

Supplementary Materials - Sport Sciences for Health

Motor imagery priming reduces vertical ratio during exhaustive treadmill running

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Motor imagery script used in the study

Participants assigned to the motor imagery group performed a guided imagery task immediately before the time-to-exhaustion test while standing on the treadmill with their eyes closed.

The researcher read the following standardized script:

Motor Imagery – Treadmill Running

“Now I will guide you through a motor imagery exercise. Please imagine that you are running on the treadmill in front of you. Close your eyes, relax, breathe deeply, and concentrate on the sensations I will describe. This imagery exercise will be divided into two phases.”

- Phase 1 – Warm-up running (~30 seconds)

“Imagine starting with a comfortable running pace, similar to a warm-up. A speed at which your breathing and heart rate begin to increase, but you still feel relaxed. Focus on the sensations of running. Feel your feet contacting the treadmill belt with every step. Imagine your foot touching the treadmill with the heel and rolling forward until the toes push off. Feel the force you use to push your body forward. Visualize each step and try to feel the movement in your body. Maintain this sensation of relaxed running.”

- Phase 2 – Intense running (~1 minute)

“Now imagine gradually increasing the running speed. You are now running at a stronger and more demanding pace that you can sustain for several minutes. Feel your heart beating faster and your breathing becoming deeper. Focus on your running technique. Imagine your stride becoming longer and smoother. Feel your foot remaining in contact with the treadmill belt as long as possible during

each step. Push forward with your toes without jumping or lifting your body excessively. Imagine that your body moves forward smoothly with minimal vertical oscillation. Try to maintain a stable running pattern with efficient movement. Continue imagining these sensations for the next moments.”

Table S1. GRASS Checklist for Reporting Action Simulation Studies

GRASS item	Description
Type of action simulation	Motor imagery (MI) performed immediately before a time-to-exhaustion treadmill running test
Task simulated	Running on a treadmill at an intensity corresponding to the velocity associated with the second ventilatory threshold (vVT2)
Experimental context	Imagery performed standing on the treadmill immediately before the running test
Participant posture	Participants stood upright on the treadmill with eyes closed
Imagery modality	Primarily kinesthetic motor imagery, focusing on the internal sensations associated with running movements
Visual perspective	First-person perspective corresponding to the performer’s viewpoint
Imagery phases	Two phases: (1) warm-up running imagery (~30 s) and (2) intense running imagery (~1 min)
Imagery content	Foot contact with treadmill, propulsion, stride length, reduced vertical oscillation, breathing rhythm, and muscular effort
Instruction delivery	Standardized verbal instructions delivered by the researcher using a predefined script
Imagery environment	Same laboratory environment in which the running test was performed
Functional equivalence principles	Protocol designed according to principles of the PETTLEP model to enhance similarity between imagined and executed movement
Control condition	Participants read a scientific summary describing the influence of biomechanics on running economy while standing on the treadmill
Imagery duration	Approximately 90 seconds total imagery time
Multisensory components	Emphasis on proprioceptive and somatosensory sensations related to running

Adapted from the Guidelines for Reporting Action Simulation Studies (GRASS; Moreno-Verdú et al., 2024).

Table S2. Participant characteristics and baseline physiological and biomechanical variables obtained during the CPET.

Variable	Group	
	MI	CONTR
VO ₂ peak (mL·kg ⁻¹ ·min ⁻¹)	45.78 ± 9.13	42.44 ± 7.95
vVO ₂ peak (km/h)	12.77 ± 1.92	12.46 ± 1.45
vVT2 (km/h)	10.92 ± 1.80	10.77 ± 1.30
HRmax (bpm)	188.46 ± 8.35	184.92 ± 10.51
Cadence (steps/min)	154.92 ± 8.53	152.38 ± 8.62
Step Length (m)	1.19 ± 0.08	1.16 ± 0.07
Vertical Oscillation (cm)	9.01 ± 1.77	9.46 ± 1.83
Vertical Ratio (%)	7.53 ± 2.16	8.16 ± 1.97
Ground Contact Time (ms)	254.46 ± 19.08	258.77 ± 19.23

Note. Values are presented as mean ± SD. VO₂peak = maximal oxygen uptake, vVO₂peak = velocity associated with VO₂peak, vVT2 = velocity associated with the second ventilatory threshold, HRmax = maximal heart rate.