



# La Valutazione della Resistenza: i Test da Campo a Dettato Sonoro



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# Piano dell'Incontro

- Definizione Resistenza
- Rassegna Test Campo
- Illustrazione Protocolli
- "Dritte" x Applicazione
- Discussione

# Resistenza

“Abilità di Protrarre un  
Attività Mantenendo la Max  
Intensità Possibile  
Relativamente al Compito”



# Resistenza

- Resistenza Aerobica
- Resistenza Anaerobica



# Resistenza: Aerobica



**VO<sub>2</sub>max**



**Soglia Anaerobica**



**Economia**

**Pate and Kriska. *Sports Med.* 1984**



# Massimo Consumo di O<sub>2</sub>

**Il Massimo Volume di Ossigeno  
Trasportato e Consumato dai  
Muscoli Attivi**

# Massimo Consumo di O<sub>2</sub>

$$VO_{2\max} = HR_{\max} \times SV_{\max} \times A-VO_2\text{diff}_{\max}$$

■ HR = Frequenza Cardiaca

■ SV = Gettata Sistolica

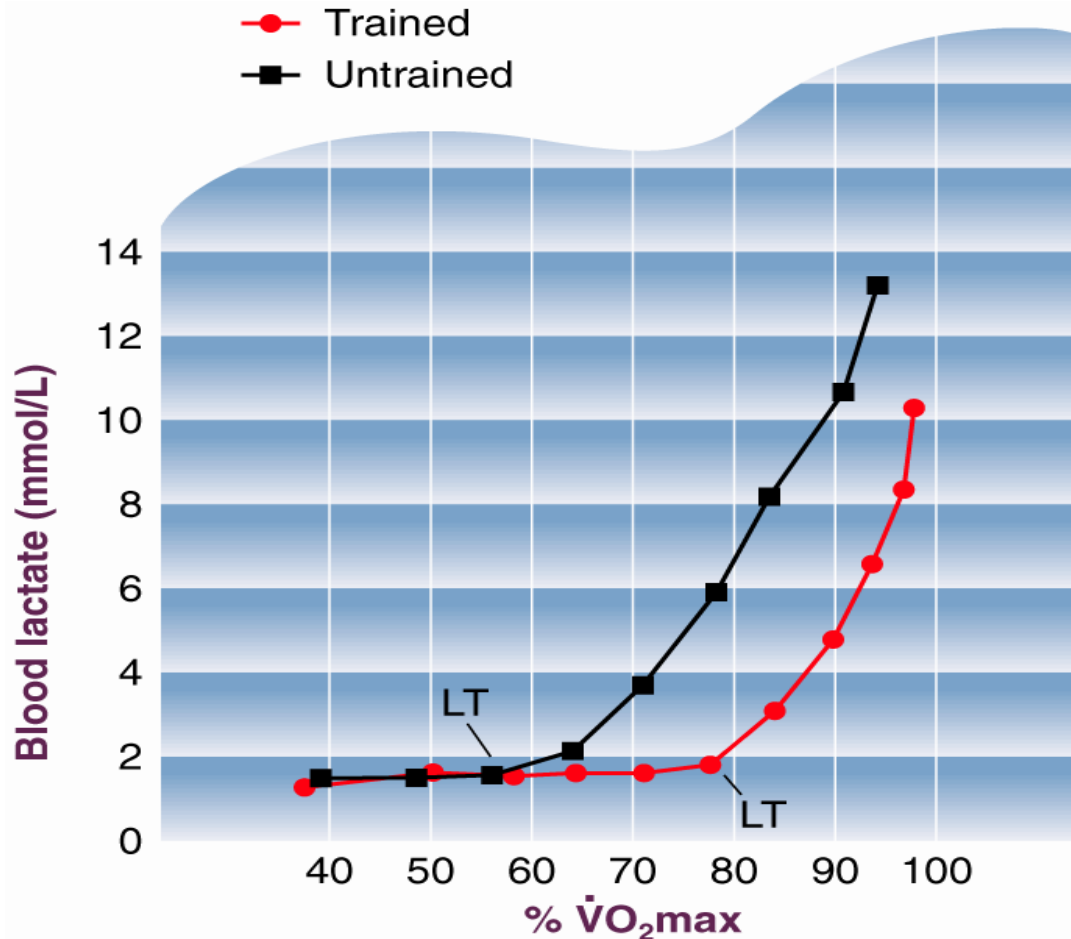
■ A-V O<sub>2</sub>diff = Differenza Artero-venosa O<sub>2</sub>



# Soglia Anaerobica

- “Punto” in cui si verifica un **Accumulo di Lattato** pur essendo ancora **in un Regime Aerobico**
- Forte relazione con la prestazione di resistenza prolungata

# Soglia Anaerobica

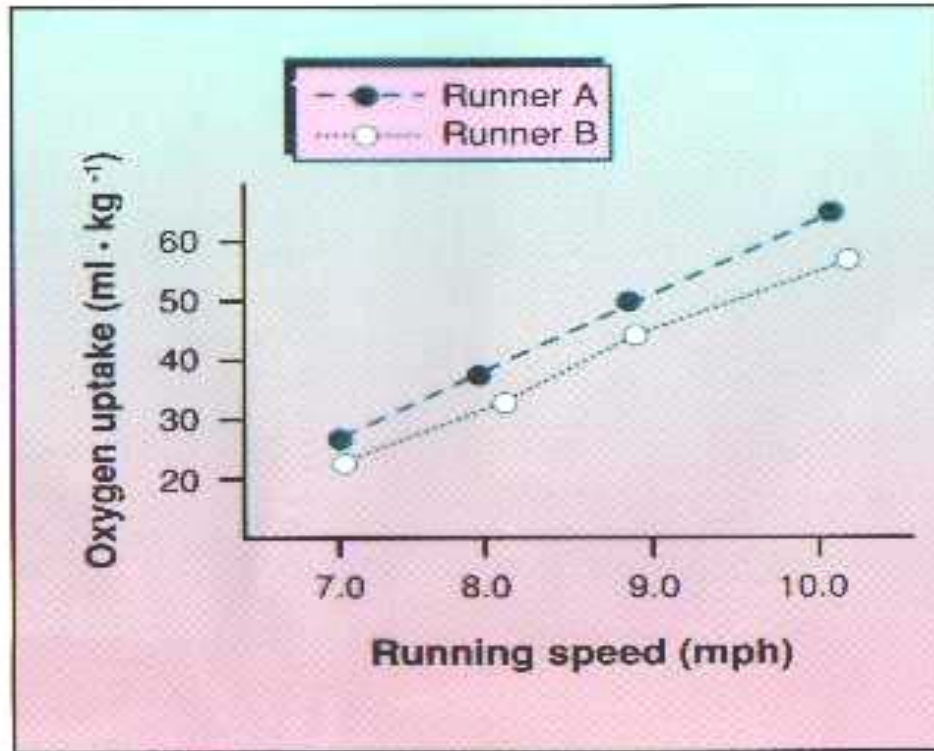


# Economia

■ Volume di Ossigeno Utilizzato per Unità di Lavoro



# Economia



Differences in efficiency of running.

# Resistenza: Anaerobica

- **Abilità di Protrarre Lavoro in Condizioni di Scarso O<sub>2</sub>**



# Valutazione: Resistenza

- **Test Laboratorio**
- **Test Campo**



# Test da Campo: Quale?

## Criteri di Scelta

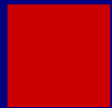
# Test da Campo: Criteri Scelta

## Validità



**Logica**

**Movimento Simile  
alla Disciplina?**



**Criterio**



**Diretta**

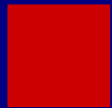


# Test da Campo: Criteri Scelta

## Validità



**Logica**



**Criterio** **Misura effettivamente  
quello che vogliamo?**



**Diretta**

# Test da Campo: Criteri Scelta

## Validità

-  **Logica**
-  **Criterio**
-  **Diretta**

**Ha relazioni con  
l'attività gara?**

# I "Beep Test"

■ Montreal Un.Track test

■ Léger 2'-1' step

■ Multistage Fitness Test

■ Yo-yo test Test



# Montreal University Track test

Léger e Boucher 1980

Protocollo:

Pista atletica 200-400m

Step 2'

Velocità iniziale 8 km h<sup>-1</sup>

Incrementi 1 km h<sup>-1</sup>



# Montreal University Track test

Léger e Boucher 1980

Ritmo dettato da beep

Punti di repera /20-50m



# Montreal University Track test

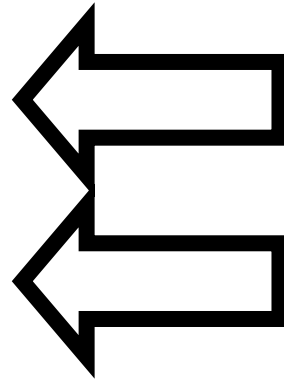
Léger e Boucher 1980

**Test ad esaurimento**

**Oggettivo\***

**Soggettivo**

**\*Incapacità di mantenere il ritmo per 100m**



# Montreal University Track test

Léger e Boucher 1980

Risultati?

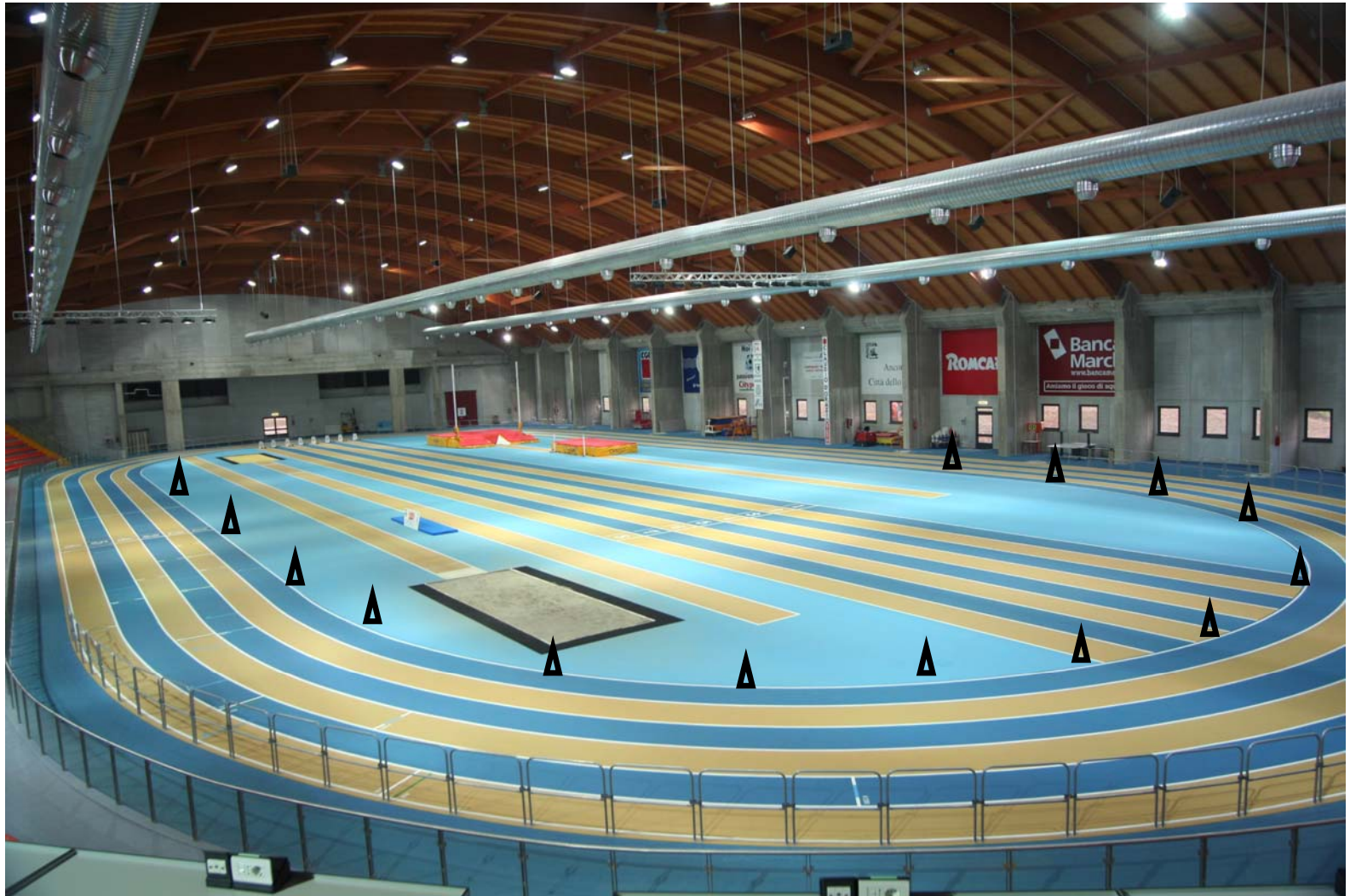
Massima Velocità Aerobica\*

$VO_{2max} = 3.5$  MVA

\*MVA= Velocità ultimo stage completato



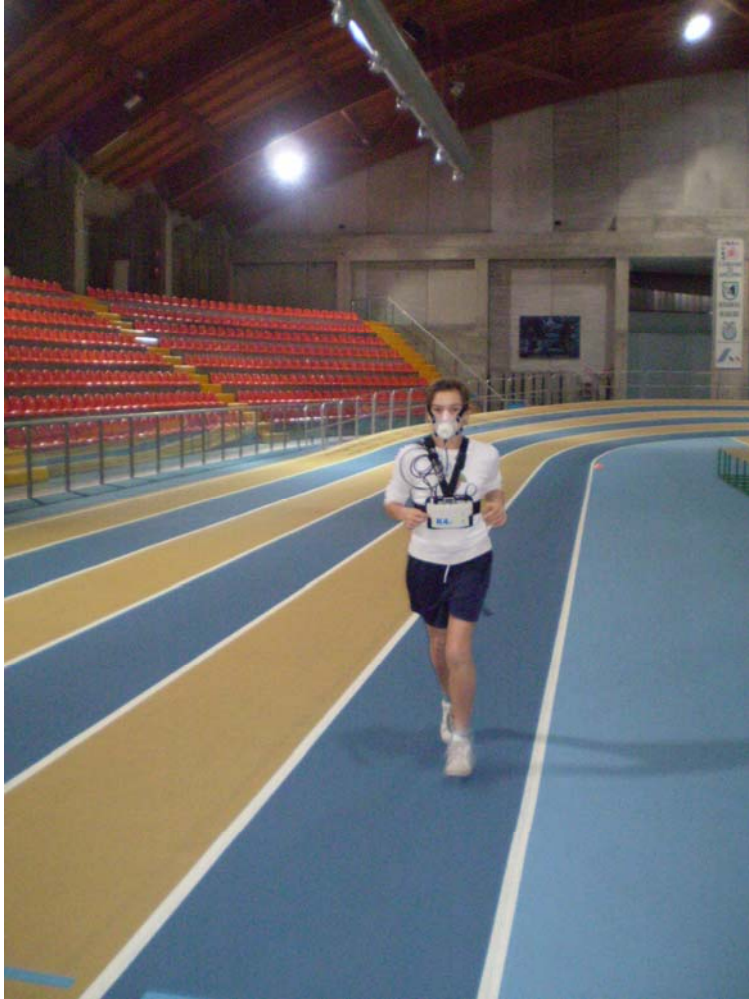
# Montreal University Track test



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# Montreal University Track test



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# Montreal University Track test

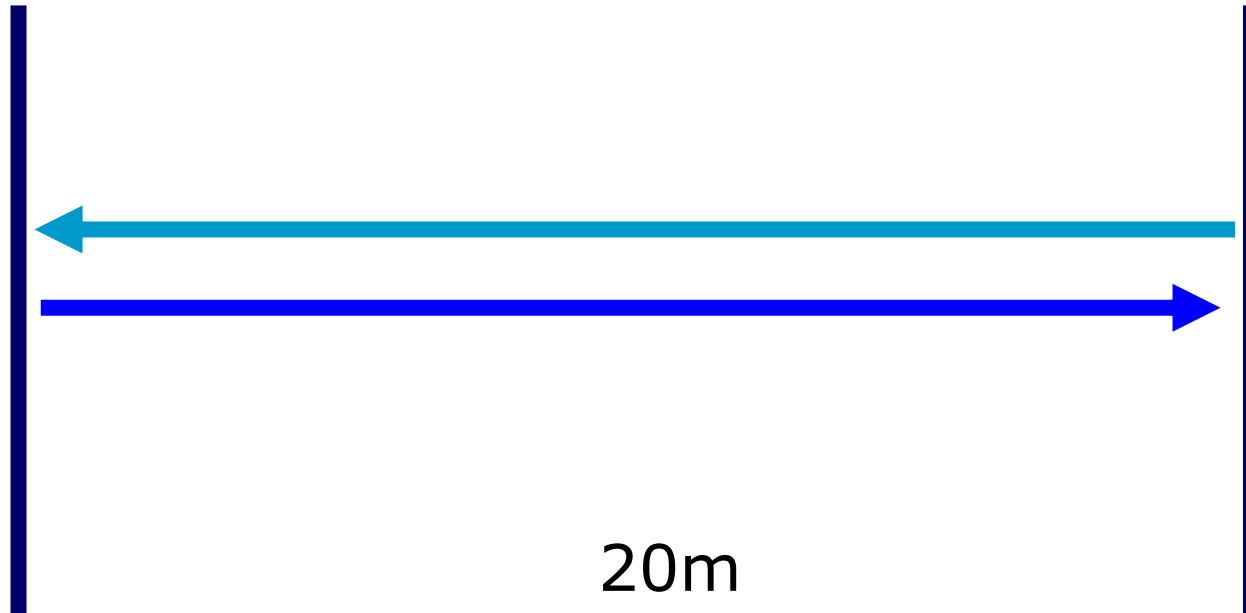
Léger e Boucher 1980

Validità?

$r=0.96$   $p<0.001$



# I Test a Navetta



# Un po' di Storia



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# Test Léger Step 2'

Léger e Lambert 1982

Protocollo:

Base 20m

Step 2'

Vel. iniziale 8.0-7.5 km h<sup>-1</sup>

Incrementi 0.5 km h<sup>-1</sup>



# Test Léger Step 2'

Léger e Lambert 1982

Protocollo:

Base 20m

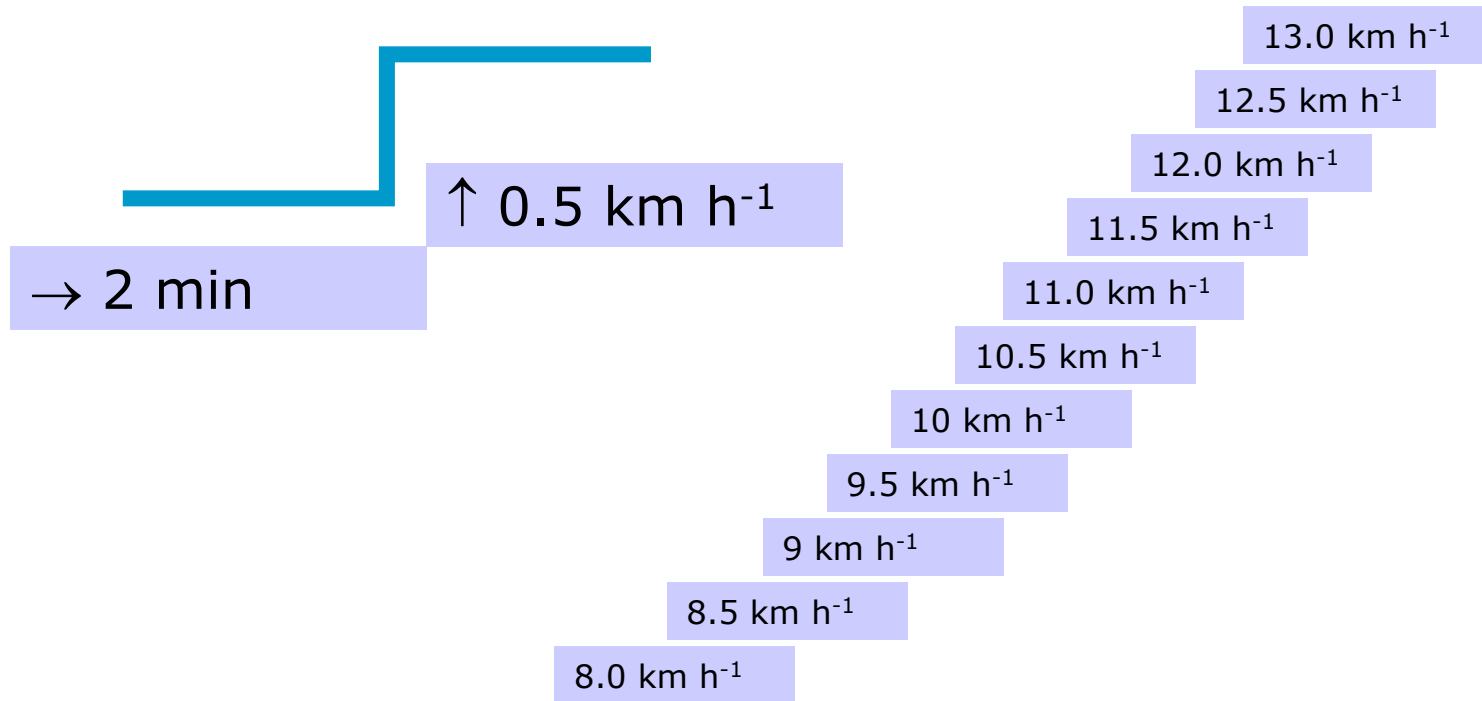
Ritmo dettato da beep

Punti di repera /20



# Test Léger Step 2'

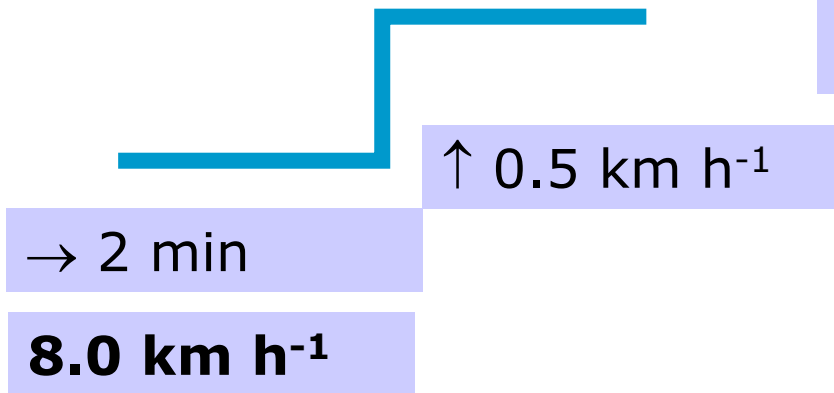
## Protocollo:



Léger e Lambert 1982

# Test Léger Step 2'

Protocollo:



Test ad Esaurimento

Oggettivo\*

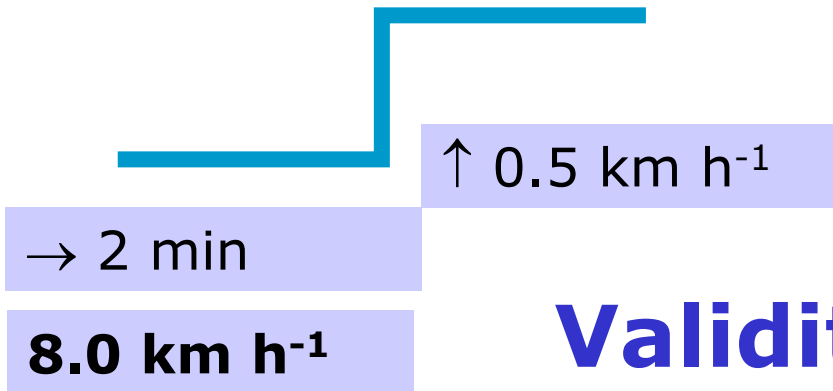
\*Ritardo di 3m al "beep"

Soggettivo

Léger e Lambert 1982



# Test Léger Step 2'



**Validità** **r=0.84**

**Ripetibilità** **r=0.97**

**MUTTvs 20-m SRT** **r=0.92**

# Test Léger Step 1'

Léger e Lambert 1982

Protocollo:

Base 20m

Step 1'

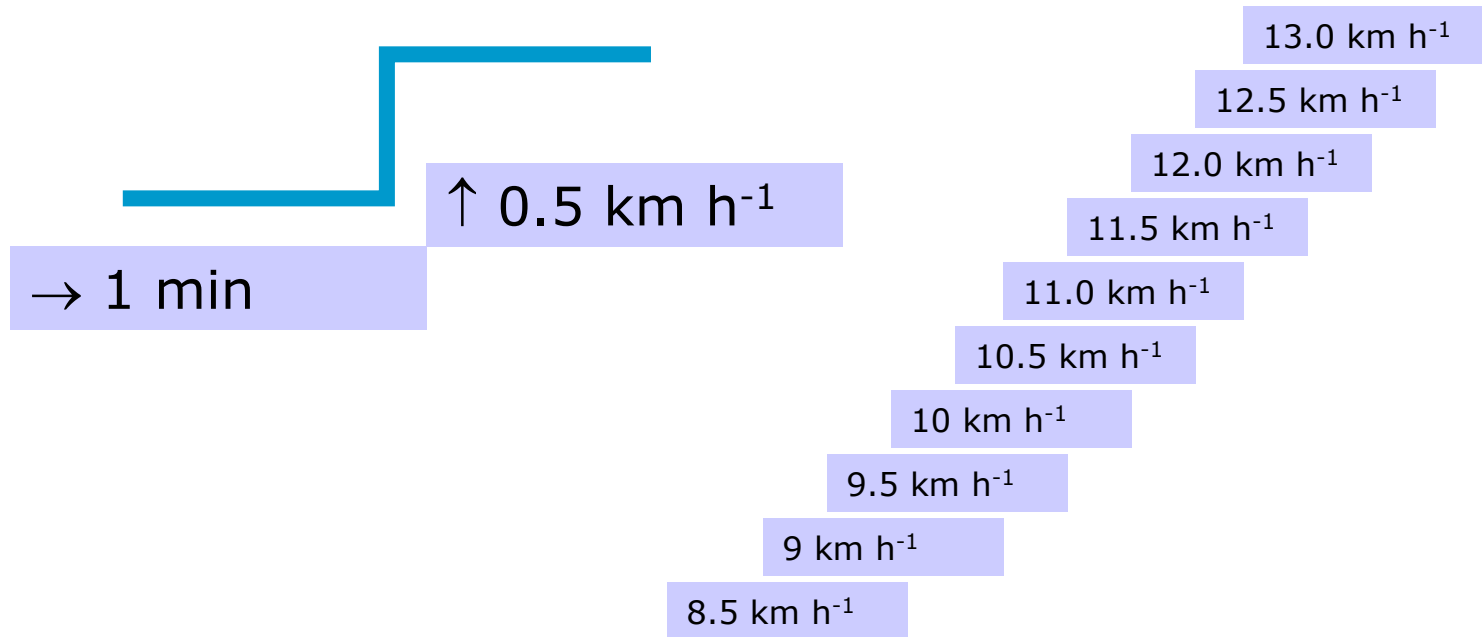
Vel. iniziale 8.5 km h<sup>-1</sup>

Incrementi 0.5 km h<sup>-1</sup>



# Test Léger Step 1'

Protocollo:



Léger e Lambert 1982; Léger e coll. 1988

# Test Léger Step 1'

Protocollo:

Base 20m

Ritmo dettato da beep

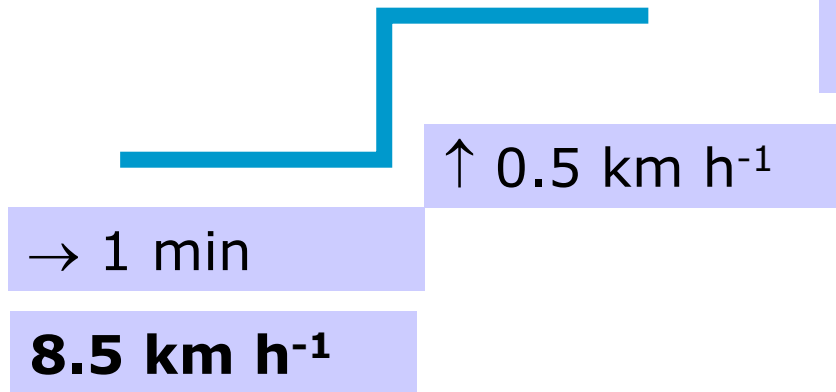
Punti di repera /20



Léger e Lambert 1982; Léger e coll. 1988

# Test Léger Step 1'

Protocollo:



Test ad Esaurimento

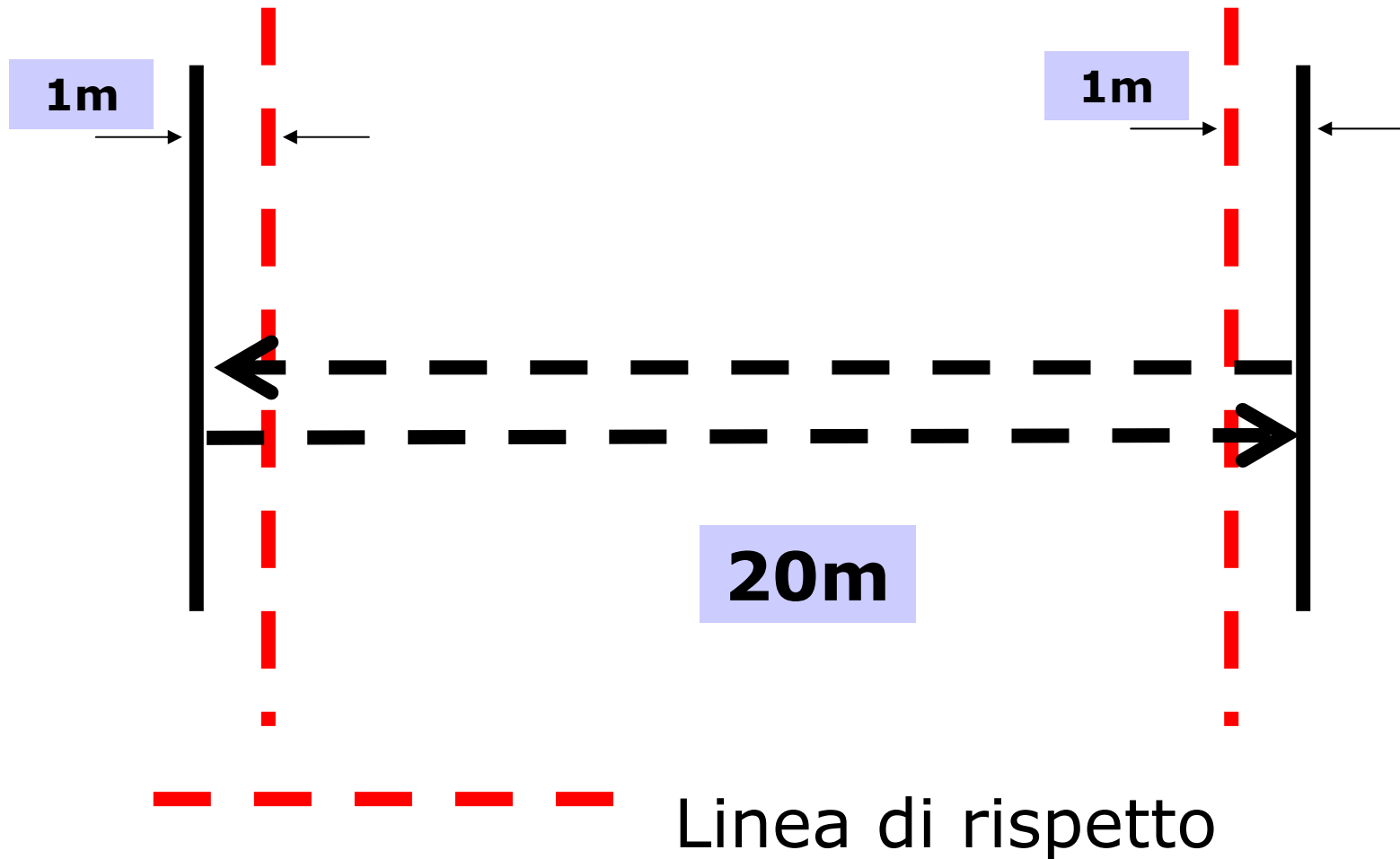
Oggettivo\*

\*Ritardo di 1-2m al "beep"

Soggettivo

Léger e coll. 1984

# Test Léger Step 1'



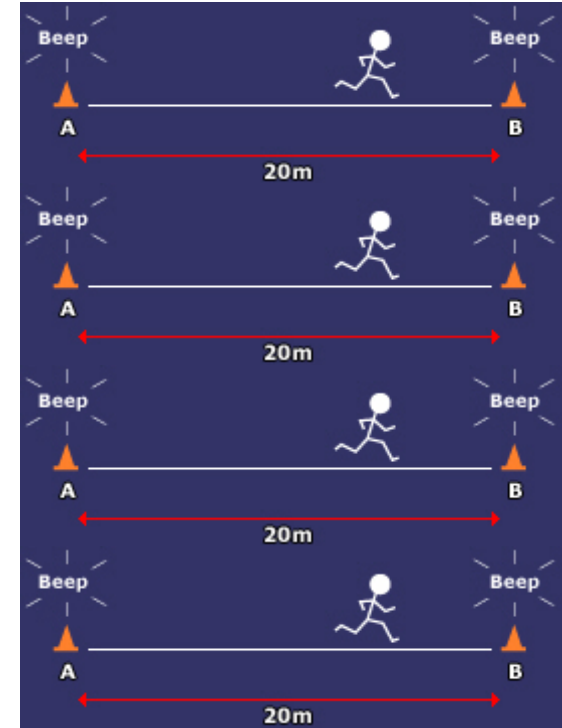
# Test Léger Step 1'

Risultati:

Step Effettuati

Tempo di Lavoro

Stima  $VO_{2max}$  ml kg<sup>-1</sup>min<sup>-1</sup>



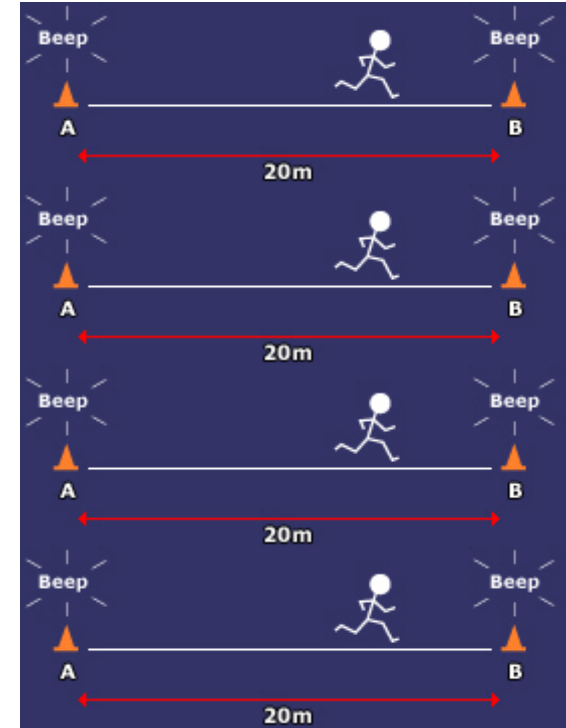
Léger e Lambert 1982; Léger e coll. 1988

# Test Léger Step 1'

Stima  $VO_{2max}$   $ml\ kg^{-1}min^{-1}$

$R=0.71$  età  $<18$  anni

$SE_y=12.1\%$



Léger e Lambert 1982; Léger e coll. 1988



# Test Léger Step 1'

Stima  $VO_{2\max}$  ml kg<sup>-1</sup>min<sup>-1</sup>

$$VO_{2\max} = 31.025 + 3.238X_1 - 3.248 X_2 + 0.1536 X_1X_2$$

$X_1$  = Vel. Ultimo Step

$X_2$  = Età Soggetti

Léger e Lambert 1982; Léger e coll. 1988

# Test Léger Step 1'

Stima  $\text{VO}_{2\text{max}}$   $\text{ml kg}^{-1}\text{min}^{-1}$

$r=0.90$  età  $> 18$  anni

$\text{SE}_y = 9.6\%$

$$\text{VO}_{2\text{max}} = -23.4 + 5.8X_1$$

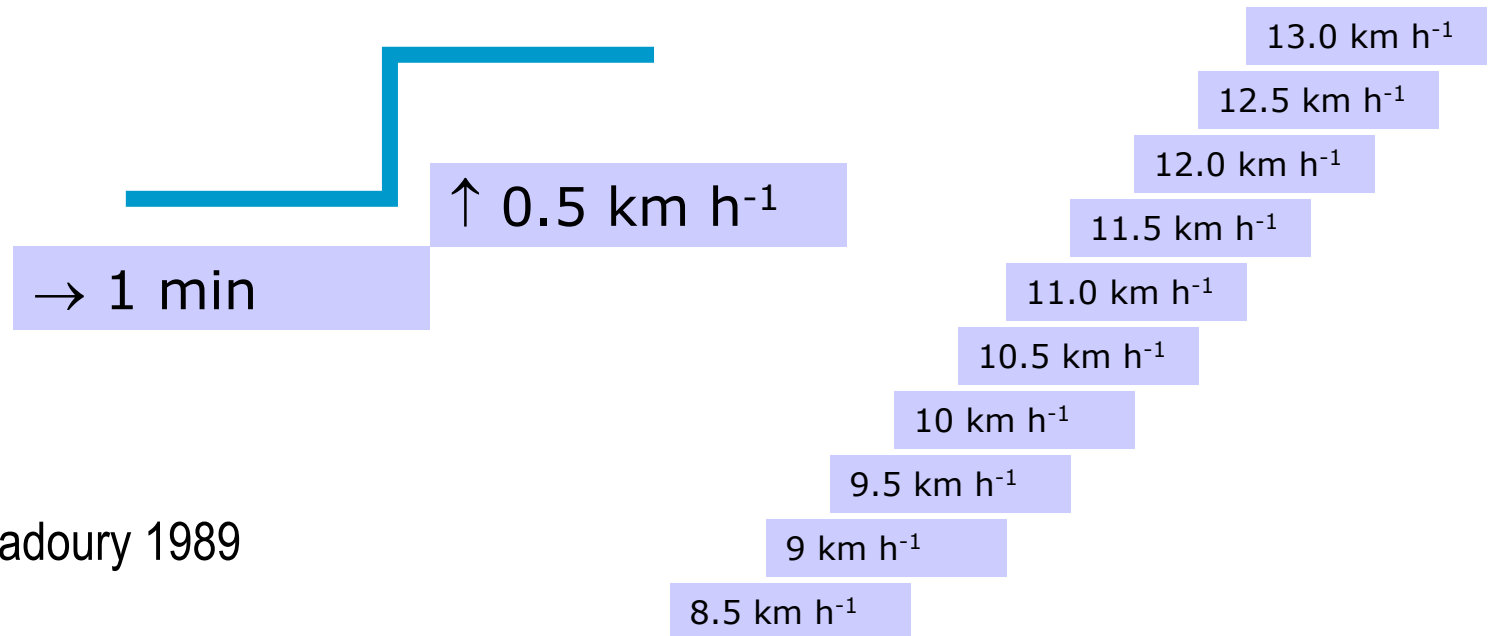
$X_1 = \text{Vel. ultimo step}$

Léger e Gadoury 1989

# Test Léger Step 1'

Particolarità

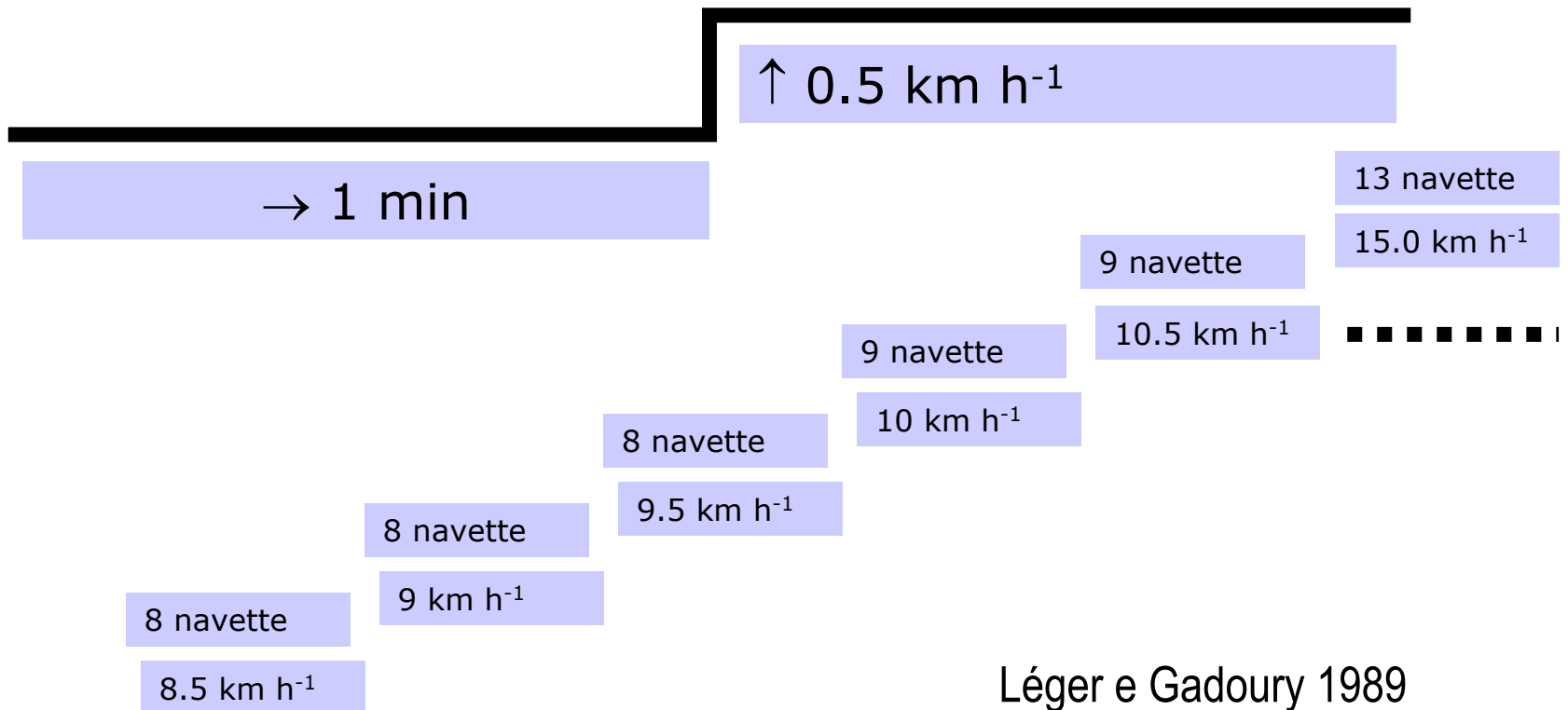
$X_1 = \text{Vel. ultimo step}$



Léger e Gadoury 1989

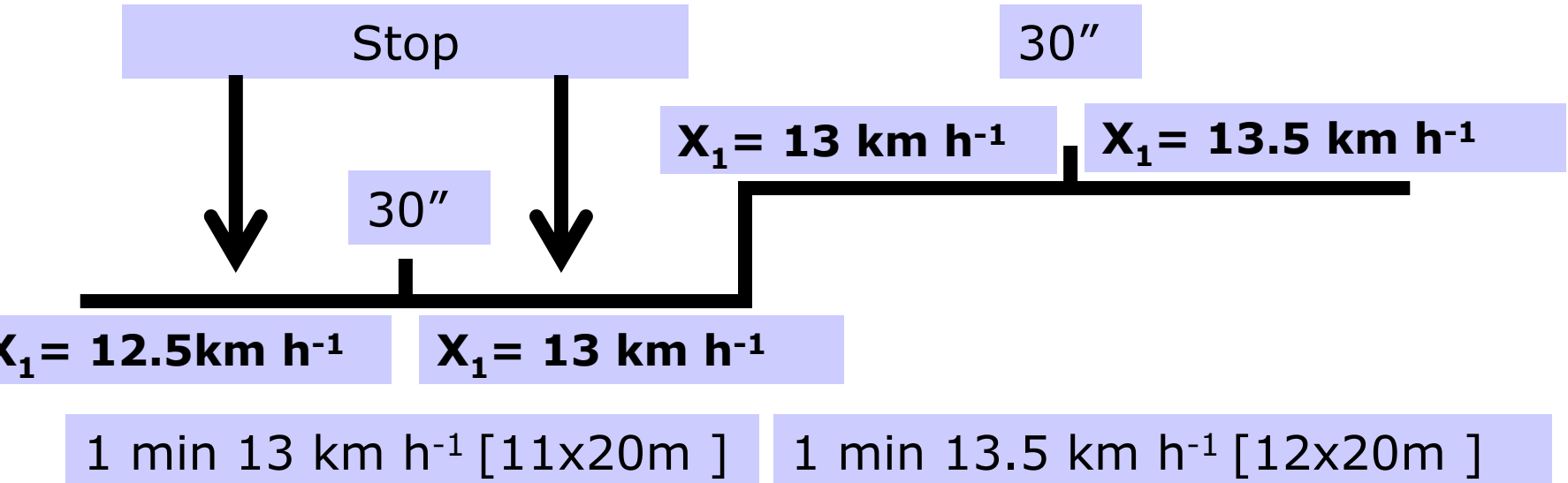
# Test Léger Step 1'

**$X_1$  = Velocità Ultimo Step**



# Test Léger Step 1'

**$X_1 =$  Velocità Ultimo Step**



Léger e Gadoury 1989

# Multistage Fitness Test

Ramsbottom e coll. 1988

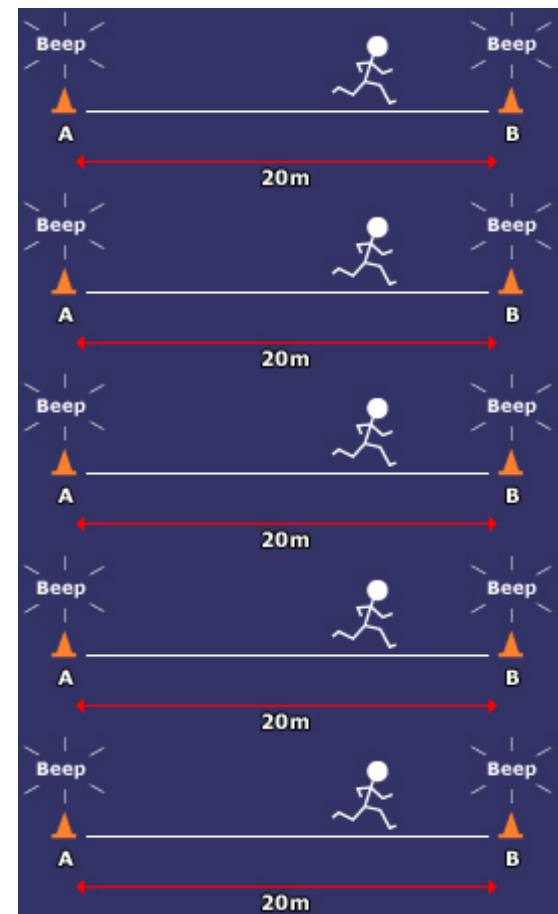
Protocollo:

Base 20m

Step 1'

Vel. iniziale 8.0 km h<sup>-1</sup>

Incrementi 0.5 km h<sup>-1</sup>



# Multistage Fitness Test

Ramsbottom e coll. 1988

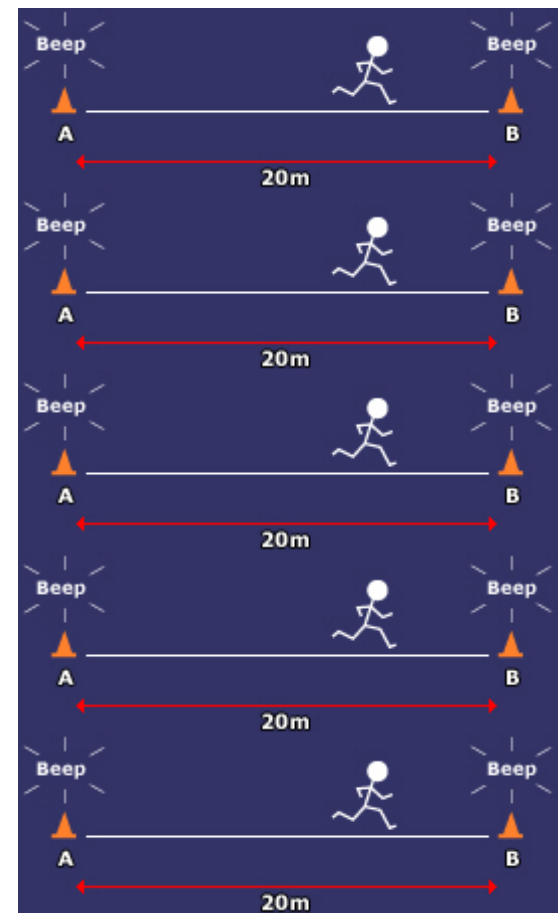
Differenze con test Léger?

Computo navette effettuate

Formula età indipendente

Facilità raccolta dati



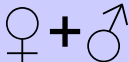
1 Formula per Stima  $VO_{2max}$



# Multistage Fitness Test

Palizkca e coll. 1987; Ramsbottom e coll 1988

Validità MSFT vs Léger?

<b>Prestazione</b>			
<b>Léger [plaiier]</b>	<b>r=0.82</b>	<b>r=0.89</b>	<b>r=0.92</b>
<b>MSFT [laps]</b>	<b>r=0.83</b>	<b>r=0.93</b>	<b>r=0.93</b>



# Multistage Fitness Test

Palizkca e coll. 1987; Ramsbottom e coll 1988

Stima  $VO_{2max}$ ?

Test

Equazione

Léger

$$VO_{2max} = 20.6 + 3 \times N^{\circ} \text{steps}$$

MSFT

$$VO_{2max} = 23.7 + 0.29 \times N^{\circ} \text{navette}$$

# Yo-Yo Tests



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# Yo-Yo Tests

Bangsbo 1992

2 Livelli

Yo-Yo Endurance

Yo-Yo Inter. Endurance

Yo-Yo Inter. Recovery



# Yo-Yo Endurance

Bangsbo 1992

Livello 1 = MSFT



# Yo-Yo Endurance

Bangsbo 1992

Livello 1

Base 20m

Step 1'

Vel. iniziale 8.0 km h<sup>-1</sup>

Incrementi 0.5 km h<sup>-1</sup>



# Yo-Yo Endurance

Bangsbo 1992

Protocollo Livello 2:

Base 20m

Step 1'

Vel. iniziale 11.5 km h<sup>-1</sup>

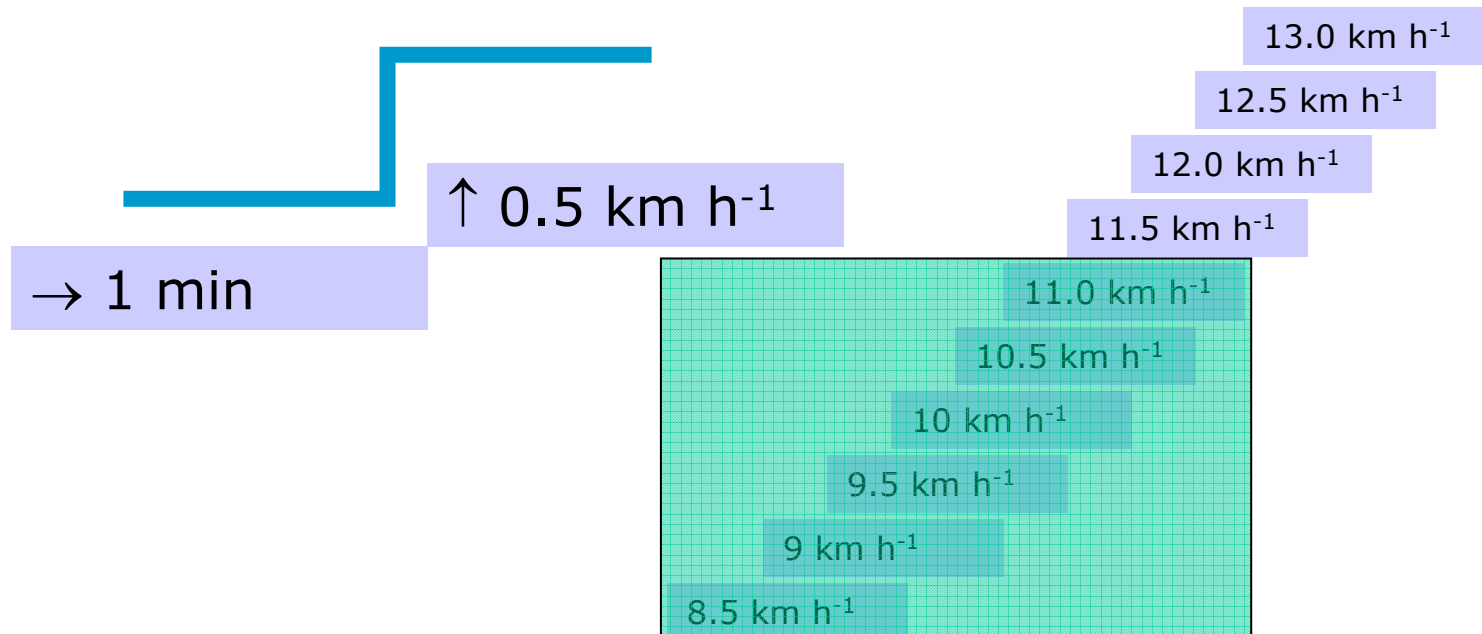
Incrementi 0.5 km h<sup>-1</sup>



# Yo-Yo Endurance L2

Bangsbo 1992

Protocollo Livello 2:



# Yo-Yo Intermittent Recovery

Bangsbo 1992

Protocollo L1:

Base 20m

Velocità iniziale 10 km h<sup>-1</sup>

Incrementi 0.5 km h<sup>-1</sup>/8x2x20m

10s recupero/2x20m



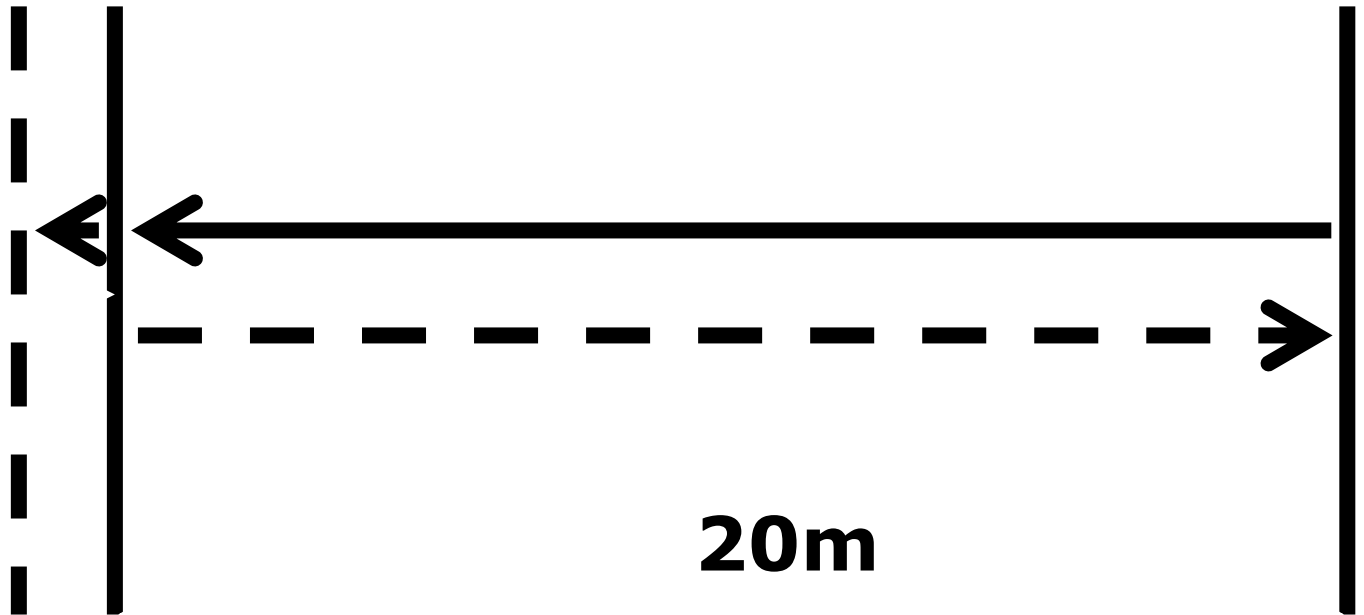


# Yo-Yo Intermittent Recovery

10s recupero/2x20m

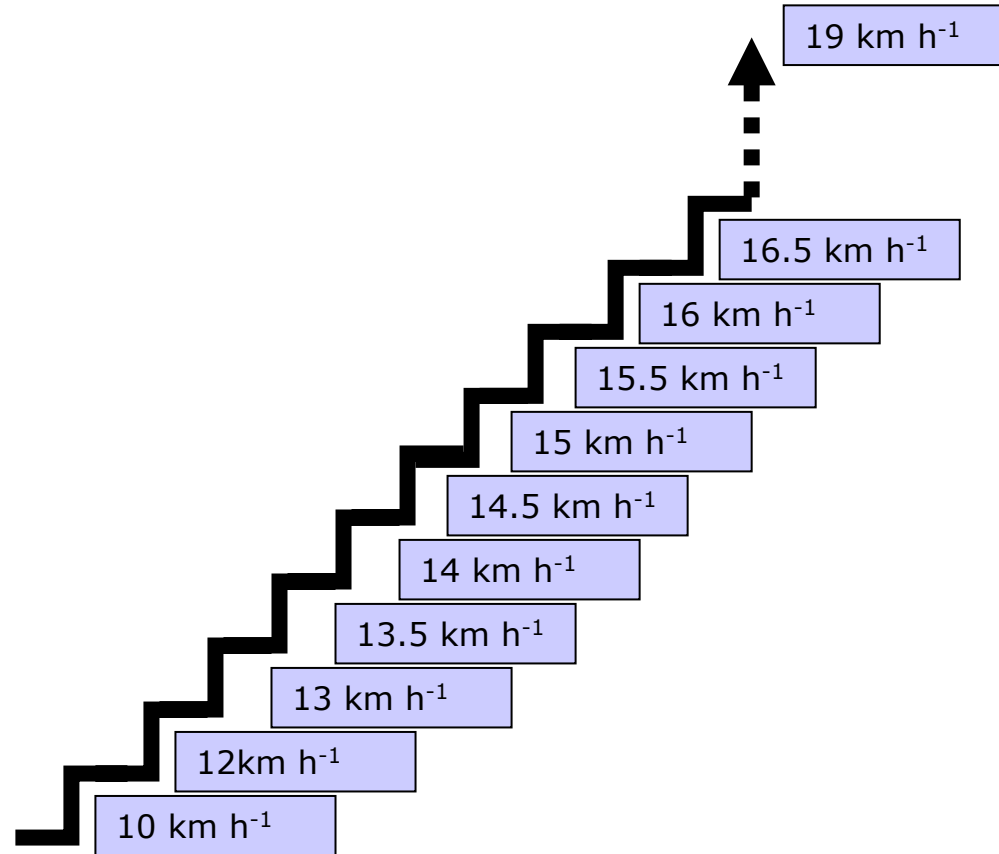
5m

Zona  
Recupero  
Attivo



# Yo-Yo Intermittent Recovery

## Protocollo L1



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# Yo-Yo Intermittent Recovery

## Protocollo L1



2X20m

19 km h<sup>-1</sup>

8

16.5 km h<sup>-1</sup>

8

16 km h<sup>-1</sup>

8

15.5 km h<sup>-1</sup>

8

15 km h<sup>-1</sup>

8

14.5 km h<sup>-1</sup>

8

14 km h<sup>-1</sup>

4

13.5 km h<sup>-1</sup>

3

13 km h<sup>-1</sup>

2

12 km h<sup>-1</sup>

1

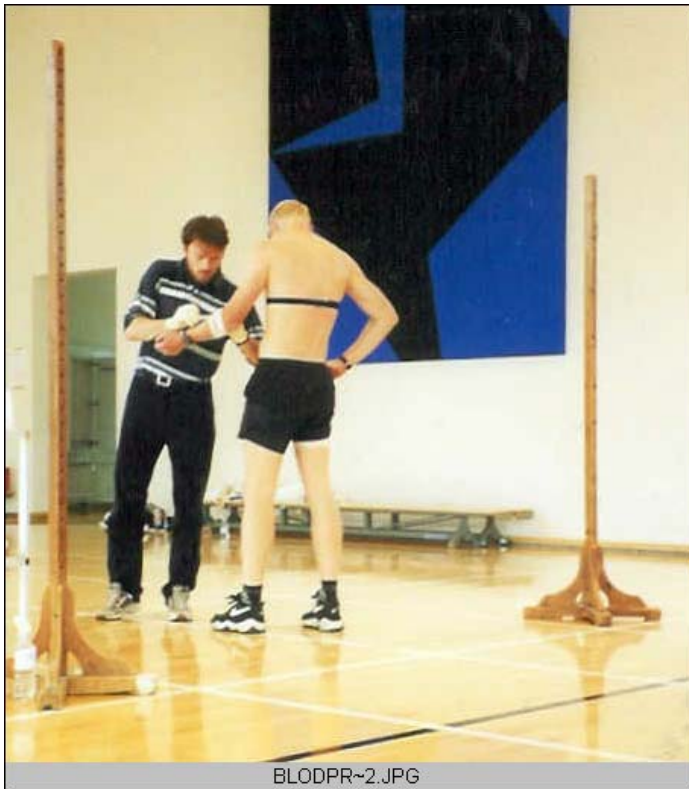
10 km h<sup>-1</sup>

1

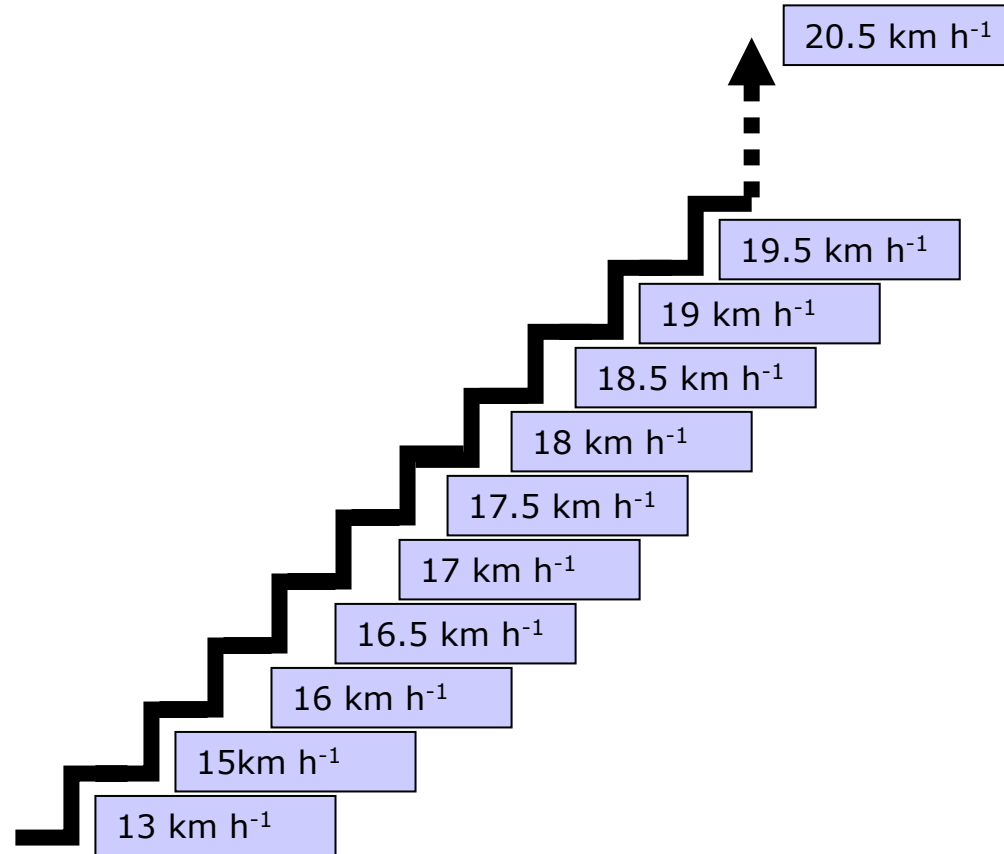
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# Yo-Yo Intermittent Recovery

## Protocollo L2



BLODPR-2.JPG



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# Yo-Yo Intermittent Recovery

## Protocollo L2

2X20m



BIOPSI-1.JPG

20.5 km h<sup>-1</sup>

8

19.5 km h<sup>-1</sup>

8

19 km h<sup>-1</sup>

8

18.5 km h<sup>-1</sup>

8

18 km h<sup>-1</sup>

8

17.5 km h<sup>-1</sup>

8

17 km h<sup>-1</sup>

4

16.5 km h<sup>-1</sup>

3

16 km h<sup>-1</sup>

2

15 km h<sup>-1</sup>

1

13 km h<sup>-1</sup>

1

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# Conclusioni

## Yo-Yo EL2

**Test Aerobico Generico**

**Guida Allenamento Aerobico**

**Inizio Preparazione!**

# Conclusioni

## Yo-Yo IRL1

**Endurance Calcio-Specifico**  
**Parte Finale Preparazione**  
**Valutazione Campionato!**  
**Importanza Forza Esplosiva!**

# Yo-Yo Intermittent Endurance L1

Base	20m
Step	1 min
Velocità iniziale	8.0 km h <sup>-1</sup>
Incrementi Vel.	0.5 km h <sup>-1</sup> min <sup>-1</sup>
Recupero	5 s / 2x20 m
Base Recupero	2.5 m

Bangsbo 1994



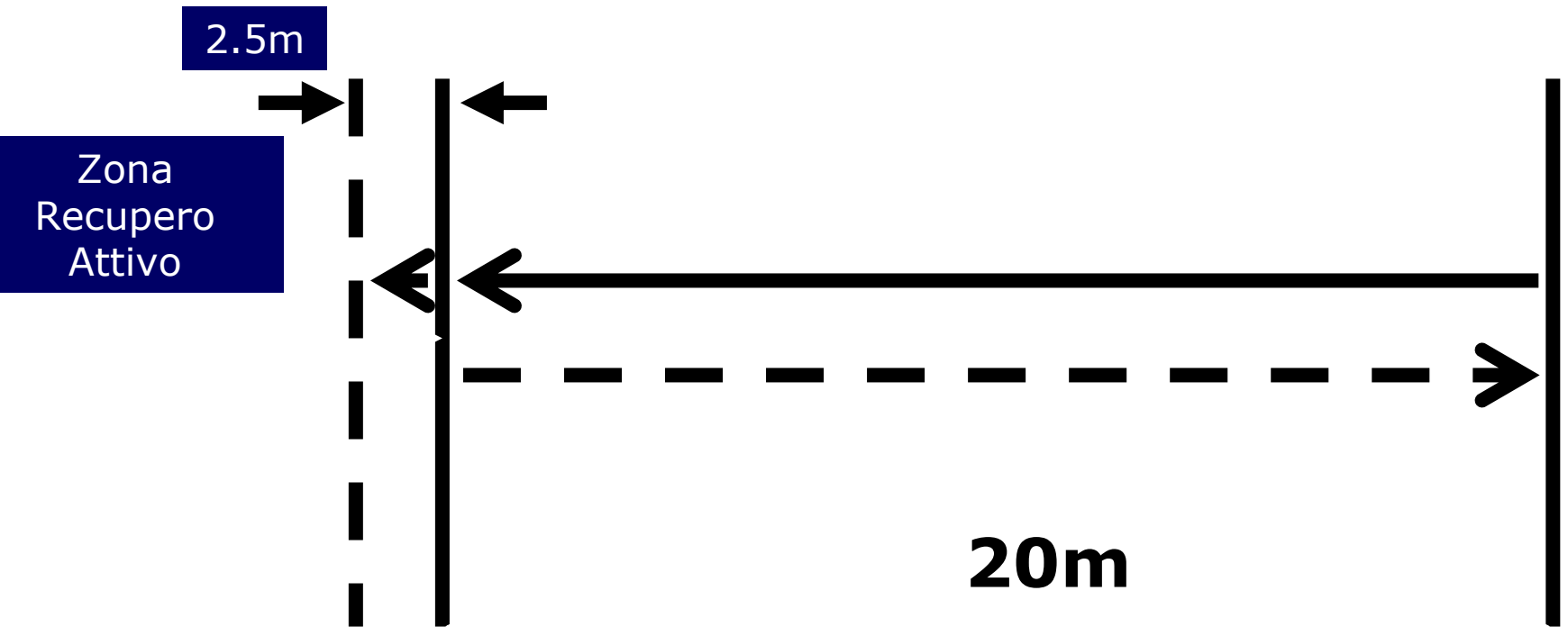
# Yo-Yo Intermittent Endurance L2

Base	20m
Step	1 min
Velocità iniziale	11.5 km h <sup>-1</sup>
Incrementi Vel.	0.5 km h <sup>-1</sup> min <sup>-1</sup>
Recupero	5 s / 2x20 m
Base Recupero	2.5 m

Bangsbo 1994

# Yo-Yo Intermittent Endurance

5s recupero/2x20m



# Yo-Yo Intermittent Endurance

Journal of Strength and Conditioning Research, 2006, 20(2), 326–330  
© 2006 National Strength & Conditioning Association

## CARDIORESPIRATORY RESPONSES TO YO-YO INTERMITTENT ENDURANCE TEST IN NONELITE YOUTH SOCCER PLAYERS

CARLO CASTAGNA,<sup>1</sup> FRANCO M. IMPELLIZZERI,<sup>2</sup> ROMUALDO BELARDINELLI,<sup>3</sup> GRANT ABT,<sup>4</sup> AARON COUTTS,<sup>5</sup> KARIM CHAMARI,<sup>6</sup> AND STEFANO D'OTTAVIO<sup>1</sup>

<sup>1</sup>School of Sport and Exercise Sciences, Faculty of Medicine and Surgery, University of Rome Tor Vergata, Rome, Italy; <sup>2</sup>Human Performance Lab, S.S. MAPEI, Castellanza, Italy; <sup>3</sup>Department of Cardiovascular Rehabilitation and Prevention, Hospital "G.M. Lancisi", Ancona, Italy; <sup>4</sup>St. Martin's College, Lancaster, United Kingdom; <sup>5</sup>Human Performance Laboratory, University of Technology, Sydney, Australia; and <sup>6</sup>Unité de Recherche "Evaluation, Sport, Santé", National Centre of Medicine and Science in Sports (CNMSS), El Menzah, Tunisia.

**ABSTRACT.** Castagna, C., F.M. Impellizzeri, R. Belardinelli, G. Abt, A. Coutts, K. Chamari, and S. D'Ottavio. Cardiorespiratory responses to yo-yo intermittent endurance test in nonelite youth soccer players. *J. Strength Cond. Res.* 20(2): 326–330. 2006.— This study examined the validity of the Yo-yo Intermittent Endurance Test (Level 1; YYIET) as indicator of aerobic power in youth soccer players. Cardiorespiratory responses were determined in 18 moderately trained nonelite youth soccer players (age,  $16.6 \pm 0.8$  years; height,  $178.7 \pm 6.2$  cm; body mass,  $69.8 \pm 6.0$  kg;  $\dot{V}O_{2\text{peak}}$ ,  $52.8 \pm 7.4$  ml·kg<sup>-1</sup>·min<sup>-1</sup>) while performing the YYIET and an incremental treadmill test. Maximal heart

Of these, the Yo-yo Intermittent Endurance Test (YYIET) has become popular (2, 4, 32). The YYIET is a progressive intermittent shuttle run test that allows 5 seconds recovery following every second 20-m shuttle. Its aim is to progressively illicit a maximal physiological response from players during a soccer specific (intermittent) protocol. Two YYIET versions are currently available, Level 1 and Level 2. Level 1 has been devised for young and-or amateur athletes or habitually active people, while Level 2 is supposed to be used to test the en-

# Yo-Yo Inter. Endurance L1

## Conclusioni

<b>Stima <math>VO_{2max}</math></b>	<b>NO</b>
<b>Troppo lungo</b>	<b>Si</b>
<b>Test <math>VO_{2max}</math></b>	<b>NO</b>

Castagna Impellizzeri e coll. 2006b

