Laurea magistrale in Scienze motorie preventive ed adattate

Biomeccanica del movimento e dello sport ARDIGO' 8
(2010/2011)

La locomozione e le 'interferenze' ambientali

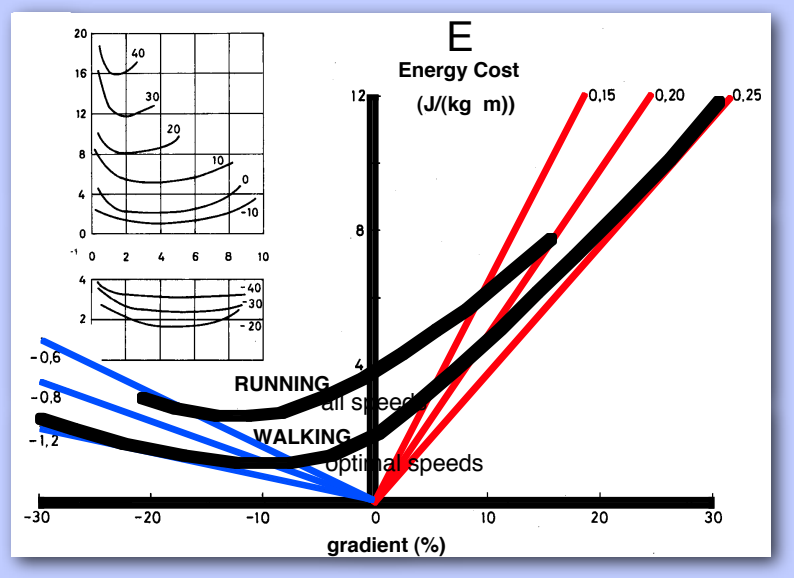
Giovedì 10 Marzo h. 13:30÷15 Biomeccanica del movimento
e dello sport ARDIGO' 8

Luca P. Ardigò

Pendenza

marcia e corsa

C vs. pendenza

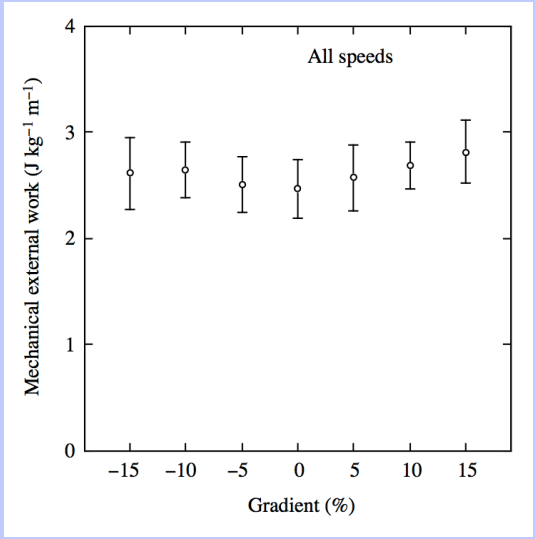


from: Margaria, R., 1976. Biomechanics and energetics of muscular exercisOxford: Clarendon Press.

Pendenza

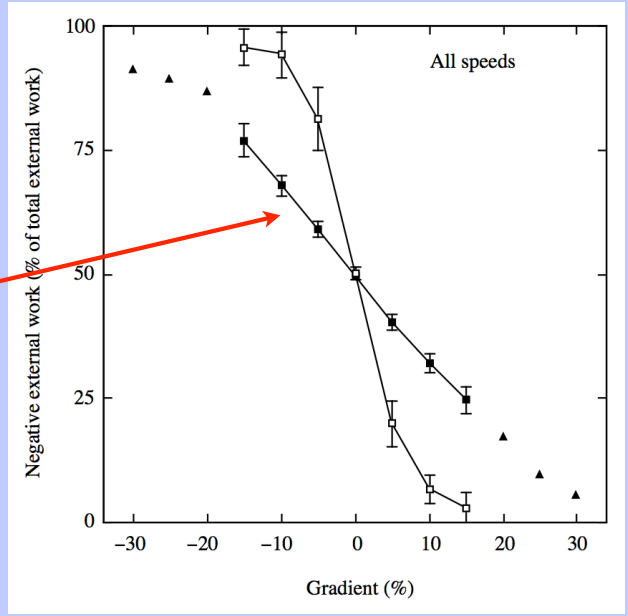
corsa

W_{ext} vs. pendenza



Pendenza

corsa

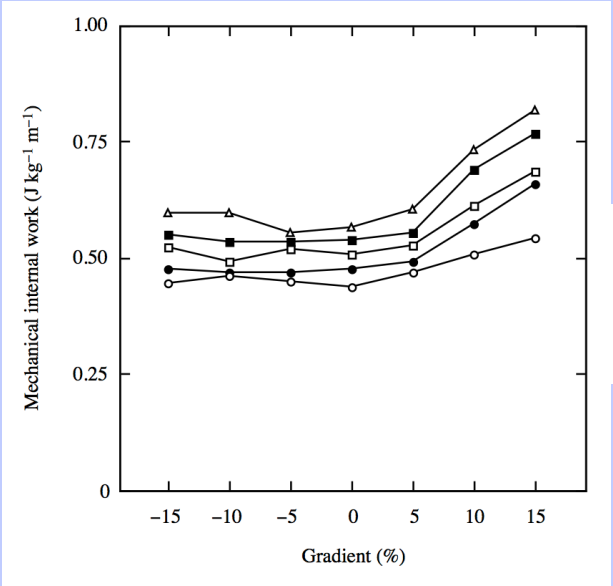


W_{ext}^{-} ($W_{ext}^{-}/(W_{ext}^{+} + W_{ext}^{-})$ vs. pendenza

Pendenza

corsa

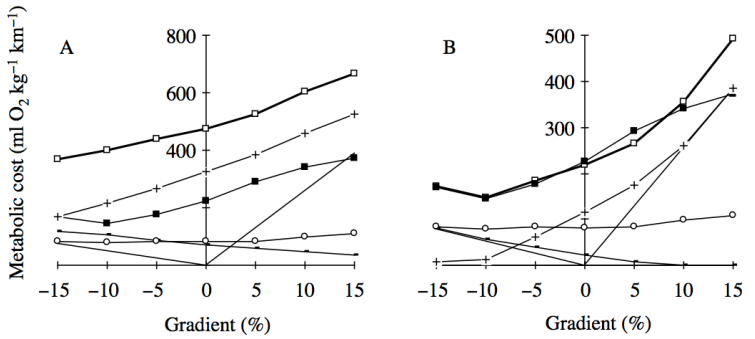
W_{int} vs. pendenza



Pendenza

corsa

CW_{ext}^{+}, CW_{ext}^{-}, CW_{int}, Cel^{+} e Cel^{-} vs. pendenza



$$C = \frac{W_{ext}^{-}}{eff^{-}} + \frac{W_{ext}^{+}}{eff^{+}} + \frac{W_{int}}{eff^{i}}$$

$$C = \frac{W_{ext}^{-} - el^{-}}{eff^{-}} + \frac{W_{ext}^{+} - el^{+}}{eff^{+}} + \frac{W_{int}}{eff^{i}}$$

Fig. 6. Mechanical explanation of the minimum energy expenditure in downhill running. In A and B, the predicted metabolic equivalents of W_{ext}^{+} (+ symbols), W_{ext}^{-} (− symbols), W_{int} (open circles) and total mechanical work (open squares) are shown. Filled squares are values for the measured metabolic cost of running (obtained by pooling all values for all speeds). Lines starting from the origin represent the metabolic equivalent of the positive and negative minimum external work (Minetti *et al*. 1993) according to the following equations:

$$W_{ext,min}^{-} = \begin{cases} -g \times i & i<0 \\ 0 & i \geqslant 0 \end{cases} \quad \text{and} \quad W_{ext,min}^{+} = \begin{cases} 0 & i<0 \\ g \times i & i \geqslant 0 \end{cases},$$

where g is the acceleration due to gravity and i is gradient (in the equations, $W_{ext,min}^{-}$ and $W_{ext,min}^{+}$ are in J kg^{-1} m^{-1}). (A) Metabolic equivalent of the mechanical work calculated using the efficiency coefficients from Table 2 and not including any elastic storage or release of energy (see equation 1). (B) Metabolic equivalent of the mechanical work calculated including the energy saving due to elastic storage and release at each step (equation 2 and the algorithm illustrated in spreadsheet format in Table 2).

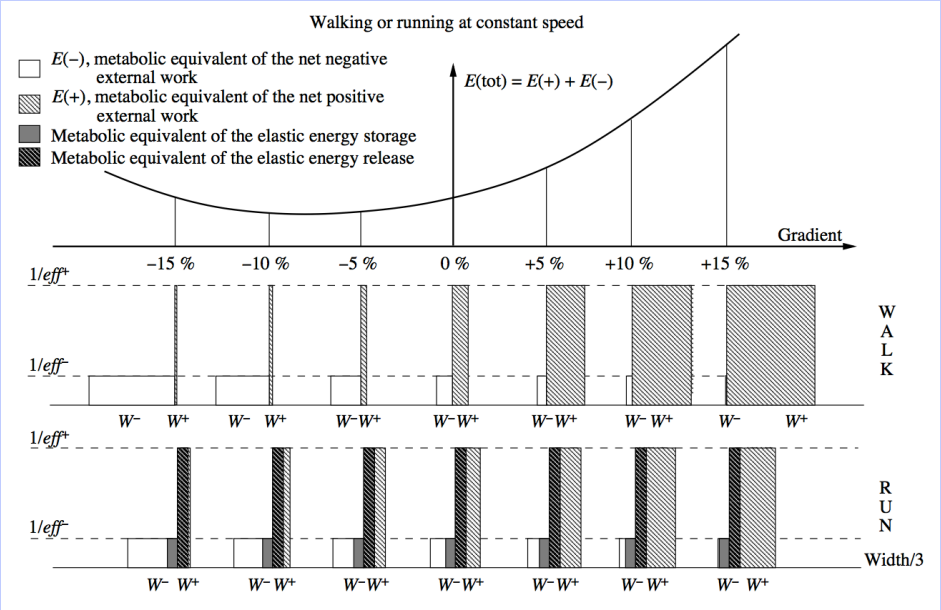
Pendenza

marcia e corsa

Fonti:

Mechanical determinants of gradient walking energetics in man. Minetti AE, Ardigò LP, Saibene F J Physiol. 1993 Dec; 472:725-35. Erratum in: J Physiol (Lond) 1994 Mar 15;475(3):548.

Mechanical determinants of the minimum energy cost of gradient running in humans. Minetti AE, Ardigò LP, Saibene F J Exp Biol. 1994 Oct;195:211-25.



CW_{ext}^{+}, CW_{ext}^{-}, Cel^{+} e Cel^{-} vs. pendenza

Esercitazione 1 (Lunedì 14 Marzo h. 10:30÷12 Biomeccanica del movimento e dello sport ES. ARDIGO' 2)

Pendenza -15, -10 e +15%

Velocità 4.5(-15), 4(-10) e 2.5 km h^{-1} (+15%) (marcia) e
12.3(-15), 8(-10) e 4.9 km h^{-1} (+15%) (corsa)

Variabili C, W_{ext}^{+} e W_{ext}^{-}

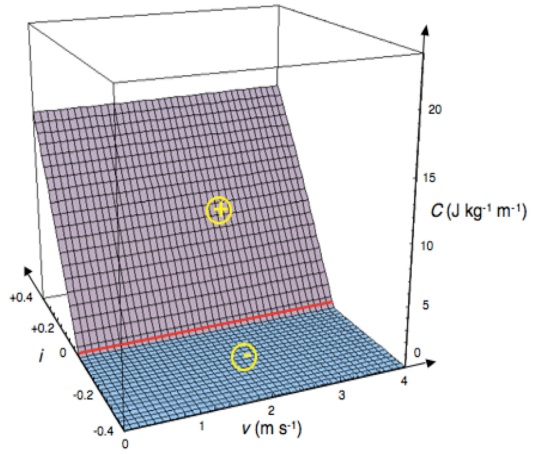
n° 1

Pendenza

ciclismo (mtb)

C vs. pendenza/velocità

$$C_B = \frac{0.17\,(m+9)\,\mathrm{Cos[Arctan(i)]} + 0.43\,A_f\,v^2 + 39.20\,(m+9)\,\mathrm{Sin[ArcTan(i)]}}{m}$$



$$C_B = (1 + m_B^{fract})\,\{0.17\,\mathrm{Cos[ArcTan(i)]} + 39.20\,\mathrm{Sin[ArcTan(i)]}\}$$

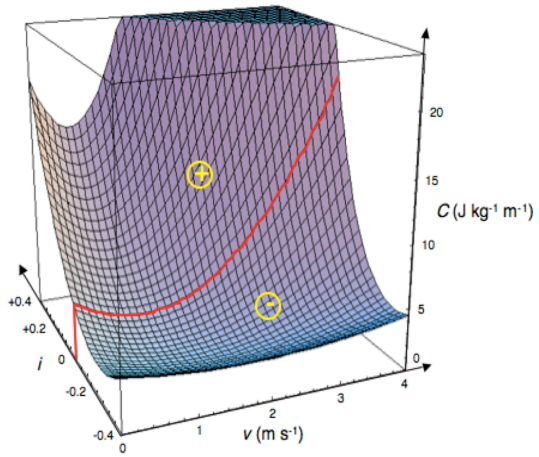
Pendenza

(un passo indietro..)

marcia

C vs. pendenza/velocità

$C_w = 1.87\ a\ v^2 - 3.77\ b\ v + c + 4.46$
$a = e^{4.91i}$, $b = e^{3.42i}$ and $c = 45.72\ i^2 + 18.90\ i$



Disponibili tirocini, tesi triennale e magistrale (1: 6)

- Recupero corsa in avanti vs. corsa all'indietro;
- bioenergetica della corsa prolungata in pista e su treadmill;
- bioenergetica & biomeccanica del nordic walking (MF);
- bioenergetica & biomeccanica della corsa prolungata (MF);
- bioenergetica & biomeccanica dell'in-line skating (MpF);
- bioenergetica & biomeccanica dell'handbiking (PhD p);

Disponibili tirocini, tesi triennale e magistrale (2: 6)

- bioenergetica & biomeccanica dell'handbiking dopo RMET (PhD p);
- bioenergetica & biomeccanica dell'handbiking dopo HIT (PhD p);
- bioenergetica & biomeccanica dopo long bed rest (MF);
- bioenergetica & biomeccanica del nordic running;
- bioenergetica & biomeccanica di vari trekking (MF);
- costo metabolico marcia, corsa, ciclismo e sci di fondo stessi soggetti;

Disponibili tirocini, tesi triennale e magistrale (3: 5)

- costo EMG della marcia (MF);

- frequenza di skipping e costo metabolico della corsa (MpF);

- review dei sistemi di misura portatili dell'attività fisica e del dispendio metabolico (C);

- salto in lungo da fermo con masse aggiunte ed allenamento;

- cronobiologia dei nuotatori, Pechino 2008.