whom tennis is too expensive an investment.

If beach tennis is indeed positioned as a tennis sport, the FFT could promote it through competitions, exhibitions, and organized beach tennis events on the seafront as has already been done on highway service areas with mini-tennis.

In our clubs, apart from the use of beach tennis as an educational means of improving the net game during sports play, we could also get people interested through organized events involving families, friendly matches in doubles like "tennis volleyball", designed with a similar purpose.

CONCLUSION

In 2007, the ITF recognized and launched Beach Tennis and officially included it in its sports.

In dealing with our society looking for casual, recreational, outdoor sports with high media potential, in the age of the teaching of progressive tennis to facilitate learning and discovery of our sport, beach tennis seems to be the perfect solution to these expectations. We hope it will have an exciting future, as a complementary sport to lawn tennis, just like beach volleyball, beach soccer and sandball…

TO FIND OUT MORE ABOUT BEACH TENNIS SOME SUGGESTED LINKS FROM THE ITF

http://www.itftennis.com/beachtennis/ (The ITF's beach tennis link)

http://www.tenniseurope.org/ProfessionalTennis/BeachTennis.aspx (Tennis Europe's beach tennis link)

http://www.federtennis.it/beachtennis/ (beach tennis link of the Italian Tennis Federation)

http://idorganisation.com/beach-tennis.pdf (Customized beach tennis services for companies, conventions, incentives, communities, events, tournaments by IDO Games - Isabelle Demongeot)

http://www.equipement.fft.fr/centrale/resultats.php?fam=26 (purchase of Beach Tennis gear on the FFT website)

http://beachtennis.free.fr/ (Mediterranée Beach Tennis Association)

Prophylactic approach to the physical preparation to tennis

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ABSTRACT

The purpose of this article is to place in perspective the prophylactic aspect of physical training with regard to the specific physical demands of tennis by basing our approach on two working pillars: developing proprioception sensitivity and building joint strength. Achieving high performance and repeated high performance involves optimizing the training system, in particular, by integrating the notion of prevention into physical training. That is why incorporating prophylactic procedures into physical training and into the tennis player's overall training and competition organization helps to reduce the risks of injuries and therefore places the player under optimum conditions that allow him/her to consistently deliver superior performance.

Key words: Prophylaxis, proprioception, building joint strength, performance.

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INTRODUCTION

Due to the demands of modern tennis, teachers, trainers and coaches are strongly encouraged to pay special attention to the multiple facets of players and their training.

Physical training is one of the constitutive areas of performance with two primary concerns: preventing risks of injuries and optimizing performance.

Specifically, the prophylactic approach to physical training seems to meet this dual concern by drawing particular attention to the improvement and reinforcement of technical learning processes, optimizing muscle efficiency (by using in addition proprioception and strength building workouts), rebalancing muscular dissymmetry, improving the coordination chain at all motor stages and lastly, the development of bodily representation, proprioception and kinesthetics.

We believe that the prophylactic facet must be present at all levels of physical preparation: assessing the player's physical qualities, muscular reinforcement, the development of bio-energetic sectors, the preparation for specific coordination and programming of training contents. To do so, it is important to match training contents to the requirements and physiological constraints of tennis.

A FEW DEFINITIONS:

Prophylaxis is a medical concept which covers all medical and hygiene measures aimed at preventing and limiting the development of a disease and getting rid of a disease or pathology; Rodineau (2004).

Translated into athletic training, this approach entails implementing "a series of measures and methodological principles enabling the avoidance or reduction of the appearance of injuries caused by the practice of sports", Aubert (2002).

In plain terms, workouts with prophylactic goals are aimed, first, at preventing dysfunctions linked to the practice of a specific sport such as tennis and second, maintaining the player's physical integrity, by paying particular attention to the muscle-tendon and joint systems.

Lastly, preventing injuries would entail anticipating the specific adaptation needs of the tennis player.

That is why, in the context of this approach, we have chosen to focus our views on the development of proprioception sensitivity and muscle-tendon strength building.

Proprioception is an increasingly trendy word in the sports world and players as well as trainers are more and more interested in this quality because it is key to the coordination and the dexterity that is critical to technical skills.

According to Fred Aubert (2008), it is the "reflexive response of periarticular muscles to bodily imbalances". Specifically, proprioception sensitivity informs us of our muscle tone as well as the relative position of the different segments of our body, their movements or again our static position and our balance.

Core stabilization corresponds to the action of building core strength, such as for example, aligning the pelvis. "It is static muscular strength that has to be un-deformable before the player acts; it can be the core strength of a segment, of the entire body or of just the abdominal belt", Aubert (2008). It is the ability to protect one or several joints using the appropriate segment placements corresponding to the individual's physical structure.

Good core strength (around the back-pelvis-femoral complex) provides core stability during the different movements specific to tennis.

The goals of this approach

Adopting this approach means proposing an approach to physical preparation focused on:

- injury prevention,
- maintaining the player's joint and muscle stability,
- developing the individual specific physical qualities of the young tennis player under training.

In a way, this methodological approach to physical training is at the crossroads of the energy, mechanical and technical facets specific to tennis playing.

We propose an illustration of this idea through two stages:

- The implementation of specific proprioception warm up,
- The integration of proprioception exercises and joint strength training into technical/tactical training sessions.

Specific proprioception warm up

It involves combining the so-called proprioception exercises with the appropriate stretching and more traditional dynamic exercises: the entire body is involved, namely the lower body, the stem and the upper torso and this allows players to alternate proprioception exercises with passive/dynamic stretching of about 6-8 seconds. The warm up must not last more than 15 minutes.

THE FOUR STAGES OF PROPRIOCEPTION WARM UP

1 – Dynamic Exercises: upper body workouts

Figure 1. Isometric pushups on balance board.

Figure 2. Shoulder workout involving catching and throwing a ball.

2 - Stretching: passive-dynamic workout of the upper body

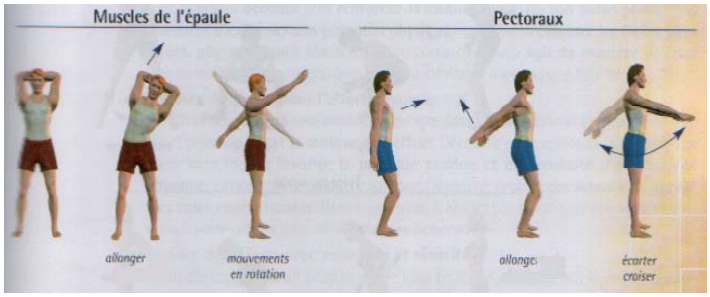


Figure 3. Passive-dynamic workout of the upper body.

3 – Dynamic Exercises : skipping rope on alternate legs

Figure 4 . Skipping rope on alternate legs.

4 -Stretching: passive-dynamic workout of the lower body

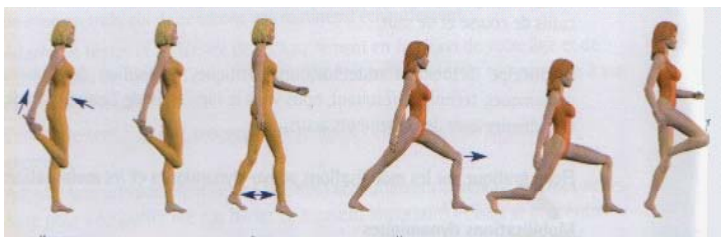
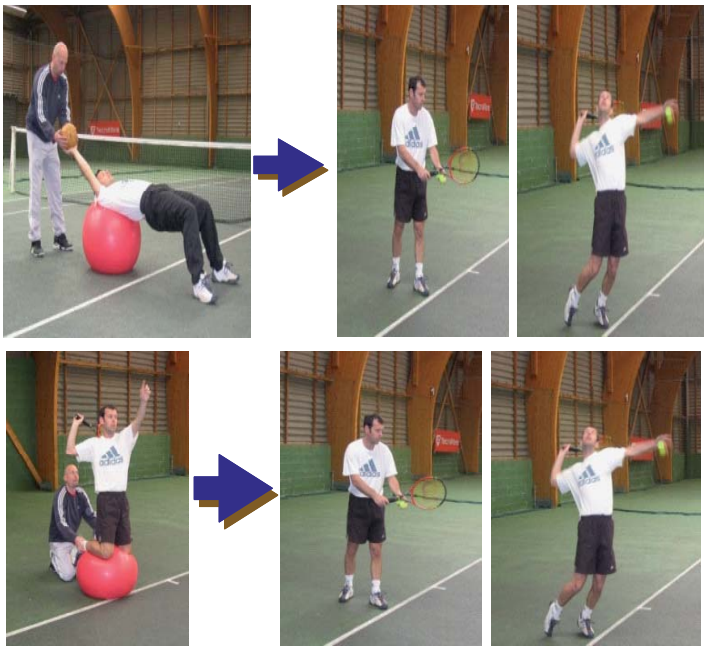


Figure 5 . Passive-dynamic workout of the lower body.

ASSOCIATION OF MUSCLE STRENGTH BUILDING (FOR PROPHYLACTIC PURPOSES) WITH TENNIS SEQUENCES



Figures 6 and 7. Exercises to improve service.

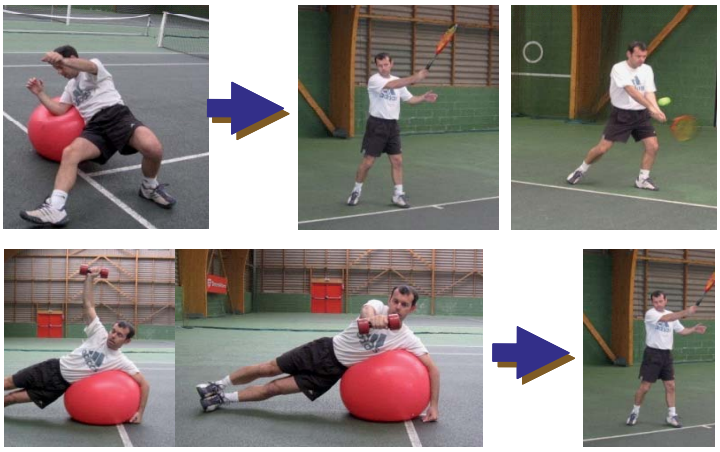


Figure 8 and 9. Exercises to improve forehand and backhand shots.

Figure 8 requires feet firmly planted on the ground, roll on the fitball, from one elbow to another, with your shoulders touching the ball.

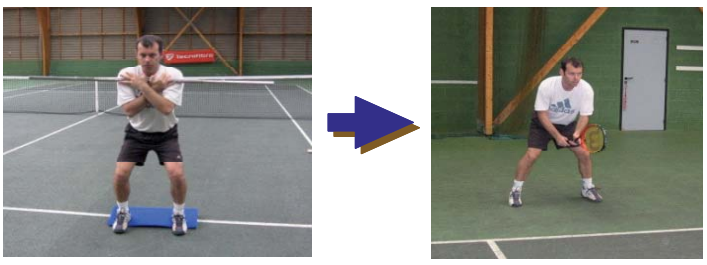


Figure 10. Exercise to improve service return shots, concentric semi-squats with bar on the shoulders.

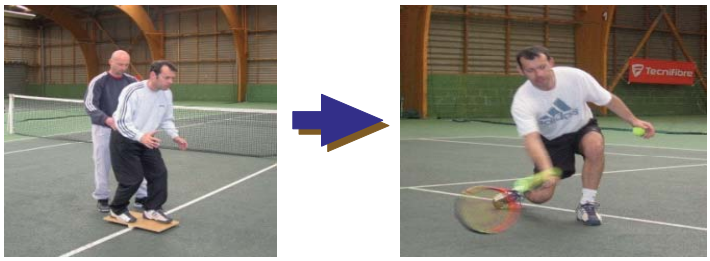


Figure 11. Exercises to improve volleying, flexions, extensions on a balance board.

Muscle strength building and tennis

This is a simple approach: combining proprioception exercises and muscle/joint strength building exercises with technical/tactical training sequences in order to move towards tennis-specific efforts which seek to promote the transfer phenomenon.

In the examples on the previous page (Figure 2), we focus on the use of a balance board and the fitball, knowing that this type of work assumes prior training and good familiarity with these tools in relation to the age of the players and their physical maturity. The different exercises and sequences presented below are only a small part of the elements required to prepare a true prophylactic training session, combining strength building exercises and tennis sequences. The essence lies in the construction and programming of the relevant sessions, in connection with the internal logic of the tennis activity and the needs of all the players.

CONCLUSION

The purpose of this article was to show that the prophylactic approach to physical preparation is a methodological response in the search to protect the player every day, as well as in the search for efficiency during competitions, while reducing muscle tears during preparations and competitions, and allowing players to improve their level of performance through the accumulation of experience and through enhanced performance in their matches.

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Training during competition periods

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ABSTRACT

During the competitive tennis period, players and their teams have to find new training solutions to cope with the demands of modern tennis, the schedule of elite tennis and scientific progress in the field of training and reduced training. This article proposes a method for preparing a training program to match the high-level demands of competitive tennis.

Key Words: Strength, conditioning, periodization.

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INTRODUCTION

Modern tennis has never been more demanding than today. Besides, the career of a professional tennis player may be long (e.g. Fabrice Santoro), with years very often crammed with an average of 60 to 80 matches a year; (about 80 matches for Roger Federer, 60 for Jo Wilfried Tsonga and Fabrice Santoro in 2007). This is an intensive schedule that leaves the player with barely any time to recover and hardly any to improve his physical or tennis potential. Many players on the competitive trail have limited fitness training programs to keep them in shape, thinking that the period of competition is a period exclusively devoted to the game, recovery and travel. 10 out of 12 months are devoted to this period of competition, with short breaks between tournaments (1 to 3 weeks). In contrast to often comparable collective sports, tennis players play almost every day during these weeks of competition. Under these conditions the work done in December (beginning of the tennis year) is supposed to last for almost an entire year. And the work between periods of tournaments should be brief but intense.

This view is widespread and still persists today in the world of tennis, although it is illusory to believe that the gains achieved in December can endure the next 11 months, even if the player plays every day. It is equally illusory to believe that we will be able to work intensively on an athlete not accustomed to receiving intensive workloads during that short period between 2 blocks of competitions. We shall see further on that there is no miraculous solution, but rather hard work practically every day.

To counter the effects due to a decline in fitness training or lack thereof, during the competition period, athletes should strike a balance between reduced training and overly intensive training in relation to the period. Recovery will be the first goal before any training. But the fitness program, developed during the training period is necessary for the player's performance, and his ability to go back to working at more intensive rhythms, without requiring a period of readjustment because the time between the weeks of tournaments is too short. This method allows the player to improve and work throughout his career, a goal that is difficult to achieve otherwise.

TRAINING PROGRAM DURING COMPETITION PERIODS

This program was developed for a period of four competition weeks, because harmful effects (such as loss of strength) appear around this time. Therefore, there will be no strength training or maintenance in this 4-week program since studies show no significant decline in this quality for the same period. The player can follow the program between blocks of four-week tournaments. If the coach or player wants to make a competition block above four weeks, he will have to reintroduce a session or two of strength training in the week to maintain this physical quality [14.15]. Blocks of four weeks of competition seem to simplify and reduce the work to preserve the positive effects.

We know very well when a tournament starts but never when it will finish. This poses problems for planning training programs. Priority will be given to recovery after the last match. Only then will workouts and preparation for the next match begin. The program is designed from D-7 to D Day. The work load tapers down to finish at the same volume, frequency and intensity as the period of peak training. The player or coach is therefore guided in the types of drills, the number of reps, sets and the recovery time.

We have developed two main types of sessions: the rehearsal session for specific sprints and intensive action, and the specific speed, explosive strength session. The work will therefore focus on the two major energy producing systems in tennis according to Dansou P. et al. [1]: aerobic and anaerobic endurance. The sessions developed in this program must not be followed by a player who has not achieved 100% of the total load, at the height of the preparation, otherwise the training might be too intensive, and the player may become exhausted or even sustain injuries. Only a well-prepared player (training period at the beginning of the season) is apt to follow this program.

For the others, the load will be different and unique to each player according to his maximum work load, because we must remember that the competition period is the period when the player must deliver peak performance. In other words, the player's workout must never exceed, in intensity, volume or frequency, the highest work load during his preparation.

Aerobics or the ability to repeat sprints

This session is designed according to the specific criteria of elite tennis matches. Thus, during a match, there are between 300 to 500 efforts in a match of 3 winning sets [3]. Representing between 200 and 340 efforts in a match of 2 winning sets, so an average of 270 intensive actions. We know that the ideal work time/recovery time (it varies by type of court) is 10 s of work for 20 s of recovery [1]. According to Mark Kovacs, the ideal ratio is 2 to 4 times the number of seconds worked, and the ideal number of repetitions is 10 to 15 repetitions, after a necessary recovery period [6]. Changeover occurs every 6 minutes on average [1]. The average point recovery time is 20 s, 90 s for side changeovers, and 2 minutes in between sets [6]. So according to Kovacs, and Dansou, we can choose about 12 repetitions of intensive action repetitions. Followed by a recovery of 90 s (side changeover) will be given to the player. This results in 22 sets of 12 intensive actions at the height of the preparation. For the competition period it should be around 60% of maximum volume [7-12], keeping the same intensity [8-11, 13]. The drills must mirror the sports activity and meet the analysis of the tennis player's movements during a match. According to Weber, a tennis player hits an average of 3 shots per exchange and during these shots he moves sideways an average of 4 times [2-4] and covers between 8 to 12 meters [2]. In addition, 80% of exchanges take place within a radius of 2.5 m around the player, 15% between 2.5 m and 4.5 m, and 5% at more than 4.5 m [5]. Regarding the frequency of training, it should be noted that for highly trained athletes we may, during the peak training period, reduce this by 0% to 20% [9, 10, 14, 15]. During a normal training period, the frequency of training for this type of drills may range from 3 to 4 times per week, it is therefore important to keep 2 to 3 training sessions during the peak training period.

We have decided to select specific drills. Below are 4 drills which the International Tennis Federation (ITF) or the USTA usually use with their elite players. But of course, other specific drills may be used. We vary the types of drills for more variety in the training content, to avoid boring the player.

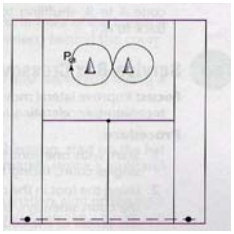
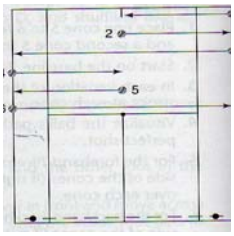
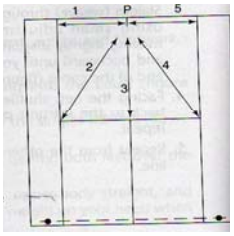
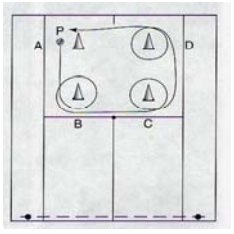

Table 1. Summary of useful pointers for preparing a standard session for sprint reps.

Intensive actions	270 on average
Side changeover	every 6 minutes
Work / rest ratio(s)	10/20
Number of reps of intensive action by set	12
Number of sets for the period of training (100%)	Session of 22 sets
Recovery between 12 reps (every 6 minutes)	90 seconds
Recovery between sets	2 minutes
Sideways movement by drill	An average of 4 sideways movement
Moving (m)	2.5 m to 4.5 m on average
Total area covered	Approximately 3,000 m
Number of sets during competition (60%)	Session of 13 sets
Combination in 2 sets	6 sets +7 sets
Frequency of training per week	2 to 3 / week

Working on specific speed

Given that a drill based solely on the practice of tennis has little or no impact on improving running and explosive strength, the development of additional specific speed and explosive strength sessions seems to be an essential supplement. This involves working on speed, agility and quickness very specific to tennis playing. According to Ferrauti et al, this is the most important quality in tennis and therefore requires training. Besides, specific performance tends to disappear quickly without training [8.14]. For less mental and physical fatigue this session will be done on days without any aerobic work. It will focus on the specific movement patterns in an attempt to improve quality.

Emphasis will be placed on time and accuracy of movement. To do so, the repetitions will be limited to about 5 to 10, with 3 to 5 sets, with 80 s of recovery between each repetition and 6 min recovery between sets. During the competition period, the volume will be reduced [7-12], and the intensity maintained [8-11,13]. Thus there will be 5 to 10 repetitions for 1 or 3 sets. Several types of specific drills will be included in the training to match the analysis of the previously detailed activity.

Table 2: Summary of the main characteristics of specific speed training

Drills per session	3 – 5 drills
Repetitions per drill	5 to 10 reps
Recovery between repetitions	80 s
Recovery between sets	6 min
Drills per session (competition period)	1 to 3 drills

SUMMARY OF TRAINING PROGRAM DURING COMPETITION

Table 3. Program during tournament period.

Program during tournament period		
Days	**Aerobic endurance: sprint repetitions**	**Specific speed**
D-7	**OFF**	**3 - 4 specific drills, repetitions = 5 to 10 r=80 s (inter sprint) and R=6 min. (between drills**
D-6	**10/20 Reps = 12; Sets = 16 (8+8); r=90 s (in between sets) and R=2min (in between sets)**	**OFF**
D-5	**OFF**	**2 - 4 specific drills, Repetitions = 5 to 10 r=80 s (inter sprint) and R=6 min. (between drills)**
D-4	**10/20 Reps = 12; Sets = 14 (7+7); r=90 s (in between sets) and R=2min (in between sets)**	**OFF**
D-3	**OFF**	**2-3 specific drills, Repetitions = 5 to 10 r=80 s (inter sprint) and R=6 min. (between drills)**
D-2	**10/20 Reps = 12; Sets = 13 (6+7); r=90 s (in between sets) and R=2 min (in between sets)**	**OFF**
D-1	**OFF**	**1-3 specific Drills, Repetitions = 5 to 10 r=80 s (inter sprint) and R=6 min. (between drills)**
D Day	**OFF**	**OFF**
		Usual fitness and tennis warm up

CONCLUSION

An optimal physical condition is required for the tennis player during the competition period. But in tennis this period lasts 10 months out of 12, and the player plays matches almost every day. There was therefore a need to find training strategies that would allow players to maintain their peak performance for the longest time possible, throughout that time of the year. At the same time, we need to avoid reduced training caused by the partial or total decrease of fitness training while taking the recovery period into account. This unique program incorporates the different strategies of training and knowledge of the activity to offer practical guidelines (through the countdown of days to the next game) which the coach or the competitive tennis player can use for the fitness training program.

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ITF LESSON PLANS FOR BEGINNER PLAYERS: LESSON 6

Level of player: Beginner (ITN 10.3 to ITN 8).

Game situation: Approach and net play.

Tactical theme: Attacking and putting pressure on the opponent by approaching the net and playing at the net.

• **Tactical theme 1:** 1. Hitting the ball, 2. Placing it over the net, 3. Inside the singles court.

• **Tactical theme 2:** 4. Approaching the right ball, 5. Approaching to the open court.

6. Approaching to the opponent's weak side.

Technical themes: 1. Preparation and movement towards the ball, 2. Hitting while moving forwards, 3. Hit in the air (volley and smash),

Number of players: 8

Equipment: Red, orange, green (transition) and regular balls and 23 in. and 25 in. racquets according to the level of the players (ITN 10.3 to ITN 8).

Courts: Recommended to set up red, orange, and regular (green) courts.

DRILL 1- OPEN SITUATION

Goal: Players to play points with ground strokes from the baseline with the intention of attacking and putting pressure on their opponent by approaching the net and playing at the net.

Methodology: Point play.

Player organisation/positioning:

• **ITN 10-10.3:** Create 4 mini-courts (red 'play tennis' courts and balls) using the court width. 2 mini-courts in each side of the net, Have 2 players playing in each mini-court.

• **ITN 8-9:** Use the full court with orange or green 'play tennis' balls. Have 4 players on each side of the court. They play in pairs down the line. 2 pairs play close to the doubles tramlines and the other 2 closer to the centre of the court. Depending on their level, they start serving from closer to or further away from the net.

• **Other options:** 12 metre or 18 metre courts can also be set up (orange 'play tennis' court).

Player rotation: Set a rule by which players should approach and play at the net at every occasion possible and give double value to points won at the net. After 5 baseline points or according to a given time (for e.g. 2 minutes), winners move up one court and losers move down one court. When using a full court, winners can play winners and losers play losers. Try to make sure that everyone gets a chance to play against each other.

Coach analysis and diagnosis points: Use effective questioning to check players' overall attitude (mental), consistency and understanding (tactics of attacking and putting pressure on the opponent by approaching the net and playing at the net), movement around the court and around the ball (condition), and racquet skills (technique).

DRILL 2- CLOSED SITUATION WITH BASKET FEEDING

Progression 1a (Technical themes).

Goal: Players to practice the fundamental technique of the approach shots and volleys to approach and play at the net. Methodology: Use self-feed, partner hand or racquet feed, or coach feed. Create stations adapted to the players' level: Station 1, Hit the ball from mid court, Station 2, Start in the same position as station 1 but hit the fed ball while moving forwards, Station 3, At the net, hit a fed ball in the air (volley) with a short swing, contact, and follow through, Station 4, At the net, hit a fed ball overhead in the air (smash) with a short swing, contact, and follow through. Station 5, Start from the ready position, move towards the ball, hit an approach, get close to the net and play a volley or a smash.

Player organisation/positioning:

• **ITN 10-10.3:** Use 4 mini courts (red 'play tennis' courts), having each mini court have one station, the rotation is completed per court ensuring each player gets to practice at each station.

• **ITN 8-9:** Use full court but with two mini courts (half court down the line), starting with the two first progressions, and then progressing to the next two progressions once everyone has completed the same number of repetitions (orange or green 'play tennis' balls can be used). The players start in the court relative to their level of play. They can start on the service line and then move back.

Player rotation: The possible rotations include the following:

• Certain amount of time

• Certain number of repetitions

• Number of successful strokes, technical or tactical

• Certain amount of points played

Coach analysis and diagnosis points: Ensure the players practice both the forehand and the backhand approaches and volleys at the same time and in the same quantity, that they approach with the right ball and direct the approach to different zones using targets or cones previously decided by both the players and the coach.

ITF LESSON PLANS FOR BEGINNER PLAYERS: LESSON 6

Progression 1b (Tactical theme)

Goal: Players to practice the fundamental tactics of the approach and net play game emphasising the tactics of putting pressure on the opponent by using the approach and net play.

Methodology: Use self-feed, partner hand or racquet feed, or coach feed. Create stations adapted to the players' level: Station 1, Approaching with the right ball (decision making), Station 2, Placing it over the net (height), and Station 3, Inside the court (direction), Station 4, Hitting the ball with depth.

Player organisation/positioning: Same as above.

Player rotation: Same as above.

Coach analysis and diagnosis points: Make sure the players begin to understand how to use the tactical concept of approaching and playing at the net and how they relate to the mid court game and volleys (i.e. direction and racquet face position, height and racquet path trajectory, etc.).

DRILL 3-RALLY WITH COACH

Goal: Players to practice the fundamental tactics of approaching the net and the net game in a rally situation with their coach to apply the tactics of putting pressure on the opponent.

Methodology: Players rally with the coach.

Player organisation/positioning:

• For ITN 10-10.3 using 4 mini-courts (red 'play tennis' courts), players serve or start the rally with an underarm serve with the coach playing on one of the courts, and with the extra player possibly picking up balls, or doing a physical activity, keeping the score, creating a station that they will be able to practice their approach shot or net game consistency (i.e. against the fence/wall or hit into a target). After 5 points, they get together to discuss theme of the lesson. The side of the coach should start the rally/point.

• ITN 8-9 using 2 mini-courts, coach and players rally down the line (using orange or green 'play tennis' balls). Putting the players into two groups of 4, (with the coach making the 4th member in one of the groups). The 8th player or spare player could be doing a physical exercise or picking up balls, or an activity that relates to the theme of the lesson.

Player rotation: Same as above.

Coach analysis and diagnosis points: Make sure the players begin to apply the basic tactics of putting pressure on their opponent by approaching and playing at the net.

DRILL 4-OPEN SITUATION WITH POINTS

Goal: Players to practice the fundamental tactics of putting pressure on their opponent by approaching and playing at the net in a rally situation with their peers.

Methodology: Players rally among themselves.

Player organisation/positioning: Players play points relative to their playing level and court size i.e.

• ITF 10-10: 3-4 mini-tennis courts

• ITF 8-9: Using half court. They could progress to using full court but having good rotation and using either orange or green 'play tennis' ball.

Player rotation: Same as above.

Point/scoring system: The following formats can be used:

• Individual scoring: Number of successful approach shots.

• Team/pair scoring: Number of approach-volley patterns

• Other options: Number of times players adopt a correct preparation, contact point, impact the ball with the strings, and hitting on the run.

• Individual points

• Extra points given for tactical (approaching the right ball, keeping the opponent in the baseline, playing close to the net) or technical proficiency

• King of the court

Coach analysis and diagnosis points: Make sure the players begin to apply basic tactics (putting pressure on their opponent by approaching and playing at the net) using their approach shots and volleys.

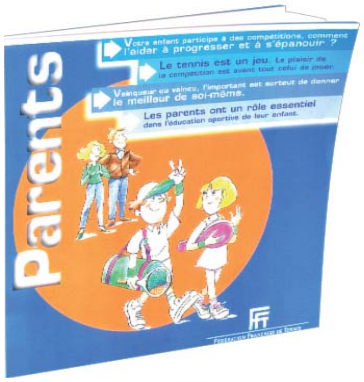
Recommended Books and DVDs

PARENTS

Author: French Tennis Federation (FFT) Year: 2009 Language: French Type: 5 page Leaflet

This leaflet identifies 22 do's and don'ts for a Tennis Parents. It describes the need for emotional control, role modelling and even promoting other sports for enjoyment. The no's remind parents not to put there child on a pedestal or create stress during competition. A simple and effective short resource to educate parents on the effect of there behaviour on children and adolescences.

For more information visit: www.fft.fr



PROGRESSIVE TENNIS 1/2 COURT DVD

Edited: Wayne Elderton and Neil Parker Year: 2008 Language: English Type: DVD

Created for Tennis Canada by Wayne Elderton and Neil Parker, this is a fantastic resource for coaching 5-7 year olds in a Progressive Tennis System. Inspired by the excellent work of the Belgium Tennis Federation, there are over 50 development drills in a systematic progression of skills.

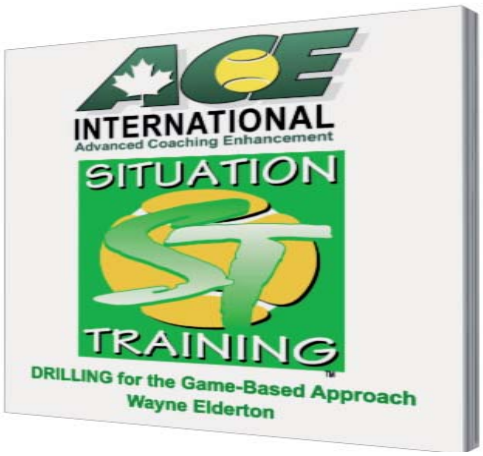
For more information visit: www.acecoach.com

SITUATION TRAINING: DRILLING FOR A GBA

Edited: Wayne Elderton Year: 2008 Language: English Type: 80 page book Level: All levels

This manual is a 'Coaching workshop in a book'. It starts with a sample of a typical tennis drill and then, section by section, 'evolves' the drill with Situation Training principles that improve the drill structure, organizes the goals of the drill, modifies the feeding, and adds decision-making. All in a Game-based Approach method. This may be the only manual you need for effective GBA drilling.

For more information visit: www.acecoach.com

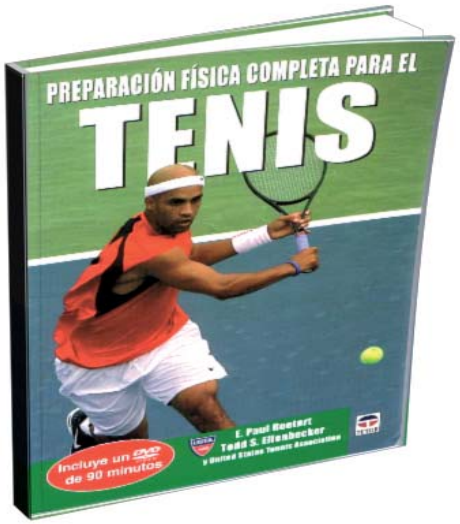


COMPLETE CONDITIONING FOR TENNIS

Author: E. Paul Roetert and Todd S. Ellenbecker Year: 2008 Language: Spanish Pages: 207 Level: All levels

Complete Conditioning for Tennis is now available in Spanish. Increase strength, power, agility, and quickness and take your game to a much higher level. Complete Conditioning for Tennis details how to make the most of your training time with exercises, drills, programs designed to assess you fitness level, improve footwork, increase your flexibility, enhance stamina, boost mental focus, and prevent common injuries. Additionally Complete Conditioning for Tennis includes a 90 minute DVD which takes you on court and into the gym to demonstrate the drills and exercises used by the pros. The book aims to develop the highest level of athleticism for success in tennis.

For more information visit: www.humankinetics.com



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FORMAT

Articles should be word-processed preferably using Microsoft Word, but other Microsoft compatible formats are accepted. The length of the article should be no more than 1,500 words, with a maximum of 4 photographs to be attached. Manuscripts should be typed, double spaced with wide margins for A4-size paper. All pages should be numbered.

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