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2020 NSCA COACHES
CONFERENCE & LIVESTREAM

#Coaches20

PRACTICAL SOLUTIONS FOR TESTING, TEACHING, & TRAINING LINEAR SPEED

LANCE WALKER, PT,MS,CNDS
VICE PRESIDENT, GLOBAL PERFORMANCE
MICHAEL JOHNSON PERFORMANCE
DALLAS, USA

CATEGORIZING TYPES OF SPEED

LINEAR

MULTIDIRECTIONAL

ACCELERATION

ANGULAR ACCELERATION

MAXIMUM VELOCITY

CHANGE-OF-DIRECTION

THE LINEAR SPEED CONTINUUM

LINEAR SPEED CONTINUUM

ACCELE
RATION

MAXIMUM
VELOCITY

MAXIMUM VELOCITY: IS IT STILL IMPORTANT TO TRAIN IT?

WHY TRAIN MAXIMUM VELOCITY?

Three (3) reasons to include maximum velocity training in your program include:

- ***Sports Performance***
- ***Injury Prevention***
- ***Transfer Effects (Athleticism, Stamina, Synergistic Adaptation)***

TRAIN IT FOR…

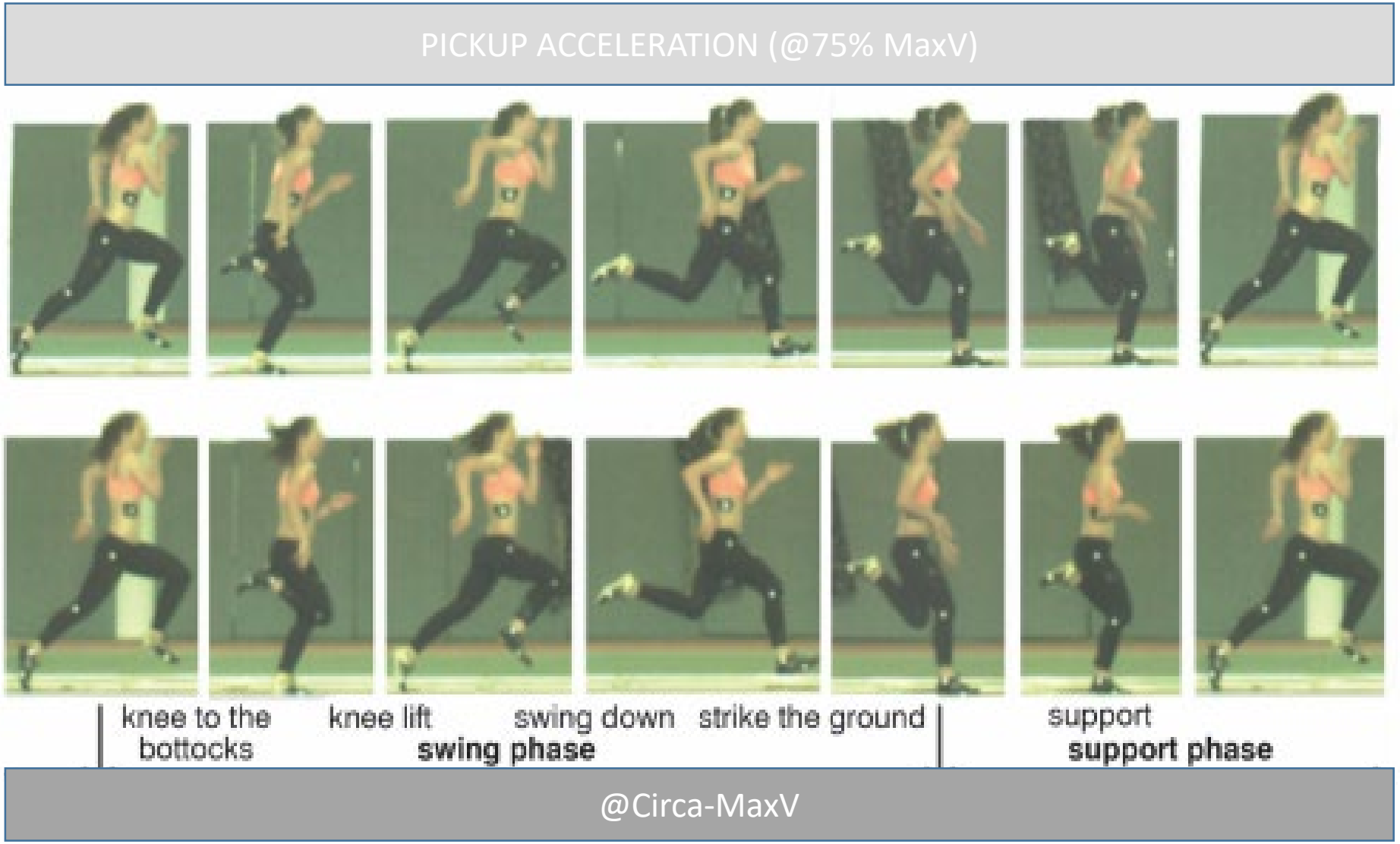


Image: Manser, Mattes, and Hollander (2016). Kinematic Analysis of Sprinting Pickup Acceleration and Maximum Velocity Sprinting Speed. Biology of Exercise, Volume 12.2.

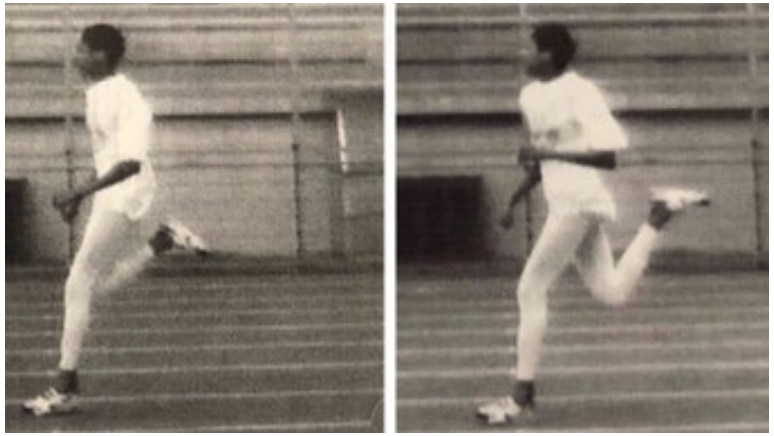
THE LINEAR SPEED CONTINUUM

100m Sprint (Elite)	0-20m (50% maxV at 10m, 75% maxV at 20m)		30-60m	60m+
Soccer & Lacrosse (Vescovi et al., 2010)	0-10m	15-30m	30+m	NA
Baseball (H2F) (Coleman & Dupler, 2004)	0-10m	10-20m	NA	NA
Rugby (Balsom, 1994)	0-10m	10-30m (flying starts)	30-60m	NA
Kids (6-12 y/o)	0-5m	5-20m	20-30m	30+m (NA)

MAXIMUM VELOCITY? IT IS IMPORTANT TO

TRAIN IT FOR…

INJURY PREVENTION



Journal of Experimental Biology

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RESEARCH ARTICLE

The human gluteus maximus and its role in running

Daniel E. Lieberman, David A. Raichlen, Herman Pontzer, Dennis M. Bramble, Elizabeth Cutright-Smith

Journal of Experimental Biology 2006 209: 2143-2155; doi: 10.1242/jeb.02255

Comparative electromyography of the lower extremity in jogging, running, and sprinting

Roger A. Mann, MD, Gary T. Moran, PhD, Sandra E. Dougherty

First Published November 1, 1986 | Other

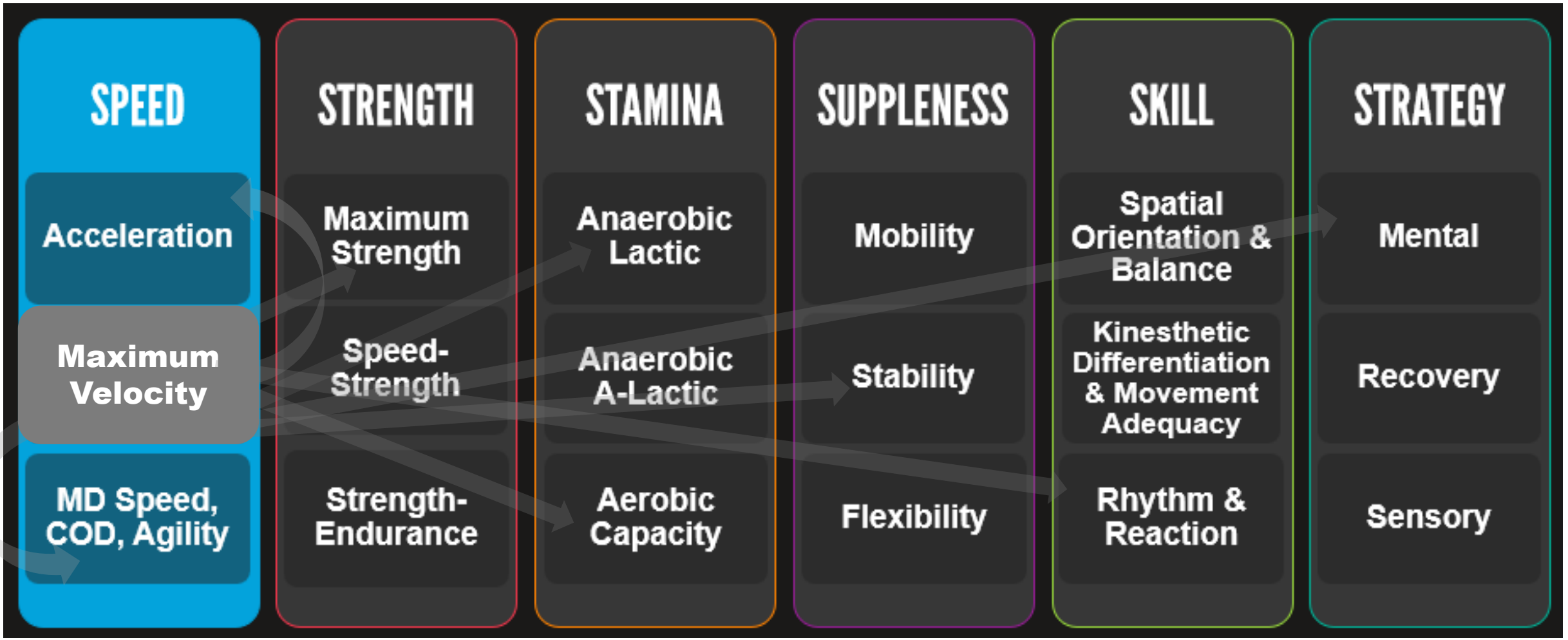
https://doi.org/10.1177/036354658601400614

Sprinting: a potential vaccine for hamstring injury?

Pascal Edouard [1,2,3,4,5], Jurdan Mendiguchia [6], Kenny Guex [7], Johan Lahti [8], Pierre Samozino [9], and Jean-Benoît Morin [8,10]

[1]Inter-university Laboratory of Human Movement Science (LIBM EA 7424), University of Lyon, University Jean Monnet, F-42023. Saint Etienne, France,[2]Department of Clinical and Exercise Physiology, Sports Medicine Unit, University Hospital of Saint-Etienne, Faculty of Medicine, Saint-Etienne, France,[3]Medical Commission, French Athletics Federation (FFA), Paris, France,[4]Swiss Olympic Medical center, Centre de médecine du sport, Division de médecine physique et réadaptation, Centre Hospitalier Universitaire Vaudois, Lausanne, Switzerland,[5]European Athletics Medical & Anti Doping Commission, European Athletics Association (EAA), Lausanne, Switzerland,[6]Department of Physical Therapy, ZENTRUM Rehab and Performance Center, Barañain, Spain,[7]School of Health Sciences (HESAV), HES-SO University of Applied Sciences and Arts Western Switzerland, Lausanne, Switzerland,[8]Université Côte d'Azur, LAMHESS, Nice, France,[9]Univ Savoie Mont Blanc, Laboratoire Interuniversitaire de Biologie de la Motricité, EA 7424, F-73000 Chambéry, France, and [10]Sports Performance Research Institute New Zealand, School of Sport and Recreation, Auckland University of Technology, New Zealand

MAXIMUM VELOCITY: TRANSFER EFFECTS



MAXIMUM VELOCITY: IT IS IMPORTANT TO TRAIN IT FOR…

TRANSFER EFFECTS: ACCELERATION

The National Football League Combine 40-yd Dash

How Important is Maximum Velocity?

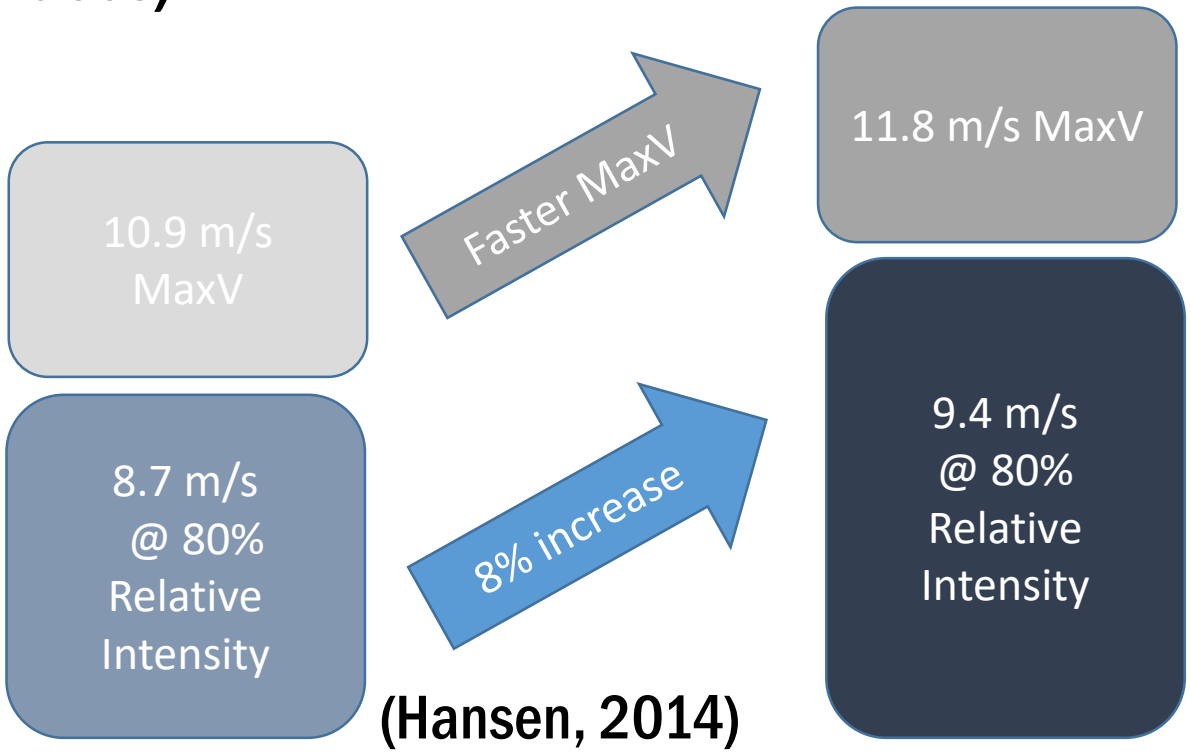
Clark, Kenneth P.[1]; Rieger, Randall H.[2]; Bruno, Richard F.[1]; Stearne, David J.[1]

The Journal of Strength & Conditioning Research: June 2019 - Volume 33 - Issue 6 - p 1542–1550
doi: 10.1519/JSC.0000000000002081
Original Research

MAXIMUM VELOCITY: IT IS IMPORTANT TO TRAIN IT FOR…

TRANSFER EFFECTS: STAMINA

Speed Reserve Transfer Effect (up to 10,000m races):

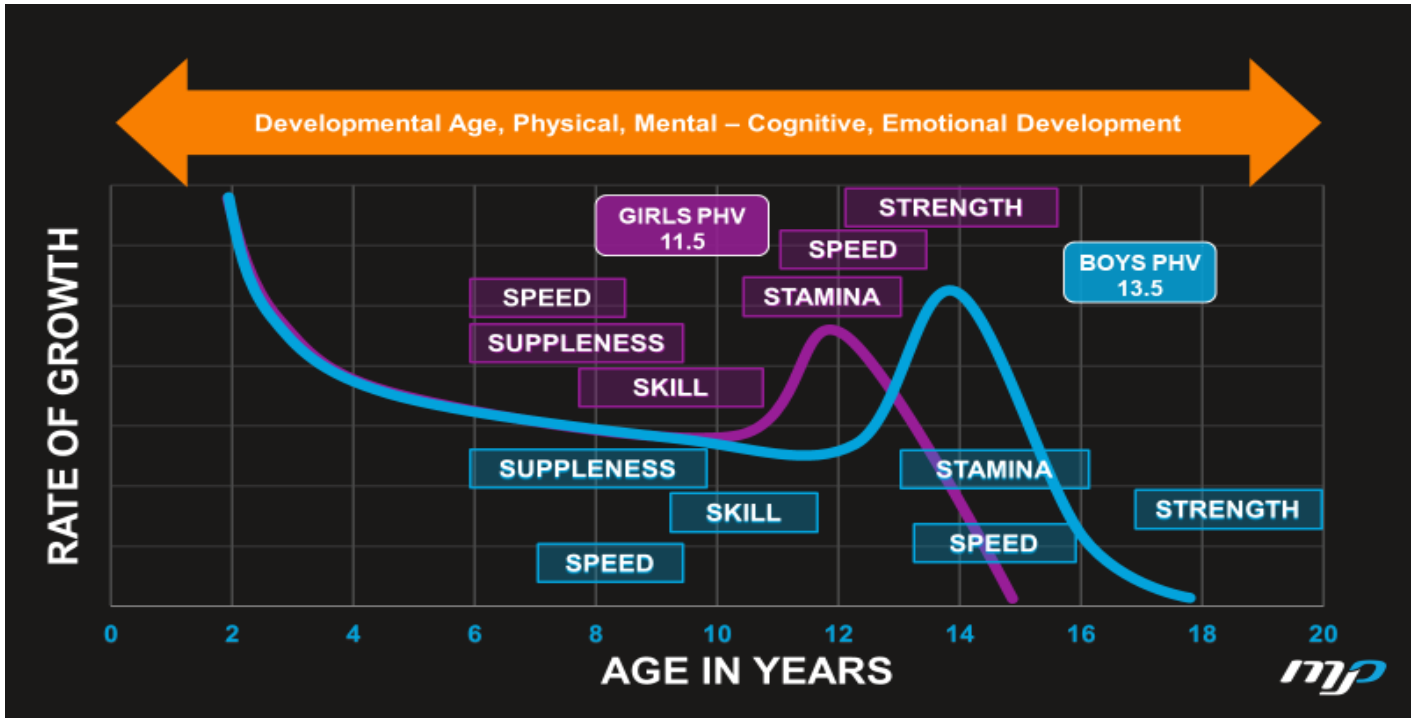


(Hansen, 2014)

MATURATION VELOCITY: IT IS IMPORTANT TO TRAIN IT FOR…

TRANSFER EFFECTS: SYNERGISTIC ADAPTATION

As other elements of athleticism, speed develops at different rates during growth and development from ages 6-18 years.



SPEED "LIMITS"

A "SWEET SPOT" PROBABLY EXISTS FOR ALL HUMANS IN HOW THEY GENERATE SPECIFIC KINEMATICS AND KINETICS (WHAT IS OPTIMUM FOR ONE MAY NOT BE FOR EVERYONE).

NOTE: Due to individual differences, it is important to note that improving stride characteristics is an iterative process.

SPEED "LIMITS"

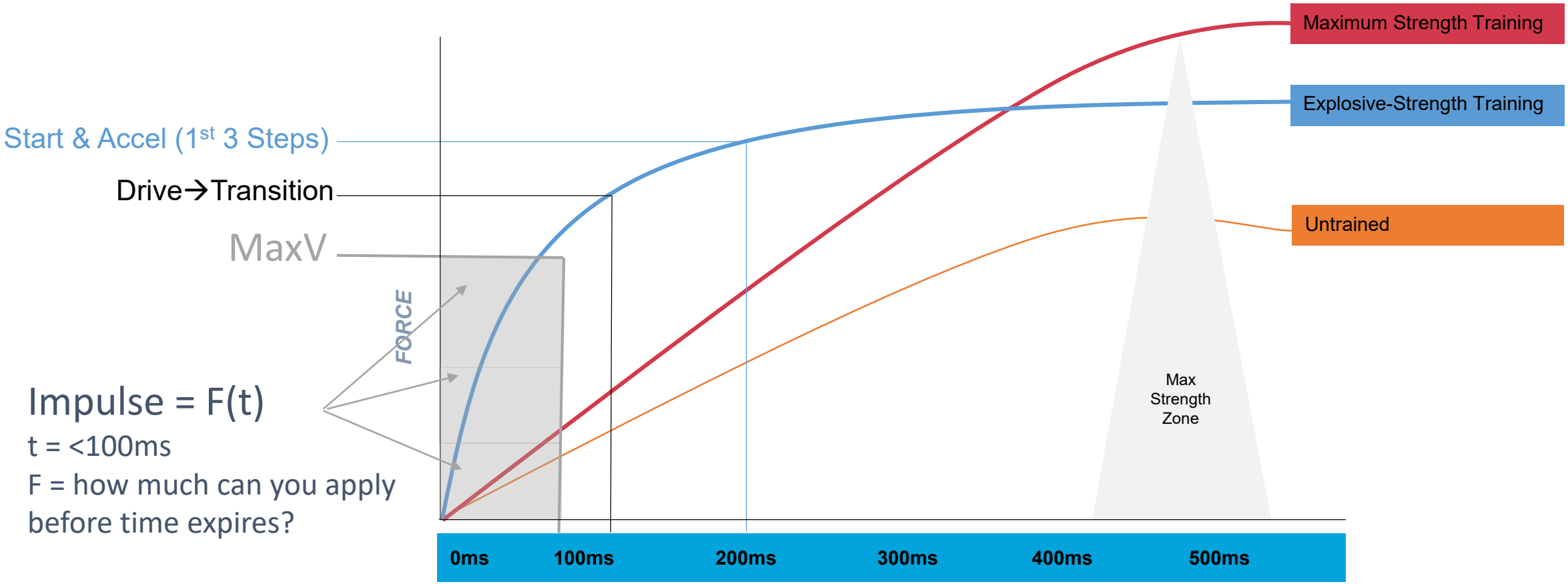
Strength & Power

FORCE PRODUCTION

- *"Apply large mass-specific force to the ground quickly."* — Peter Weyand
- Larger = Better; Vertical > Horizontal
- How much? 3-5 x Bodyweight ground reaction forces at ground contact!
- Rate of Force Development (RFD): How fast can force be delivered to ground?
- Impulse: change in momentum of an object (impact of collision/"punch").

SPEED "LIMITS"

Relationship Between Force Applied vs Time (impulse)



Impulse = F(t)

t = <100ms

F = how much can you apply before time expires?

SPEED "LIMITS"

Technique

FORCE LOCATION

- *"Proper force* application results in both stride length and stride frequency increases.*"* – Tom Tellez
- *"Direction of ground reaction forces* in stance phase.*"* – Frans Bosch
- Orientation of force line into the ground at the optimum time and synchronously with repositioning of swing leg.

SPEED "LIMITS"

Coordination

- *"Stiffness of support leg in harmony with speed of swing leg flexion."* — Gary Winckler
- *"If relative strength qualities exist, coordination and dexterity may be the key differentiating factor to being fast."* — Lance Walker
- Ability to transmit force into the ground, then transfer the resulting ground reaction force through the kinetic chain to propel the center of mass (COM)
- Optimum timing of force production in both OKC and CKC requires optimum sequential ordering of muscle contractions and relaxations (Early Impulse)

MJP TRAINING SYSTEM

NOT SPEED: A CONSOLIDATE APPROACH TO SPEED TRAINING

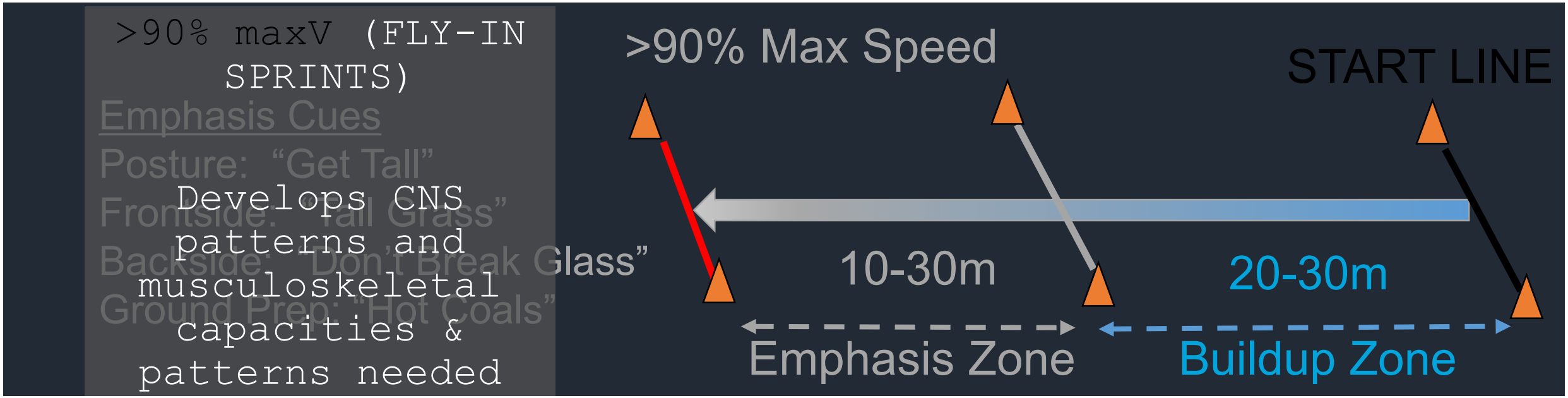
Drills, routines, pattern practice that target specific elements of speed kinetics and kinematics.

SPEED TRAINING

Practicing (via repeat runs, games/relays, competitions) the actual locomotion patterns (eg., running, sprinting).

PRACTICAL TRAINING APPLICATIONS: PUTTING IT ALL TOGETHER

- ***MAXIMUM VELOCITY SPRINTING: SPEED APPLICATION***
  - ***EMPHASIS ZONE FLY-INS***



Emphasis Cues
Posture: "Get Tall"
Frontside: "Tall Grass"
Backside: "Don't Break Glass"
Ground Prep: "Hot Coals"

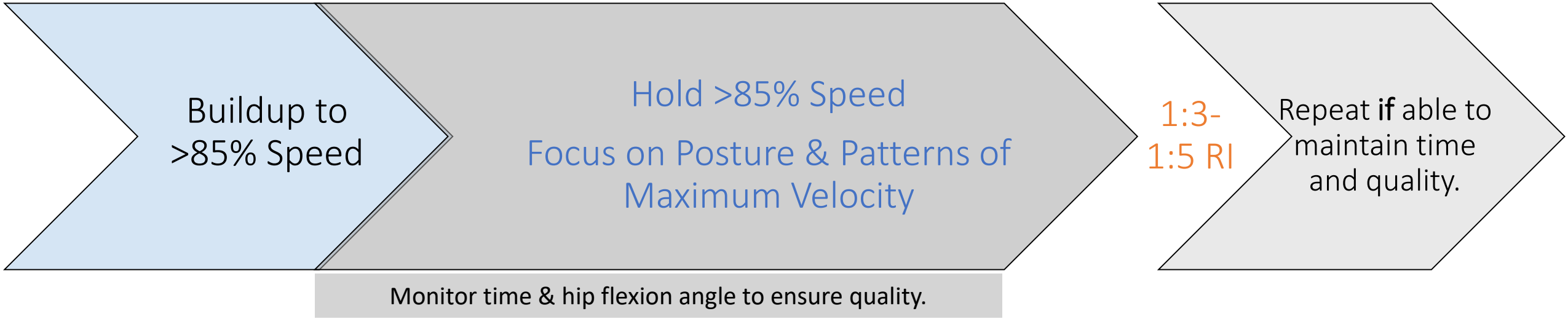
One session minimum every week; at least 72 hours between sessions.

Under 18 years use S-2-L (>90%); >18 y/o build L-2-S (from <85% to >95%)

PRACTICAL TRAINING APPLICATIONS:
PUTTING IT ALL TOGETHER

SPEED APPLICATION

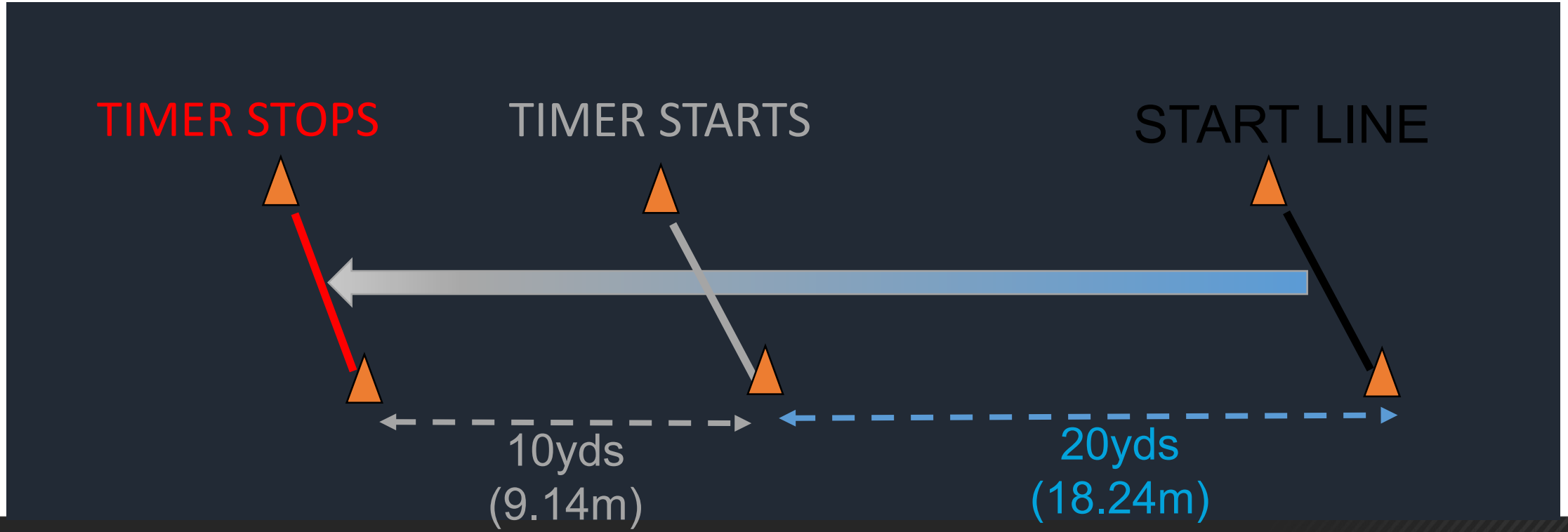
- ***TEMPO RUNNING***



No more than 1-2 sessions per week maximum

At least 48-72 hours b/w sessions; progress only if times are achieved

PRACTICAL TRAINING APPLICATIONS: PUTTING IT ALL TOGETHER

SPEED APPLICATION

- ***TESTING: FLY-IN 10S***