



COACHES REVIEW



Spring 1993

Welcome to the first issue of ITF Coaches Review. This brand new ITF publication contains material that we believe can assist coaches with the training of elite young tennis players. This issue features articles from Australia, Canada, Germany, Sweden, Britain and the United States. Over the past decade, developed tennis nations such as these have conducted a great deal of research into specific tennis areas. As a result, the application of sports sciences (biomechanics, physiology, psychology etc.) has played an important role in the development of many top young players. We are pleased that the coaches and National Associations conducting this research have agreed to share their findings with their colleagues from around the world through the ITF Coaches Review.

The ITF Coaches Review is a direct result of the formation of the ITF Coaches Commission. The Commission, comprising nine international experts, held its inaugural meeting last September during the US Open. The primary functions of this new Commission are to advise the ITF on matters related to coaching, recommend topics for future research and to review new research in tennis. The members of the Commission are: Charles Applewhaite (UK), Tim Gullikson (USA), Carlos Kirmayr (Brazil), Pierre Lamarche (Canada), Alberto Riba (Spain), Lynne Rolley (USA), Richard Schonborn (Germany), Masaru Uchiyama (Japan) and Ron Woods (USA).

At its first meeting, it was recognised that it is difficult and often impossible for coaches from many nations to obtain tennis specific sports science material. Research in this area is usually printed in books and magazines in large nations such as the United States, Germany or Australia. For various logistical reasons, this information does not reach the coaches in many ITF member nations.

The Commission proposed that the ITF Coaches Review be created to act as a forum for new research in tennis. In the first issues we intend to publish research that is already in existence. However, in the long term, we hope that coaches from all over the world involved in research will submit articles regularly for publication. The members of the Commission will review the material submitted and decide if it warrants inclusion in the Coaches Review. In time, we believe that the ITF Coaches Review will become the publication with the most up to date tennis research, and will be distributed by the ITF to performance coaches around the world.

In this issue you will also see details of the 8th ITF Worldwide Coaches Workshop which will be hosted by the USTA in Key Biscayne, Florida in November. This unique event will once more see a gathering of the coaching fraternity from around the world to exchange ideas and learn of new developments in coaching tennis. Each nation is limited to four participants who must be endorsed by their National Association. We hope to see you there.

Finally, we would like to thank all of the coaches that have allowed us to reproduce their work in ITF Coaches Review. We are especially grateful to the Coaching Department of the British LTA, particularly Charles Applewhaite and Paul Dent, who have assisted us with the preparation of this first issue and allowed us to reprint their "Coaching Excellence" publication which appears in pages 3-10. We would also like to thank the USTA who have, through Ron Woods and Paul Roetert, given us permission to publish articles from their "Sports Science for Tennis" booklet. We hope that you enjoy this first issue and that you find it useful in your work on court, in whichever corner of the world you may be.

Doug MacCurdy *Director of Development*

David Miley *Development Administrator*

Training Principles To incorporate into a Fitness Program By Anne Quinn

1. Define your Goals and make a commitment

Making a total commitment in sport means defining specific fitness goals – short term and long term. Goals should be difficult, realistic and challenging. Try to set performance rather than outcome goals. Incorporate some goal-achievement strategies, and identify target dates for attaining these goals. Record the goals in writing, and place them where they can be seen every day. Finally, coaches should check their players' progress regularly to see if they are moving positively toward the accomplishment of their personal goals, and reward them every time they reach one of their goals. After all, their goals set the limits of their potential and allow their dreams to become a reality.

2. Warm-Up/Cool Down

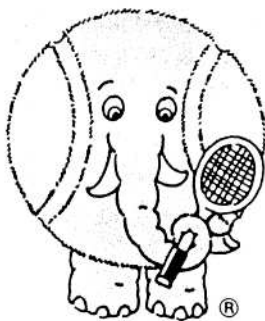
Fifteen to twenty minutes warm-up should be done every time players walk onto a tennis court or begin training. The very first thing players should do is increase the temperature of their muscles before stretching. When players have warmed-up muscles, they should then spend some time stretching out.

Post match stretching is also emphasised to increase local blood flow, enhance the removal of lactic acid, reduce muscular tension, and thus help to minimise any muscle soreness the next day.



8th ITF Worldwide Coaches Workshop

Featuring Presentations by Some of
The World's Top Coaches



The Theme of the Conference will be
"Strategy and Tactics – Towards Tennis in the Year 2000"



Hosted by: The USTA at The Sonesta Beach Hotel and Tennis Club
Key Biscayne, Florida
31 October-6 November 1993

Each Member Nation may nominate 4 coaches to attend the workshop.
Application forms will be sent to National Associations in March.

Coaches may also write direct to the ITF for information on the workshop.
However, all coaches wishing to attend must have the approval of their
national association.



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Preparing Players to Compete in the Heat

(Lawrence Armstrong is an environmental physiologist at the University of Connecticut, Department of Sport Leisure and Exercise Sciences)

Competing in the heat, especially if you are from a cooler region of the country, puts a tremendous strain on the body. In any new environment, essentially all body organs must adjust to maintain body temperature, oxygen and fuel delivery to cells and remove waste products. The function of these physiological adaptations is to improve heat transfer from the body's core to its periphery and ultimately to the external environment. If the process of perspiring does not occur, heat will be stored and exercise performance will diminish because of hyperthermia (elevated body temperature).

During repeated days of prolonged, moderately-intense exercise-heat exposure, the body acclimatizes. Acclimatization to a given environment offers greater stability of body systems. Acclimatization and physical training have two goals in common:

1. To reduce the physiological strain experienced by athletes.
2. To allow athletes to compete as though they were in a neutral environment. To induce optimal heat acclimatization for tennis training and competition, the total exposure time in the heat and the exercise intensity should be gradually increased for 10 to 14 days. Begin with basic hitting drills that do not require a lot of running and slowly increase the activity level. If conditions are severe, athletes will probably not be able to complete intense workouts which were previously done in cooler environments. The goal of this training is to elevate the internal temperature to a safe level and maintain it, utilizing aerobic exercise.

Before, during and after practice or a match, it is critical athletes drink water. By consuming one pint to one quart of water before activity begins, they will achieve adequate pre-exercise hydration. During the activity, four to eight ounces of water should be consumed every 15 minutes.

Wearing lightweight, loose-fitting, porous clothing is also important. The skin surface must be open to the air for evaporative cooling to take place. If tennis players acclimatize to a hot-dry environment, then move into a hot-wet environment, they should acclimatize to the humidity before attempting competition.

Preparing the athlete for competition in a new environment not only enhances performance, but will lessen the chance of heat syncope (fainting) and heat exhaustion. By acclimatizing, the symptoms of heat exhaustion are reduced by more than 50 per cent because of improved cardiovascular stability. Likewise, heat syncope occurs most often during the first five days of heat exposure. However, the cardiovascular adaptations which occur during the first three to five days of heat acclimatization result in a rapid decline of fainting episodes.

If players should experience any of the symptoms below, stop the activity, have them sit or lie in a shaded area and drink cool liquids. Medical attention should also be sought.

Recommended Sports Science Videos

Tennis Australia has produced three new videos which look at the modern strokes from a biomechanical viewpoint.

TENNIS 2000

Volume I – Multi Segment Forehand · Volume II – Backhand · Volume III – Serve and Volley

To order these, contact:

McDonalds Junior Tennis Australia,
PO Box E460, St. James, Sydney NSW 2000, Australia.
Fax: (61) 2 261 5777.

The USTA has produced a video on Fitness Testing, featuring Dr. Jack Groppe

Test to be Your Best – USTA Fitness Testing Protocol

To order this video, contact:

USTA Publications Department, 70 West Red Oak Lane, White Plains, NY 10604, USA.
Tel: (1) 914 696 0330.

TACTICS

based on work by Richard Schönborn

MATCHPLAY

How many times have we heard coaches comment on players "... looks good, but can't play the game!", "... stylish, but doesn't know where the court is" or "good in practice but can't play matches."

Unlike gymnastics, athletics (particularly Field) and swimming, tennis is a sport which depends on making decisions about WHAT TO DO NEXT in a constantly changing environment.

Tennis is more of a thinking game than a hitting game. The following tactical tips and drills will make your pupils more effective match players.

The following tactical tips are taken from Richard Schoenborn's presentation at the 7th International Worldwide Coaches Workshop 1991, "New Ideas in Tactics".

TACTICAL TIPS

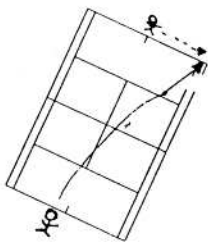
1. Play every point as if it were the last one – concentrating fully, relaxed, attacking, aggressive, active. To strive for highest performance level in all rallies.
2. Use the tactics which give you best chance and with which you have previously been successful – regardless of the game situation.
3. Like a busy bee, collect every possible point.
4. Try to win the highest number of points possible; you then have a 99% probability of winning the match.
5. Try to win the most series (three points and more consecutively) and then you are 100% sure of winning the match.
6. Do not let yourself get irritated by big points, as they are known, or game situations.
7. Do not be affected by prejudices and myths, e.g. do not necessarily have to hit down the line on the approach.
8. In tournaments and in training, introduce your own individual ploys, without regard for recognised theories, and use them as often as possible, at least as long as you are successful with them.
9. Make full use of the breaks between rallies and when changing ends for recovery.

TACTICAL DRILLS:

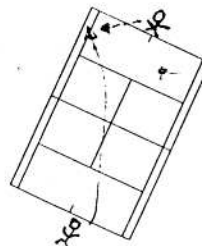
To enhance tactical play in our players, we therefore need to design drills which encourage the development of problem solving and decision making.

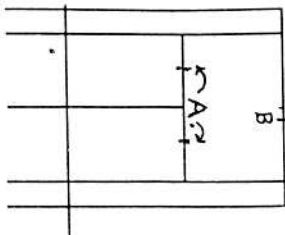
- * Play a match where if one player wins 3 points in a row, she wins the game.
- * If player wins first point in a game, the score is 30-0.
- * 11pts game. Two players play in full singles court. Server has to win point within 11 strokes. If this is done, she then serves from advantage side and has to win the next point in 10 strokes. If she loses a point, the serve goes to the other player who has to win the point before 11 strokes have been played. Continue until player wins point in 1 stroke, i.e. an unreturnable serve.
- * Play out points, starting with a feed to produce a specific tactical situation.

Feed = high, looped cross-court to players backhand.



Feed = aggressively hit short angle cross-court to players forehand. Repeat to players backhand.



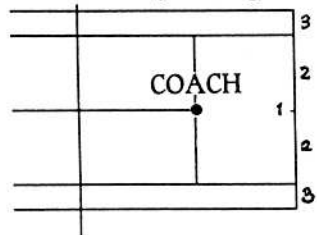


4. Purpose: to develop leg speed power, reaction time and precision.

Description: coach stands in the middle of 2 ball cans, but slightly in front of both in position 'A'. Player (holding a ball), sprints from the singles sideline to just beyond a cone (position 'B'), when they then simulate a groundstroke with an underarm throw of the ball in their can the coach 'covers' one of the two cans by moving in front of it. The player throws the ball (underarm) to the 'uncovered' can!

5. Purpose: to develop proper footwork (movement technique) and speed power.

Description: the coach stands on the service-line 'T', holding a ball and facing the player. The coach directs the players movement by calling out '1', '2', or '3' AND at the same time, moving the ball in their hand to the left or right, a specific point on the baseline.



Position 1: player develops footwork around the ball to then shadow swing a forehand or backhand (as directed).

Position 2: player moves to a can placed in position 2. After shadowing the appropriate stroke the player side steps back to the middle.

Position 3: player moves to position 3, but after shadowing the appropriate stroke, initiates first a cross-over step (running) and then side steps to return to the start.

N.B. Players after shadowing, should allow their back foot to come through to level with their front foot and then use it push off back to the start.

6. Purpose: to develop response time and co-ordination.

Description: coach stands on the 'T', facing the player, with a ball in each hand. The coaches' arms are outstretched, directly in front of the coach. Player lies face down on the baseline, resting their chin on their clasped hands. The coach gently places one of the balls in the air. As soon as the player sees the coach's arm move, she can respond to catch the ball before it bounces twice on the ground.

All of the above drills can be done on and off the court, and can be done with any age and level of player.

An example of how one of these sessions should be conducted is as follows: Repetitions: 6, Sets: 3, Work time: 2-7 seconds, Pause between reps: 12-42 seconds, Rest between sets: 90 seconds, Work: rest ratio: 1:6, Intensity: 100%

KNOW THE JARGON

by Tennis Canada

Certain jargon or terminology is used when talking about physical conditioning and drills training. It is important that the coach is familiar with some of these terms. (Extracts from Tennis Canada's U18 Club Tennis Manual).

- **Repetition or reps:** A single execution of an exercise.
- **Sets:** A series of consecutive repetitions.
- **Work time:** The actual time spent performing the repetition.
- **Intensity:** The level or percent of maximum work that is required to properly perform a repetition.
- **Ratio:** The ratio is a quantitative measure of the amount of work in relation to the amount of time allowed for pausing in a set.
- **Rest or pause:** Pausing and resting between repetitions and sets should occur in an active manner by either doing light stretches or by walking. Pausing will permit regeneration of energy and recovery of the central nervous system between reps and should last between 5-60 seconds. Younger athletes require shorter recovery due to lower work intensities.

Resting is similar to pausing but occurs after the set and is of a longer duration (30 secs – 3 mins).

- **Type of training:** The various types of exercises or equipment used. The choice of the type of training depends on various factors: • phase of training • level of training • age of the player • equipment available • personal preferences

The coach should be able to choose which type of training is best suited for her athletes.

- ⊙ 'V' LOW VOLLEY MOVEMENT PATTERN: Move diagonally forwards to shadow a low forehand volley and then immediately move diagonally forwards to the left to shadow a low backhand volley. Quickly back shuffle to the start and repeat as many times as possible in 7 seconds. Alternate starting off with opposite side volleys.
Tip: to encourage the correct movement technique through the first volley to the second, have players move their back foot level with their front foot just after contact. This will encourage forward weight transfer and will move them smoothly through one volley to the next.

- ⊙ STEFFI GRAF OFF-FOREHAND DRILL: Start on the baseline and run in a 'C' pattern to a cone 3 metres away, and shadow an inside-out forehand. Shuffle quickly backwards to the start, facing the net. Repeat as many times as possible in 7 seconds.

SUMMARY

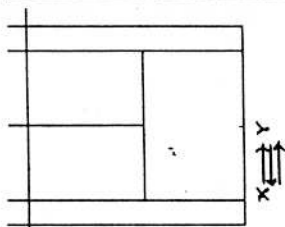
The aim of both circuits** is to provide the coach with a simple method of improving specific anaerobic fitness for tennis. The main objective for the coach is to have players who can hit the ball aggressively and move as explosively during the last point of a long hard match as during the very first point. To help this overall objective, the circuits include the use of tennis specific elements and time intervals representative of those found in a match. This will assist in producing players who are fit for tennis.

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***(The Speed Power Circuit will be featured in a future issue).*

SPEED TRAINING related to CO-ORDINATION, ANTICIPATION, REACTION, FOOTWORK AND CONCENTRATION

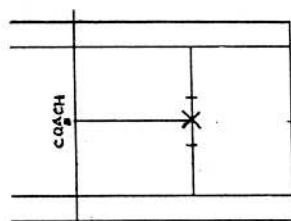
by Leonardo Snelleman



During his presentation at the 1992 European Coaches Symposium in Crete, Leonardo Snelleman, head coach of the Boras Tennis Club in Sweden, demonstrated the following drills to improve movement on court.

1. Purpose: to develop lower body speed power and the precision of the movement of the torso and hitting arm.

Description: Player starts from position 'x'. On the word 'go' from the coach, the player picks up a tennis ball (which is in front of them on the baseline) and side-steps to a ball can (which is upright, (position 'y')). The player gently places the ball on top of the can and quickly side-steps back to the singles side line where they must touch the floor with their right hand and then side step back to the can. When they get to the can, they must move into an appropriate hitting position and knock the ball off the can with their hand, without knocking the can over.



2. Purpose: to develop response time and agility.

Description: player stands at position 'x' between two ball cans placed approximately 0.5 metre either side of the 'T'. Player faces away from the coach. On the command of 'one' from the coach, the player simply turns around inside the two cans and moves to catch a ball (before the second bounce) which has been thrown by the coach. If coach shouts 'two', the player must first move around the can on their left hand side before catching the ball. On the

command 'three' the player must first turn around the right hand side can.

3. Purpose: to develop correct footwork (movement technique), response time, co-ordination and agility.

Description: player starts on the 'T', in between two ball cans.

i) on command of 'side', the player turns sideways and moves in a cross-over pattern to approximately 1 metre inside the baseline to shadow a smash. After recovering from the smash, the player must quickly run back to the 'T' where the coach will then quickly throw a ball underarm either to the left or right. The player must react and touch the ball with their hitting hand to simulate a volley*.

ii) on command of 'back', the player simply runs backwards to simulate preparing for a smash in which they have lots of time to prepare. After shadowing the smash, repeat as above.

iii) On the command of 'turn' the player turns around and runs forwards to the baseline to simulate chasing a lob. After shadowing a groundstroke, the player sprints to the net to simulate the volley movement pattern.

*In order to fully develop the players' co-ordination, response time and agility, it is important that the coach provides a very challenging volley.

CIRCUIT TRAINING FOR TENNIS

by Dave Reddin* and Paul Dent

Match analysis can supply important information about the physical demands of the game of tennis. Current statistics show that the average point on clay between 2 skilled males lasts for 10 seconds; on a hard court 5.2 seconds and on grass, 2.8 seconds. During the game itself, on a fast court, only about 15% of the time on court is spent in action, (25% on clay) the rest of the time being active or passive recovery.

In a match, the work interval is variable in length and intensity and the rest time is strictly controlled. Players have up to 25 seconds rest at the end of each point and 90 seconds at the end of every two games. In tennis, the work or action aspect can encompass many activities, from those of a mostly aerobic nature e.g. long baseline rallies, to those which are mostly anaerobic e.g. intense points involving repeated short sprints and recoveries.

All these factors have a bearing on the way we should train players to play tennis. Circuit training has long been a popular way to train large groups of players in an efficient and effective manner. The important factor in circuit training (as with all types of training) is the ratio of work to rest and the intensity of the activity. These factors will dictate the training adaptations that take place. The high intensity circuit (see below) and the speed power circuit (see future issue) each place different emphasis on aspects of fitness for tennis, and this is reflected in the work to rest ratios given. The high intensity circuit also trains the co-ordination of tennis specific movement patterns.

HIGH INTENSITY CIRCUIT

The emphasis in this circuit is to simulate the game itself, both in terms of the work to rest ratios and also in terms of the actual activities performed. Thus the work time will be 7 seconds (the length of an average point) and the recovery time will be 25 seconds, representing the actual time between points during a game. A circuit using this arrangement of work and rest intervals will tend to be an anaerobic type circuit, having short periods of maximal activity with relatively brief recovery intervals. During the 25 second rest breaks, the players should pick up their racket and 'play' with the strings, as they should in a match.

The circuit will comprise 8 different tennis specific activities to be used at 12 stations of the circuit. On the first circuit, the players will do all eight activities and then repeat the first 4 to give 12 stations, whilst on the second circuit they will do all 8 activities and then repeat the last 4 to give 12 stations.

Twelve stations have been used as an average value for the number of points in two games. Between each circuit there is a recovery period of 90 seconds, which is used to simulate a changeover after 2 games.

THE ACTIVITIES

- ① **GROUNDSTROKE 'V' DRILL** Move off the baseline 'T', sprint 3m diagonally forwards to the left and shadow a backhand. Move backwards to the start and sprint 3m diagonally to the right. Then shadow a forehand before moving backwards to the start. Repeat as many times as possible in the 7 seconds.
- ① **SIDE-STEP SPRINT** Start from just in front of the service-line 'T'. Side-step to the right hand singles side-line, whilst facing forwards towards the net. Touch the right singles side-line with the racket and quickly side step to the left hand side-line. Repeat as many times as possible in 7 seconds.
- ① **SMASH AND LOW VOLLEY DRILL** Start at the front right hand corner of a service box, holding a sponge tennis ball. Move backwards to the back left corner of the service box, throw the ball as far as possible whilst jumping to simulate the action needed for an inside-out forehand smash. Move quickly forward to try and catch the ball in dominant hand before it has bounced twice. Repeat as many times as possible in 7 seconds.
- ① **TRAM LINE JUMPS:** This movement simulates the recovery step. Stand on one side of the tram lines and do as many jumps as possible, jumping from one tram line to the other. On landing, powerfully explode the other way (on the outside leg) to land on the other line. Repeat as many times as possible in 7 seconds.
- ① **APPROACH SHOT SPRINT:** Sprint 4 metres and do one carioca step while shadowing a backhand slice approach. At the end of the 4 metres, do a stabilising double footed jump just before turning round a cone to run back to the start whilst shadowing a forehand slice approach shot. Repeat as often as possible in 7 seconds.
- ① **COMPASS DRILL:** Place two medicine balls (cones or racket bags) approximately 4 metres apart (e.g. one on the service line 'T' and one on the junction of the service and side lines). With racket in hand, lunge right to tap the back of the ball with the racket. Then move explosively to the left to tap the back of the other ball. Repeat as many times as possible in 7 seconds.

THE BALL TOSS

The height that the ball should be pushed in the toss has always proven a problem for beginners, and even tournament players have been shown to impact the ball at a variety of heights below the maximum height of the toss (Newcombe, 0 to 2cm; Gonzales, Hoad and Laver 15 to 22cms). Without considering air resistance, a player has eightfold the time to contact the ball when it is thrown to the height of the sweet spot of the racket, than when the ball is thrown 1.2m above this point. When the ball is tossed 1.2m above the racket, the player has to make contact with a target moving at approximately 5 metres per second.

- ⊙ **Application:** As a general rule, the ball should be pushed to the height of the top of the racket for a fully extended body. It is assumed that the dynamics of the service action will elevate the player more than when just stretching for height and this should then cause the ball, at its highest point, to be aligned with the central region of the racket face.
- ⊙ **Coaching tip:** Referring to the clock face, for flat and slice serves, the contact point should be in the same place from right to left, i.e. at '12.30'. For the kick serve the contact point should be at '11.30'. (Take 12.00 to be directly above the players' head).
- ⊙ **Coaching tip:** Players must be aware of the ball placement which is too high as this invariably causes a too long pause in the action as the player waits for the ball to drop to the optimum hitting position.

⊙ WEIGHT TRANSFER

⊙ Studies, using a force platform to measure the push against the ground during the service action, showed that the level of forward – back forces was relatively small compared to the forces recorded in the vertical direction.

Application: Transference of weight is a desirable characteristic of a good service action, however, body weight may initially be positioned to cater for individual preference.

- ⊙ **Coaching Tip:** I would generally recommend that the rocking position sequence of weight transfer is forwards, backwards, forwards. When setting up to serve, ensure that all of your body (except your back foot) is leaning over the baseline into the court. After making contact with the serve, encourage your players to fall into the court. When practising their serve, many players remain behind the baseline after making contact with the ball. Therefore, they cannot transfer their weight effectively and the player often pikes out at the waist (i.e. pushes their hips backwards away from the court) which prevents effective hip and shoulder rotation as well as linear and vertical weight transfer.

What body movements then drive the body forward and upward for impact? It has been found that players with a foot-up service action produce more vertical weight transfer. The greater vertical forces resulted in a significantly higher impact position and a better up-and-out racket trajectory for the foot-up technique when compared to the foot-back style. The foot-back technique produced greater forwards weight transfer than the foot-up style and may, therefore, be more conducive to rapid movement to the net following the serve.

LANDING FOOT

It is commonly believed by coaches that a power serve is associated with a crossover, where the back foot is the first to land in the court after impact. The only study that addressed this issue reported that neither technique (i.e. front foot landing first or back foot landing first) was associated with a higher service velocity.

- ⊙ **Coaching Tip:** If a player's back foot lands in the court first (i.e. the cross-over) then the player has a better chance of hitting the slice serve wide to the deuce court and getting more swing on the slice down the centre line to the advantage court. The personal preference of the player should probably dictate which technique is used.
- ⊙ **Coaching Tip:** re: tactical serving. In modern day tennis, a server needs to be able to hit 3 or 4 different serves every game. Variety on the serve is vital if the returner's effectiveness is to be reduced. Using a variety on the serve will reduce the ability of the returner to anticipate and get into a groove.

When serving, if you make a mistake, make it long. If you hit the serve into the net, you can't even get into an argument! The returner will also be more inclined to push into the court to return the serve, especially the second serve, if you dump too many serves in the net.

Two serves to promote with players are the slice serve wide to the deuce court and the serve which is hit down the centre service line to the advantage court, which swings away forcing the returner to play the return from just inside the deuce court. The most important serve in today's game is the serve to the body because the top players are returning so well.

Encourage your players to be aware of where their opponent is standing to receive serve and what grip they are waiting with. These two sources of information are needed to make an appropriate decision regarding service placement and type.

From a teaching point of view, there are several points which can be used here:

- * give the instruction 'left hand, left knee'. This means that as the ball hand starts upwards, the left (and right) knee(s) will co-ordinate in a rhythmical movement.
- * instruct the server to keep the left hand pointing upwards after the ball is placed in position. The server's weight can then be efficiently transferred downwards (knee flexion).
- * realise that the server's body leaves the ground, not by jumping intentionally, but as the result of driving upwards to meet the ball.

Further power can be added by:

* rotating the shoulder (and arm and racket) beyond 90 degrees to the baseline (or perpendicular to the fence). The rotation of the shoulder can be achieved by keeping the racket (right) arm moving, whilst holding the ball (left) arm momentarily still, before moving it upwards.

- * the correct knee bend should also tilt the right shoulder downwards and the left shoulder upwards.

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HIP ROTATION

The second part of the link in the chain is the use of the hips. The advanced player will transfer the power generated by the knees to the trunk through the hips.

Hip rotation occurs after the knees bend (flexion), and then straighten (extend). Such an action upwards drives the shoulder up and out which forces the racket further down the back of the server. This phenomenon is called displacement and requires excellent co-ordination.

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TRUNK ROTATION

The force has been transferred from the ground, through the legs to the hips. When the hips achieve maximum rotation velocity, then the trunk is rotated. Most good servers have considerable trunk rotation.

It is up to the coach to notice the trunk rotation of the player, but it is important to understand that if excessive trunk rotation is emphasised, injury to the back could take place.

Note that the left arm is tucked in front of and across the body. This arm action acts to decelerate the trunk rotation thus allowing the arm to accelerate.

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ROTATION OF THE ARM AND SHOULDER

Following the trunk rotation, the next link in the system is the rotation of the arm about the shoulder. When the arm is at the bottom of the backswing behind the back, it is externally rotated at the shoulder.

On the upward or forward swing, the upper arm internally rotates at a very high speed.

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ELBOW EXTENSION – FOREARM PRONATION

The next part of the link involves the elbow in two ways:

- * the elbow extends from the position when the racket is behind the back and
- * pronation (turning outward) of the forearm and hand around the elbow occurs.

The velocity of these two actions is very high and care should be taken to avoid injury.

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WRIST SNAP

It is a very contentious issue as to whether there is a wrist snap in a serve.

In the backswing (behind the back) and early forward swing, the wrist is hyperextended (the hand bends back at the wrist). As the racket head accelerates towards the impact point, the hand flexes at the wrist until, at impact, it is relatively straight compared to the forearm, and then the racket head continues in its high velocity so that the wrist flexes.

Whether or not the wrist snap takes place, it is a good teaching technique to suggest that the server points the wrist in the direction she wants the ball to go.

The wrist action from a hyperextended position, through to a straight (at impact) and then flexed position (after impact) is the final stage in the chain of links which produces a powerful serve.

- ⊙ **Coaching tip:** to encourage players to use the wrist more on the serve, have them serving in a totally square on stance to the net, with feet shoulder width apart. This is to block out the effect of rotation of the hips and shoulders encouraging the use of the wrist for the generation of power.

So remember:

The advanced service action requires an efficient transfer of force which develops from the ground. For the chain link to be efficient, the force must pass through the body parts in the correct order.

From a teaching point of view, there are several points which can be used here:

- * give the instruction 'left hand, left knee'. This means that as the ball hand starts upwards, the left (and right) knee(s) will co-ordinate in a rhythmical movement.
- * instruct the server to keep the left hand pointing upwards after the ball is placed in position. The server's weight can then be efficiently transferred downwards (knee flexion).
- * realise that the server's body leaves the ground, not by jumping intentionally, but as the result of driving upwards to meet the ball.

Further power can be added by:

- * rotating the shoulder (and arm and racket) beyond 90 degrees to the baseline (or perpendicular to the fence). The rotation of the shoulder can be achieved by keeping the racket (right) arm moving, whilst holding the ball (left) arm momentarily still, before moving it upwards.
- * the correct knee bend should also tilt the right shoulder downwards and the left shoulder upwards.



HIP ROTATION

The second part of the link in the chain is the use of the hips. The advanced player will transfer the power generated by the knees to the trunk through the hips.

Hip rotation occurs after the knees bend (flexion), and then straighten (extend). Such an action upwards drives the shoulder up and out which forces the racket further down the back of the server. This phenomenon is called displacement and requires excellent co-ordination.



TRUNK ROTATION

The force has been transferred from the ground, through the legs to the hips. When the hips achieve maximum rotation velocity, then the trunk is rotated. Most good servers have considerable trunk rotation.

It is up to the coach to notice the trunk rotation of the player, but it is important to understand that if excessive trunk rotation is emphasised, injury to the back could take place.

Note that the left arm is tucked in front of and across the body. This arm action acts to decelerate the trunk rotation thus allowing the arm to accelerate.



ROTATION OF THE ARM AND SHOULDER

Following the trunk rotation, the next link in the system is the rotation of the arm about the shoulder. When the arm is at the bottom of the backswing behind the back, it is externally rotated at the shoulder.

On the upward or forward swing, the upper arm internally rotates at a very high speed.



ELBOW EXTENSION – FOREARM PRONATION

The next part of the link involves the elbow in two ways:

- * the elbow extends from the position when the racket is behind the back and
- * pronation (turning outward) of the forearm and hand around the elbow occurs.

The velocity of these two actions is very high and care should be taken to avoid injury.



WRIST SNAP

It is a very contentious issue as to whether there is a wrist snap in a serve.

In the backswing (behind the back) and early forward swing, the wrist is hyperextended (the hand bends back at the wrist). As the racket head accelerates towards the impact point, the hand flexes at the wrist until, at impact, it is relatively straight compared to the forearm, and then the racket head continues in its high velocity so that the wrist flexes.

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So remember:

The advanced service action requires an efficient transfer of force which develops from the ground. For the chain link to be efficient, the force must pass through the body parts in the correct order.

BIOMECHANICS

by Bruce Elliott and Dennis Colette

MAKE THE SERVE AN EFFECTIVE WEAPON

This article combines sound scientific research in the form of extracts from the Australian Sports Commission National Sports Research Program by Bruce Elliott PhD, and 'Tennis the Australian Way' Manual, with practical applications. Ian Barclay former coach to Pat Cash, gives us the benefit of his knowledge and experience by providing practical tips. It is important, to understand the biomechanics of the serve, so that advanced service techniques can be added to make the serve an effective weapon.

The primary consideration of any service technique is rhythm. As the body provides the energy supply for the serve, it is important that the co-ordination of the body segments occur in a sequence that produces an optimal racket position, trajectory, and velocity at impact. Better servers are those best able to co-ordinate the sequence of motion which produces an ideal racket position at impact.

⊙ Coaching Tip: To develop a rhythmical action, players need to be relaxed. Use the phrase 'loose as a goose' to help the players feel relaxed, and it has to be like that at 5-all in the final set tie-break. Use your rhythm to generate power – don't try to muscle it over.

⊙ Coaching Tip: If your rhythm and ball toss are perfect, you can hit the ball with your eyes closed. Young developing players practise serving with their eyes closed as this will prevent them from chasing the ball and allow them to work on a co-ordinated, rhythmical feeling.

THE LINK SYSTEM ADDS POWER

The parts of the body act as a system of chain links whereby the energy (or force) generated by one link (or part of the body), is transferred in a succession to the next link. The link system can be explained by the following:

BODY PART

BIOMECHANICS

LEGS

KNEES (flexion and extension)

↓

↓

HIP

HIP ROTATION

↓

↓

TRUNK

TRUNK ROTATION

↓

↓

ARM/SHOULDER

ROTATION OF ARM ABOUT THE SHOULDER

↓

↓

ELBOW

ELBOW EXTENSION – FOREARM PRONATION

↓

↓

WRIST

WRIST FLEXION

It is important to understand that power (force) is not developed by the trunk and arm. The primary source of power is generated from the ground in the form of ground reaction force. The ground reaction force is that force which is emitted by the ground on the body as the server pushes against it. Newton's Third Law explains the biomechanical principle of what happens. The Law states, 'for every action, there is an equal and opposite reaction.'

Thus the primary source of power for the advanced server is found in the leg action. It is with this action that the source of power is transferred through the link system. It is the efficient transfer of this power which will be explained in this article.

'Players who hit the ball at a greater height are able to hit it at higher velocities'.

USE THE LEGS FOR EXTRA POWER

If pushing against the ground is the way to develop force (and thus power), then the knee bend (flexion and extension) becomes the main technique to master.

The optimum knee bend is quite individual, depending on the strength and co-ordination of the server. There are two problems which are associated with an incorrect use of the knees:

- * not enough, or too much knee bend (flexion)
- * remember, the link system, to be efficient, requires good co-ordination. If the knee bend and push (flexion and extension) is unco-ordinated with the rest of the links (the service motion), then the service power will be impeded.



PSYCHOLOGY

from Tennis Canada

The competitive nature of an elite player's tennis development means that we as coaches must be able to understand, recognise and help solve problems which arise. The majority of the problems associated with competition are psychologically based as a result of performing in a potentially stressful environment.

Therefore, to be effective as a coach of talented players, a thorough understanding of these psychological 'cause and effect' situations needs to be achieved. The following article consists of a series of practical solutions for common psychological problems taken from Tennis Canada's U.18 Club Training Manual.

MENTAL PROBLEM SOLVING

COMMON PROBLEMS BEFORE COMPETITION

SOLUTIONS

Your player lacks confidence

Have your player match herself against her opponent, skill for skill.
 Have your player think how hard she has trained and how well prepared she is.
 Remind your player that there are only two things you expect from her:

1. To give her best effort.
2. To follow her game plan.

Let your player know that you have confidence in her.
 Have your player do some positive self-talk and/or visualisation training.
 Encourage your player to act confident.

Your player is too nervous

Have your player do muscle relaxation and/or mental relaxation training.
 Have your player do some intense physical work.
 Remind your player that some nervousness is normal and necessary for her to play well.
 Get your player to focus on the things she can control, i.e.:

Effort/applying her game plan/responding the right way to her nervousness/replacing a negative thought with a positive one, etc/remind your player that 'nervousness' or 'pressure' is something you put on yourself.

COMMON PROBLEMS DURING COMPETITION

SOLUTIONS

Getting your player to manage mistakes properly

Remind your player that she cannot always control whether she makes mistakes but can always control how she responds to her mistakes.

Encourage your player to respond to mistakes in the following manner:

- * accept mistakes
- * learn from mistakes
- * forget mistakes
- * get ready for next point

Your player is too nervous

Have your player implement the following strategies:

- * treat the situation as a normal reaction to really caring
- * try softer rather than harder
- * take more time in between points
- * take several deep breaths
- * remember your opponent is in the same situation
- * remove racket from non-dominant hand
- * go through a routine or ritual before the point begins
- * breathe out when striking the ball
- * exaggerate footwork (movement) when the point is on
- * accelerate the racket head through the ball

Your player is too flat

Have your player implement the following strategies:

- * take short quick breaths
- * jump up and down in between points
- * think of things which produce energy
- * as a last resort, get angry

3. Be Specific

Similarity should exist between training and tennis, both in the terms of the muscle group involved and the energy systems utilised. You could well be very fit, but not specifically fit for tennis. You must train specifically for tennis. During a tennis match, you are constantly starting, stopping and changing direction, and giving your heart the opportunity to recover between points. Thus movements in your training program should be short, sharp and explosive with plenty of stops, starts, twists and turns, and obviously there's no better place to train than on a tennis court.

4. Progressively Overload

To gain fitness, it is necessary to undertake a training load which exceeds that to which the body is normally accustomed. Coaches must find a happy medium where exercise resistance is at its highest in the beginning, for each individual, and then is gradually increased as the player's fitness capacity improves through the course of the training program. The muscles will respond with increased capacity and efficiency.

5. Strive for Quality Workouts. Listen to your Body

"Quality is more important than quantity" is a well coined phrase that also applies to a training program. For example, the player who jogs 30 minutes a day is not going to benefit as much as one who spends 30 minutes interspersing the jog with short, intense sprints.

Here are some guidelines to help improve the quality of training sessions:

- **Plan ahead:** Plan the time, the place, who you will train with, and what you will do.
- **Add variety:-** With different routines, different people, at different places and different times.
- **Set realistic goals:** Don't expect to play tennis for 5 hours on a hot, humid day, because you will feel you have failed, but you haven't. You just set an unrealistic goal. Remember goals are flexible. They are not cast in stone, and can be adjusted according to circumstances.
- **Be prepared:** Get adequate sleep, eat sensibly, drink water frequently to replenish lost fluids, and keep an extra change of clothes in your bag.

6. Be Innovative

It is always my aim to make sessions interesting, challenging, and lots of fun, but at the same time specific to present goals. This will not only avoid boredom and staleness, but make for greater enjoyment and interest. Squash, basketball, boxing or swimming are often on the agenda. Different training methods, different drills, working on different components of fitness, varying the duration and intensity of our workouts, all help to add variety.

7. RRR. Rest, Recovery, Relaxation. Don't Overtrain

Rest is probably the most neglected, and one of the most underrated principles of any training program. Proper rest and nutrition is very important to prevent overtraining.

To monitor training schedules and prevent overtraining, morning heart rates should be taken, body weight checked regularly, and fatigue indexes used. Heart rates can also be monitored during workouts to check intensity levels of training so as not to overtax the body. Short naps are recommended with plenty of nourishing complex carbohydrates to refuel the energy tank throughout the day.

8. Tailor Training to Individuals

As each player is an individual, it is necessary for the coach to develop an individualized program, and concentrate on areas of fitness to help the player improve weaknesses and meet specific needs. Some players need work on speed and agility, others on cardiovascular endurance and power. All players will have varying needs. The test results will determine these needs and ascertain an individual's strengths and weaknesses. No two players should be given the same training, since they often respond differently.

9. Take a Holistic Approach to Training. Develop Complete Athletes

We are in training 24 hours a day, and everything we do will affect performance. Success of a training program is also due to one achieving balance in life. When working with an athlete, help them as a whole person. Getting to know and understand them better as a person, will help you as a coach help them more.

10. Have Fun

Strive to make the training sessions FUN. With a bit of creativity, training sessions can be fun. Doing the same workout, day in and day out, rapidly becomes boring. Use various training methods and different drills, work on different components of fitness, vary the duration and intensity of your sessions, and set goals for individuals to achieve.

Ann Quinn, M.Sc, B.App.Sc., Dip.Ed.

*Presented at the 7th ITF Worldwide Coaches Workshop
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The next issue of ITF Coaches Review will feature some tennis specific exercises that Anne believes should be incorporated into a player's fitness programme.