

HIGH-PERFORMANCE Coaching

The  **USTA Newsletter for Tennis Coaches**

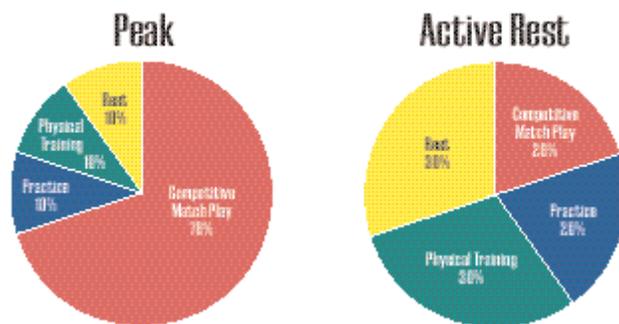
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To Everything There Is a Season

by Paul Roetert, Ph.D.

Pete Sampras has won 11 Grand Slam titles and is chasing Roy Emerson's record of 12. Yet, Pete decided not to play the Australian Open. He was tired and needed a break. Although criticized by some for this decision, from a sport science perspective it may have been a very wise move. The sport of tennis does not have an official off-season like most other sports. This makes it difficult to peak for specific tournaments, fully recover from injuries and of course build in some rest periods. This problem is not just isolated to the pros; junior players can participate in tournaments just about every week of the year. So how can you as a coach help prevent injuries, burnout or poor tournament results due to over-playing? The answer is by designing a proper "periodization training" program. Periodization training has been used for many years, mostly in Olympic sports such as weightlifting, swimming and track and field. **It is a method for organizing the training activities of an athlete so that the chances of overtraining are minimized and the chances of achieving peak performance are optimized.** Coaches and players have to balance competition, rest, practice and physical training throughout the year. The charts shown are an example of how you can manipulate these four components depending on where you are in the cycle. Each of the four "seasons" makes up a cycle. In a full year you may go through three or four cycles.

The percentages in the charts refer to the relative amount of

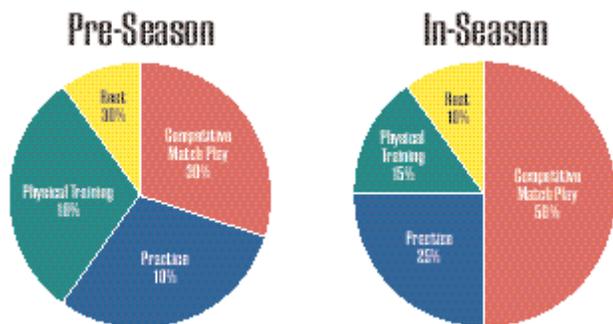


time spent on each of the four components and are just guidelines. Each of these "seasons" should last approximately three to four weeks for optimum benefit. Notice that even in the active rest phase some tennis will be played, very little initially, but steadily increasing throughout the period. During the first few days of the active rest period the player will play no tennis, but as the period goes on the rest days will steadily decrease and the other components will increase. By introducing seasons to your players' games, you are more likely to keep your players injury free and enhance their performance. Keep in mind that a program has to be individualized. There are differences in genetics, tournament schedules and fitness levels. Many players will need to take a short break after two or three tournaments. It also makes a big difference if (1) a player loses in the first round or makes it to the finals, (2) has a short or long match, (3) travels a long way to get to the tournament or (4) has to deal with extreme environmental conditions.

The most important (and difficult) component of a proper periodization training program is when to give your body a rest. One way to structure a periodization schedule is to choose tournaments that carry the most significance and build a training program based on the performance peaks. By controlling the following five variables, you will be able to obtain the best results:

1. Volume or duration—the amount of work performed or how long you train.
2. Intensity—how hard you train.
3. Frequency—how often you train.
4. Specificity—how similar is your training to the demands of your sport?
5. Variation—how much you vary your training.

continued on page 2



Dear Reader:



Here it is the second edition of the *High Performance Coaching* newsletter. We appreciate all your letters and suggestions. Since we received many comments regarding the technique article on the center pages of the first issue, we decided to expand that section to a four-page foldout of sequence pictures. The tactics article on page 9 is also related to the serve and volley sequence. The purpose of most of the articles in the *High Performance Coaching* newsletter is to help increase your knowledge in the (profession) field of coaching. A lot of this information will form the basis for our new Coaching Education and Certification Program, which we will initiate in the year 2000.

Currently, we are preparing all the educational materials, competencies and testing information. We look forward to having many of you participate in this new program and will provide you with more information in future issues of this newsletter. Please continue to give us your feedback and suggestions.

Sincerely,

E. Paul Roetert, Ph.D.

Nick Saviano

To Everything There Is a Season...continued from page 1

So how do you start your players on a program? Several principles may assist you in balancing the aspects of a training program and fitting them successfully into an effective regimen.

#1.) Prioritize, Prioritize, Prioritize! A player who tries to suddenly implement several components simultaneously such as strength training, sprints, aerobic conditioning, and plyometrics into a start-up fitness program is bound to fail. Pick one or two key components to focus on initially and build your program *from* that initial training focus to a more comprehensive program over time. An example would be adding a more focused regimen of flexibility before and after tennis play, along with shoulder and trunk exercises for a period of two to four weeks, and then adding items to the program such as anaerobic on-court drills or aerobic training. Begin with the one or two items that need the most emphasis, and build the program as your body allows.

#2.) Integrate flexibility training with all other aspects of your training. There is not usually enough time for any athlete to spend an hour stretching on a daily basis. However, if flexibility training is integrated before and after all other modes of training, then no specific block of flexibility training

is usually required. Additionally, a brief period of stretching both before and after a weight workout or an aerobic training workout is equally important and accomplishes the same overall goals as stretching before and after your on-court training.

#3.) Don't expect immediate results. If you're expecting immediate results you may be disappointed. It takes four to six weeks minimum to develop true changes within the muscle. Similarly, the program you initially develop make take several weeks to garner results...this is normal.

#4.) More is not necessarily better. Remember to include rest and recovery. When putting together a training program that includes several components, you cannot always perform every component on every day. For example, in many instances strength training is performed two to three times per week, allowing the trained muscles to recover a day or two between sessions. The same would hold true for aerobic conditioning and other elements in the program.

Whatever level player you are coaching, adding a properly designed fitness program will enhance your players' performance levels and increase their enjoyment in the game.



Portions from this article were adapted with permission from: *Complete Conditioning for Tennis*, USTA, Roetert, E.P. and Ellenbecker, T.S., Human Kinetics, 1998

USA Tennis Player Development Update

by Tom Gullikson and Doug MacCurdy

This article is about competing.

Early in 1998, we were given the task of restructuring the player development efforts of the USTA. The first step was to spend hundreds of hours talking with people involved in competitive tennis in the U.S. and abroad, including young players, coaches, parents, and former and current pro players. Our strengths and weaknesses were assessed. Things that had always worked well for American tennis in the past were scrutinized, some good things had been forgotten and needed to be resurrected, others were, perhaps, outdated.

One of the most startling things we found was that it appeared that a subtle change in attitudes towards competition had taken place. Traditionally, American athletes have always been regarded as ferocious competitors by their worldwide counterparts. However, in our discussions we heard scores of comments like: “Kids don’t play practice matches” or “If he plays this tournament, he can only go down in the rankings.”

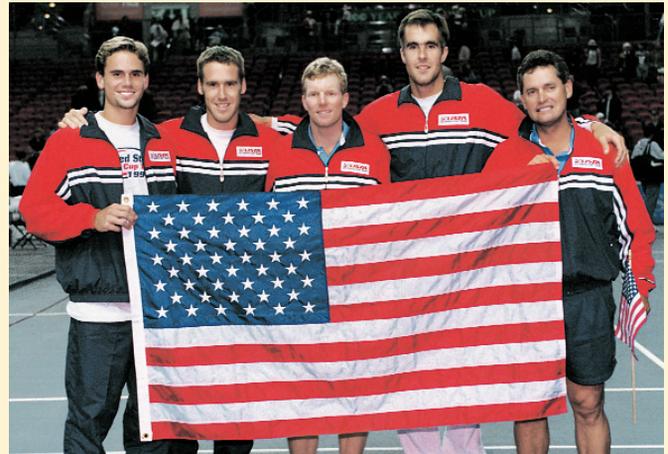
It became apparent that a major objective of USA Tennis Player Development was to encourage and promote match play at all levels. The process begins with practice matches. No matter how well the technique of a stroke is developed or how closely a drill may simulate match play, there is simply no substitute for playing points, sets and matches. In a match, every point begins with a serve and an attempted return. The placement and quality of these two shots will affect the structure of every point. By playing thousands of points the players begin to internalize and spontaneously develop good decision making, personal percentage play, effective patterns, anticipation, problem solving skills, and the ability to adjust to different game styles and playing conditions. It says quite a bit for playing points.

By playing serious practice sets and matches, your players also can develop all of the positive attributes of a successful player. The image of the American player we wish to see is one who is mentally tough, technically sound, physically fit and tactically shrewd. They will achieve this by returning thousands of different serves, fighting off break points, serving out sets, trying hard when they don’t feel like it and looking forward to the battle.

By all means, we encourage you to follow principles of periodization, spend quality time working on technique and work with your players to obtain optimum levels of fitness. But always keep in mind that playing points, sets and matches is essential for improvement.

Planning competitive schedules can seem like a very complex undertaking. Here are some points to consider and recommendations for young tournament players.

From around the age of 14, an optimum annual number



The U.S. Davis Cup team that defeated Great Britain (left to right): Jan-Michael Gambill, Alex O'Brien, Jim Courier, Todd Martin and Captain Tom Gullikson.

of competitive (tournament) singles matches would be approximately 70 and about half as many doubles matches. Younger juniors would generally play fewer matches and older juniors a few more.

Try to succeed at each age group and each level of play. “Playing up” is a no-pressure situation if the player is not expected to win. Do not avoid pressure situations. Continue to play primarily in your own section and in your own age group until you have proven mastery over the rest of the group.

An ideal schedule would allow the player to finish the year with about a 2:1 or 3:1 win-to-loss ratio. In some of the tournaments, your players should be among the best in the field. In others, they should be challenged by being introduced to a new level. Winning tournaments can be very beneficial to the player’s overall development. Playing finals is a much different experience than consistently losing in the second or third round. Strive to get your players to be challenged and motivated by competition. Some players seem to be born with incredible competitive instincts and desire, while others become super competitors over time.

The USA victory over Great Britain in the first round of the 1999 Davis Cup may be fairly fresh in your mind. This great tie could have gone either way. We are all very proud of the American Team that was fortunate to win in the end. It was a magnificent display of what competing is all about.

Next time you watch a great match or video tape of a match with your players, ask them to observe how the players are competing instead of just how and where they are hitting the ball. Competitive skills separate good players from great players.

Tom Gullikson is the Director of Coaching for USA Tennis Player Development and USA Davis Cup Captain. Doug MacCurdy is the Director of USA Tennis Player Development.

10 Reasons Why Tennis Players Don't Eat Well and What They Can Do About It...

by Page Love Johnson, R.D.



1. I don't have time to eat right with my hectic schedule: If you can get at least one core shopping trip per week, you will get a jumpstart for having more fresh appetizing food on hand. Shop for quick, ready-to-eat foods—i.e. hand held fruits, already cut fresh vegetables, fresh ready-to-eat meals, fresh luncheon meats, yogurts, single serve cottage cheeses, low-fat granola bars, pretzels. Most of these foods can be packed in a cooler and even transported on the road.

2. With being on the road so much, I overeat while dining out: Yes, it is true you will have larger portions and more hidden fat in your diet if you don't dine out carefully. Try to order entrees with lower fat cooking methods—broiling, grilling, baking or roasting. Order dressings, sauces, and regular cheeses on the side. Doggie bag large meat portion sizes—most entrees give you 8-10 oz. of meat protein. Hold regular desserts and opt to eat fresh fruit from the salad bar.

3. I am confused by what I hear and read...should I be avoiding breads and pasta? The main fuel for muscle activity in tennis is carbohydrate in the form of starch or flour in breads and pastas as well as cereals, rice, crackers, corn, peas, beans. Tennis players need to eat at least eight servings a day from these types of foods (with a portion size being ½ cup cooked pasta or one slice of bread, approximately an 80 calorie equivalent). These types of foods raise your metabolism and help you last longer on the court!

4. I am not hungry for breakfast, and I feel lighter on the court when I haven't eaten: When your body is not used to having fuel input in the morning it gets accustomed to expecting no food and thus not being hungry. By missing breakfast you are missing a key opportunity to fuel up especially for tennis play later in the day. Often the breakfast meal is the key meal to be digested in time to provide energy for tennis matches later in the day. For starters, introduce a piece of fruit or a glass of juice with a slice of toast, bagel or a yogurt in the morning.

5. I am most hungry at night, so I eat my biggest meal at the end of the day: When you under-eat earlier in the day, you will build up a calorie deficit later in the day that leads to an increased risk of overeating. Unfortunately, this appropriation of fuel intake doesn't best meet the player's needs for training during the day. Shifting calories earlier in the day, even having a larger lunch than dinner may be helpful.

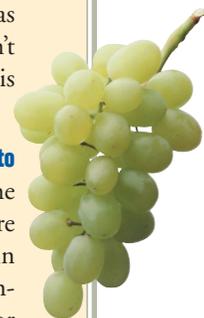
6. I do not drink milk...I don't need it now that I am grown: You may think you don't need it anymore, but calcium is not only used to grow bones, but to maintain bone density as well as serve as a conductor for nerve impulses to make muscles contract. Dairy products also are an important part of the tennis player's protein intake. Players should try to consume 2-3 one-cup equivalents of milk, yogurt, and low-fat cheeses per day.

7. When I try to drink more, I frequently have to go to the bathroom: Yes, you need to be drinking more. Most players in training need a minimum base of 100 oz. of hydrating fluids per day. When you start drinking more, your body is not used to the increased volume of fluid and this will cause an increased urinary frequency. For the most part this is transitional and as your body adapts to the improved fluid status. Don't give up hope, it will improve and what will result is an overall improved energy level.

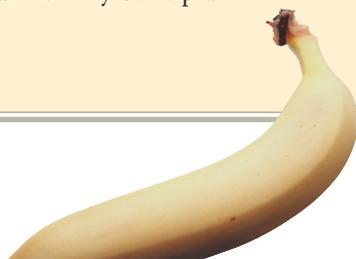
8. I feel like I need coffee first thing in the morning to improve energy: One cup of coffee first thing in the morning is not a negative practice, as long as you are doing a good job hydrating yourself as mentioned in #7. Coffee alone (before matches, practices or teaching) is a diuretic and will increase your risk for cramping, fatigue, and heat illness.

9. I try to get an energy boost by drinking a soda before I go out on the court: Yes, you may feel like you get a boost, but that energy burst is very short lived. What you are doing is experiencing a sugar high for 15-30 minutes. Most matches last 3-5x this duration, so you will need a more significant energy boost than this. Drinking a sport beverage would be a more appropriate choice. Sodas are extremely high in sugar and are diuretics because of the caffeine content.

10. I feel like if I don't eat enough I can replace the nutrients with vitamin pills: A multi-vitamin is a good safe guard for ingesting some of the vitamins or minerals that you may have missed with your food intake, but that is it...just non-caloric nutrients. Vitamins do not contain energy and do not help prevent fatigue from an under-fueled body.



Page Love Johnson is President of NutriSport/NutriFit Consulting.





The Serve

There is no one correct way (technique) to serve a tennis ball, a point which is clearly illustrated by the many different styles and techniques used by the top touring professionals today. However, there are certain fundamentals in technique which most of the best servers in the world use. The intent of this article is to point out some of these keys (commonalities) to maximizing service technique. To illustrate this we have used sequence pictures of two of the best servers (serving action) in the game today, Pete Sampras and Richard Krajicek.

To properly analyze the service action of a competitive player, the coach needs to be familiar with the concept of the kinetic link system. The basic principle of the kinetic link system as it applies to the serve is as follows: There is a storing of energy in the major muscle groups in the preparation phase. This energy is transferred from the ground up in a sequential order (Ground-Legs-Hips-Trunk-Shoulders-Elbow-Wrist-Racket head) creating a whipping action which culminates with tremendous racket head speed on impact. Any major breaks in this linked system causes diminishing power and efficiency. This may sound complicated but really it is not.

Between each of the seven sets of photos there is a list of key points pertaining to that particular picture. There is an asterisk by the ones that are considered to be fundamentals of technique on the serve.

Both of these players have truly great serves, yet they have very different service actions. What we have tried to do is point out similarities in the two actions which are commonly used by most great servers today.

This article is intended for the High Performance Coach's personal benefit in analyzing and teaching the serve. It is not recommended that players be presented with this type of technical break down. As with any stroke, the more naturally the players can learn without having to be "taught" the better. One final note: it is always best to analyze a serve either by seeing it in person or by use of slow-motion video. Still pictures by themselves can sometimes be misleading.

Nick Saviano is the Director of Technical Development for USA Tennis Player Development.



PHOTO #1

- Both players are in the starting position just after finishing their pre-serve ritual of bouncing the ball. At this stage they are deciding where to serve and how they will attempt to set up the point.
- * There is relaxation in the facial muscles, which usually indicates there is relaxation throughout the body. This is important for maintaining good timing, maximizing power, injury prevention and consistency.
- * The weight is on the back foot as they start the tossing action.
- * The front toe is pointed at an angle to facilitate the rotation of hips and shoulders. Both players will actually turn the toe even more as they begin to rotate. Virtually all of the outstanding servers will either start with the toe pointed to the side or if the toe is pointed straight forward they will turn the toe as they rotate their shoulders and hips. If not, it makes it difficult to get adequate rotation and puts stress on the front knee.
- The different starting positions (Sampras with the racket up higher, bent arm, and toe up vs. the lower racket position, straight arm and toe down, for Krajicek) are a function of style, not fundamentals.





PHOTO #2

- * Notice how the ball is held in the fingers. The palm is facing directly toward the sky as the tossing arm goes up. Both of these factors help limit spin on the ball and enhance overall control of the toss.
- * Tossing arm goes up to the side of the body, facilitating rotation. Krajicek is more straightforward with his toss and has less rotation than Sampras, who rotates a great deal.
- * The weight starts to move forward as the tossing arm goes up. This is part of a gradual buildup of the action.
- * Notice the turning of the front toe with the hips, torso and shoulders facilitating the turn.
- Krajicek gets to this stage of the action much quicker than Sampras. He is already starting to bring the racket head up whereas Sampras' racket is pointed toward the ground. These are personal differences in service rhythm, timing and style.
- * Racket face stays perpendicular (closed) to the ground during the buildup, which keeps the shoulder muscles relaxed. A common mistake is to open the racket face in the backswing, which often causes the elbow to be too low when exploding up.



PHOTO #3

- * The "power position." This is the stage of the serve where players store maximum energy in the major muscle groups the split second before exploding up after the ball. If players get into a good power position at the correct time, chances are it will be an excellent serve.
- * They have full extension of tossing arm with the shoulders tilted and weight leaning forward.
- Sampras has significantly more knee flexion. In addition, he has more rotation of the hips and shoulders. **Note that Sampras is serving in the deuce court and Krajicek in the ad court.** This makes his serve particularly hard to read and also makes it easier for him to hit a flat, kick or slice serve to any area of the court from the same service position.
- * The height of the elbow is in line with the shoulders, which is an optimum throwing action position.
- Krajicek brings the back leg forward quickly and creates a "platform" to explode up with both legs. Sampras drags the back leg and appears to generate less power from it as he explodes up. The movement of the back foot is a matter of style.





PHOTO #4

- * Notice the players' heads are up as they start their vertical and slightly forward explosion.
- * As the legs thrust upward, the racket drops down farther in the back, which will help generate more power.
- * The racket face is relatively perpendicular to the ground, which is optimum for accelerating the racket head up to the ball.
- * Notice that the racket head is away from the shoulders, which is critical to maximizing the throwing action. This is contrary to the old "scratch the back" theory of having the racket face close to the shoulders.

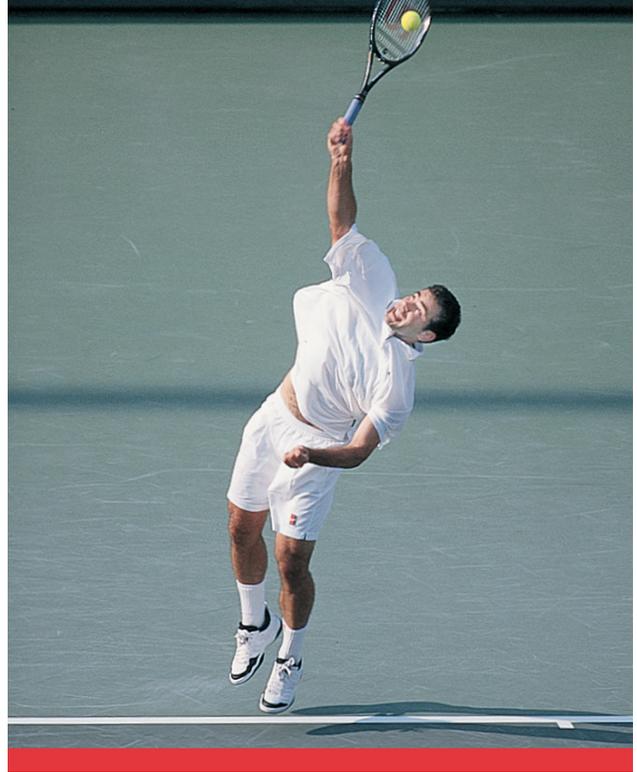


PHOTO #5

- Contact point is slightly to the right of the head, creating a beautiful "line" in the vertical explosion. The actual contact point will often vary depending upon service style and type of serve being hit.
- * The thrusting up from the legs has propelled both players off the ground as they get full extension. Professional players do not intentionally jump.
- * The left arm is pulled down and tucked in close to stomach/chest. This helps slow the torso down, which in turn creates more of a whipping action at the top of the action.

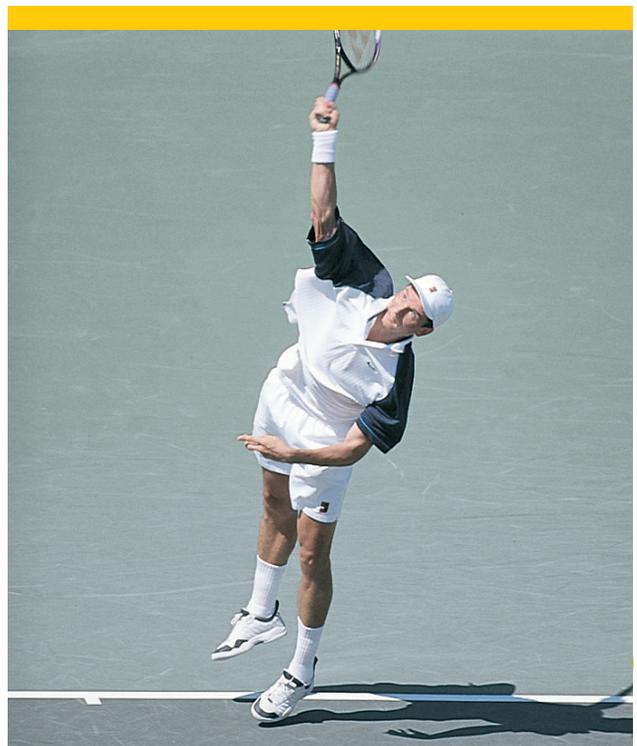




PHOTO #6

- * High arm and racket head speed cause a natural pronation of the forearm immediately after contact. This pronation helps to alleviate the stress on the elbow and shoulder.
- Coaches should be extremely careful of attempting to teach advanced players how to pronate. When it is taught there is a danger of pronating too early which can cause problems with the arm as well as the service action.
- Notice how Krajicek tucks his left arm in close to his chest as he makes contact. This helps to slow the torso down and create more speed via a whipping in the shoulder, arm, wrist and finally the racket head. This is more biomechanically efficient for maximizing power than Sampras whose left arm does not tuck in as closely to the body, then flies back behind him after the hit. (This is by no means a criticism of Sampras' service action, which is one of the best service actions ever.)



PHOTO #7

- * The vertical explosion combined with a ball toss that is out in front of the body propels both players into the court.
- Notice how Krajicek (6'5") lands considerably farther into the court than Sampras (6'1"). This is a result of his ball toss being more out in front, his height advantage and the fact that he does not rotate his shoulders and hips as much as Sampras. (Landing far into the court should not necessarily be a goal.)
- * Both players will land on their front foot with excellent balance, which enables them to explode forward to the net. (Almost all of the big servers today land on their front foot.)



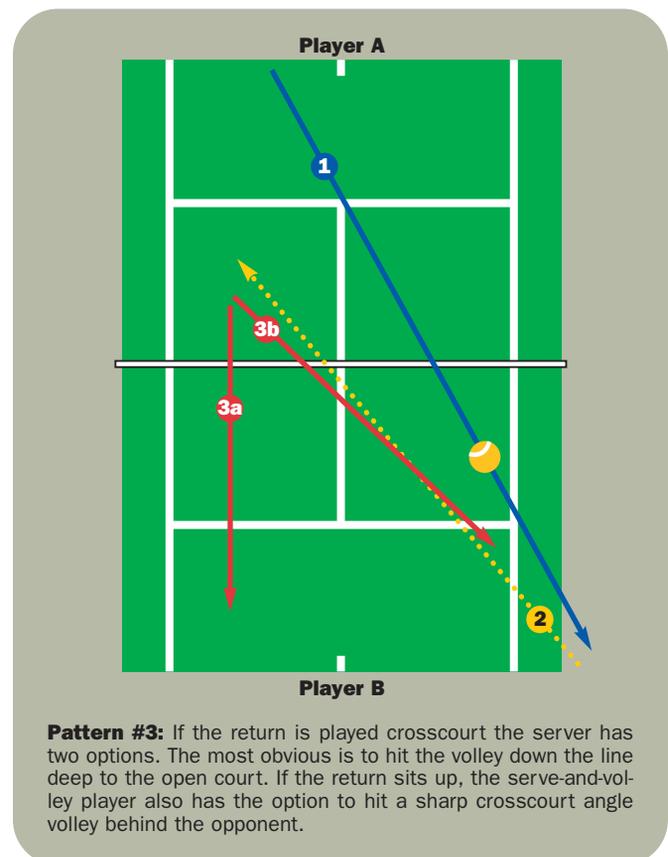
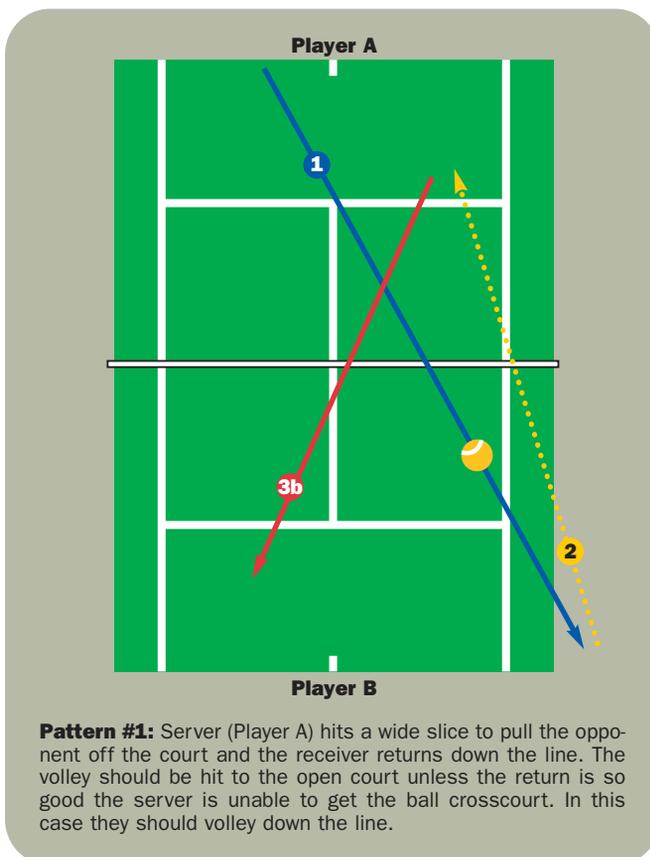
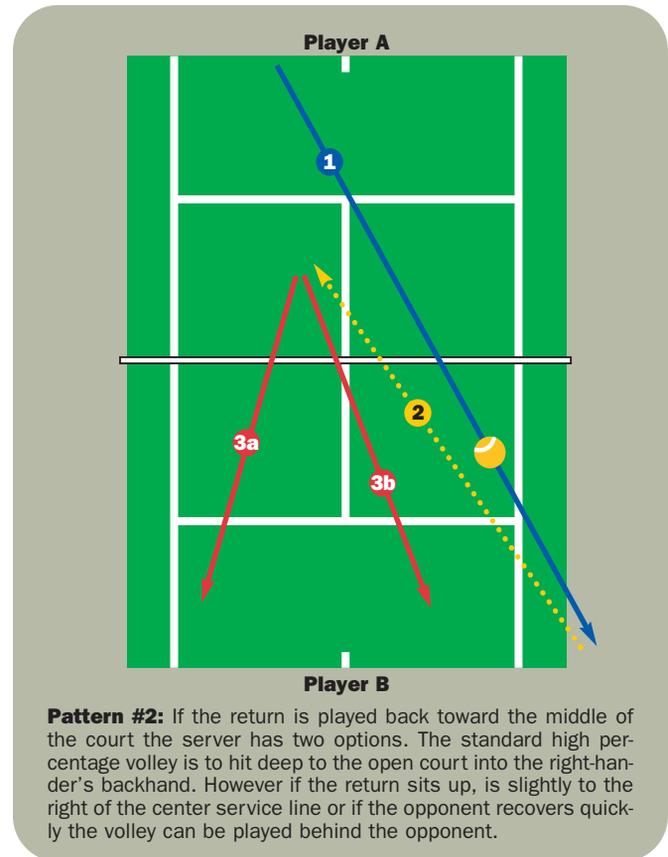
Serve and Volley Tactics (Deuce Court)

by Tom Gullikson

On the previous pages you saw sequence pictures of Pete Sampras and Richard Krajicek, two of the best servers in the game. Both players back up their great serves with excellent volleying skills and patterns. One of the most important principles in the serve-and-volley sequence is to pull the player off the court with the wide slice on the deuce or the kick serve to the ad court (given a right-hander server). The same patterns emerge on either the deuce or ad court. For the purposes of this article we will deal with the deuce court patterns.

The server should always be thinking of how to set up the point with the serve and what to do with the next shot, especially when serving and volleying. In addition, when serving and volleying the player should follow the flight of the ball and start the split step right before the opponent makes contact. Sometimes, however, the receiver does not cooperate and hits a great return either at the feet or close the sidelines. In these cases a general rule is to have Player A hit the volley deep and down the middle to cut down the opponent's angle.

The receiver has three basic options with the wide slice and it is important that the server understands what the choices are for a high-percentage volley.



We keep hearing it... “You’ve got to make tennis fun” if you want to attract new players and keep them in the sport. We nod our heads in agreement, look somewhat puzzled and resolve that we have to do better. But do better at what?

Sometimes it’s just hard to understand what “fun” is. Clearly it is different things to different people. We all know what “fun” feels like—a positive mood or good feeling. It may be silly, frivolous fun or a more serious, long-lasting fun.

Nearly 10 years ago, a study of 10,000 students on their feelings about sports sponsored by the Athletic Footwear Association revealed the number one reason kids play sports is “To have fun!” Their top 10 reasons to play sports also included: to improve skills, stay in shape, do something they’re good at, excitement of competition, to be part of a team, and for the challenge of competition. For many kids, these reasons are also part of “fun.”

We know that adults and kids find it more fun to be

active in tennis rather than standing, listening or picking up balls. They enjoy getting **excited, enthusiastic** and sharing that joy with teammates.

The atmosphere for tennis starts with the coach! Are you a coach who plays music in the warm-up, smiles often, praises easily, and looks like just being on the court is fun? Do players clamor to be on **your** court? Can you guarantee that every player will smile in the first 5 minutes?

Players can be busy, happy and amused, but still missing something to keep them coming back for more tennis.

Fun for many players is a chance to be successful, to improve personal skill, to challenge themselves and succeed or to be a success independently.

Other players may value making new friends and tennis partners. Some love being part of a group or a team and working together. Teenagers and adults often choose activities based solely on “who else is there.”

Lots of players love the thrill of competing, first against their own prior performance, and later against others. Kids like to keep score and earn points for everything they do from picking up balls, answering a question correctly or keeping a rally going for 25 hits.

Adults who are fitness conscious value a vigorous workout and measure their “fun” by their heart rate and amount of perspiration. Older adults love to outsmart younger and stronger opponents by using their experience and cunning.

Sports Psychologist Steven Danish suggests “people tend to believe that activities are fun when the challenge is in balance with their skill.” If the challenge is too great, anxiety sets in. If the challenge is too easy, boredom results.

I guess what we’re really after is “fun” in the short term **balanced** by “enjoyment” in the long term. Short term “fun” can be like extrinsic rewards—they work for a while but are never as powerful as the joy that results from personal achievement in a sport of skill.

Ron Woods is Director of Youth Tennis for the USTA.



Jay Silverman

Use the checklist below to rate yourself on helping players have fun...

1. Can players tell **you** are having “fun?”
2. Did every player smile once in the first 5 minutes?
3. Do players get lots of trials and plenty of activity?
4. Did every player hear frequent positive comments from you?
5. Are players grouped with their friends? Did you change groupings so they gained new friends and partners?
6. Do the tennis drills and activities promote success — even for the slower learners?
7. Was there excitement, enthusiasm, and energy on the court?
8. Did you use competition for incentive? Did everyone win sometime during the session?
9. Did you change activities frequently for variety?
10. Did players get to choose their favorite games or activities sometime during the session?
11. Did anyone stay longer after the session just because they were having so much fun?
12. Did you offer snacks and drinks periodically to encourage off-court socializing and interaction?

Is It Bad When My Body Goes “Snap, Crackle, Pop”?

by W. Ben Kibler, M.D.

Tennis players occasionally hear their bodies making strange sounds on, and sometimes off, the court. These sounds are described as a popping, snapping, or crunching, and are usually associated with movement of a joint. Players may be concerned that these sounds could be evidence of damage to a muscle, tendon, or joint, and that continued play may worsen the condition. There are several guidelines to help you determine whether the sounds are significant for injury.

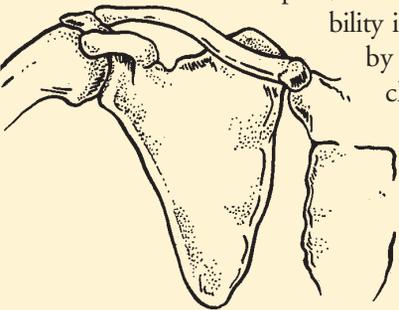
The major guideline is presence or absence of pain associated with the sound. Painless noise is quite common. The exact cause is unknown, but it probably represents changes in pressure within a joint as it is moved, or sliding of a muscle over a smooth bony prominence. It is common in young tennis players, especially teenage female players. There is no evidence that continued painless popping of joints leads to later joint damage. The most commonly non-painful “noisy” joints are the fingers, neck, knee, and ankle.

Painful noise should be taken more seriously. Cracking, snapping, or crunching that is worse in the morning, after sitting down, or at the beginning of a match, can indicate muscle inflexibility or tendinitis in its early stages. Painful noise that increases during the day or the match can indicate an injury to a muscle or a joint structure, such as a cartilage or ligament. In any case, a painful noise should be evaluated by a sports medicine specialist.

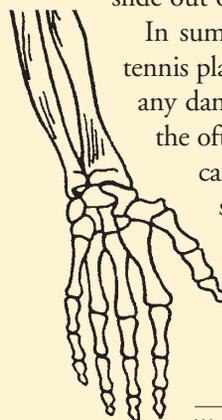
Other important guidelines include the presence of swelling, loss of muscle strength, or a decrease in joint motion. This also indicates the need for further evaluation.

There are several areas in tennis players where painful noise is common:

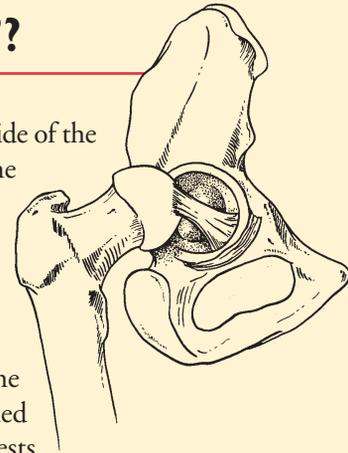
Shoulder: “Snapping scapula,” a popping or crunching along the inner border of the shoulder blade near the spine, is usually caused by a muscle or flexibility imbalance that may be corrected by exercise. Painful popping or clunking in the shoulder may indicate injury to the labrum, a cartilage-like structure between the bones, or it may represent mild instability of the joint.



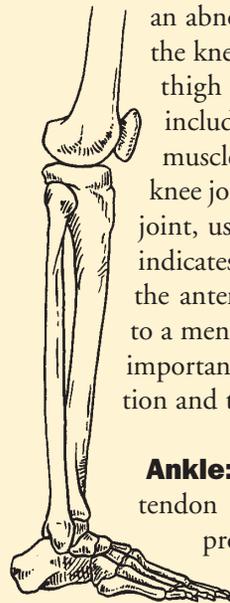
Wrist: Several tendons can have a tendency to snap out of their normal positions as the wrist moves during tennis strokes. Many times, the tendons can actually be seen moving in and out of their normal positions.



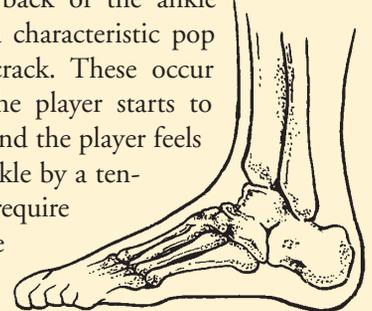
Hip: The large muscle on the outside of the hipbone commonly slides over the prominence of the bone as the leg is rotated. This is almost always due to inflexibility, and is treated with stretching exercises.



Knee: Painful noise around the kneecap that is worse with continued use or stooping suggests an abnormality in the normal movement of the kneecap in its groove on the front of the thigh bone, or femur. Possible causes include bone spurs, ligament damage, or muscle imbalance. A painful pop inside the knee joint, caused by twisting or rotating the joint, usually accompanied by joint swelling, indicates an injury to a ligament (most often the anterior cruciate ligament—the ACL) or to a meniscus. These two structures are vitally important to knee function, so early recognition and treatment is important.



Ankle: Ruptures of the Achilles tendon at the back of the ankle produce a characteristic pop or crack. These occur as the player starts to sprint or change direction, and the player feels as if they were hit on the ankle by a tennis racket. These most often require surgical repair. The ankle joint itself will painfully pop or crack if the ligaments are loose from repeated ankle sprains, or the tendons on the outside or inside corners of the joint slide out of their normal positions.



In summary, most snaps, crackles, and pops in tennis players are nonpainful, and do not represent any danger with continued use. However, due to the often vigorous nature of tennis play, injuries can occur that cause painful noises. These should be evaluated and treated by a sports medicine specialist, to allow the tennis player to return to the courts as soon as possible.

W. Ben Kibler is Medical Director of the Lexington Clinic Sports Medicine Center in Lexington, KY.



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