DOES EARLY SPECIALIZATION LEAD TO ELITE PERFORMANCE?

Neeru Jayanthi, M.D.
Associate Professor Orthopaedics and Family Medicine
Director, Tennis Medicine
Emory University Sports Medicine Center

President International Society for Tennis Medicine and Science (STMS)
AMSSM Board of Directors
Iowa Hawkeyes
DISCLOSURES: YOUTH SPORTS BACKGROUND

• Editor BJSM-AMSSM “Care of the Young Athlete” special issue
• Overuse injuries in young athletes AMSSM Panel/Writing Group
• Collaborative Research with Lurie Children’s (multiple AMSSM grants)
• Consultant (Unpaid):
  • American Academy Pediatrics (AAP) Council of Sports Medicine Fitness (COSMF)
  • Aspen Institute (Project Play)
  • Mom’s Team Institute
• WTA medical advisory board (Age Eligibility Rule)
What happened to youth sports?
Crazy Sports Parents!!
Objectives

• Discuss evidence to support that sport on what training leads to elite level performance
• Discuss the concept of sport specific recommendations for development of elite level performance
• Is sports specialization detrimental to development of elite level performance?
Why Kids Shouldn't Specialize in One Sport

Jennifer Breheny Wallace

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

SINGLE-SPORT ATHLETES DON'T ALWAYS WIN

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

Tiger Woods
Sports Specialized Training

- What information would we provide non medical sports community to change this “perceived success by specialization”?
- Do we have evidence about successes and risks?
EARLY SPECIALIZATION MODEL

Hours per week

Onset of Specialization

Early  Middle  Late  Adult

Adolescence

Stage of Development
LATE SPECIALIZATION MODEL

Hours per week

Onset of Specialization

Early  Middle  Late  Adult

Adolescence

Stage of Development
### Sports Specialization in Young Athletes: Evidence-Based Recommendations

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

<table>
<thead>
<tr>
<th>Study</th>
<th>Sport(s)</th>
<th>Athletes</th>
<th>Evidence for (+): Study conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Law 2007††</td>
<td>gymnastics</td>
<td>6 sub-elite</td>
<td>+ + +</td>
</tr>
<tr>
<td>Helsen 1998‡‡</td>
<td>Men’s soccer, Men’s field hockey</td>
<td>33 international, 39 national, 52 provincial</td>
<td>+</td>
</tr>
<tr>
<td>Hodges 1996‡‡</td>
<td>Wrestling</td>
<td>21 elite, 21 club-level</td>
<td>+</td>
</tr>
<tr>
<td>Soberlak 2003‡‡</td>
<td>Men’s ice hockey</td>
<td>4 elite</td>
<td>+ +</td>
</tr>
<tr>
<td>Carlson 1988‡‡</td>
<td>Men’s and women’s tennis</td>
<td>10 elite, 10 near-elite</td>
<td>+ +</td>
</tr>
<tr>
<td>Lidor 2002¶</td>
<td>Various men’s and women’s sports</td>
<td>63 elite, 78 near-elite</td>
<td>+ +</td>
</tr>
<tr>
<td>Gullich 2006‖</td>
<td>Olympic sports</td>
<td>1558 German athletes from Olympic promotion programs</td>
<td>+ +</td>
</tr>
<tr>
<td>Moesch et al. 2011‖</td>
<td>Sports measured in cms, gms or secs*</td>
<td>148 elite, 95 near-elite</td>
<td>+</td>
</tr>
<tr>
<td>Baker et al. 2003‖</td>
<td>Men’s and women’s field hockey, Men’s basketball, Women’s netball</td>
<td>15 elite, 13 near-elite</td>
<td>+ +</td>
</tr>
<tr>
<td>Barynina 1992‖</td>
<td>Men’s and women’s swimming</td>
<td>Elite Russian swimmers (number not reported)</td>
<td>+</td>
</tr>
<tr>
<td>Wall 2007‖</td>
<td>Boys’ ice hockey</td>
<td>Parents of 8 minor league players (mean age 13.9 yrs) and 4 ex-minor league players (mean age 14.5 yrs)</td>
<td>+</td>
</tr>
</tbody>
</table>

Activities from age 4–16, and accumulated more hours training by age 16.

Soccer began practicing at age 5, field hockey at age 9. Hours spent in practice were similar among levels until age 12. After age 12, international players spent more time in practice than national players, and national players spent more than provincial players.

Elite wrestlers spent more time training after age 16 compared to club-level wrestlers. However, since all subjects began intense training at 13.2 ± 0.6 yrs, comparison to early intense training (before age 12) not possible.

Elite players intensified their deliberate hockey training in late adolescence and played other sports during developmental years.

Elite players began intense training and specialized later (after age 13-15) than near-elites (age 11).

Elite more likely than near-elite athletes to begin intense training after age 12 and to have played >1 sport during developmental years.

Elite athletes began intense training and competition in their sport later than near-elites (11.4 yrs vs 10.2 yrs and 13.1 vs 12.0). More elites participated in >1 sport from age 11 than near-elites (64% vs 50%).

Elite athletes began intense training at a later age compared to near-elites. Near-elites accumulated more hours of training by age 9, 12 and 15 than elites, while elites accumulated more training by age 21 than near-elites.

Elites accumulated more hours of sport-specific practice from age 12 years onwards. However, all subjects began intense training at about age 12, so unable to compare to an early intense training group. Elites had broader range of sports experiences throughout their careers compared to near-elites.

Swimmers who began specializing before 11 yrs of age spent less time on national team and retired earlier than later specializers.

Dropouts began off-ice training earlier than non-dropouts (11.75 vs 13.8 yrs of age) and spent more hours in off-ice training (107 vs 6.8 per year). Both groups participated in a similar number of other sports (4.75) from 6-13 yrs of age.

*Canoeing/kayak, cycling, orienteering, rowing, sailing, skiing, swimming, track and field, triathlon, weightlifting.
Olympic Development Training Camps

- N=1558 athletes
- Elite athletes began intense training and competition in their sport later than near-elites (11.4 yrs vs 10.2 yrs and 13.1 vs 12.0).
- More elites participated in >1 sport from age 11 than near-elites (64% vs 50%).

  - Gullich et al. 2006
FACTORS FOR ELITE SUCCES

• **Elite Soccer players**
  • More unstructured free play between ages 6-12
    • Helsen et al.

• **Elite Tennis Players**
  • Same Coach
  • Less overall demands for success
    • Carlson et al.
The reality—who has the burden of proof?

Early specializers

- Examples
  - Tiger Woods, Andre Agassi

Middle/late specializers

- Examples (Steve Nash, Federer, etc.)
- Woman’s USA soccer
Urban Meyer

**Ohio State Recruits by Urban Meyer**

- 42 Multi-Sport in High School
- 5 Football Only in High School

Only play football? #WWU5
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
Who Specializes?

• High level goals
  • College
  • Professional

• Specialized training in higher median incomes
  • >70,000 dollars and with private insurance
  • Jayanthi et al.

• Technical, individual sports
  • Jayanthi et al.
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
Sports Specialization for Success (College)

- 318 athletes, 184 females and 134 males
- Loyola University (Div I)
- Lewis University (Div II)
NCAA athlete success

Sport Distribution

- Basketball 15%
- Cross Country/Track 33%
- Soccer 27%
- Volleyball 18%
- Golf 2%
- Softball 2%
- Swimming 0%
- Baseball 3%
Hours Played per Week vs Grade in School

- 3rd Grade: 2
- 4th Grade: 2
- 5th Grade: 4
- 6th Grade: 6
- 7th Grade: 6
- 8th Grade: 8
- 9th Grade: 10
- 10th Grade: 12
- 11th Grade: 13
- 12th Grade: 14

P < 0.001
Number of Sports Played vs. Grade in School

<table>
<thead>
<tr>
<th>Grade in School</th>
<th>Number of Sports Played</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd</td>
<td>2.2</td>
</tr>
<tr>
<td>4th</td>
<td>2.2</td>
</tr>
<tr>
<td>5th</td>
<td>2.3</td>
</tr>
<tr>
<td>6th</td>
<td>2.5</td>
</tr>
<tr>
<td>7th</td>
<td>2.7</td>
</tr>
<tr>
<td>8th</td>
<td>2.5</td>
</tr>
<tr>
<td>9th</td>
<td>2.0</td>
</tr>
<tr>
<td>10th</td>
<td>1.8</td>
</tr>
<tr>
<td>11th</td>
<td>1.6</td>
</tr>
<tr>
<td>12th</td>
<td>1.4</td>
</tr>
</tbody>
</table>

P < 0.001
Months Spent Competing Each Year vs. Period in School

- Elementary: 4 months
- Middle: 6 months
- High: 9 months

P < 0.001
Athletes Choosing One Main Sport vs Period in School

Percentage of Athletes Choosing One Main Sport

- Elementary
- Middle
- High

P < 0.001
CONCLUSIONS

• Although there is an increase in the amount of annual training, in general, year round training in a single sport does not appear to be necessary to participate in NCAA university athletics.

• There appears to be early introduction to the university sport without widespread early specialization.
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
David Epstein
“Sports Gene”

- 10,000 hours +/- 10,000 hours
- Can be 3,000-4,000 hours
- Genetic restriction to your sports success
Your Mom lied to you!!

- "You can do anything you want, if you just work hard and put your mind to it!!"
- Remember, Rudi only got in for 1 play!!
Why Diversification?

- Positive transfer of skills
  - Abernathy et al.
- Creates an off season
- Physical literacy
When to specialize?

Early Adolescence
• Early entry sports
  • Gymnastics, swimming, Diving

Middle adolescence
• Most individual and team

Late Adolescence/Adulthood
• Better to do for those involved in sports with high physical activity and/or aerobic capacity
  • Endurance sports, Moesch, et al.
NFL Combines-”Unscientific study”
## Sports-Specific Specialization Rates

<table>
<thead>
<tr>
<th>Sport</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>50.74%</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>37.44%</td>
</tr>
<tr>
<td>swimming</td>
<td>21.50%</td>
<td>45.78%</td>
</tr>
<tr>
<td>tennis</td>
<td>47.95%</td>
<td>45.79%</td>
</tr>
<tr>
<td>track &amp; field</td>
<td>21.84%</td>
<td>45.79%</td>
</tr>
<tr>
<td>volleyball</td>
<td>24.18%</td>
<td>43.79%</td>
</tr>
<tr>
<td>wrestling</td>
<td>12.20%</td>
<td>48.78%</td>
</tr>
</tbody>
</table>
What do you believe is the biggest hindrance to athletes participating in multiple sports?

- Club sports coaches: 53.3%
- Parents: 15.6%
- High school coaches: 14.3%
- Other: 16.9%
“I think there’s a lot of kids that elect to not even go to the college ranks because they’re just too tired of playing basketball all the time.”

―Mike Lightfoot
Aspen Institute-Project Play
Organizational and community efforts

- Sports specific National Governing Bodies
- Youth sports leagues
IN THE LAST 5 YEARS, FEWER KIDS ARE ACTIVE THROUGH SPORTS, DUE IN PART TO EARLY, SINGLE-SPORT SPECIALIZATION*

EARLY SPECIALIZATION* DOES MORE HARM THAN GOOD

INCREASES RISK OF OVERUSE INJURIES IN DEVELOPING BODIES
CAUSES KIDS TO BURN OUT AND QUIT SPORTS ALTOGETHER
DECREASES OVERALL ATHLETIC DEVELOPMENT

MULTI-SPORT PARTICIPATION CAN LEAD TO BETTER PERFORMANCE, LESS BURNOUT, LESS SOCIAL ISOLATION, AND, MOST IMPORTANTLY, MORE LIFELONG ENJOYMENT IN SPORTS.

THE UNITED STATES TENNIS ASSOCIATION, ALONG WITH THESE ORGANIZATIONS, ENDORSES MULTI-SPORT PLAY.

LEARN MORE AT PROJECTPLAY.US
Where is our focus?

- Intensive/specialized
- Competitive athlete
- Non-athlete
DON’T MISS THE BOAT!

Oh, crap! Was that TODAY?
MAIN PROBLEM

- We have many children who are disengaged from sports participation and physical activity as there is not an adequate environment for participation.
AS PEN INSTITUTE-PROJECT PLAY

The Aspen Institute’s
PROJECT PLAY
REIMAGINING YOUTH SPORTS IN AMERICA
American Development Model - USA Hockey

What's wrong with where we're going?

For starters, many athletes spend too much time traveling, competing and recovering from competition and not enough time preparing for it. Second, there is too heavy a focus on the result rather than the performance. This attitude leads to long-term failure, as coaches forego the development of skills to focus on specific game tactics. And third, too many athletes are specializing too early on. An early focus on just one or two sports often leads to injuries, burnout and capping athletic potential.

This way of mining has led to 60% of players dropping out before pee wee, and 20% dropping out after only one season, leading to an overall decline in retention since 2000.

Coach Herb Brooks was famous for saying that, “Great moments are born from great opportunities.” Well this is our opportunity. Our time to get it right.

The American Development Model is a nationwide model for successfully developing American hockey players. It is a tool that will ensure every kid will have the same chance to succeed.

By implementing ADM, associations will see an increase in player retention. Again, ADM is a set of guidelines designed specifically to help kids reach their full potential.
THE PROBLEMS

• “Many athletes spend too much time traveling, competing and recovering from competition and not enough time preparing for it.”
• “Second, there is too heavy a focus on the result rather than the performance.”
  • This attitude leads to long-term failure, as coaches forgo the development of skills to focus on specific game tactics.
• And third, too many athletes are specializing too early on. An early focus on just one or two sports often leads to injuries, burnout and capping athletic potential.
  • ADM-USA Hockey
THE RESULT-USA Hockey

- 60% of players dropping out before PeeWees and 20% dropping out after only one season leading to an overall decline in retention since 2000.

- Year round travel teams and national championships for U12’s were not positive effects on participation
THE SOLUTION (ADM)

• Play
  • Focus on skill development in younger players during fun practices rather than tactical means to win.
  • Age appropriate skill development

• Love
  • Discourage early specialization and year round training. Make them fall in love with the sport, rather than feel like it is a “chore”
  • Play multiple and other sports

• Excel
  • May add more intense training through adolescence and introduce competition.
Sports specialization Conclusions

• The current evidence (weak/moderate) suggests that early sports specialized training in groups of athletes does not lead to elite level performances in evaluation of populations.

• There is no evidence that individual elite level performance is not possible with early sports specialization.

• The decision of specializing impacts more than just performance, but how youth sports is organized from performance vs participatory models.
Thank You!