What it takes to keep your tennis players healthy?

www.emoryhealthcare.org/tennismedicine
I’M TOLD I LIKE TENNIS
New Doubles Partner-Millan Jayanthi
GOLF-Athleticism
TENNIS-Athleticism
The specialized comprehensive care of medical and musculoskeletal issues of junior competitive, adult recreational, and elite level tennis players to optimize participation and performance in tennis.

www.emoryhealthcare.org/tennismedicine
Tennis Medicine

- On court evaluations
- Tennis specific partners
- Education Research
- Tennis Performance Training
- Relationships with teaching professionals and clubs
- Tournament Coverage
- Tennis-Specific Rehab

EMORY SPORTS MEDICINE CENTER
Comprehensive EXPERT TENNIS-SPECIFIC MEDICAL CARE

• Clinical
  – Tennis-specific history
  – Tennis-specific clinical exams and treatments
  – On court evaluations
• Continuing Tennis Education
  – Tennis-specific patient ed
• Research
  – Creating and/or applying evidence
• Injury Prevention/Performance
• Comprehensive care
  – Nutrition, psychology
• Tennismedicine.org
• iTPA-tennis.org
Objectives

• 1. Discuss evidence based player development and potential risks of injury in junior and elite players
• 2. Discuss potential stroke related risks and on court modifications
• 3. Do some college tennis player cases
Player Development
Why Kids Shouldn't Specialize in One Sport

Posted: 09/18/2015 7:00 am EDT | Updated: 09/18/2015 12:59 pm EDT

Jennifer Breheny Wallace | Freelance writer, blogger at EmpoweringParents.com

Single-Sport Athletes Don't Always Win

By Tom Farrey | Sep 2, 2015
Special to espnW.com
Urban Meyer

OHIO STATE RECRUITS BY URBAN MEYER

MULTI-SPORT IN HIGH SCHOOL

FOOTBALL ONLY IN HIGH SCHOOL

ONLY PLAY FOOTBALL?

#WWU5
NCAA studies

Di-Fiori, et al.
296 student athletes vs 164 students
Similar age of specialization (14-17 y/o)
Parent or sibling in competitive sports (p<0.001)
Unpublished

Malina et al.
376 Div 1 Female athletes
17% specialized (highest rates in individual sports)

Jayanthi, et al.
318 student athletes
Many chose their Univ sport as main sport in elem school
Many played multiple sports in high school without year round training
Unpublished
Early Specialization Programs-Talent Identification

• “Reviews of the talent detection and identification literature in sport, however, show that long-term prediction of talented athletes is unreliable, especially when detection of talent is attempted during the prepubertal or pubertal growth periods”

• Cote 2014
Training for success

Retrospective review of top 10 men’s players and mean number of tournaments

- 17 y/o = 11.0
- 18 y/o = 15.2
  - Reid M et al. 2009

Successful elite players

- Train less <15 y/o
- Have same coach
- Fewer demands for success
  - Carlson, et. al. 1985
Training for Success

- European U-14 tournaments (top down and bottom up approach)

  - U-14 success can lead to elite level success, however under-14 tournament success is not necessary to develop later elite level success.
Training and sports specialization risks in junior elite tennis players

Neeru Jayanthi, MD
Amanda Dechert, MS2
Amy Luke, PhD
Ramon Durazo-Arvisu, PhD
Loyola Stritch School of Medicine
Methods

• Design: Prospective cohort study

540 players consented

519 sufficiently completed baseline survey

21 medically withdrew

498 did NOT medically withdraw

Summer Tournament Play
Training profiles of US Junior Elite

- Median 16-20 hours/week training
- 11-25 tournaments/year
- 70% specialized in tennis

- Mean age specialization 10.4
What have we learned about Sports Specialization?

Sports Specialization in Young Athletes: Evidence-Based Recommendations

Neeru Jayanthi, MD,**†† Courtney Pinkham, BS,‡ Lara Dugas, PhD,† Brittany Patrick, MPH,§ and Cynthia LaBella, MD‖

POSITION STATEMENT

Overuse Injuries and Burnout in Youth Sports: A Position Statement from the American Medical Society for Sports Medicine

John P. DiFiori, MD,* Holly J. Benjamin, MD,† Joel Brenner, MD, MPH,‡ Andrew Gregory, MD,§ Neeru Jayanthi, MD,‖ Greg L. Landry, MD,‖ and Anthony Luke, MD, MPH**
Defining Sports Specialization

• Intense **Year Round Training in a Single Sport** at the exclusion of other sports

  • Jayanthi et al., DiFiori et al.

Year round training/competition> 8 months)
Choose a main sport
Quit all other sports to focus on one sport
Degree of Specialization

- Overuse and Serious Overuse injuries more likely with increased specialization (Jayanthi)

<table>
<thead>
<tr>
<th>Degree of Specialization</th>
<th>Risk of Injury</th>
<th>Risk of Serious Overuse Injury</th>
<th>Risk of Acute Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low specialization (0 or 1 of the following): Year-round training (&gt;8 months per year) Chooses a single main sport Quit all sports to focus on 1 sport</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
</tr>
<tr>
<td>Moderately specialized (2 of the following): Year-round training (&gt;8 months per year) Chooses a single main sport Quit all sports to focus on 1 sport</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>Highly specialized (3/3 of the following): Year round training (&gt;8 months per year) Chooses a single main sport Quit all sports to focus on 1 sport</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
</tbody>
</table>

*Reproduced with permission from Jayanthi et al.*
# Sports Specialization Rates (Tennis)

<table>
<thead>
<tr>
<th>Sports</th>
<th>Highly specialized</th>
<th>Low specialization</th>
</tr>
</thead>
<tbody>
<tr>
<td>baseball</td>
<td>15.42%</td>
<td>50.25%</td>
</tr>
<tr>
<td>basketball</td>
<td>20.51%</td>
<td>47.34%</td>
</tr>
<tr>
<td>cheerleading</td>
<td>28.30%</td>
<td>41.51%</td>
</tr>
<tr>
<td>cross country</td>
<td>27.62%</td>
<td>43.81%</td>
</tr>
<tr>
<td>dance</td>
<td>25%</td>
<td>34.72%</td>
</tr>
<tr>
<td>diving</td>
<td>38.46%</td>
<td>30.77%</td>
</tr>
<tr>
<td>football</td>
<td>12.32%</td>
<td>42%</td>
</tr>
<tr>
<td>gymnastics</td>
<td>32.97%</td>
<td>21.98%</td>
</tr>
<tr>
<td>lacrosse</td>
<td>26%</td>
<td>42%</td>
</tr>
<tr>
<td>soccer</td>
<td>26.56%</td>
<td>39.06%</td>
</tr>
<tr>
<td>softball</td>
<td>22.89%</td>
<td>45.78%</td>
</tr>
<tr>
<td>swimming</td>
<td>21.50%</td>
<td>45.79%</td>
</tr>
<tr>
<td><strong>tennis</strong></td>
<td><strong>47.95%</strong></td>
<td><strong>50.74%</strong></td>
</tr>
<tr>
<td>track &amp; field</td>
<td>21.84%</td>
<td></td>
</tr>
<tr>
<td>volleyball</td>
<td>24.18%</td>
<td>44.83%</td>
</tr>
<tr>
<td>wrestling</td>
<td>12.20%</td>
<td>48.78%</td>
</tr>
<tr>
<td></td>
<td>Main sport tennis (N=91)</td>
<td>Diversified Tennis (N=59)</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Age (yr)</td>
<td>14.7 ± 1.9 yr</td>
<td>13.1 ± 2.4 yr</td>
</tr>
<tr>
<td>Injuries (%)</td>
<td>89.0% injured (81/91)</td>
<td>77.3% injured (45/59)</td>
</tr>
<tr>
<td>Specialization Score</td>
<td>2.6 ± 0.6</td>
<td>1.8 ± 0.8</td>
</tr>
<tr>
<td>Total hrs</td>
<td>17.7 ± 6.1 hrs/wk</td>
<td>17.1 ± 7.6 hrs/wk</td>
</tr>
<tr>
<td>Tennis hrs</td>
<td>12.5 ± 5.1 hrs/wk</td>
<td>9.1 ± 4.6 hrs/wk</td>
</tr>
<tr>
<td>Free/rec hrs</td>
<td>2.8 ± 3.3 hrs/wk</td>
<td>5.1 ± 4.7 hrs/wk</td>
</tr>
<tr>
<td>Sports training ratio</td>
<td>4.5</td>
<td>1.8</td>
</tr>
</tbody>
</table>
ATP and WTA Player Pathway studies

• Kovacs et al.

• What does it take to get to top 100 and top 10 and by what age?
ATP: Key Takeaways (courtesy, Mark Kovacs PhD)

- Top 10 achieved a Top 100 ranking on average at 18.90
- The average age when individuals entered the Top 100 was 21.96.

Average age of the Top 100 was approximately 28 years of age.

Average height for the Top 100 men does not differ significantly between different groups within the Top 100. Average height is 188cm (6ft 2 inches).

Age at Top 500 was a time point of interest and showed a separation between the different ranking groups within the Top 100.
Over the course of the study, between 40-50% of all Americans that achieved a Top 100 ATP ranking attended a U.S. University to play tennis for at least one year.

However this compares to the 6% (6/100) of the current Top 100 players analyzed in this study.
WTA Key Takeaways (courtesy, Mark Kovacs PhD)

Average height for the Top 100 females does not differ significantly between different groups within the Top 100.

- However a non-significant trend is toward an extra cm in the higher ranked players. Average height is 174cm (5ft 9inches)

Average age of the Top 100 female was approximately 25 years of age.

- The average age when individuals entered the Top 100 was 19.75 years of age.
- The Top 10 achieved a Top 100 ranking at 18.20 years of age (over 1.5 years sooner than the Top 100 player average).

The age at Top 300 was a time point of interest and showed a separation between the different ranking groups within the Top 100.

- This is different to the male ranking progression.
20 yr WTA Age eligibility rule (AER) Otis, et al.

Before AER
- 7% premature retirements

-Phased in Approach
- PDP’s
- 1% premature retirements
- Increased length of careers
Injury Prevention Recommendations

- **Competition**
  - Within a tournament
  - Annual match/tournament volume

- **Training**
  - Weekly volumes
  - Off court injury prevention
  - Specialization

- **Biomechanical risks**
  - Strokes

- **Individual risks**
  - Screening

**Review Article**

Neeru Jayanthi, Erin Feller, Abigail Smith

J Med Sci Tennis 2013; 1(02):

**Junior Competitive Tennis: Ideal Tournament and Training Recommendations**
RECOGNIZING INJURY

- JUNIOR/COMPETITIVE
  - Low Back
  - Medial Elbow
  - Shoulder
  - Knee
  - Ulnar wrist
  - Hip joint (lead hip)
  - Foot/ankle
## Quantifying Injury Risk

<table>
<thead>
<tr>
<th>LEVEL OF RISK</th>
<th>RISK OF ATHLETE</th>
<th>RISK OF INJURY</th>
<th>SPORTS PARTICIPATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH</td>
<td>SPECIALIZED</td>
<td>SPONDYLOLYSIS</td>
<td>RESTRICT</td>
</tr>
<tr>
<td></td>
<td>HIGH VOLUME &gt;10-16 hrs</td>
<td>STRESS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HIGH COMPETITION</td>
<td>FRACTURES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PRIOR INJURY (back)</td>
<td>GROWTH PLATE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RAPID GROWTH</td>
<td>OCD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OLDER, MALE &gt;4th match in tournament</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTERMEDIATE</td>
<td>LOW SPECIALIZE</td>
<td>APOPHYSITIS</td>
<td>TEMPORARY</td>
</tr>
<tr>
<td></td>
<td>INTERMEDIATE GROWTH</td>
<td>APOPHYSEAL</td>
<td>RESTRICTIONS OR</td>
</tr>
<tr>
<td></td>
<td>INTERMED VOL.</td>
<td>AVULSIONS</td>
<td>REDUCE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>INSTABILITY</td>
<td></td>
</tr>
<tr>
<td>LOW</td>
<td>MULTIPLE SPORTS</td>
<td>PATELLOFEMORAL</td>
<td>MINIMAL</td>
</tr>
<tr>
<td></td>
<td>RECREATIONAL</td>
<td>MUSCLE STRAIN</td>
<td>RESTRICTIONS, AS</td>
</tr>
<tr>
<td></td>
<td>LOW VOLUME</td>
<td>TENDONITIS</td>
<td>TOLERATED</td>
</tr>
<tr>
<td></td>
<td>STATIC GROWTH</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Return to Play

- Biomechanical risks
- Sports specific progressions
- Modified play
Stroke changes and injury risk

Upper Extremity

- Rotator cuff tendinitis/impingement/impingement
- Proximal humerus epiphyseal stress fracture/humeral shaft stress reaction

Lumbar spine

- There is no known interventional study testing biomechanical changes and injury risk in junior elite players!

- Jayanthi, Esser, CSMR, 2013
Biomechanical Risks

- 13 yr old appropriate age for kick serve (SORT C)
  - Increased lumbar spine forces
- Kick serve places higher demands on the low back and shoulder
  - Abrams
- More shoulder and elbow stress with limited knee bend (<10 degrees)
  - Fleisig, et al.
- **Recommendation:** Delay kick serve until after age 13 to reduce stressful loads (SORT C)
  - Kovacs, Abrams
Neeru Jayanthi, M.D.

On court stroke modifications in return to play after tennis injury
Methods

• **Study Design:**
  Retrospective case series

• **Subjects**
  – 74 patients who were tennis players (64/74 junior elite/competitive)
  – (2011-2014)
Diagnoses (on court evaluations)

- **Low back pain** (17) (34.0%)
  - Pars stress fracture
  - Lumbar facet/axial low back pain
- **Shoulder pain** (14) (28.0%)
  - Rotator cuff impingement
    - With or without scapular dyskinesis
  - Labral tear
  - Instability
- **Ulnar wrist pain** (9) (18.0%)
  - ECU tendonitis
  - Dequervain’s, ulnar shaft stress injury
- **Medial elbow** (8) (16.0%)
  - UCL
  - Ulnar nerve
  - Triceps
Follow up

• 47/50 (94.0 %) returned successfully to tennis at a minimum of 6 months post on court evaluation
• 1 recurrence, (parents chose surgery for spondylolysis)
• 1 axial low back pain lost to follow up
• 1 is currently unable to play with partial UCL of elbow
Stroke Efficiency Rating (SER)

• Assess risk for future injury
• Optimize/efficiency of the stroke
• 7 areas of risk:
  – Preparation (loading)
  – Acceleration
  – Deceleration
Lumbar extension
Serve: Rear and front knee flexion

Figure 2a: Player demonstrating appropriate knee bend on serve.
Shoulder elevation-90 degrees
• Courtesy
• Mark Kovacs, USTA
Avoid hyperangulation
“Short arm axis”

• TENNIS CHANGES
  – Limit Valgus
  – Slice serves
Medial Elbow Pain in Overhand Athlete

**TENNIS CHANGES**

- Forehand grip
  - Reduce full western
- Almost never see lateral epicondylitis in junior/elite tennis players
Forehand: Wrist Ulnar deviation

Figure 3a: Excess ulnar wrist deviation on a forehand. Figure 3b: Modified ulnar deviation and improved lower body lunge positions. After (reduced ulnar deviation)
Avoid early pronation
Backhand: Wrist ulnar deviation
WHO LISTENS TO THE DOCTOR ANYWAYS!!

• PLAY AS MUCH AS YOU CAN!!!