POSITIONING YOUTH TENNIS FOR SUCCESS

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PREFACE

The Rules of Tennis have changed! That's right. For only the fifth time in the history of tennis, the Rules of Tennis have changed. The change specifies that sanctioned events for kids 10 and under must be played with some variation of the courts, rules, scoring and equipment utilized by 10 and Under Tennis. In other words, the Rules of Tennis now take into account the unique physical and physiological attributes of children. Tennis is no longer asking children to play an adult-model sport.

And the rule change could not have come fast enough. Something drastic needs to happen if the poor rate of tennis participation in children is taken seriously. Among children under 10, tennis participation pales in relation to soccer, baseball, and basketball. Worse, only .05 percent of children under 10 who play tennis participate in USTA competition.

Clearly, something is amiss, and the USTA believes that the new rule governing 10-and-under competition will help transform tennis participation among American children through the USTA's revolutionary 10 and Under Tennis platform.

The most basic aspect of any sport rollout is to define the rules of engagement for training and competition. So in an attempt to best gauge how to provide the proper foundation for kids to excel in tennis—through training, competition, and transition—the USTA held its inaugural Youth Tennis Symposium in February 2012. Experts from around the world were invited to address training, competition, and transition in 10 and Under Tennis, as well as to address the unique aspects of children relative to adults. This book sprung from that symposium and the accompanying pertinent literature, with the goal being to provide a rationale for developing a child-centered training, competition, and transition model through 10 and Under Tennis.

Children are not young adults. They differ physically, physiologically, and medically. And because children differ from adults, imposing an adult model on a child's sport is unlikely to succeed. This book will examine what makes a child unique, how that affects the training that is necessary to develop children who are successful and active in sport and society, and how to get them more involved and active through tennis by increasing participation.

This is a critical time for such thinking. Never has participation in sport been more important. The United States has become the "fattest" country on the planet, and this includes adults and children. Obesity in children more than tripled between 1990 and 2010, and obesity health-related costs are more than 42 percent compared to normal-weight individuals.

The societal contributions to the American obesity epidemic are manifold, and the ability to reverse the effects of these forces is difficult at best. Still, we believe tennis can be a significant force for good—but only if it is tennis that is learned and played the right way.

So as we navigate the tipping points of youth tennis, sport, and health in the United States, the USTA has asked: "Is there a better way?" This book attempts to explore this question in detail, breaking down the fault lines that exist in the current tennis and developmental structure, and exploring 10 and Under Tennis as a definitive, viable solution for the long-term health of our lifetime sport of opportunity—and the people who play it.

Scott Schultz
Managing Director, Youth Tennis
United States Tennis Association

ACKNOWLEDGMENTS

There are so many people to thank for assuring that *Positioning Youth Tennis for Success* became a finished product. Importantly, *Positioning Youth Tennis for Success* is the culmination of a joint project between USTA Community Tennis and USTA Player Development. This project was a true team effort, and sprung from the creativity and hard work of the inaugural USTA Youth Tennis Symposium's organizing committee members: Kirk Anderson, Jessica Battaglia, Lew Brewer, Jose Higueras, Craig Jones, Kurt Kamperman, Mark Kovacs, Paul Lubbers, Patrick McEnroe, and Scott Schultz. I am grateful to Kirk Anderson, Craig Jones, Kent Kinnear, Lauren Kittlestad, Mark Kovacs, Paul Lubbers, Patrick McEnroe, Bill Mountford, Geoffrey Russell, and Scott Schultz for reading the first draft of *Positioning Youth Tennis for Success* and providing thoughtful commentary. E.J. Crawford provided insightful and consistent editing. Monica Kirmayer and Sue Hunt navigated how to position this booklet. Andrew Hickcox, Sarai Bartels, and Beth Meyer gave *Positioning Youth Tennis for Success* its polished and creative look. Jim Loehr's vision for USTA Player Development forms the core of "Youth Tennis: Psychological Overview," and Tom Farrey's groundbreaking book *Game On* is the backbone of "The Health of American Sport." Scott Schultz consistently and reliably tied all of the pieces together, and will ensure that *Positioning Youth Tennis for Success* becomes an integral part of the USTA 10 and Under landscape.

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INTRODUCTION

SYNOPSIS

- The USTA is the national governing body of the sport of tennis in the United States of America. USTA governance must be consistent with Olympic guidelines, and USTA-sanctioned tournaments and events must conform to the Rules of Tennis as determined by the International Tennis Federation.
- The USTA's constitution specifies that the purpose of the USTA, among other things, is to effectively promote tennis as a means of healthful recreation and physical fitness; to establish and maintain good sportsmanship in tennis; and to encourage through tennis the development of health, character, and responsible citizenship.
- The inaugural Youth Tennis Symposium and *Positioning Youth Tennis for Success* help the USTA members and tennis stakeholders to understand how to safely and effectively roll out 10 and Under Tennis and the transition to 12-and-under tennis.

The United States Tennis Association Incorporated (USTA) is the national governing body for the sport of tennis in the United States of America. As such, the USTA oversees tennis as it pertains to its involvement in the Olympic Games, and in some instances, USTA governance is required to be consistent with the bylaws of the United States Olympic Committee. The USTA is also one of 205 national tennis associations of the International Tennis Federation (ITF). The ITF is the governing body of world tennis and determines the Rules of Tennis.

The USTA, which was formerly known as the United States National Lawn Tennis Association when it was established in 1881, is the world's first national governing body of tennis. According to the Constitution of the USTA, the purposes for which it is formed are:

- To promote the development of tennis as a means of healthful recreation and physical fitness;
- To establish and maintain rules of play and high standards of amateurism and good sportsmanship;
- To foster national and international amateur tennis tournaments and competitions;
- To encourage, sanction, and conduct tennis tournaments and competitions open to athletes without regard to race, creed, color, or national origin and under the best conditions possible so as to effectively promote the game of tennis with the general public;
- To generally encourage through tennis the development of health, character, and responsible citizenship; and
- To carry on other similar activities permitted to be carried on by such a not-for-profit corporation.

The mission of the USTA is to promote and develop the sport of tennis. The USTA understands that change is a given in sport and that the USTA leadership must help to ensure that any changes are developed in a manner that is consistent with its constitution, purpose, and mission. One aspect of tennis that has changed little over time is the Rules of Tennis. In fact, the ITF Rules of Tennis changed for only the fifth time in the history of the game in January 2012.[60] The change specified that 10-and-under tennis competitions could only be played using a stage 3 (red) ball, stage 2 (orange) ball, or stage 1 (green) ball, and that a smaller court (designated "red" for a 36-foot court or "orange" for a 60-foot court) could be utilized with short-duration scoring methods.[71] (See Appendix I for more.)

It was in this setting that the inaugural USTA Youth Tennis Symposium was held in Tampa, Florida, February 10-11, 2012. This closed event included nationally and internationally renowned speakers and guests (see Appendix II for more), and the purpose of the symposium was to present and discuss the most up-to-date evidence regarding 10 and Under Tennis and transition from 10 and Under Tennis to tennis for 11- and 12-year-olds. Although there has been some controversy about the merits of the 10 and Under Tennis changes, the reality is that the new rules are a permanent fixture in the sport. The USTA takes the position that all tennis players should embrace these new rules because they offer extraordinary opportunities from the point of view of tennis participation, player development, and the promotion of health and wellness through tennis.

The USTA hopes to develop the next generation of tennis players in a way that promotes health and wellness in our players and in our sport.

Because there is not a scientific blueprint for how best to navigate the introduction to and transition from 10 and Under Tennis, the presentations and discussions at the USTA Youth Tennis Symposium became the foundation for *Positioning Youth Tennis for Success.* This booklet's goal is to help the USTA tennis family and all tennis stakeholders understand, promote, and develop 10 and Under Tennis and transition to the game played with yellow balls on a 78-foot court (hereafter referred to as "12-and-under tennis"). The more specific interest is to create a player development blueprint for training and competition in 10 and Under Tennis and the transition to 12-and-under tennis. However, this booklet also serves as a springboard for understanding 10 and Under Tennis from a broad perspective.

The USTA Youth Tennis Symposium was held in conjunction with the National Youth Sports Health and Safety Institute (NYSHSI), which was officially formed in September 2011 following a presentation on Capitol Hill in Washington, D.C.[10] The mission of the NYSHSI is to advocate for developing, advancing, and disseminating research, education, recommendations, guidelines, and policy to enhance the experience, development, health, and safety of children and adolescents participating in sport.[10] The NYSHSI recognizes the inherent value of participation in sports for children but soberly understands the multitude of risks from repetitive injury and burnout in the setting of forced, early specialization and the "professionalization" of youth sport. We are hopeful that the NYSHSI message is taking shape. A recent survey found that 91 percent of Americans feel that participation in sports is important for children and adolescents, and 94 percent feel that more needs to be done to ensure the health and safety of young athletes. The USTA embraces the mission of the NYSHSI, and hopes to develop the next generation of tennis players in a way that promotes health and wellness in our players and in our sport.

It is important to understand that children are not young adults.

The USTA Youth Tennis Symposium agenda (see Appendix III) addressed many issues critical to understanding how to recommend training and competition in 10 and Under Tennis and the transition to

12-and-under tennis. Before developing guidelines for training, it is important to understand that children are not young adults. They are different physically, psychologically, cognitively, physiologically, and socially. That is why the first segment of the Youth Tennis Symposium was devoted to these special concerns. If we develop training and competition guidelines for children that do not take into account their unique mind and body characteristics, we risk living vicariously through our children while endangering their health and wellness.

Tennis is one of many sports that are struggling to find the proper balance of training and competition in children. For this reason, we invited experts from hockey, baseball, and swimming to discuss the ways in which these sports have tried to manage such issues. We also gathered data from other countries and sports regarding the same issue. We held a special session on character development, which we believe is a critical component of player development. With character development in mind, we also embrace the vision of "True Sport" from the United States Anti-Doping Agency.

There are many myths about strength and conditioning training in children. Whereas there is a limit to the gains a child may obtain through strength and conditioning training, and there are inherent risks in overtraining, there remains a clear role for such athletic development in children. All strength and conditioning training in children—and adults—should be placed in the context of recovery and periodization (a training regimen that involves cycles of progressive training with defined periods of rest), which is why both of these topics were addressed in the symposium.

The USTA and all tennis stakeholders should understand that 10 and Under Tennis, though often known by different names, is an international phenomenon. Modified tennis has been discussed within the USTA for more than 25 years, but the well-coordinated rollout of 10 and Under Tennis took full shape in anticipation of the January 2012 change in the ITF Rules of Tennis. The USTA works closely with the ITF not only in implementing the changes to the Rules of Tennis, but also in many competitive events that are managed by the ITF, including Davis Cup, Fed Cup, Hopman Cup, Pro Circuit, Junior Circuit, Grand Slam tournaments, and Olympic/Paralympic events. The ITF was at the forefront of developing "Play & Stay," whose purpose is to present tennis as a sport that is fun, easy to learn, and healthy. "Tennis 10s," which is part of the "Play & Stay" program, is the ITF equivalent of 10 and Under Tennis and has been promoted and developed in many countries for the past several years. With this in mind, Day 2 of the USTA Youth Tennis Symposium began with an international overview of 10 and Under Tennis/Tennis 10s.

With the advent of 10 and Under Tennis, the sport suddenly shifted from one prototypic tennis ball to an additional three tennis balls.

One of the most contentious areas of any long-term athlete/player development program is the differentiation of early initiation versus early specialization in sport, which was discussed following our international perspective review. Initiation refers to the age when an individual begins a sport, and specialization refers to the age that an individual trains exclusively in a chosen sport. One of the great temptations of rolling out an entirely new format in tennis is that parents, coaches, administrators, teachers, and others may believe that a child should focus on tennis exclusively so as to develop a competitive edge in the sport. The question that must be answered by empirical and scientific

evidence is whether such an approach leads to success or failure and, furthermore, whether such an approach may be dangerous to an individual's health and well-being.

The developing tennis player may achieve his or her dreams of greatness, in whatever form or materialization, through a sport that is ever mindful of the health and wellness of the athlete.

The USTA has a unique governing structure in which the board of directors and the chief executive officer/president, who are volunteers, change every two years. This governance structure can have benefits and pitfalls. Given the two-year cycle, it is not surprising that some ideas and proposals may be presented in various forms and incarnations over time. For these reasons, it is important to discuss prior attempts within the organization to address core issues of competition such as national tournaments and rankings for children and adolescents. This is why we asked a former USTA executive director to provide historical perspectives on USTA national rankings and tournaments.

As the national governing body of tennis, the USTA establishes the format and regulation of American tennis competition. It is through the modification of the competitive structure that behavior will change, and the USTA must be mindful of the types of behavior that are encouraged through competition. What works for young adults and senior adults may not be appropriate for children. Furthermore, children cannot train as young adults would because they do not have the physical endurance and strength capacities of adults. With this in mind, we discussed how to find the proper balance of training and competition in children.

With the advent of 10 and Under Tennis, the sport suddenly shifted from one prototypic tennis ball to an additional three tennis balls, which are designed so that they may encourage developmentally appropriate tennis technique. There is little literature regarding how to transition from the red to the orange to the green ball, but there is much expertise from the field, which is why we invited youth-tennis experts to guide us in this important discussion.

Another important transition is from 10 and Under Tennis to the more traditional 12-and-under tennis—which follows the "standard" rules of tennis, with the exception that a green ball may be used in sanctioned tournaments and events. Again, there is little scientific literature regarding how to properly transition from 10 and Under Tennis to 12-and-under tennis, and we discussed this important matter from both an international and American perspective.

Following a roundtable and numerous other discussions, plus a review of pertinent literature, this *Positioning Youth Tennis for Success* booklet came into shape. The USTA Youth Tennis Symposium is the primary springboard of this booklet, and this booklet is placed within the context of utilizing 10 and Under Tennis and the transition to 12-and-under tennis so that our most important asset—the developing tennis player—may achieve his or her dreams of greatness, in whatever form or materialization, through a sport that is ever mindful of the health and wellness of the athlete.

AMERICA'S HEALTH

SYNOPSIS

- The United States is in the midst of an obesity epidemic that is fueled by physical inactivity and poor eating choices.
- Through 10 and Under Tennis, the USTA has a unique opportunity to position tennis as a model sport for children that promotes health and wellness.

The United States has become the "fattest" country on the planet.[150] Despite the fact that our national health expenditures as a share of the gross domestic product has increased from 5 percent to more than 18 percent from 1969 to the present, and despite the fact that this increase far outpaces other countries worldwide, we are in the midst of an extraordinary obesity epidemic.[145] Obesity has more than tripled between 1990 and 2010, and obesity health-related costs are more than 42 percent compared to normal-weight individuals.[22] The causes of the American obesity epidemic are manifold, and include: (1) decreased physical activity among children;[26] (2) increase in poor food consumption, especially processed food and beverages made from bleached flour, sugar, and high-fructose corn syrup coupled with the availability of fast, calorie-dense foods in larger portion sizes;[99] (3) an aggressive mass media advertising campaign that promotes fast food to children and that associates fast food with positive reinforcement; and[94] (4) a progressive decrease in physical education opportunities in grade school and high school.[124]

The causes of the American obesity epidemic are manifold.

The conventional wisdom regarding children's health used to be that cardiovascular disease and diabetes do not begin until adulthood. However, we now know that cardiovascular disease and diabetes begin in childhood and are directly related to obesity, lack of physical fitness, and physical inactivity.[151] In essence, our obesity epidemic is directly correlated to an epidemic in cardiovascular disease and diabetes.[48] This shocking reality is amplified when we consider that one-third of children entering kindergarten in the United States are overweight or obese.[102] For the first time in American history, younger generations are expected to live less healthy and have shorter life spans than their parents.[104] Furthermore, overweight and physically inactive children have lower IQs than children who are physically fit and do not perform as well academically.[21, 132] Athletes are more likely than non-athletes to attend college and earn degrees. Even beyond school, high school athletes make up 95 percent of the highest-ranking executives in Fortune 500 companies.[23]

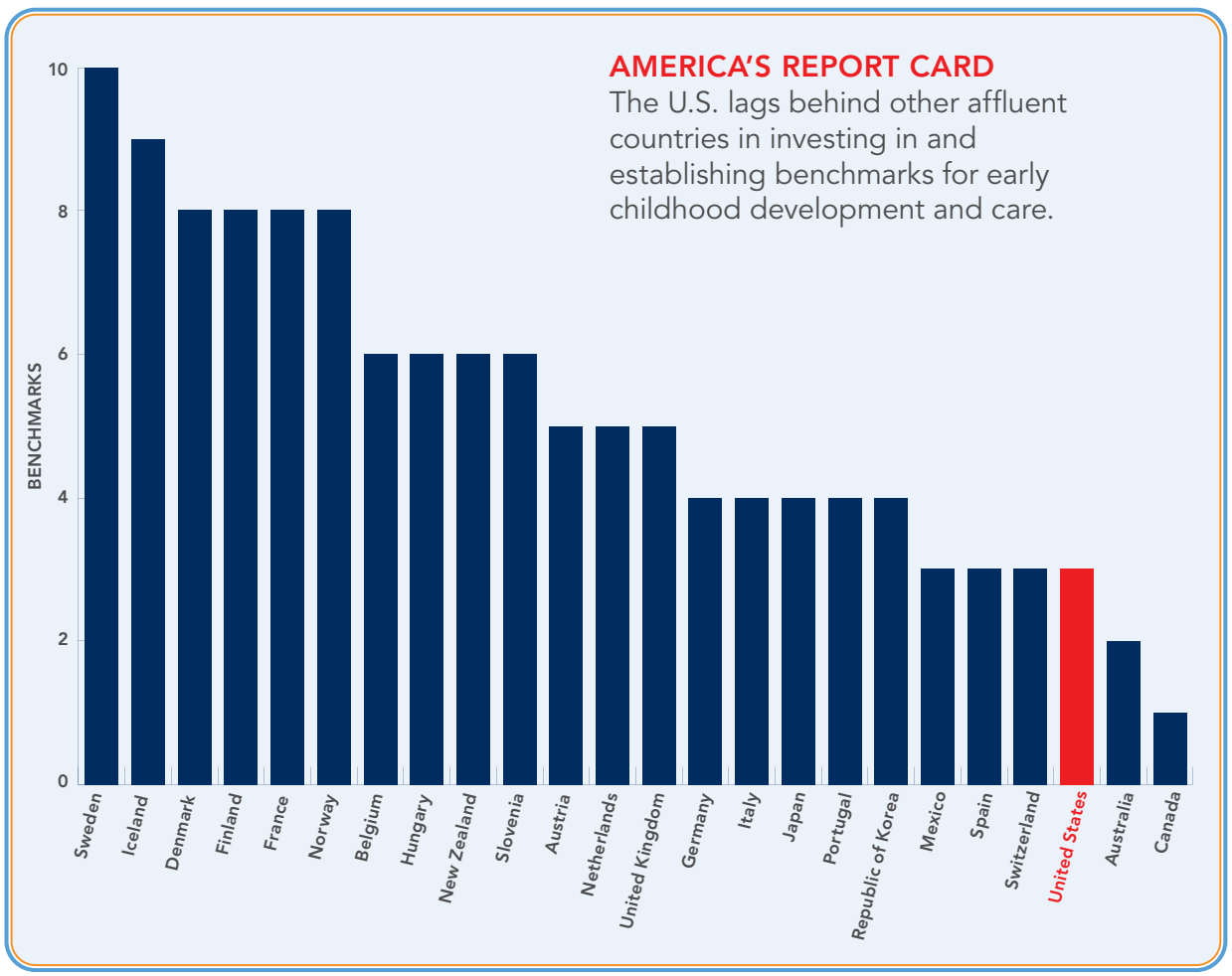
For the first time in American history, younger generations are expected to live less healthy and have shorter life spans than their parents.

Because of its status as the national governing body for the sport of tennis, the USTA has a unique opportunity to partner with public and private agencies that provide enriched opportunities to children that focus on health and wellness. An essential part of this opportunity is to ensure that children meet the minimum requirements of exercise, as recommended by the "Physical Activity Guidelines for Americans." These

requirements include one hour or more of moderate- or vigorous-intensity physical activity daily, with vigorous-intensity activity occurring at least three days per week. In addition, muscle-strengthening and bone-strengthening activities should be performed at least three days per week.[64, 100, 107, 129] The rationale is clear; such physical activity leads to the following proven benefits: (1) improved cardiorespiratory endurance and muscular fitness; (2) favorable body composition; (3) improved bone health; (4) improved cardiovascular and metabolic health biomarkers; (5) reduced symptoms of anxiety and depression; and (6) improved academic performance.[65, 136] The follow-through with these recommendations is dismal: three out of every four high school students do not engage in the recommended amount of physical activity.[65]

Unfortunately, Americans are saturated with targeted marketing to children that promotes and glorifies unhealthy eating habits.[94, 128] And as noted in the graph below, we perform dismally in establishing standards for healthy early childhood development and care.

The USTA, through 10 and Under Tennis, has a unique opportunity to reverse these startling statistics by actively promoting and developing tennis as a model sport for children—a sport that promotes health and wellness for life and that is consistent with "Physical Activity Guidelines for Americans."



Graph adapted from Early Childhood Services - a league table, *The Child Care Transition, Report Card 8*, UNICEF Innocenti Research Center

THE HEALTH OF AMERICAN SPORT

SYNOPSIS

- The visionary Amateur Sports Act of 1978 was poorly funded and never became integrated into American society.
- There is a growing culture of promoting children entertainers as elite athletes. Meantime, an increasing number of American schoolchildren no longer play sports and the majority does not exercise in accordance with recommended guidelines.
- The number one reason why boys and girls want to play sports is to have fun.

In 1978, the U.S. Congress passed the Ted Stevens Olympic and Amateur Sports Act, which placed the United States Olympic Committee (USOC) in charge of directing Olympic international competitions and of coordinating grass-roots sports across the nation. One far-reaching goal of this act was to make it easier for all Americans to develop their athletic interests, with the logical conclusion that such a momentous grass-roots effort would provide the USOC with the world's best athletic talent in Olympic competitions. The grass-roots component of the Amateur Sports Act also included: (1) expanding access to sports to women and minorities; (2) promoting physical fitness; (3) assisting organizations in the development of amateur athletic programs; (4) developing and promoting new research in sport science and sports medicine; (5) creating rigorous and transparent standards for coaching certification; (6) strengthening the club systems to integrate them with school sports programs; and (7) reaching across the whole system rather than remaining confined to the elite.[122]

Despite the progressive vision of the Amateur Sports Act, funding was minimal and the USOC became dependent on cash from sponsors and broadcast revenues. It did not take long for USOC priorities to shift to supporting athletes who had the best chance of winning an Olympic medal. The practical consequence was that only about $1 million became invested in grass-roots community sports, while sponsorship money became further invested into elite athletic training and competition.

REASONS FOR PARTICIPATING IN SCHOOL SPORTS

Boys	Girls
1. To have fun	1. To have fun
2. To improve my skills	2. To stay in shape
3. For the excitement of competition	3. To get exercise
4. To do something I'm good at	4. To improve my skills
5. To stay in shape	5. To do something I'm good at
6. For the challenge of competition	6. To be part of a team
7. To be part of a team	7. For the excitement of competition
8. To win	8. To learn new skills
9. To go to a higher level of competition	9. For team spirit
10. To get exercise	10. For the challenge of competition

REASONS FOR PARTICIPATING IN NON-SCHOOL SPORTS	
Boys	**Girls**
1. To have fun	1. To have fun
2. To do something I'm good at	2. To stay in shape
3. To improve my skills	3. To get exercise
4. For the excitement of competition	4. To improve my skills
5. To stay in shape	5. To do something I'm good at
6. For the challenge of competition	6. To learn new skills
7. To get exercise	7. For the excitement of competition
8. To learn new skills	8. To play as part of a team
9. To play as part of a team	9. To make new friends
10. To go to a higher level of competition	10. For the challenge of competition

Over time it has become clear that the United States lost track of the vision of the Amateur Sports Act. Youth sports are no longer designed to promote broad-based health and wellness. Instead, there is an increasing emphasis on winning—and winning early—which leads to promoting and sometimes exploiting the next generation of young athletes who pay for the sponsors' bills. Contrast the young athlete-entertainer's world with the grave statistics about the lack of meaningful exercise in school-age children. We have become a society in which sport is less accessible to the disadvantaged, the late-bloomer, and the person of average genetic athletic ability.[14]

We are not listening to our children, and they are not playing sports or exercising enough.

We forget why boys and girls want to play sports, and therefore we do not encourage this desire. Consider the tables above from the "Participation and Attrition Patterns in American Agency-Sponsored and Interscholastic Sports." Unfortunately, we are not listening to our children, and they are not playing sports or exercising enough.

Contrast these desires with the following general assessment of how sponsorship drives youth sports: Youth sport competitions must now always be considered in the context of the sponsoring organization and its motive for conducting competition. In most cases, these competitions and associated rankings serve to produce income for the agency, coach, or facility. There is no developmental plan to produce champions or even to create a base of skilled young athletes. For example, USA Football, the national governing body for the sport, has no youth national championships. However, the National Youth Football Organization holds a national championship for 7-year-old children, and Pop Warner conducts national championships for children ages 8, 9, and 10 years old. In *Game On*, Tom Farrey notes that there is no correlation between kids who play in these championships and future success at the high school, college, or professional level.[42]

Basketball has recruiting services that rank young players as early as the fourth grade, and the Amateur Athletic Union (AAU) conducts a national championship for second graders. Since 1990 the number of children who play basketball at least once a year has fallen by more than 3 million. Even with the increase in organized play on the high school and AAU levels in the decade leading up to 2000, there are fewer women of all ages playing basketball now than in 1987—before Title IX was enforced. The decline in recent years has been steeper among males, including casual players, frequent players, first-year players, and players loyal to the game.[42]

Golf has a world championship conducted by U.S. Kids Golf for children beginning at age 6. The American Junior Golf Association publishes rankings for kids 12 and over. However, the top nine golfers voted best in the 20th century had a mean starting age of 8.8 years.[42]

Baseball has a 9-and-under national championship conducted by the AAU. The well-known Little League World Series for 12-and-under players signed an eight-year, $30.1 million contract with ABC and ESPN in 2006. Baseball is on a decline in the United States, even with organized baseball and Tee-ball leagues. Participation in the 11-12-year-old group has declined from 575,000 in 1997 to 450,000 today. Of the 7,000 kids who have participated in the Little League World Series in the last 60 years, only 31 have ever played in Major League Baseball and no Little League World Series pitcher has ever pitched in the major leagues. In tracking participants of one Little League World Series team, fewer than half the kids on the Spring, Texas, finalist team in 1995 played high school baseball. The founder of Little League and the Little League World Series, Carl Stotz, suggested that the tournament he created be abolished. He stated that county or state championships would be sufficient to end the season—"a tournament close to home and inexpensive, financed the same way the leagues are financed, by local sponsors," he said.[42]

USA Swimming dropped its 10-and-under age-recognition program of recording times in 2007. It determined that only 25 percent of the kids who were outstanding in elementary school were still outstanding in later years. However, the AAU hosts a national championship for swimming for 8-and-under children and diving for 9-and-under children.[42]

One might ask why the AAU sponsors national championships that seem at odds with the national governing bodies. The AAU earns a considerable amount of income when it conducts a national championship. In 1995, the organization put out a bid to local organizers for about 100 national championship events, few of them involving children below age 12. Now it sanctions more than 250 such events in which a total of 1,900 age-group champions are crowned, starting at age 6. The AAU collects most of the annual membership fees for players, coaches, and participating clubs, as well as tournament fees. It also receives revenue for merchandise sales, programs, and photographs along with concessions and referral fees from hotels. The AAU has found that older kids come as teams, but that younger kids travel with the whole family to Orlando and pay for hotels, meals, and souvenirs for everyone.[42]

In summary, America is losing some of its youth sports vision.[49] Our country's best intentions have become trumped by the fame, glory, and money promoted by sponsors and organizations, and we have left the rest of our children behind.[66] We are promoting and developing youth-sport elitism while abandoning the fundamental moral duty to ensure that all children are afforded the opportunity to participate meaningfully in sport and exercise.[41, 115]

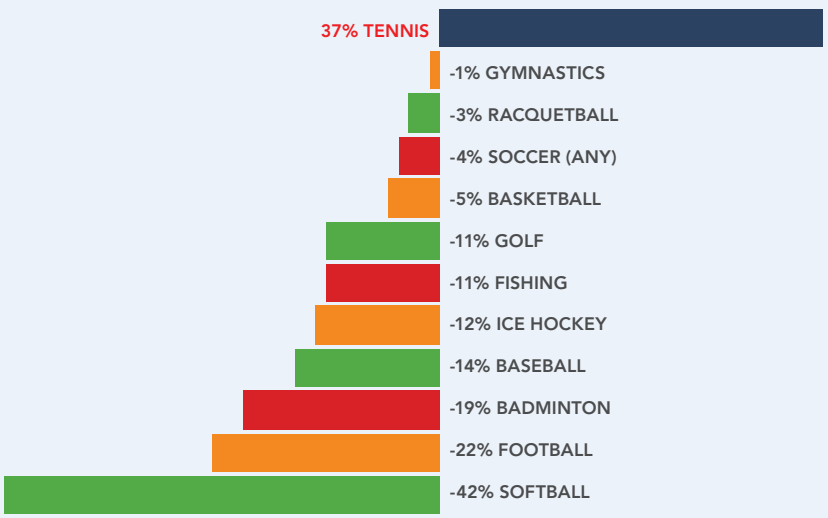
THE HEALTH OF AMERICAN TENNIS: GENERAL

SYNOPSIS

- Although tennis participation has increased relative to other traditional sports, absolute tennis participation numbers for children pale relative to other sports.
- The USTA has few members in comparison to the number of Americans who play tennis and in comparison to other countries with much smaller populations.
- 10 and Under Tennis offers an exciting possibility to increase tennis participation.

Tennis is the only traditional sport that has demonstrated considerable growth in participation during the past several years, as noted in the graph below.

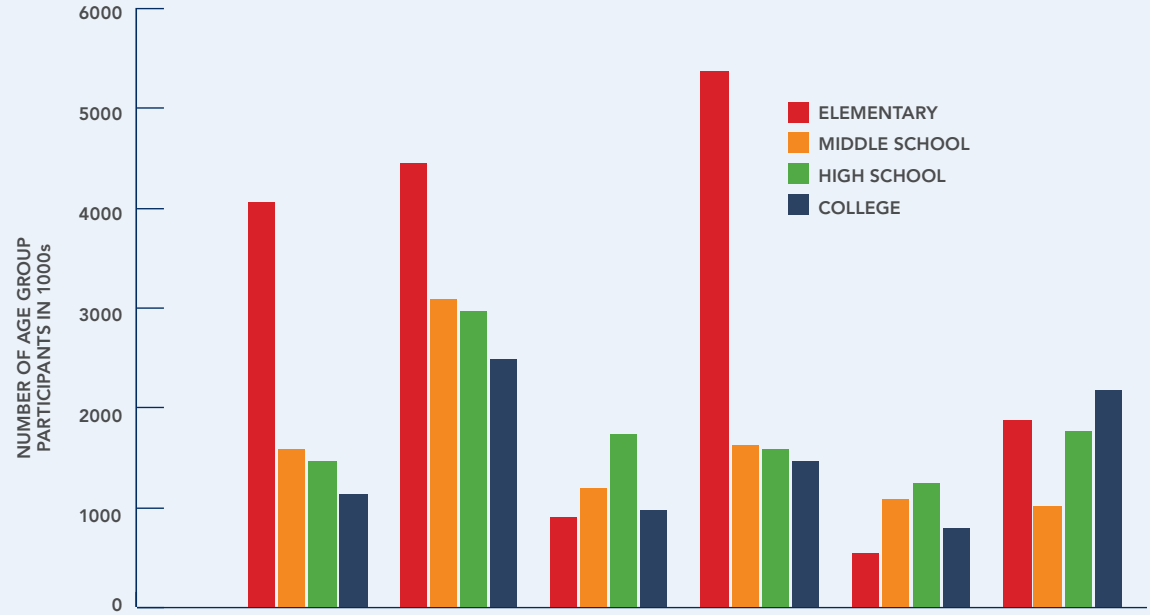
TRADITIONAL SPORTS: CHANGE FROM 2000 TO 2011



Source: 2012 Physical Activity Council

However, in absolute terms, there are far fewer elementary school children who play tennis than who play soccer, baseball, or basketball, as noted in the following chart.

PARTICIPATION BY SCHOOL AGE

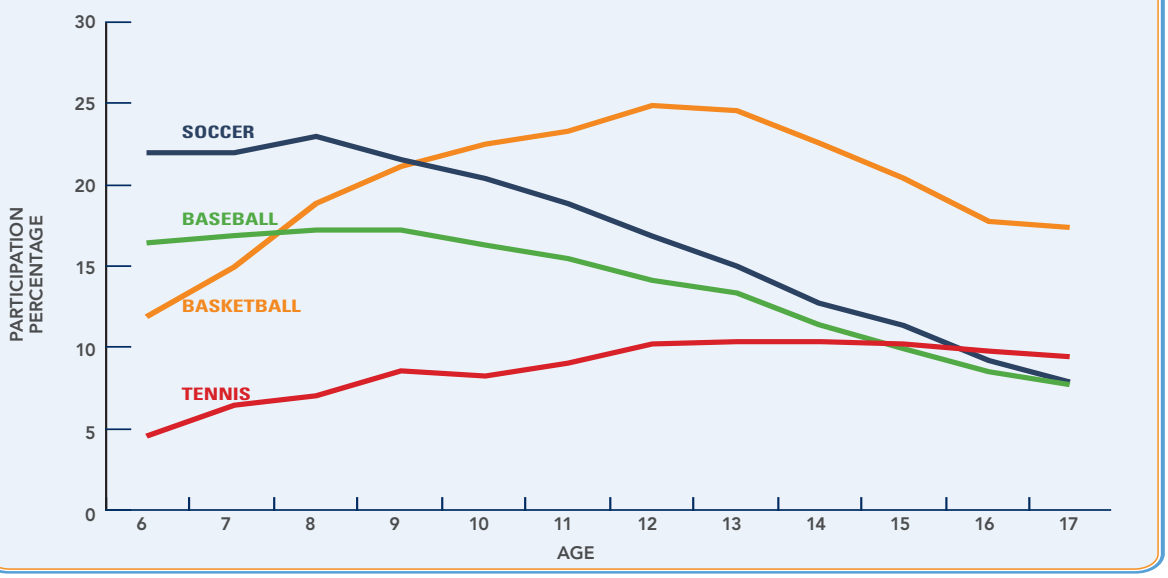


	BASEBALL	BASKETBALL	FOOTBALL	SOCCER	VOLLEYBALL	TENNIS
ELEMENTARY (6–11)	4,062	4,449	894	5,363	5,363	1,868
MIDDLE SCHOOL (12–14)	1,579	3,088	1,184	1,648	1,648	1,005
HIGH SCHOOL (5–18)	1,465	2,955	1,762	1,583	1,238	1,760
COLLEGE (19–24)	1,134	3,480	974	1,458	792	2,165

Source: 2012 Physical Activity Council

Despite the low absolute number of children who play tennis relative to other traditional sports, there is an upward trend in tennis players in the later teenage years—whereas other sports ultimately begin to decline by age 17, with soccer showing a rather dramatic decline.

PARTICIPATION PERCENTAGE BY AGE GROUP



Source: 2012 Physical Activity Council

Thus, even though the relative numbers for tennis are encouraging, the absolute numbers for children who play tennis are poor. In essence, relative to other sports, tennis has not yet developed a large following or participation model that results in meaningful participation (again, relative to other traditional sports). Furthermore, at national conferences such as Exercise is Medicine/American College of Sports Medicine, tennis is not part of the discussion when analyses are made of children in sport. (Such discussion is typically reserved for traditional children's sports such as those noted on the previous page.)

Tennis is truly the only sport that fosters lifetime participation at an individual, group, and family level.

Currently, the USTA has more than 785,000 members. And while membership numbers have increased over the years, this absolute number pales in relation to some other countries with a much smaller population. It also pales in comparison to the approximately 27 million Americans who participate in tennis. The table below illustrates the difference in membership between the United States and some representative countries.

The good news is that of all traditional sports, tennis is truly the only sport that fosters lifetime participation at an individual, group, and family level.[45, 46, 68] Approximately 27 million Americans play tennis, and this participation includes all age and ethnic demographics. Assuming reasonable retention rates, total American tennis participation could increase dramatically if the American public became captivated by the multitude of reasons to play tennis as a child.[59, 114] With the new 10 and Under Tennis initiative—which includes considerable investments in facilities, equipment, affordability, availability, and marketing the benefits of tennis in children—the USTA is in a unique position to increase substantially the number of children who play tennis.

Country	Size (Square km)	Population (Million)	Population Density (People per Square km)	Membership Number	Number of Clubs	Number of Tennis Courts
Australia	7.7 million	22.8	2.92	180,000	2176	16,500
Belgium	30,516	10.2	337	229,259	848	5,620
Canada	9.9 million	34.1	3.42	n/a	n/a	n/a
France	547,030	63.6	111	1.1 million	8,362	32,875
Great Britain	244,820	61	244	518,527	2,700	23,000
Netherlands	41,426	16.7	393	695,000	1,740	13,500
Spain	515,782	46.7	88	108,471	1,178	5,501
USA	9.8 million	313	32	783,254	25,000	400,000

Source: USTA, 2011

THE HEALTH OF AMERICAN TENNIS: PLAYER DEVELOPMENT

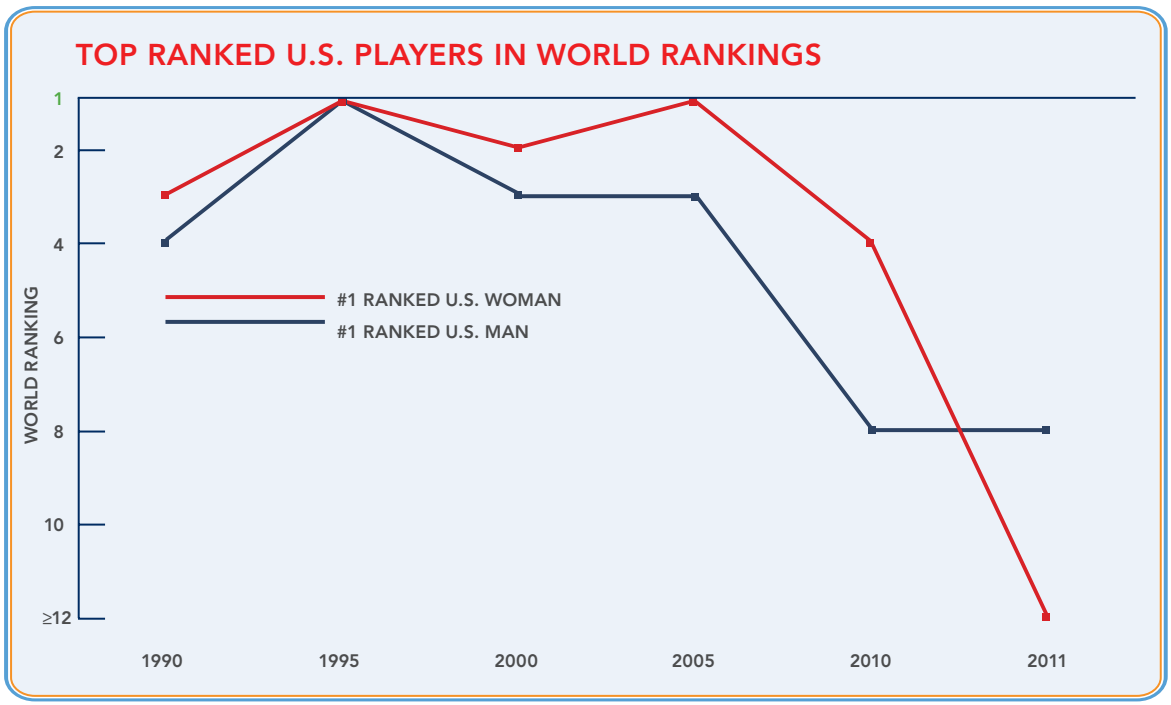
SYNOPSIS

- With the advent of numerous playing and developmental opportunities in countries worldwide, American tennis dominance can no longer be assumed.
- Very few American youth play competitive tennis, which suggests that our current competition structure is unattractive to children.

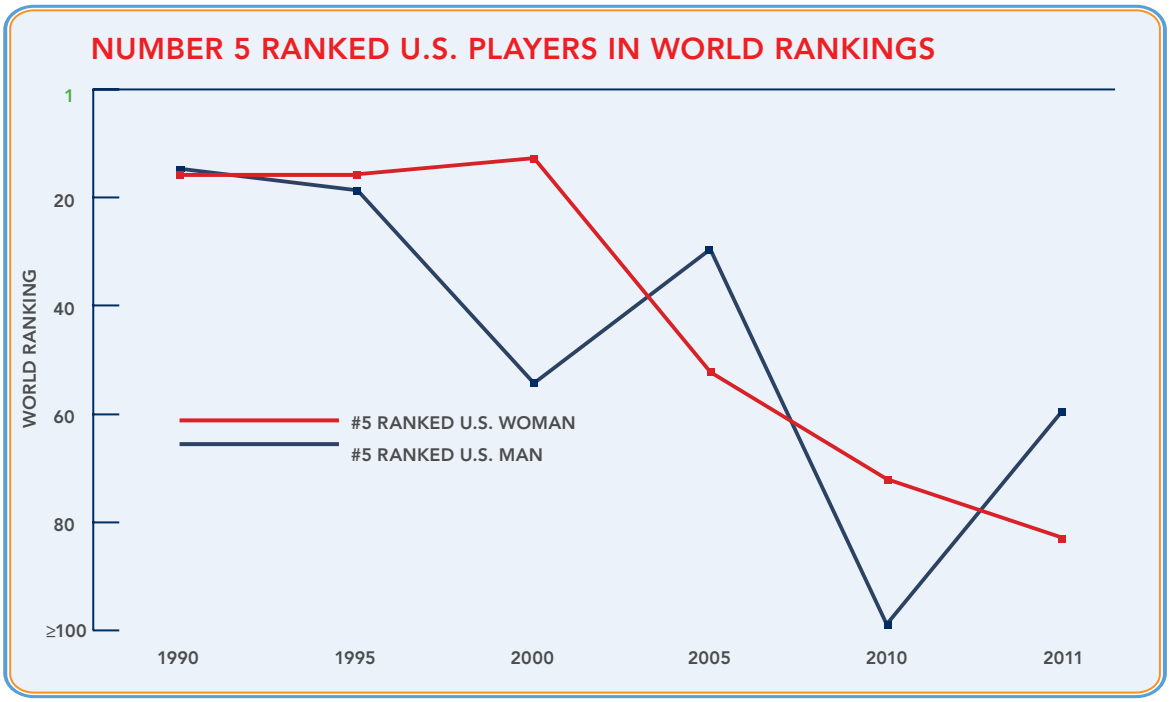
For most of the life of modern tennis, one could assume that the top American players would also be ranked highly in the world. For example, in 1990 the top five American women were ranked in the Top 16 in the world. Similarly in the same year, the top five American men were ranked in the Top 15 in the world. The graphs below demonstrate how this assumption no longer holds true.

Consider 2011, for example. The No. 1 American woman was ranked 12th in the world, and the No. 1 American man was ranked eighth in the world. There is a dramatic shift for the No. 5-ranked woman and man, who obtained world rankings of Nos. 84 and 59, respectively. It can also no longer be assumed that an American will win a Grand Slam championship. The last time an American man won a Grand Slam title was in 2003 (Australian Open and US Open). American women have fared better, capturing the Australian Open title in 2010, and Wimbledon titles in 2010 and 2012; however, an American woman has not won the US Open since 2008.

Part of the reason that American dominance in tennis can no longer be assumed is that tennis opportunities have increased worldwide, and considerably at that.[93] Tennis was reintroduced as an Olympic sport in 1988, with 39 countries participating in the men's and women's singles and doubles events. Immediately following the 1988 Olympics were the Revolutions of 1989, which led to the



Source: USTA



Source: USTA

overthrow of many Communist regimes in Eastern Europe and opened their world to many young, aspiring athletes. Many of these young athletes received funding through the International Olympic Committee's Olympic Solidarity Program, which provides assistance to newly independent countries.

In addition, around this same time, the ITF made a concerted effort to broaden tennis-playing opportunities worldwide. In the 1980s, there were very few opportunities for elite tennis athletes to play professional tennis. Entry-level professional tournaments (ITF Pro Circuit events) and ITF Junior Circuit tournaments were scant in number. The norm was for highly competitive tennis players to move straight from national junior tennis to professional tennis. Between 1990 and 2004, there was an exponential growth in both ITF Pro Circuit and ITF Junior Circuit tournaments, and this growth has continued since that time. In essence, a "minor league" developed that allowed players from all areas of the world to increasingly test their competitive skills in a graduated manner. At present, Europe has almost four times the number of Pro Circuit tournaments as the United States; Junior Circuit tournaments are even more imbalanced, with 17 in the United States and more than 125 in Europe.[61]

For Americans to remain competitive, they must compete with a growing pool of players who have an increasing number of opportunities.

Thus, for Americans to remain competitive, they must compete with a growing pool of players who have an increasing number of opportunities to develop in a progressive, coordinated system of competitive play.[93] Furthermore, many countries have developed both central and regional training centers that develop players through a combination of excellence in sport science and coaching.

The concerns of a diminishing American dominance in tennis worldwide led to a "USTA Competitive Pathway Ad Hoc Committee" (February 2005) that made many recommendations to improve player development in the United States, including a bold recommendation that the USTA develop American players rather than simply "facilitate" their development.[139] This recommendation was approved by USTA leadership, and was followed by the creation of the USTA Training Center Headquarters in Boca Raton, Florida, where up to 24 juniors are housed and schooled full-time while undergoing intense training and conditioning through national coaches. Two additional national training centers—the USTA Training Center West in Carson, California, and the USTA Training Center East in Flushing, New York—and numerous Certified Regional Training Centers have been developed subsequently, with a goal of providing excellence and uniformity in coaching and the application of the sport sciences for strength and conditioning. The combination of a (hopefully) much larger pool of American tennis players coupled with a thoughtful player development pathway brings renewed hope for American tennis dominance.

One major hurdle in casting a wide net and nourishing a genetically diverse and qualified pool of tennis players is that, at present, very few children play competitive tennis. As noted in the chart below, of the 3 million children ages 6-10 who played tennis last year, only .05 percent participated in USTA competition. Of the 600,000 frequent players ages 6-10, the same number (16,000) played tournament competition, which is 2.6 percent of this pool. This represents a very small number of potential great tennis players to develop, and indeed it is about the same number as players competing in varsity college tennis.

In the 12- to 18-year-old group, 7 million played tennis and about 100,000 participated in tournament competition (1.4 percent). On the other hand, there are 355,000 high school tennis players. This disparity strongly suggests that our current competitive structure is unattractive to developing tennis players.

Of the 3 million children ages 6-10 who played tennis last year, only .05 percent played in USTA competition.

If 10 and Under Tennis is to become the base for our future champions, there must be some radical changes in the current competitive structure so that children will want to compete. Data from the "Qualitative and Quantitative Findings: USTA Juniors Opportunity Study," reveal that children like competition, but they do not like driving long distances to play a single match that may result in a loss.[75] Children especially want to have fun when they compete, and they are attracted to events such as "Tennis Play Days," which are typically half-day events with a

Total Participation Ages 6 – 10	USTA Tournament Participation	Percentage Playing in USTA Tournaments
3M+ Total	16,000	.05%
600,000+ Frequent	16,000	2.6%

Source: USTA 2012, National Federation of High Schools 2012

round-robin format, and in which results are not documented.[140] Children are also attracted to team formats, such as USTA Jr. Team tennis, where they can compete with their friends. Competition can be packaged in many ways, and competition breeds success, especially if its foundation is coupled with enticing participation.[140] The fundamental structure of 10 and Under Tennis competition must address the needs of children and incorporate innovative ideas that promote fun-filled days for all participants. The chart that follows is a sober reminder that tennis does not have a nationally branded following in children, especially when compared to soccer.

Our current competitive structure is unattractive to developing tennis players.

HOW DO WE COMPARE?
Percent of kids playing in a nationally branded competition.

Source: USTA 2009

INTERNATIONAL TENNIS PERSPECTIVE

SYNOPSIS

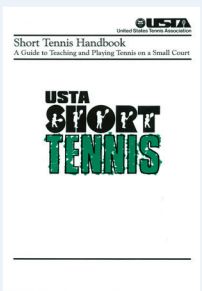
- The goal of the ITF "Play and Stay" campaign is to introduce tennis as a sport that is fun, easy, and healthy.
- 10 and Under Tennis is grounded in scientific and technical research focused on technique, movement, and development in children.
- Small-court tennis previously failed in the United States because there was never a competitive structure to support such programs.

10 and Under Tennis has been discussed in the United States for more than 25 years. In the pivotal 1987 task force organized by the USTA president, "Taking Care of Tomorrow," it was recommended that the USTA begin teaching children under 10 years old on a smaller court with modified balls and equipment.[142] As the chart below indicates, there have been many U.S. short-court tennis programs that have been introduced and have failed, including USTA Short Court Tennis, PeeWee Tennis, PTR Munchkin Tennis, and USPTA Little Tennis.

10 and Under Tennis has been discussed in the United States for more than 25 years.

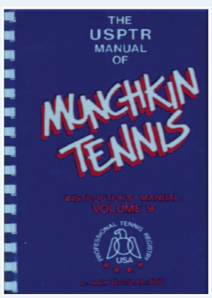
Short-court tennis and its many variations did not become part of the American tennis development culture because there was never a competitive structure to support these programs.[121] In 2002, the ITF assembled a task force that examined how to position introductory tennis. This task force included representation from the USTA, the Professional Tennis Registry (PTR), and the United States Professional Tennis Association (USPTA), and included buy-in from the ATP and WTA tours.

EVOLUTION OF KIDS' TENNIS

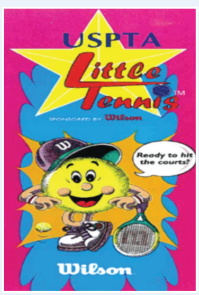


1985
USTA
SHORT COURT TENNIS

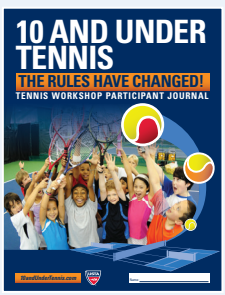
1987
WILSON
PEE WEE TENNIS



1994
PTR
MUNCHKIN TENNIS



1995
USPTA
LITTLE TENNIS



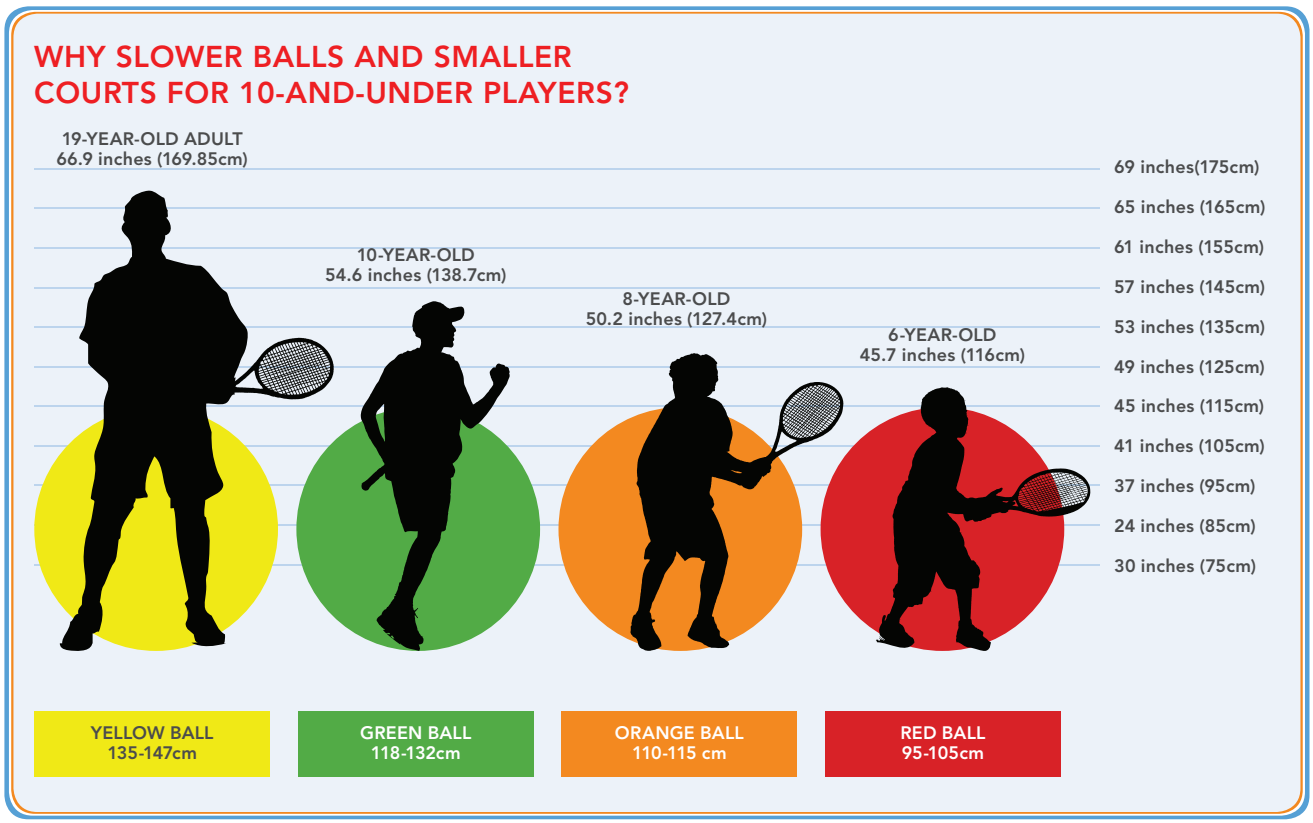
2008
USTA
10 AND UNDER TENNIS

In essence, the goal was to position introductory tennis as a game that is easy, fun, and healthy. More specifically, the ITF task force developed five key messages:

1. Introductory tennis is easy when coaches use slower balls.
2. Introductory tennis is fun when starter players serve, rally, and score from the beginning.
3. Introductory tennis competitions should be fun, and can be adapted to the lifestyles and needs of the customer.
4. Introductory tennis is healthy, even for recreational players, because they are moving and developing interval training.
5. Introductory tennis is a sport for all because you can play the game, get a rating, and play with other people at the same level.

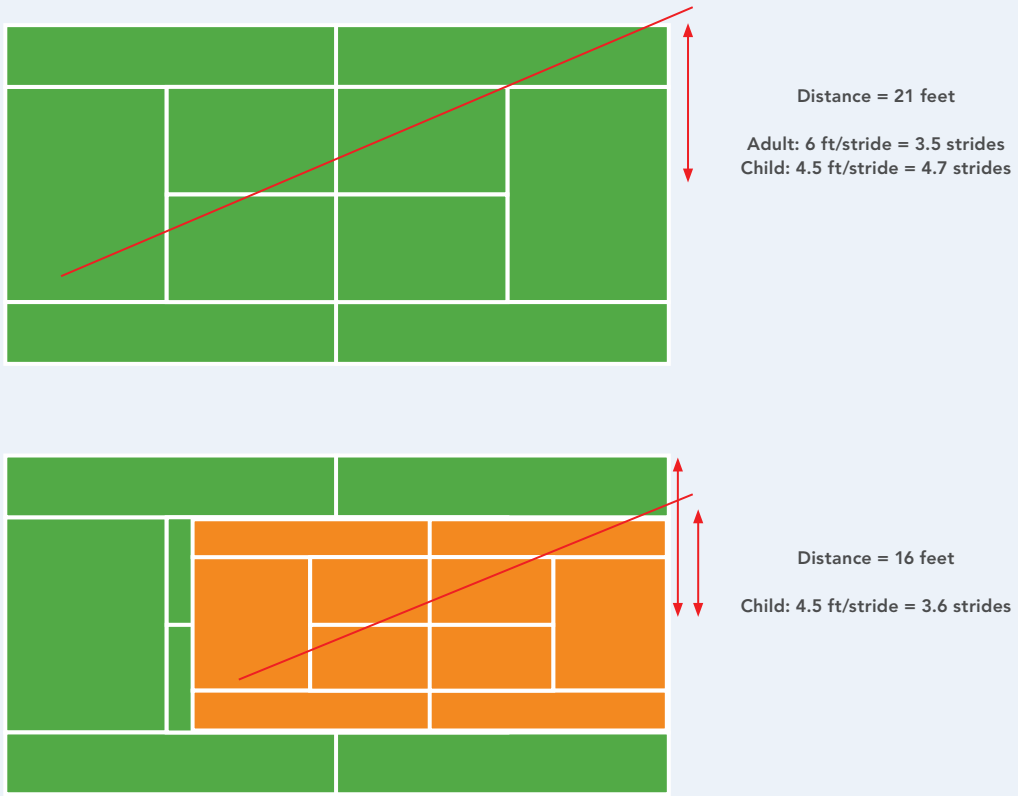
This five-message model was based on much philosophical discussion coupled with technical and scientific research. As noted in the graphs below, there is a sound technical reason to introduce tennis with a modified ball and racquet, and this is based on the average height of a child and the bounce height of a ball.[96]

For most children under the age of 10, the traditional yellow ball bounces higher than their height, which means that the stroke biomechanics for children playing with a yellow ball must differ from adults (that is, the ball bounces over their heads, thus their swing path differs from an adult, whose swing path typically meets the ball at waist level). If we believe that stroke mechanics and technique are important at a young age, then the ball bounce is important. According to the ITF, the "red" ball, made of foam or felt, is approximately 75 percent slower than a regular yellow ball and is designed primarily for children



Average height of males and females combined (World Health Organization, 2007). ITF rebound height specifications for approved balls.

COVERING THE COURT



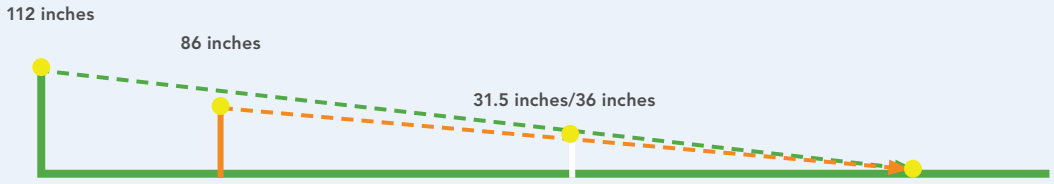
Source: ITF

ages 5 to 8 and for play on a 36-foot court. The "orange" ball is approximately 50 percent slower and designed primarily for children ages 8 to 10 and for play on a 60-foot court. The "green" ball is approximately 25 percent slower and designed primarily for more advanced 9-to-10-year-olds and for play on a 78-foot (or full-size) court, and can also be used in the transition period to 12-and-under tennis.[70]

Movement on the court is also a key aspect of development. When children play with the yellow ball, quality movement may be less than when playing with a modified ball. A primary reason is that children have more difficulty controlling the yellow ball, and because of a smaller stride length, they cannot cover the entire distance of a traditional 78-foot court as well as an adult. However, if a child is able to play on a court better suited to his or her size, the number of strides is very similar to that of an adult playing with a yellow ball on a 78-foot court, as demonstrated in the illustration above. Assuming an average adult stride of 6 feet and an average child stride of 4.5 feet, the average number of strides to cover the court side-to-side is about 3.5 for adults on a 78-foot court and for children on a 60-foot court.

Movement is important from another perspective as well. Because children are more likely to have poor ball control with a yellow ball and have less ability to cover wide shots on a 78-foot court, they have less tactical options relative to playing with

ORANGE COURT VS. GREEN COURT: ATTACKING THE SERVE



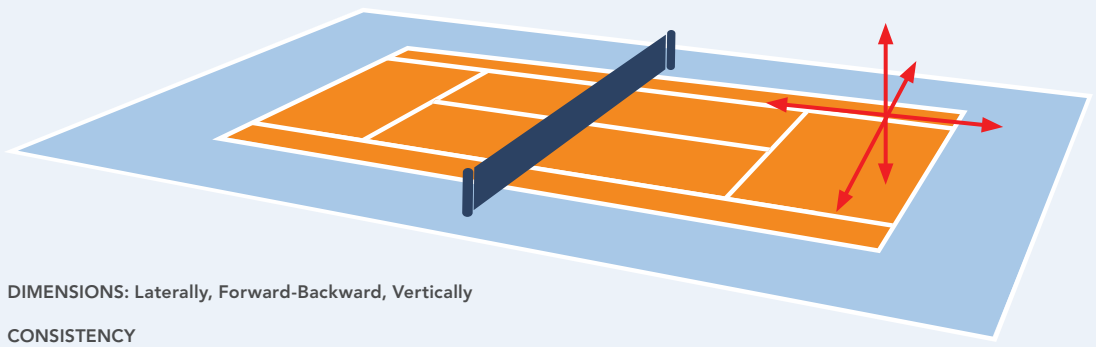
Source: ITF

a modified ball on a modified court. On an appropriate-size court with an appropriate ball, the child can become more easily engaged in playing the game of tennis with quality movement. In addition to having fun, assuring quality movement encourages tactical decision making.

The ITF also performed an analysis of the serve. An average adult can attack the serve with some degree of power, but this would be near impossible for a 10-and-under child on a 78-foot court. However, as the illustration above demonstrates, a child playing on a 60-foot (orange) court can similarly attack the serve.

Another important component of the developing player is learning to play in a comfort zone, which assumes that the player is able to move forward as opposed to backing up. With the high-bouncing yellow ball, 10-and-under children are frequently backing up and striking the ball above their head level, which also encourages a more extreme grip in order to make contact. As the illustration below demonstrates, children who play on a

CONTACT COMFORT ZONE: EQUIDISTANT MOVEMENT ON ORANGE COURT



DIMENSIONS: Laterally, Forward-Backward, Vertically

CONSISTENCY

PENETRATION

Source: ITF

60-foot court are frequently able to move and strike the ball in a comfort zone that is relatively equidistant whether they are going forward, backward, or laterally.

The ITF research included the transition from the green ball to the yellow ball. This critical transition usually takes place around ages 10 and 11. When the transition is done piecemeal, at a time when the child has developed proficiency in technique, the following is more likely to occur:

- Players will contact the ball at a "comfortable" height more often when using green balls.
- Players will contact the ball twice as often above shoulder level when using yellow balls.
- Players make more bad errors (5 feet-plus) when using yellow balls.
- Players are able to hit from a position in front of the baseline more often when using green balls.
- Players direct the ball down the middle of the court more often when using yellow balls.
- Rallies are the same length but play is at a higher tempo when using green balls.
- Players adapt easily and are positive about using the green ball; the challenge is that parents and coaches want to speed the transition because they do not feel the green ball is a "real" tennis ball.[96]

The mass of the modified balls is considerably less than the mass of a yellow tennis ball.

Finally, the ITF considered overall stroke biomechanics and force generation to a child's arm and body when playing 10 and Under Tennis. As the chart below demonstrates, the mass (weight) of the modified balls is considerably less than the mass of a yellow tennis ball.[71] With modified balls and an appropriate sized racquet—which acts as a lever—less force is generated to the arm and body. This, coupled with proper technique, lessens the chance of injury.[60]

MASS OF TENNIS BALLS

Ball	Weight
Stage 3 (Red) Foam	**0.882-1.517 ounces**
Stage 3 (Red) Standard	**1.270-1.728 ounces**
Stage 2 (Orange) Standard	**1.270-1.654 ounces**
Stage 1 (Green) Standard	**1.658-1.817 ounces**
Yellow Medium	**1.975-2.095 ounces**

Source: ITF Rules of Tennis 2012

YOUTH TENNIS: MEDICAL OVERVIEW

SYNOPSIS

- Children are not miniature adults. They differ physically, physiologically, emotionally, cognitively, and socially.
- Boys and girls develop differently, and there are brain-based reasons for this difference. Girls are more language-oriented, and boys prefer spatial-mechanical functions such as moving balls.
- The growth rate peaks between ages 11 and 12 in girls, and between ages 13 and 14 in boys.
- There are inherent limitations to a child's endurance and strength capacity, and these limitations begin to shift after puberty.
- Although there are limited data, there are no known medical risks for pre-pubertal children who play tennis.
- As with adults, children need to recover physically, nutritionally, and emotionally after exercise.

GENDER DIFFERENCES

We have all seen the difference between boys and girls, and we sometimes wonder if we create this difference through the environment or if there is really an innate difference between boys and girls. Why do boys want to fly rockets and throw rocks? Why do girls become more attached to dolls? Of course, this is not universal, but it is noteworthy to look at some aspects of gender and development that help us to understand the difference between boys and girls.

- Boys get 70 to 80 percent of D's and F's in grade school.
- Boys make up 80 percent of the disciplinary problems in grade school.
- Boys make up 70 percent of learning disabilities in grade school.
- 80 percent of children on Ritalin (amphetamine) for attention-deficit disorder are boys.
- Boys are 1 to 1.5 years behind girls in reading and writing.[146]

Can we explain why there is such a difference? From a neurodevelopmental viewpoint, the corpus callosum of girls is 25 percent larger than for boys. The corpus callosum is a large bundle of nerve connections in the brain that connects the two hemispheres. Simplistically speaking, the brain has a left hemisphere, a right hemisphere, deep brain structures that make up the brain stem, and a cerebellum that navigates our balance. The two hemispheres mediate our language, visual spatial perception, judgment, planning, sensory integration, and movement. Without the corpus callosum, the two sides of the brain operate independent of one another. For example, the left hemisphere, or language-dominated rational part of our brain, would operate independent of our right hemisphere, which mediates visual-spatial skills and more intuitive responses. From a developmental perspective, girls are more "connected" than boys, which in part explains their earlier maturity.[147]

If we analyze behavior and correlate this with neurological development, boys have more cortical brain areas devoted to spatial-mechanical functioning, which is associated with behaviors such as moving balls and other objects. Boys also are more prone to pushing the limits of safety and exploration, and are significantly more likely than girls to do something dangerous. Boys have less cortical development than girls for language and rational reasoning; from this perspective, the more you try to reason with a boy relative to a girl using language, the greater chance he will quit listening to you. These gender differences are important to

understand when teaching and coaching young athletes, as instruction and pedagogical differences may be needed to reach the same outcome—proficiency in tennis skill development.[117]

GROWTH AND PHYSIOLOGICAL DEVELOPMENT

Growth is a continuous process from birth to maturation and results in increased height, increased body mass, and an increase in organ size. The growth rate of girls peaks between ages 11 and 12, and in boys the growth rate peaks between ages 13 and 14. In addition to physical growth, the physiology of boys and girls changes over time, and these changes influence how boys and girls adapt to exercise.[119]

When we exercise, our body produces heat, and the heat must be regulated by sweat. If we exercise in a warm or hot environment, the body's heat regulation becomes even more important.[12] When our sweat evaporates, the body becomes cooler. Without this process, the body temperature could become dangerously high.[13] Children have a larger surface area of skin relative to their entire body mass, and this means that children can absorb heat from the sun more quickly than adults. In addition to absorbing heat more quickly, children have a delayed sweating mechanism and decreased ability to produce sweat droplets compared to adults. For these reasons, we must be careful that children do not become ill from the heat when they exercise in a hot and humid environment.[146] Ultimately, children can adapt, and there is no clinical evidence that children have a higher incidence of heat illness problems from the heat, but they are at a relative disadvantage because their physiology for heat regulation is not as developed as it is in adults.[12]

The heart beats continuously in order to move oxygen-poor blood from the veins to the lungs, and oxygen-rich blood from the lungs to the rest of the body. Blood from the veins has already delivered oxygen-rich nutrients to the organs, and when this blood is circulated through the lungs, the blood again becomes oxygen-rich and is ready to provide this critical element to all organs. A child's heart rate at rest is considerably higher than an adult's resting heart rate. In addition, children breathe faster than adults. This means that children do not have the same heart and lung reserve to become engaged in strenuous physical activity. Indeed, the average VO2 max of 11-year-old boys is 2 liters per minute, and for girls it is 1.85 liters per minute. (The VO2 max is a term that refers to the maximum capacity of an individual's body to transport and use oxygen during incremental exercise, which reflects the cardiorespiratory fitness of the individual.) Compare the VO2 max of 11-year-old-boys to 17-year-old boys, who have a VO2 max of almost 3.5 liters per minute—17-year-old girls have a VO2 max of 2.5 liters per minute—and you'll see that 17-year-old boys are capable of substantially more vigorous exercise than 11-year-old boys. Furthermore, by extension, 17-year-old boys have a greater fitness potential than 17-year-old girls. This is important to recognize when structuring training programs for young athletes, as their capacity for metabolic work is less than for a post-pubertal athlete.[146]

17-year-old boys are capable of substantially more vigorous exercise than 11-year-old boys.

Because of low androgen (testosterone) levels, it is not normal for boys and girls to develop large muscles, although they can still exercise through strength training. The point of strength training in children is to help the body adapt to increasing challenges, to improve stability around

joints, and to develop muscular endurance. Boys and girls can strength train without fear of stunting growth, and such training is an important part of overall athletic development. There is no evidence that complications such as bone fractures or complications caused by epiphyseal injuries (growth plate fractures) are seen disproportionately in children who participate in organized sports or higher levels of competition.[146]

Given equal amount of exercise and strength training, there are some inherent differences between boys and girls. Boys naturally have greater muscle mass and lower body fat than girls. This means that the greater muscle mass can help enhance performance, and the greater fat mass can be a disadvantage because it must be carried during exercise, though regular exercise for boys and girls will generally lead to less fat mass in both.[146]

It is important to note that strength training needs to be performed using appropriate technique and under the supervision of qualified individuals who are familiar with the sport (tennis) and with young athletes.[11]

MEDICAL CONCERNS

There are few studies available regarding medical concerns of children in sports. Most of the children's sports literature focuses on the critical period of puberty, during which time there is a considerable change in growth accompanied by hormonal and sex characteristic changes.[130] It is during this time that children may become more specialized in sport, and the training load may increase substantially. This increase in activity leads to various injuries such as Osgood-Schlatter's disease, which is a condition in which the patella tendon just below the knee becomes quite irritated. The patella tendon attaches the quadriceps (thigh muscle) to a bone called the tibial tuberosity. During growth spurts, especially around the time of puberty, children who are very active in sports have a much higher likelihood of developing this condition compared to inactive children.[143] The treatment is rest and an assessment of how much training the child is doing compared to his/her relative strength.

Spinal damage has been reported in children under the age of 10 who specialize in sports such as gymnastics, and it is becoming increasingly reported in young tennis players, especially as they reach puberty. Specifically, a condition called spondylolysis, which is a fracture of part of the spine called the pars interarticularis, may develop in children who train at very high levels.[118] In pre-pubertal and peri-pubertal children, the ligaments and tendons are actually stronger than the bone. In children who rotate and extend their lower back excessively, the force on the bone in the lower back can be such that the bone will fracture. Such children develop localized back pain and must rest between one and three months, and they often require a back brace. Reintroduction of sport should be accompanied by an analysis of the training load compared to the strength of the individual.

Exercise in children under 10 does not seem to predispose them to growth plate injuries in other parts of the body; these conditions occur more commonly around puberty. Perthes disease, which is a progressive hip degeneration in children under 10, is not a result of training or exercise, but is rather from causes unrelated to exercise.[130]

There is very little information about tennis injuries in children under 10. An analysis of hospital emergency rooms in the Netherlands demonstrates that the risk of injury from tennis in children ages 6 to 12 is 0.01 injuries per player per year.[28] This means that for every 100 children who play tennis, one child will develop some type of injury; there is no pattern to the type of

injury that develops. In an Australian study of school children ages 5 to 12, tennis had an injury rate of 1.10 per 1,000 hours of play.[126] This means that for every 1,000 hours of playing tennis, there is a little more than one injury that will develop; again, there is no specific pattern of injury noted. Heat illness, which includes heat stroke, heat exhaustion, and severe cramping, is more common in teenagers than in children under 10.[72] Even though a child's physiology is not well adapted to heat dissipation relative to teenagers and adults, young children seem to adapt in other ways so they do not become heat ill.[12] There is not good data about sudden cardiac death in children who exercise. In high school athletes, one in 200,000 will develop sudden cardiac death, which is why pre-season screening exams are recommended. Burnout has been reported in teenagers, but there is limited data for children under 10.[29] Burnout is a psychological and physical condition that results from overtraining, and that leads to poor athletic performance, irritability, fatigue, lack of motivation, and an increase in resting heart rate.[51]

In summary, there are limited data about medical problems in young children who exercise. Most injuries and medical concerns become apparent during and after puberty.[124] Whether the emphasis on early specialization will cause increasing medical problems in children under 10, however, warrants monitoring.

STRENGTH TRAINING

There are many myths and concerns about strength training in children, and this is compounded by a lack of consistent competency standards that are in place for strength and conditioning coaches.[79] The National Strength and Conditioning Association (NSCA) is now developing improved competencies for coaches that is consistent with evolving scientific data. Another problem is that there are very strong commercial influences for strength training, and these influences are more in keeping with selling a product or program rather than focusing on best evidence for age-appropriate strength and conditioning. Furthermore, commercial influences often market the use of machines, and they are rarely, if ever, properly designed for children.[79]

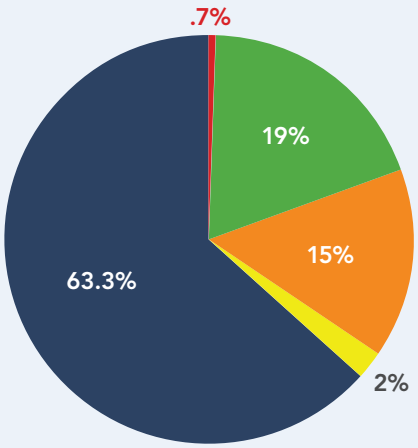
The primary reasons for considering strength and conditioning training in children is to improve health and athleticism.

The primary reasons for considering strength and conditioning training in children is to improve health and athleticism.[101] Furthermore, as noted above in the "Physical Activity Guidelines for Americans," strength training is recognized as an important aspect of childhood exercise. Realistic goals for strength training in pre-pubertal children include:

- Improved muscle strength and power
- Little or no change in muscle size
- Improved muscular endurance
- Improved body composition
- Improved strength balance around the joint
- Prevention of injury
- Improved sport performance
- Improved self-confidence[40, 116]

In order to achieve these goals, a program should be properly designed and supervised by a knowledgeable adult, and the child and adult should share realistic goals while assuring that the child can follow directions safely and with proper form. When this is accomplished, the evidence indicates that very few injuries

INJURY RATES IN SCHOOL-AGE CHILDREN



- RESISTANCE TRAINING
- FOOTBALL
- BASKETBALL
- SOCCER
- OTHER SPORTS

"Injuries related to resistance training in high school athletes appear to involve the aggressive progression of training loads or improper exercise [or moving weight] technique" Faighenbaum. et al. 2009 JSCR

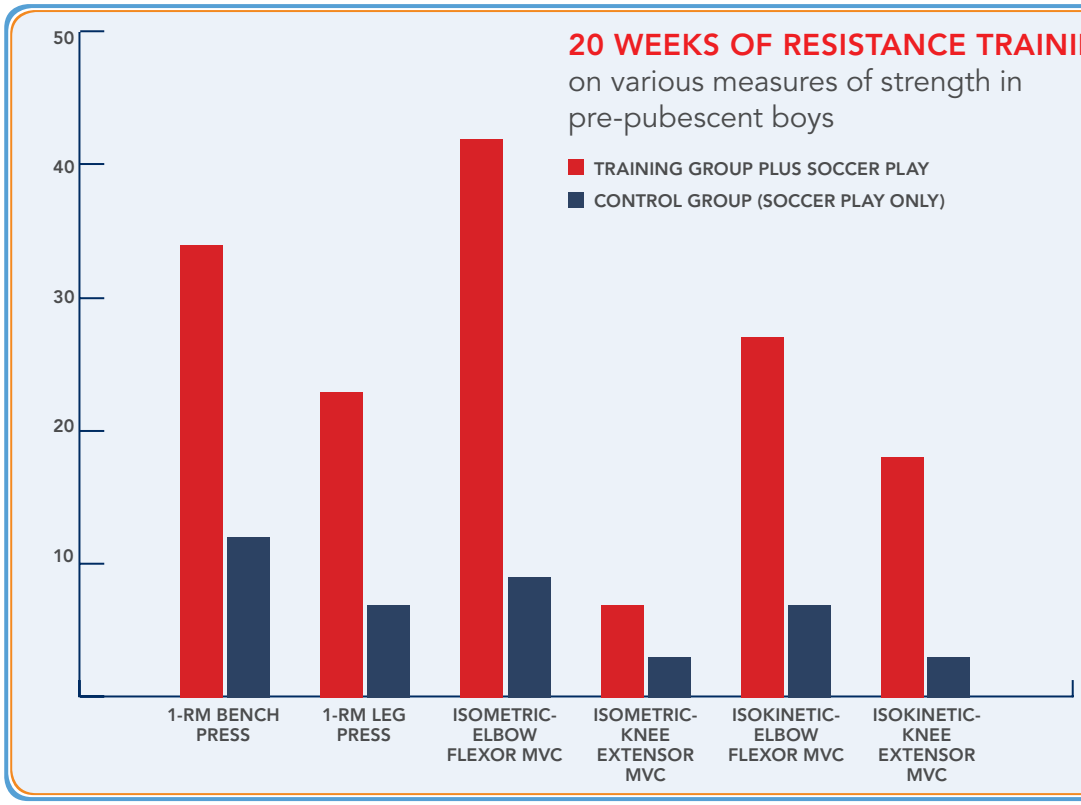
develop from strength (resistance) training relative to actually playing sports, as shown in the chart on the left.[40]

Furthermore, if a properly designed program is accompanied by good nutrition, the results are even better. For example, if you substitute milk for sugar-containing beverages in 14-year-old girls, their overall strength and conditioning gains are statistically significantly better.

In a study of soccer players, children performed much better when they combined resistance exercises with soccer play, as noted in the table below. Similar gains are also demonstrated for girls.[67]

20 WEEKS OF RESISTANCE TRAINING

on various measures of strength in pre-pubescent boys



Ramsay JA, Blimkie CJR, Smith K, Garner S, MacDougall JD, Sale DG. Strength Training effects in prepubescent boys. *Med Sci Sport Exercise.* 1990;22:605-614

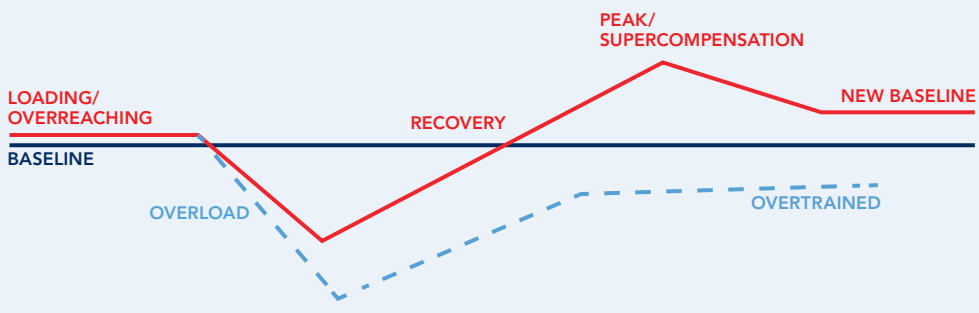
Although there are no tennis-specific guidelines, there are general strength training guidelines that can be followed by children who play tennis, which include:

- Begin at 7-8 years old
- Frequency: 2-3 days per week
- Provide qualified instruction and supervision
- Ensure the exercise environment is safe and free of hazards
- Start each training session with a 5- to 10-minute dynamic warm-up period
- Begin with relatively light loads and always focus on the correct exercise technique
- Perform 1-3 sets of 6-15 repetitions on a variety of upper- and lower-body strength exercises
- Include specific exercises that strengthen the abdominal and lower back region
- Focus on symmetrical muscular development and appropriate muscle balance around joints
- Sensibly progress the training program depending on needs, goals, and abilities
- Increase the resistance gradually (5-10 percent) as strength improves
- Cool down with less intense calisthenics and static stretching
- Listen to individual needs and concerns throughout each session
- Begin resistance training 2-3 times per week on nonconsecutive days
- Use individualized workout logs to monitor progress
- Keep the program fresh and challenging by systematically varying the training program
- Optimize performance and recovery with healthy nutrition, proper hydration, and adequate sleep
- Support and encouragement from instructors and parents will help maintain interest[79]

RECOVERY AND PERIODIZATION

Recovery may be the most important component of being able to train and compete on a regular basis. Although we have limited data on children, we know with certainty that lack of recovery impedes performance and leads to repeated injuries in teenagers and adults. In a 16-year study of players at the US Open Tennis Championships, the

ROLE OF RECOVERY IN TRAINING



Source: M Kovacs, USTA Youth Tennis Symposium, 2012

majority of injuries were from overuse,[123] and the most common trend was for players to return to training or competition before recovering adequately.

Overreaching is a normal process of training.

Recovery is an integral part of daily training and is not simply reserved for injury management. Recovery is the body's ability to return to a state of readiness following a physical and/or mental challenge.[77] Recovery is physical, nutritional, emotional, and mental.[78]

The chart on the previous page illustrates the role of recovery in training.

This chart demonstrates the difference between overreaching and overtraining. Overreaching is a normal process of training, and it is the accumulation of training and non-training stressors that lead to a short-term decrease in performance—a decrease that can be overcome with a recovery lasting a few days.[78] Every good coach pushes a player to a place of overreaching. It is here that the player discovers new and creative sources of inner strength and adaptations. If the athlete recovers following a vigorous workout, then a new baseline of superior strength, athleticism, or adaptation develops.

Overtraining results from an accumulation of training and non-training stressors that has a detrimental long-term effect on performance, with a recovery period that may take several weeks or months.[74] Approximately 50 percent of athletes who play individual sports such as tennis overtrain.[77] All too often, the athlete begins to perform more poorly and the response is to train harder rather than to back off and recover more.[80] An athlete who is overtrained by 5 percent will perform less well than an athlete who is 90 percent prepared for competition.[149] It is the wise coach who understands the difference between overreaching and overtraining, between going to the edge of the cliff and falling over the cliff.

We have very little data on recovery in children.[76] However, it is noteworthy to observe children in unstructured, active play. Typically, the duration of low- to medium-intensity activities in 6- to 10-year-old children is six seconds, and it is three seconds for high-intensity activity.[5] The question is whether this data should serve as a guide to how we structure tennis and other physical activity in children. Should we do away with 20-second-and-more drills? We have no answers. However, based on everything we do know, children should take time to recover after exercise. They should eat properly within one hour (carbohydrates and proteins), they should be well hydrated, they should be able to rest, and they should sleep properly.[78]

We must be ever mindful of balancing recovery with training.

As we continue to expand our tennis horizons, we must be ever mindful of balancing recovery with training. The USTA recently passed a "Recovery Rule" that mandates the offering of a two-hour rest period in outdoor tennis matches that follow a traditional 2-out-of-3 set format. This is the beginning of integrating proper recovery into the tennis regimen. Ultimately, recovery and training become part of a periodization strategy. Periodization is a training strategy that combines cycles of training with appropriate recovery on a daily, weekly, monthly and seasonal basis.[134]

YOUTH TENNIS: PSYCHOLOGICAL OVERVIEW

SYNOPSIS

- Tennis presents many unique demands that can foster psychological development in children.
- The three key developmental foundations for children are autonomy, mastery, and relatedness.
- Children have an increased interest in sport when it is fun.
- Children have a limited concentration span, which begins to increase in pre-pubertal development.
- Exercise has a beneficial impact on cognitive development in children.

The early years of a child's life, including school-age children (ages 6-13), present a unique opportunity to foster healthy psychological development. Psychological development refers to cognitive, emotional, intellectual, social, and moral capabilities. Most researchers and theorists believe the child progresses through a series of discrete developmental stages; most also agree there is wide variation in considering what is "normal."[32]

Before reviewing the specifics of psychological development for children 5 to 10 years of age, it is worth considering the unique demands of traditional tennis relative to other sports, including:

- There are no timeouts, and there are no substitutions.
- There is no clock. Matches can last anywhere from 45 minutes to several hours. Players are never certain how long they will be competing on the court.
- A player's opponent in the next round may have had an easy match lasting only 45 minutes, whereas the player's match may have lasted three hours.
- Players are all alone with little or no coaching allowed.
- Tennis involves both aerobic and anaerobic capacity, and physical fatigue can affect both cognitive and emotional processes.
- Tennis's scoring system promotes mounting pressure. A lead can evaporate very quickly. Regardless of the score, players rarely feel secure, even with a substantial lead.
- Nervousness and anxiety play a significant role in competition due to the vast array of fine motor skills required for success.
- Competitive categories are determined by age, not size or weight. Short competes against tall and small competes against large.
- The tennis player's brain must make hundreds of thousands of split-second calculations for him or her to make contact in the center of the strings in a way that will result in the ball traveling to the intended point on the opponent's side of the court. Ball speed, spin, height, and wind conditions must be factored in as the player is running toward the ball in dynamic motion. It is no wonder, then, that lapses in concentration or the presence of anger or nervousness can completely undermine gross and fine motor skill execution and balance.
- Singles play is one-on-one competition—much like a boxing match, where competitors trade blows. Players can see their opponent's facial expressions of anger, disgust, contempt, fear, range, and conceit.

- Rivalries can become bigger than life, adding considerable emotional and social pressures to win.
- Spectators are very close to competitors as they compete. Players can see parental faces of disgust, joy, embarrassment, or fear.
- Opportunities for cheating and gamesmanship are ever present, potentially contributing to significant emotional pressure on players.
- Fractions of inches separate "in" from "out." Even professional players make frequent mistakes on line calls as confirmed by the use of video replay during professional matches.
- Bad losses (losing to someone ranked lower) can be highly threatening to a player's tennis identity.
- In school-age years (6-13), girls can and frequently do beat boys of the same age, resulting in powerful feelings of embarrassment and perceived failure.[83]

Few, if any, sports offer such a diverse array of opportunities for psychological development.

These tennis-specific stressors represent an extraordinary field of demands that can be leveraged to accelerate psychological development. Excessive doses of stress prolong development; insufficient doses of stress prolong development; the right dose of stress facilitates positive developmental adaptations. Temper tantrums, crying, quitting, and tanking are all great learning opportunities for accelerating self-control and self-regulation. Few, if any, sports offer such a diverse array of opportunities for psychological development. This consideration, combined with the reality that risk of injury for tennis participants is low and tennis can realistically be played for a lifetime, makes it a particularly attractive choice from a learning and development perspective.[83]

Take, as an example, exposing a 6-year-old to tennis. At age 6, the child is beginning to use language to express displeasure and frustration rather than display aggression or throw tantrums. Exposure to tennis affords the child repeated opportunities to talk his or her way through the barrage of missed balls, mistakes, and unsuccessful execution of complex eye-hand motor skills. At this age, children experience frequent mood swings, require closeness and nurturing from parents, and constantly seek adult praise, approval, and reassurance. Tennis, when properly managed, can help children to self-regulate mood swings and provides separation from parents but still occurs within a fun and supporting environment—one where the needs for approval and reassurance can be constructively met. At age 6, most children are unable to view the world from others' perspectives and do not understand ethical or moral standards without specific, concrete rules. Tennis can be very useful in stimulating moral development—"now it's her turn"; "be careful not to hurt anyone"; "great job but don't swing so hard"; "how do you think Mary feels? Would you like to feel that way?" Countless opportunities are afforded in every group lesson to teach respect for others, kindness, patience, self-regulation, and control of aggressive impulses.[83]

ABILITY OF 10 AND UNDER TENNIS TO FULFILL BASIC NEEDS OF CHILDREN

There is great consensus in the research world regarding the fundamental imperative of developing three basic needs for healthy development. These needs allow for progressive self-determination. They include:

1. Autonomy
2. Mastery (Competence)
3. Relatedness[33]

Autonomy is the psychological need to feel that our behavior is self-initiated and self-endorsed; we pursue something because it is inherently satisfying to pursue. Mastery represents the need we feel to be effective and competent at what we do; children receive great fulfillment simply from learning, growing, and developing mastery. Relatedness represents the powerful need humans possess to connect with others and is pervasive with young children; feelings of belonging, attachment, and bonding with others are core elements in the formation of healthy self-esteem.

10 and Under Tennis can help develop these three needs as follows:

Autonomy: When parents expose children to a wide variety of sport options and give them a choice as to what they want to pursue, the need for autonomy is reinforced. "Do you like the people in your group?" "Do you like the instructors?"

Mastery: When parents and coaches instill a love of learning for its own sake, when they help kids receive satisfaction from simply getting better and mastering something very hard, they help children meet their need for mastery. "Is it fun?" "Is it challenging?" "Did you learn something new?"

Relatedness: When parents and coaches provide opportunities to interact, play cooperatively together, make new friends, and share experiences together, they help kids meet the need for relatedness.[83]

PSYCHOSOCIAL DEVELOPMENT AND 10 AND UNDER TENNIS

Erikson's eight-stage psychosocial development model is particularly important because of its classification of character-strength insights. Each of Erikson's chronological stages has corresponding character strengths, and his model also provides age-specific guidelines for learning virtues, and it demonstrates how the learning and non-learning of specific virtues has a developmental trajectory.[39]

ERIKSON'S EIGHT-STAGE PSYCHOSOCIAL DEVELOPMENT MODEL

Stage	Approximate Ages	Character Strength/Virtue
I	Birth to age 1	Trust
II	1 – 3 years old	Autonomy
III	3 – 6 years old	Initiative
IV	6 years old to puberty	Competence
V	Puberty to 18 years old	Identity
VI	18 – 25 years old	Intimacy
VII	25 – 50 years old	Generativity
VIII	50 years old to death	Ego Integrity

Source: EH Erikson, Identity and The Life Cycle, 1959

ERIKSON'S EIGHT STAGES AND CHARACTER DEVELOPMENT

Approximate Ages	Characterization	Resulting Character Strength
Birth to age 1	Infants must learn to achieve a sense of safety, trusting caretakers to provide for their well-being	Trust
1 – 3 years old	Children must learn to make things happen, to choose, to exercise will	Autonomy (Persistence)
3 – 6 years old	Children must learn to initiate their own activities, thereby gaining confidence in themselves	Initiative (Curiosity)
6 years old to puberty	Children must learn to explore systematically their skills and ability	Competence (Love of Learning, Creativity)
Puberty to 18 years old	Adolescents must create a set of personal values and goals by which to live, represented as a coherent identity	Identity (Social Intelligence, Spirituality)
18 – 25 years old	Young adults must learn to merge their identity with that of another person	Intimacy (Love)
25 – 50 years old	Middle aged adults must learn to concern themselves with the world and the next generation	Generativity (Kindness)
50 years old to death	Later adults must come to terms with how they resolved previous issues	Ego Integrity (Integrity, Perspective)

Source: C Peterson and MEP Seligman, Character Strengh and Virtues, 2004

Erickson was convinced that when a stage was satisfactorily "passed," the character strengths and virtues associated with that stage spawn, facilitating the next stage to emerge. Christopher Peterson and Martin Seligman expounded on this concept by illuminating the connection between Erikson's eight stages and resulting character development, as summarized in the chart above.[111]

It is important to take advantage of a child's perspective when introducing sport and exercise such as tennis.

The fourth stage of development (age 6 to puberty) occurs during grade school and at a time when many children may become initiated into 10 and Under Tennis. It is during this time frame that important life skills are acquired such as: (1) relating to others, particularly peers according to rules; and (2) progressing from free play into structured play that is governed by rules and requires constructive interaction with others. 10 and Under Tennis clearly supports both elements of healthy stage IV development.

From a general psychological viewpoint, it is important to take advantage of a child's perspective when introducing sport and exercise such as tennis. Below are guidelines for different age groups with regard to developing in a tennis pathway.

AGES 5-6 TO 9-10: SUMMARY OF MENTAL AND EMOTIONAL CHARACTERISTICS

- Interest levels are maintained if the child has FUN.
- Effort and ability are perceived as the same thing—a young child thinks that by trying harder he or she will succeed.
- Decision-making is slower, and making choices between more than two things is difficult.
- Perception of time is largely absent.
- Concentration span is limited.
- Visual processing of information (what to do and what the outcome will be) is very important to a child, and is developed before he or she can verbalize what to do and what the outcome will be.
- Abstract concepts are hard to understand—this age group needs to experience concepts such as winning and losing or the best-of-three-sets scoring in tennis.
- Winning and losing needs to be experienced in the right type and length of competition and in a supportive environment (such as on a team as opposed to individually).
- Chronological and biological age differences may increase toward the end of an age group, particularly in early developing athletes.

Specific skill sets in this age group can be developed, taking into consideration the following psychological characteristics:

- Confidence through fun and success
- Concentration and focus are improving but still present in short spans of time
- Copying and visual learning are the best ways to learn
- Simple decision-making (making a choice between two or a maximum of three things)
- Learning and concept of winning and losing
- Learning without a parent present
- Helping others in a group, and sharing
- Often preferring to be with their own gender
- Developing responsibilities through simple tasks and requests

AGES 8-11 (GIRLS) AND 9-12 (BOYS) [PRE-PUBERTY]: SUMMARY OF MENTAL AND EMOTIONAL CHARACTERISTICS

- Having fun is important.
- Concentration is developing.
- Enjoyment of the sport based on intrinsic motivation is increasing.
- Independence is developing.
- Ability to train cooperatively with others is developing.
- Understanding the difference between ability and effort is developing.
- Coping with winning and losing is easier.

Specific skill sets in this age group can be developed, taking into consideration the following psychological characteristics:

- Decision-making skills are developing rapidly, so more information can be introduced.
- Independence is developing, which can allow for more time to experiment with skill sets.

- Concentration is improving and activities can take place over a longer period of time.
- Boys are rapidly developing confidence relative to girls.
- An understanding of winning and losing is developing, which allows for a prudent increase in competition.
- Some in this age group find it difficult to understand the difference between ability and effort, which means that increasing loads of deliberate learning needs to be explained and introduced with care (See "Deliberate Practice").
- Enthusiasm is paramount and easily seen.
- Working with others and sharing is normal and can be encouraged.
- The members of this age group often prefer to be with their own gender.
- The awareness of who they like and dislike is developing, which requires increased sensitivity.
- Adult opinions are important and are accepted.
- The ability to verbalize opinion and thought and explain well is developing, which allows for more two-way interaction.[83]

Evidence is mounting regarding the positive effect exercise has on learning, memory, attention control, and problem solving.

COGNITIVE DEVELOPMENT AND 10 AND UNDER TENNIS

Cognitive development primarily concerns the child's ability to learn, solve problems, acquire language skills, and expand memory capability.

Jean Piaget[113] is the most cited theorist in the realm of cognitive development for children. His third stage of cognitive development that most directly connects to 10 and Under Tennis is referred to as the concrete operations stage. Occurring between ages 7 and 11, it is here that children gain a better understanding of mental operations and how to think logically about concrete events.

Another important consideration in cognitive development is the beneficial impact physical activity has on the developing brain.[63] Evidence is mounting regarding the positive effect exercise has on learning, memory, attention control, and problem solving for both children and adults. Clearly, 10 and Under Tennis involves dynamic exercise for extended periods of time, thereby stimulating cognitive growth.[83]

DELIBERATE PRACTICE

SYNOPSIS

- Deliberate practice involves focused cognitive activity and is referred to as "closed play" in the USTA 10-and-under player development program.
- Cumulative deliberate practice time over a period of many years is a critical determinant of achieving elite status in sport.
- Deliberate practice in children is limited by their shortened attention spans and by their need to have fun in order to remain engaged.

Deliberate practice refers to a specific type of training in sport, or in any other domain, that involves focused cognitive activity. The USTA 10-and-under Player Development program refers to deliberate practice as "closed play."[141] Deliberate practice involves maximal concentration on a very specific task—which can be tennis-specific or athletic-competency specific—with the manner of practice being taught by a teacher or coach. It is important to understand the difference between deliberate practice (closed play) and general practice (open play). There have been many articles and books written about the "10,000-Hour Rule,"[25, 50, 127, 144] which states that it takes 10,000 hours—or approximately 10 years of practice—to acquire expertise in any domain. However, a more careful analysis of elite performers by K. Anders Ericsson indicates that total practice time is not the primary determining factor of elite success, but rather total deliberate practice time.[37]

Deliberate practice involves maximal concentration on a very specific task.

It has often been assumed that the brain is like a computer that has a limited hardware capacity. However, research has demonstrated that the brain is capable of developing new circuits that seem to expand the hardware possibilities. For example, it was formerly thought that there was an absolute limit to the ability to memorize a sequence of digits, or on the number of pushups that could be performed at a single setting. We now have pushed the digit memorization to 61,000 digits of pi, and the number of pushups to 8,000. Thus, the brain and nervous system have a plasticity that allows for a marked increase in performance parameters. This plasticity is most influenced by deliberate practice.[37]

Tennis has not been studied in the same detail as other sports with regard to deliberate practice. In analyzing soccer, dart throwing, and gymnastics, there is an evident difference in elite performers from non-elite performers with regard to the amount of time devoted to deliberate practice. Although the cumulative play and practice time is important, the deliberate practice time allows for a level of analysis of situation and performance that is not possible with general practice. Furthermore, deliberate practice is an important aspect of nurturing that determines whether a genetically gifted individual will excel. Genetic destiny alone is not enough.[38]

As an example of deliberate practice, suppose you are playing tennis and you miss a backhand volley. If you are playing in a game or open-play situation (i.e., non-deliberate practice), you will simply continue playing and you will not focus on the various reasons why you missed the volley. This means that the next time around you may not be any more successful with that shot. However, if you are working with a coach and the coach breaks down the various technical

aspects of the volley that are needed for improvement, and if you focus specifically on these techniques for a specified period of time, then you have engaged in deliberate practice—or closed play.[15] The next time you play you will be able to take advantage of this newly acquired skill, and that becomes the foundation for future deliberate practice for perfecting the shot even further. Monsaas has studied deliberate practice in tennis players and concludes that a 10-year commitment to high levels of training is the minimum requirement to reach the expert level.[98]

Optimal deliberate practice gradually increases over time, and the individual becomes increasingly proficient at self-monitoring and problem solving.

The difficulty with deliberate practice is that it must be carried out in specific time elements, and must be integrated with other types of more open or non-deliberate practice. This is especially important for 10-and-under children, who have a much more limited ability for prolonged and focused attention.[83] Furthermore, the foundation for success in sport for children is fun activity, and deliberate practice is generally not perceived as fun, especially for children.[31] That is why deliberate practice in children should be done in increments that are appropriate to the attention span and development of the child, and this time can be increased based on the child's response, attention span, and perception of fun. It is fun to improve and it is also fun to play.

There are also inherent limitations to deliberate practice. The general rule of thumb in the pursuit of excellence is that tasks that are easy to perform, and that are repeated at such a level, do not lead to meaningful improvement in performance. However, when the task is too difficult to perform, improvement also does not occur, and there is a risk of psychological or physical injury. Optimal deliberate practice gradually increases over time, and the individual becomes increasingly proficient at self-monitoring and problem solving.[37]

Deliberate practice also takes advantage of developmental windows. For example, we know that no amount of strength training or endurance training will have a notable effect on progressive muscle size or endurance in pre-pubertal children because they have physical limitations in muscle mass growth and VO2 max.[79] Thus, overly focused efforts in children can lead to either no significant gain or, perhaps, injury. Once puberty begins and the body's physiology takes on more adult characteristics, deliberate practice can be increased incrementally while still respecting the body's transition and vulnerabilities. On the other hand, deliberate practice should not be avoided out of fear of taking away fun or creating injury. Small doses of deliberate practice in children allow for proper physical and mental constructs that create a solid foundation for future improvement.[6] If a child is engaged only in open play and develops improper technique, it can take two to three years to relearn the fundamentals, which is difficult financially and motivationally.[85]

Ultimately, top level performers in any domain have engaged in substantial deliberate practice, but such practice is introduced piecemeal from an early age and only becomes a more focused part of the regimen after puberty. It is the wise coach who helps athletes transition from fun, well-rounded athletic development to more focused and specialized player development.

LONG-TERM ATHLETE DEVELOPMENT MODEL

SYNOPSIS

- The long-term athlete development model is founded on two premises: (1) all sport initiation should be centered on fun; and (2) it is critical to develop an athlete before developing a player.
- In late-specialization sports such as tennis, the transition to uniquely focused sport play does not happen until after puberty.

Istvan Balyi is one of the leaders in athlete development, and he developed a multi-stage long-term athlete development (LTAD) model whose primary emphasis is two-fold: (1) all sport initiation should be centered on fun; and (2) it is critical to first develop an athlete before developing a player. All sport models reinforce these basic truisms. With regard to tennis, if children are not having fun, they will not want to continue to play the sport. And if the early emphasis is on tennis development rather than overall athletic development, the child may learn tennis at an early age but will not be as effective long-term because he or she will not have innate athletic ability.

It is important to note that the LTAD model is appropriate for late-specialization sports,[9] which include tennis. In a sport such as gymnastics, where individuals may peak during their teenage years, this model must be condensed. However, tennis athletes peak in their 20s, as discussed in "Initiation and Specialization." If we try to accelerate a child's long-term athlete development by a forced early specialization in tennis, we not only increase the likelihood that the athlete will peak early and not reach his or her potential, but we also set up an environment that encourages sport dropout, burnout, or injury.[84]

The seven stages described by Balyi follow.[7] The first three stages encourage physical literacy and sport for all, and become the foundation for excellence or lifelong physical exercise. The next three stages focus on excellence. The final stage encourages lifelong physical activity.[84] In tennis, we can follow such a model and not only encourage peak player development, but also lifelong athletic participation.[8]

Stage 1: Active-Start Stage: Ages 0-6
FUN and part of daily life
Fitness and movement skills development
Focus on learning proper movement skills such as running, jumping, wheeling, twisting, kicking, throwing, and catching
Not sedentary for more than 60 minutes except when sleeping
Some organized physical activity
Exploration of risk and limits in safe environments
Active movement environment combined with well-structured gymnastics and swimming programs
Daily physical activity

Stage 2: FUNdamentals Stage: Chronological Ages 6-9 for Males, 6-8 for Females
Overall movement skills
FUN and participation
General, overall development
Integrated mental, cognitive, and emotional development
ABC's of athleticism: agility, balance, coordination, and speed
Basics of athletics: running, jumping, wheeling, and throwing
Medicine ball, Swiss ball, own-body strength exercises
Introduce simple rules of ethics of sport
Screening for talent
No periodization, but well-structured programs
Daily physical activity

Stage 3: Learning-to-Train Stage: Chronological/Development Ages 9-12 for Males, 8-11 for Females
Overall sport skills development
Major skill-learning stage: all basic sport skills should be learned before entering Stage 4: Training to Train
Integrated mental, cognitive, and emotional development
Introduction to mental preparation
Medicine ball, Swiss ball, own-body strength exercise
Introduce ancillary capacities
Talent Identification
Single or double periodization
Sport-specific training three times per week; participation in other sports three times per week

Stage 4: Training-to-Train Stage: Chronological/Developmental Ages 12-16 for Males, 11-15 for Females
Sport-specific skill development
Major fitness development stage: aerobic and strength; the age at onset of peak height velocity and the age at peak height velocity are the reference points. (Peak height velocity is directly linked to the development age of athletes. Peak height velocity is a measure of the maximum rate of growth in stature during a growth spurt. The age of maximum velocity of growth is called the age at peak height velocity).
Integrated mental, cognitive, and emotional development
Develop mental preparation
Introduce free weights
Develop ancillary capacities
Frequent musculoskeletal evaluations during peak height velocity
Selection
Single or double periodization
Sport-specific training 6-9 times per week, including complementary sports

Stage 5: Training-to-Compete Stage: Chronological/Developmental Ages 16-23 for Males, 15-21 for Females
Sport, event, position-specific physical conditioning
Sport, event, position-specific technical and tactical preparation
Sport, event, position-specific technical and playing skills under competitive conditions
Integrated mental, cognitive, and emotional development
Advanced mental preparation
Optimize ancillary capacities
Specialization
Single, double, or triple periodization
Sport-specific technical, tactical, and fitness training 9-12 times per week

Stage 6: Training-to-Win Stage: Chronological Ages 19+ for Males, 18+ for Females
Ages are sport-specific based on international normative data of peak performance
Maintenance or improvement of physical capacities
Further development of technical, tactical, and playing skills
Modeling all possible aspects of training and performance
Frequent prophylactic breaks
Maximize ancillary capacities
High performance
Single, double, triple, or multiple periodization
Sport-specific technical, tactical, and fitness training 9-15 times per week

Stage 7: Active-for-Life Stage: Enter at Any Age
Minimum of 60 minutes moderate daily activity or 30 minutes of intense activity for adults
Transfer from one sport to another
Move from highly competitive sport to lifelong competitive sport through age-group competition
Move from competitive sport to recreational activities
Move to sport careers or volunteering
There is a better opportunity to be active for life if physical literacy is achieved before the Training-to-Train stage

For a more detailed analysis of three model sports and their approach to long-term athlete development, see Appendix III.

CHARACTER DEVELOPMENT

SYNOPSIS

- National governing bodies should provide training and education on the values and ethical expectations of sport.
- Sport provides an opportunity to develop character, and if coaches and athletes value and promote such character development, our society will share integrity and value through sport.

If we follow the Olympic model of character development in sport, we understand that the national governing body should provide training and education on the values and ethical expectations of the given sport. That is the role of the USTA.[92] In order to succeed in fostering character development, it is helpful to understand what Americans believe about the role and significance of sport in society, especially with regard to views on sport ethics and values, role models, and aspirations. To this end, the United States Anti-Doping Agency (USADA) conducted a national survey; here are some of its important findings:

- More than three-fifths of American adults—approximately 162 million Americans—claim some relationship to sport-related activities.
- Parents overwhelmingly cite personal and social values when describing their hopes for their children in playing sport.
- Coaches are ranked as the #1 positive influence on today's youth involved in sport.
- Americans rank the use of performance-enhancing drugs as the most serious problem facing sport today, closely followed by issues such as the focus on money and the criminal behavior of well-known athletes.
- Nearly 90 percent of U.S. adults agree that well-known athletes have a responsibility to be positive role models for young people, and by wide margins they agree that the personal conduct of well-known athletes is as important as their athletic accomplishments.[137]

Retired U.S. Army General Norman Schwartzkopf said: "Leadership is a potent combination of strategy and character, but if you must be without one, be without strategy." Americans value sport because it builds character, and through athletic excellence, teaches character.[92] Many people drop out of sport at an early age because they no longer perceive its value, and we must remember that the primary reason—the primary value—of early sport participation is fun. When sport is no longer fun, children and youth are more likely to stop participating, and we lose our chance to build character. When we overemphasize winning, which can quickly translate to winning at all costs, children learn that cheating may be acceptable. They can become confused because even though eight in 10 American adults agree that breaking or bending the rules in sport is always cheating and is not acceptable, the profound emphasis on winning smothers the truth of this belief.[137]

The lessons that can be learned from sport transcend the playing field and shape the character of American citizens. With more sport participation, and with a steady infusion of ethical values from our coaches, we can become a society that shares integrity and value through sport. Children should be allowed to develop their character through a stress-free tennis environment. With this solid foundation, the true competitor will become more effective when facing adversity, and thus can become a role model for our youth. 10 and Under Tennis offers an ideal platform for teaching and developing our future sport role models.

INITIATION AND SPECIALIZATION

SYNOPSIS

- Initiation refers to the age at which someone begins playing a sport; specialization is the age when someone trains and competes at an advanced level in one sport throughout the year.
- Tennis is a late-specialization sport, which means that players do not peak until they are in their 20s.
- In late-specialization sports, general athleticism should be the foundation of the athlete, and specialization should not begin until after puberty.
- Forced early specialization is associated with burnout, injuries, and dropout from sport.

Initiation and specialization in tennis must be defined and differentiated.

Initiation refers to the age at which someone begins playing the sport. Even if there is only occasional play, the age at which such play begins is the age of initiation. From a community tennis perspective, tennis can start at any age. The relative success of beginning tennis at a late age will depend on the underlying athleticism of the individual. From a player development perspective, the top-ranked players on the ATP and WTA tours began playing tennis at a relatively young age, as noted in the tables below.[110] There is a two-year difference in age initiation between the 2011 Top 10-ranked men

Initiation refers to the age at which someone begins playing the sport.

INITIATION AGE FOR TOP 100 MEN IN 2011

Ranking	Mean Age	Age Range
Top 10	4.9 years	2-8 years
Top 25	5.5 years	2-9 years
Top 50	5.6 years	2-9 years
Top 75	5.7 years	2-9 years
Top 100	5.7 years	2-9 years

Source: W. Pattenden: Long term athlete development plan for the sport of tennis in Canada, 2011

INITIATION AGE FOR TOP 50 WOMEN IN 2011

Ranking	Mean Age	Age Range
Top 10	6.9 years	4-10 years
Top 25	6.8 years	4-10 years
Top 50	6.3 years	3-12 years

Source: W. Pattenden: Long term athlete development plan for the sport of tennis in Canada, 2011

(mean age: 4.9 years) and the 2011 Top 10-ranked women (6.9 years). There is a trend upward in age initiation as we move from the 2011 Top 10-ranked men to the Top 100-ranked men, whereas there is no meaningful trend in women between the Top 10 and the Top 50. For men, the age range is from 2-9 years for all rankings. For women, the age range is 4-10 years for the Top 25 and 3-12 years for the Top 50. These data simply indicate the age the players began playing tennis but do not indicate the amount or intensity of play. The data also demonstrate that players can begin playing tennis as late as 8 or 9 years old and still be successful in competitive tennis.[110]

The American Academy of Pediatrics defines specialization in sport as the age when individuals train and compete at an advanced level in one sport throughout the year. In essence, the athlete is concentrating all practice and competitive time on a single sport, year round.[1] From a community tennis perspective, sport specialization is not so meaningful because it is generally only the player development-pathway player who chooses to specialize in order to achieve an advanced level of play. What is critical in tennis is to define the age at which it makes sense to specialize.

Before discussing the age at which one should specialize in tennis, it is important to differentiate early specialization sports from late-specialization sports. Early specialization sports are those sports in which peak performance is expected in the middle teenage years, as in gymnastics. Late-specialization sports are sports in which peak performance is expected after the age of 20, such as basketball, football, baseball, and tennis.[2] Indeed, in tennis the age at which players peak has been drifting upward, as noted in the table below. Between 1996 and 2009, the average age of a Top 100 ATP player increased from 20.8 years to 22.3 years, and in the same time frame the average age of a Top 100 WTA player increased from 17.9 years to 21.6 years.[34]

Late-specialization sports are sports in which peak performance is expected after the age of 20.

Early or late specialization categories link the technical, mental, emotional, and physical requirements of the sport to the facts of growth, development, and maturation.[108] As tennis has become increasingly physical and has also assumed a world presence, the age for

AVERAGE AGE OF TOP 100 PLAYERS

	Year	Age
ATP	1996	20.8 years
	2009	22.3 years
WTA	1990	17.9 years
	2009	21.6 years

Source: M. DeVylder, USTA Youth Tennis Symposium, 2012

full maturation and development has increased. It is critical to recognize this trend and to understand that tennis is a late-specialization sport.[3] This means that attempts to specialize too early will lead to a peak performance for the individual at a younger age but that peak performance will not coincide with elite status. In other words, the tennis athletes who specialize at an early age are more likely to achieve their best results at junior age level and will not duplicate such relative results as adults.[108] This is supported by research on athlete development by Benjamin Bloom[16] and Jean Côté,[27] even though their research bases differed. Both suggest that for late-specialization sports, specialization should and could happen around mid-teens (14-15 years: puberty), and with a few athletes, possibly in late childhood (11-12 years). In essence, specialization should begin around the age of puberty, which is variable for individuals and which occurs earlier in females than in males.

In addition to peaking at an early age and not peaking as an adult, early specialization in a late-specialization sport such as tennis can have many negative consequences, including:[17, 18, 90, 108]

- Pre-pubertal children are immature physically and therefore do not have the physical skills necessary to focus singularly on one sport.
- Pre-pubertal children do not have the cognitive skills to specialize in a sport such as tennis, which is an open-, random-skill sport requiring decision-making training, with variable and varied technical skills.
- Pre-pubertal children do not have the mental and emotional skills necessary for singularly focused competition.
- Pre-pubertal children are too young to understand, project, and consider the outcomes of specialization.
- Pre-pubertal children who specialize in tennis are responding to the motivations of significant adults because innate motivation does not develop until after puberty.
- Pre-pubertal children who specialize in tennis are more prone to overuse injuries and burnout, often because adult expectations and pressure are placed on them in a manner to which their body and psyche cannot adapt.
- Pre-pubertal children who specialize early in tennis often develop a social network that revolves around tennis, thus risking social isolation.[148]

Ultimately, any player development pathway must recognize that tennis is a late-specialization sport if the pathway is to succeed. As will be discussed in "Training and Competition," the tennis-specific training must be graduated in children and must not dwarf the more important foundation of athletic development.

In summary, initiation must be differentiated from specialization in tennis. Competitive tennis players tend to begin tennis at a young age, but the general consensus is that tennis players should not begin to specialize until around the age of puberty, thereby helping to assure long-term success while avoiding short-term physical and psychological injury. Since pre-puberty should not be associated with early specialization, it follows that pre-puberty is not a reliable age at which to begin talent identification. Although it is understandable that a national governing body may want to focus on the next world champion, to do so prior to specialization makes no empirical sense,[97] and to force specialization in order to fit into a talent identification paradigm risks making a foolish investment while risking the health and well-being of the child. (See "Player Identification" for more on this subject.)

TRAINING AND COMPETITION

SYNOPSIS

- In late-specialization sports such as tennis, patience is required for any training and competition program.
- Training should be age- and developmentally appropriate, and it should focus on essential athletic skills such as agility, balance, coordination, and speed as the foundation of all sport.
- Competition in children can promote healthy play and development, but such competition must not be "adult-style" in format and length. Instead, competition in children should provide short-format matches in which the goal is to play against many different people on different surfaces, to play team matches, and to avoid focusing on the win-loss record.
- There is an emerging consensus that tennis' national governing bodies should not offer national 10-and-under tennis tournaments and should not develop a national ranking system for children 10 and under.
- The USTA Player Development model for 10 and Under Tennis integrates a long-term athlete development model with a progressive introduction of proper technique that recognizes the prime importance of playing tennis with the mind and eyes, the feet, and the hands.

Training and competition are the stepping stones for developing the person, the athlete, and the tennis player. From a community tennis perspective, training and competition allow the tennis player to have fun while improving his or her game and engaging in various competitive formats that reinforce having fun and improving as a player. One of the great advantages of community tennis league play is that various formats may be utilized to suit the particular needs of the community and the individual, and league play fosters a sense of team camaraderie.

From a player development perspective, training and competition provide an opportunity for the national governing body (NGB) to take charge of the most pivotal pathway in a person's overall development. All the evidence to date reinforces the notion that competitive tennis is an early initiation and late-specialization sport.[2, 3, 9, 108] For a NGB to succeed in providing a framework that fosters excellence in personal, athletic, and tennis-specific development, the framework must take into consideration the fact that patience is required for long-term success. Any attempt to jump start or bypass the pillars of late specialization will more than likely lead to combinations of peaking early, dropping out of tennis early, burnout, and overuse injury. From such a perspective, the NGB has failed the individual and has failed as a morally responsible entity.[17, 18, 90, 108]

The brilliance of 10 and Under Tennis is that scoring and competition can and should be as adaptive as the courts and equipment.

Patience does not mean avoiding competition. Indeed, much of the evidence presented at the USTA Youth Tennis Symposium embraced early and frequent competition, but the competition that drives and develops children is not the adult-model competition of traditional tennis.[29, 31, 109] Children do not have the physical and psychological makeup to engage in long matches that utilize a best-

two-out-of-three-sets format, and there is no compelling reason to force such an adult model on developing children.[15, 52, 83, 106] The brilliance of 10 and Under Tennis is that scoring and competition can and should be as adaptive as the courts and equipment.[121] For NGBs to succeed in providing an ideal environment that fosters long-term success, they must be willing to legislate competition, which is the best way to influence the behavior of parents, coaches, administrators, and the developing player. Such legislation should be based on the best available evidence-based data and should not be driven by politics or traditional sentiments.[7]

The USTA has wrestled with junior competition for many years and recently amended the junior competition structure so that national tournaments are fewer and regional competition is encouraged. Twenty-five years ago, a USTA task force (Taking Care of Tomorrow) recommended the elimination of national championships and rankings for 12- and 14-and-under boys and girls.[142] The rationale was to place a greater emphasis on developing technical correctness and tactical development while placing less emphasis on competitive outcomes and rankings. In this framework, the task force also recommended "short-court tennis" with modified equipment. The task force members believed that the childhood focus should be fun, and that early tournament play should be focused on round robins and compass draws rather than single-elimination tournaments.

As a result of the task force recommendations, national championships and rankings for 12-and-under boys and girls in the United States were discontinued in 1989. (They were reinstated in 1998.) Unfortunately, we do not have prospective outcome data regarding this experiment.[44] We do know that during the subsequent 10 years, junior membership increased by 24 percent.[44] However, this competitive structure shift occurred during the time of rapid expansion for ITF Junior Circuit and Pro Circuit events, and the international landscape changed accordingly. As a result, a progressively competitive entrance pathway to professional tennis became more easily accessible worldwide and many players (through their parents and coaches) took advantage of this pathway by turning professional at a young age.[61] The pathway opportunities coincided with the reintroduction of tennis as an Olympic sport in 1988 and came with remarkable political opportunities, especially in Eastern Europe. The Revolutions of 1989 led to the overthrow of many Communist regimes in Eastern Europe, opening the world to many young, aspiring athletes. In addition, these young athletes received funding through the International Olympic Committee's Olympic Solidarity Program, which provides assistance to newly independent countries. Therefore, while the USTA was focusing on one pathway of long-term player development, many other countries were rapidly launching into a new world of athletic opportunity, which was often coupled with sport specialization at a young age.

It is impossible to judge whether the recommendations of the Taking Care of Tomorrow task force, if followed through in whole, would have advanced the USTA's constitution and mission of growing the game in a healthy manner while providing an environment that fostered the development of world-class players.[61] It is fair to say, however, that the rush to early specialization worldwide had devastating consequences on players. Indeed, the WTA developed a special advisory panel that addressed this devastation in girls with forceful legislation limiting a player's ability to compete in professional tournaments. This Player Development Advisory Panel created age-eligibility rules

in 1994 that did not allow girls under age 14 to play professional tournaments, and that allowed girls between ages 14 and 17 to play professional tournaments in a strictly enforced and piecemeal manner.[105] Such age-eligibility requirements were coupled with an extraordinary educational campaign for players, parents, and coaches, plus progressive recommendations for health-care delivery at all professional tennis tournaments. What was the driving force of this advisory panel? A somber realization that young female tennis players were becoming victims of parental, coach, and societal abuse, with numerous documentations of premature career cessation because of burnout, injury, and unhappiness.[61, 105]

What has been the result of this bold intervention by the governing body of professional women's tennis? Remarkably, the WTA supported its legislation with considerable structural support that helped to ensure player education and well-being. At the same time, it collected data prospectively that clearly demonstrated a positive result from the interventions. Published 10 years later in a peer-reviewed scientific journal, the WTA's report demonstrated that the Age Eligibility Rule/Player Development pathway was associated with the following 10-year results:

- The median WTA career length improved in all age divisions between 14 and 17.
- The median career length and probability of a 10-year career or longer increased considerably.
- The Age Eligibility Rule was reinforced by health-care initiatives that effectively dealt with many of the known stressors in professional tennis. These initiatives included:
  - ◊ Annual sport-specific physical exams
  - ◊ Enhanced sport science and sports medicine services
  - ◊ Proactive coach, player, parent, and agent education
  - ◊ Mentor programs
  - ◊ Media training
  - ◊ Guidance on proper training, periodization, injury prevention, and rehabilitation[105]

The WTA continues to convene on a regular basis with international experts who are members of their Player Development Advisory Panel. It is the charge of these experts to analyze pertinent data and to make recommendations to the evolution of the Age Eligibility Rule, keeping in mind the safe and healthy development of the player. The WTA is a model of how legislation of competition, coupled with sport-science initiatives, improves the health and wellness of players while helping to assure player longevity.

The Age Eligibility Rule was reinforced by health-care initiatives.

The ITF has also developed age-eligibility rules for players who compete in ITF Junior Circuit events, and these rules are coupled with an expanding educational campaign and sport-science support. Unfortunately, the WTA and ITF have not agreed on a common rule, even though the evidence clearly demonstrates that internationally competitive junior players will compete in both ITF Junior Circuit events and professional tournaments. Thus, many highly competitive junior players compete in a world that has two separate age-eligibility and competition requirements, and it is entirely possible for such players to compete in the maximum number of tournaments allowed

by both governing bodies while ignoring a more unified holistic approach to competitive excellence.[61]

As discussed earlier, the average age of the top 100-ranked professional players has increased considerably since 1996. For men, the average age has shifted from 20.8 years to 22.3 years, and for women from 17.9 years to 21.6 years.[34] In part, especially for women, this shift toward late specialization resulted from legislative efforts. However, power has become important in today's game, and physical maturity is required to move and deal with power effectively. Any rush to turning pro at a young age has been counterbalanced by legislation and a shift in the nature of the game, and these forces have led unequivocally to the late specialization of tennis.

Children must develop athletically before they develop as tennis players.

All player development training and competition guidelines must be driven by long-term athlete-development concerns and late-specialization concerns.[7, 8] One could argue that a long-term vision of training and competition must artfully combine fun, athleticism, incremental deliberate practice, a healthy competitive structure, and patience by all. And we must always remember that having fun is the essential foundation of any long-term athletic development program. There is overwhelming evidence that player retention is driven by the child's perception that he or she is having fun.[7]

With regard to training, we now have a wonderful opportunity to incorporate the magic and science of 10 and Under Tennis. The magic is the fun. The science is the ability to learn tennis in an age-appropriate and developmentally appropriate manner.

From a tennis-specific viewpoint, the progression from the red to orange to green ball represents the pillar of training. Such ball progression will be discussed under "Transition from the Red to Orange to Green Ball." Irrespective of ball and court transition, the more primary foundation of training for 10 and Under Tennis is that children must develop athletically before they develop as tennis players.[7, 8] That is the best evidence we have to date, and therefore should become the basis for our training recommendations. As demonstrated in the table on the following page, although there is not universal consensus about the specifics, there is general agreement from representative countries and the ITF that tennis is but one part of player development in children.

This table also introduces competition recommendations. As a player progresses in age and development, the competitive landscape changes and becomes blended into adult-style competition. However, best evidence tells us that this progression must be slow and developmentally appropriate for 10-and-under players. They are not physically and psychologically equipped to play long matches, and the imposition of adult-style competition on children does not breed success. More importantly, a child's early exposure to competition should be fun. If the formats are successful, then the competitions become another tool for engaging the child while improving his or her tennis experience.[15] The competitions should not simply be a way to measure a child's success, as such a measurement will result in failure for too many children.

Tennis is unique in that it can be played as both a team and individual sport for life.

COUNTRY AND ITF COMPARISON IN RECOMMENDATIONS FOR TENNIS-SPECIFIC AND GENERAL ATHLETIC TRAINING

Country or ITF	Age	Tennis Training (Hours/Week)	Other Training (Hours/Week)	Yearly Matches	Total Hours (Weekly)
Australia	4 – 7	2 – 4	5 – 7	n/a	7 – 11
Canada	5 – 6	1 – 4	4	15 – 25	5 – 8
ITF	6 – 8	1.5	2.5	Various formats/ scoring with short match format	4
U.S.	5 – 8	1.5 – 3	4.5 – 8	n/a	6 – 11
Australia	7 – 8	4 – 5	5.7	15 singles/ 25 doubles	9 – 12
Australia	9 – 10	7 – 9	5 – 7	15 singles/ 25 doubles	12 – 16
Canada	7 – 8	4 – 9	4.5 – 5	25 – 40	8.5 – 14
Canada	9-10 (boys)	8 – 10	5 – 6	30 – 45 singles/ 30 doubles/ 40 practice matches	13 – 16
	9 (girls)	6 – 8	4.5 – 5.5	24 – 30 singles/ 16 – 20 doubles/30 – 40 practice matches	10.5 – 13.5
	10 – 11 (girls)	10 – 12	5.5 – 7	30 – 45 singles/20 – 30 doubles/30 – 40 practice matches	15.5 – 19
ITF	9 – 10	4.5	4.5	Various formats/ scoring with short matches and multi – match format	9 – 12
U.S.	8 – 12	4 – 6	8 – 11	20 (8 – 9 years old) plus unlimited practice matches	12 – 17
Australia	10 – 12	10 – 12	6 – 8	35 – 45 singles/ 15 – 25 doubles	16 – 20
Canada	11 – 12 (boys)	10 – 12	5.5 – 7	45 – 60 singles/ 30 doubles plus 48 practice matches	15.5 – 19
Canada	11 – 12 (girls)	12 – 14	4 – 5	45 – 60 singles/ 30 doubles plus 48 practice matches	16 – 19
ITF	11 – 12	6	5	70 singles and 35 doubles matches	11 – 16
U.S.	10 – 13 (girls)	15 – 20 (combined with other training)	15 – 20 (combined with other training)	40 (by 11 years old) plus unlimited practice matches	15 – 20
U.S.	11 – 15 (boys)	15 – 20 (combined with other training)	15 – 20 (combined with other training)	60 matches (by 14 years old)	15 – 20

Source: USTA

Tennis is unique in that it can be played as both a team and individual sport for life. Even progressive player development pathways can encourage some players to specialize as a team (doubles) rather than as an individual. Fed Cup, Davis Cup, and Hopman Cup epitomize team tennis and drive national participation in a team worldwide. In 10 and Under Tennis, players can share the fulfillment of competition if the format encourages fun. And if children are having fun, they will want to continue to have fun. With this in mind, 10 and Under Tennis competition can focus on team matches, short matches, and accessible competition. Why? Kids also like to play on teams, and the physical and psychological attention span of kids is of short duration. If matches are accessible and desirable, then the whole family can participate in the activities.[75, 139]

Following are the ITF guidelines for 10-and-under tennis competition:

- Utilize short matches and multi-match formats.
- Do not record results for children who are 8 and under.
- Encourage the local network (clubs, community tennis associations, etc.) to cater to competition needs of all players.
- Provide user-friendly competition.
- Competition for 10 and Under Tennis is "playing a game." Kids like to play games, and this does include winning and losing.
- Compete against a variety of opponents on a variety of surfaces.[96]

These guidelines are in keeping with long-term athlete development and the realization by coaches and clinical scientists that healthy and fun competition is more important for a child than a competitive model that is driven by win-loss ratio and rankings. Experts agree that when the professional adult model of wins versus losses, coupled with rankings, is forced on a child, then the child loses. Children do not have the coping mechanisms and physiological substrate to thrive in such an environment.

The ITF does not allow 10-and-under children to play international events.[96] There is an emerging consensus that national competition and rankings are inappropriate for 10-and-under tennis competition because such a structure encourages a focus on the win-loss ratio and rankings, which will then lead to a drive for early specialization. That is the balancing act.[31, 109] NGBs should set the competitive structure so that they can shape a healthy behavior by coaches and parents while facilitating the healthy development of the child.

The table on the next page provides a snapshot of 10-and-under national competition and rankings in select countries.

RANKINGS

At the USTA Youth Tennis Symposium, there was universal consensus that rankings are inappropriate for children 10 and under.[3, 31] Rankings are determined by competition that thrives on winning, and in children, this model is developmentally inappropriate. Parents, coaches, and administrators need to understand that children can be harmed by rankings more than they can be helped. Furthermore, all the evidence-based data reveals that rankings in children under age 10 have no predictive value in a child's ultimate success in a late-specialization sport. Indeed, much of the data reveals a negative correlation between high rankings in children and sport participation as a teenager for late-specialization sports.[54, 110, 135, 148] For the purpose of separating kids into levels, internal ratings or standings based on past results may be appropriate.[35, 109]

10-AND-UNDER NATIONAL COMPETITION AND RANKINGS IN SELECT COUNTRIES

Country	U10 National Championship	Competition Structure	Singles or Doubles	Scoring Format	Ball Use	National Rankings
Australia	No	n/a	n/a	n/a	n/a	n/a
Brazil	Yes	Knockout & Consolation	Singles only	Best of 3, short sets with match tie-break	Green	No
Canada	No	n/a	n/a	n/a	n/a	n/a
France	Yes	Round Robin	Singles only	Variable	Green	No
Germany	No	n/a	n/a	n/a	n/a	n/a
Great Britain	U9 Invitational Event	Round Robin of 4 with compass draw with consolation	Singles only	Best of 3, tie-breaks	Orange	No
Great Britain	U10 Invitational Event	16-player compass draw with consolation	Singles only	Best of 3 short sets with match tie-break	Green	No
Japan	No	n/a	n/a	n/a	n/a	n/a
Netherlands	No	n/a	n/a	n/a	n/a	n/a
Russia	No	n/a	n/a	n/a	n/a	n/a
South Africa	No	n/a	n/a	n/a	n/a	n/a
Spain	No	n/a	n/a	n/a	n/a	n/a
U.S.	No	n/a	n/a	n/a	n/a	n/a

Source: USTA

TRAINING AND COMPETITION: USTA PLAYER DEVELOPMENT PERSPECTIVE[15]

The foundation of USTA Player Development's philosophy is that fundamental athletic skills are a necessity for success in tennis. These fundamental skills are often referred to as the ABC's of sport:

A: Agility

B: Balance

C: Coordination

S: Speed

These types of skills are primarily developed in both a closed- and open-play environment. It is important to differentiate open play from closed play, as they intertwine at every level of an athlete's career, beginning with youth. In open play, the child is allowed free range and experimentation. Closed play, on the other hand, refers to deliberate practice and precise repetition. Once the deliberate practice leads to a new level of understanding and technical development, the newly learned skill can be tested in an open-play environment. The USTA Player Development model ascribes to open-closed-open learning in tennis. New skill teaching and acquisition occurs in a controlled, closed-play environment (e.g., drills), and skill refinement is done in a more open environment.

Training must always take into consideration the child's age, cognitive and emotional capabilities, and physicality. First and foremost, training of children must be fun. The long-term athlete development (LTAD) model has been repeatedly verified as a model that breeds success in athlete development (See "Long-Term Athlete Development"), and has influenced the USTA Player Development model. The

LTAD model describes various stages of athlete development that must be respected. Skipping stages risks alienating the athlete from sport, or causing injury to the athlete from overtraining at a young age. LTAD is based on the physical, mental, emotional, and cognitive development of children and adolescents, and each stage reflect a different point in athlete development and maturity. If followed progressively, the athletes develop proficiency in fundamental motor skills and individual sport skills.

For 10 and Under Tennis training, children under age 6 should be largely encouraged to move and to have fun.

It is important to note that the LTAD model is appropriate for late-specialization sports, which include tennis. The seven stages described by Balyi have been described in detail under "Long-Term Athlete Development." The USTA has developed a similar model that incorporates some of Balyi's research and important research from Benjamin Bloom. In addition, there are models from the ITF and other countries that demonstrate a fundamental similarity in approach that is developing worldwide with regard to progressing players in tennis.

The stages of development in the USTA Player Development model are as follows:

- Introduction and Foundation Phase (ages 6-10 in girls, 6-12 in boys)
- Refinement and Transition Phase (ages 11-15 in girls, 13-15 in boys)
- World Class Performance Phase (ages 15-30+)

It is important first and foremost to focus on athletic development and not simply tennis development.

For 10 and Under Tennis training, children under age 6 should be largely encouraged to move and to have fun. The learning environment is primarily open play, although focused intervention for teaching the fundamentals of a proper grip and swing are appropriate. In LTAD stage 2, which is the USTA "Introduction and Foundation Phase" of training, the learning themes should always be FUN while introducing core fundamentals. The fundamentals of progression are based on the fact that the game of tennis is played first with the mind and eyes, second with the feet, and finally with the hands. In teaching the fundamentals of tennis, the progression is taught in the opposite order:

1. Hands (e.g., grips, swing shape and path, unit turn)
2. Feet (e.g., split step, movement patterns, stances, recovery)
3. Eyes/mind (e.g., decision-making)

It is important first and foremost to focus on athletic development and not simply tennis development, never forgetting that athletic development should be fun and should focus on the foundations of agility, balance, coordination, and speed. In addition to these fundamentals, there is a critical window for developing a foundation for many aspects of athletic development, as demonstrated in the table on the following page. If the focus is on tennis development and not athletic development, there may be important

CRITICAL PERIODS OF TRAINING FOR FOUNDATIONS OF ATHLETICISM
(E=Excellent, G=Good)

Age	5	6	7	8	9	10	11	12	13	14	15	16	17
Coordination, balance, agility		E	E	E	E	E	G					G	G
Running, jumping,throwing		E	E	E	E	E							
Sliding, gliding		E	E	E	E	E							
Motor learning		G	G	E	E	E					G	G	G
Motor control			G	G	E	E	E				G	G	G
Speed of reaction			G	E	E	E	E						
Rhythm/cadence capacity			G	G	G	G	G	E	E	E			
Spatial awareness					G	E	E	G	G				
Endurance	G	G	G	G	G	G	G	E	E	E	E	E	E
Strength				G	G	G	G	E	E	E	E	E	E
Speed		E	E					G	G	E	E	E	
Strength													
Speed													

Source: USTA

components of athletic skills that will be very difficult to obtain later in life. For example, the critical window for developing coordination and running/jumping/throwing skills is between ages 6 and 10. This table can serve as a guide for all coaches and teachers who work with tennis athletes.

Whereas the impetus of *Positioning Youth Tennis for Success* sprung from player development concerns, it remains appropriate to teach technique to children even if the long-term goal is to enjoy tennis for a lifetime without following a progressive player development pathway. All developing tennis players need to learn the tennis fundamentals known as GPS: Grips, Preparation, and Swing Path. It is also important to note that teaching technique to children should be done in small increments. Whereas deliberate practice/closed play is appropriate even for children, the duration and amount of deliberate practice should be adjusted according to attention, tolerability, and the perception of having fun.

Training at the "Introduction and Foundation Phase" takes full advantage of the new court sizes and equipment. Children should progress sequentially from a 36-foot court (Red Ball Court) to a 60-foot court (Orange Ball Court) and finally to a full-size 78-foot court. As the child grows and develops, he or she will move from the red to orange to green and finally to a yellow ball while using a racquet whose length allows for control. Training also includes learning competitive skills, which are best done initially in short-duration matches. Competition drives the sport, needs to be age- and developmentally appropriate, and does not have to have a negative connotation. Kids play games all the time, and they become used to winning and losing. With this in mind, playing many short-duration matches may help children to learn how to compete without the pressure of an infrequent tournament in which there is undue pressure to advance to the next round. It is worth remembering that kids love to compete, parents love to compare.

THE PRIMARY GOAL OF RED TENNIS TRAINING IS TO TEACH AND DEVELOP:

Physical Skills

- Agility, balance, and coordination (ABC)
- Running, jumping, and hopping
- Throwing (especially overhand) and catching
- Hitting and kicking
- Speed over a very short time (max five seconds)
- Reaction and tracking skills

Mental and Emotional Skills

- Confidence through FUN and success
- Concentration and focus is improving but is still in short spans of time
- Copying and visual learning is the best way to learn
- Simple decision-making (making a choice between two or a maximum of three things)
- Learning the concept of winning and losing

Social Skills

- Learning without a parent present
- Helping others in a group and sharing
- Often preferring to be with their own gender
- Develop responsibility through simple tasks and requests

Teaching Methods

- Coaching the children in small groups is important for rapid learning and self-confidence
- Use parents and helpers who show the children what to do and how to do it
- Set up circuits of activities to keep interest and the opportunity for success high
- Keeping children with their friends is important
- Developing a FUN and positive environment is important
- Physical activity is essential to maintain interest
- The activities should be changed frequently and be simple and basic
- Give brief and positive feedback—tell the children what they have done well or correctly
- Introduce the children to simple rules that begin the process of learning the basic tennis rules
- Avoid explanations in preference to setting activities where, in succeeding, the children are also "doing it right"

THE PRIMARY GOAL OF ORANGE TENNIS IS TO TEACH AND DEVELOP:

Physical Skills

- Agility, balance and more complex coordination (ABC)
- Reaction and anticipation skills
- Speed over a short time frame
- Throwing, catching, and hitting skills

Mental and Emotional Skills

- Decision-making skills are developing rapidly
- Independence is developing
- Concentration is improving and activities can take place over a longer period of time

- Confidence in boys is developing rapidly relative to girls
- Understanding of winning and losing is developing
- Some find it difficult to understand the difference between ability and effort
- Enthusiasm is paramount and easily seen

Social Skills

- Working with others and sharing is normal
- Often preferring to be with their own gender
- The awareness of who they like and dislike is developing
- Adult opinions are important and are accepted
- The ability to verbalize opinions and thoughts and explain them well is developing

Teaching Methods

- Coaching environment should be positive and encouraging; teach in groups and team
- Find different ways to mix groups up for short periods; keep friends together
- Use circuits to keep interest levels high by moving between a number of activities
- Success and enjoyment is essential; enable the child to improve and feel competent
- Feedback should be more specific and related to the task, not to the child's behavior
- Activity is still essential and visual learning is still the dominant learning style
- Teach through the game and develop the technical skills in order to improve the game

The next phase of training is the USTA "Refinement and Transition Phase." Training at this phase is based on three characteristics:

1. To build on the fundamental skills and abilities learned and developed in the "Introduction and Foundation Phase."
2. To develop the key needs of players at this stage in their tennis development.
3. To serve as the launch pad for the "World-Class Performance Phase" of performance that follows.

Tennis is an open-skill sport in which success depends on rapid decision-making and a sound tactical understanding.

The learning theme for the "Refinement and Transition Phase" is training and competition, since this is the prime time in the player's development to learn the skills for both. In terms of tennis training, fundamental technical skills should be solid and well established by this time. Players are able to develop more pace and improve movement and footwork because of the physical skills learned in the "Introduction and Foundation Phase" and because they are growing stronger and faster.

Physical and technical training is especially important in this phase. However, an increased emphasis should be placed on tactical development. The player is maturing rapidly both mentally and emotionally, and this is reflected in improved concentration and ability to

conceptualize things like goal-setting and anxiety control. Tennis is an open-skill sport in which success depends on rapid decision-making and a sound tactical understanding. In this phase, players are able to make quality decisions when presented with a range of options. A personal game style makes sense as the player's personality becomes more evident.

In the "Introduction and Foundation Phase," competition is primarily team-based and is used to coach simple skills like winning, losing, and scoring. In the "Refinement and Transition Phase," the opportunity and feasibility exist to teach skills such as defense, offense, and counter-attack because the player has the mental maturity to understand such skills. Therefore, competition is a vital development tool, and rankings become increasingly important to provide benchmarks of measurable improvement.

The ratio of competition to training increases as players move through this phase, with the players having a periodized schedule for their training, competition, and recovery. Of note: As they move through this phase, the players are also moving through puberty—a stage that represents the greatest change in their lives in terms of physical growth and emotional and mental development. Good practice in terms of coaching, training, and competition in this phase is crucial because it can have a great impact on the player's future as a tennis player.

There are significant changes in players in this phase. In physical terms, there are real biological/physical differences between young players of the same chronological age. Chronological age is the age on the birth certificate—the player's actual age in months and years. Players in this phase can be 2 years or more above or below their chronological age in physical terms. This poses a challenge for coaches who need to coach and teach players appropriately in groups. A further dilemma for coaches is that a player may appear talented but may in fact simply be bigger and stronger than his or her peers. The differences in chronological and biological age also mean that coaching technical and physical skills becomes increasingly individualized. One way to address the differences in growth and to identify a player's unique needs is to implement physical testing. Both fitness testing and injury prevention tests like the USTA's High Performance Profile, which is a musculoskeletal functional movement screening profile, are great tools when beginning to develop long-term plans for a young player.

In this phase, there also will be marked physical differences between girls and boys. These differences will be reflected in the way each gender plays the game. As the player matures throughout this phase, his or her tennis improves, so the range of knowledge of the coach will need to be higher to ensure that the coaching skills match the player's needs.

The USTA has published "The Progressive Development of a High Performance Player" chart that highlights the athletic and tennis-specific training noted above. This progression is consistent with the current world literature and the material presented at the USTA Youth Tennis Symposium.

TRANSITION FROM THE RED TO ORANGE TO GREEN BALL

SYNOPSIS

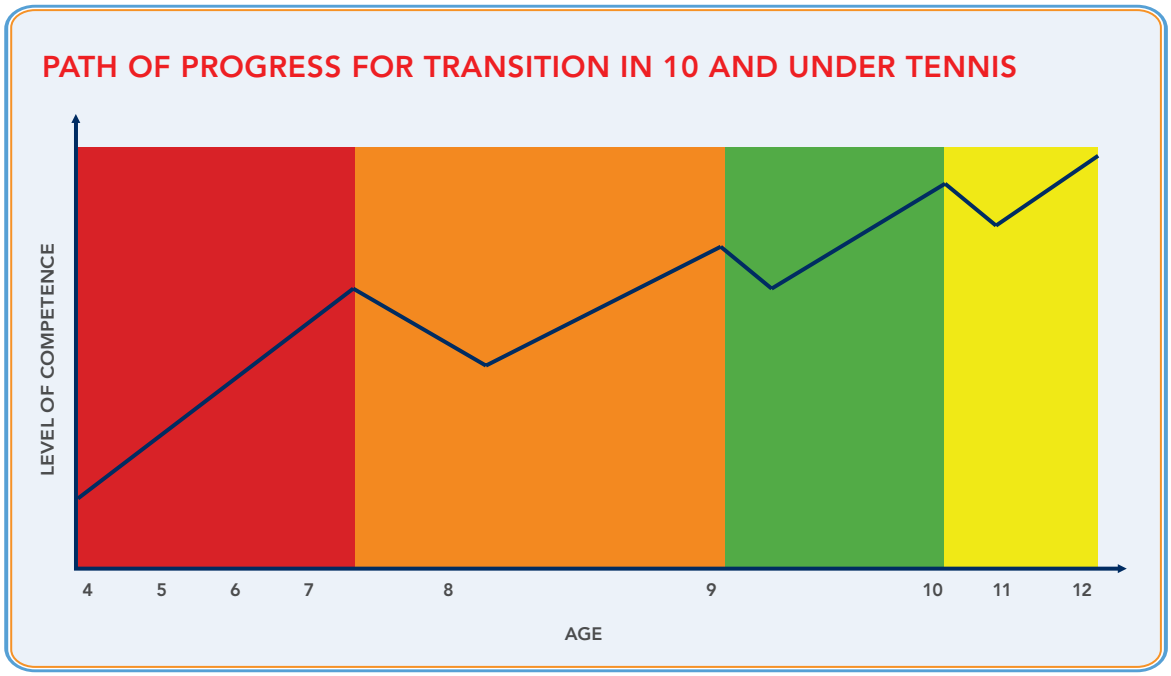
- A proper transition from the red to orange to green ball should be based on sound technique and tactical competencies rather than impatience to skip from one level to the next.
- There is a normal decrement in performance with each transition phase, and this decrement can be much greater if a premature transition is made.
- When children transition too quickly from one ball to another, there is a much greater likelihood that they will develop technical flaws as a means of compensating for developmentally inappropriate play.

There are not concrete guidelines about when a child should transition from a red ball/red court to an orange ball/orange court to a green ball. It is possible that making a transition from one ball to another could become associated with a race to make the transition as quickly as possible.[35] This is in part because some people associate the non-yellow balls as "not real" tennis balls, and they furthermore associate the smaller courts as "not real" courts. It is important to educate all stakeholders that the red, orange and green balls are all a legitimate part of progression in tennis, and are as real—and appropriate—for children as the yellow ball is for adolescents and adults.[31] The transition is based on a natural progression in technique, skill, athleticism, and age. Because each child matures differently, and because there is no known correlation between a fast transition in childhood to teenage and adulthood performance, there is no reason to hurry the transition prematurely. The transition should not be placed in the context of a "race" in which moving quickly is equivalent to "winning." When working with children, winning should never override proper development.[30]

With regard to a competitive structure, the national governing body (NGB) must choose the rules, and most often the rules are determined by age category.[35] Even within this framework there exists the possibility for experimentation. For example, rather than designating a single year (e.g. 7-and-under, 8-and-under) or every two-year transition (e.g., 8-and-under, 10-and-under), it is possible to develop a competitive schedule that divides a year in two. That means that for 8-and-under, there could be two divisions that roughly follow the school year: 8-and-under players born between September and March, and 8-and-under players born between April and August.[35] The reason to consider such a schedule is that a child's success in sports is often determined by his or her date of birth.[19] If we follow the strict calendar year, a child born in January has an almost one-year advantage over a child born in December, which is a substantial proportion of time in such a young child. In the United States, the potential age advantage is neutralized somewhat by allowing children to play in their age group until the month they age up.

When working with children, winning should never override proper development.

The other variables to consider are whether the transition is for a player development-competition track or for a community tennis-friendly play track. For player development, the competition and training transition are in parallel, but even



Source: ITF

in this scenario, there can be flexibility. For example, a player may transition from the orange to the green ball but may still have difficulty with the backhand volley technique. Utilizing deliberate practice/ closed play, a coach could work specifically with the orange ball for the backhand volley while the player otherwise trains with the green ball, and he or she will transition fully to the green ball after improving technique in the backhand volley with the orange ball.[62]

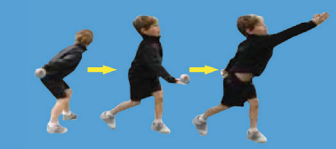
If a player makes a transition too quickly, the player will likely feel frustrated at playing worse and may even lose interest. As noted in the chart above, almost all players will experience a decrement in performance when making a transition from one ball to another, which means that there could be less emphasis on competition during the transition phase.

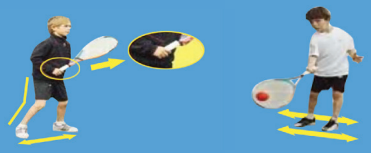
If the player is not technically ready to make the transition, then the performance decrement would be expected to be much greater. This would likely translate to less fun for the player, and fun is what drives the player to continue to play over time.[96]

It is essential for coaches to be well versed in the maturational expectations of childhood as well as the technical competencies that allow for the best transition from the red to orange to green ball.[24, 43] Many countries are in the process of experimenting with different ways to make the transition, but virtually all rely on the models below, which are based on ITF research.

The diagram on the following page illustrates the technique competencies developed by the ITF that guide children in making a smooth transition from the red to orange to green ball.

TRANSITION AND TECHNIQUE COMPETENCIES





Ages 5 – 6

Throwing/sending:

- Half open stance
- Hold the racket at the bottom, close to the butt-cap

Catching/receiving:

- Be alert and dynamic
- Well balanced position when throwing and catching
- Hitting the ball in front of the body
- Good balance while hitting the ball and having good distance from the ball

Ages 6 – 7

Throwing:

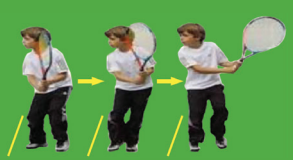
- Half open to open stance
- Initiate shoulder turn
- Hit the ball in front of the body

Receiving and return of serve:

- Dynamic, attentive and alert
- Holding the racket close to the bottom/butt-cap and distinguishing between forehand and backhand grip
- Early rotation of the shoulder and trunk
- Hitting the ball in front of the body
- Good control of balance

Ages 9 – 10

- Dynamic, attentive and alert
- Good acquisition of forehand and backhand grip
- Turning/rotation of the trunk right after split step
- Follow through higher than the contact point
- Compact backswing before hitting the ball
- Racket head acceleration with the arm and lower arm/ wrist action
- Hitting the ball in front of the body and following through
- Various forms of footwork: open, semi open or square stances depending on situation/ tactic
- Good control of balance by using different stances
- Various forms of recovery according to situation



Ages 11 and Up

- Adjustment of the backhand grip according to the spin needed
- Separation of the upper body and lower body according to the stance used
- Racket head lower to give more spin
- More racket head acceleration with the arm and lower arm/wrist action
- At the end of the backswing, the balance should be forward according to the stance and target
- Follow through according to the spin applied and tactical objective

Source: ITF

It is noteworthy that each transition is associated with more sophisticated stance, footwork, racquet swing, racquet grip, and dissociation of upper and lower body movements.

The illustration below illustrates the age-driven transition.

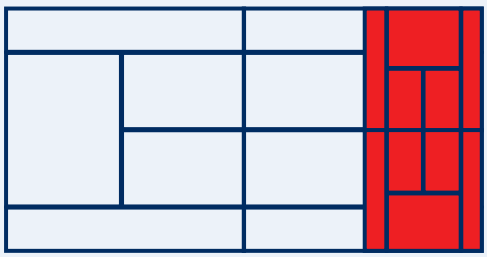
Although this type of transition is easier to administer and does not require the more coach-driven intervention, the danger of relying simply on age to determine advancement is that the child may not be physiologically or technically ready to make the change, and a premature change can lead to premature dropout.[31, 96]

Even for proficient green ball 10-and-under tennis players, there is no good evidence to suggest that players should be transitioned to a yellow ball prematurely. It is only in exceptional cases that a 10-and-under tennis player should make the full transition to a yellow ball, with the caveat that player ability and player ranking pre-puberty do not correlate with late teenage and adulthood success.[30, 31, 35]

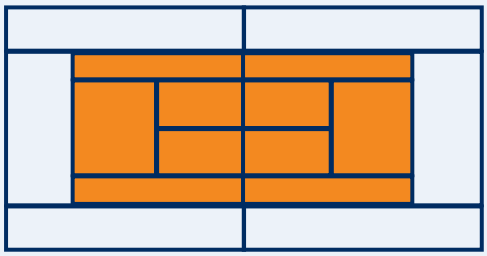
It is appropriate for 10-and-under tennis children to compete, but the competition should be fun while utilizing a short scoring format. Ideally, most competition matches will last about 20 minutes or less for 8-and-under children (e.g., 2-out-of-3 tie-breaks), thus allowing an abundance of play opportunities with many different children.[31, 96, 121] As children age, they can tolerate longer-duration matches; for example, 9- and 10-year-old children can play 2-out-of-3 short sets, which could last 20 to 45 minutes.[15]

USTA 10 AND UNDER SPECS FOR COMPETITION

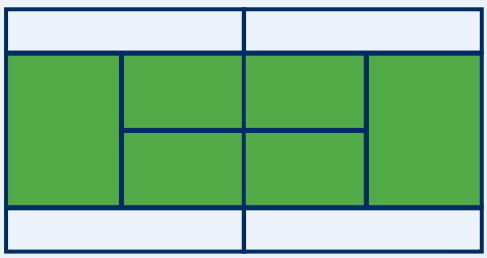
RED: 8 AND UNDER



ORANGE: 9 – 11 YEARS OLD



GREEN: 10 AND UP



Source: ITF (modified)

The table below illustrates the approach some countries take with regard to 10-and-under tennis competition while utilizing the red, orange, or green ball.

The ITF does not allow 10-and-under children to play international events.

The ITF does not allow 10-and-under children to play international events.[96] Most NGBs do not hold national 10-and-under championships, nor do they rank 10-and-under children. Indeed, only two countries (Brazil and France) hold annual singles national 10-and-under championships, although Great Britain hosts a national invitational tournament for 9-and-under and 10-and-under children. Great Britain uses the orange ball for its 9-and-under invitational event, and otherwise the green ball is used by Great Britain, Brazil, and France for their 10-and-under national events, and they employ a shortened scoring format. None of these countries has a 10-and-under national ranking in place.

10-AND-UNDER COMPETITION IN SELECT COUNTRIES

Country	Red Scoring	Red Match Format	Orange Scoring	Orange Match Format	Green Scoring	Green Match Format
Australia	Varies among territories	Various scoring and match formats	To be announced	To be announced	To be announced	To be announced
Belgium	Single tie-break to 10, or 7-point tie-break if limited courts	Round robin individual	10-point tie-break for recreational; 2-of-3 short sets for competitive	Round robin without winners for recreational; draws with consolation for competitive	10-point tie-break (Kinder Tour) or 2-of-3 short sets with tie-break at 3-3 for Volvo Tour	Round robin for Kinder Tour and draws for Volvo Tour
Canada	First to 15 or 21 points, alternate serves every 2 points; 10-15-minute timed matches	Round robin or team matches, to guarantee 2-3 matches	2-of-3 short sets with no-ad scoring, tie-break at 3-3	Round robins with team and individual; 3 matches minimum with time limit of 45 minutes	Same scoring format as for orange ball	Same as for orange ball
France	All scoring allowed; start 1-2-3-4, then regular scoring	Clubs free to choose format; strongly recommend doubles and team, plus multi-sport	Same as red for recreational; 2 sets of 4 games each with tie-break at 3-3 for competitive	Round robins and compass draws; promote teams and doubles, especially for girls	Set to 5 games, tie-break at 4-4, no-ad scoring	Compass draws Friday afternoon to Sunday noon
Great Britain	Regular tie-break and match	All round robin with teams	2-of-3 tie-break sets	Mostly round robin	2-of-3 short sets	Mostly elimination and compass draws
Netherlands	Tie-break and 2-of-3 tie-breaks, with much disparity	Round robins, team and individual competitions	2-of-3 short sets	Round robin with some elimination	2-of-3 short sets and some 2-of-3 sets to 6	Various formats
Spain	2-of-3 tie-breaks	Round robin and team matches in weekend comp	2-of-3 short sets, win by 2 with no-ad	Team and individual format, guarantee 2 matches; lasts 2-3 days	2-of-3 sets to 6 games	Round robin and elimination draws over 3-7 days

Source: USTA

All USTA sections have some type of competitive structure for 10-and-under tennis players. The chart below, however, demonstrates that the USTA sections do not have a unified system for 10-and-under competition with regard to the balance of orange and green ball tennis.

USTA SECTIONAL 10-AND-UNDER COMPETITION

Section	Junior Members	U10 Tournaments	U10 Levels	U10 Ball Use
Caribbean	1,582	8	1	100% orange
Eastern	19,328	318	5	70% green, 30% orange
Florida	17,263	750	4	100% orange
Hawaii Pacific	1,646	45	2	66% green, 33% orange
Mid-Atlantic	10,501	159	5	15% green, 85% orange
Middle States	10,298	40	2	10% green, 90% orange
Midwest	35,567	839	7	93% green, 7% orange
Missouri Valley	8,036	204	2	23% green, 77% orange
New England	10,257	80	1	100% orange
Northern	5,361	35	1	100% orange
Northern California	13,649	120	3	85% green, 15% orange
Pacific Northwest	5,905	204	3	100% orange
Southern	55,280	965		100% orange
Southern California	16,021	350	3	79% green, 21% orange
Southwest	3,779	116	4	100% orange
Texas	19,970	310	2	50% green, 50% orange

Source: USTA

USTA PLAYER DEVELOPMENT PERSPECTIVE[15]

In the USTA Player Development model, technique and tactical competencies are combined when providing the red ball to orange ball transition guidelines for children. As the table below indicates, children must develop red ball proficiency for the forehand, backhand, combo, serve, return and volley before they transition to the orange ball.

10 AND UNDER COMPETENCIES IN TRANSITION FROM RED BALL/36-FOOT COURT TO ORANGE BALL/60-FOOT COURT

	Hands	Feet	Eyes and Mind
Forehand	Grip: Eastern to semi-western Unit turn Preparation: Racquet above the wrist	Ready position Lateral movement Split step Recovery: cross-over Diagonal movement Forward movement Stances: closed, semi-open	Moving forward → down the line Moving back → high cross-court Control/direct ball to zones of the court (7 out of 10) to each zone Topspin & slice Open court zone
Backhand	Grip: Bottom hand: Continental; Top Hand: Continental to eastern Unit turn Preparation: Racquet above the wrist		
Combo	Transition grip between forehand and backhand	Lateral movement Split step Recovery step	Side to side (7 out of 10)
Serve	Continental grip Coordinated service motion Consistent contact point	Balance Stable platform	7 out of 10 to the correct box—each side
Return	Grips Ready position Quick unit turn	Split step	7 out of 10—return to each side
Volley	Continental grip	Split before contact	Volley to open court (7 out of 10)

Source: USTA

Children must also develop orange ball proficiency for the same aspects of the game before transitioning to the green ball, as noted in the table on the next page.

10 AND UNDER COMPETENCIES IN TRANSITION FROM ORANGE BALL/60-FOOT COURT TO GREEN BALL/78-FOOT COURT

	Hands	Feet	Eyes and Mind
Forehand	Introduce racquet-head acceleration Consistent contact point Moving toward full extension at point of contact Unit turn, working on keeping non-dominant hand on racquet until the hitting shoulder rotates Wrist load/pre-stretch Load: coordinated movements *Grip: Eastern to semi-western* *Unit turn* *Preparation: Racquet above the wrist*	Diagonal up Stances: Establish semi-open and introduce the open stance *Ready position* *Lateral movement* *Split step* *Recovery: cross-over* *Diagonal movement* *Forward movement* *Stances: Closed, semi-open*	20 balls cross-court past the service line in a row with shape and rotation (top spin) to both sides Understand offense and defense (slice) *Moving forward → down the line* *Moving back → high cross-court* *Control/direct ball to zones of the court (7 out of 10) to each zone* *Topspin & slice* *Open court zone*
Backhand	Consistent contact point Moving toward full extension at point of contact Set wrist in proper position Load: Coordinated movements *Grip: Bottom hand: Continental; Top hand: Continental to eastern* *Unit turn* *Preparation: Racquet above the wrist*		
Combo	Smooth efficient grip change *Transition grip between the forehand and backhand*	Timing of split step Increase scope of movement Speed of drills increase *Lateral movement* *Split step* *Recovery step*	Cross-court down the line, side to side (7 out of 10) Change direction of ball both down the line and cross-court during cooperative rally with partner *Side to side (7 out of 10)*
Serve	Synchronized upper-body mechanics with consistent toss from inside of the front leg *Continental grip* *Coordinated service motion* *Consistent contact point*	Introduce leg drive (use of ground) Either platform or slide *Balance* *Stable platform*	Wide/body/T (split box into 3 zones and have to make 7 of 10) Slice serve and flat serve *7 out of 10 to the correct box-each side*
Return	Outside leg behind the ball Fully execute grip change Outside leg behind the ball with a deeper load *Grips* *Ready position* *Quick unit turn*	Assimilate the 3 footwork movement patterns: back, lateral, forward *Split step*	Split step and backswing sync with speed of serve 7 of 10—return cross-court on wide serves, return down middle on middle serves *7 out of 10—return to each side*
Volley	Outside leg behind the ball Able to maintain firm wrist at contact Control racquet head *Continental grip*	Transitional footwork patterns Explosive split step Moving to volley and timing the step *Split before contact*	Short, deep, and angle volley—control and accuracy (7 out of 10) *Volley to open court (7 out of 10)*

Source: USTA

Finally, children must develop green ball proficiency for the same aspects of the game before transitioning to the yellow ball, as noted in the table below.

10 AND UNDER COMPETENCIES IN TRANSITION FROM GREEN BALL/78-FOOT COURT TO YELLOW BALL/78-FOOT COURT

	Hands	Feet	Eyes and Mind
Forehand	**Weapon development: Racquet-head acceleration** **Develop forehand as a weapon** *Introduce racquet-head acceleration* *Consistent contact point* *Moving toward full extension at point of contact* *Unit turn—working on keeping non-dominant hand on racquet until the hitting shoulder rotates* *Wrist load/pre-stretch* *Load: Coordinated movements* *Grip: Eastern to semi-western* *Unit turn* *Preparation: Racquet above the wrist*	**Well-developed load in sync with unit turn** **Backward diagonal movement** **Integrate all three movements** **Stances: Able to execute all three** *Diagonal up* *Stances: Establish semi-open and introduce the open stance* *Ready position* *Lateral movement* *Split stept* *Recovery: Cross-over* *Diagonal movement* *Forward movement* *Stances: Closed, semi-open*	**Speed** **Spin** **Height** **Depth** **Location** **Ball recognition: 7 of 10—random and 3-way forehand/backhand into appropriate zones** *20 balls cross-court past the service line in a row with shape and rotation (topspin) to both sidest* *Understand offense and defense (slice)* *Moving forward → down the line* *Moving back → high cross-court* *Control/direct ball to zones of the court (7 out of 10) to each zone* *Topspin & slice* *Open court zone*
Backhand	**Weapon development: Racquet-head acceleration** **Change direction and shape** *Consistent contact point* *Moving toward full extension at point of contact* *Set wrist in proper position* *Load: Coordinated movements* *Grip: Bottom hand: Continental; Top hand: Continental to Eastern* *Unit turn* *Preparation: Racquet above the wrist*		
Combo	**Able to position body in relation to ball and establish a contact point** **Create space between body and the ball** **Absorb power** *Smooth, efficient grip change* *Transition grip between forehand and backhand*	**Drop step** **Move backward on diagonal, get behind the ball and establish the base to get hips moving back into the court** *Timing of split step* *Increase scope of movement* *Speed of drills increase* *Lateral movement* *Split step* *Recovery step*	**Game style** **Patterns to game style** **Attack and defend on both sides** **Random: Side to side with appropriate response to coach in corner—20 in a row** *Cross-court down the line, side to side (7 out of 10)* *Change direction of ball both down the line and cross-court during cooperative rally with partner* *Side to side (7 out of 10)*

Chart continues on next page.

10 AND UNDER COMPETENCIES IN TRANSITION FROM GREEN BALL/78-FOOT COURT TO YELLOW BALL/78-FOOT COURT *cont.*

	Hands	Feet	Eyes and Mind
Serve	Integration of lower and upper body (leg drive) in sync Front foot up and over the baseline (leg drive) Introduce kick serve Elbow up to strong man with palm down *Synchronized upper body mechanics with consistent toss from inside of the front leg* *Continental grip* *Coordinated service motion* *Consistent contact point*	Recovery: Re-establish base after making contact *Introduce leg drive (use of ground)* *Either platform or slide* *Balance* *Stable platform*	Routine Adjust speed on first and second serves Accuracy: 1st Serve: 6 of 10 2nd Serve: 8 of 10 8 of 10 to backhand side of court *Wide/Body/T (split box into 3 zones and have to make 7 of 10)* *Slice serve and flat serve* *7 out of 10 to the correct box—each side*
Return	Be able to handle: High kick, wide slice, and hard, flat serve *Outside leg behind the ball* *Fully execute grip change* *Outside leg behind the ball with a deeper load* *Grips* *Ready Position* *Quick unit turn*	Use of all three stances on both sides Recovery after contact Move around and hit forehand on second serve Backhand slice approach *Assimilate the 3 footwork movement patterns: back, lateral, forward* *Split step*	Routines Return and attack Return 7 out of 10 to all three zones (short, deep cross-court, deep down the line) *Split step and backswing sync with speed of serve* *7 of 10—return cross-court on wide serves, return down middle on middle serves* *7 out of 10—return to each side*
Volley	Swing volley Low and high volleys with different speed and spin *Outside leg behind the ball* *Able to maintain firm wrist at contact* *Control racquet head* *Continental grip*	*Transitional footwork patterns* *Explosive split step* *Moving to volley and timing the step* *Split before contact*	Volley sequence: deep to short (7 out of 10) Swing volley (7 out of 10) *Short, deep, and angle volley—control accuracy (7 out of 10)* *Volley to open court (7 out of 10)*

See also: www.usta.com/about-usta/player-development/10_and_under_tennis_competencies_instruction

Source: USTA

One primary purpose of 10 and Under Tennis is to better allow players to emerge with solid fundamentals. As contrasted with the yellow ball for young children, the 10 and Under Tennis format allows the child to become well versed in the parameters of grips, preparation, swing path, and ball placement. If these competencies are developed at each level, they do not need to be re-learned later on. Unfortunately, the trend today is that many teenagers need to spend considerable time addressing technical flaws. Indeed, in reviewing more than 1,000 players at various USTA Certified Regional Training Centers during the past year, approximately 75 percent of players had technical flaws that impeded their progress.[85] This means that considerable time needed to be spent in a deliberate practice/closed play setting to correct the flaws. Otherwise, the player could not advance optimally to his or her skill set in tennis.

75 percent of players had technical flaws that impeded their progress.

TRANSITION FROM 10 AND UNDER TENNIS TO 12-AND-UNDER TENNIS

SYNOPSIS

- Transition to 12-and-under tennis should be based on a child's development and technical proficiency. A green ball may be appropriate for many children as they begin to play on a full-size court.
- As children begin to compete in more matches, it is important to be placed in a competitive environment in which there are more wins than losses (but also where there is a balance between wins and losses).
- 12-and-under children are not allowed to play ITF Junior Circuit tournaments, but national governing bodies—including the USTA—sanction national 12-and-under championships.

The transition from 10 and Under Tennis to 12-and-under tennis (or to the 78-foot court) must be grounded in maturational and technical proficiency. Because 12-and-under tennis is most often played with the yellow ball, there are many potential pitfalls with assuming that the developing child is ready for a full transition, including:

- Most 12-and-under children are either pre-puberty or are just entering puberty. As such, they are still children, both physically and emotionally. An attempt to impose adult standards on such children poses the same dangers as doing so with 10-and-under children.[31, 55, 56]
- Because the child is now playing "traditional" tennis on a full court with a yellow ball, the perception from parents, coaches, and players could be that the child must now behave in all "traditional" adult ways, and there may be an increasing emphasis on winning rather than developing. Since children at this age are still focused on fun and since they are just beginning to develop an innate love of the game, shifting the emphasis to adult-style winning too soon may lead to a premature exit from the sport.[31, 120]
- There is not a clear-cut linear correlation between the success of a 12-year-old and ultimate peak performance. With this in mind, the transition must be done cautiously and patiently, with attention to technique and emotional balance.[31]
- Even though 12-and-under children are often playing with the yellow ball, there are still many options available for making the transition maturation and technique appropriate, including:
  - ◊ The Rules of Tennis provide an option for children at this age to train and compete with a green ball. It is the wise coach and parent who recognizes that a child may need more time perfecting technique with a green ball before rushing to play with the yellow ball.
  - ◊ Many children at this age may continue to have short attention spans and limited endurance, even if they are developing in an appropriate manner athletically and technically. With this in mind, the rules of tennis allow for modified scoring that may be more appropriate. What is key is to adjust any competition to the needs of the player, and to consider shorter matches or Play Days as alternatives.[31, 85, 120]

The transition must be done cautiously and patiently.

With any type of competition, it is important for the coach and parent to be mindful of the competition goals. Remember, competition should be a tool for improving,

and the focus—especially at this age—should not be on winning. That being said, it is important that the child be placed in a competitive environment in which he or she has a win-loss record of two to one (2:1) or better. If the child is losing more regularly than he or she is winning, then it is difficult to continue to have fun and the chance of losing interest in the game increases.[31, 85, 120] It is nearly impossible to try to improve when your psyche is fraught with unhappiness and feelings of being inferior. If the child's win-loss record is very high, then improvement may be impaired as well. A major learning point of competition is to enter the competition with the result in doubt, as this fosters a creative approach to playing the game and forces technique mastery and shot selection to improve.[106]

Competition at this age should also focus on children playing a variety of opponents on a variety of surfaces, as this increases versatility, which is a key component of later success. Additionally, doubles play should be intertwined with singles play and should also be considered for ranking purposes. Most experts believe that early doubles play encourages a wide variety of shot selection and a more complete mastery of the tennis court, which is pivotal for the progressive development of the tennis athlete.[31, 85, 120]

The ITF has placed restrictions on 12-and-under children. No child 10 years old and under is allowed to play international competition, and no child 12 years old and younger is allowed to play ITF Junior Circuit tournaments.[96] NGBs set their own rules of engagement for national play. As noted previously, the USTA had previously abandoned 12-and-under national competition and rankings, but has reinstated both, which is consistent with

NATIONAL COMPETITION IN SELECT COUNTRIES

Country	12-and-under National Championships	Competitive Structure	Singles/Doubles	Scoring Formula	Ball Used	National Rankings in Place
Australia	Yes	Round robin and playoff	Singles	Best-of-3 sets	Yellow	Yes
Brazil	Yes	Single elimination	Singles & doubles	Best-of-3 sets	Yellow	Yes
Canada	Yes	Round robin with single-elimination playoff	Singles & doubles	Best-of-3 sets	Yellow	Yes (under review)
France	Yes	Single elimination	Singles	Best-of-3 sets	Yellow	No
Germany	Yes	Round robin with single-elimination playoff	Singles	Best-of-3 sets	Yellow	Yes
Great Britain	Yes	Single elimination	Singles & doubles	Best-of-3 sets	Yellow	Yes
Japan	Yes	Single elimination and consolation	Singles	Best-of-3 sets	Yellow	No
Netherlands	Yes	Single elimination	Singles	Best-of-3 sets	Yellow	Yes
Russia	Yes	Round robin with single-elimination playoff	Singles	Best-of-3 sets	Yellow	Yes
South Africa	Yes	Qualifying and feed-in, single elimination and consolation	Singles & doubles	Best-of-3 sets	Yellow	Yes
Spain	Yes	Single elimination	Singles	Best-of-3 sets	Yellow	No
U.S.	Yes	Compass draws (multiple elimination)	Singles & doubles	Best-of-3 sets, tie-break for 3rd set	Yellow	Yes

Source: USTA

NGBs worldwide. All national federations have annual singles national 12-and-under championships that utilize the yellow ball, and most countries have a national 12-and-under ranking in place. The majority favor a standard knockout competition structure, while some prefer round robin with qualification to a single-elimination playoff. The table on the previous page illustrates some select countries' approach to national competition.

It is interesting to note that there is experimentation within the USTA sections regarding the type of ball utilized in 12-and-under competition. This suggests that USTA sectional leadership is not necessarily pushing children to play a traditional adult-style format in this age category.[73] Ideally, data will be collected and analyzed so that we can all learn from this non-uniform approach. The table below demonstrates how various sections are approaching 12-and-under competition.

In summary, the transition from 10 and Under Tennis to 12-and-under tennis should be done carefully, with an eye toward the developing child's capacity and interest in the game. The green ball and optional scoring provide an opportunity to help ensure that the developing child continues to advance with a mastery of technique and athleticism, while not pushing the child out of the game with adult formulas and expectations.

USTA SECTION 12-AND-UNDER COMPETITION

Section	Junior Members	U12 Tournaments	U12 Ball Use
Caribbean	1,582	12	66% yellow, 33% green
Eastern	19,328	600	100% yellow
Florida	17,263	800 (U11 & U12)	11: 100% green; 12: 100% yellow
Hawaii Pacific	1,646	79	100% yellow
Mid-Atlantic	10,501	159	100% yellow
Middle States	10,298	113	100% yellow
Midwest	35,567	817	97% yellow, 3% green
Missouri Valley	8,036	220	100% yellow
New England	10,257	180	65% yellow, 35% green
Northern	5,361	35	100% yellow
Northern California	13,649	280	100% yellow
Pacific Northwest	5,905	238	86% yellow, 14% green
Southern	55,280	1144	60% yellow, 40% green
Southern California	16,021	350	100% yellow
Southwest	3,779	146	100% green
Texas	19,970	348	100% yellow

Source: USTA

PLAYER IDENTIFICATION

SYNOPSIS

- The purpose of Player Identification is to predict future success in children, but because tennis is a late-specialization sport, there are no good predictive models for children who are pre-pubertal.
- Most Top 100 players have had some measure of success by age 14, but rankings at this age do not linearly predict future rankings.
- The USTA Player Identification process is fluid, with the recognition that players may bloom differently because of a difference in maturity and physiology.

Player Identification is the prediction of future performance of young players, and entails a process of identifying young players who may one day achieve success at the national or international level. There are two fundamental components to Player Identification:

1. Identifying athletes who are not currently playing tennis and attracting them to the sport; and
2. Identifying talented athletes who are playing tennis and investing more time, attention, and resources to their development.

There is clear evidence that 10-and-under children who may one day take a Player Development pathway in tennis should begin playing tennis at an early age (sport initiation) while focusing more on athleticism than tennis-specific development.[7, 8, 110] There is also clear evidence that tennis is a late-specialization sport, which means that players do not peak until they are in their 20s. Within the conceptual framework of the long-term athlete development model, there is wide consensus that athletes who participate in late-specialization sports such as tennis should not begin sport specialization until puberty.[2, 3, 108] Despite these empirical truisms there is a counterforce that tries to develop and identify tennis talent at an early age. This is because national governing bodies, parents, coaches, and stakeholders want to boast that they have produced a Grand Slam champion or a Top 10-ranked player.[2, 3]

The purpose of Player Identification is to predict future success in children.

Whereas there is nothing wrong with trying to foster the development of a future tennis champion, there is something wrong if the pathway for doing so hurts more children than it helps, or if it leads to increasing sport dropout.[3, 47, 131] Tournament competition and training in children can ideally be structured to increase participation and to provide the greatest number of opportunities to participate in and experience the wonder of sport. This can be coupled with an evidence-based programmatic approach that will allow great players to achieve their greatness and that will promote greatness in those who may otherwise have become lost in the system.[95]

Because the purpose of Player Identification is to predict future success in children, an investment of resources is made to help nourish the possibility of success. Three difficulties with Player Identification in young tennis players are:

1. Although tennis is an early initiation sport, it is also a late-specialization sport. Tennis results at age 10 or 12 are not linearly predictive of future success.[3]
2. Tennis is a high-skill "Open Loop" sport. This means that tennis requires constant decision-making, spatial

awareness, organization of responses, and multi-dimensional abilities—abilities that become more manifest after puberty. This is in contrast to "Closed Loop" sports such as rowing or weightlifting which are more uniformly repetitive in nature, and thus certain physical characteristics become more predictive.[15, 83]

3. The complex-skill, Open Loop nature of tennis means that there is a balancing act in development. Good technique before puberty is not predictive of later success, but improper technique at a young age can delay tennis progression after puberty. Thus, some aspects of technique can and should be learned before puberty through deliberate practice. Teaching proper tennis technique should be intertwined with a focus on athletic development in a fun environment.[7, 8, 15, 85, 110]

Player Identification is a process that entails re-evaluation of an individual over time.

As discussed earlier, because tennis is a late-specialization sport, it is only after puberty that the combination of athleticism and tennis proficiency becomes readily apparent. That being said, it is also true that most top players have made a firm commitment to tennis around the time of puberty, and they are beginning to demonstrate tennis talent at this time.[20, 110] That means there is a two- or three-year window between pre-puberty and post-puberty in which tennis talent emerges. Attempts to force tennis talent emergence prematurely risks psychological and physical injury.[54, 55, 130] There is good consensus that forcing an adolescent into a uni-dimensional program before he or she is ready often leads to burnout.[54, 55] From a physical viewpoint, pubertal adolescents do not have well-developed bone structure, and their motor skills diminish during the rapid growth spurt. This places them at a much higher risk of developing growth plate fractures or spine fractures if they are forced into repetitive activities for which their bodies are not prepared.[130, 146, 147] It is the wise coach and parent who can help a child navigate this two- to three-year window with skill and patience.

There is no universally accepted methodology for identifying talent in tennis players. There is wide consensus that Player Identification is a process that entails re-evaluation of an individual over time, and that cannot be simply focused on results at a young age.[82, 133] There are two seemingly disparate factors in Player Identification. First, most Top 100 players have had some measure of success by age 14. Second, the success at age 14 is not linearly predictive of peak performance as a world-ranked player. Consider the two tables below, which analyze participation by players who had a Top 100 ranking between 2009 and 2011 when they were previously playing in the 14 and under age category.

PARTICIPATION IN KEY JUNIOR EVENTS FOR TOP 100 MEN, 2009-2011

	U14 LPA (1)	U14 OB (2)
Top 10	73%	33%
Top 25	59%	20%
Top 50	44%	19%
Top 75	34%	8%
Top 100	28%	9%

(1) U14 Les Petis As (2) U14 Orange Bowl | Source: W. Pattenden: Long term athlete development plan for the sport of tennis in Canada, 2011

PARTICIPATION IN KEY JUNIOR EVENTS FOR TOP 50 WOMEN, 2009-2011

	U14 LPA (1)	U14 OB (2)
Top 10	45%	10%
Top 25	40%	5%
Top 50	26%	10%

(1) U14 Les Petis As (2) U14 Orange Bowl | Source: W. Pattenden: Long term athlete development plan for the sport of tennis in Canada, 2011

Although only two tournaments are analyzed, these results indicate that many top-ranked players had already begun to show success by age 14 in that they were competing in international events. An analysis of USTA players since 1990 reveals similar findings in that most American players who achieved Top 100 ATP/WTA rankings had achieved Top 100 national rankings by age 12 and even more had achieved Top 75 rankings nationally by age 14.

Compare this data with results-oriented data for male players who had obtained a Top 200 ranking between 1992 and 2008, and for female players who obtained a Top 200 ranking between 1992 and 2007, as demonstrated in the tables below. These tables demonstrate clearly that the Top 20-ranked men and women players had poorer results than players ranked in the Top 200. In other words, top-ranked players are playing international events at age 14 but they are not necessarily obtaining the best results relative to other players who do not ultimately become ranked in the Top 20. On the other hand, success in these international tournaments does have some predictive value of forecasting a Top 100 professional tennis player. What is evident is that Player Identification could not have predicted future Grand Slam champions or top world rankings based on 14-and-under results, but could have predicted who was likely to achieve a Top 200 ranking. In essence, there is broad consensus that talent predictions become more accurate when they are made closer to the time of peak performance.

YOUTH TOURNAMENT* ANALYSIS FOR TOP-RANKED MEN PROFESSIONAL PLAYERS

	Winners	Finalists	Semi-finalists	All tournament participants
	44	42	83	1,897
Top 200	43.2%	28.6%	13.3%	6.2%
Top 100	36.4%	19%	8.4%	4.1%
Top 20	18.2%	9.5%	4.8%	1.3%

*Les Petit As, BNP Paribas, European Championship | Source: J. Brouwners, Journal of Medicine and Science in Tennis, 2010

YOUTH TOURNAMENT* ANALYSIS FOR TOP-RANKED WOMEN PROFESSIONAL PLAYERS

	Winners	Finalists	Semi-finalists	All tournament participants
	40	41	78	1,624
Top 200	60%	39%	29.5%	9.2%
Top 100	47.5%	29.3%	17.9%	5.6%
Top 20	22.5%	9.8%	1.3%	1.1%

*Les Petit As, BNP Paribas, European Championship | Source: J. Brouwners, Journal of Medicine and Science in Tennis, 2010

PLAYER IDENTIFICATION SCENARIOS IN SELECT COUNTRIES

Player ID	System and Progression	Coaching and Opportunities	Selection Process
Australia	Talent/coach manager in 6 states and 2 territories; about 100 Player ID coaches; 10s and 12s are invested in coaching; 5 national academies, and coach travels with player	Player ID mentor in each territory; 12-and-under national championship is hub of selection; kids awarded money according to age; 5 mentors and 83 pros involved with Player ID; top level is Australian Institute of Sport: 10 athletes, full funded, ages 16-21; must give back 50% of earnings while in program	5 national and 3 state academies; rarely take anyone under 12 years old
Belgium	Training days at club for 6-8-year-olds; physical testing and observation in competition; has Fun days; about 40 national coaches and 20 for club level	5 levels of coaching; must be L4 or preferably L5 to do Player ID; club testing can be reviewed online; 4,000 per year are tested in clubs	200 of 4,000 tested in clubs are chosen for 2-day camps with tennis and skill testing; 60 kids chosen for development program, which is 4 weeks of 4 days and is preparation for Player ID days; financial help if selected; 8-and-under potential based on motor ability and predisposition for enjoying and learning tennis; 9-and-under Player ID system with detection, camps and ID plus development system based on motor results/evaluation of development/ tournament results; Player ID for 12-and-under based on tournament results/play and skillfulness level/ high-performance profile/mental abilities/ attitude/motor abilities
Canada	Moves from local (10) to provincial (6) to national (3) training centers for players ages 5-15; Player ID is for 5-8-year-olds	Ensure that experienced coaches help at club level, with provincial and national level coaches; national coach monitors development down to local level	20 kids selected for 12-and-under camps; 32 kids in 12-and-under national championships; selection based on motor skills/global competencies, while considering birth month; sliding scale: 10-and-under more competency-based; 14-and-under more performance-based
France	Clubs send kids to departments and then to 1 of 26 regions; departments and regions organize "festivals" 3-4x/year; 1 training center per region	3 levels of coaches, 2 have state diplomas; must have state diploma to train kids at competition level; Player ID leads to individual and competition training program with financial assistance; can participate in regional camps and be selected for bigger tournaments	200 kids age 9-12 selected into national camps; select by birth year for camps but can play at current age for tournaments; select at age 6-7 according to leagues, and continue to search for new kids after age 8
Great Britain	Broken into county, regional, and national; approximately 100 centers for 12-and-under and 20 for 12+	7 talent performance managers and 25 coordinators; provide funding for camps, invitational tournaments, coaching, player support, and international travel	8 players selected for national camps, 24 per age group for national Player ID; selections are 2 groups per year; begin at age 7 for county level and up to 12 for national level; 7-10-year-old selection based on competencies, pre-testing, and competitive attitude; 11-12-year-old selection based on ranking
Netherlands	Start locally, progress to regions and then national; 5 regional centers plus training at local clubs	Segmented into club coach, performance coach, and international coach; no camps; assistance provided with coaching through traveling	Selection by birth year
Spain	Begin in clubs in regions (18); best players go to local training center, then national center; federation oversees regional and national centers	3 levels of coaches: personal/ club coaches, local federation coaches, national coaches; coaches visit kids in national competition and select the best for a yearly national camp	5 national and 3 "state" academies; national academies have more funding; rarely take anyone under 12 years old
U.S.	Details to follow	Details to follow	Details to follow

Source: USTA

There are many countries that begin Player Identification at a young age. In part, this may be driven by the sense of urgency to develop the next world champion as a way of justifying investment into Player Development. In part, this may also be driven by a sincere attempt to provide a developmental pathway for children who demonstrate unique skills and attributes, taking into account not simply results but also other key variables such as physiology, psychology, athleticism, technical and tactical skills, and the intangible intuition of a wise coach.[34]

The table on the previous page demonstrates that there are a variety of approaches in different countries for how to identify talent, and it is clear that there is not one formula for success. There is developing consensus that Player Identification should not be results-based pre-puberty, and that results become more important as the player enters and moves through puberty.[87, 88, 89, 133]

THE USTA APPROACH TO PLAYER IDENTIFICATION

The USTA Player Identification and Development Department works at the base of the USTA Player Development Pathway structure to help ensure the identification and development of the U.S.'s best young players. The goal is to provide an intersection of effort, ability, opportunity, and growth and development for as many gifted athletes as possible. As more and more fundamentally sound 13- and 14-year-old players develop, USTA Player Development will be able to provide an opportunity for a base of elite juniors to train together, to compete against each other, and to make each other better.

The focus of the USTA Certified Regional Training Center program is to develop a large base of players who are technically sound (strokes are within the parameters of 10-and-under competencies). The technical base will be a direct result of solid teaching, attention to detail, developmental planning, and using the correct formats for training and competition.

The foundational characteristics that are important in children ages 8-13 are:

1. Beginning of a strong technical foundation
2. Parents/family who are supportive and committed
3. Athletic parents
4. Agility, balance, coordination, speed
5. Coachability and willingness to try new things
6. Love of the game and desire to play
7. Problem-solver
8. Resilient
9. Self-confident
10. Ability to manipulate racquet head and produce different spins
11. Multisport athlete: plays other sports to increase athletic foundation (5-10 general sports and 10-13 sport-specific activities)
12. Throwing mechanics: ability to throw a ball well
13. Established partnership: trust between player, parent, and coach
14. Outlier – doesn't necessarily do things the same way as others

The establishment of Certified Regional Training Centers (RTCs) allows USTA Player Development to partner with the best programs in the country, building relationships between America's best coaches, and raising the level of training for the best 8- to 14-year-old juniors. The partnerships also make the transition

of the very best juniors in the country into the USTA's national program more seamless. Currently, USTA Player Development has partnered with 24 RTCs across the country. These programs help train hundreds of junior players (ages 8-14) close to home and help facilitate relationships between personal coaches and national staff. This partnership has become a way of growing the Player Development family. USTA Player Development tracks the development and performance of these juniors and builds strong relationships with their coaches and parents. RTCs are important because:

- A player's technical foundation is built between the ages of 8 and 14.
- A critical coaching phase is 8 to 12 years old for girls and 10 to 14 years old for boys.
- Maturity is a function of socialization.
- It's a TEAM effort: RTCs help to create hubs of collaboration and cooperation, which will greatly increase the number of juniors developed.

Regional Training Center Camps, which are weekend-long training sessions, give juniors in the 17 USTA sections an opportunity to receive high-performance training near their homes and provide competitive opportunities for talented juniors who might not otherwise be able to afford such training. RTC Camps help USTA Player Development to recruit and retain the most important resource: young athletes ages 8 to 13. By increasing the number of young athletes recruited and retained, USTA Player Development can grow the player pool of junior players and create a new wave of world-class tennis professionals in the years to come. It all starts with building the base of players.

USTA Player Development recognizes that the Player Identification system is fluid, allowing for players to bloom based on their maturity and physiology.

USTA Player Development Player Identification occurs in three ways:

1. USTA national coaches identify young athletes at camps and tournaments throughout the country and begin to track them.
2. Coaches in USTA sections, and specifically coaches on USTA Section's Coaches Commissions, identify young athletes in their programs or at local tournaments, and contact USTA national coaches, who then begin to track the players.
3. Sectional coaches' commissions identify players who will participate in RTC Camps.

Once players are tracked, the USTA Player Development coaches nurture talent by supporting the player, family, and coach through coaching and training support. They also nurture talent by inviting promising young athletes to Player Development camps at the three USTA National Training Centers—the USTA Training Center Headquarters in Boca Raton, Fla.; the USTA Training Center West in Carson, Calif.; and the USTA Training Center East at the USTA Billie Jean King National Tennis Center in Flushing, N.Y.

COACHING

SYNOPSIS

- If 10 and Under Tennis is to succeed, coaches must be well-versed in all aspects of 10-and-under tennis and must recognize that children are not miniature adults.
- One hope of *Positioning Youth Tennis for Success* is to help develop a unified and comprehensive tennis coaching program for America's youth.

Coaching provides a wonderful opportunity to develop young children as people, as athletes, and as tennis players. As noted previously, coaches are ranked as the #1 positive influence on today's youth involved in sport.[137] If tennis coaches are to succeed in influencing our youth in a positive manner, they must understand that children are not miniature adults, and they must recognize that children need to develop in a multi-dimensional manner that is age- and developmental-appropriate.[93, 121] In the United States, there are several pathways to becoming a tennis coach, but they are not unified. Furthermore, there are very few coaching workshops that provide a broad overview of 10 and Under Tennis.

Positioning Youth Tennis for Success can become the foundation of developing a unified and comprehensive approach to teaching tennis to America's youth. We hope that a unified coaching pathway will emerge that is developed jointly by the USTA, Unites States Professional Tennis Association (USPTA), and Professional Tennis Registry (PTR), and that will address the following key issues:

- Understanding children
- Health, wellness, and injury prevention in children
- Long-term athlete development
- Athletic skill development
- Tennis-specific development
- Training and competition guidelines in children
- Competition for children
- Helping the child to transition in sport and in life

As 10 and Under Tennis may lead to an exponential increase in tennis play among children, we must be prepared to guide our children in the appropriate manner.[121] We must also be prepared to raise the standard of coaching education and certification in a manner that is consistent with international standards.[93] As we launch this exciting 10 and Under Tennis initiative for children, we hope that all pertinent stakeholders will join forces to embark on a coaching education and certification program that will promote and develop our greatest asset—the developing tennis player—in a consistent, reliable, and widely accessible manner.

We hope that a unified coaching pathway will emerge.

PARENTING

SYNOPSIS

- Good tennis parenting involves a combination of providing support, knowing when to push, and focusing on the developmental process rather than on winning.
- The "optimal parent push" means motivating a child without placing undue pressure on the child to succeed.

The primary goal of parenting is to do what is right for our children. 10 and Under Tennis can become an ideal vehicle for parents to promote health and well-being in their children, and it can foster a pathway for some children to become top-ranked tennis players. The important issue is for parents to understand what they are trying to accomplish when they encourage their children to play tennis.[138] As noted earlier in this text, youth sport should ideally promote athleticism with character development.[7, 137] For some, this may lead to a lifelong journey of keeping fit through exercise and sport. For others, this may lead to a competitive pathway of scholastic varsity sports, national competition, and even international competition. If the parenting goals are clearly defined, and if the parent is well-informed, then there is a greater chance of succeeding in doing what is right for our children.[138]

Most children are introduced to tennis through their parents, and therefore the parent's attitude will greatly influence the child's perception of the game.[57, 58] Ideally, the parent will reinforce that the basis of 10 and Under Tennis should be to have fun. If a child is having fun, then he or she will want to continue to play tennis. Having fun should be intermixed with participating in a multitude of sports with a goal of overall athletic development. A child should not be forced to play tennis exclusively; furthermore, playing tennis should be intermixed with playing other sports throughout the week. The foundation of all great competitors and lifelong sport enthusiasts is a solid foundation in athleticism rather than a singular focus on one sport. Remember, help develop the athlete before developing the player.[7]

As children begin playing tennis, they rely on their parents to provide emotional, logistical, financial, and organizational support. The balancing act is to provide this support while fostering an environment in which the child will thrive. Dr. Daniel Gould, Director of the Institute for the Study of Youth Sports has demonstrated through research that the majority of tennis parents have a positive influence on their child's development. They provide a positive influence that is based on love and support, and that emphasizes hard work, taking responsibility for one's actions, and good sportsmanship. A significant minority (35 percent) of tennis parents adopt an inappropriate perspective that overemphasizes winning and rankings at the expense of long-term athlete development.[57, 58]

Dr. Gould defines what he terms the "optimal parent push" as understanding how to motivate a child when he or she is being lazy or is not doing what is needed to develop as an athlete and tennis player, while not placing undue pressure on the child to succeed. Optimal parent push is dependent on a number of factors, including age, athletic potential, and intrinsic self-motivation. Optimal parent push can work in conjunction with good coaching, and it often involves knowing when to let go so that the coach can do his or her job. Coaches perceive that optimal parent push goes wrong (that is, when it is no longer optimal) when the focus is on winning, when guilt is a component of parent motivation, or when the parent fails to recognize negative reactions from the child.[53]

Research has identified the following Top 7 parent-player positive interaction behaviors (as exhibited by parents):

1. Discipline child for poor behavior/ handle poor behavior effectively
2. Exhibit a balanced approach, supportive but not overbearing
3. Provide financial support
4. Stay calm and control emotions
5. Sacrifice for child (time, effort)
6. Focus on the performance, not the outcome
7. Provide unconditional love and caring

The consequences of positive interactions between parents and players are that the developing player:

- Becomes a better person
- Has enhanced friendships and social benefits
- Takes a grounded, not-above-others perspective
- Has a positive experience

Research has also identified the Top 7 parent-player negative interaction behaviors (as exhibited by parents):

1. Exhibit an outcome orientation (i.e., primarily invested in the outcome, not the effort)
2. Are negative and overbearing
3. Apply pressure to win or perform
4. Make tennis too serious
5. Are over-involved and controlling
6. Compare child to other players
7. Distract child during the match

The consequences of negative interactions between parents and players include:

- Increased pressure on the player
- Development of player inhibition
- Lack of player motivation
- Player distraction on-court[53, 57, 58]

Coaches perceive that optimal parent push goes wrong when the focus is on winning.

Parents are in the difficult position of doing what is right for the child while avoiding living vicariously through the child's results. The evidence-based approach in *Positioning Youth Tennis for Success* provides a foundation for the parent to help his or her child develop as an athlete and as a person with integrity. For those children who emerge with tennis talent, the parent must negotiate how to guide the child while encouraging self-motivation and independence. For the gifted tennis athlete, the USTA Player Development pathway provides an extended family-oriented approach that couples coaching expertise with long-term athlete development, always with an eye on promoting health and wellness in our greatest asset—the developing tennis athlete.

CONCLUDING REMARKS

10 and Under Tennis is an exciting program that opens the door to myriad possibilities for the USTA and for America. It is not only an ideal solution to help kids become physically active in a healthy and safe manner, but is also a wonderful opportunity to provide a multitude of pathways for the developing child. For 10 and Under Tennis to succeed, parents, coaches, and all tennis stakeholders need to understand the essential foundation of this program: 10 and Under Tennis is for children, must be based on fun, and requires an educated intervention if the program is to succeed.

So what, then, are the next steps? If we are truly invested in positioning youth tennis for success, we must be willing to use empirical evidence as a steppingstone for thoughtful training, competition, and transition guidelines for 10 and Under Tennis while being ever mindful of the health and well-being of the developing child. Tennis stakeholders in the United States need to address the following key areas, while being committed to analyzing programs over time:

At what point do we start ranking kids? Rankings are a powerful motivator and a just reward for hard work. The key is to find the proper balance of motivation versus stunting interest and deflating a kid's desire to compete. There is solid evidence that national rankings for 10-and-under tennis are inappropriate. The development of sectional placements might be considered in the context of providing a reward for participation and encouraging multiple types of fun, competitive events.

How do we advise coaches and parents about when a child should specialize in tennis? Specialization is a process and not an "all-or-none" phenomenon. Even though top players should not begin tennis specialization until puberty, they must make a serious commitment to the game by age 12 if they hope to become a Top 200 player. Commitment is a long-term process, and the key is to nurture commitment over time. Commitment is not the same as specialization; a 12- or 14-year-old child may commit to tennis while continuing to explore other sports and other aspects of athletic development. Specialization is a process that should not be forced on the individual, and it is ideally a commitment that a highly motivated individual makes repeatedly over time.

What is the appropriate duration and frequency of competitive events? We understand that adult-model competition does not work for children, and we must be willing to implement a competitive structure that makes sense for the developing child and adolescent. For 10 and Under Tennis, short-duration matches make sense. But how do we transition to longer matches after age 10? Currently, some kids play longer matches repeatedly on the same day than what is allowed in professional tennis. Surely there must be a better way, and we must be willing to explore what makes sense.

How do we make tennis competition more accessible, more affordable, and more attractive to parents and kids? More of the same is not an acceptable answer. The poor rates of tennis competition participation in children relative to soccer should awaken us to the realization that our competitive structure needs a makeover.

We hope that *Positioning Youth Tennis for Success* will become the springboard for addressing these questions and more as we develop the policies and procedures for placing 10 and Under Tennis at the foundation of tennis development in the United States. We further hope that all tennis stakeholders will commit to analyzing the policies and procedures that are developed, and we hope to present such analysis at a future USTA Youth Tennis Symposium. We are all learning together for the sake of our children—and for the love of our sport.

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APPENDIX I
ITF RULES OF TENNIS 2012

10 AND UNDER TENNIS COMPETITION

Courts: In addition to the (full-sized) court described in Rule 1, the following court dimensions may be used for 10-and-under tennis competition:

- A court, designated "red" for the purposes of 10-and-under tennis competition, shall be a rectangle, between 36 feet (10.97 m) and 42 feet (12.80 m) long, and between 14 feet (4.27 m) and 20 feet (6.10 m) wide. The net shall be between 31.5 inches (0.800m) and 33.0 inches (0.838m) high at the centre.
- A court, designated "orange", shall be a rectangle, between 58 feet (17.68 m) and 60 feet (18.29 m) long, and between 20 feet (6.10 m) and 27 feet (8.23 m) wide. The net shall be between 31.5 inches (0.800 m) and 36.0 inches (0.914m) high at the centre.

Balls: From January 2012, only the following ball types can be used in 10-and-under tennis competition:

- A stage 3 (red) ball, which is recommended for play on a "red" court, by players aged up to 8 years, using a racket up to 23 inches (58.4 cm) long.
- A stage 2 (orange) ball, which is recommended for play on an "orange" court, by players aged 8 to 10 years, using a racket between 23 inches (58.4 cm) and 25 inches (63.5) cm long.
- A stage 1 (green) ball, which is recommended for play on a full-sized court, by advanced players aged 9 to 10 years, using a racket between 25 inches (63.5 cm) and 26 inches (66.0 cm) long.

Note: From January 2012, other ball types described in Appendix I cannot be used in 10-and-under tennis competition.

All tests for rebound, mass, size and deformation shall be made in accordance with the regulations described in the current edition of ITF Approved Tennis Balls, Classified Surfaces & Recognised Courts.

Scoring methods: For 10-and-under tennis competition using stage 3 (red), stage 2 (orange) or stage 1 (green) balls, scoring methods specified in the Rules of Tennis can be utilised, in addition to short-duration scoring methods involving matches of one match tie-break, best-of-3 tie-breaks/match tiebreaks or one set.

SPECIFICATIONS FOR STAGE 1, 2 AND 3 BALLS

	Stage 3 (Red) Foam	Stage 3 (Red) Standard	Stage 2 (Orange) Standard	Stage 1 (Green) Standard
Mass (Weight)	25.0-43.0 grams (0.882-1.517.ounces)	36.0-49.0 grams (1.270-1.728 ounces)	36.0-46.9 grams (1.270-1.654 ounces)	47.0-51.5 grams (1.658-1.817 ounces)
Size	8.00-9.00 cm (3.15-3.54 inches)	7.00-8.00 cm (2.76-3.15 inches)	6.00-6.86 cm (2.36-2.70 inches)	6.30-6.86 cm (2.48-2.70 inches)
Rebound	85-105 cm (33-41 inches)	90-105 cm (35.41 inches)	105-120 cm (41-47 inches)	120-135 cm (47-53 inches)
Forward Deformation	---------	---------	1.40-1.65 cm 0.551-0.650 inches)	0.80.1.05 cm (0.315-0.413 inches)

APPENDIX II
USTA YOUTH TENNIS SYMPOSIUM SPEAKERS AND ATTENDEES

Kirk Anderson (attendee)
Director of Training, Youth Tennis, USTA

Gary Avischious (speaker)
Author, speaker, coach & founder, CoachingSchool

Tom Avischious (speaker)
Field Services Director, USA Swimming

Istvan Balyi (speaker)
Coaching Educator and Developer of Long-Term Athlete Development Model

Jessica Battaglia (attendee)
Coordinator of Coaching Education and Sport Science, USTA Player Development

Michael Bergeron, PhD (speaker)
Executive Director, National Youth Sports Health & Safety Institute

Nick Bollettieri (attendee)
IMG Academies

Doug Booth (attendee)
Executive Director, USTA Florida

Karin Buchholz (attendee)
Director of Community Outreach & Education, USTA

John Callen (attendee)
Executive Director, USTA Southern

Andrea Calvert-Sanders (attendee)
Former Director of Junior Competition, USTA Midwest

Jorge Capestany (attendee)
10 and Under Task Force Committee Member

Liz Chaffin (attendee)
Medical Coordinator, USTA

Ingrid Chen (attendee)
Director of 10 and Under Tennis, USTA

Virgil Christian (attendee)
Director of Community Development, USTA

Hugues de Castilla (speaker)
Technical National Director, French Tennis Federation

Max de Vylder (speaker)
Research & Development Manager, Lawn Tennis Association

Jean Desdunes (attendee)
Senior Director of Junior Competition, USTA

K. Anders Ericsson, PhD (speaker)
Conradi Eminent Scholar and Professor of Psychology, Florida State University

John Evert (attendee)
Director of High Performance & Tour Professionals, Evert Tennis Academy

Rick Ferman (speaker)
Former USTA Executive Director and Chief Operating Officer

Sean Ferreira (attendee)
10 and Under Task Force Committee Member

Andy Gladstone (attendee)
Competitive Tennis Coordinator, USTA Florida

Brian Hainline, MD (speaker)
Chief Medical Officer, USTA

Feisal Hassan (attendee)
USPTA Representative

Michael Howell (speaker)
Shoulder Center of Kentucky—Conditioning Programs and Throwing Clinic

Tom Jacobs (attendee)
Managing Director of Business Affairs, USTA Player Development

Craig Jones (speaker)
Director of Youth Play and Competition, USTA

Kent Kinnear (attendee)
Director of Player Identification & Development, USTA Player Development

Monica Kirmayer (attendee)
Assistant Manager of Marketing, USTA

Mark Kovacs, PhD (speaker)
Coaching Education and Sport Science, USTA Player Development

William Kraemer PhD (speaker)
Professor, Department of Kinesiology, Human Performance Laboratory, University of Connecticut

Whitney Kraft (attendee)
Director of NTC Tennis Programs, USTA

Andre Labelle (attendee)
U12 National Coach, Tennis Canada

Dave Licker (attendee)
Junior Academy Director, Lakes Tennis Academy

Dan Limbago (attendee)
National Manager of NJTL, USTA

James Loehr, EdD (speaker)
Co-Founder, the Human Performance Institute, Orlando, Florida

Paul Lubbers, PhD (speaker)
Director of Coaching Education and Sport Science, USTA Player Development

Patrick McEnroe (speaker)
General Manager, USTA Player Development

Andy McFarland (attendee)
Associate Executive Director, USTA Florida

Ken Martel (speaker)
Director USA Hockey American Development Model

Todd Martin (speaker)
Director at Large, USTA Board of Directors

Dave Miley (speaker)
Executive Director of Tennis Development, International Tennis Federation

Bill Mountford (attendee)
Marketing Development Specialist, USTA

Marikate Murren (attendee)
Former National Manager of Jr. Team Tennis, USTA; current Executive Director, USTA New England

Bill Ozaki (attendee)
Director of Player Development, USTA Southern

Scott Paluch (attendee)
Regional Manager, USA Hockey

Anne Pankhurst (speaker)
Former Coach Education Director, Lawn Tennis Association

Vesa Ponkka (attendee)
Senior Director of Tennis, Junior Tennis Champions Center

David Sanz (speaker)
Director Coaches Education and Research Department, Spanish Tennis Association

Mark Saunders (attendee)
Executive Director, USTA Midwest

Scott Schultz (speaker)
Managing Director, Youth Tennis, USTA

Walter Taylor III, MD (speaker)
Program Director, Sports Medicine Fellowship, Mayo Clinic, Jacksonville, Florida

David Westerdahl, MD (speaker)
Department of Orthopedic Surgery, Cleveland Clinic Florida and USTA Player Development Consultant

James Whitehead (attendee)
Executive Vice President, American College of Sports Medicine

APPENDIX III
USTA YOUTH TENNIS SYMPOSIUM AGENDA

(in conjunction with the National Youth Sports Health & Safety Institute)

February 10-11, 2012
Tampa, Florida

AGENDA: DAY 1
FRIDAY, FEBRUARY 10, 2012

Time	Activity	Presenter
8:00 a.m. – 8:10 a.m.	**Welcome and Introduction**	Brian Hainline, MD
	The USTA 10 and Under Project:	
8:10 a.m. – 8:25 a.m.	Broad Objectives	Scott Schultz
8:25 a.m. – 8:40 a.m.	Player Development Concerns	Patrick McEnroe
8:40 a.m. – 9:00 a.m.	National Youth Sports Health & Safety Institute Perspective	Michael Bergeron, PhD
	Overview of Pre-Pubertal Children:	
9:00 a.m. – 9:30 a.m.	Gender and Development	David Westerdahl, MD
9:30 a.m. – 10:00 a.m.	Psychological/Emotional	Jim Loehr, PhD
10:00 a.m. – 10:10 a.m.	Break	
10:10 a.m. – 10:40 a.m	Cognitive/Learning	K. Anders Ericsson, PhD
10:40- a.m. – 11:10 a.m	Medical Concerns	Walter Taylor, MD
11:10 a.m. – 11:30 a.m.	**Character Development**	Todd Martin
11:30 a.m. – 12:00 p.m.	**Roundtable Discussion**	
12:00 p.m. – 1:00 p.m.	**Lunch**	
1:00 p.m. – 1:30 p.m.	**Long Term Athlete Development: Overview**	Istvan Balyi, PhD
	Three Model Sports:	
1:30 p.m. – 2:00 p.m.	Hockey	Ken Martel
2:00 p.m. – 2:30 p.m.	Baseball	Mike Howell
2:30 p.m. – 3:00 p.m.	Swimming	Tom Avischivous
3:00 p.m. – 3:10 p.m	**Break**	
3:10 p.m. – 4:40 p.m	**Roundtable Discussion**	
	Maximizing the Tennis Player's Competitive Potential: Sport Science Perspective	
4:40 p.m. – 5:10 p.m	Strength & Conditioning Guidelines	William Kramer, PhD
5:10 p.m. – 5:40 p.m.	Recovery & Periodization	Mark Kovacs, PhD
7:30 p.m.	**Dinner (meet in lobby at 7:10 p.m.)**	

AGENDA: DAY 2
SATURDAY, FEBRUARY 11, 2012

Time	Activity	Presenter
8:00 a.m. – 8:30 a.m.	**International Perspective**	Dave Miley
8:30 a.m. – 9:00 a.m.	**Early Specialization: Broad Perspective**	Gary Avischious
9:00 a.m. – 10:30 a.m.	**Early Specialization: Tennis Specific Concerns**	Max de Vylder Anne Pankhurst
10:30 a.m. – 10:40 a.m.	**Break**	
10:40 a.m. – 11.00 a.m.	**Lessons Learned: Eliminating Ranking and National Tournaments in Adolescents**	Rick Ferman
11:00 a.m. – 12:00 p.m.	**Roundtable Discussion**	
12:00 p.m. – 1:00 p.m.	**Lunch**	
1:00 p.m. – 2:00 p.m.	**Training and Competition: Finding the Proper Balance**	Hugues de Castilla Anne Pankhurst
2:00 p.m. – 3:00 p.m.	**Transition from Red to Orange to Green Balls**	Hugues de Castilla Max de Vylder
3:00 p.m. – 3:15 p.m.	**Break**	
3:15 p.m. – 4:45 p.m.	**Transition from 10 and Under to 12s:** International Perspective US Player Development Perspective US Community Tennis Perspective	 David Sanz Paul Lubbers, PhD Craig Jones
4:45 p.m. – 5:45 p.m	**Roundtable Discussion**	
	Concluding Remarks	Brian Hainline, MD

USTA YOUTH TENNIS SYMPOSIUM ORGANIZING COMMITTEE

Program Chairs:
Brian Hainline, MD
Scott Schultz

Science Advisor:
Mark Kovacs, PhD

Coaching Advisors:
Kirk Anderson
Jose Higueras
Paul Lubbers, PhD
Patrick McEnroe

Community Outreach Advisor:
Kurt Kamperman

Competition Advisors:
Lew Brewer
Craig Jones

Symposium Coordinator:
Jessica Battaglia

APPENDIX IV
THREE REPRESENTATIVE SPORTS AND LONG-TERM ATHLETE DEVELOPMENT

HOCKEY

Hockey, like tennis, is a late-specialization sport. USA Hockey has realized that the push to develop super 8-year old and super 9-year-old teams led to the development of children who peaked early (usually in association with early puberty) but who did not become great players later in life. Children under the age of 10 do not have the developmental and cognitive capacity to understand the importance of puck passing in a team manner. It is more important at this age to practice general athletic skills and to learn to survive the pack with the puck.[91]

The table below indicates Olympic participation relative to total population and hockey facilities. It is noteworthy that countries such as Sweden and Finland do extraordinarily well relative to their total populations and available facilities. This is in keeping with their very high standings in teaching physical literacy at a young age. (See "America's Health" for more.) The model in such countries is to teach sound athleticism prior to focusing on specific sport development. This is the model that USA Hockey is now developing.[91]

IIHF SURVEY OF PLAYERS — OLYMPIC PARTICIPANTS 2010

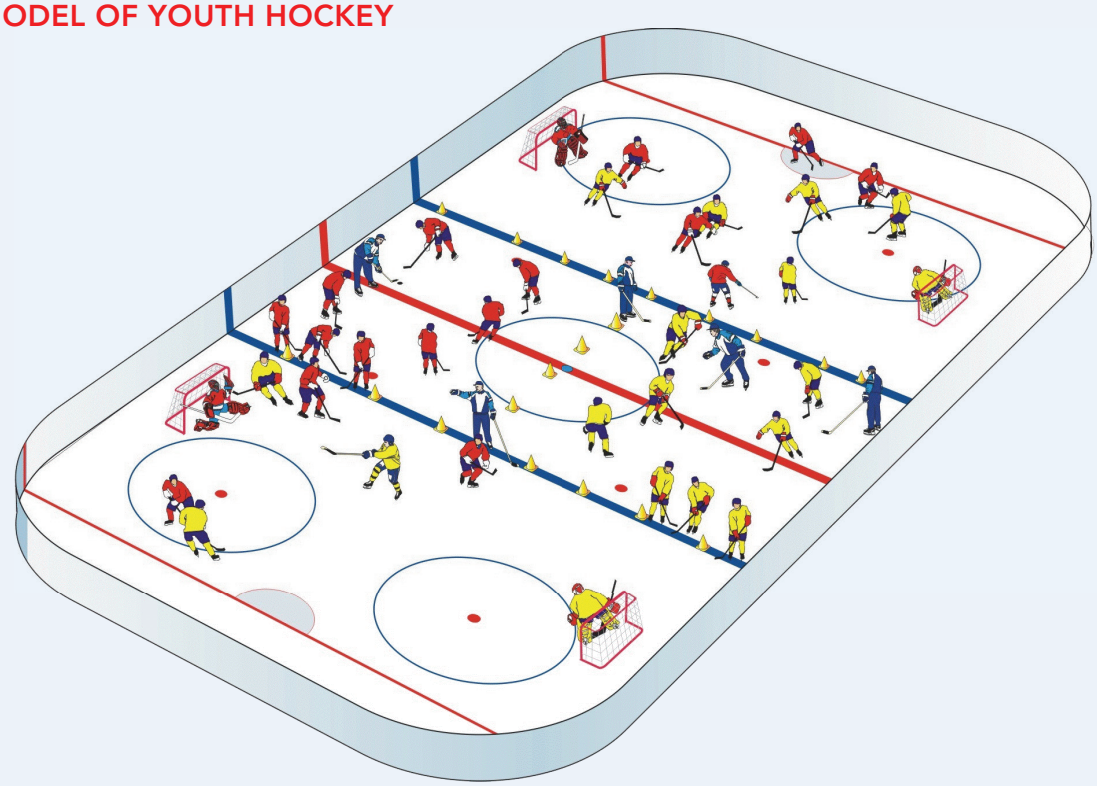
Federation	Registered Players				Indoor Rinks	National Population
	Total	Senior	Jr./Youth	Female		
Canada	572,411	18,488	468,096	85,827	2,486	34,030,589
United States	500,579	132,866	302,104	65609	1,800	313,232,044
Russia	63,-58-	2.050	61,000	530	340	139,739,892
Minnesota	52,333	7,099	46,351	12,250	194	5,303,925
Sweden	62,003	17,875	41,053	3,075	324	9,088,728
Massachusettes	43,445	3,381	40,064	8,550	134	6,547,629
Finland	65,251	25,324	35,167	4,760	246	5,259,250
New York	46,389	11,806	35,583	5,264	158	19,378,102
Michigan	51,404	19,186	32,394	54,429	127	9,883,640
Czech Republic	100,668	75,671	22,828	2,169	157	10,190,213
Germany	28,932	8,624	18,129	2,580	175	81,471,834
Switzerland	26,166	11,219	13,775	1,172	158	7,639,961
Slovakia	8,280	2,072	5,896	327	47	5,477,038
Norway	6,177	1968	3,709	500	41	4,440,539
Latvia	4,424	2,930	1,417	149	17	2,204,708

Source: USA Hockey

In analyzing early specialization programs, USA Hockey discovered very poor results. For example, in Illinois there are 10-and-under elite teams that are channeled into four programs. However, five years later 80 percent of ongoing elite hockey players come from programs that were non-specialized at a young age. A more careful analysis demonstrated that the 10-and-under elite players were simply those that were more developmentally mature at that age, thus giving them a competitive advantage while ignoring overall athleticism.[91]

USA Hockey is now encouraging the development of sound athletic programs that involve skating only six months a year. Play is on a modified rink, as shown below, which is very similar to 10 and Under Tennis. USA Hockey specifically has developed the "American Development Model," which is based on Balyi's long-term athlete development model of age-appropriate training and competition for kids. One problem that USA Hockey is facing is the cultural argument that playing hockey on a modified rink with modified rules is not "real" hockey. Over time, the organization hopes to shift the culture and to emulate Sweden, which continues modified hockey for children under age 10.[91]

MODEL OF YOUTH HOCKEY



Source: USA Hockey

BASEBALL

Baseball, like tennis and hockey, is a late-specialization sport. Baseball is especially noteworthy because the biomechanics of the baseball pitch share similarities with the tennis serve.[69] One of baseball's biggest problems is the loss of players between ages 14 and 16. In part this is because there are many competing interests in baseball, without a uniform approach to training and competition, including the Amateur Athletic Union (AAU), the United States Specialty Sports Association (USSSA), and the ESPN Little League World Series, which is an international baseball tournament held for players between the ages of 11 and 13 and run by Little League Baseball Inc.[69] As noted previously, no pitcher in the ESPN Little League World Series has ever pitched in Major League Baseball.[42] With competing organizations and an emphasis on early competitive development, baseball has lost many players due to early peak, burnout, and/or injury.

Baseball does provide a good rule of thumb for pitchers, which differs markedly from the lack of any specific guidelines for the total amount of tennis serves players should hit in a day, month, or year. There is an increasing emphasis on injury prevention in pitchers. They are encouraged to develop their overall athletic skills, coupled with proper technique and strength training in the legs and core musculature.[86, 103] The guiding principle is to limit the number of pitches in a game and in a week, as noted in the table below.

Clinical data demonstrate clearly that injured pitchers:

- Play more months per year
- Play more games per year
- Pitch a greater number of innings per game
- Have higher pitch counts
- Throw more warm-up pitches
- Pitch more total innings
- Pitch more often with arm fatigue and/or pain[69]

RECOMMENDED MAXIMUM NUMBER OF PITCHES

Age	Max. Pitches/ Games	Max. Games/ Week
8 – 10	50	2
11 – 12	60	2
13 – 14	75	2
15 – 16	85	2
17 – 18	105	2

Source: M. Howell, USTA Youth Tennis Symposium, 2012

RECOMMENDED REST BETWEEN PITCHING OUTING

Age	1 Day of Rest	2 Days of Rest	3 Days of Rest	4 Days of Rest
8 – 10	20 – 30	30 – 35	35 – 40	40 – 45
11 – 12	20 – 30	30 – 40	40 – 45	45 – 50
13 – 14	20 – 30	30 – 40	40 – 50	50 – 60
15 – 16	20 – 30	30 – 40	40 – 55	55 – 70
17 – 18	20 – 30	30 – 45	40 – 60	60 – 80

Source: M. Howell, USTA Youth Tennis Symposium, 2012

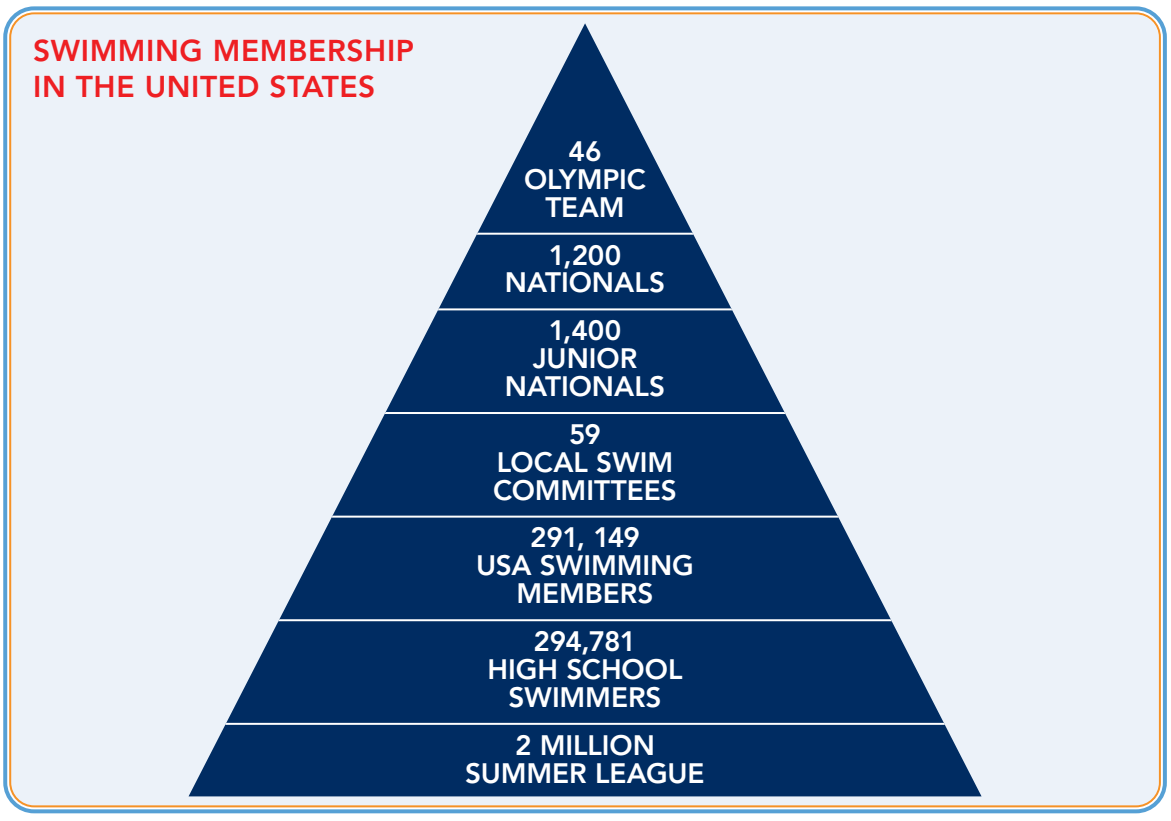
When young pitchers are not allowed to recover properly, and when they pitch more than eight months per year, the risk of shoulder and elbow pain requiring surgery is five times higher than in pitchers who follow pitch-count recommendations. The data are even specific with regard to the number of rest days in relation to the total number of pitches, as noted in the table on the previous page.[103]

Although there is not a direct comparison, this pitching limitation, which is based on injury-prevention data, stands in sharp contrast to the lack of guidelines for serving in tennis. Ten-year-old children who play competitive tennis may serve 25,000 to 30,000 times per year, which contrasts sharply with an approximate 800-pitch limit per year in baseball.[77] At this point, we do not have developmental serving limitation guidelines in tennis.

SWIMMING

There are approximately 2 million summer league swimmers, and about 300,000 are members of USA Swimming. Virtually all USA Swimming members are also members of a swim club, which differentiates swimming from tennis. Swimming does not hold national championships prior to 18-and-under. The qualification for the national championship is based on time and not age. Before this, all championships take place at the local and state level.[4] The pyramid below shows the breakdown of swimming members at various levels of competitive development.

Swimming research analysis of the top 100 kids in each age division reveals that only three children who were ranked in the Top 100 in freestyle in the 10-and-under age category were ranked in the Top 100 for 17-18-year-olds. An analysis of



Source: USA Swimming

all strokes reveals that only 10 percent of top-ranked 10-and-under swimmers will be ranked in the 17-18-year-old category. Thus swimming, like tennis, is a late-specialization sport. More revealing is that swimming data indicate that there is no predictive value in talent identification prior to puberty.[4] With an early emphasis on results, the child peaks early but will likely miss the opportunity to explore his or her full potential. Furthermore, it is important to understand why most kids like to swim. As the table to the right demonstrates, kids like to swim to have fun.

USA Swimming has developed a progressive training model that is noted in the chart below. In 10-and-under swimming, kids are training in the pool for 15 minutes twice weekly, and for 30 minutes three times weekly. They are also encouraged to spend "dryland" time five times weekly. The amount of swim time gradually increases with each successive age group.[4]

WHY KIDS SWIM

Enjoy/Fun	28%
Fitness	15%
Be With Friends	13%
Compete	13%
Improve	8%
Meet New People	8%

Suzie Tuffey, Ph.D., USOC, Understanding Factors Influencing Dropping Out Versus Continuing Participation in Age Group Swimming. Identified from open-ended responses.

USA SWIMMING PROGRESSIVE TRAINING MODEL

	Bronze	Silver	Gold
Ages	9 – 10	11 – 12	11 – 12
Instructions vs. Training	70% instruction/ 30% Training	40% Instruction/ 60% Training	30% Instruction/ 70% Training
Water Time	1:15 2x/week 1:30 3x/week	1:15 2x/week 1:30 3x/week	10.5 hrs/wk school
Dryland Time	15 min 3x/week 30 min 2x/week	15 min 3x/week 30 min 2x/week	2 hours/week + 3 days of 15 min stretching
Attendance	Ideal: 75% or greater Min: 50%	Ideal: 80% or greater Min: 60% (3 of 5)	Ideal: 85% or greater Min: 75% (9 out of 12 for 2 wk period)

Source: USA Swimming

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usta.com

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