**Treadmill**

- Example: A slider-ladder test to validate a collision model

  \[ 60 \text{kg (588.6 N) subject, speed } 200 \text{m/min}^{-1}, \]

  \[ 7.5 \% \text{ grade, for } 10 \text{ min, } \]

  Once subject is at maximal power output would equal:

  \[ \Rightarrow \text{ Vertical displacement } = \% \text{ grade } \times \text{ distance} \]

  \[ \Rightarrow 0.075 \times 200 \text{m/min}^{-1} \times 10 \text{ min} = 150 \text{m} \]

- Work = body weight \times total vertical distance

  \[ \Rightarrow 588.6 \text{N} \times 150 \text{m} = 88290 \text{ J} \]

  \[ \Rightarrow 60 \text{kg } \times 9.81 \text{m/s}^2 \times 200 \text{m/min}^{-1} \times 10 \text{min} = 9000 \text{ kgm} \]

\[ \Rightarrow \text{ Maximal power output} \]

\[ \Rightarrow \text{ Power output} \]

\[ \Rightarrow \text{ Work} \]
The relationship between workload and L.W.G. cost is linear.

![Graph showing the relationship between workload and L.W.G. cost.]

The graph illustrates how the linear relationship between workload and L.W.G. cost is evident. As workload increases, L.W.G. cost also increases linearly.

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Relationship between Work Rate and VO₂ for Cycling
Effect of Speed of Movement of Net Efficiency

<table>
<thead>
<tr>
<th>Net Efficiency (%)</th>
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</thead>
<tbody>
<tr>
<td>40</td>
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<tr>
<td>35</td>
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<tr>
<td>30</td>
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<td>25</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>15</td>
</tr>
<tr>
<td>10</td>
</tr>
</tbody>
</table>

Speed of movement vs pedal rate (rpm)

Work rate = 150 watts

Running Economy

- Not possible to calculate net efficiency of horizontal running

- Running Economy
  → Oxygen cost of running at given speed
  → Lower VO₂ (mL·kg⁻¹·min⁻¹) at same speed indicates better running economy

- Gender difference
  → No difference at slow speeds
  → At "race pace" speeds, males may be more economical than females