



## The physical component

**T**he last USPTA Player Development Program insert, "Anatomy of a modern shot (Vol. 3, No. 1/2006)," and others before that examined just the foundational aspects of modern tennis **technique**. Obviously, there are many additional levels of technique that must still be covered. However, as we continue to delve further into the technical aspects of our game, we will occasionally publish inserts that deal with the foundational aspects of the other five general performance components for learning and teaching tennis – **physical, tactical, strategic, mental/emotional and environmental**.

*continued next page*

Exhibit I outlines each performance component and its defining concepts. In this insert, we'll cover the **physical** component and its seven subcomponents.

The USPTA Player Development Program is based on the premise that it is virtually impossible to isolate the **physical** component, or any one of the six general performance components, from the others when it comes to diagnosing and solving any problems a player might have in his or her development.

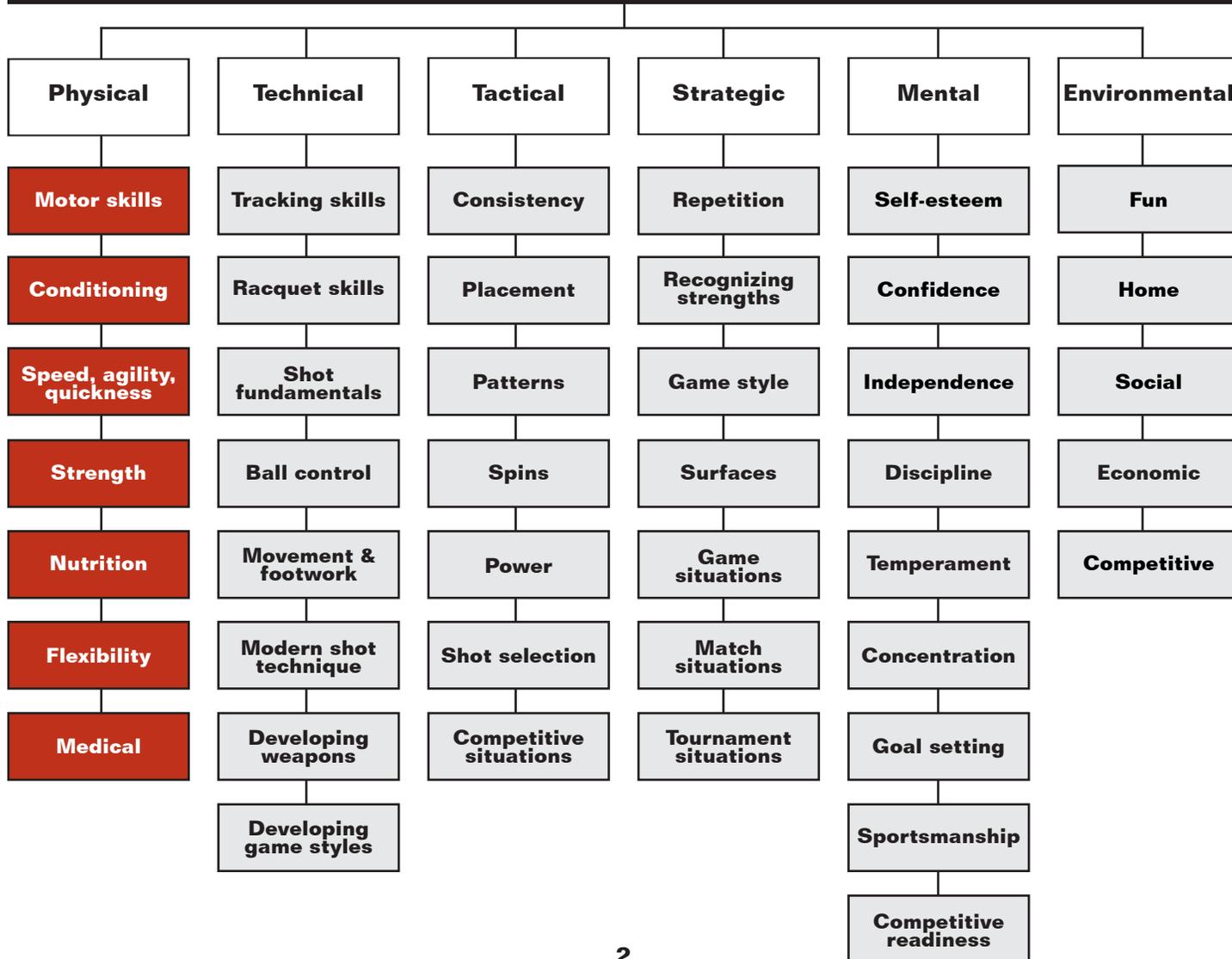
For example, let's consider the following case study:

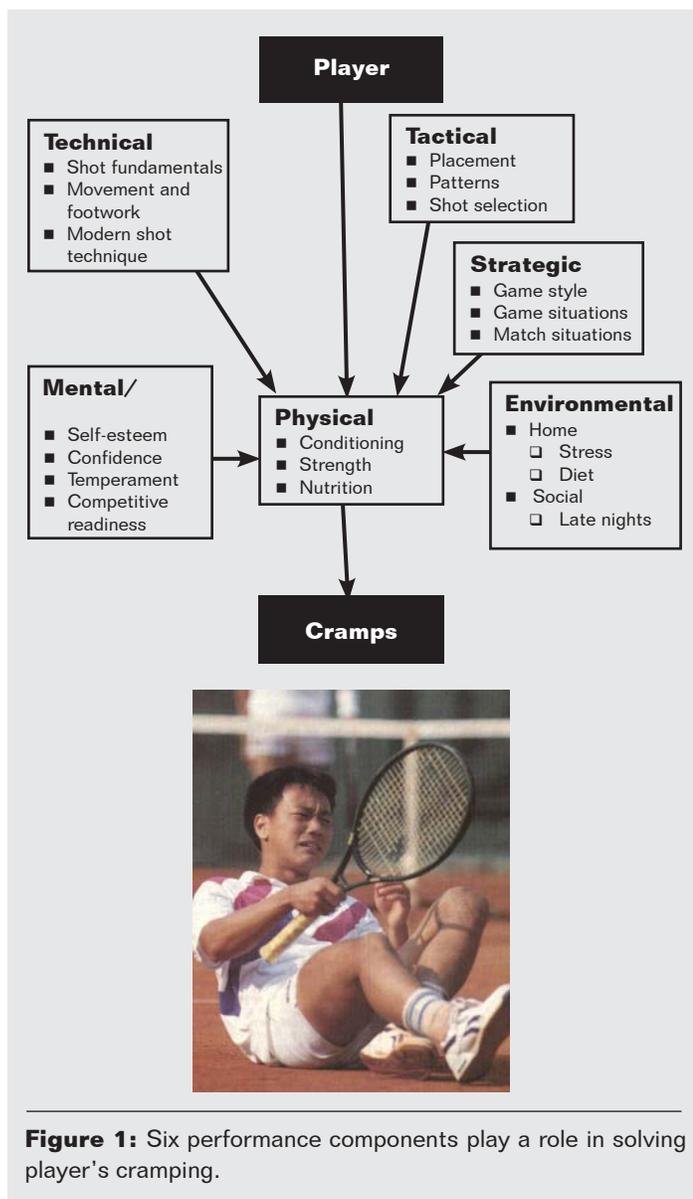
*A coach works with a player who regularly starts to cramp in the third set. The coach might first consider the **physical** component and its subcomponents of **conditioning, strength and nutrition** to determine the cause for the cramps. However, because he's been working with this player for some time, he also knows the player hits every shot with excessive energy and motion. This burns energy, fluids and electrolytes at such a high rate that it's impossible for the player to adequately replace them on changeovers or between sets. Therefore, the coach may conclude that the cause of the problem may be **technical** in nature, and involves the player's **shot fundamentals, footwork/movement and modern shot techniques**.*

*To further complicate the situation, whenever the player gets into a third set, he worries about cramping and talks about it audibly. The stress he places on himself mentally breaks down his game, creating a connection to another performance component – the **mental** aspect. The coach may also address the **tactical** and **strategic** components in an effort to teach the player to more effectively use **patterns, shot selection, and game style** to reduce the amount of energy expended during points, games, sets and matches. Only by addressing all of the separate yet connected issues will the coach be able to retrain the player using the various general performance components and their related concepts. See the graphic on the next page.*

In developing this material, we asked members of the USPTA Player Development Advisory Council if we were oversimplifying the integration that occurs between performance components by covering only one at a time. The members agreed that although the relationships between the performance components are impossible to ignore, separating them for the sake of providing more details for teachers and students alike is more easily explained and understood. After we've covered all six components, we will tie them together through more examples and a detailed insert on periodization.

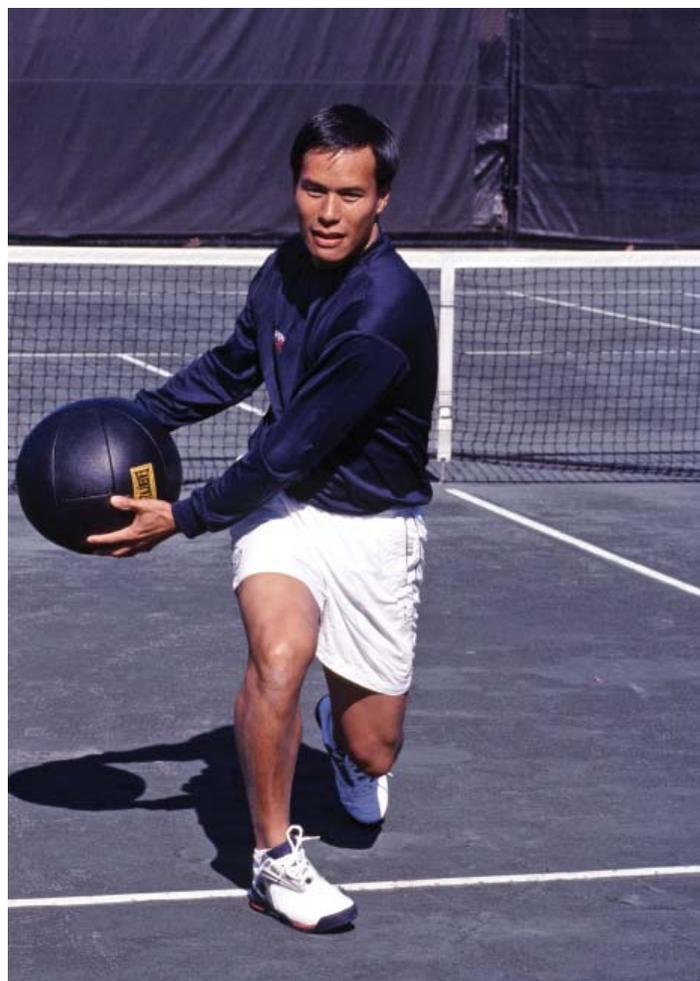
### Exhibit I: General performance components for periodization





skipping, running, jumping, pivoting on one foot, changing direction, throwing and catching. When teaching young players, such as 3- to 10-year-olds, teachers should incorporate these skills into lesson plans or the periodization of the players. Many of the Little Tennis lessons available online through USPTA incorporate these basic skills in weekly lesson plans.

With beginners you may have to be more creative in teaching these skills (if not already acquired) and incorporating them into your lesson plan as part of a fun and interactive drill or game. Catching and throwing may have to be acquired by children as they learn related tennis skills such as volleys or serves. Overhanded throws are representative of the serve and overhead shots; sidearm throws are representative of groundstrokes. There are also training methods that not only strengthen the core, but also help with stroke production by getting a player to “feel” how his body works and also establish a more efficient kinetic chain. Exercises with a lightweight medicine ball and similar drills can help a player improve tennis-specific motor skills.



In a recent interview with Jack Groppe, Ph.D., we asked him to define motor skills for us.

*“Gross motor skills really involve very large muscle groups, for example, running, jumping, and actions that are very large in nature. Fine motor skills are smaller, for example, such as carving with a knife. If you’re carving a piece of meat or picking up marbles with your toes, these are fine motor skills.”*

### The physical subcomponents include:

**Motor skills, conditioning, speed, agility and quickness, strength, nutrition, flexibility, medical** (see colored boxes in Exhibit I)

Let’s address each one of the physical subcomponents with insights from our Player Development Advisory Council and other resources:

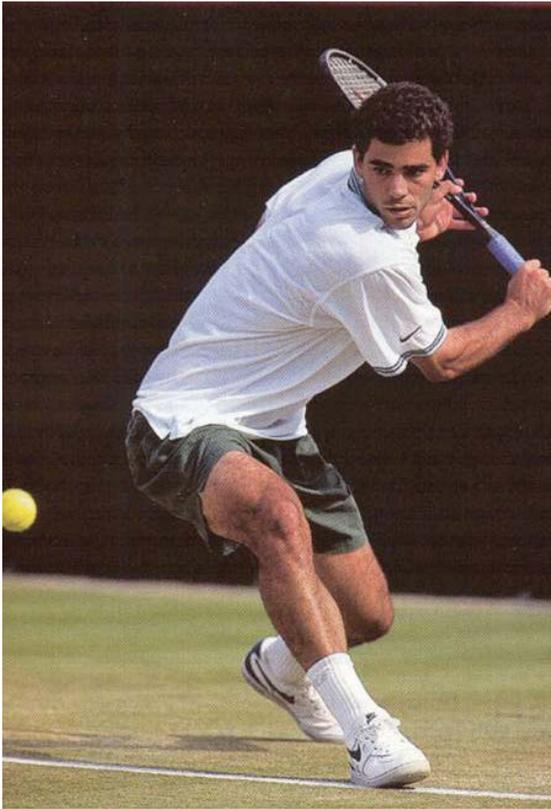
### Motor skills



When we speak of motor skills, we are talking about the skills that build a foundation for further athletic success.

This foundation consists of many skills that are taken for granted, especially for beginners. These skills form the basis for not only

success in hitting and playing, but also for the rate of skill acquisition for these players. The required skills include walking,



*Coordinating a one-handed backhand involves multiple motor skills.*

"Now, as they relate to tennis, when you're running to hit a forehand and you've been pulled wide and you're on a full run and you've got to hit a passing shot down the line, that action requires a lot of gross motor skills to make the shot and stay in control. Fine motor skills are different. For example, let's say you're coming in to the net and you've pulled your opponent deep into a corner and the opponent hits a ball crosscourt and you're going to hit a really soft drop volley. Now you have to soften things up a little bit and slow down. In other words, with gross motor skills, you accelerate a great deal. With fine motor skills, you start decelerating a little bit, so you can start controlling the movement a lot more," Groppe explained.

When coaching the player and these skills, Jack Groppe likes the theory of "simplest is best." He explains that the coach should not only know what to correct, but also be able to communicate the helpful information in a way that the student does not have to process or think about it. "It is not in the student's best interest to be heavily involved in stroke mechanics. It can create a situation such as 'paralysis by analysis,' which is when the athlete cannot perform because he is focusing on the 'how' of the shot rather than just executing it. This can lead to athletes who struggle with their execution during the heat of competition.

"The greatest teachers will use 'cues' that require no processing by the student. They are regularly occurring words/statements that the student grasps easily. For example, to get a young student to use the legs more, you could say 'as you toss, sit down.' They won't really sit down, but they will flex the knees and then push off. There are easy teaching cues for every move in the game. We as teachers have to be creative to connect with our students," said Groppe.

From David T. Porter, Ed.D., we learn that tennis is a game of movement and, as such, is considered an open-skill activity. This means that the environmental conditions during play are constantly changing. According to Porter, the most important motor skills at the earliest stages of learning tennis are **predicting** and **intercepting**. For example, the foot-hand-eye coordination is crucial in all aspects of learning to play, enjoy and succeed at tennis.

"Learning to predict where the opponent's ball will land, based on speed, spin, trajectory, and height of the ball and where it will end up are **predicting** skills," Porter said. "**Intercepting** skills involve moving to the spot where you have predicted the ball will end up and being there ahead of your opponent's ball.

"These **predicting** and **intercepting** skills are the cornerstone of efficient stroke technique. This is why students with a wide variety of athletic skill pick up tennis up much quicker than students with little movement experience."

Nick Bollettieri speaks about motor skills in these terms. "Humans begin their motor skill development very early. However, it takes years to fully develop and master. We start by learning the basic skills of human movement and eventually combine those skills into natural behavior as well as athleticism," he said.

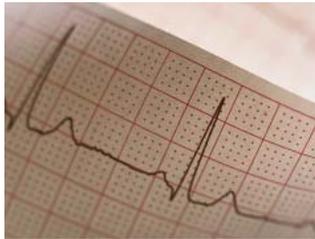
"Specific tennis motor skills consist largely of hand-eye coordination. The various nervous and muscle system functions synchronize over time to provide the athlete with the 'feel' of tennis."

When Rick Macci speaks of motor skill development he emphasizes the importance of having children play all kinds of sports. "Even simple games such as 'tag' will develop the abilities to run, turn, stop, improvise, create, and will develop overall coordination. The best part is they will be having fun while they are doing it. Just being outside and playing anything will help develop motor skills that will carry over to tennis skills," said Macci.

There are differing schools of thought when it comes to deciding how a young athlete should be developed. In *Bollettieri's Tennis Handbook*, writers Istvan Balyi and Ann Hamilton conclude that the United States and Canada have been seen in the past as negligent in teaching the basic motor skills before racquet skills in tennis. Still there are others who believe in a recreational and fun atmosphere to first develop a correlation between the activity and enjoyment. There are still others who believe in an approach that stresses a variety of different athletic activities before concentrating on one sport.

What does this mean to you and your players? It means that by the time players get to you for lessons or formal training, they might not have developed all their motor skills. These players could be any age when they come to you. It could be the child in a class of four kids who hasn't developed the skills of the others. It could also be the 40-year-old trying tennis for the first time in a beginner program. You must be very aware of your player's motor skills and be able to help your student improve his basic skills while still raising his overall comprehension of the other general performance components as well.

## Conditioning



The *Encarta Dictionary* lists conditioning as a “gradual training process” and this process in our definition covers many aspects. These aspects of conditioning are **aerobic conditioning, anaerobic conditioning, conditioning for strength, and conditioning for movement/speed**, etc. The

conditioning for strength, movement and speed will be covered in their respective sections of this document. For now, we will focus on the **aerobic** and **anaerobic** training of a tennis player. Even though we are covering these two types of conditioning under the same heading, they are vastly different from each other.

*The importance of conditioning is stressed by the information we received from Nick Bollettieri. “Tennis can be considered an intermittent anaerobic sport with a large demand on a cardiovascular base. Typically points range between three and 10 seconds, with an average of four to five seconds. The area tennis players cover per point is generally 8 to 12 meters or 10 to 15 yards. Considering the short breaks in between points, games and the overall duration of match time, which reaches into the hours, the demand for the successful athlete to be highly conditioned is clear,” Bollettieri said.*

Both **aerobic** and **anaerobic** conditioning is necessary for tennis and they need to be addressed in a player’s training program whether she is a weekend warrior, aspiring junior or tour player, according to Bollettieri.

Your body gets its energy from two sources. In Paul Roetert and Todd Ellenbecker’s *Complete Conditioning for Tennis*, we find definitions for **aerobic** and **anaerobic** and how the source of energy determines the definition.

- ❖ **Aerobic** – means needing oxygen to take place. Aerobic activity includes longer duration and steady-paced movements that require the body to receive energy from burning carbohydrates and fats using energy pathways that include oxygen.
- ❖ **Anaerobic** – means not needing oxygen to take place. Anaerobic activity includes high-intensity, short-duration events that use stored energy in the muscles or energy made rapidly when you initiate the activity.

Let’s look at how **aerobic** and **anaerobic** conditioning are related.

*Complete Conditioning for Tennis* by Roetert and Ellenbecker explains how both **anaerobic** and **aerobic** conditioning is important in tennis. It says, “An average point even on a clay court, probably won’t last more than 10 seconds. During this time, you may have as many as four or five direction changes. Following a point you will have a maximum (play to the pace of the server) 25-second rest period and on the changeovers a 90-second rest period. This clearly makes tennis an anaerobic sport, requiring agility and speed. However, a tennis match can last as long as three hours. Therefore, aerobic conditioning and muscular endurance come into play as well. Having a good aerobic base will help you recover between points, and muscular endurance will improve



*Cardio Tennis provides a tennis-specific way to train the aerobic and anaerobic system.*

*muscle strength and may correct muscle imbalances from the one-sidedness of tennis. Clearly to be a good tennis player, you need a properly designed, tennis-specific training program."*

*Groppe says, "Depending on the skill level and the aspirations of your students, you need to determine if you are using tennis to help them get fit or if they need to get fit to play tennis. As they climb the competitive ladder, they must get fit to play tennis. The foundation must be sound aerobic fitness to give them endurance and to help them recover between points. It could take at least four to six weeks to develop this foundation. Then, they can go into tennis-specific training to achieve high levels of anaerobic fitness, including speed and power. Next, strength is critically important. Muscular strength and endurance will play a large role in shot execution, court coverage and endurance to play the long matches. Flexibility, or range of motion, becomes increasingly more important as the player improves her ability level."*

Porter suggests working conditioning into your student's training schedule. "Once an overall cardiovascular base is established, conditioning most often becomes sport specific. Tennis is certainly an example of this," he adds.

"Conditioning for tennis should include explosive movements over relatively short distances with emphasis being placed on maintaining appropriate balance. This almost always involves changing directions.

"Utilize games and drills that most closely resemble actual playing situations. At the early stages this may mean designing on-court games using racquets that challenge a player's ability to work when tired.

"At the higher levels this means creating a workload that places a player in oxygen debt (oxygen requirements are greater than a player's ability to replace used oxygen) and then training at that level. This ultimately will increase what is referred to as the anaerobic threshold or the place where the workload challenges both the physiological and psychological peaks. Gradually increasing this threshold will give a player both a physical and a mental advantage in competition," Porter says.

"Physical conditioning is a true separator. Andre Agassi was quoted as saying that mental toughness is very important but that it didn't matter how strong your mind was, if your body won't back it up, forget it."

How does this apply to your weekly lessons? As a complete professional you must ask questions of your players to find out what their goals are. There is not a single case where some sort of conditioning would not benefit a player at any age or level. From a junior perspective, it is imperative young players work on their conditioning and not just "hit balls." The comprehensive professional helps his students by guiding them and recommending conditioning exercises to help enhance their performance.

From the perspective of an adult beginner or intermediate player, staying fit is one of the reasons for playing tennis. By incorporating conditioning into even 10 percent of a lesson, you can make a positive impression on your player and also add more variety to your lessons. Your commitment to conditioning may allow you to differentiate yourself from other teaching pros.

What about all those drills and examples for your lessons? You probably already know many and have included them in your lessons. It would be impossible to include all the examples of conditioning in this small space, so if you need more, we will direct you to one of the best resources we used for this insert. We recommend *Complete Conditioning for Tennis* by Roetert and Ellenbecker. This book not only contains many drills and overall guidelines for all areas of the physical component, but also is very comprehensive and is a great starting point for building your expertise in this area.

## **Speed, agility, quickness**



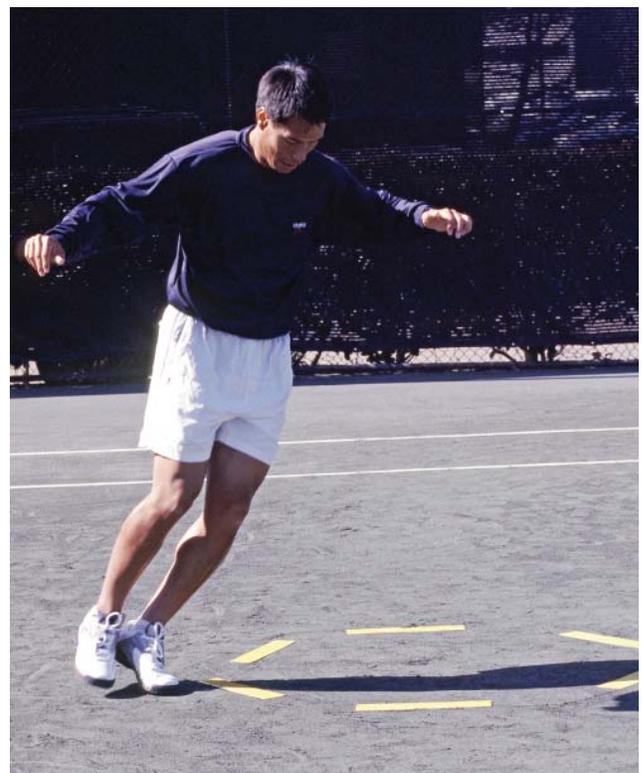
The USPTA Player Development Program has grouped speed, agility and quickness into the same subcomponent to keep related subcomponents together. Each one of these is important unto itself and could be addressed as a separate subcomponent of the physical

performance component. With that in mind, we will separate these for our discussion.

Some of the best definitions for each of these come from the Nick Bollettieri Tennis Academy Group, which contributed valuable information to this insert. The group's insights are as follows.

**Speed, agility and quickness** are interrelated components of movement. Tennis players with good movement have strong skills in each area.

**Speed** can be considered movement of the limbs as fast as possible in order to propel the body forward in a straight line.





*Enhancing quickness and agility enables a player to cover all parts of the court for better performance.*

An example of speed is the act of getting to the opponent's dropshot when a player starts from behind the baseline.

**Agility** is the ability to change direction quickly with balance and control. In tennis, agility particularly applies to all directions of movement. A common example is when a player moves back and forth along the baseline and adjusts with the depth of shots she receives. A better example is the player's ability to move back to hit a shot and while recovering, change direction and move diagonally forward to cut off the short ball. Having good agility provides the player with an advantage by providing the opportunity to get into position and implement the technique of the selected stroke.

**Quickness** involves the ability to react to visual, auditory and kinesthetic (body awareness) information. Quickness involves a subconscious decision-making process that invokes speed and agility. The return of serve best exemplifies quickness in tennis.

"Agility, quickness, speed, coordination and dynamic balance are all critical components of being a good tennis player," said Groppel. "An athlete's first step can be developed and experiences can be created to help the athlete 'learn' anticipation skills on the court. Quickness is all about the first step. If you show me a player with a slow first step, I will show you a slow tennis player. Practice sessions can be designed to help the individual work on 'emergencies' and practice being in a balanced state during an unbalanced situation. When I have worked with players in this area, I always highlighted the 3 R's – ready, read, react and then explode

to the ball. I used drills using z-balls, hexagon jumping drills, ball reaction drills, etc., to teach all the movement principles," Groppel explains.

"Speed, agility and quickness in tennis all relate to a player's ability to recognize the need to move, to start early (quickness), to get to a designated spot in as short a time as possible (speed), and to do so while maintaining balance even when changing directions (agility)," adds Porter.

"Although these skills are somewhat limited by genetics, training can help immensely. Speed, agility and quickness should be emphasized early in development with drills as simple as catching with the hands on the hips, the eight-ball drill, and/or the check drill. (See the "On Court with USPTA" episode "Footwork for the open-stance forehand and backhand.") Each of these drills on DVD combines all three skills and rewards a player who develops the ability to make a good first step," said Porter.

Macci emphasizes developing the athlete in your students to create better skills. "Make your player the best athlete he can be. Tennis is so athletic and getting more and more so every day. The best players will be the best athletes. By being better athletes, the players will have better body control and balance and be able to improvise their movement on the court to create situations that will lead to success. Movement is key; it is one of the 'X factors,' the ultimate variable in today's game, as it allows you to play both offense and defense and gives you a chance at any point because you can get to the ball," he said.



*The speed ladder can be a great tool for agility training.*

How can you apply speed, quickness and agility training to your teaching? Just as with conditioning and even as part of conditioning, you can and should incorporate quickness and fitness drills into your lessons. The great thing about these skills is that they are directly related to conditioning and you can tailor your conditioning for your players directly to their speed, agility and quickness drills. Remember to consider the work-to-rest ratios of a tennis point and the fitness level of your students.

## Strength



**Strength** is defined as the maximum amount of force a muscle can produce. The subcomponent of strength in the Player Development Program includes not only the base definition of strength, but also all the related areas of strength that teaching professionals and coaches must know.

Strength is an integral part of a tennis player's development for many reasons. They need to have muscular strength to not only execute the movements and striking motions that go into hitting a tennis ball, but also to propel their bodies to get into position to hit a tennis ball. Strength also significantly helps an athlete in his ability to accommodate all the force he creates and encounters while playing. And, strength is especially important in preventing injuries.

Since tennis demands a player to repeat powerful actions over a long period of time, a player needs to have **muscular endurance** as well.

But strength without the ability to quickly summon that force is not very useful for a tennis player. That is why power must be covered and needs to be defined under this topic. We know that **power** in a scientific sense is the amount of work per unit of time.

In other words, it is speed applied to strength and we see this as the explosiveness of a muscle or muscle group when in action. Training for tennis must include the aspect of power.

Porter explains power as "a combination of speed and strength." He believes players should participate in overall body strengthening programs, in addition to tennis-specific activities, that develop muscular areas most often used in tennis, such as legs, the core and shoulders.

Nick Bollettieri has divided the subcomponent of strength into five focus areas: **relative, optimal, endurance, speed, and stabilization and core strength**. Breaking them down helps him define what he is looking for and helps him evaluate a player. These terms are provided as a form of reference for you, however, not all of these terms are scientific. They are words used to define some aspect of strength or power.

The Nick Bollettieri definition of strength is the ability to exert force against an external resistance. In tennis, strength is demonstrated when a player exerts force into the ball and into the ground to produce body movement. There are various types of strength. In tennis the most important types of strength are:

- **Relative strength:** This is the amount of force that can be produced relative to one's body weight. Lighter people who are relatively strong typically move better and have good levels of conditioning.
- **Optimum strength:** Optimum strength refers to the ability to generate the right amount of force at the right time. This is important for tennis strokes due to time sensitivity and force production.
- **Endurance strength:** The ability to produce and maintain force over a prolonged period of time is a definite requirement when a match goes into the fifth and deciding set.
- **Speed strength:** Speed strength is closely related to movement and is another term for power. It is the ability to exert force as fast as possible. There are several variations of speed strength – starting strength, explosive strength



*Adam Brewer with various training aids.*



and reactive strength. The ability to start movement quickly (starting strength) can be seen in the initiation of the return of serve or getting to the dropshot. Generating power for a serve or groundstroke requires explosive strength. Changing directions rapidly in a baseline rally relies heavily upon reactive strength. Speed strength is arguably the most important form of strength for high-level tennis.

- **Stabilization and core strength:** These forms of strength are essential for the development of any athlete. It is important to develop and maintain stability and core strength in order to sustain the correct body position during movement. Doing so will help prevent injury and allow the body to handle the various levels of force that it absorbs and produces.

The need for core strength is emphasized by Groppe. *"In the early 1980s, one of my graduate students, Ann Quinn, Ph.D., who went on to coach Pat Cash and Pat Rafter in their fitness, studied this and saw that, even on the volley, the abdominals contracted at over 50 percent of their maximum."*

Before going further, we must impress upon you that any off-court strength training program should be developed by a certified trainer and done with his or her exacting standards of form and balance.

## Nutrition



Although we plan to include the topic of nutrition in a separate insert, we also wanted to include it in this insert as a part of the physical component.

To Nick Bollettieri, nutrition is an important part of overall development. "Nutrition is essential to providing the fuel for the machine that is the human body. High-level training and competition places huge demands upon the various systems of the body. Optimal nutrition is essential to replace the supplies used up in the demands of each day. A

carefully selected and timed diet can make the difference between "feeling good" and "feeling great."

We interviewed Groppe recently about the topic of nutrition and he offered the following: "An athlete needs a well-balanced diet, consisting of proteins, carbohydrates and fats. Water is a critically important nutrient that must be consumed at regular intervals. The other important nutrients include vitamins and minerals, which should be found in the normal, daily consumption of foods in a well-rounded diet. Athletes should always consider how their diet varies, the portion sizes consumed, and the timing of when and how to eat.

"I believe you have to look at nutrition in two ways. The first is to view food as fuel. The body needs fuel for sustenance. The second way you should view food – and I don't want to sound facetious in saying this, but – you should almost look at food as a drug. You see, food changes your body chemistry. When you eat, hormones are affected, blood glucose rises, and on and on. At the Human Performance Institute, we believe that food can either help or hinder your performance. The key point to observe is that you don't have to become a 'health nut' but you do have to understand how your nutrition choices, as well as the timing of your meals and snacks, affect your physical, emotional and mental performance," Groppe said.

"I always consider how you are 'fueling' your body to perform at the highest level possible. This is an effective approach with which to begin, without going into too much depth. The most simplistic way to look at food is as fuel. The best word picture is to study how a person reacts when he does not eat well. If you go more than four hours without food, blood sugar drops and you can become impatient, irritable and lose focus. If you overeat, you become sluggish and fatigued. When you eat strategically, you have more energy, your metabolism gets a boost and you truly can get into a state of high positive energy," Groppe adds.

"To give you an example, let's say you eat a well-balanced breakfast at 7 am. Your glucose levels rise and you feel pretty good. If you haven't eaten anything by 11 a.m. (four hours later), your blood sugar levels will be in a depressed state and you will easily become irritable and impatient. However, if you eat a small strategic snack about three hours after the breakfast, you will stabilize your blood sugar and it will not drop into a depressed state. And, although this is the "cliff notes" version of strategic eating, you can maintain high levels of energy if you eat at strategic intervals throughout the day. There is much more to this that we will cover in a dedicated section on nutrition," said Groppe.

According to Groppe, when it comes to snacking, people must be aware of the glycemic index of food. The higher the glycemic index, the faster the spike in blood glucose levels. The faster the rise in blood glucose, the faster that insulin is released from the pancreas to stabilize blood sugar and the quicker a person enters a state of hunger. However, if a person eats a low glycemic food (one that has protein, fat or fiber), the rise in blood sugar is much slower and the longer the glucose level will be sustained. Eating low glycemic foods such as nuts or raw fruits and vegetables makes the release in blood sugar optimal.



*Eat your veggies!*

“The final point to make for an athlete is to never experiment with foods on match day. On the day of competition, players want to eat foods that they are comfortable with and that they “feel” will help them,” Groppe explains. “Yes, the psychological implications of eating are important to consider. Here are two different examples. Physiologically, there are players who love to drink orange juice on noncompetitive days but, when they are in a tournament and feeling a little nervous, the acid in the orange juice might upset their stomachs. Consider the psychological implications if you force your players to eat foods they don’t like, **even if it will help them**. They have to believe that the foods will help them.

“If you and your players want to understand how food will help and the players are willing to try different ‘pre-match’ foods, do it on days when they will be under ‘some’ pressure,” Groppe suggests. Their body is their laboratory and they want to experiment with how various foods will work for them on nonmatch days.”

Groppe believes the principles of nutrition not only enhance the tennis play of your students, but also are quality-of-life issues for them, you or anyone. Good nutrition isn’t just about the high-level athlete, it is for everybody. “If your body has the right fuel at the right times and has the necessary rest to recover, your quality of life becomes better,” he says.

## Flexibility



On the topic of flexibility, Porter suggests, “Flexibility is essential for two very important reasons. First, it can lessen the risk of injury. Second, it can allow for a faster muscular contraction and, therefore, produce more power.” The perfect introduction for flexibility comes to us from

*Complete Conditioning for Tennis*, which states:

“Flexibility training is often the most overlooked and least applied component in a quality conditioning program. Some reasons for this include:

- Stretching doesn’t feel good
- Flexibility’s benefits on the court are not obvious to the player
- Most players have no specific, individual guidelines for how, why, what, and when to stretch; and
- Flexibility receives less emphasis by coaches than other components of conditioning

We define flexibility as the degree to which the muscles, tendons, and connective tissue around the joints can elongate and bend. There are several types of flexibility. **Static flexibility** describes the amount of motion you have around a joint or series of joints while at rest. **Dynamic flexibility** refers to the active motion about a joint or series of joints and represents the amount of movement a player has available for executing serves, groundstrokes, and volleys.



Dynamic flexibility is limited by the resistance to motion of the joint structures (bones and ligaments); the ability of the soft connective tissues to deform (muscles and tendons); and neuromuscular components of the body which include nerves.”

There are many factors influencing flexibility including heredity, neuromuscular components, and tissue temperature. The most applicable factor to you as a tennis-teaching professional is tissue temperature. Heat increases the elongation and bending properties of soft tissue. Warming up before stretching by raising the body’s core temperature or by breaking a light sweat will give you greater gains in flexibility, with less microtrauma to the tissues you are stretching.

There are generally three types of stretching: **ballistic**, **static**, and **dynamic**. Ballistic is the type of quick bouncing at the joint or motion extremes. Since this is potentially harmful and provides no significant benefits over the other techniques, we **do not** recommend ballistic stretching.

**Static stretching** involves slow, isolated, smooth movements and passively holding the extreme range. This type of stretching is highly recommended as it is the most practical and effective method and can improve flexibility safely. Done correctly, it requires little energy, creates minimal danger and no soreness, and it is best after playing.

**Dynamic stretching** is another recommended type of stretching and is effective before playing. Dynamic stretching simulates the movements of tennis without the stresses of weight bearing



or impact. The body actively goes through the motions under control, gradually increasing and exaggerating the size of the flowing motions. We have included the table below from *Complete Conditioning for Tennis* for information on dynamic stretching.

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#### Incorporating Stretching into Tennis

1. General body warm-up (three to five minutes) to increase tissue temperature (slow jog, jumping jacks, etc.)
2. Static stretching of tight and restricted areas.
3. Dynamic stretching with progressive increases in range and velocity of movements.
4. Playing tennis.
5. Static stretching cool-down to prevent muscle soreness and gain flexibility.

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As stated earlier, flexibility is an important part of the physical component and one of the most overlooked. In future inserts we will cover flexibility as a separate insert and include flexibility exercises for tennis.

#### Medical



The medical component of a player development program involves both preventative and curative measures.

Prevention is perhaps the most important issue in the physical-medical component for learning tennis. If coaches and players can

successfully practice prevention, they will not have to resort to emergency treatments, cures and even rehabilitation that can interfere with a player's competitive goals and, ultimately, a tennis career.

So, a tennis-teaching professional's main focus should be on the prevention of injuries, since he or she can make a huge difference

in a player's ability to stay injury free and develop a body, skills and game plan geared toward success on the court.

Preventing injuries requires a multifaceted approach involving all of the subcomponents in the physical development of an athlete. Most experts will agree that the best way to prevent injuries is to develop sound motor skills, strive for an optimally conditioned body, increase speed, agility and quickness, build strength, practice good nutrition, and maintain flexibility.

"Specific programs for increasing flexibility and strength are staples of injury prevention," said Jack Groppel, a fellow in the American College of Sports Medicine. "Appropriate training helps players reduce the potential for overuse or other types of sports-related injuries."

Beyond specific training, it is common sense, Groppel says. "There's no reason to do things that will increase your risk for injury. For example, don't jump the net." He also suggests that teachers and parents work together to emphasize safety on and off the court since most injuries occur at home and often during mundane tasks or just plain horseplay.

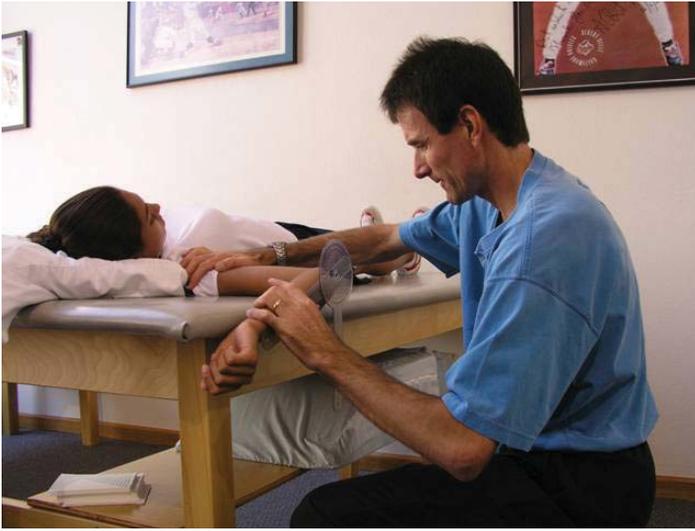
Injury prevention must become a state of mind with every serious play since many injuries occur with a senseless act that a conscious mind could always avoid.

Of course, even the best training cannot prevent accidents or the overuse that results in injuries. For this reason, tennis teachers must understand curative measures, including basic first aid for treating player injuries. See "Tips for injury treatment" on Page 12.

The majority of tennis injuries are the result of overuse from repetitive stress and minor traumatic events, such as the effects on the shoulder after serving thousands of times or the injuries to knees after playing hundreds of points with pivots, turns, twists and aggressive stops and starts. Overuse injuries occur because tennis players exert and produce repetitive forces that cause minor traumas and tissue breakdown.

To cure injuries, tennis teachers must know that they fall into two categories – acute and chronic – that require different curative responses. An acute injury is a new injury or a complaint from the time it occurs and the short time that follows its start. An example of an acute injury suffered by many tennis players is an ankle sprain. A chronic injury typically recurs or repeats itself due to continued play or lack of proper rehabilitation. An example of a chronic tennis injury is tennis elbow that is present for one or two years and flares up during long, grueling tournaments. Acute tennis injuries are much easier to treat, and when treated promptly and properly, you can prevent an acute injury from becoming chronic.

According to Nick Bollettieri, world-renowned tennis coach, people concerned with their own health should surround themselves with the right team of professionals. "Ideally, the medical team around a high-level tennis player should rarely be noticed but always exert its influence. The team's control of injury prevention via corrective exercise, general body maintenance and short-term



*Todd Ellenbecker checks an athlete's range of motion in her shoulder.*

attention to minor issues hopefully will help a player avoid time away from competition. However, the law of averages dictates that occasionally significant health problems will arise. When they do, a certified athletic trainer, sport physical therapist and physician form the basis of a solid medical team. Bollettieri adds that it is important to develop a relationship with these professionals prior to the need for treatment.

A tennis teacher must always be conscious of the physical component, whether he or she is hitting with a student, using dead-ball feeds or overseeing an intense workout. Regardless of a student's age or skill level, it is vital for a teacher to assess the player's activity level and overall condition. Inquire about any health issues that may put him or her at risk on the court, and if there's any doubt about a student's physical condition, limit the intensity level of any activity.

After sufficient evaluation of a student's physical condition, a teacher should be able to design a training regimen that mixes common sense and sound medical knowledge to create a program that is both enjoyable and educational for a player.

#### References

- *Complete Conditioning for Tennis*, Paul Roetert, Ph.D., and Todd S. Ellenbecker, MS, PT, SCS, OCS, CSCS
- *Fit to Play Tennis*, Carl Petersen and Nina Nittinger
- Sports Medicine Specialty Course PowerPoint presentation, 2004 World Conference, Todd Ellenbecker
- "Strength and Conditioning for Injury Prevention and Performance" PowerPoint presentation, 2004 USPTA Competitive Player Development Conference, Scott Riewald

## Tips for injury treatment – the “PRINCE” ciple

Initial treatment – the first 24 hours following an acute soft tissue injury are the most important. Injured tissue usually means injured blood vessels. When blood accumulates and causes swelling and compression around adjoining tissue, the lack of blood flow can cause further damage. As swelling and pressure increase, it can inhibit the healing of the tissue and cause pain and muscle spasm and decreased use. Therefore, every effort should be made to reduce the amount of bleeding at the site of the injury. Following the guidelines listed below will help ensure that you treat the injury properly.

- P** – Protect. Protect the site from further injury or aggravation. This may range from protective taping and bracing to orthotic devices to more stable shoes.
- R** – Rest (complete or modified). Depending on the severity of the injury, you may need to have complete or modified rest. Moving the injured part may result in increased bleeding and swelling. In more serious injuries, the injured part may need to be rested completely with the use of crutches for the lower extremity or a sling for the upper extremity.
- I** – Ice. Applying ice or cold packs minimizes pain and causes a local vasoconstriction, thus reducing bleeding and swelling by reducing blood flow to the injured area. Pain is decreased due to the numbing effect of the cold. The cold may also decrease inflammation and muscle spasms.
- N** – Nonsteroidal anti-inflammatory. This medication, taken under a physician's supervision, can be effective in decreasing inflammation and pain and thus speed the healing process. Other-over-the counter remedies such as ibuprofen can also be helpful (speak to your physician).
- C** – Compression. External compression with a firm bandage helps decrease the amount of bleeding and swelling into the injured area. Using a tensor bandage, begin wrapping below the injured area and work upwards, unwinding the bandage evenly without too much tension and overlapping the layers by half. Using compression during and after the application of ice will improve its effectiveness. **[Do not apply ice or compression if you have circulatory problems or trouble distinguishing hot from cold.]**
- E** – Elevation. Elevating or raising the injured area reduces blood flow to the area and encourages venous blood flow away from the injury. Raising an upper extremity above the heart and a lower extremity above the pelvis helps prevent swelling and aids in draining the swelling into large blood vessels.