

ROMA, 4 Settembre 2010

CQN-FIPAV SDS

***Controllo della verticale e
decadimento propriocettivo:
prestazione e infortuni.***

DARIO RIVA



International Society of Proprioception and Posture

ROMA, 4 Settembre 2010

CQN-FIPAV SDS

***Le esercitazioni propriocettive
controllo-prevalente e
forza-prevalente.***

DARIO RIVA



International Society of Proprioception and Posture

- **A che cosa serve la propiocezione?**
- **Come allenare la propiocezione?**
- **Gli effetti sono esercizio “specifici”?**
- **Gli effetti sono “dose-dipendenti”?**



FIGURE SKATING

Four times world champion and Olympic champion



**Top level vertical control in a
four times world champion and Olympic champion**



Proprioception in microgravity

First Non-Governative Zero-G Science Flight

10 Aprile 2005 Miami FL, USA



22 seconds
Martian
gravity

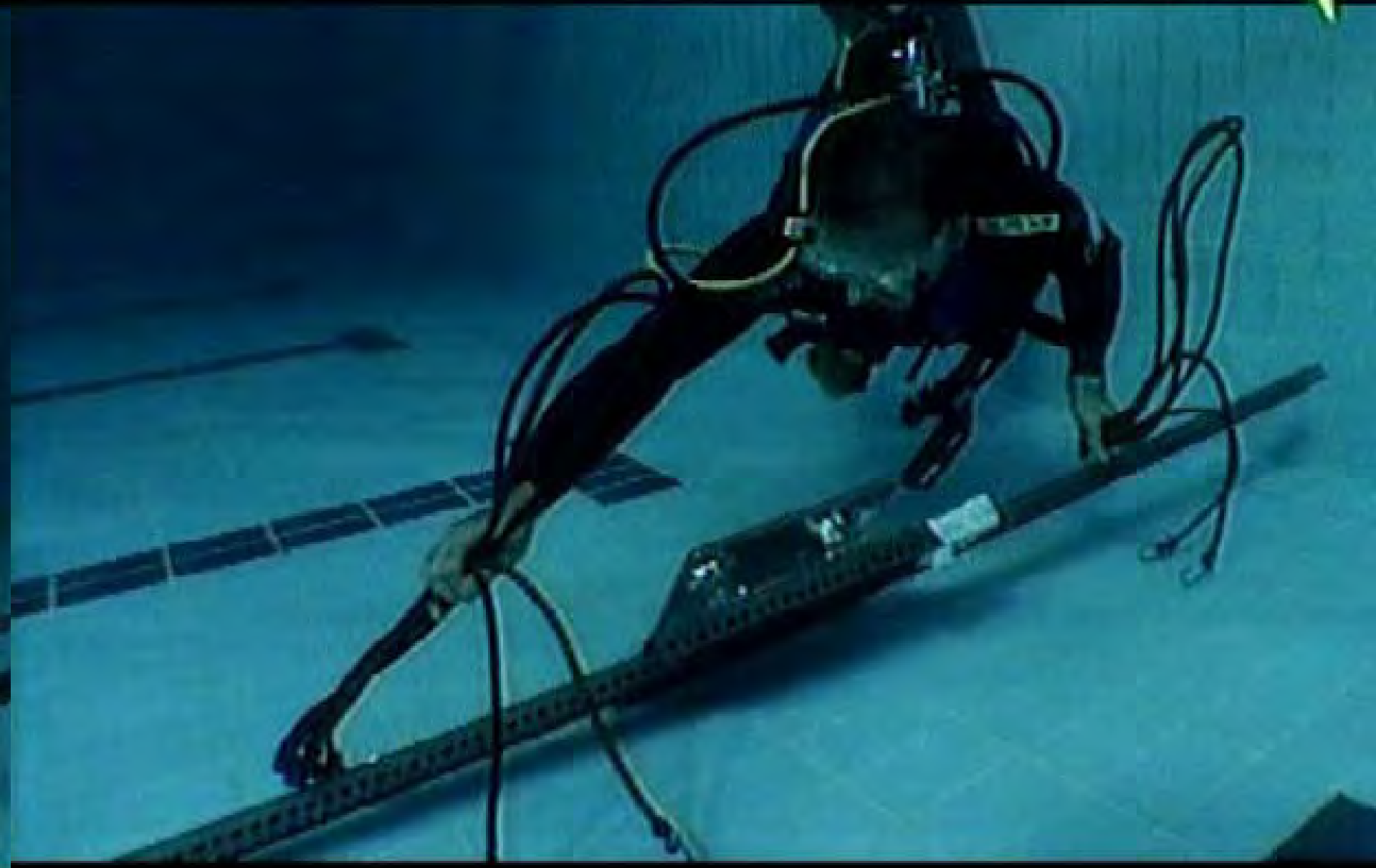


22 seconds
Lunar
gravity



22 seconds
Zero-G
x 21 times

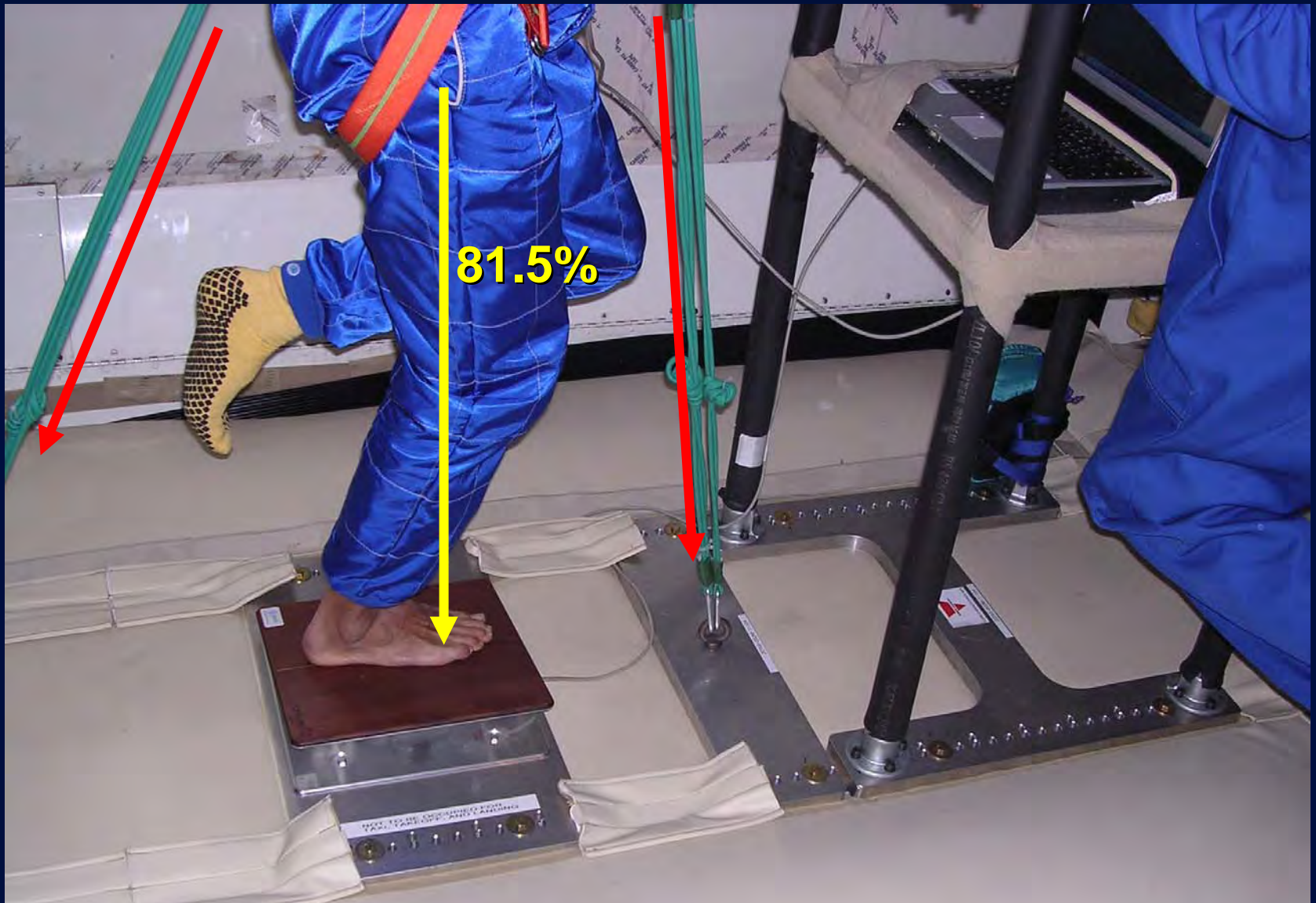








Muscular Atrophy Prevention and Recovery through Visual-Proprioception



D. Riva, et al., Acta Astronautica 65 (2009) 813-819.

Postural muscle atrophy prevention and recovery and bone remodelling through high frequency proprioception for astronauts.



Ian Waterman

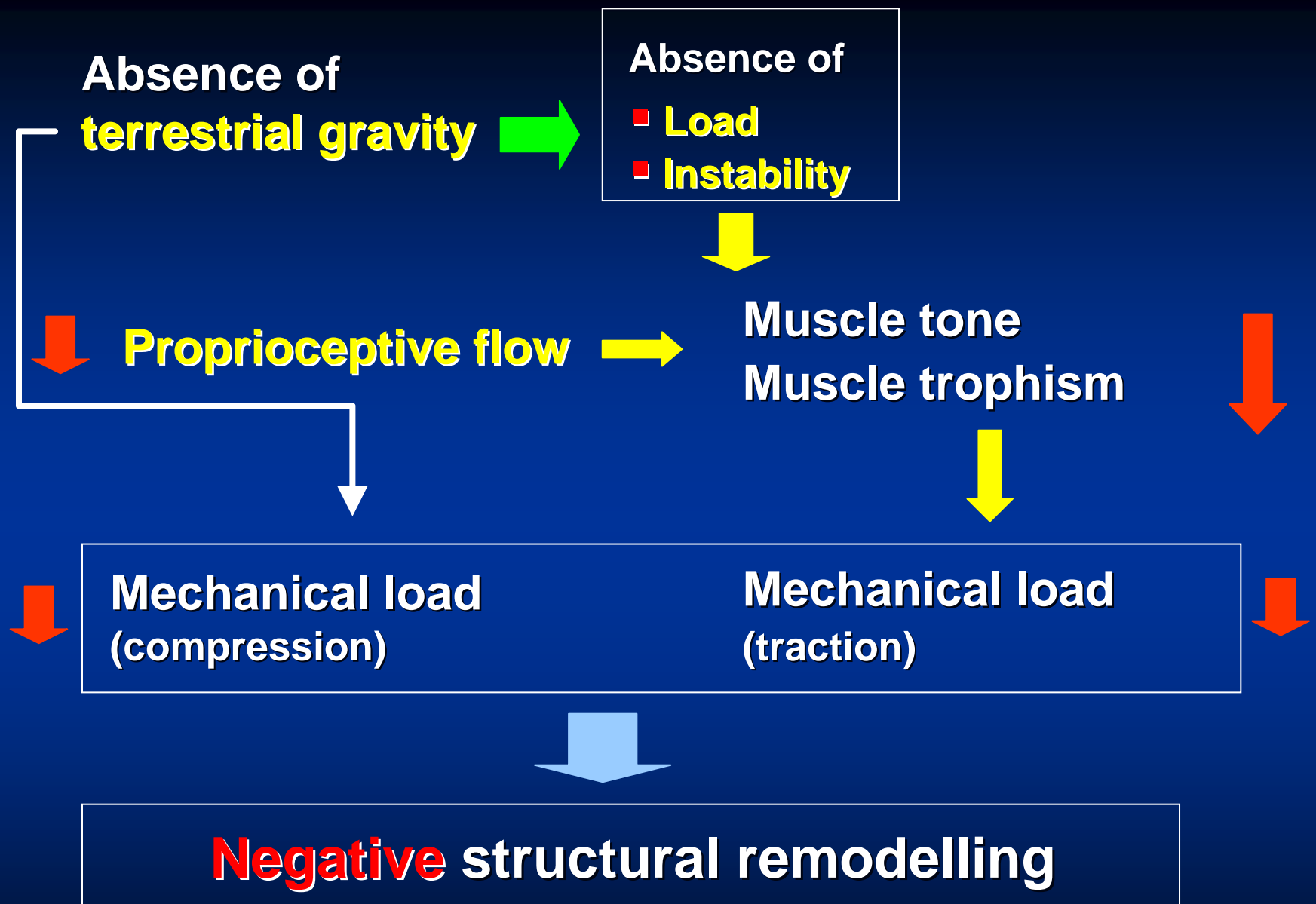
Hampshire, England

In 1972 when he was 19 years old a viral disease destroyed his proprioceptive fibers coming from spindles, tendons and joints.

He can feel temperature, pain, deep pressure and muscle fatigue.

He lost the conscious and unconscious proprioceptive sensibility.

He can be aware of movements or of the segment position only with sight.



D. Riva, et al., *Acta Astronautica*, 65 (2009), 813-819.

Postural muscle atrophy prevention and recovery and bone remodelling through high frequency proprioception for astronauts.

Controllo posturale e gestione del movimento

Sistemi informativi coinvolti

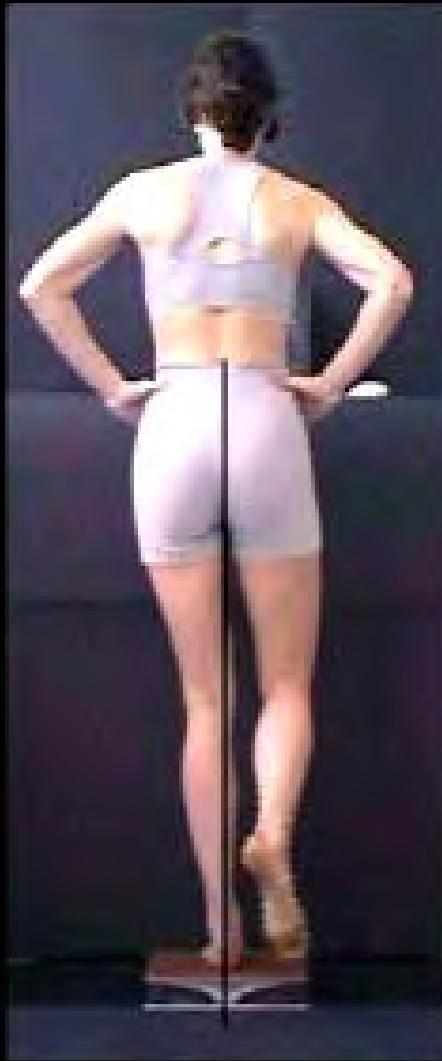
• **Propriocettivo** il più rapido *

• **Visivo** il più preciso

• **Vestibolare*** il più tardivo e violento

* Sistema di precisione

* Sistema di emergenza



**vestibular
strategy**



**Congenital absence of labyrinths
vestibular strategy: impossible**

What is **proprioception**?

It is the flow of signals which arises from our muscles, tendons, joints,

Sherrington 1906



Propriocezione: due componenti

cosciente

incosciente

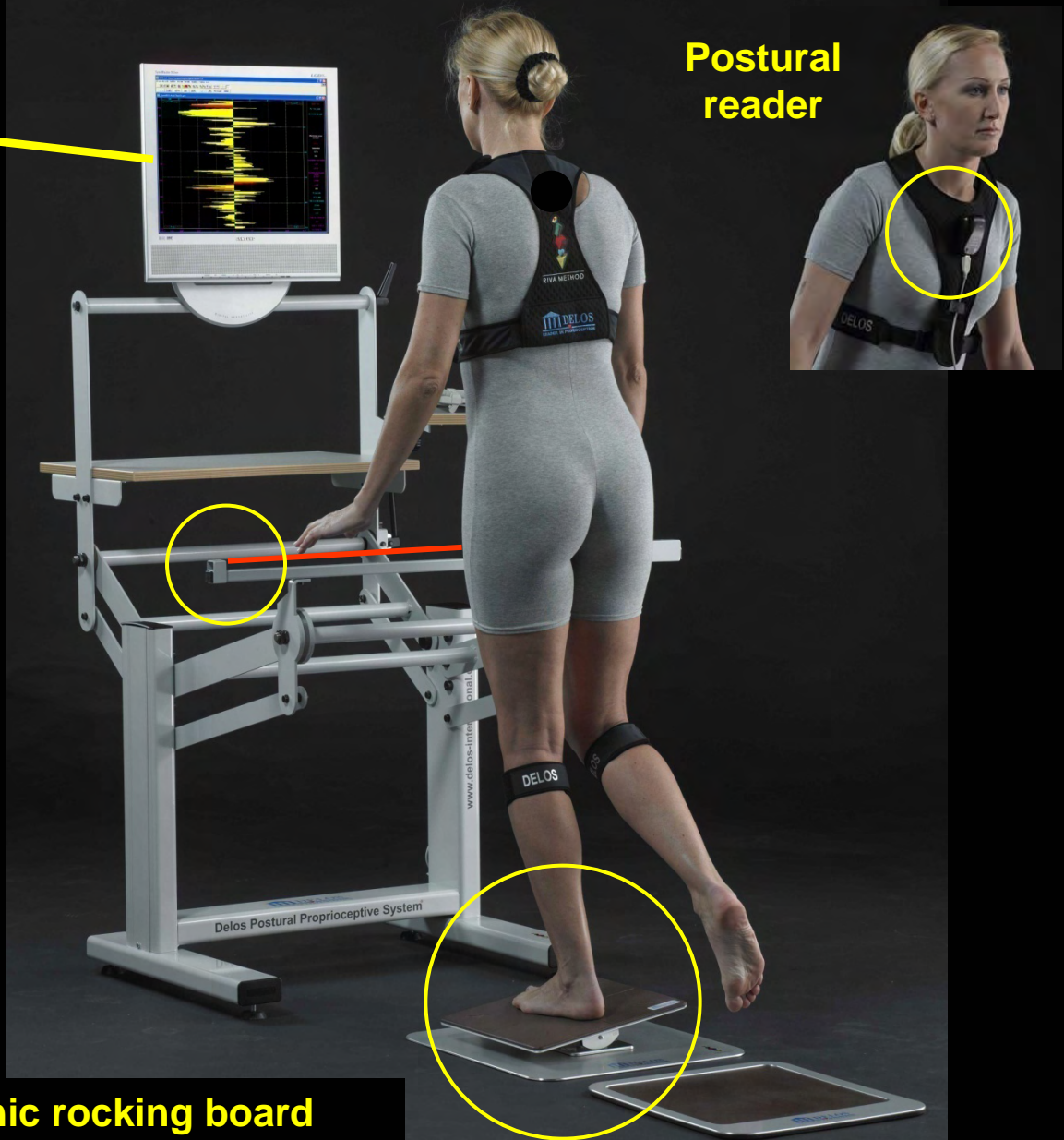
* Dalla periferia solo UN segnale su un milione riesce a passare il filtro e a raggiungere il livello cosciente





Visual tracking

**Visuo-proprioceptive
test**



**Postural
reader**

Electronic rocking board

What is the first goal of the control system of movement on Earth?

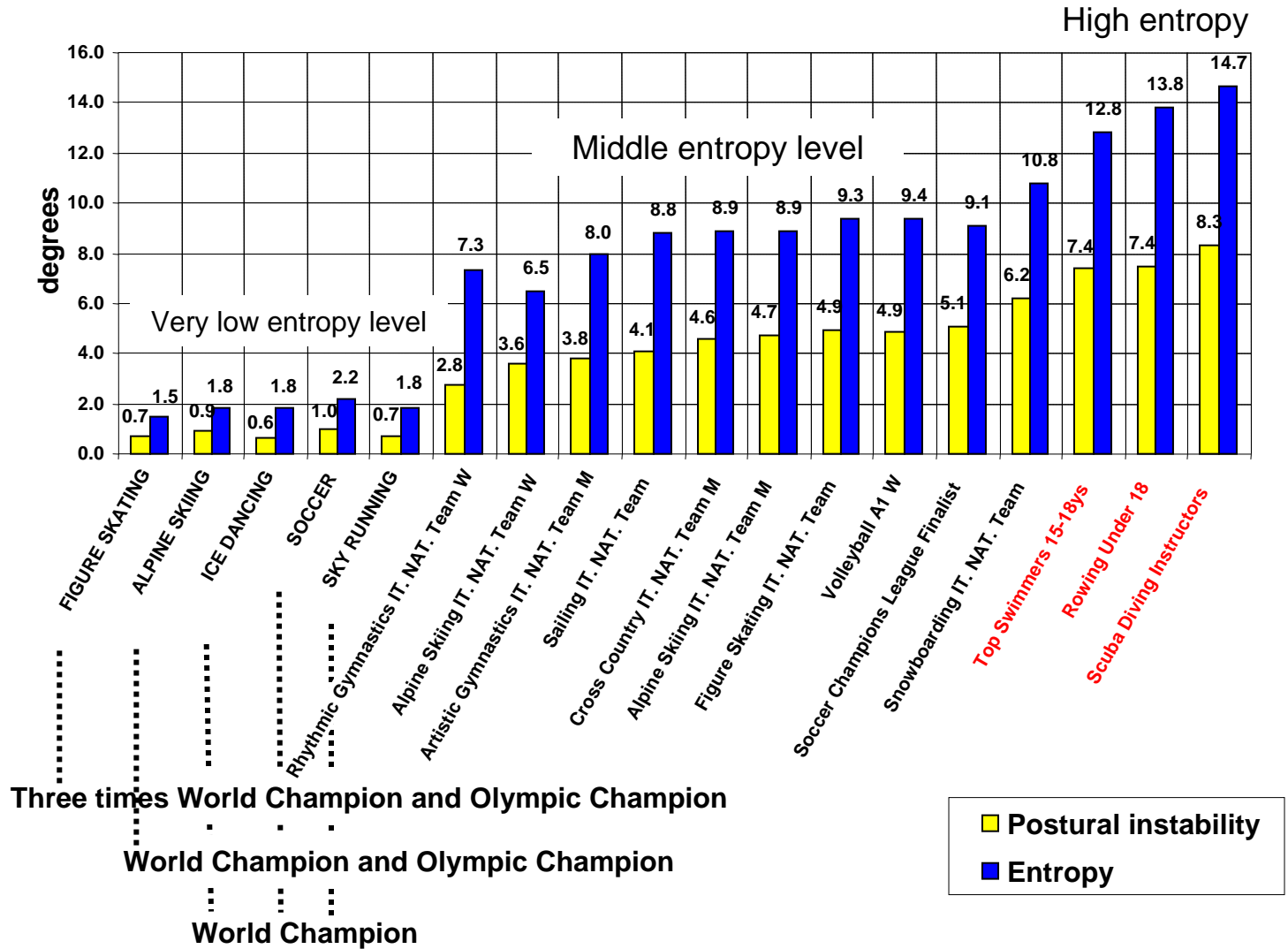
- World sport champions
- Middle level athletes
- Astronauts
- Elderly people
- Motor impaired subjects



Conscious task: foot hyperextension

**Top priority (unconscious):
finding stability**

ENTROPY IN SPORT DISCIPLINES



D. Riva, et al., *Acta Astronautica* 65 (2009) 813-819. doi: [10.1016/j.actaastro.2009.03.023](https://doi.org/10.1016/j.actaastro.2009.03.023)

Postural muscle atrophy prevention and recovery and bone remodelling through high frequency proprioception for astronauts.

Entropy* of a system

Lower is the entropy, higher is the expressible energy

* disorder



Cheetah vs gazelle – The gaze

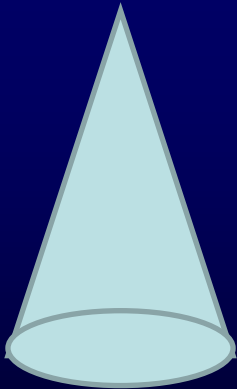
**What does it maintain efficient
antigravity movements
in wild animals?**

**Coupling load and instability
is indispensable**

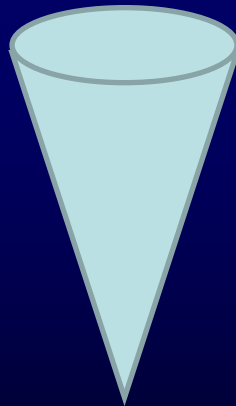
but most part of modern human activities are unable...

Quando c'è instabilità...

Quali contromisure?



Anziani

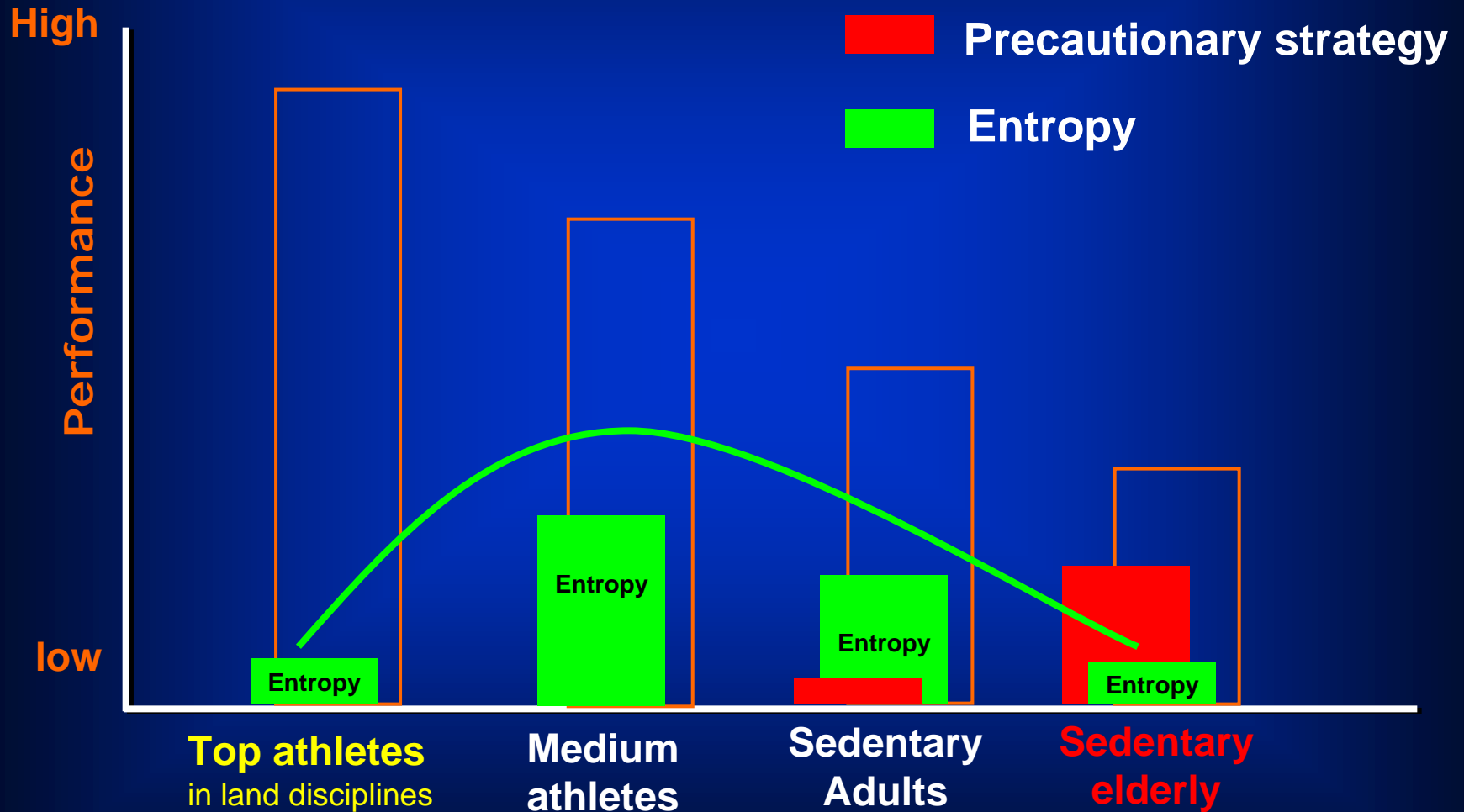


Atleti



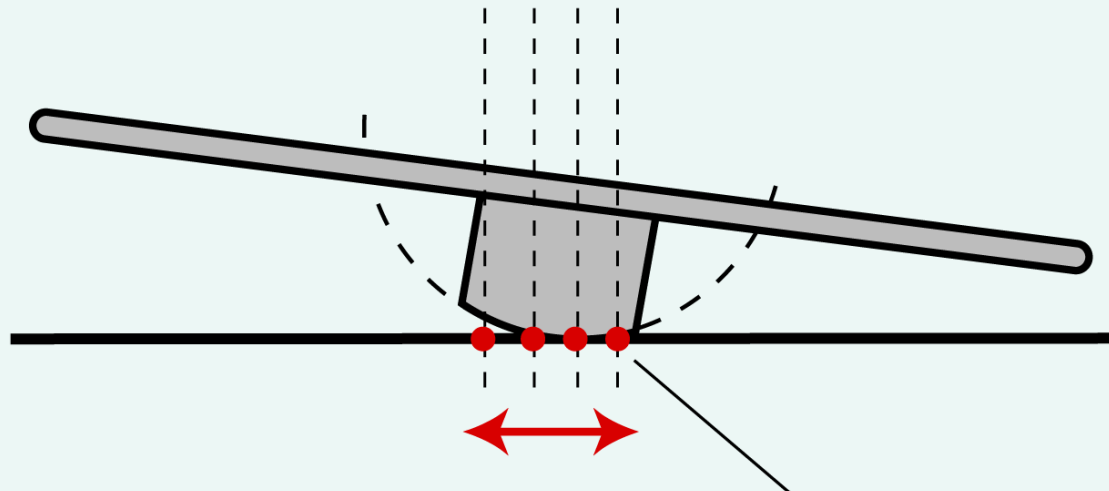
**Campioni del mondo
e Olimpici**

ENTROPY LEVEL in terrestrial activity



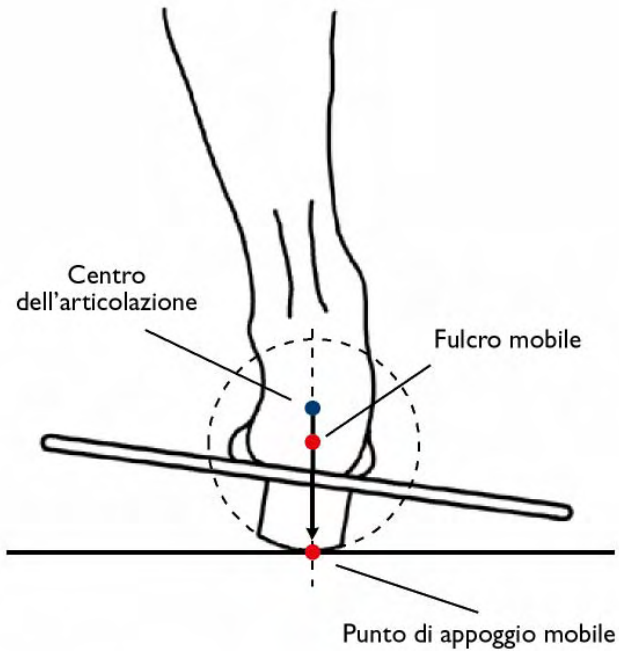
Aspetti biomeccanici



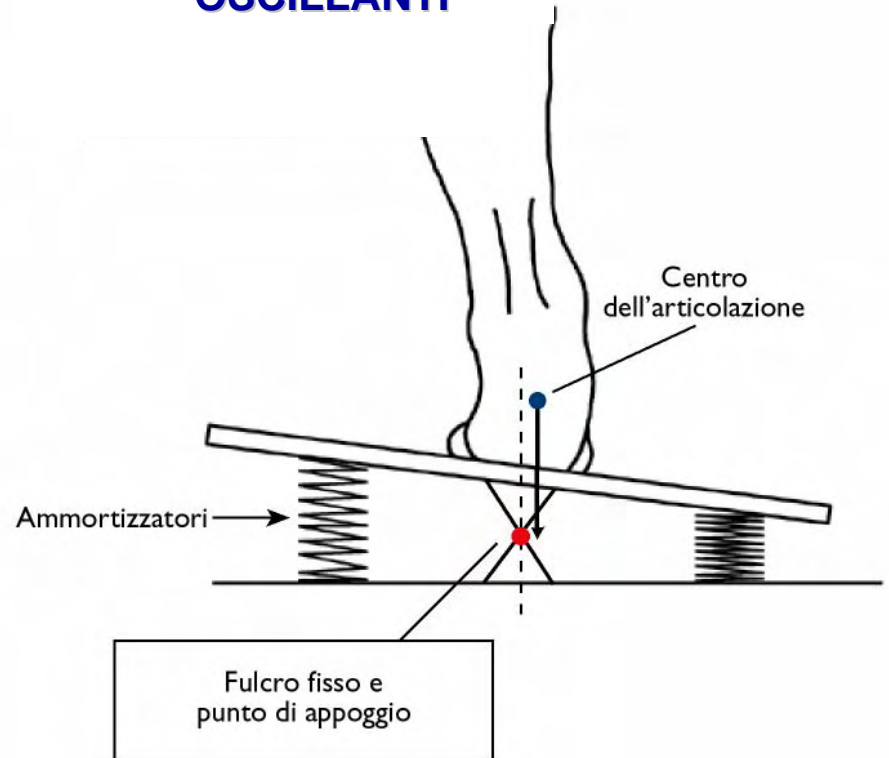


Rolling point of support

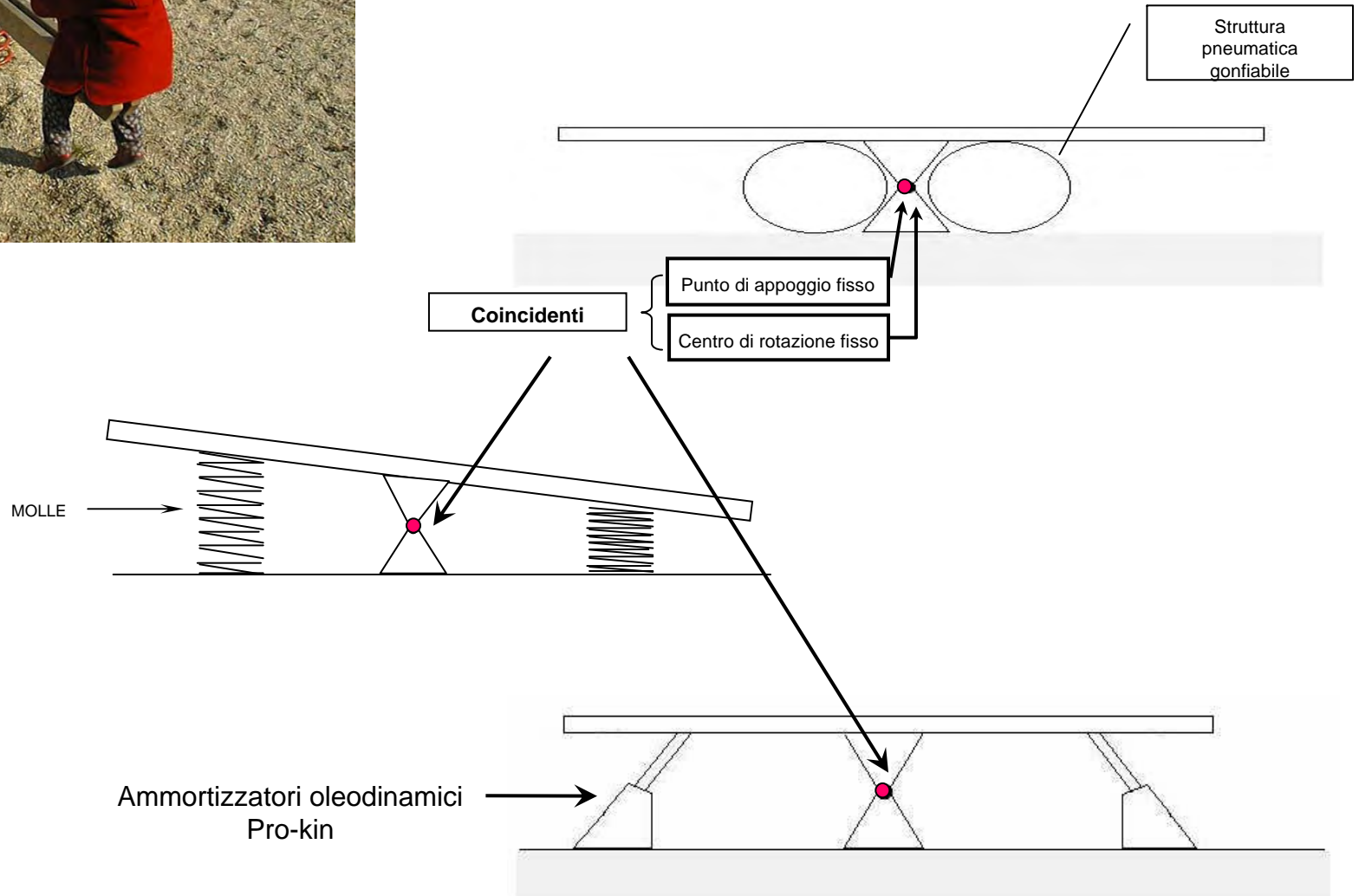
Tavole "BASCULANTI"



Tavole "OSCILLANTI"



TAVOLE OSCILLANTI AMMORTIZZATE-FRENATE



Aspetti neurofisiologici

Il tracking visivo

Come una lingua straniera...



Visual Tracking



Tracking visivo e alta frequenza

Latenza meccanica

REQUISITI MINIMI

per una riprogrammazione propriocettiva

efficace

- ☰ **alta frequenza** di situazioni biomeccaniche
- ☰ doppio movimento
 - ☰ **rocking**
 - ☰ **rolling**
- ☰ possibilità di **arrestare-invertire** il movimento di inclinazione/rotolamento della tavola in tempi brevissimi (**latenza meccanica ininfluyente**)

Allenare il disordine

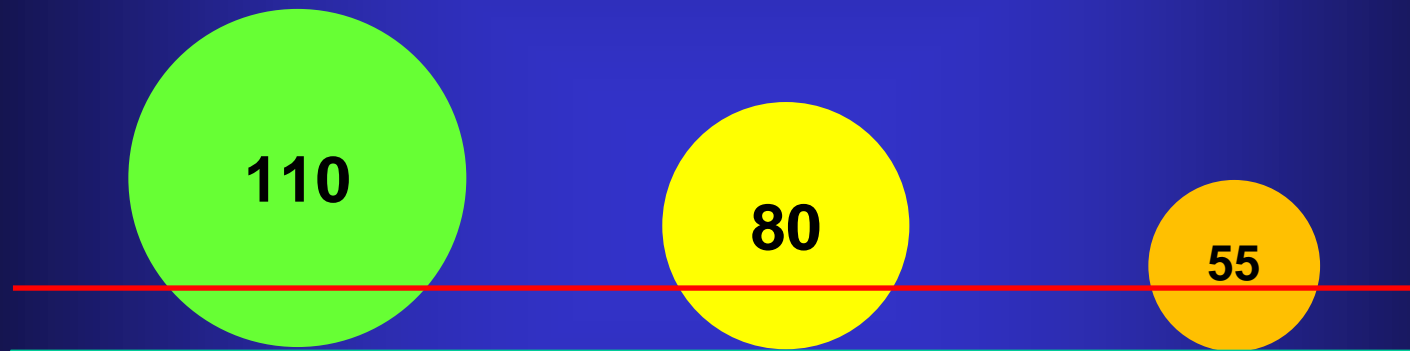
OBBIETTIVI

- ARTICOLARITA' - GROUNDING
- CONTROLLO
- ENDURANCE
- RIMODELLAMENTO STRUTTURALE

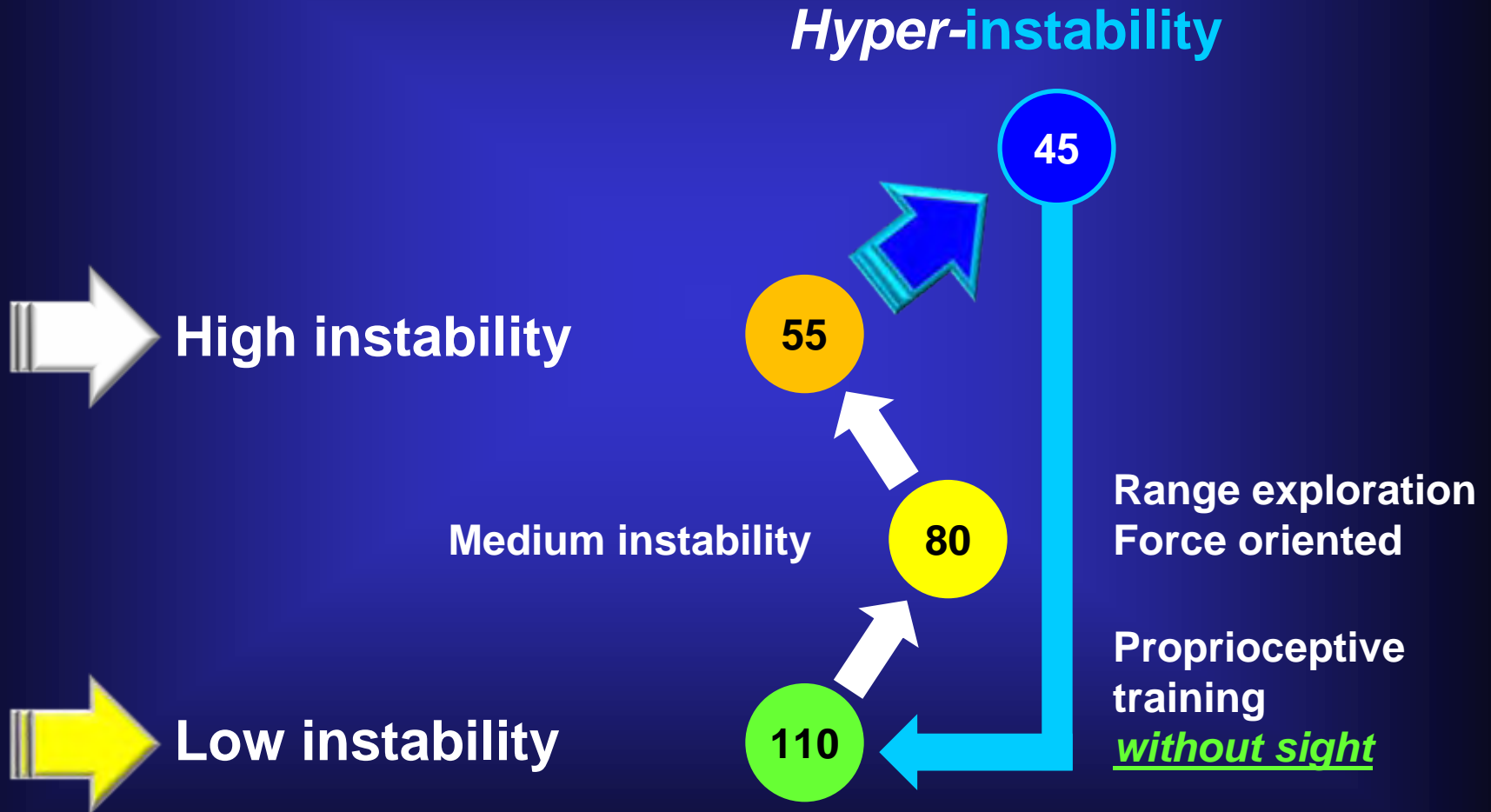
PROPRIOCEPTIVE DOORS



PROPRIOCEPTIVE DOORS

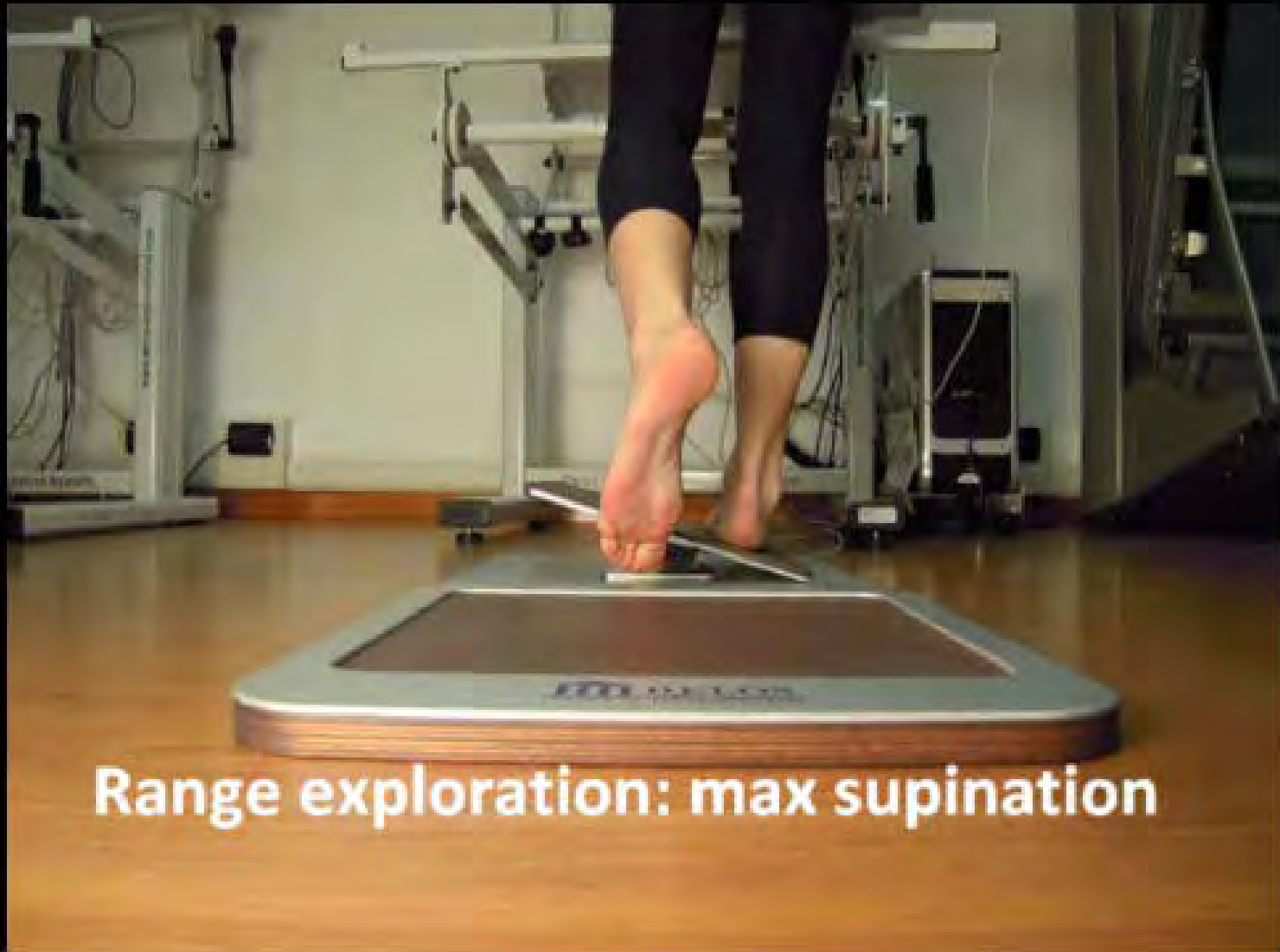


PROPRIOCEPTIVE *DOORS* FOR ATHLETES



The effectiveness is depending on:

- Frequency of instability
- Joint range exploration:
 - ▶ static limit exploration
 - ▶ dynamic exploration
- Working volume
- Working density



Range exploration: max supination



LOOP STRATEGY



LOOP STRATEGY







L'allenamento propriocettivo

- deve essere
- è meglio che sia
- non deve essere

sport-specifico?

Dynamic joint range exploration



Range exploration
single axis
supination -12° left
Latero-lateral

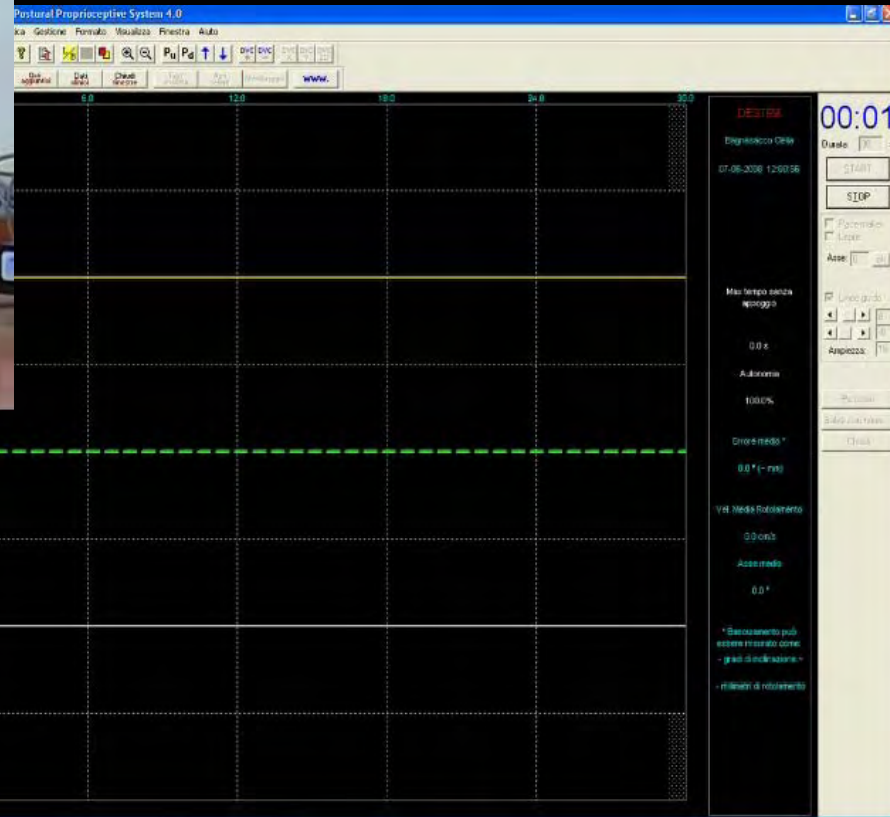


Range exploration

single axis

pronation -8° right

Latero-lateral



Range exploration

single axis

+8° -8°

Antero-posterior right