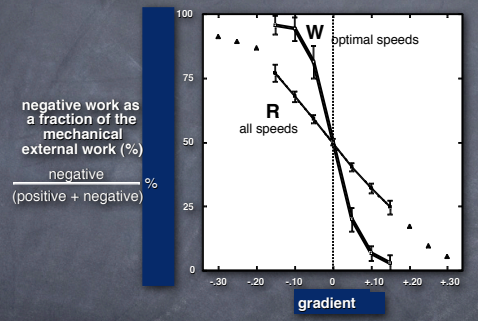
# Biomeccanica II

## Lez. BM9

Mercoledì 28 Novembre 2007 14÷15:30

Luca P. Ardigò




Minetti et al. 1993, 1994

transforming MECHANICAL WORK into ENERGETIC COST in GRADIENT LOCOMOTION

**TE increases = positive mechanical work: raise and accelerating the body centre of mass**

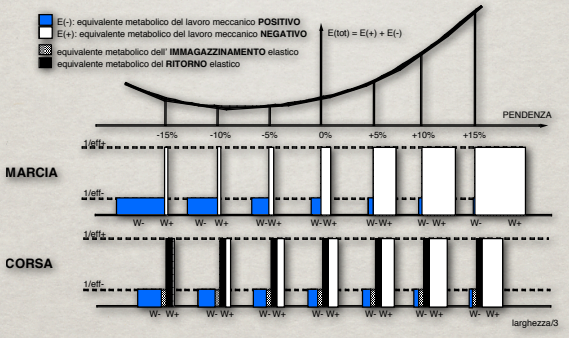
**TE decreases = negative mechanical work: lowering and decelerating the body centre of mass**

$$W_{tot} = W_{ext}^{+} + W_{ext}^{-} + W_{int}$$

$$\text{efficiency} = \frac{\text{Mechanical Work}}{\text{Energetic Cost}} \qquad E = \frac{W_{tot}}{eff} \qquad eff^{-} = 3\text{-}5 \times eff^{+}$$

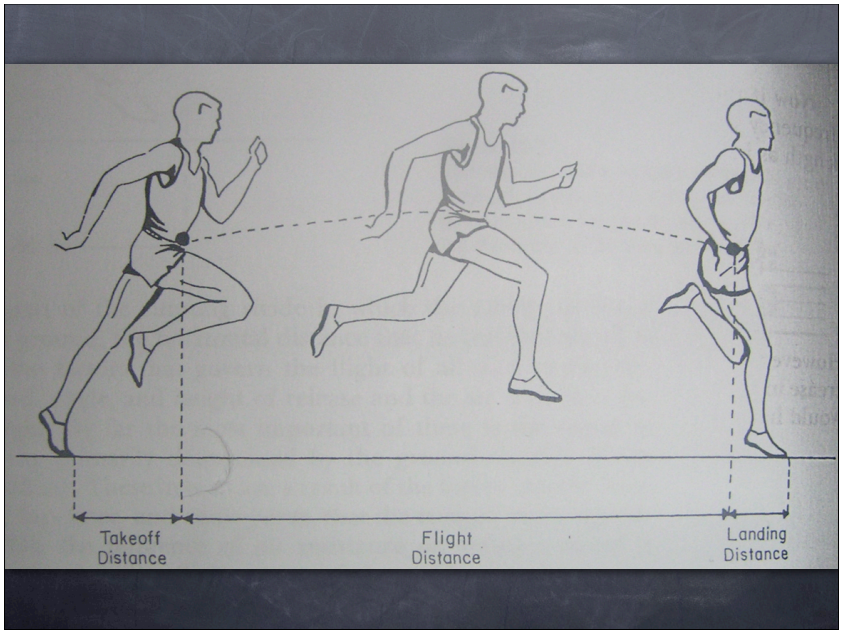
$$E_{tot} = E^{+} + E^{-} = \frac{W_{ext}^{+}}{eff^{+}} + \frac{W_{ext}^{-}}{eff^{-}}$$

MARCIA A VELOCITA' OTTIMALE, CORSA A QUALSIASI VELOCITA'



## Definizioni

v = SL x $\nu$ (cicli $min^{-1}$)




## Definizioni/2

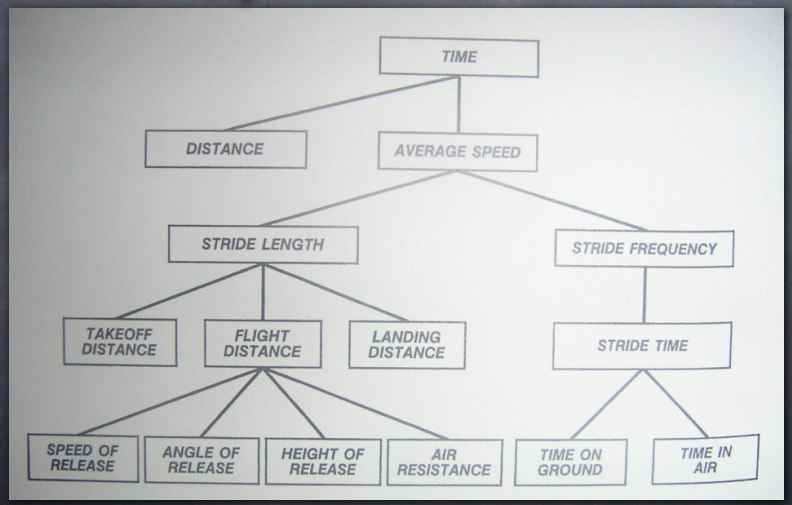
v = SL x $\nu$ (cicli $min^{-1}$)

– Distanza 'di decollo' 22 [% GC] 26 30 [min] [media] [Max];

– distanza 'di volo' 50 57 64;

– distanza 'di atterraggio' 12 17 20.

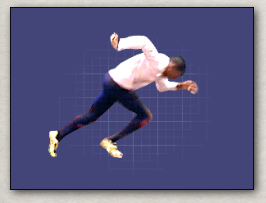
## 'Ingredienti' della corsa




## Partenza della corsa

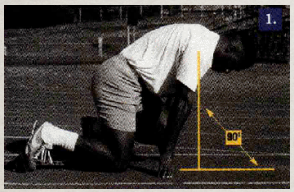
'ai vostri posti'

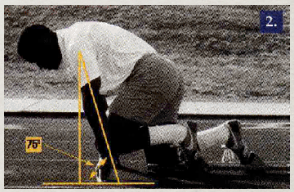
'pronti'

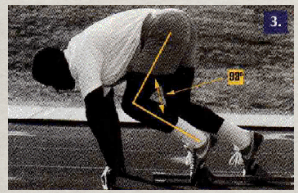


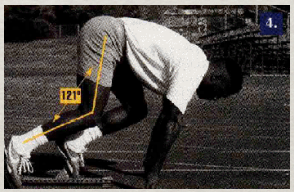
'via'

## Partenza della corsa/2

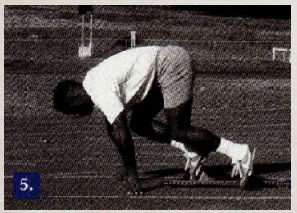


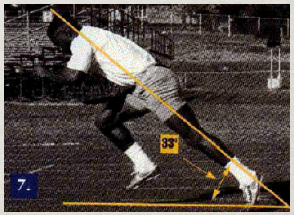




## Partenza della corsa/3




# Partenza della corsa = corsa in salita

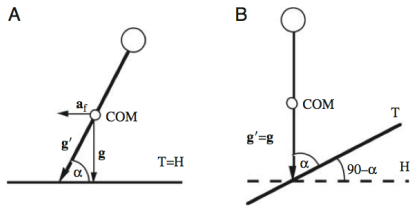






Fig. 1. Simplified view of the forces acting on a runner. The subject is accelerating forward while running on flat terrain (A) or running uphill at constant speed (B). The subject's body mass is assumed to be located at the centre of mass (COM); $\mathbf{a}_f$=forward acceleration; $\mathbf{g}$=acceleration of gravity; $\mathbf{g}'=(\mathbf{a}_f^2+\mathbf{g}^2)^{0.5}$ is the acceleration resulting from the vectorial sum of $\mathbf{a}_f$ plus $\mathbf{g}$; T=terrain; H=horizontal; α (=arctan $\mathbf{g}/\mathbf{a}_f$) is the angle between runner's body and T; the angle between T and H is α'=90–α. (Modified from di Prampero et al., 2002.)

di Prampero et al., 2005