
HAMSTRING
REHAB IN
PROFESSIONAL
FOOTBALL
Jurdan Mendiguchia
ZENTRUM

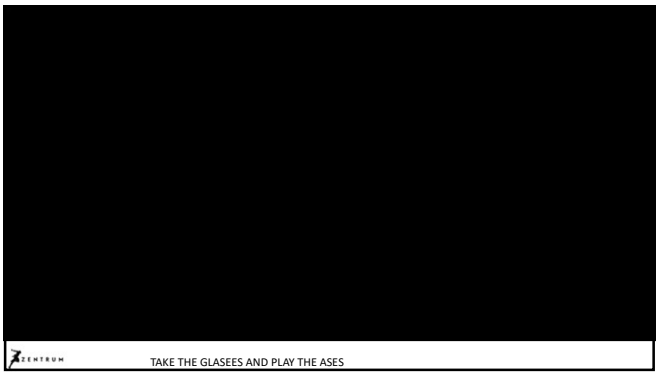
1


APPROVED
ZENTRUM

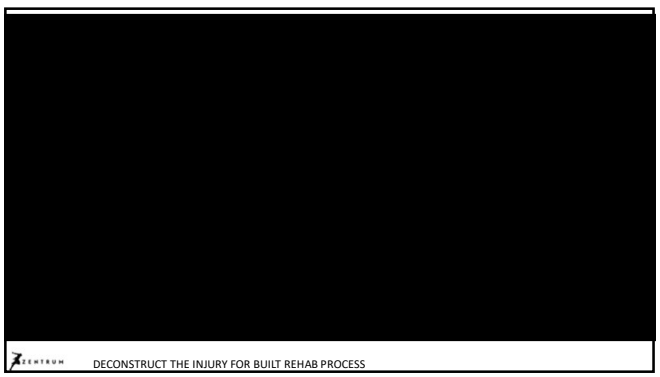
2


ZENTRUM

3


ZENTRUM
TAKE THE GLASEES AND PLAY THE ASES

4


ZENTRUM
DECONSTRUCT THE INJURY FOR BUILT REHAB PROCESS

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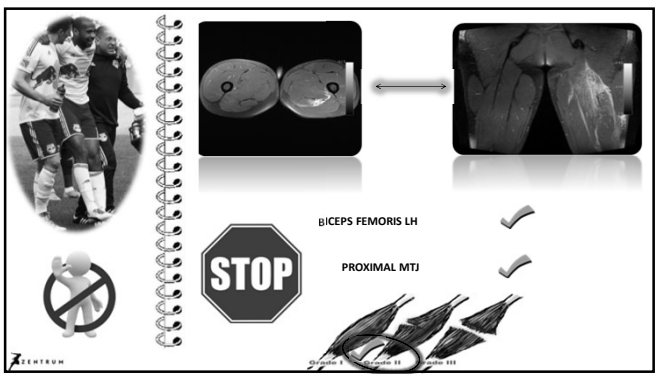
STOP
BICEPS FEMORIS LH
PROXIMAL MTJ
ZENTRUM

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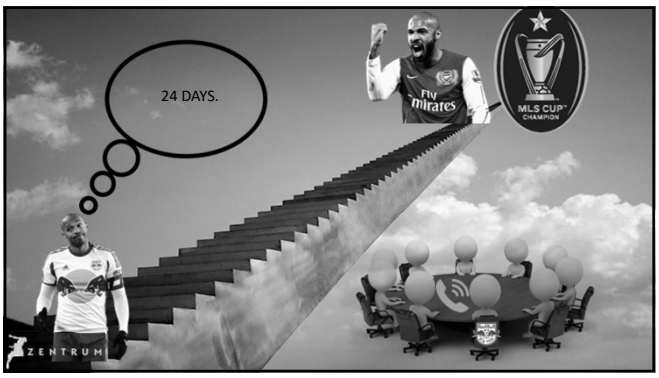
Jacobsen P et al. 2014
Initial examination vs 7 days
Walk pain free
Max pain injury time
Strength
Delay physio
Pain
SL bridge
97% of the total variance of TIME to return to play
Predicting time to return .....to play
31 days (±5 days)

7


24 DAYS.
fly emirates
MLS CUP CHAMPION

8


24 DAYS
MLS CUP

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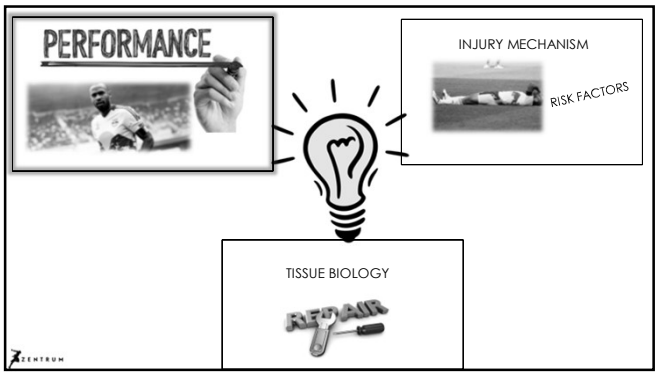
PERFORMANCE
INJURY MECHANISM
RISK FACTORS
TISSUE BIOLOGY
REPAIR

10


024 DAYS LEFT
TIME TO PLAN
PREPARE
&
REPAIR

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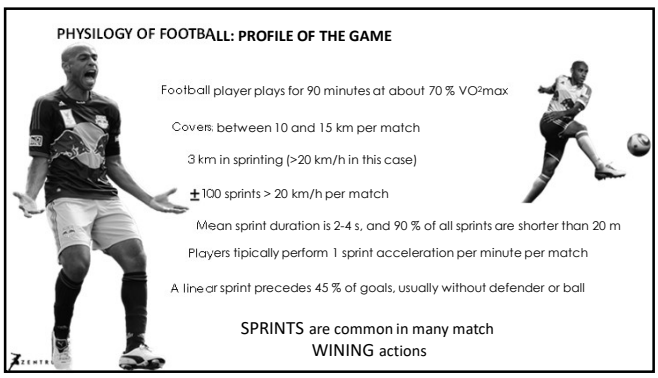
PHYSILOGY OF FOOTBALL: PROFILE OF THE GAME
Football player plays for 90 minutes at about 70 % VO²max
Covers: between 10 and 15 km per match
3 km in sprinting (>20 km/h in this case)
±100 sprints > 20 km/h per match
Mean sprint duration is 2-4 s, and 90 % of all sprints are shorter than 20 m
Players tipically perform 1 sprint acceleration per minute per match
A linear sprint precedes 45 % of goals, usually without defender or ball
SPRINTS are common in many match
WINING actions

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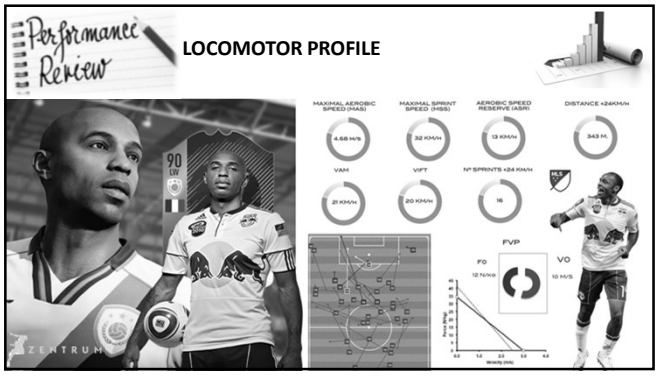

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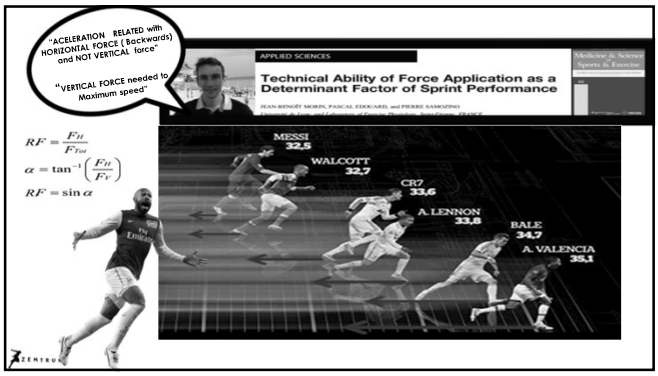

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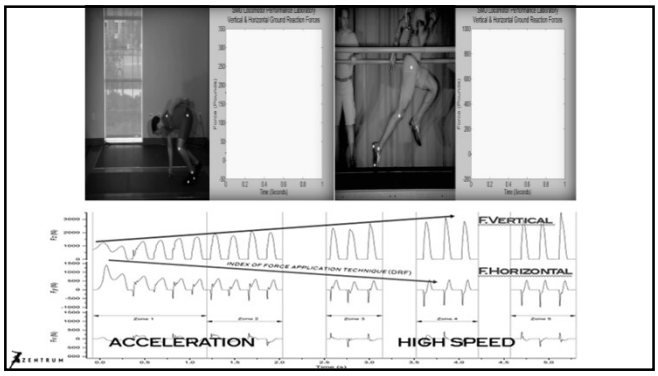

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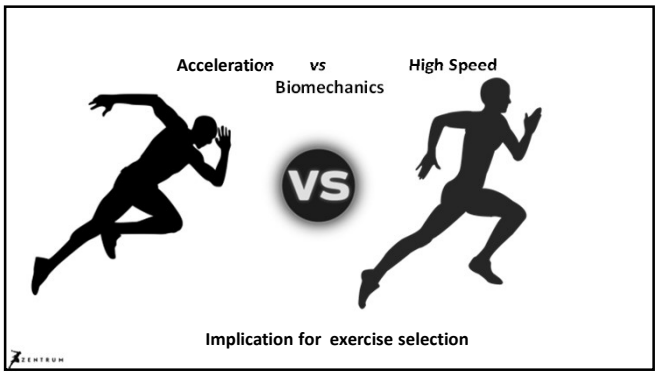

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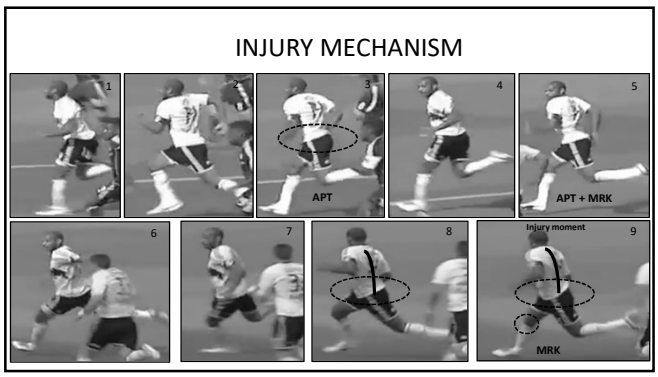

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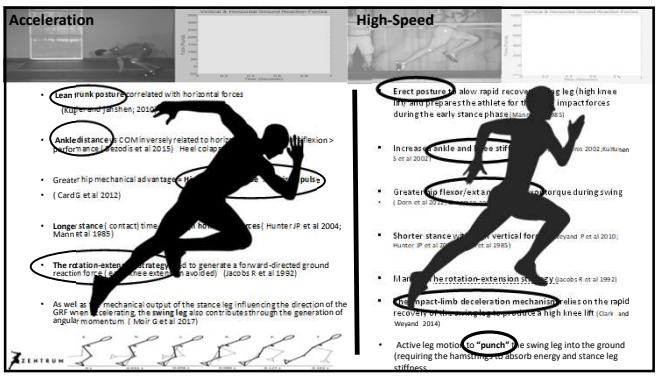

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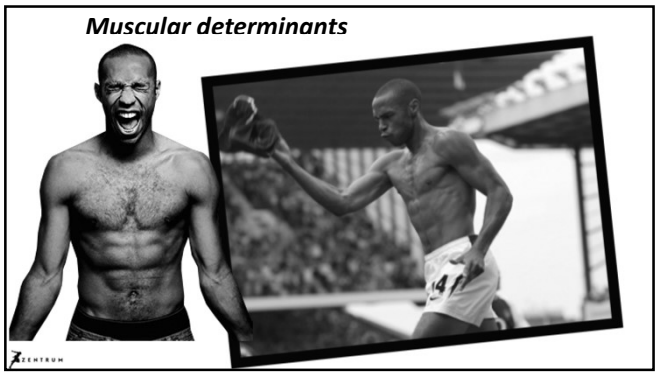

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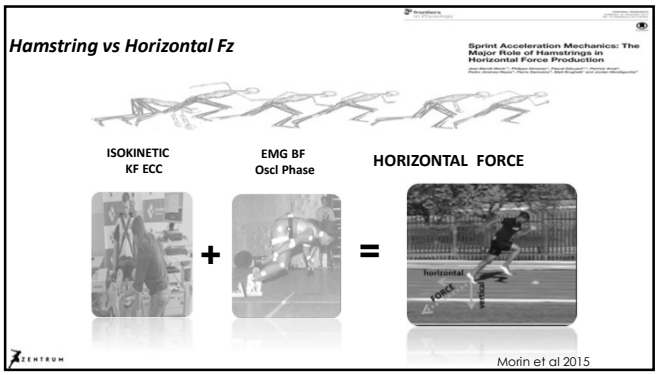

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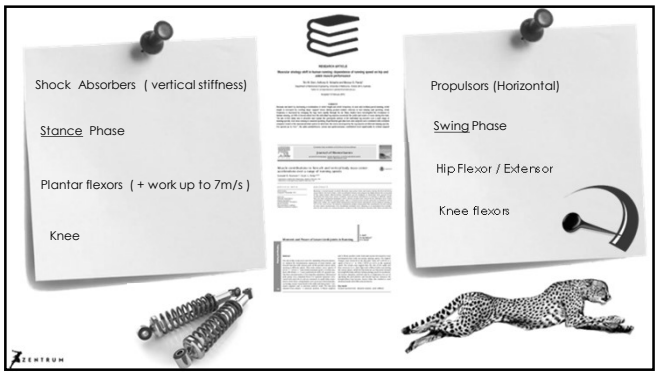

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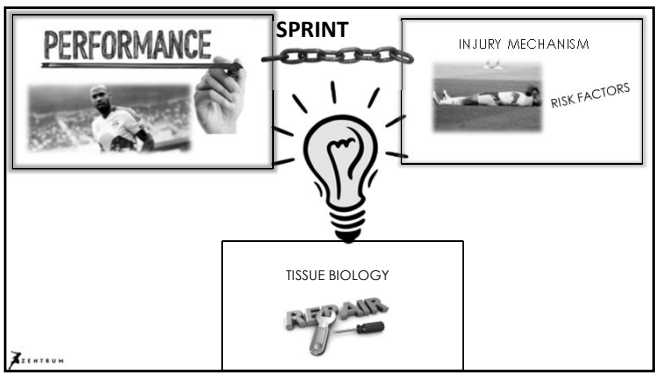

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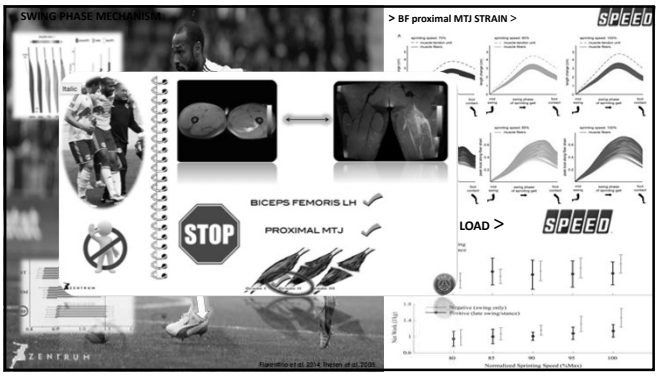

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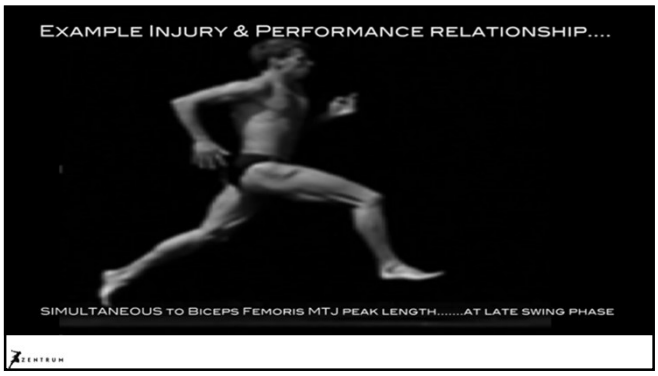

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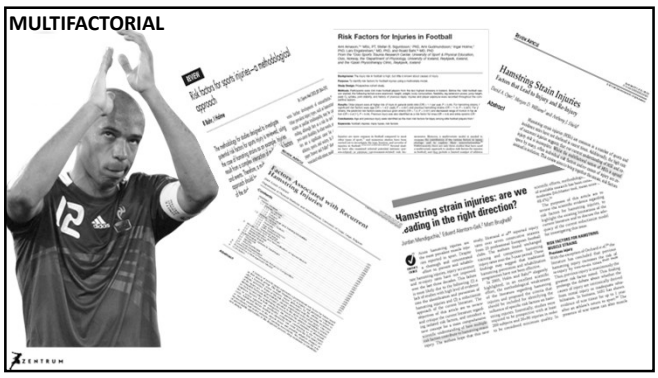
MULTIFACTORIAL



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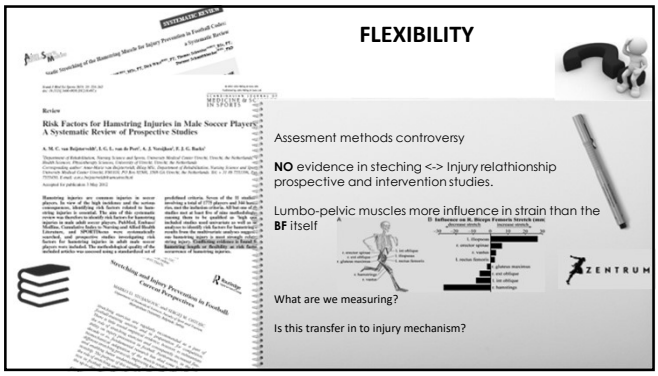
FLEXIBILITY



Assesment methods controversy

NO evidence in steching <-> Injury relathionship prospective and intervention studies.

Lumbo-pelvic muscles more influence in strain than the **BF** itself

What are we measuring?

Is this transfer in to injury mechanism?

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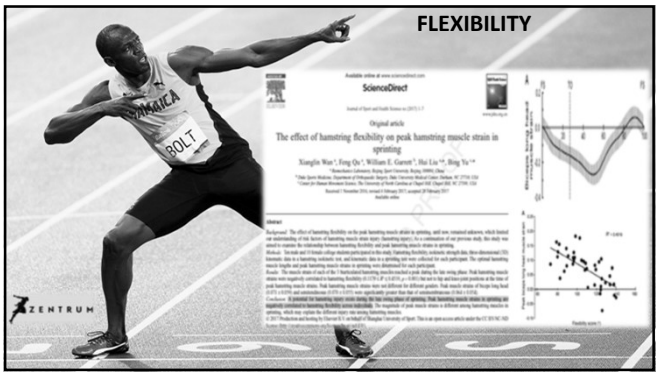
FLEXIBILITY



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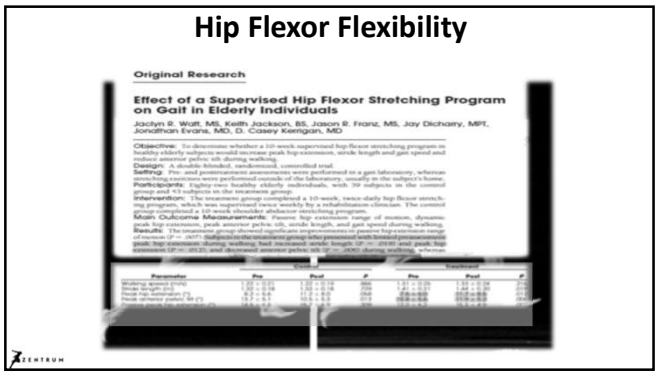
Hip Flexor Flexibility



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Flexibility

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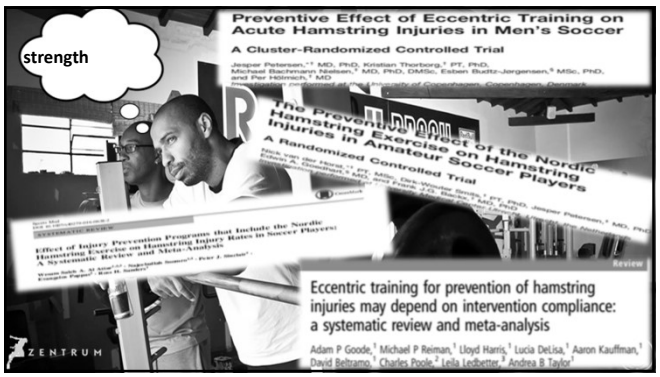

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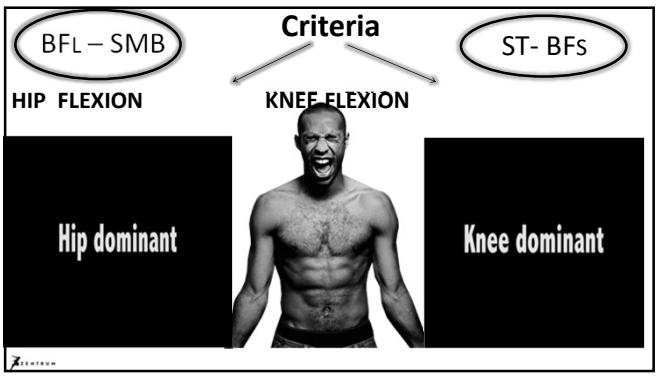

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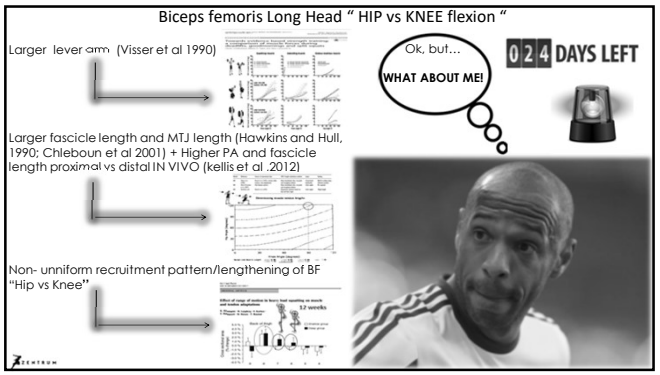

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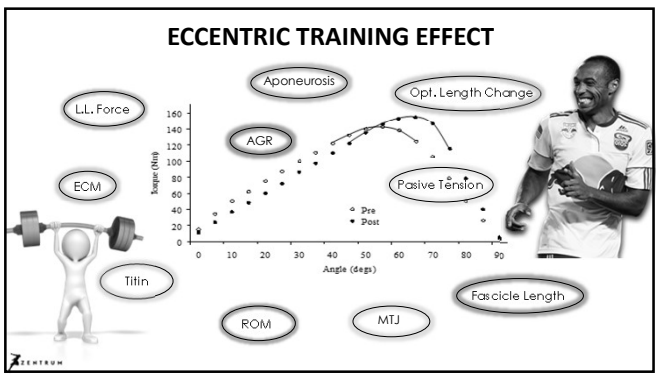

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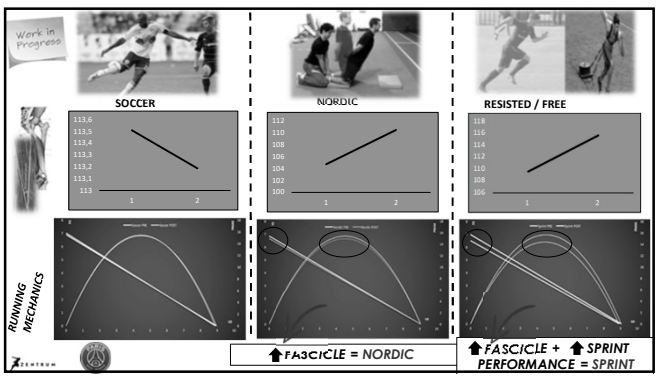

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CLASIFICATION

- CKC and OKC (Injury mechanism): Eccentric and SSC
- Multi-articular exercise (HIP or KNEE dominant)
- Targeted muscle
- Localized (Proximal – distal)
- Unilateral and bilateral (avoid assimmetries)
- LENGTH vs Force (Intensity), Volume, Velocity….

Progression: *" Think in **lenght** MORE than in **strenght** "*

CLASSIFIED

Malliaropulos, Mendiguchia et al 2012

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Gluteus maximus

RESEARCH REPORT

Strength Deficits Identified With Concentric Action of the Hip Extensors and Eccentric Action of the Hamstrings Predispose to Hamstring Injury in Elite Sprinters

Proximal Neuromuscular Control Protects Against Hamstring Injuries in Male Soccer Players

A Prospective Study With Electromyography Time-Series Analysis During Maximal Sprinting

Joke Schuermans,[1] PT, PhD, Lieven Danneels,[1] PT, PhD, Damien Van Tiggelen,[1] PT, PhD, Tanneke Palmans,[1] Dipl-Ing, and Erik Witvrouw,[1] PT, PhD
Investigation performed at the Department of Rehabilitation Sciences and Physiotherapy, Ghent University, Ghent, Belgium

Conclusion: Muscle activity of the core until during explosive sprinting appeared to be associated with hamstring injury occurrence in male soccer players. Higher amounts of gluteal and trunk muscle activity during the airborne phases of sprinting were associated with a lower risk of hamstring injuries during follow-up. Hence, the present results provide a basis for improved, evidence-based rehabilitation and prevention, particularly focusing on increasing neuromuscular control of the gluteal and trunk muscles during sport-specific activities (eg, sprint drills, agility drills).

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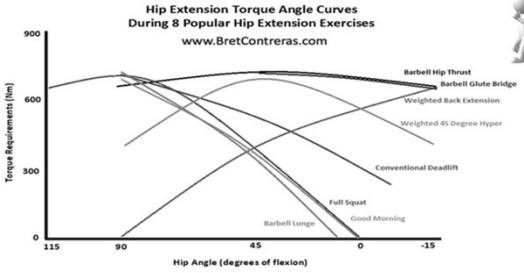
Are All Hip Extension Exercises Created *Equal*?



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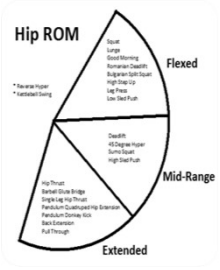
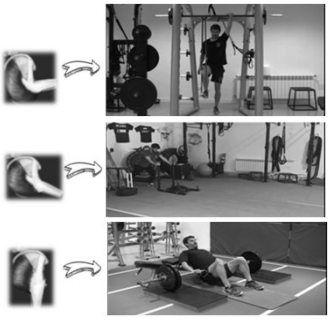
Accentuated Regions of Force Development





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ANTERIOR PELVIC TILT

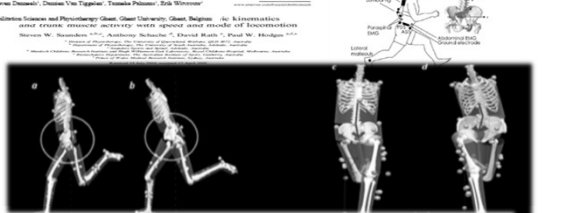

Table 1 Pelvis and trunk kinematics during crucial* terminal back- and front swing phases

	Control (n = 25)	Injury (n = 4)
Amount of (sagittal plane) Pelvis Tilt during terminal backswing (mean ± SD; °)**	12.73 ± 5.90	25.64 ± 7.90
Amount of (coronal plane) thoracic side-bending during terminal front swing (mean ± SD; °)**	3.89 ± 2.68	10.73 ± 4.30

*SD, Standard Deviation; * number of degrees; *at time-frame of highest in-between-group difference as established by SPM*

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Lumbopelvic control

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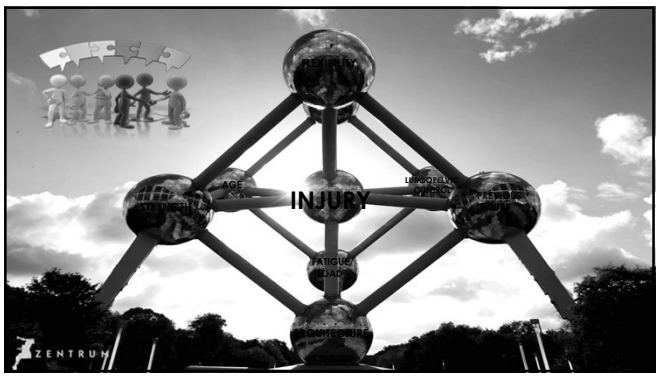

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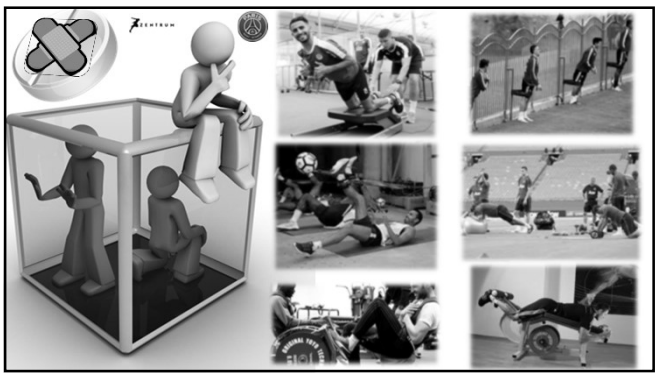

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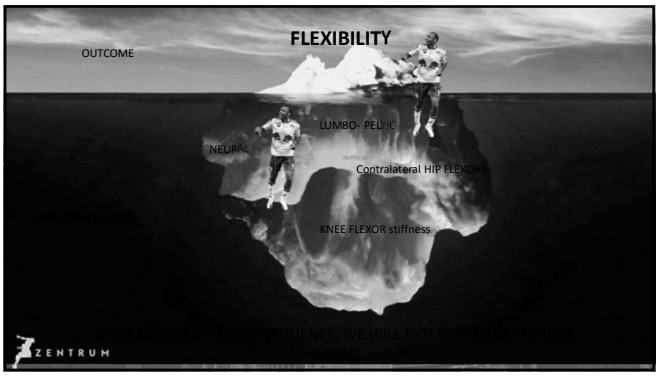

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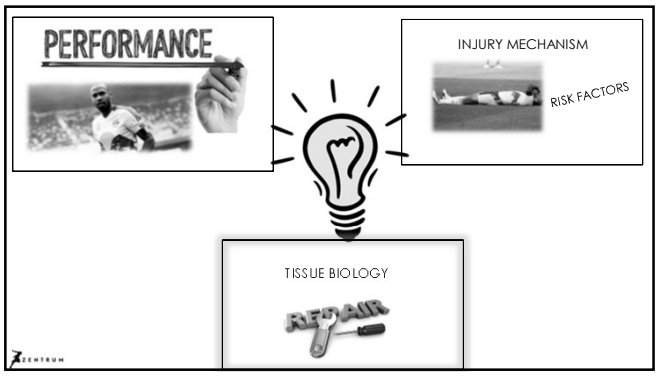

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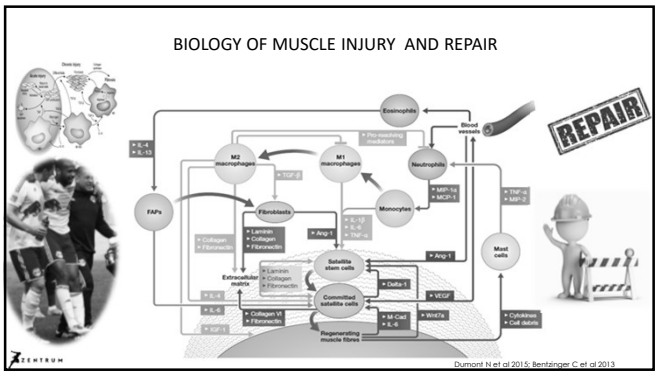

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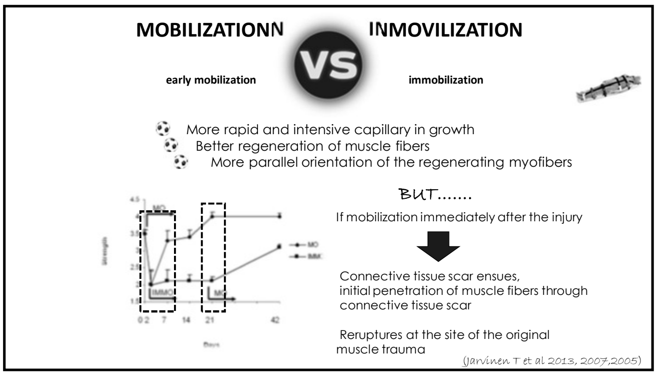
MOBILIZATIONN
VS
INMOVILIZATION
early mobilization
immobilization
More rapid and intensive capillary in growth
Better regeneration of muscle fibers
More parallel orientation of the regenerating myofibers
BUT.......
If mobilization immediately after the injury
Connective tissue scar ensues,
initial penetration of muscle fibers through
connective tissue scar
Reruptures at the site of the original
muscle trauma
(Jarvinen T et al 2013, 2007,2005)

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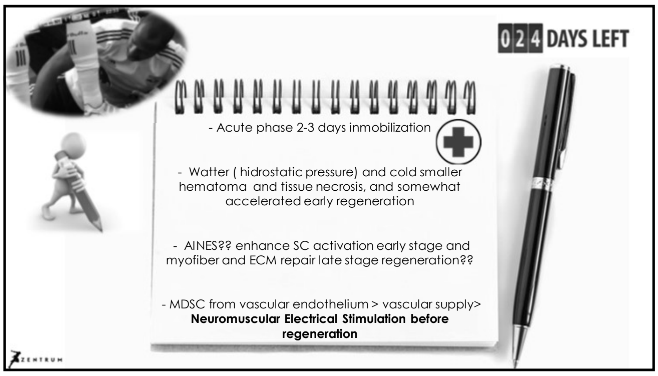
024 DAYS LEFT
- Acute phase 2-3 days inmobilization
- Watter (hidrostatic pressure) and cold smaller hematoma and tissue necrosis, and somewhat accelerated early regeneration
- AINES?? enhance SC activation early stage and myofiber and ECM repair late stage regeneration??
- MDSC from vascular endothelium > vascular supply>
Neuromuscular Electrical Stimulation before regeneration
ZENTRUM

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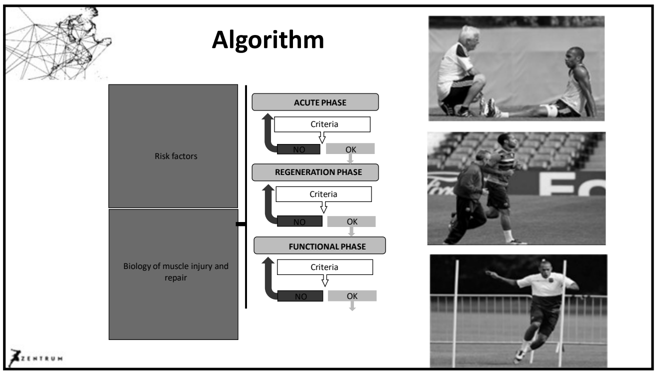

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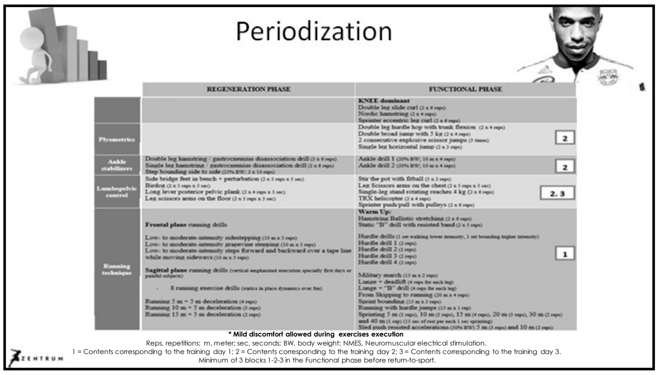

	REGENERATION PHASE	FUNCTIONAL PHASE	
		KNEE dominant Double leg slide curl (2 x 6 reps) Nordic hamstring (2 x 4 reps) Sprinter eccentric leg curl (2 x 6 reps)	
Plyometrics		Double leg hurdle hop with trunk flexion (2 x 4 reps) Double broad jump with 5 kg (2 x 4 reps) 2 consecutive explosive scissor jumps (3 times) Single leg horizontal jump (2 x 3 reps)	2
Ankle stabilizers	Double leg hamstring / gastrocnemius disassociation drill (3 x 6 reps) Single leg hamstring / gastrocnemius disassociation drill (2 x 6 reps) Step bounding side to side (25% BW; 2 x 10 reps)	Ankle drill 1 (20% BW; 10 m x 4 reps) Ankle drill 2 (20% BW; 10 m x 4 reps)	2
Lumbopelvic control	Side bridge feet in bench + perturbation (2 x 5 reps x 5 sec) Birdog (2 x 5 reps x 5 sec) Long lever posterior pelvic plank (2 x 4 reps x 5 sec) Leg scissors arms on the floor (2 x 5 reps x 5 sec)	Stir the pot with fitball (3 x 2 reps) Leg Scissors arms on the chest (2 x 5 reps x 5 sec) Single-leg stand rotating reaches 4 kg (2 x 6 reps) TRX helicopter (2 x 4 reps) Sprinter push/pull with pulleys (2 x 6 reps)	2. 3
Running technique	**Frontal plane** running drills Low- to moderate-intensity sidestepping (10 m x 5 reps) Low- to moderate-intensity grapevine stepping (10 m x 5 reps) Low- to moderate-intensity steps forward and backward over a tape line while moving sideways (10 m x 5 reps) **Sagittal plane** running drills (vertical emphasized execution specially first days or painful subjects) - 8 running exercise drills (statics in place dynamics over 5m) Running 5 m + 5 m deceleration (4 reps) Running 10 m + 5 m deceleration (3 reps) Running 15 m + 5 m deceleration (2 reps)	**Warm Up:** Hamstring Ballistic stretching (2 x 6 reps) Static "B" drill with resisted band (2 x 5 reps) Hurdle drills (1 set walking lower intensity, 1 set bounding higher intensity) Hurdle drill 1 (2 reps) Hurdle drill 2 (2 reps) Hurdle drill 3 (2 reps) Hurdle drill 4 (2 reps) Military march (15 m x 2 reps) Lunge + deadlift (4 reps for each leg) Lunge + "B" drill (4 reps for each leg) From Skipping to running (20 m x 4 reps) Sprint bounding (15 m x 3 reps) Running with hurdle jumps (15 m x 1 rep) Sprinting 5 m (3 reps), 10 m (3 reps), 15 m (4 reps), 20 m (3 reps), 30 m (2 reps) and 40 m (1 rep) (15 sec of rest per each 1 sec sprinting) Sled push resisted accelerations (30% BW) 5 m (3 reps) and 10 m (2 reps)	1

*** Mild discomfort allowed during exercises execution**

Reps, repetitions; m, meter; sec, seconds; BW, body weight; NMES, Neuromuscular electrical stimulation.
1 = Contents corresponding to the training day 1; 2 = Contents corresponding to the training day 2; 3 = Contents corresponding to the training day 3.
Minimum of 3 blocks 1-2-3 in the Functional phase before return-to-sport.

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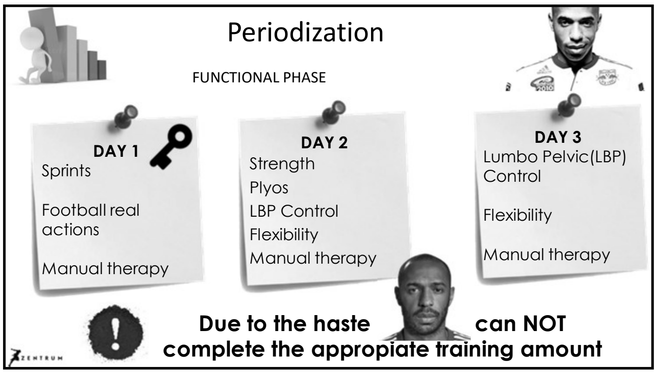
Periodization
FUNCTIONAL PHASE
DAY 1
Sprints
Football real actions
Manual therapy
DAY 2
Strength
Plyos
LBP Control
Flexibility
Manual therapy
DAY 3
Lumbo Pelvic(LBP) Control
Flexibility
Manual therapy
Due to the haste can NOT
complete the appropiate training amount
ZENTRUM

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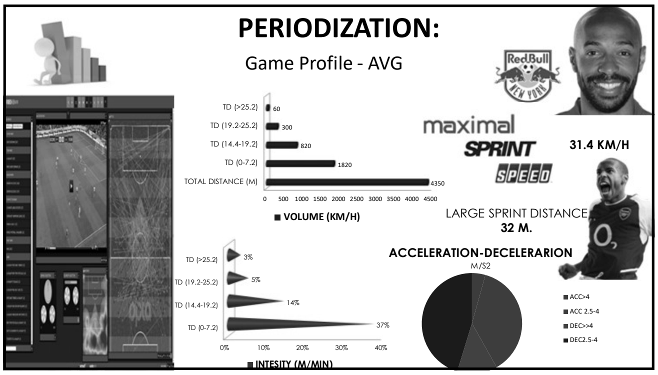
PERIODIZATION:
Game Profile - AVG
TD (>25.2) 60
TD (19.2-25.2) 300
TD (14.4-19.2) 820
TD (0-7.2) 1820
TOTAL DISTANCE (M) 4350
0 500 1000 1500 2000 2500 3000 3500 4000 4500
VOLUME (KM/H)
maximal
SPRINT
SPEED
31.4 KM/H
LARGE SPRINT DISTANCE
32 M.
TD (>25.2) 3%
TD (19.2-25.2) 5%
TD (14.4-19.2) 14%
TD (0-7.2) 37%
0% 10% 20% 30% 40%
INTESITY (M/MIN)
ACCELERATION-DECELERARION
M/S2
ACC>4
ACC 2.5-4
DEC>>4
DEC2.5-4

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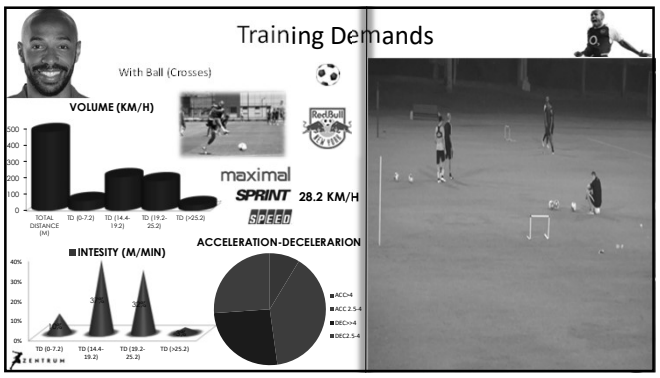

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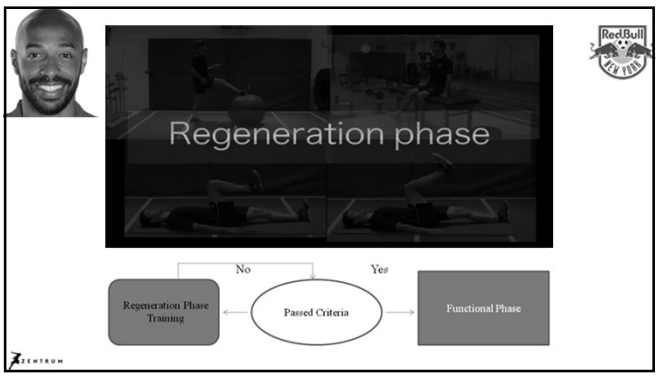

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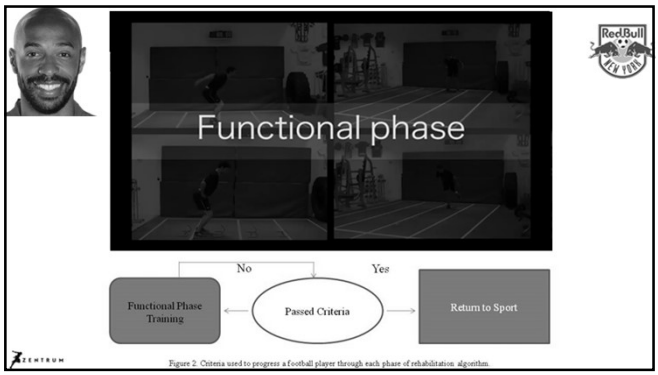

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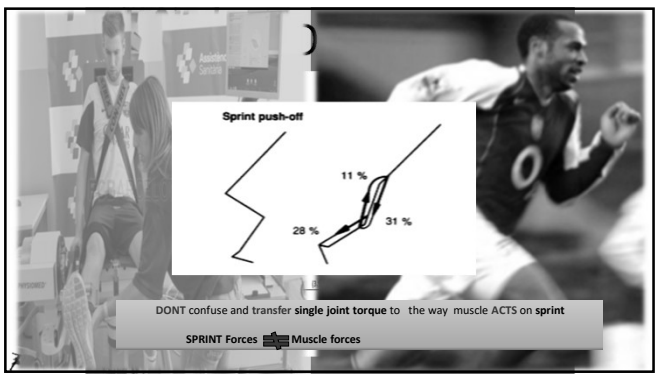

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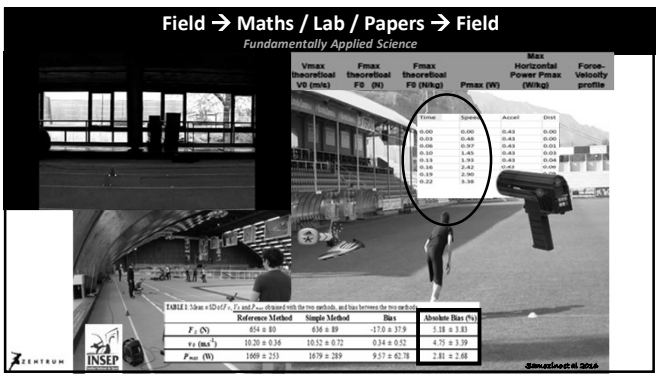

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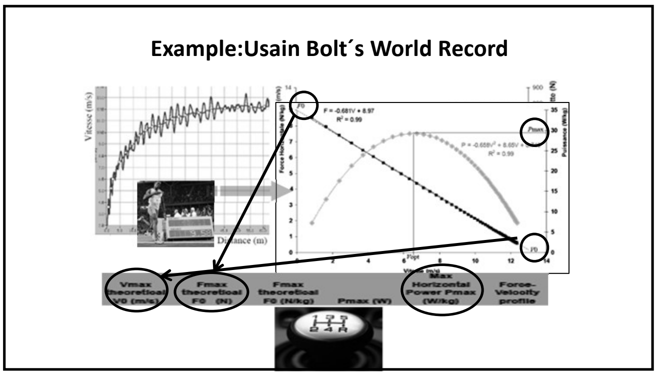

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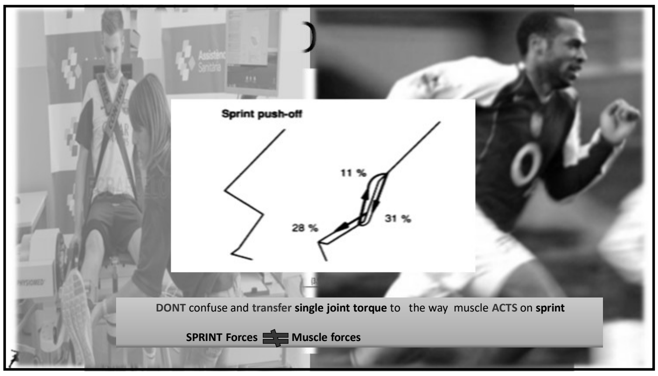

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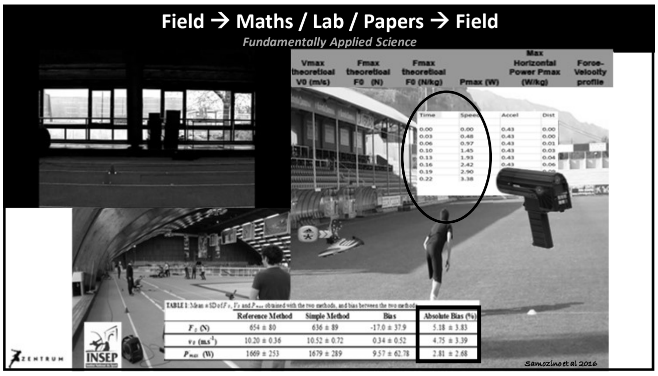

TABLE 1: Mean ± SD of F_0, V_0 and P_{max} obtained with the two methods, and bias between the two methods

	Reference Method	Simple Method	Bias	Absolute Bias (%)
F_0 (N)	654 ± 80	636 ± 89	-17.0 ± 37.9	5.18 ± 3.83
v_0 (m.s^{-1})	10.20 ± 0.36	10.52 ± 0.72	0.34 ± 0.52	4.75 ± 3.39
P_{max} (W)	1669 ± 253	1679 ± 289	9.57 ± 62.78	2.81 ± 2.68

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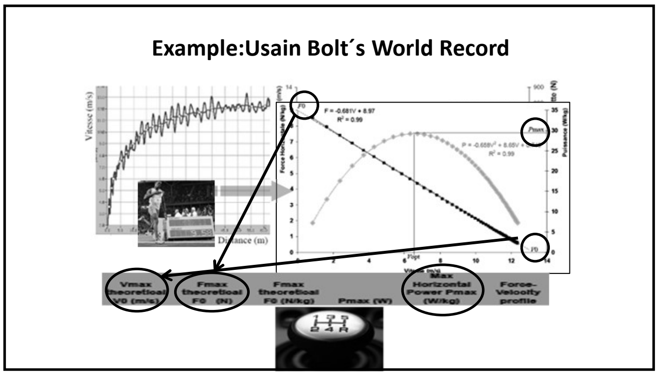

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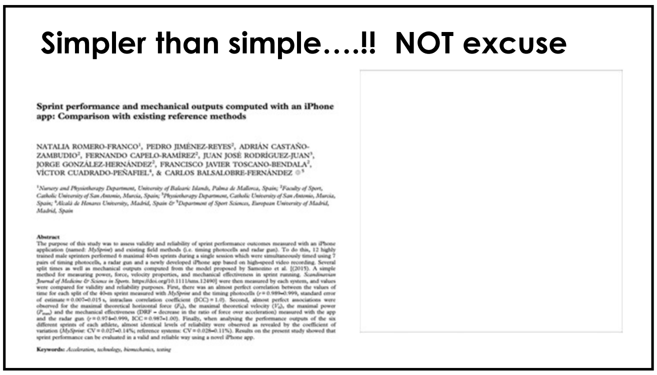

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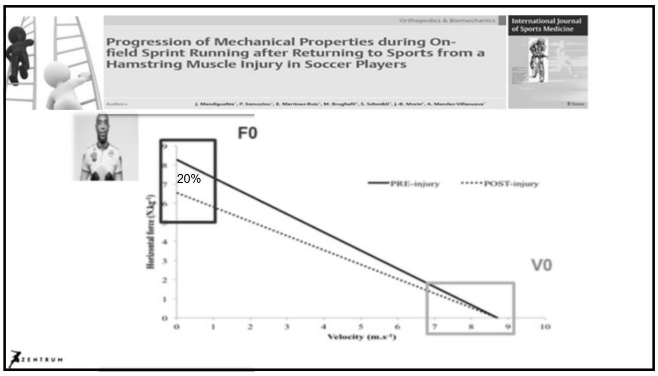

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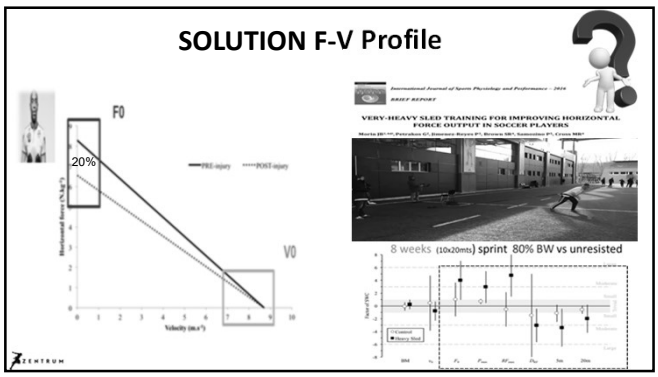

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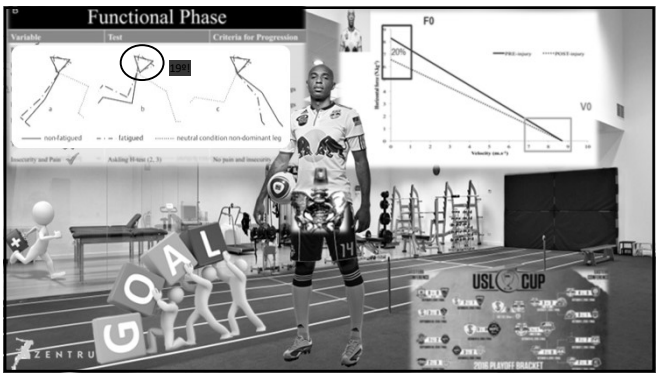

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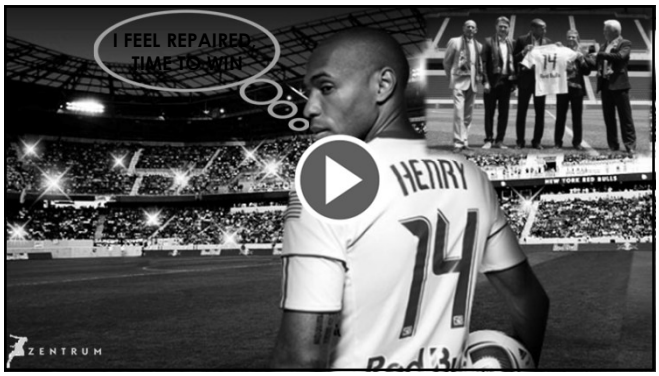

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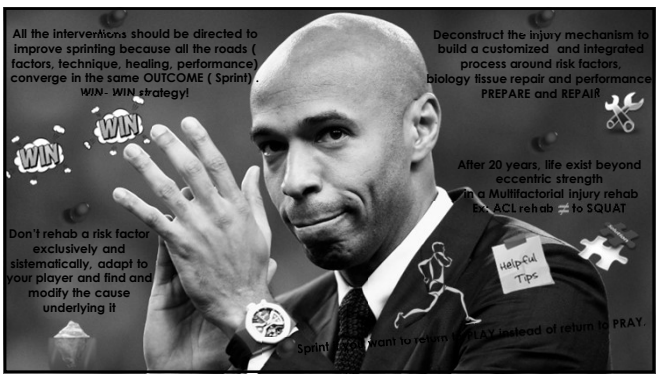

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