



PRODUCING WORLD-CLASS ATHLETIC PERFORMANCES AND DOMINANCE

Patrick Gélinas, Dept. of Exercise & Sports Science, UofSC Aiken

HOW WILL WE EXPLORE THIS?

- Week 1:
 - Things to consider, to appreciate world-class performance
- Week 2:
 - What role do genes/heredity play?
- Week 3:
 - What about mindset and “grit”?
- Week 4:
 - How has technology & equipment influenced performances?

NATURE VS. NURTURE

- The age-old question
- Is there such thing as a “natural”?
- Are great athletes born with those “gifts”?
 - If so, how much do they matter?
- Notion of choosing your parents “wisely” 😊

CONT'D...

- Nature/nurture
 - Popular model, BUT...
...doesn't clearly explain human talent
- “Thinking that talent comes from genes and environment is like thinking that cookies come from sugar, flour, and butter. It's true enough, but not sufficiently detailed to be useful”.

- Daniel Coyle, *The Talent Code*

SKILL ACQUISITION

- **Variance** among top performers
 - What accounts for this variance?
 - Genes, practice, ... something else?
- Nothing controversial about practice
 - But how much, exactly?
 - 10,000 hours?
- Most studies:
 - Practice accounts for low-to-moderate amount of variance

DATA-SUPPORTED VIEW OF SKILL

- Paradigm: not just “hardware”, nor software
 - But of both innate hardware AND learned software
 - Example: Michael Jordan
- Is there an age “sweet spot” for serious practice?
- What about early specialization? Good or bad?

MANY SPORTS, MANY RECORDS

- Mainstream and obscure
 - Running, soccer & basketball → Jai alai, dogsled racing, synchronized swimming
- Many platforms
 - Olympics
 - World championships
 - Pan-Am Games
 - National championships
 - League championships

ENDURANCE BASED

- Running distance longer than the mile (1,609m)
 - 5K
 - 10K
 - ½ Marathon
 - Marathon
- Cycling events
 - Tour de France

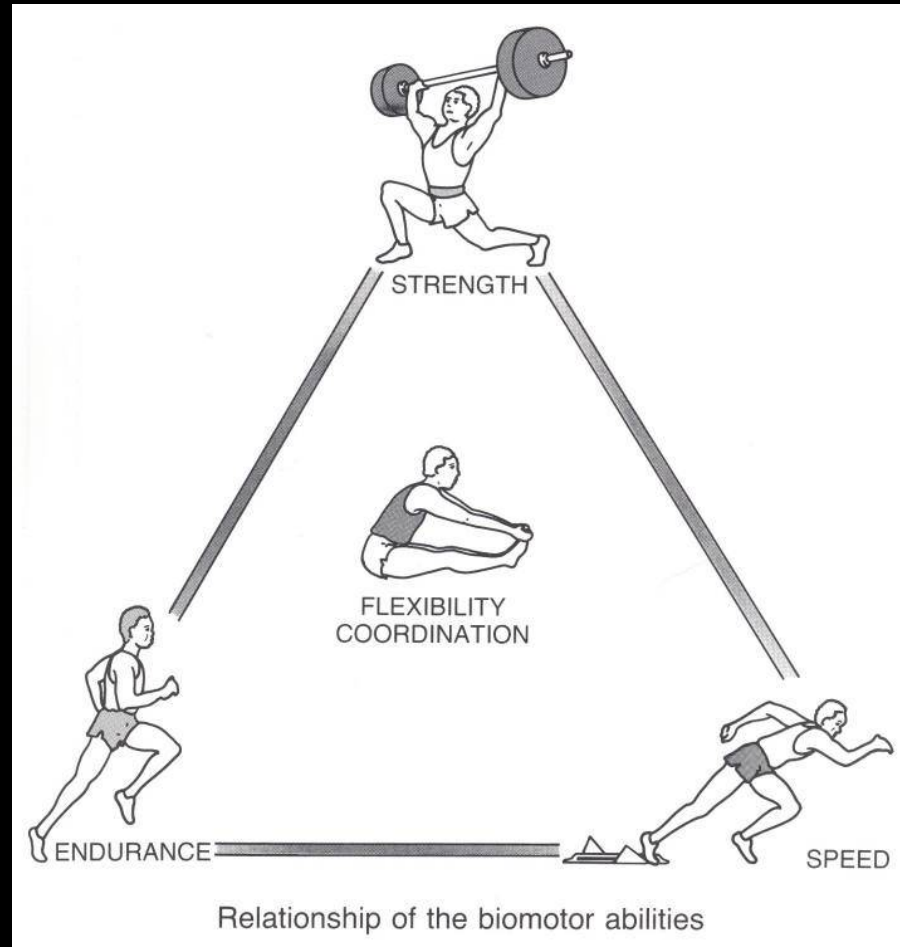
STRENGTH & POWER

- Olympic weightlifting
- American football
- Track & field events
 - Sprints
 - Shotput, javelin, discus
- Wrestling

SPECTRUM OF SKILL REQUIREMENTS

- Demands of the sport/athletic domain
 - Predominant metabolic pathway (“energy system”)
 - Predominant muscle fiber type(s)
 - Specific biomotor abilities

BIOMOTOR ABILITIES



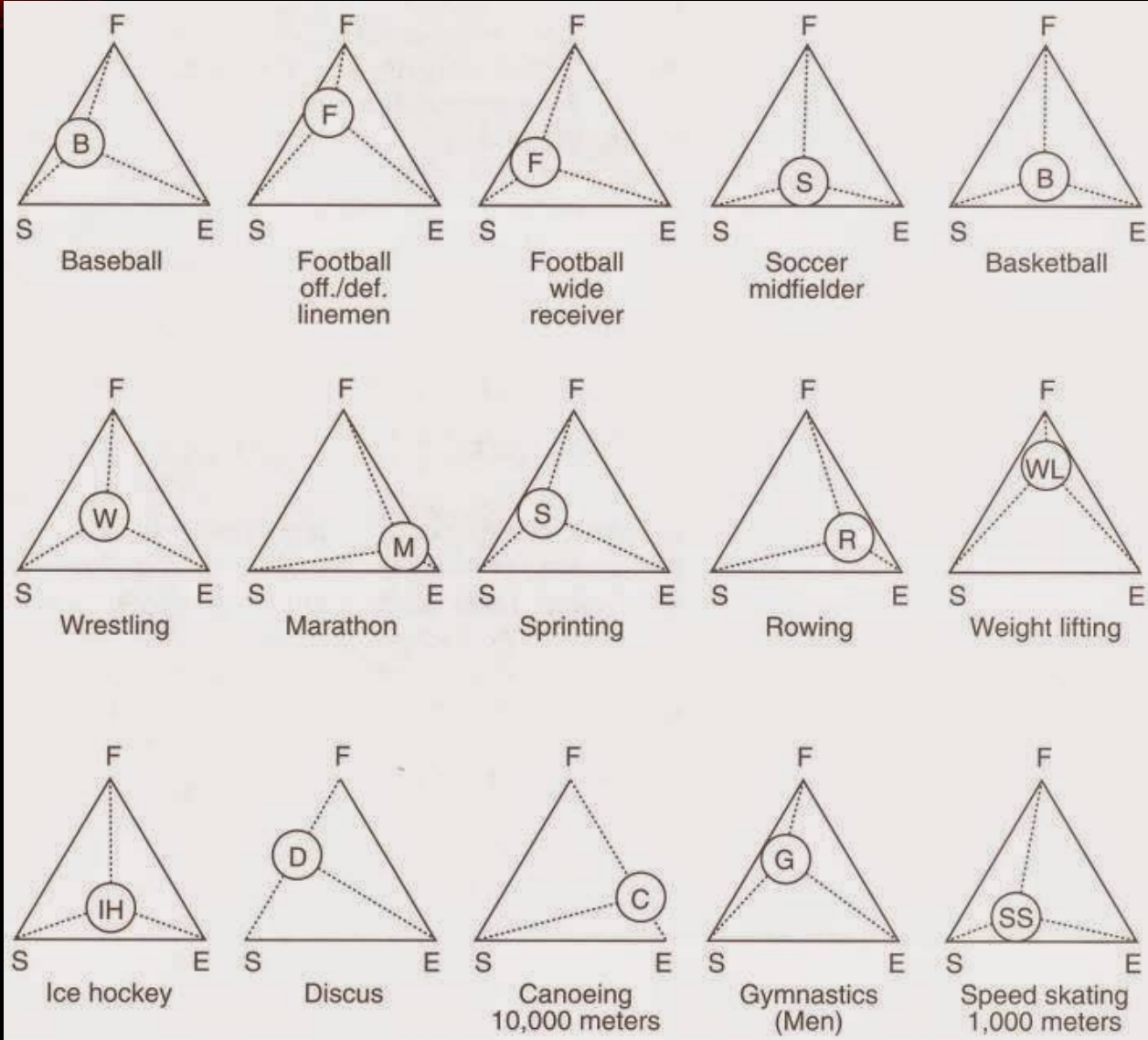
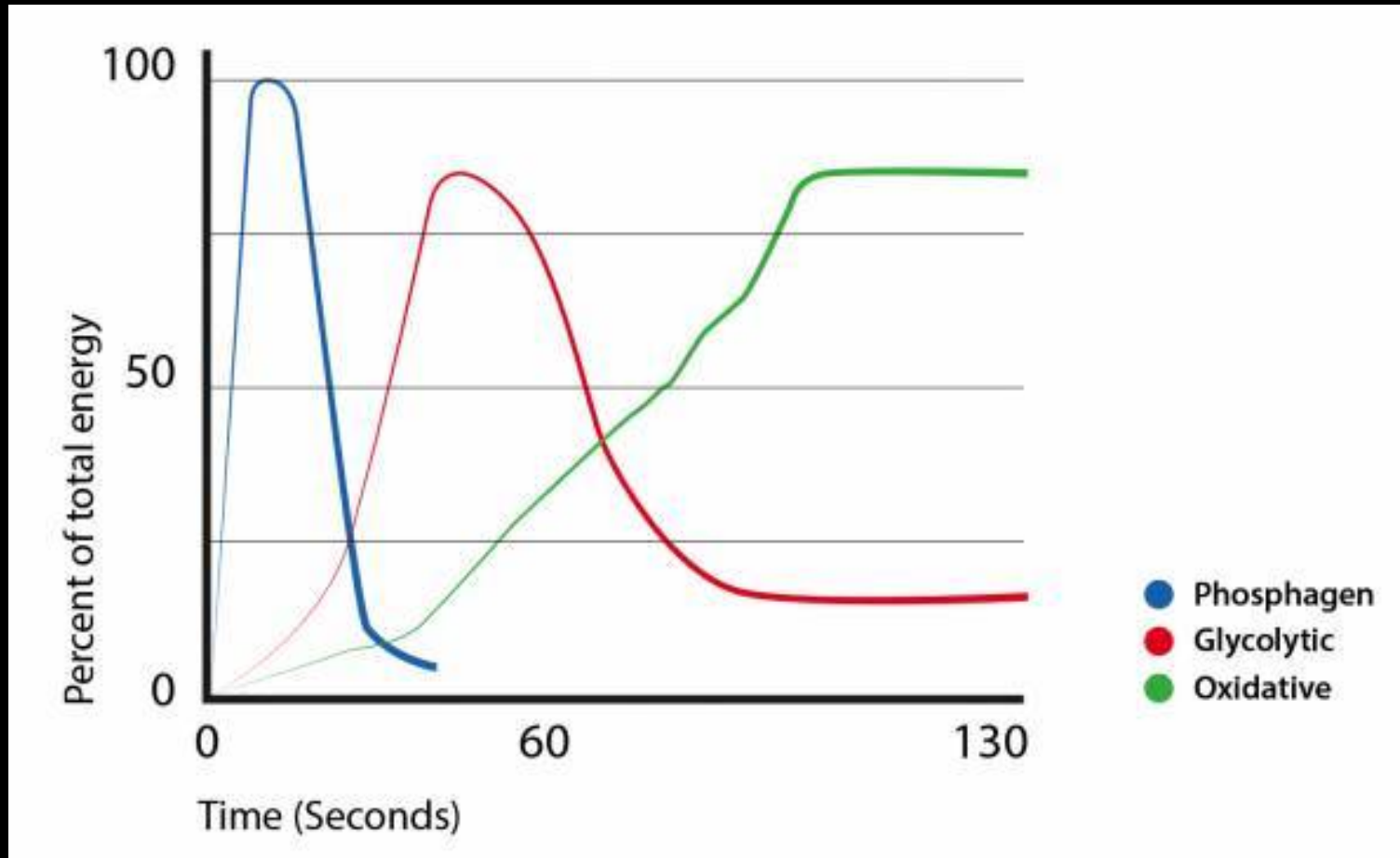


Figure 1.3 Dominant composition among the biomotor abilities for various sports.

METABOLIC PATHWAYS



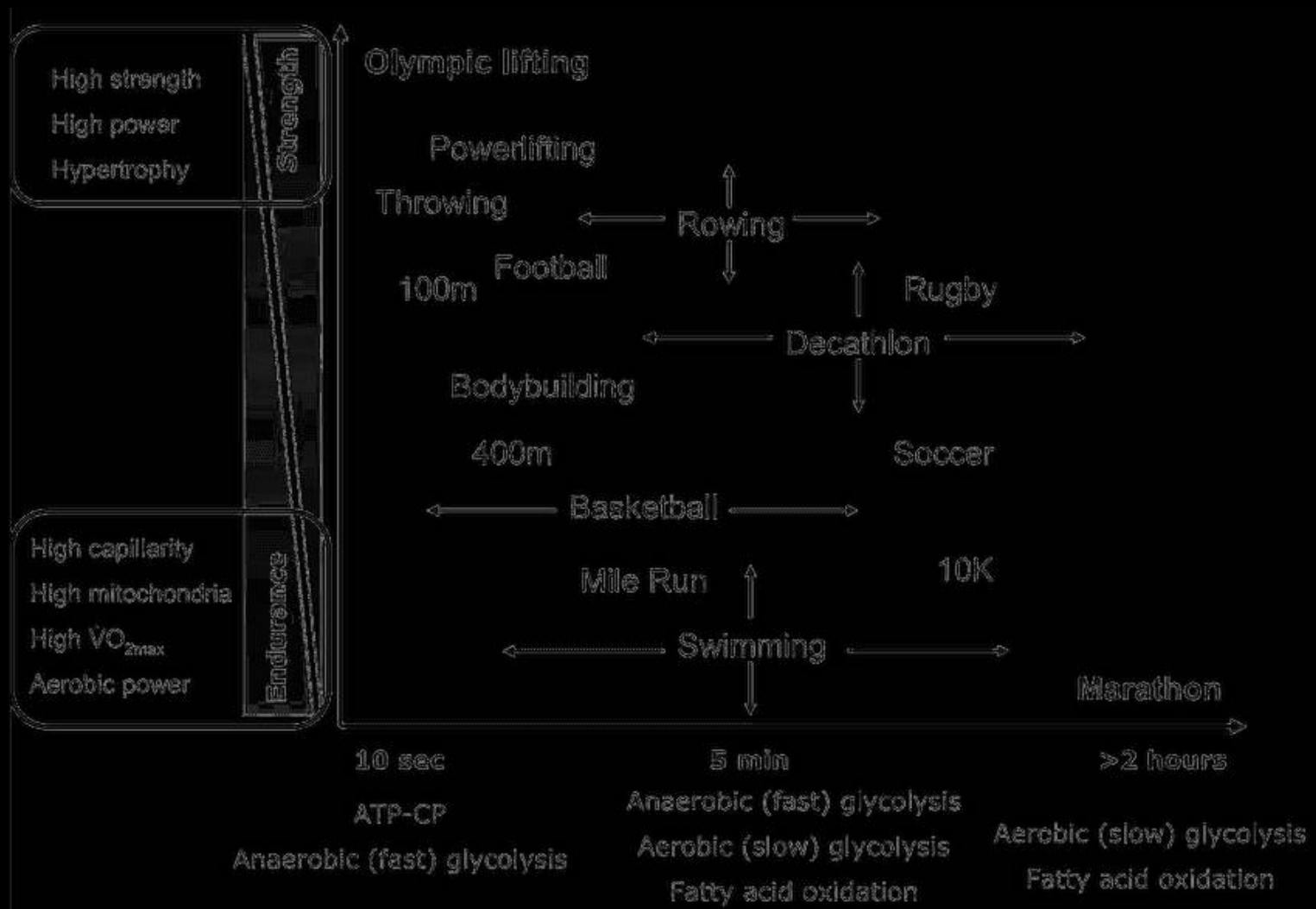
ENERGY PRODUCTION

	% Aerobic	% Anaerobic	
Weightlifting, gymnastics	0	100	100m sprint, diving, football
Wrestling, hockey	10	90	Basketball, baseball
Tennis	20	80	Volleyball, 400m run
Field hockey	30	70	Soccer
800m run	40	60	
Boxing	50	50	200m swim
1-mile run	60	40	
	70	30	
	80	20	800m swim
10K	90	10	
Marathon	100	0	

MUSCLE FIBER TYPE

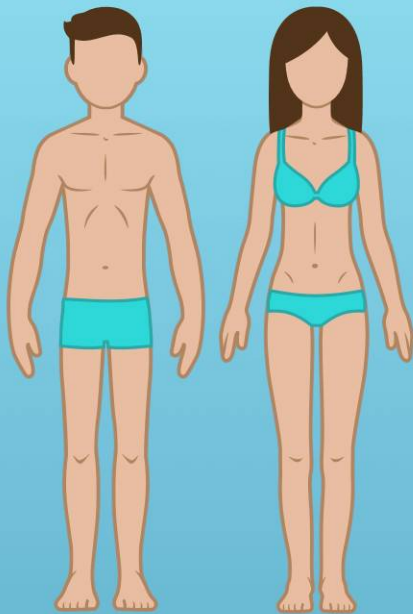
TABLE 3.5 Characteristics associated with the three types of muscle fibers.

Type	<i>I</i>	<i>Ila</i>	<i>Ilb (IIX)</i>
Twitch speed	Slow	Faster	Fastest
Color	Red	Red	White
Size (diameter)	Small	Medium	Large
Fatigability	Slow	Moderate	Fast
Force production	Low	High	Highest
Oxidative processes	Highest	Moderate	Lowest
Mitochondria	Highest	Moderate	Low
Myoglobin	Highest	Moderate	Low
Blood flow	Highest	Moderate	Lowest
Triglyceride use	Highest	Moderate	Lowest
Glycogen use	Lowest	Moderate	Highest
Phosphocreatine levels	Lowest	Higher	Higher
Phosphocreatine levels	Lowest	Higher	Higher
Energy for sports	Aerobic capacity; aerobic power	Aerobic power; anaerobic capacity	Anaerobic power; anaerobic capacity

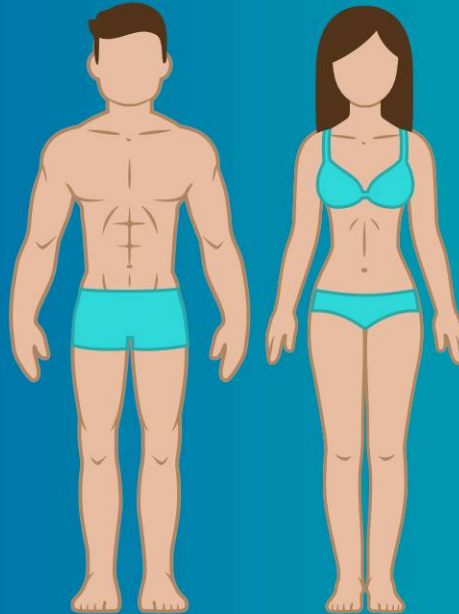


ANTHROPOMETRIC SOMATOTYPES

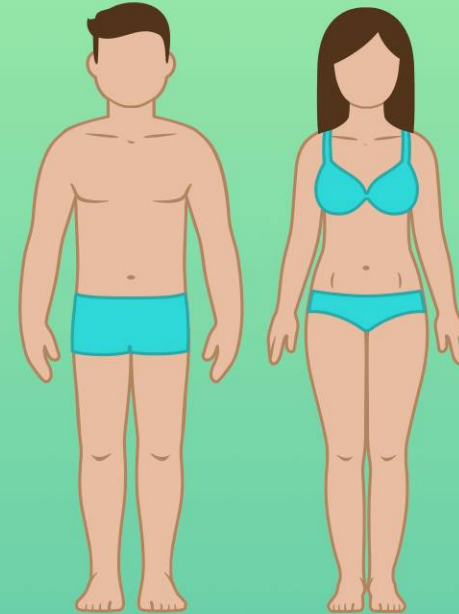
Ectomorph



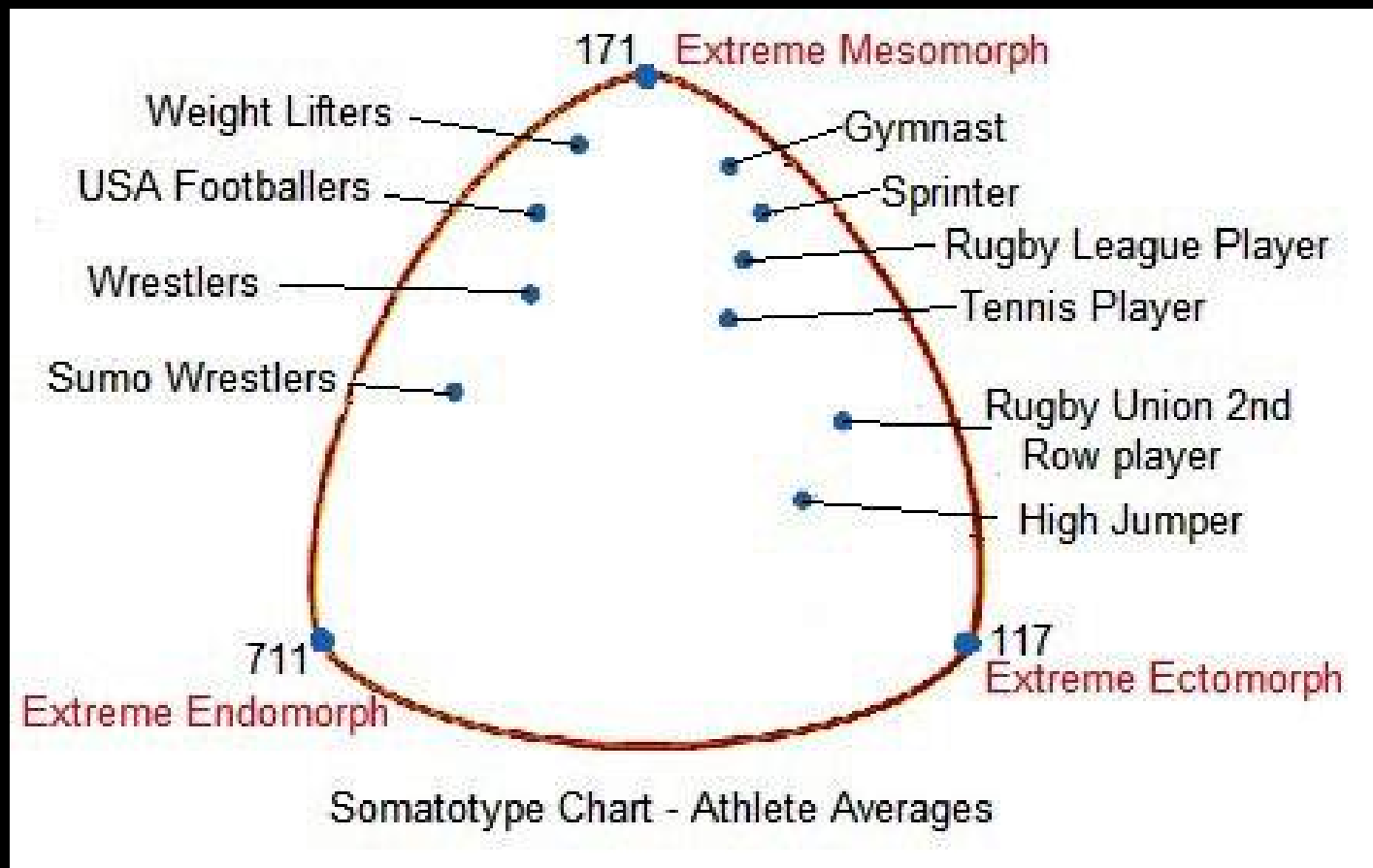
Mesomorph



Endomorph

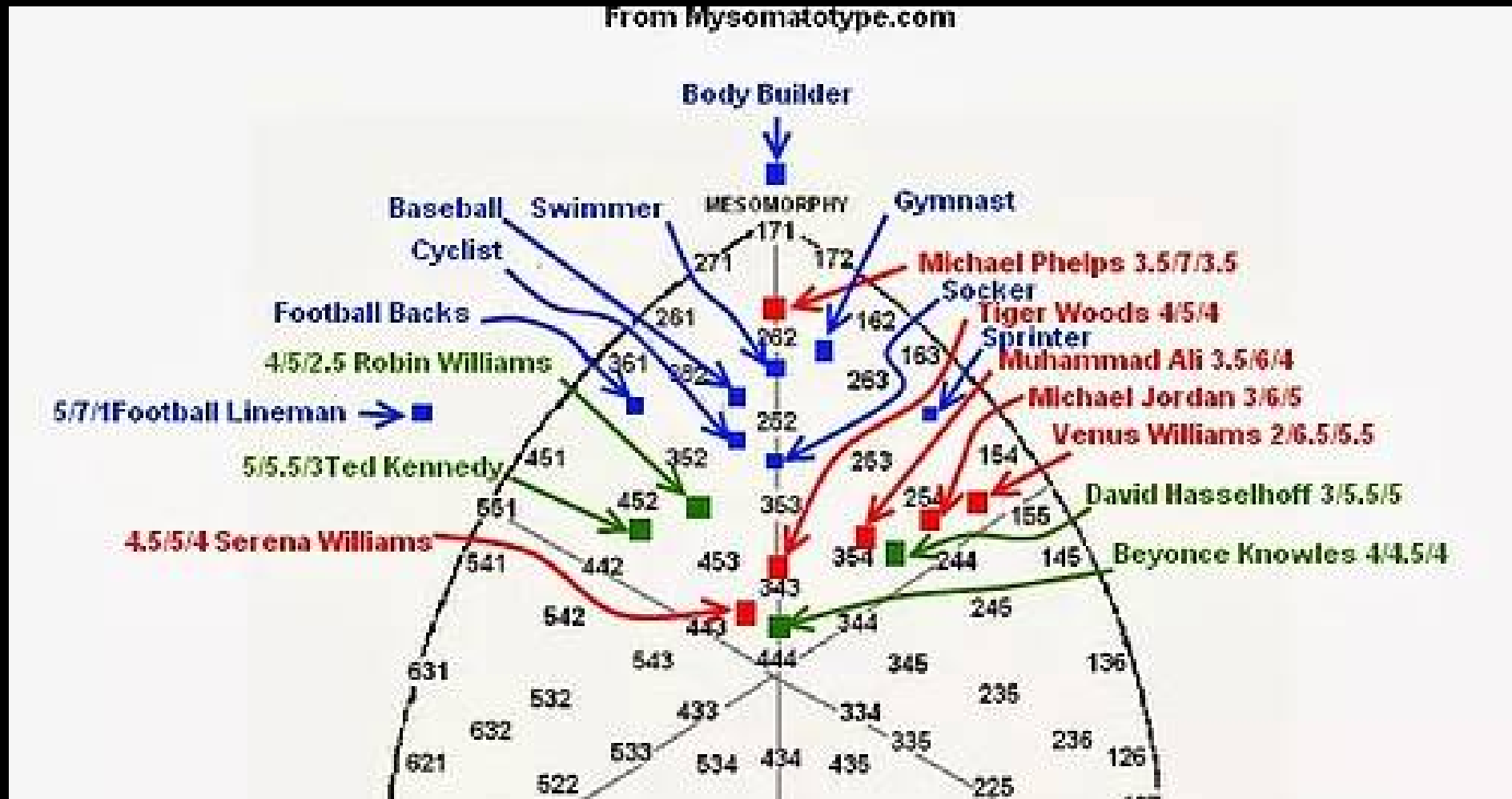


ANTHROPOMETRIC SOMATOTYPES



CONT'D

From Mysomatotype.com



A FEW NOTABLE PERFORMANCES

- Usain Bolt, 2009: https://www.youtube.com/watch?v=3nbjhpzcZ9_g
- Florence Griffith Joyner, 1988: <https://www.youtube.com/watch?v=Mrt9yZL8dbl>
- Jennie Finch: <https://www.mlb.com/video/finch-k-s-pujols-c37118593>
- Michael Jordan: <https://www.youtube.com/watch?v=oqdfjGmFEgA>
- Simone Biles: <https://www.youtube.com/watch?v=lyzdDu7ZHz8>
- Lionel Messi: <https://www.youtube.com/watch?v=WkqecpHclPw>
- CJ Cummings, 2019:
<https://www.facebook.com/hookgripdotcom/videos/cj-cummings-73-192kg-clean-and-jerk-junior-world-record/450605212442086/>