

# Sports Specialization

What we need to know

Jeffrey Backes MD

August 17<sup>th</sup>, 2019



- 60 million kids between age 6-18 years participate in organized sports
- Trend towards more time intensive, travel, and year-round sports
  - “The professionalism of youth sports”
- American Orthopedic Society for Sports Medicine (2016)
  - Defined Early Sports Specialization:
    - 1) Involving prepubertal, seventh grade, and or younger than 12 years ?
    - 2) Does the athlete participate in the sport > 8 months ?
    - 3) Is participation in one sport at the exclusion of other sports or limiting free play?

# Sports Specialization

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- Is early sports specialization (ESS) necessary to achieve elite athletic success ?
- Is there an association between ESS and injury risk ?
- Impact of ESS on long-term participation ?

# *How did we get here ?*

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- Ericsson's "deliberate practice" and the 10,000 hour rule....
  - Amount of practice is the most critical factor to become an expert
  - Elite musicians
- Eastern European influence
  - Olympic success



- Parents are the most important influence on the initiation of sport
- But *Coaches* are more likely to be influential on intense training and specialization

Padaki et al. 2017

- Strongest predictor of youth athlete's perfectionistic mindset is attitude fostered by the same-sex parent

Appelton et al. 2011





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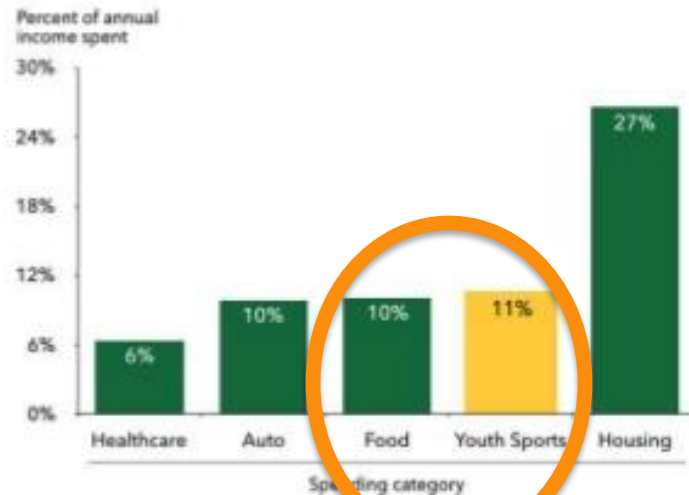


- Survey of over 200 parents
  - 52 % expected their child to play college or professional sports
  - 57% encouraged their child to focus on one sport
- About 2% of high school athletes end up capturing a sports scholarship to an NCAA school

## Youth Sports Specialization



Share of household income spent on major categories across U.S. households



Source: United States Department of Labor using data from U.S. Bureau of Economic Analysis, Consumer Expenditures Survey, September 2015.

# An Analysis of Sports Specialization in NCAA Division I Collegiate Athletics

Hasani W. Swindell,\* MD, Melanie L. Marcille,\* BA, David P. Trofa,\* MD, Franklin E. Paulino,† MD, Natasha N. Desai,\* MD, Thomas Sean Lynch,\* MD, Christopher S. Ahmad,\* MD, and Charles A. Popkin,\*‡ MD

*Investigation performed at Center for Shoulder, Elbow and Sports Medicine, Columbia University, New York, New York, USA*

- 303 athletes
- 19 different sports
- **45% played multiple sports to age 16**
- **Only 17 % specialized by age 12 or younger (tennis, swimming, fencing)**
- **Team sport athletes specialized age 15.5 versus individual 14 years**

TABLE 3  
Age of Specialization by Sport

	Age of Specialization, y, mean ± SD
Archery	18.5 ± 0.71
Rowing	15.2 ± 3.17
Water polo	18.0 ± 0
Wrestling	13.3 ± 0.96
Squash	13.0 ± 5.09
Cross-country	15.3 ± 1.51
Golf	13.6 ± 3.95
Tennis	11.6 ± 3.60
Volleyball	14.1 ± 1.46
Lacrosse	17.2 ± 1.55
Softball	13.5 ± 3.33
Fencing	12.8 ± 1.82
Field hockey	16.8 ± 1.17
Basketball	13.8 ± 3.08
Baseball	15.6 ± 3.37
Soccer	13.9 ± 2.40
Swimming and diving	12.4 ± 3.36
Football	17.2 ± 1.38
Track and field	15.4 ± 2.48

“Personal interest, skill level, time constraints, potential scholarship, professional ambitions were most important reported reasons for specialization”



## Unintended Consequences of Early Specialization

- NCAA data, specialization by age 12
  - For DI women, the highest percentage was in gymnastics (87 percent) followed by tennis (72), soccer (62), basketball and swimming (55) and softball (48).
  - For DI men, the highest was soccer (68), tennis (66), basketball (49), swimming (37), football (33) and baseball (32).



## Sports Specialization

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- Psychological and social risks to ESS
  - Less exposure to peers outside their one sport
  - Limiting interpersonal growth
- ESS role in burnout
  - Chronic stress
  - Reduction in sense of accomplishment
  - Perception cannot meet the demands any longer
  - 47% athletes wanted to quit by age 14  
(age of sport specialization 8.1 years)
- Injury....

# Early Single-Sport Specialization

## A Survey of 3090 High School, Collegiate, and Professional Athletes

Patrick S. Buckley,\* MD, Meghan Bishop,\* MD, Patrick Kane,\* MD, Michael C. Ciccotti,\* MD, Stephen Selverian,\* BS, Dominique Exume,\* BS, William Emper,\* MD, Kevin B. Freedman,\* MD, Sommer Hammoud,\* MD, Steven B. Cohen,\* MD, and Michael G. Ciccotti,\*<sup>†</sup> MD

*Investigation performed at the Rothman Institute at Thomas Jefferson University Hospital, Philadelphia, Pennsylvania, USA*

Summary of Survey Demographics

	High School	Collegiate	Professional
No. of surveys	503	856	1731
No. of sports represented	23	17	2
Age, y, mean ± SD	15.3 ± 1.4	19.6 ± 1.3	23.6 ± 3.5

TABLE 2  
Summary of Survey Specialization  
and Injury History Results

	High School	Collegiate	Professional	P Value
Did you quit other sports to focus on 1 sport? % yes	45.2	67.7	46.0	<.001
If yes, what age did you quit other sports? mean ± SD	12.7 ± 2.4	14.8 ± 2.5	14.7 ± 2.4	<.001
At the age of specialization, how many months/year did you train for your sport? mean ± SD	8.5 ± 3.4	10.0 ± 2.6	8.8 ± 3.3	<.001
At the age of specialization, how many months/year did you compete in your sport? mean ± SD	6.1 ± 3.3	7.2 ± 3.2	7.8 ± 2.5	<.001
Did you ever sustain an injury that you attributed to specializing in 1 sport? % yes	39.0	42.3	25.4	<.001

TABLE 3  
Summary of Athletes' Perspectives  
on Single-Sport Specialization

	High School	Collegiate	Professional	P Value
Looking back, are you glad you focused on only 1 sport at the age you did? % yes	84.2	83.7	89.4	.006
Do you think specializing in 1 sport helps an athlete play their sport at a higher level? % yes	79.7	80.6	61.7	<.001
Do you want your children to specialize in only 1 sport during their childhood/adolescent years?	30.56	27.4	22.3	<.001

- Individual sport athlete was twice as likely to have specialized than a team sport athlete
- Baseball – age of specialization in HS was 12 versus 15 for college and professional

Summary:

- 1) High school athletes specialized at a younger age compared to current college/professional athletes
- 2) These HS athletes also report higher injury rate attributable to specialization



# Injury



- Study by the University of Wisconsin School of Medicine and Public Health
  - Included over 1,500 high school athletes
  - Athletes who specialized in one sport were **twice** as likely to report a lower extremity injury as compared to those who played multiple sports
  - 60% of athletes that specialized in one sport sustained a new lower extremity injury



# A Prospective Study on the Effect of Sport Specialization on Lower Extremity Injury Rates in High School Athletes - 2017

Timothy McGuine PhD, ATC, Eric Post MS, Scott Hetzel MS, David Bell PhD, ATC



- 1544 participants
  - mean age 16, equal male-female
- Sport specialization
  - Low (59.5%)
  - Moderate(27.1%)
  - High (13.4%)
- **Degree of specialization directly correlated with injury**
- Mean time off with injury 7 days
- **Conclusion:**
  - Athletes with moderate or high sport specialization were more likely to sustain LEI than athletes with low specialization



# Early Sports Specialization Is Associated With Upper Extremity Injuries in Throwers and Fewer Games Played in Major League Baseball

Jamie Confino,\* MD, James N. Irvine,\* MD, Michaela O'Connor,\* BA,  
Christopher S. Ahmad,\* MD, and T. Sean Lynch,\*† MD

*Investigation performed at Columbia University Irving Medical Center, New York, New York, USA*

- 746 MLB athletes
  - 240 multisport (32%) and 506 single sport (68%)
- 1980 study:
  - 68% HS basketball, 59% football

TABLE 4  
Mean Number of Games Played per Player<sup>a</sup>

	Single Sport (n = 506)	Multisport (n = 240)	<i>P</i>
Total games played, n	300.79	362.80	<.01
Major league games played, n	71.60	95.87	<b>.04</b>
Percentage of possible games played <sup>b</sup>	82.4	84.0	.157

<sup>a</sup>Bold indicates  $P < .05$ .

<sup>b</sup>Games for which the athlete was listed as available.

TABLE 5  
Most Common Injuries by Type (Major League Baseball)<sup>a</sup>

	Single Sport (n = 216)	Multisport (n = 110)	<i>P</i>
Shoulder impingement/ tendonitis	39	14	<b>.046</b>
Elbow sprain	23	7	
UCL tear requiring Tommy John surgery	21	11	
Lumbar strain	20	11	
Oblique strain	17	12	
Hamstring strain	14	12	

<sup>a</sup>Data are shown as No. of injuries. Bold indicates  $P < .05$ . UCL, ulnar collateral ligament.

Professional baseball players who were multisport in high school

- 1) Played in more MLB games
- 2) Fewer upper and lower extremity injuries

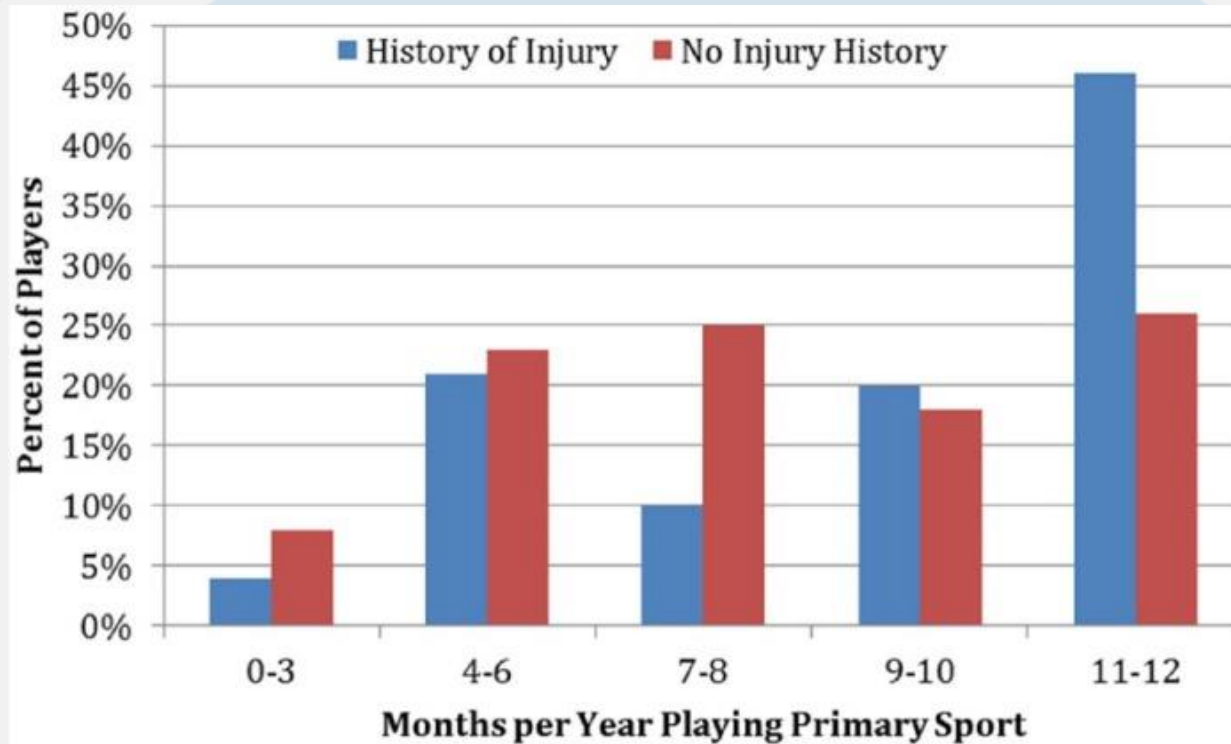
Looking at just *Pitchers* who were multisport

- 1) More made it major leagues
- 2) Less elbow and shoulder injuries (50% versus 75.4%)

## Factors That Drive Youth Specialization

Ajay S. Padaki, MD,<sup>†</sup> Charles A. Popkin, MD,<sup>†</sup> Justin L. Hodgins, MD, FRCS,<sup>‡</sup>  
 David Kovacevic, MD,<sup>§</sup> Thomas Sean Lynch, MD,<sup>†</sup> and Christopher S. Ahmad, MD<sup>\*†</sup>

Months per year young athletes played their primary sports, as separated by injury history

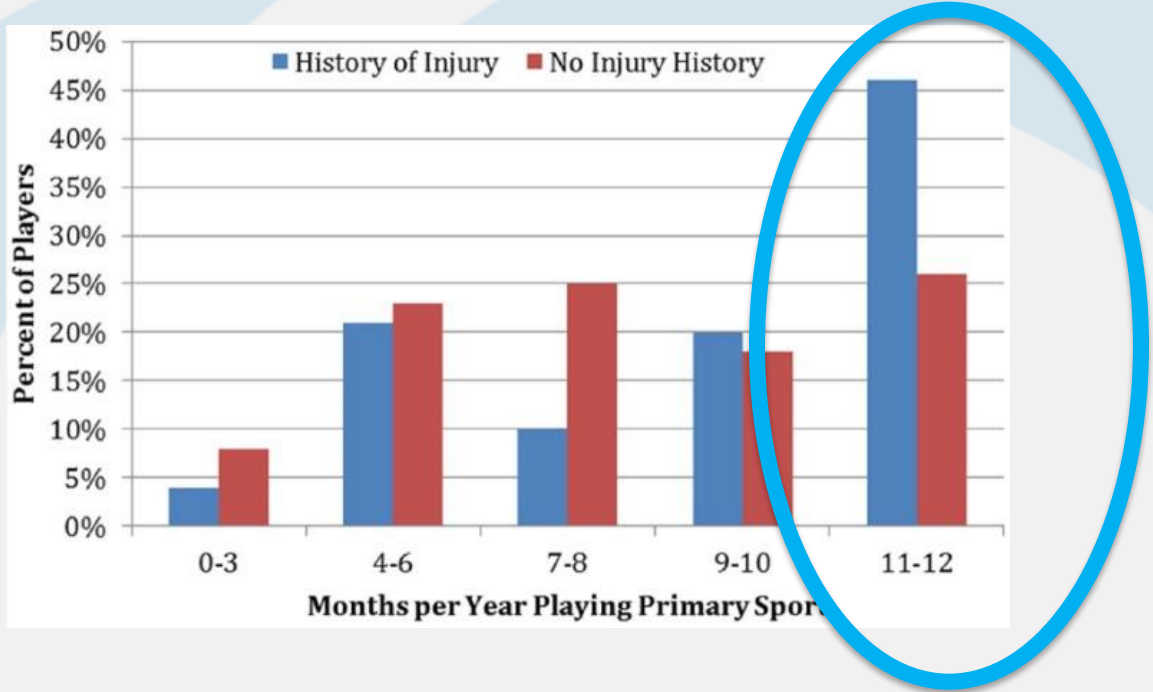


Players with an injury history played significantly more months per year than those without

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Months per year young athletes played their primary sports, as separated by injury history



Of those with an injury, 50% were playing their sport 11-12 months per year



- Is early sports specialization (ESS) necessary to achieve elite athletic success ?
  - Does it even help ?



Table 2

## Evidence for Early Sport Specialization and the Achievement of Elite Status

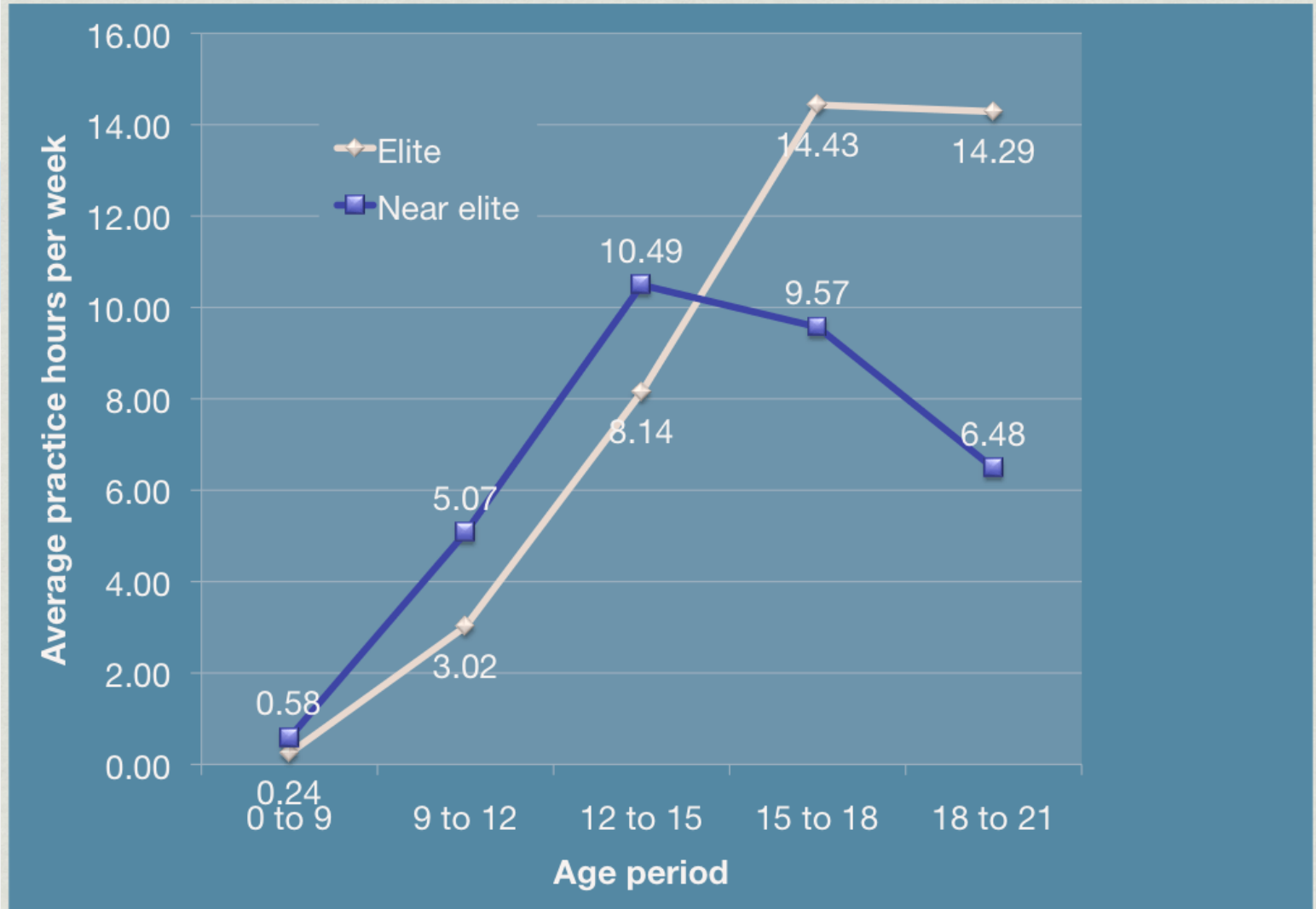
Study	Sport	Country	Athletes	Conclusions:
Baker et al <sup>26</sup>	Field hockey, men's basketball, and women's netball	Australia	15 expert and 13 nonexpert but experienced athletes	Expert athletes accumulated more hours of training after age 12 yrs; no notable difference in the start of intense training (12 for both); and experts participated in more sport compared with the nonexperts
Baryina and Vaitsekhovskii <sup>30</sup>	Swimming	Russia	Numbers not reported)	Swimmers who started before age 11 yrs spent less time on the national team and stopped swimming earlier than those who started after age 11 yrs
Carlson <sup>31</sup>	Tennis	Sweden	10 elite and 10 near-elite	Elite players started specializing later (13 to 15 yrs) compared with near-elite players at 11 yrs of age
Güllich and Emrich <sup>32</sup>	Olympic athletes	Germany	1,558 German athletes	Elite athletes started intense training and competition later than near-elite athletes (11.4 vs 10.2 yrs and 13.1 vs 12.0 yrs); and higher rate of multisport participation after age 11 yrs in the elite group
Helsen et al <sup>17</sup>	Men's field hockey and soccer	Belgium	33 international, 39 national,	Practice time after age 12 yrs, Intl > Natl > Provincial
Hodgson and Starling				
Hume				
Law et al	Rhythmic gymnastics	Multiple nations	Elite and near-elite	Elite athletes accumulated more hours of training compared with the nonelites
Lidor and Lavyan <sup>35</sup>	Multiple sport	Israel	63 elite and 78 near-elite	Elite athletes were more likely to have started intense training after >12 yrs and play more than 1 sport
Moesc				
Soberl and Côte				
Wall a				
			league players and 4 ex-minor league players	than players who did not dropout and quit

Elite level athletes more likely to have specialized and begun intense training *after* age 12

However, by age 21, the elite athletes had accumulated more time training in their main sport



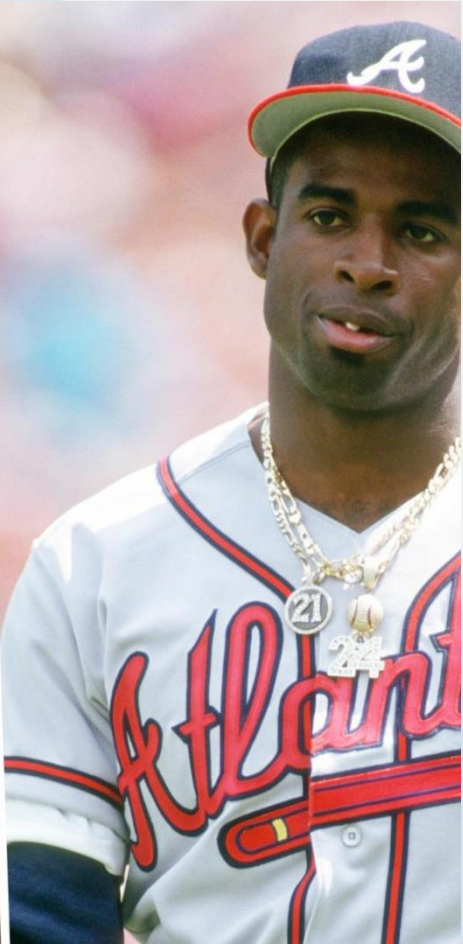
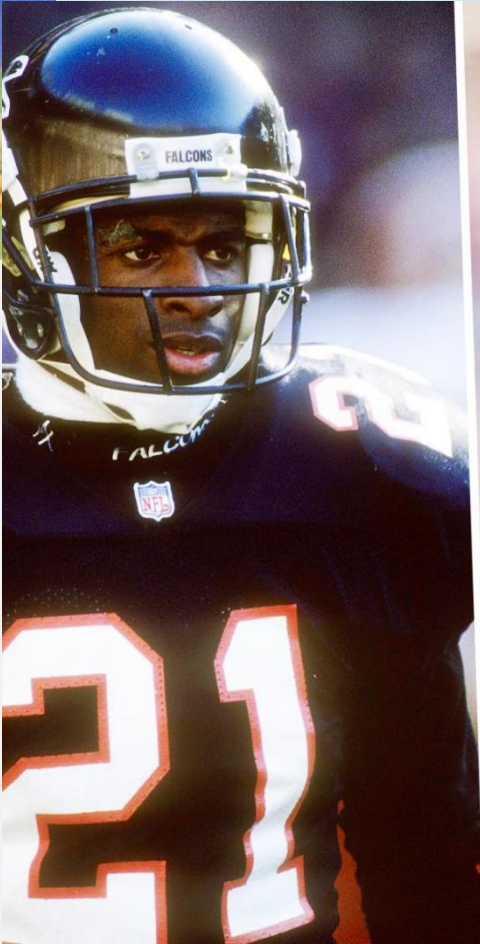
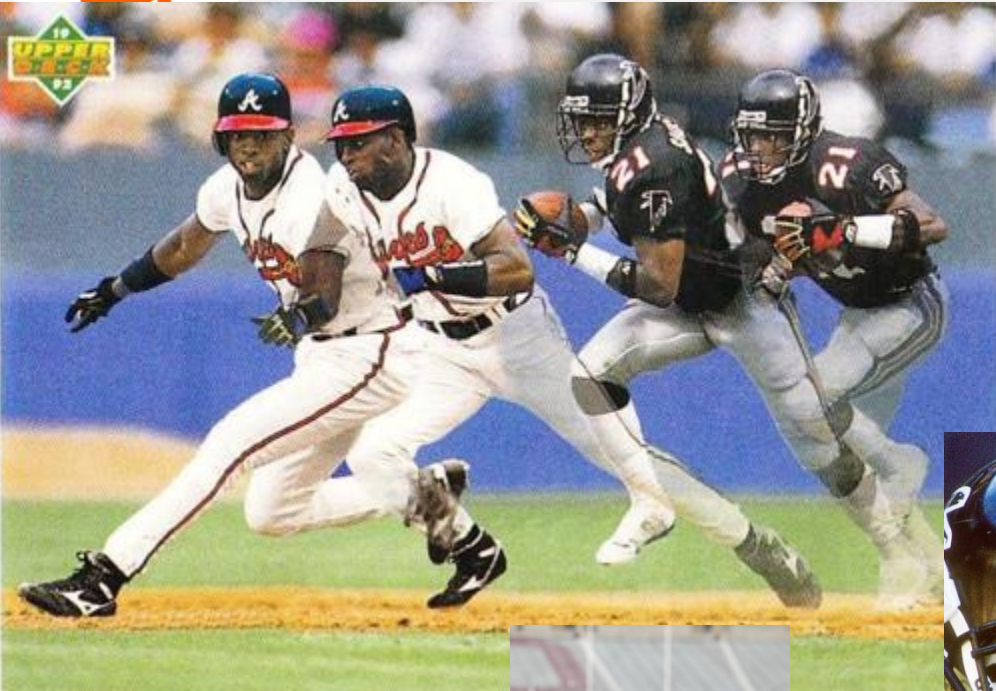






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# EXCEPT.....

## Specialization and the Achievement of Elite Status

		Country	Athletes	Conclusions:
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Helsen et al <sup>17</sup>	Men's field hockey and soccer	Belgium	33 international, 39 national, and 52 provincial	Practice time after age 12 yrs, Intl > Natl > Provincial
Hodges and Starke <sup>33</sup>	Wrestling	Canada	21 elite and 21 club-level	Elite wrestlers trained more after age 16 yrs compared with club-level; and intense
Hume et al <sup>16</sup>	Rhythmic gymnastics	New Zealand	106 across different levels (novice to elite)	Strong correlation between training during development and attainment; and enjoyment of gymnastics is also a strong predictor
Law et al <sup>34</sup>	Rhythmic gymnastics	Multiple nations	6 elite and 6 near-elite	Elites were involved in less activities and accumulated more hours of training compared with the nonelites
Lidor and Lavyan <sup>35</sup>	Multiple sports		near-elite	intense training after > 12 yrs and play more than 1 sport

“highly technical sports” with an early peak age performance such as gymnastics and figure skating

Multiple countries and multiple sport are included in this table. Two take home points are elite players put in more deliberate practice than nonelites and elites more likely to diversify and play multiple sport. Adapted with the permission from Jayanthi N, Pinkham C, Dugas L, Patrick B, Labella C: Sports specialization in young athletes: Evidence-based recommendations. *Sports Health* 2013;5:251-257. Adaptations are themselves works protected by copyright. Thus, to publish this adaptation, authorization must be obtained both from the owner of the copyright in the original work and from the owner of the copyright in the translation or adaptation.





# Biomechanics of Youth Injuries

- The muscles, ligaments, and bones of adolescents are not fully developed, leading to potential injury with repeated use
- Kids are NOT mini-adults : altered musculoskeletal tissue characteristics can distort normal biomechanics
  - Youth pitchers tend to use more rotator cuff
  - Hockey use ER in abduction during the push-off phase then IR through increasing hip flexion during the recovery phase = created more impingement of femoral neck
- Hall et al. looked at 546 middle and high school girls
  - Basketball, soccer, volleyball
  - Increase in patellofemoral pain (1.5 x more) in athletes who specialized in a single sport



## Risk of early sport specialization

- Study on 12-18 year olds showed the odds of reporting injury were 62-90% higher among athletes who compete in 1 sport > 8 months
  - Regardless of the sport !
- Youth athletes who participate in ratio of organized sport to free play (<2:1) have been shown to be a decreased risk of serious overuse injuries



Single sport may pose a risk...  
But is multisport beneficial ?





# Sport Sampling Is Associated With Improved Landing Technique in Youth Athletes

Lindsay J. DiStefano, PhD, ATC,\* Eleanor M. Beltz, MS, ATC, Hayley J. Root, PhD, MPH, ATC, Jessica C. Martinez, PhD, ATC, Steve Boyle, and Thomas H. Trojian, MD

- Multisport athletes had superior neuromuscular control and fewer movement errors during landing tasks
- Could influence future risk of injury
  - ACL tears

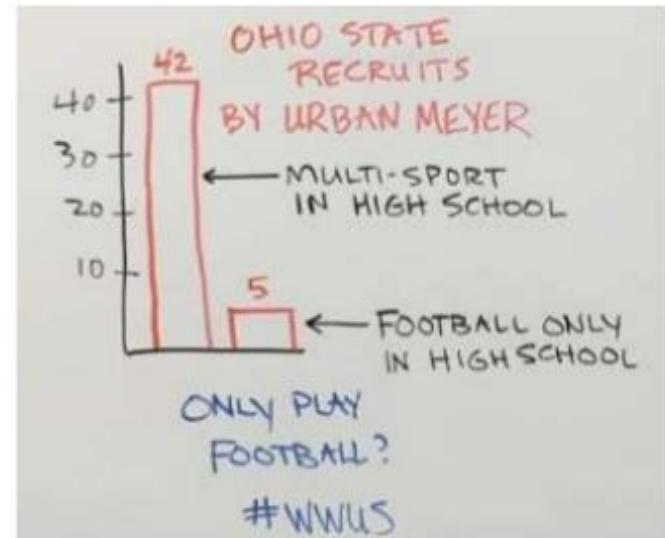


**“Kids who play multiple sports have a larger athletic base of skill to draw from.** This means that they have the ability to pick up and learn skills, techniques, tricks, etc much faster than their one sport counterpart”



## Adolescent Years

- Sport specialization is not helpful in achieving elite status.
- Early diversification is actually more likely to lead to success.




# Recommendations

- Our focus must be how to minimize the risk of injury and promote lifelong physical activity and enjoyment of sport
- Numerous position statements from Pediatric, Orthopedic, and Sports Medicine community supporting multi-sport play
  - And Professional athletic organizations

**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.**

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



LEARN MORE AT [PROJECTPLAY.US](https://projectplay.us)

# Recommendations

- Should not play 1 sport more than 8 months per year
- Should not participate in organized sport more hours per week than their age
- Should never exceed more than 16 hours per week total

# Summary

- There is NO strong evidence that early specialization achieves elite athletic status
  - With the exception of some early peak performance sport
- Literature links early sport specialization with increased injury risk
- Early specialization is a major risk factor for burnout and lower future sport participation



Thanks

