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2019 COACHES CONFERENCE

JANUARY 10 – 12

INDIANAPOLIS, IN

2.0 CEUS

#COACHES19

Conflict of Interest Statement

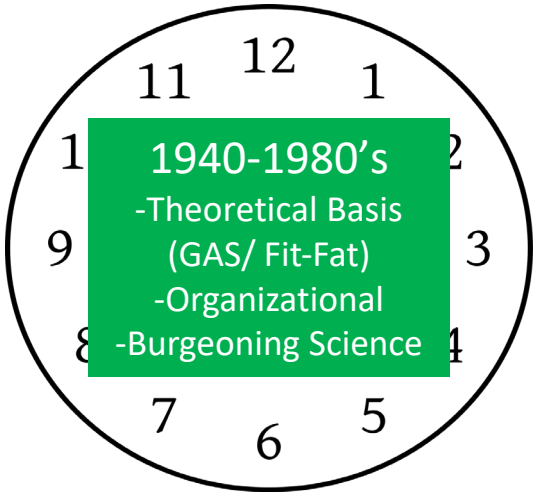
We have no actual or potential conflict of interest in relation to this presentation.

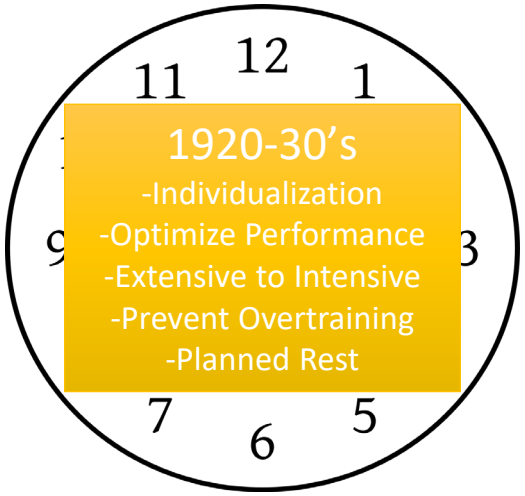
Objectives

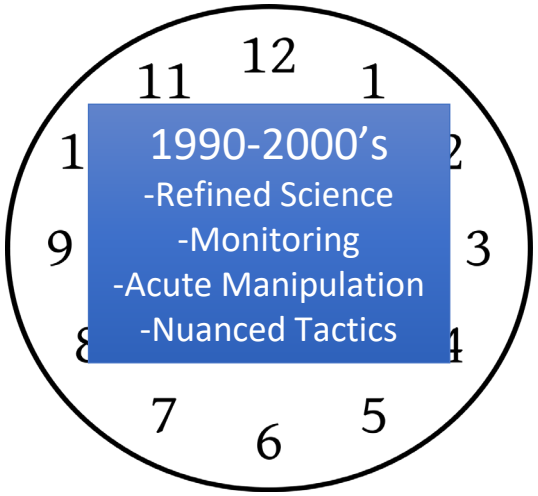
- ✓ Acknowledge the difference between periodization and programming in order to frame the training process.
- ✓ Gain clarity on the underpinnings of linear speed success.
- ✓ Learn how to maximize sprint speed development through sequential strategies.
- ✓ Understand the similarities between linear and changing direction speed.
- ✓ Review a framework for comprehensive movement speed and quality.


1910's
-Continuous Training
-Cyclic & Phasic Stages
-Planned Variation

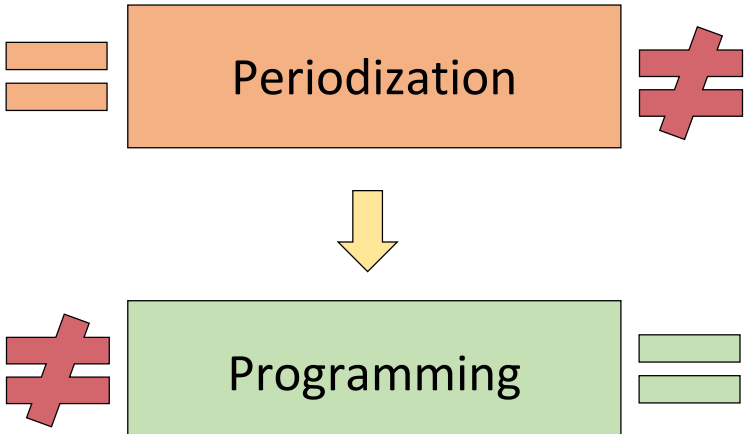

PERIODIZATION


1940-1980's
-Theoretical Basis
(GAS/ Fit-Fat)
-Organizational
-Burgeoning Science


1920-30's
-Individualization
-Optimize Performance
-Extensive to Intensive
-Prevent Overtraining
-Planned Rest


1990-2000's
-Refined Science
-Monitoring
-Acute Manipulation
-Nuanced Tactics

1. Performance Optimization
2. Individualized Dosing
3. Planned Rest and Recovery
4. Prevention of Overtraining & Injury
5. General to Specific
6. Extensive to Intensive Workloads
7. Planned Variation
8. Cyclic and Phasic
9. Evidence-Driven

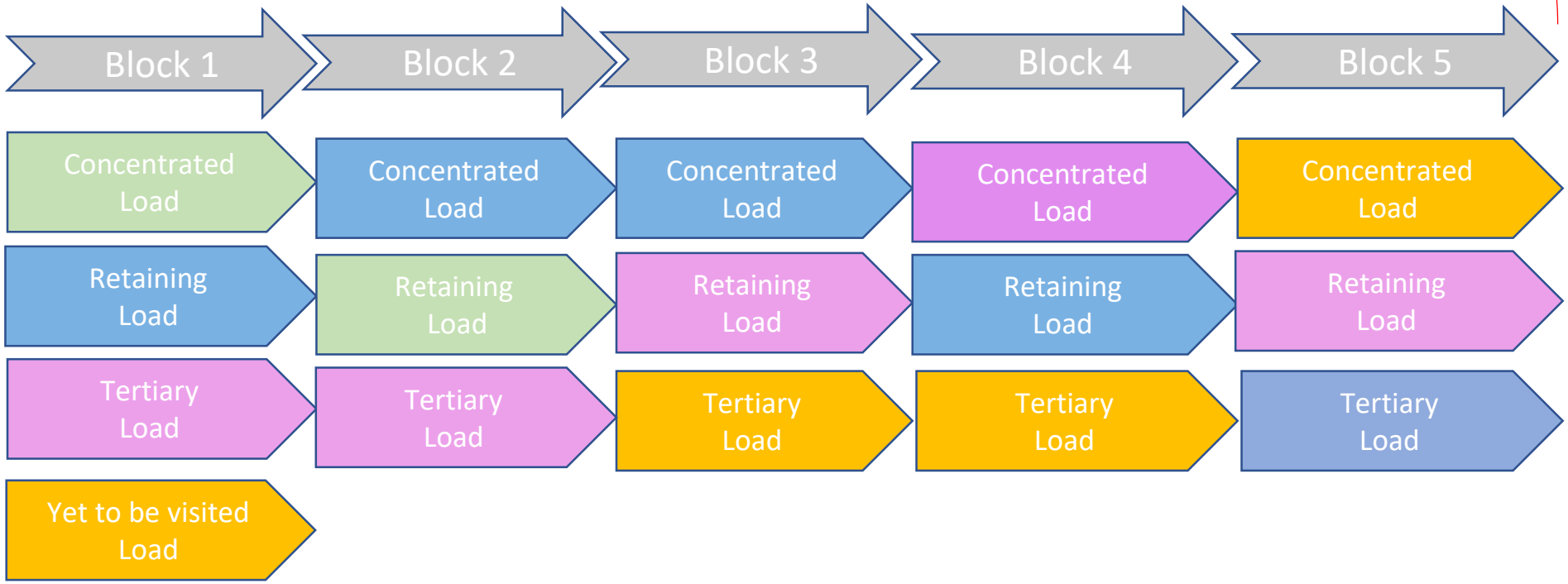


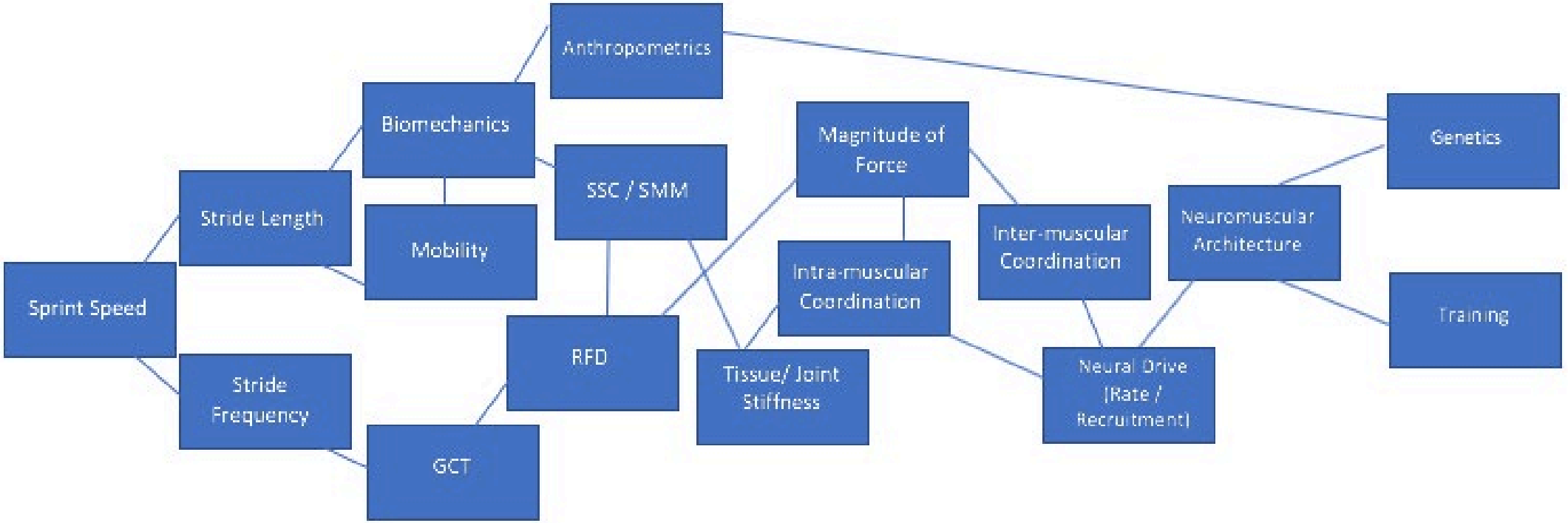
1. Frequency
2. Density
3. Volume
4. Intensity
5. Exercise Mode
6. Exercise Order
7. Sets
8. Repetitions
9. Recovery Mode
10. Recovery Duration

1. Block
2. Undulating
3. Fluid
4. Conjugated
5. Concurrent
6. Traditional
7. Flexible
8. Reverse
9. Non-Linear
10. Linear

Conjugate Sequential

Vertical Integration




Anthropometrics
Biomechanics
Genetics
Magnitude of Force
SSC / SMM
Stride Length
Mobility
Inter-muscular Coordination
Neuromuscular Architecture
Intra-muscular Coordination
Sprint Speed
Training
RFD
Stride Frequency
Tissue/ Joint Stiffness
Neural Drive (Rate / Recruitment)
GCT

Plainly Speaking…

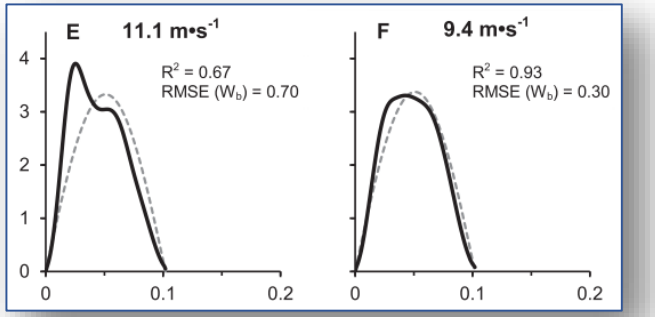
1.Large Forces each step;

2.Swing time not significant;

3.Higher RFD = more displacement during flight;.

4.During flight, better sprinters utilize ground reaction forces to achieve an optimal position with which to strike the ground. This is demonstrated by stacked joints, neutral hips/pelvis, flexed hip leading to “high knee”, and more proximal ground contact.

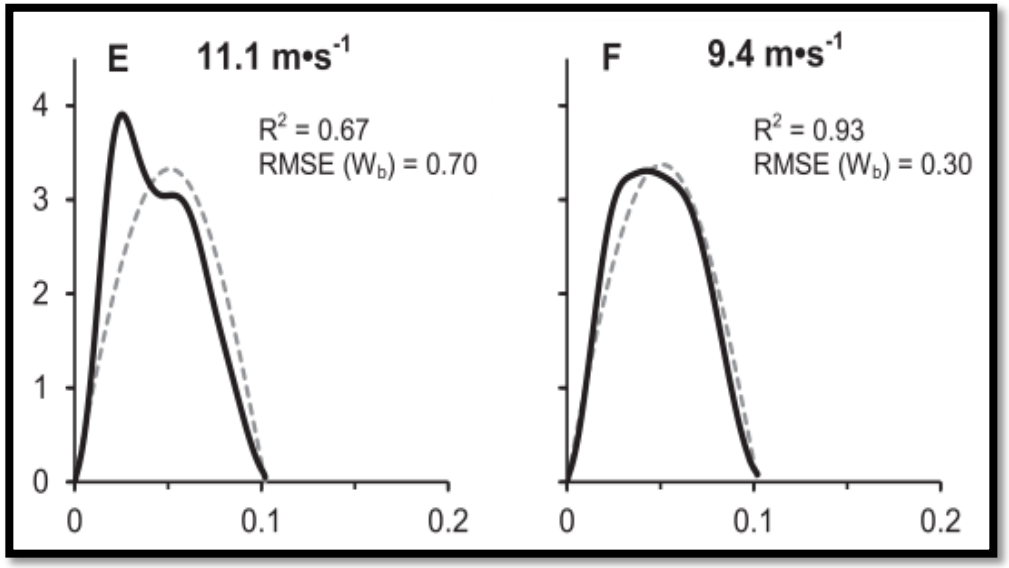
5.This sets up next stance phase where most force can be produced upon contact, allowing preservation of stretch-shortening cycle “elasticity”.

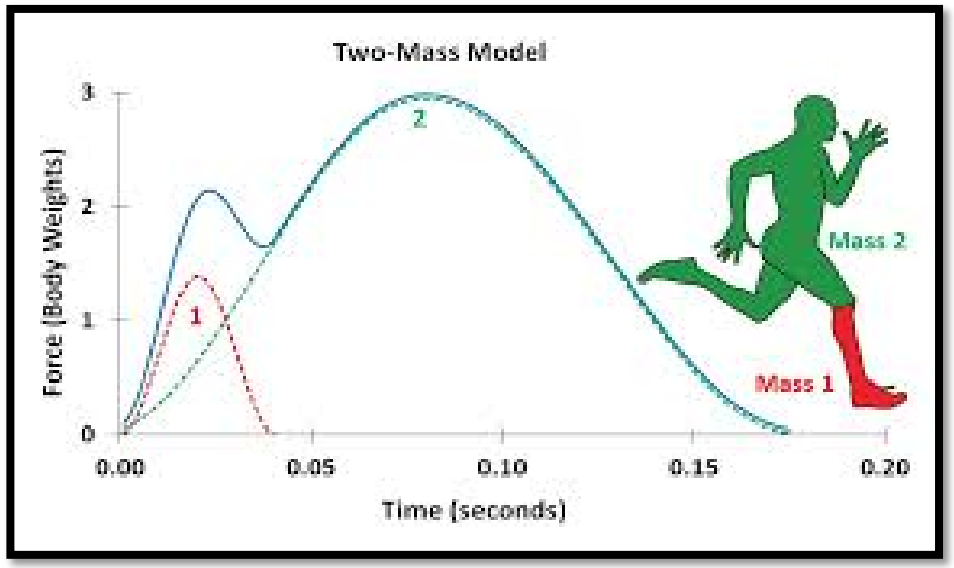


Attributing Asymmetry

- Clark et al (2014) notes that faster sprinters produce high forces in first half of stance.

- Using the 2-mass model, evidence demonstrates that higher forces result from impulse 1 (shank stabilization).





- Training can potentially improve impulse characteristics.

- To run faster, extend & mature accelerative ability which will see larger impulse, namely Impulse 2.

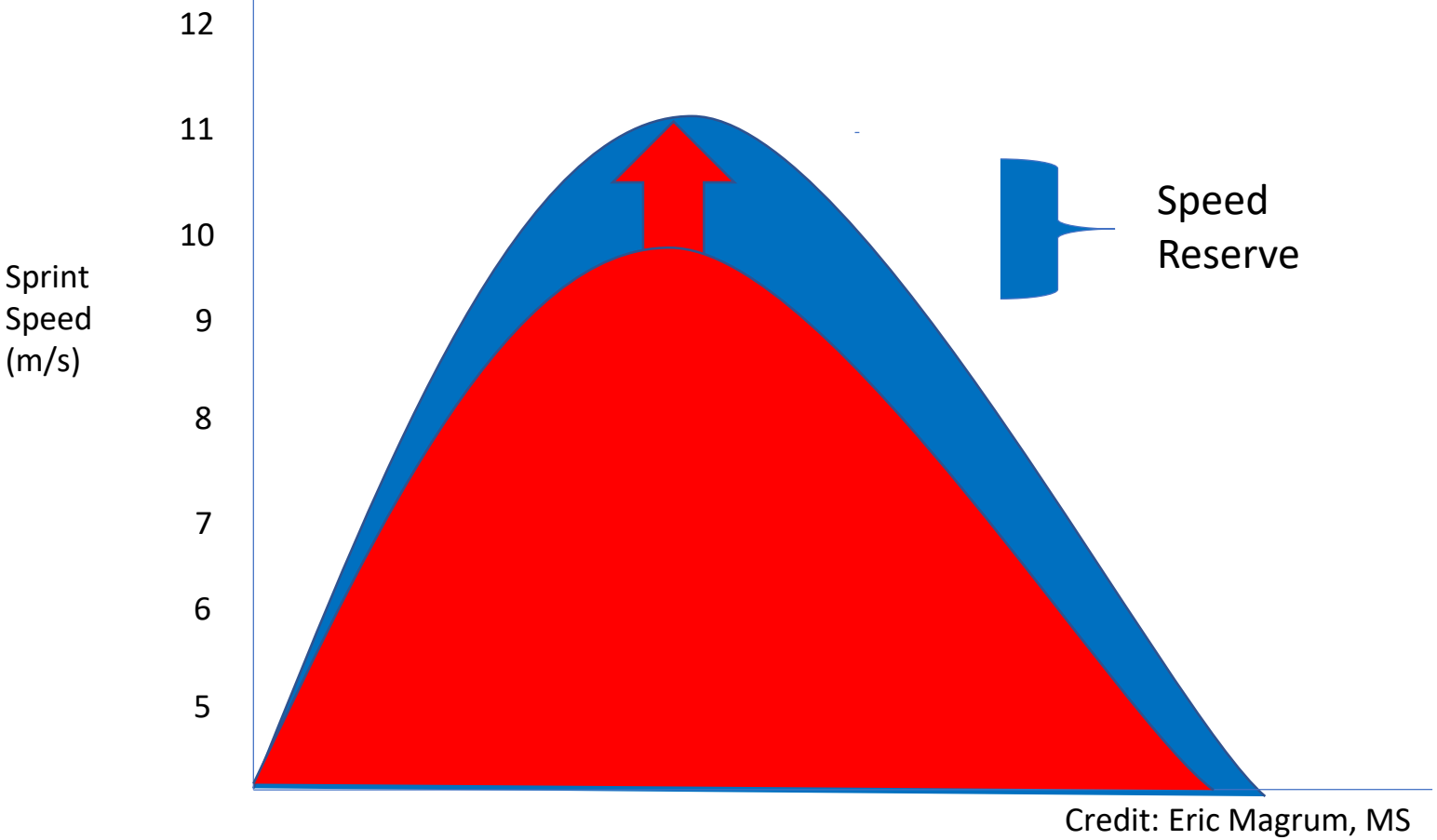
- As transition to top-speed becomes prioritized, a shift toward impulse 1 may occur.

If you understand this, you don't need these

#OrientationMatters

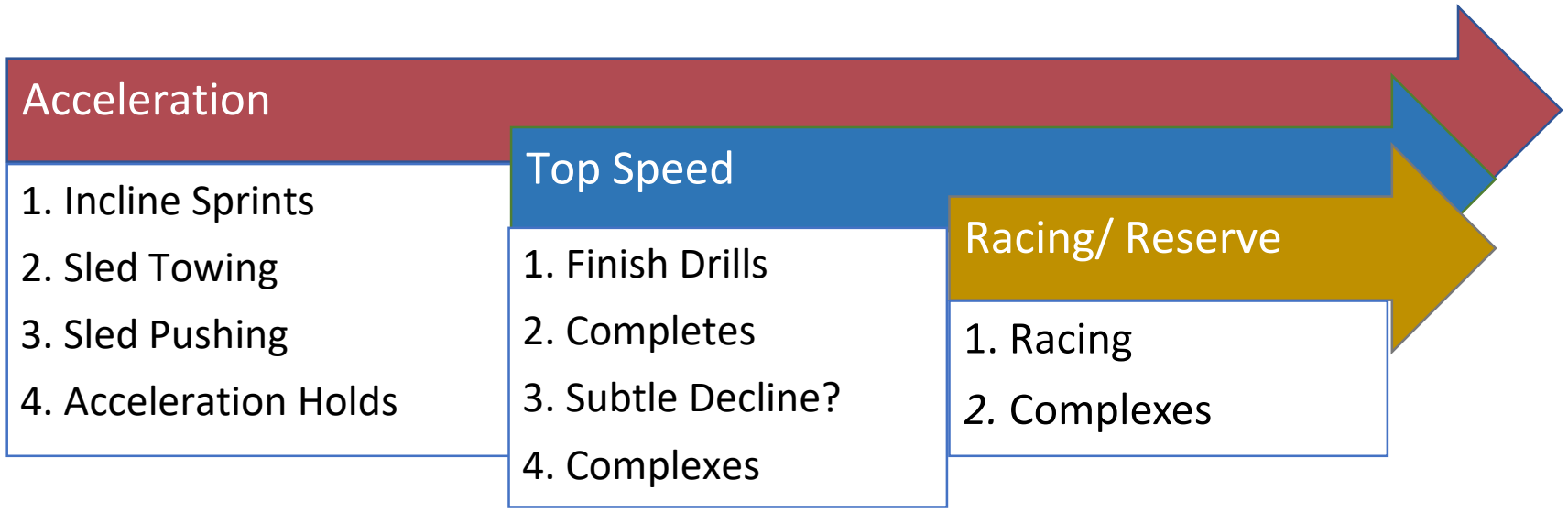
#StiffnessFollowsSkill

Goal: Deepen the Reserve



Credit: Eric Magrum, MS

Speed Sequencing



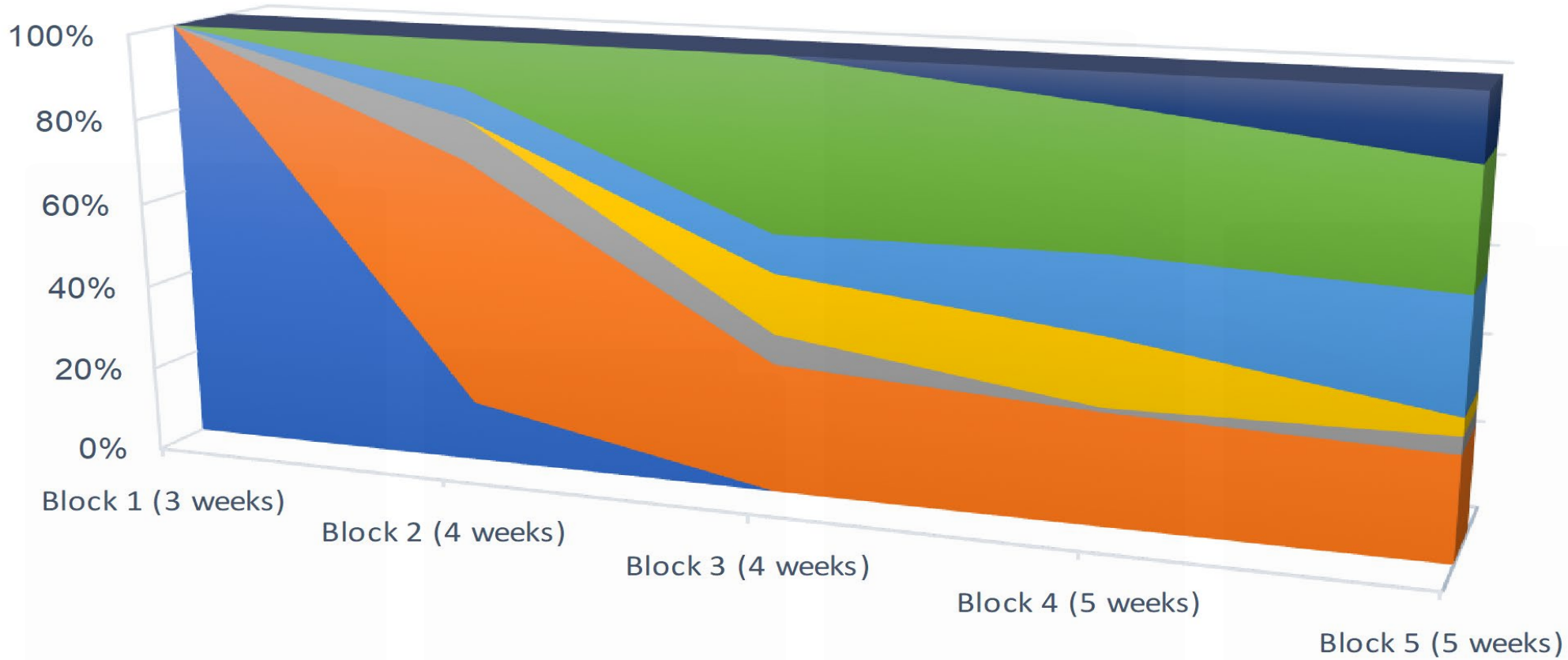
Aim(s):
1. Just as with strength training, the ability to produce force underpins sprint success.
2. Never completely remove acceleration training.
3. Build top speed as readiness becomes apparent (AKA optimized force production)

ENHANCING SKILL: INITIAL ACCELERATION

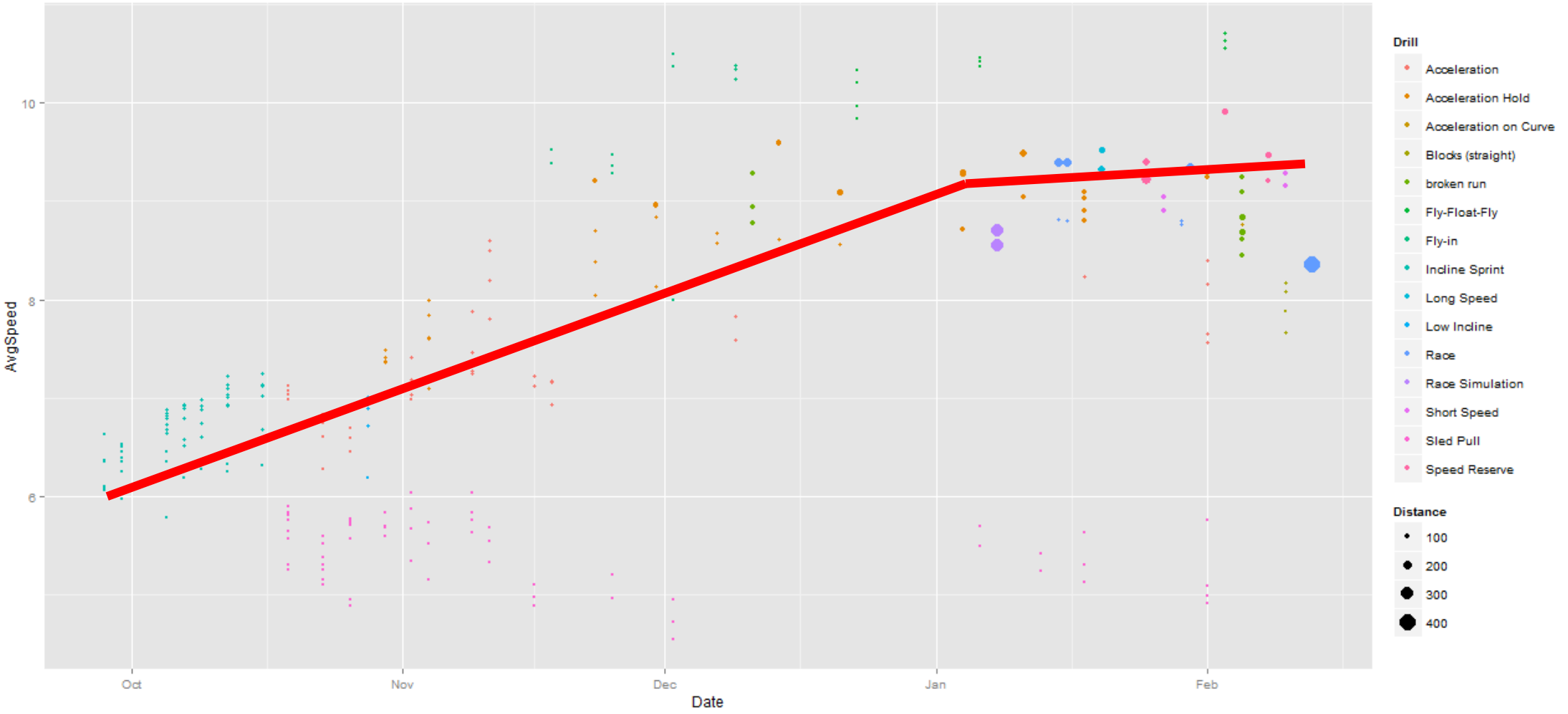
Tactics that have traditionally been considered to overload the GRF of a sprint start through

- Lowered COM
- Exaggerated Position (horizontal orientation)
- Additional Mass

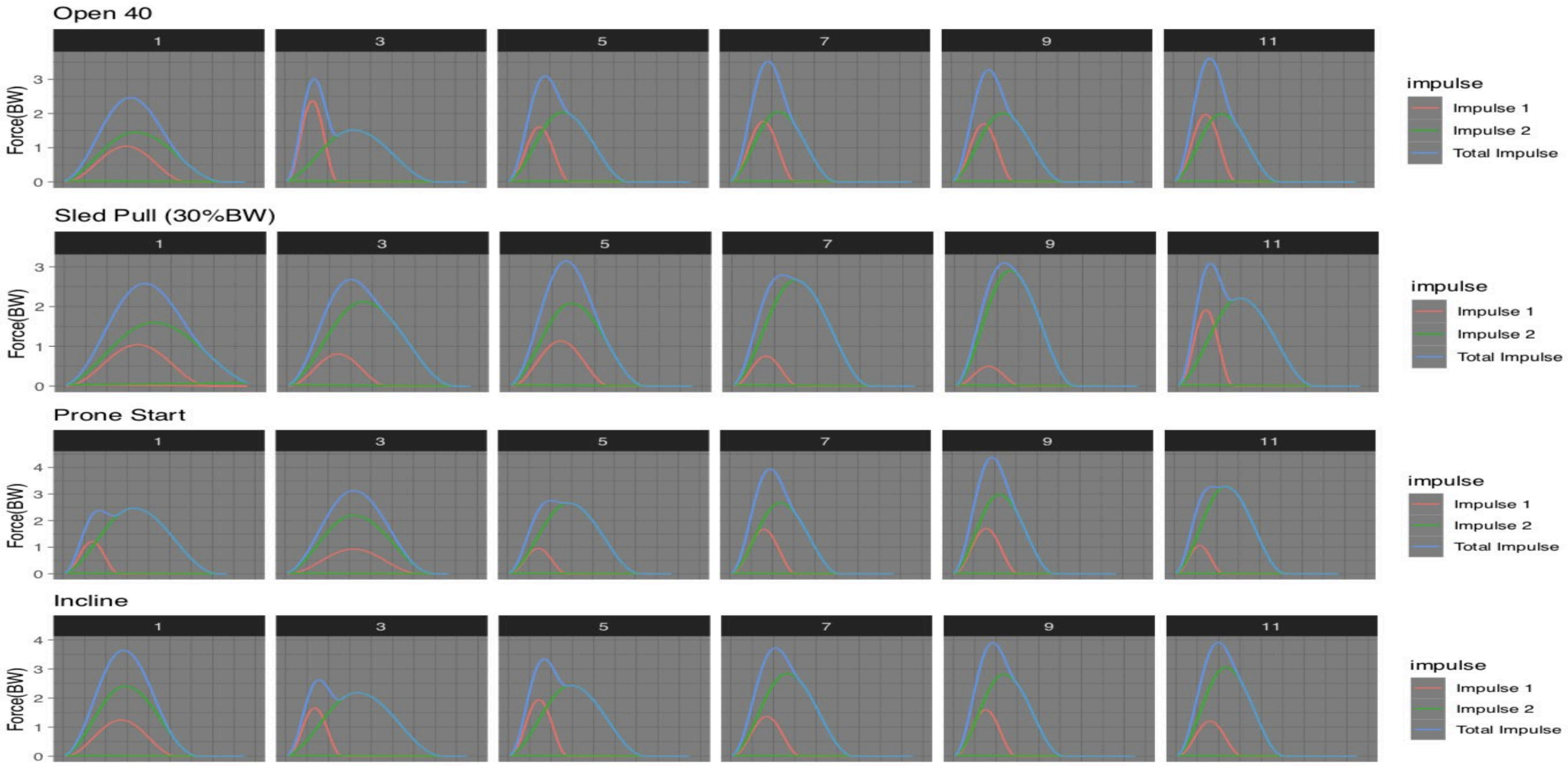
Sequenced Integration: Speed



Surfing with Speed



Wave Forms Determine Function

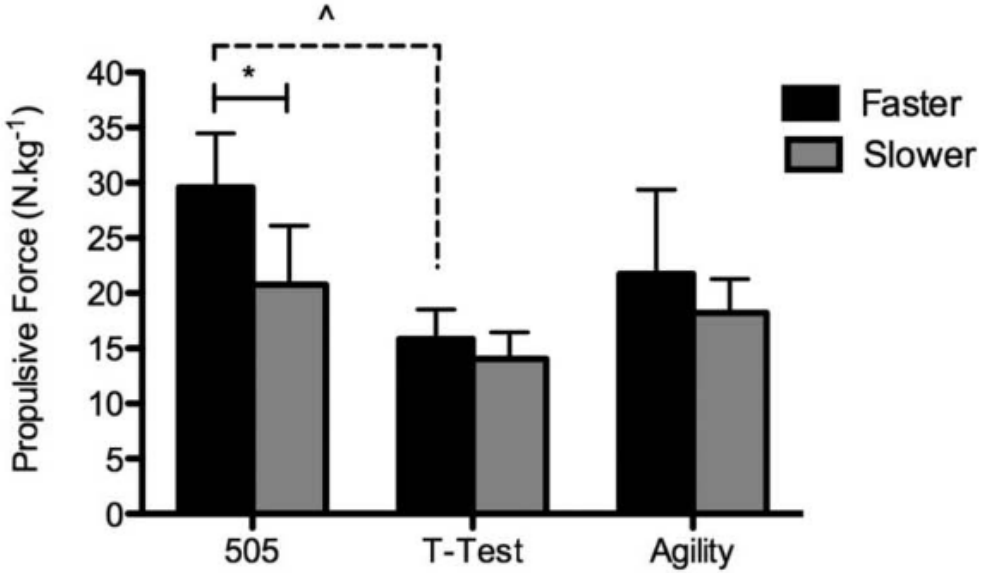


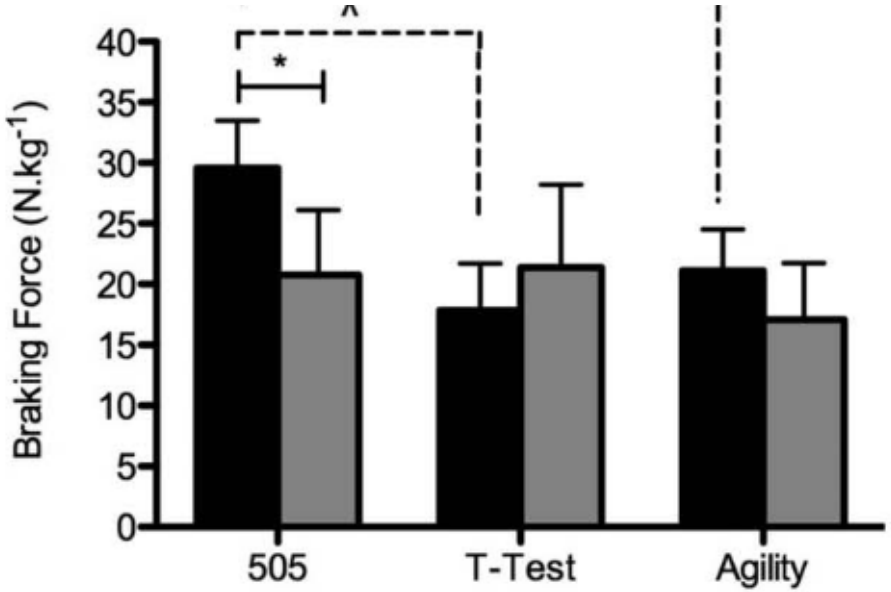
Programming Lenses for Integrating COD & Agility

1. Rapid Force Production
2. COD Intent
3. Skill Progression
4. Complexity

Importance of Rapid Force Production

- Rapid force production also critical for change-of-direction (COD) & agility.
  - Spiteri et al. (2015)
- Faster athletes also displayed shorter GCT in all 3 tests.
- Larger GRF over shorter GCT…do the math…higher RFD & power!
- Ability to rapidly apply force is the “primary lens” to consider when developing multi-direction skills

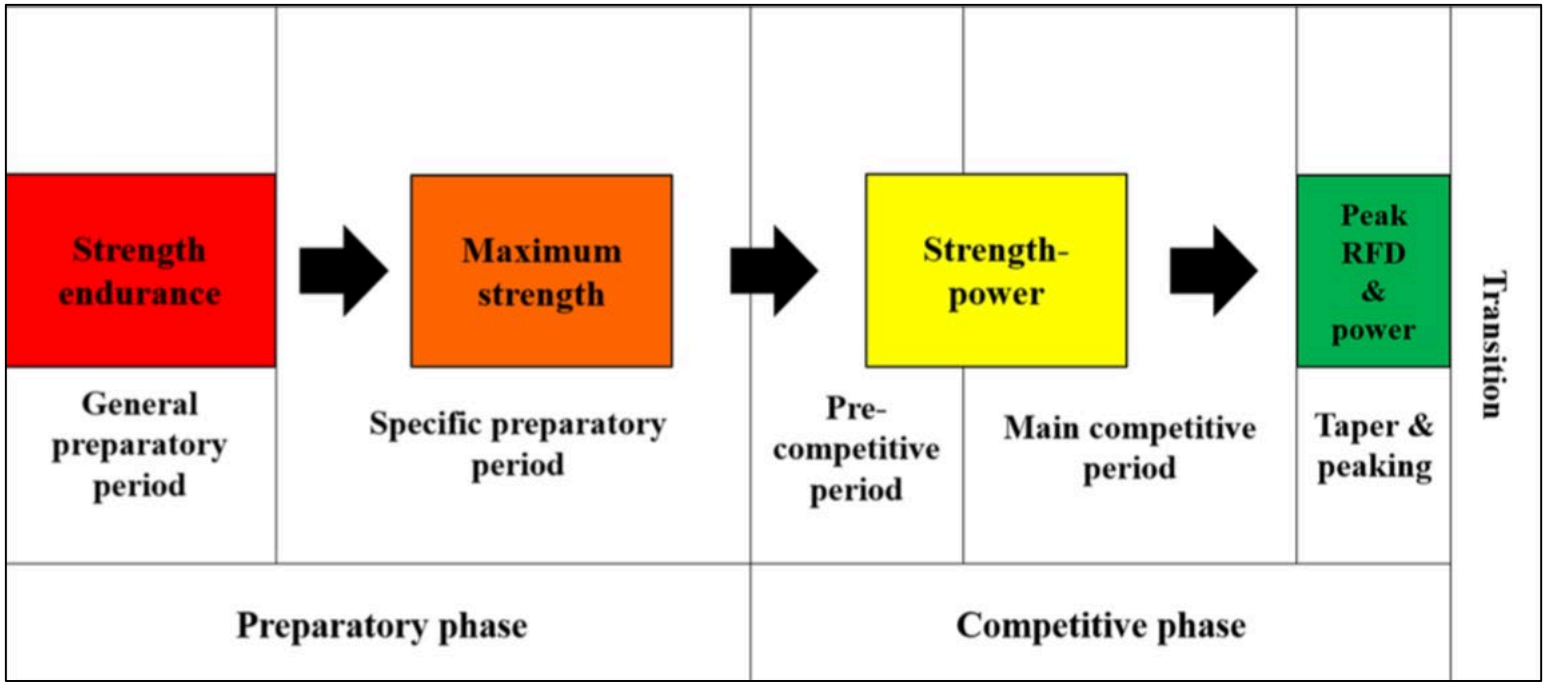




Rapid Force Production across the Annual Training Plan

1. Periods of higher training volumes and low-moderate intensities (i.e. GPP) often reduce rapid for production (RFD) & vice versa.
   - Mangine et al. (2016)
2. Force production influences kinematics
   - Clark et al. (2017)

- In other words, the way we produce force strongly influences how we move!

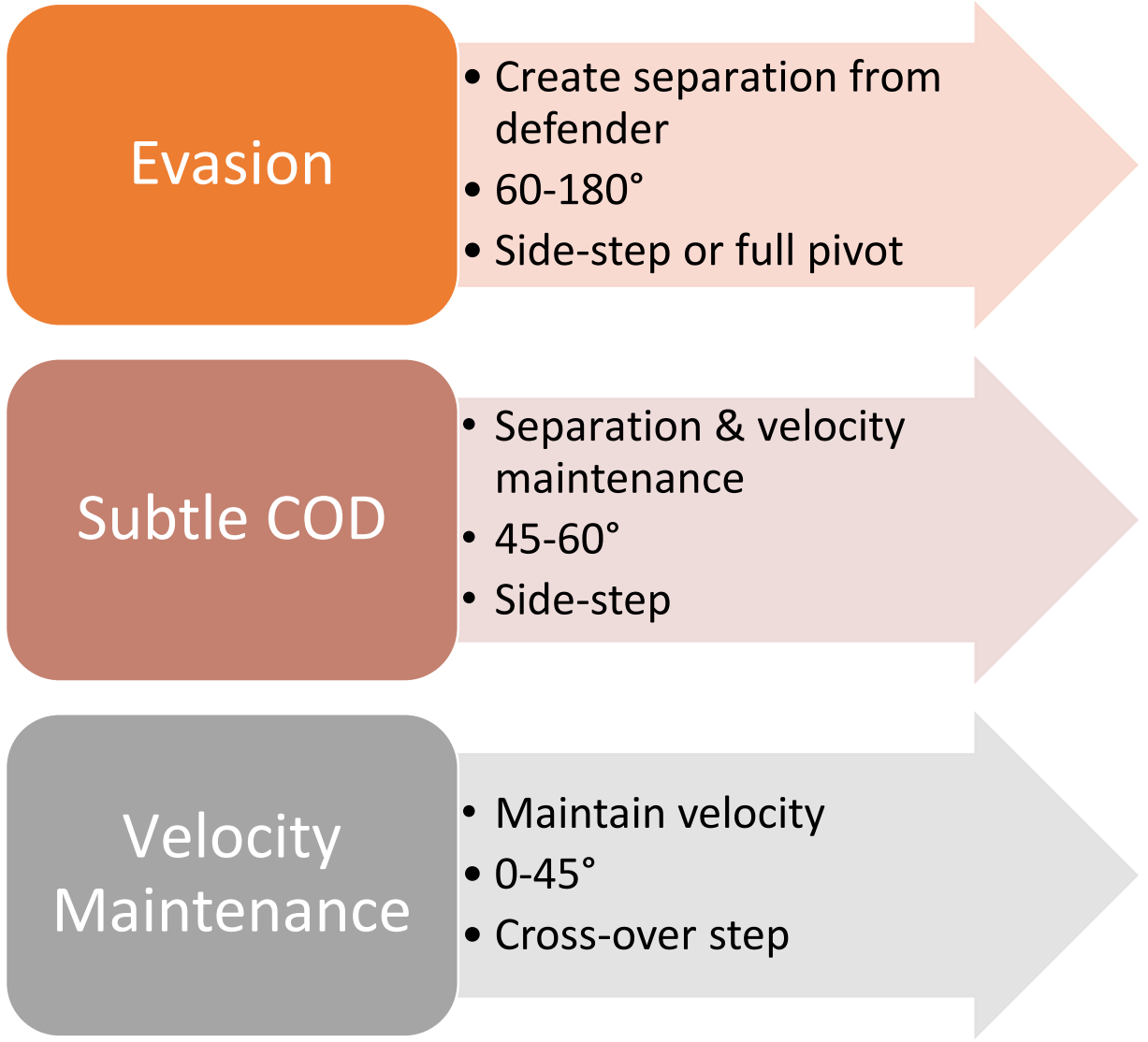


From Suchomel et al. (2018)

Training Lens	General Preparatory Period	Specific Preparatory Period	Pre-Competitive Period
RFD & Power	Lower	Higher	Highest
COD Intent			
Skill Progression			
Complexity			

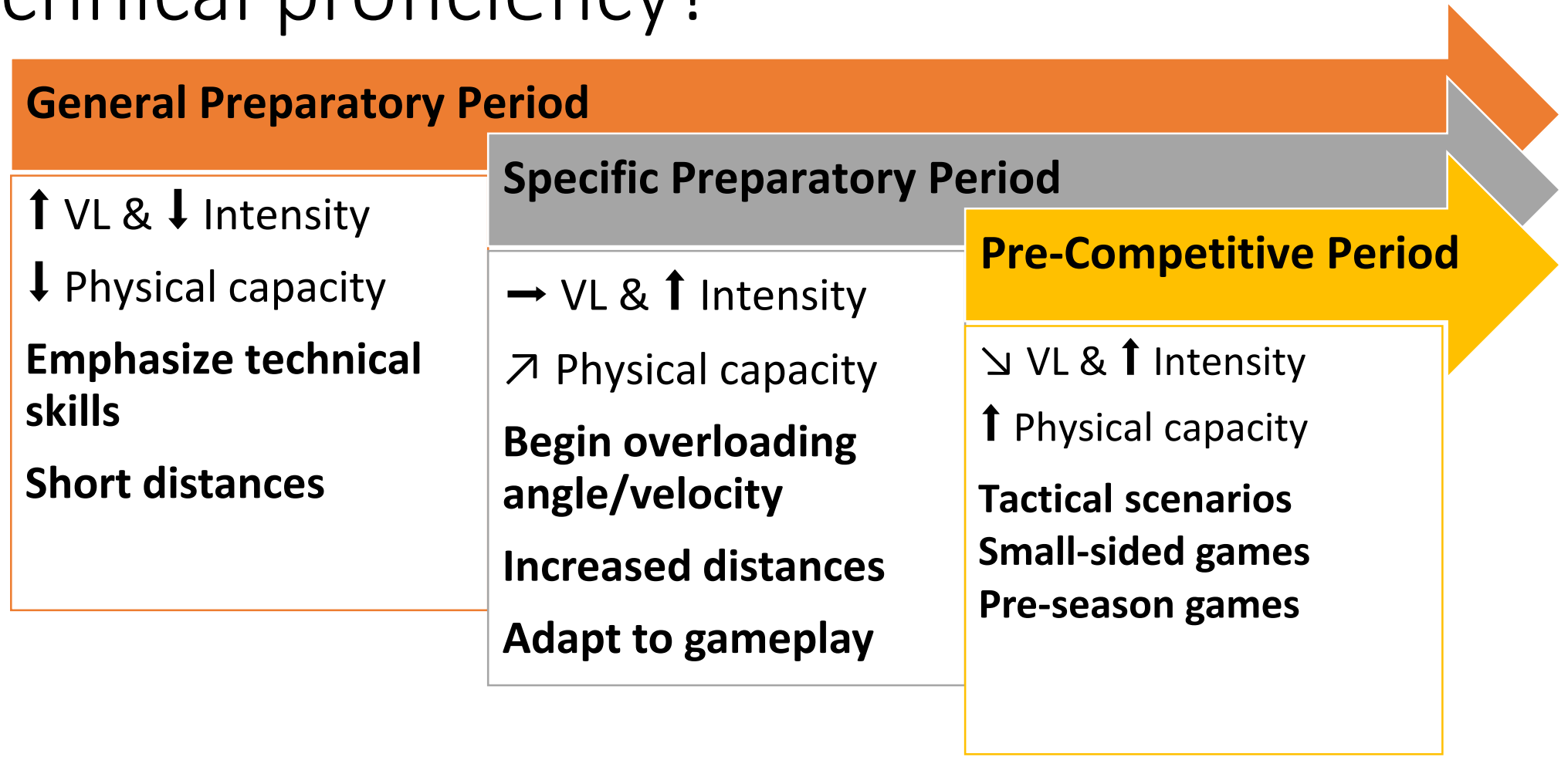
Intent of COD

- Define the intent of the COD movement
- Intent influences **technical** and **physical demands** of COD
- Sharper angles (e.g. ≥90°) require lower approach velocity but subject athlete to greater joint loading, particularly at the knee
- Subtle angles (e.g. 45°) require higher approach velocity, which also increases knee joint loads
- Need to progress physical capacity and technical proficiency to tolerate the loading



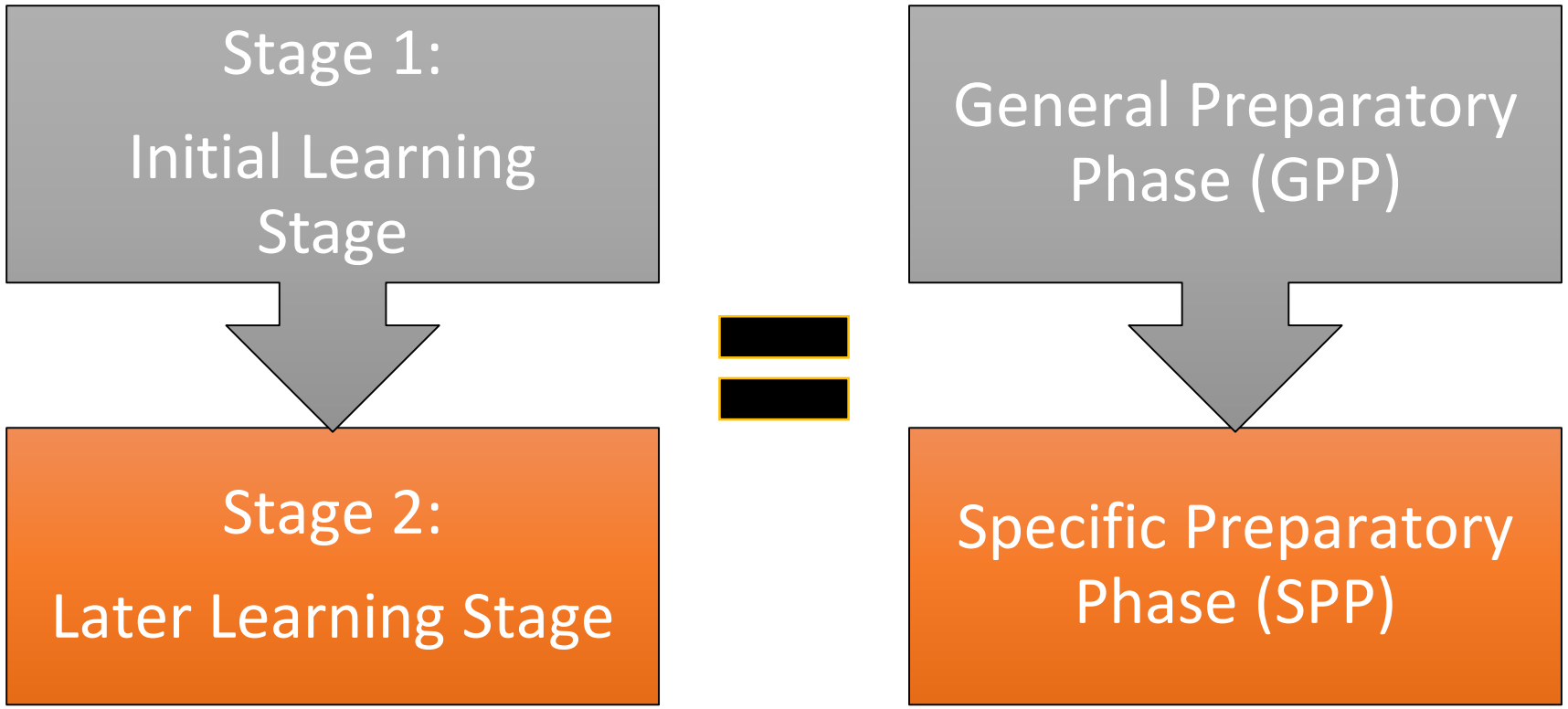
Modified from Dos'Santos et al. (2018) with permission from author

How do we progress physical capacity and technical proficiency?



Training Lens	General Preparatory Period	Specific Preparatory Period	Pre-Competitive Period
RFD & Power	Lower	Higher	Highest
COD Intent	Technical Skill & Short Distances	Overload Velocity/Angle	Modified Gameplay
Skill Progression			
Complexity			

Gentile's Model of Motor Learning



Magill (2007)

Initial Stage - GPP

- Two fundamental objectives:
  1. Acquire basic movement pattern.
  2. Discriminate between “regulatory” & “non-regulatory” conditions.

- *Regulatory conditions* essential components of a skill desired goal
  - ✓ Forces – force required for skill
  - ✓ Angles – body angles
  - ✓ Directions – anterior/posterior
  - ✓ Distances – distance covered

- *Non-regulatory conditions* are not essential, but may indirectly influence the performer.
  - Magill (2007)

- **Direct attentional focus to critical elements of the skill!**

Acceleration pattern

Deceleration pattern

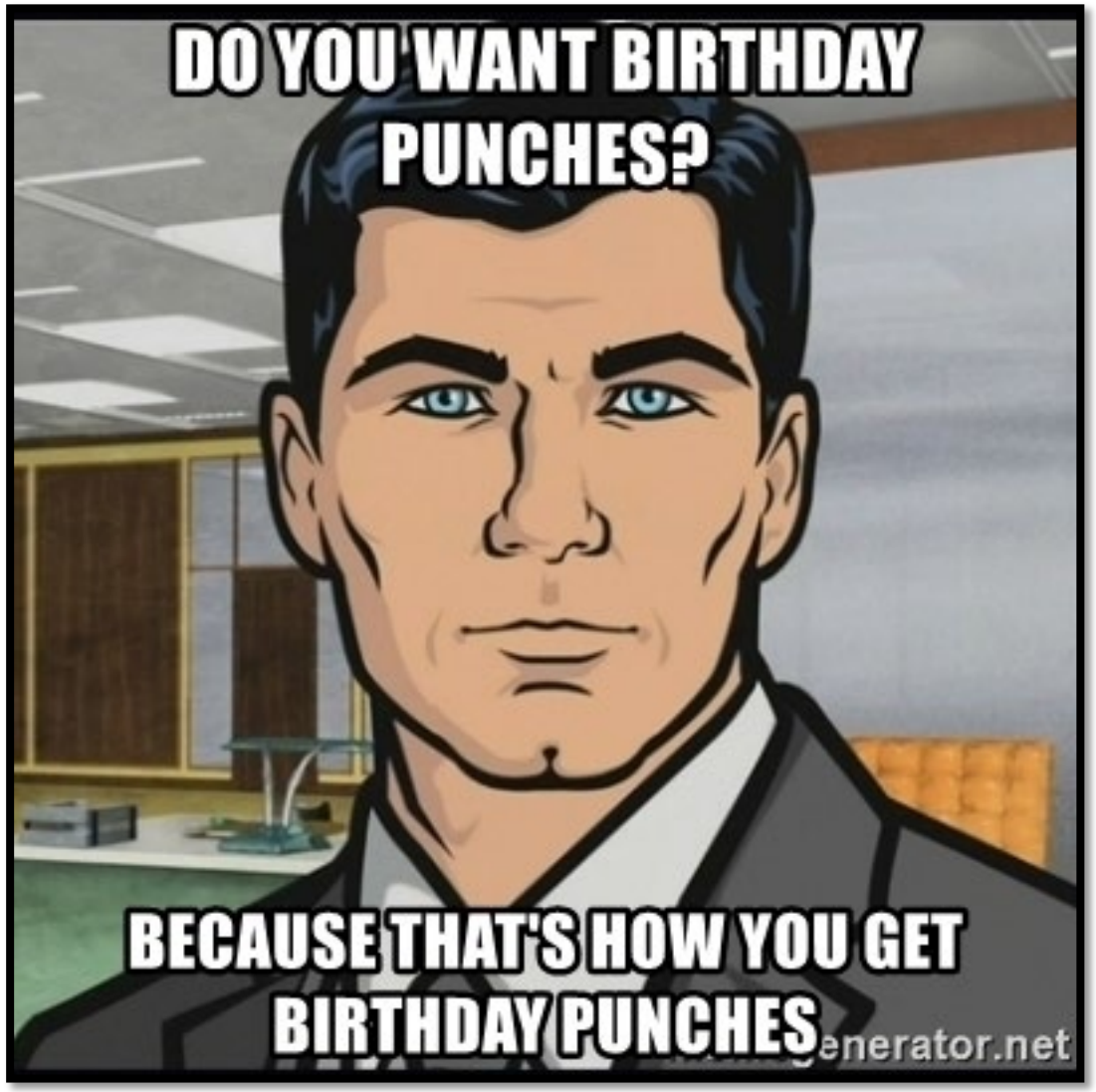
Training Lens	General Preparatory Period	Specific Preparatory Period	Pre-Competitive Period
RFD & Power	Lower	Higher	Highest
COD Intent	Technical Skill & Short Distances	Overload Velocity/Angle	Modified Gameplay
Skill Progression	Basic	Advanced	Game Context
Complexity			

Task Complexity

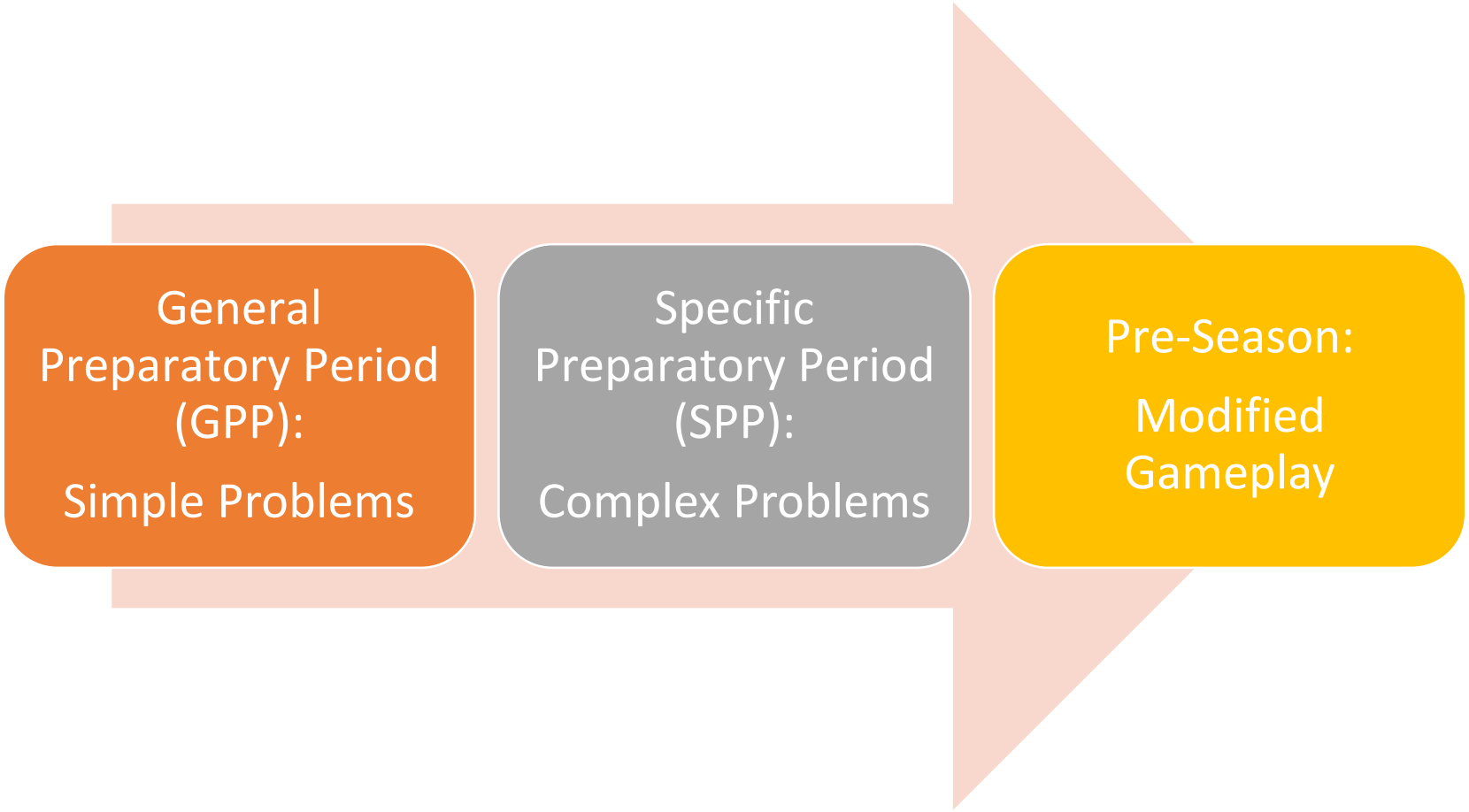
- Great athletes are physically competent AND good problem solvers
- Sport skills can be thought of as solutions to problems on the field of play
- Problems be conceptualized as “simple” or “complex” tasks
- Problems are presented in sport with varying amounts of variables, time and space
- Simple = ⬇ variables, ⬆ time, and ⬆ space
- Complex = ⬆ variables, ⬇ time, and ⬇ space
- ***Why is this distinction important?***

Task Complexity

- Complex problems often require a larger quantity of “unplanned movements”
- Reactive or “unplanned movements” (e.g. – agility) are often more physically demanding than planned movements (e.g. – COD)
- External joint loads are higher during uncertain or unplanned multi-directional movements. Also accompanied by greater knee valgus…
  - Besier et al. (2001)
- Less time to pre-activate musculature prior to change-of-direction movement
- Limited time to make postural adjustments
- Must be physically prepared to tolerate these joint loads!



Task Complexity



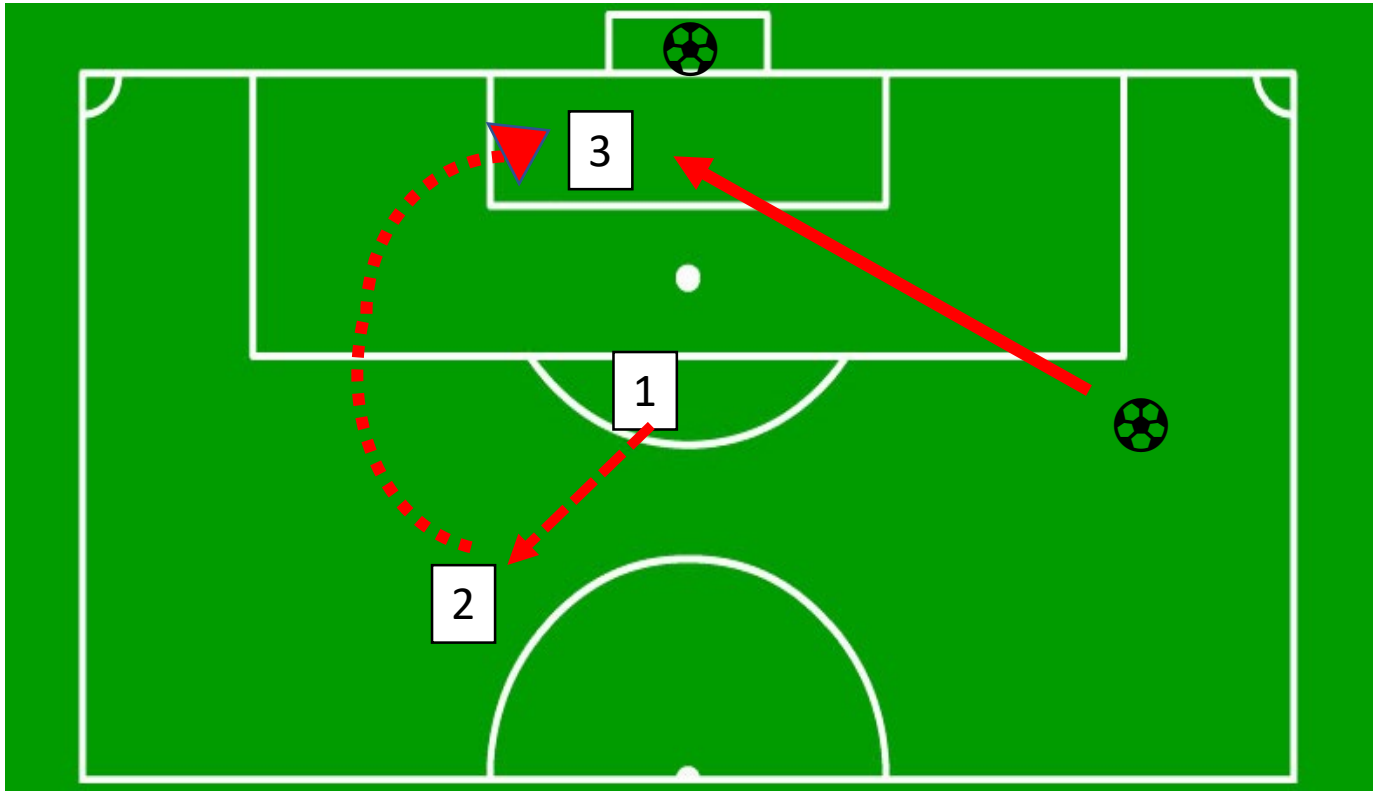
Task Complexity

- Progressively overloading task complexity:

1. Gradually exposes the athlete more rapid GRF's as they attain greater strength and power
   - ✓More prepared to tolerate rapid joint loading
2. Provides an opportunity to learn effective decision-making skills
   - ✓More efficient problem-solvers

Physically superior or just great problem solvers?

Example: Sport Task for a Striker



The Backbone of this Progression

- Get to know the physical and **tactical** demands of the sport
- Be a student of the sport
- Talk shop with sport coaches
- Get **their** input on what movements need to be addressed to play **their** system
- Another avenue to building strong relationships

Training Lens	General Preparatory Period	Specific Preparatory Period	Pre-Competitive Period
RFD & Power	Lower	Higher	Highest
COD Intent	Technical Skill & Short Distances	Overload Velocity/Angle	Modified Gameplay
Skill Progression	Basic	Advanced	Game Context
Complexity	Simple	Complex	Game Scenarios

References

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