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# Durability of Parameters Associated with Endurance Running Performance in Marathoners

**Hunter, B.** and Muniz-Pumares, D.

b.hunter@londonmet.ac.uk

@benshunter.bsky.social

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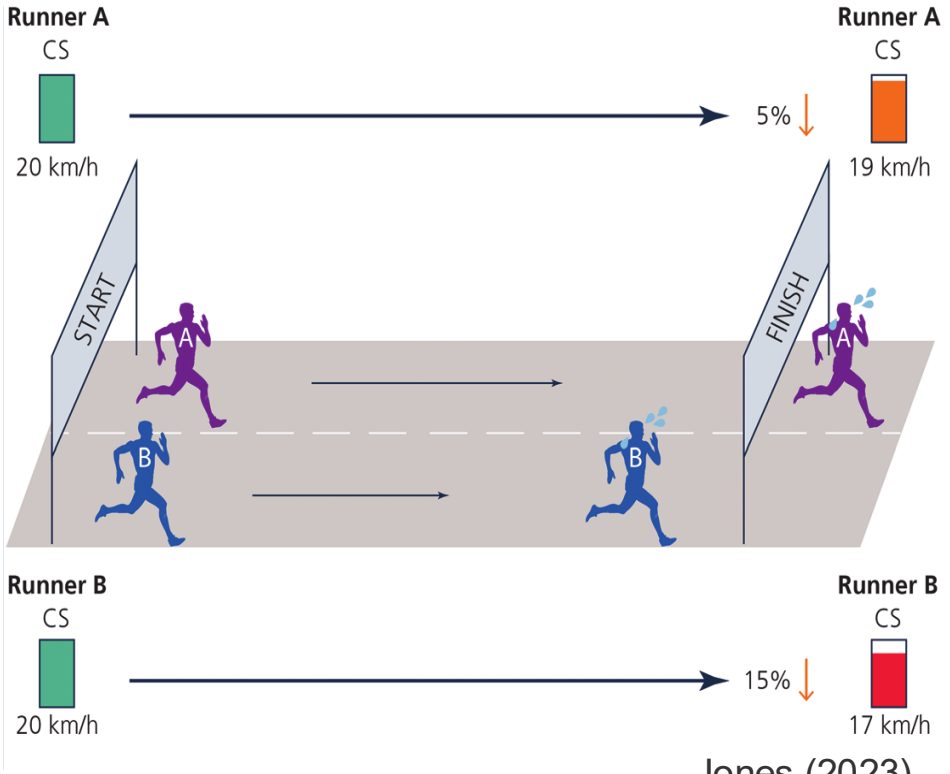
# Background

Marathon performance is associated with the three physiological pillars (Joyner, 1991)

- $\dot{V}O_{2max}$
- Fractional utilization of $\dot{V}O_{2max}$
- Running economy

Each are subject to significant change during endurance exercise (Zanini et al., 2025)

Ability to preserve these traits is known as “durability” (Maunder et al., 2021)




Jones (2023)

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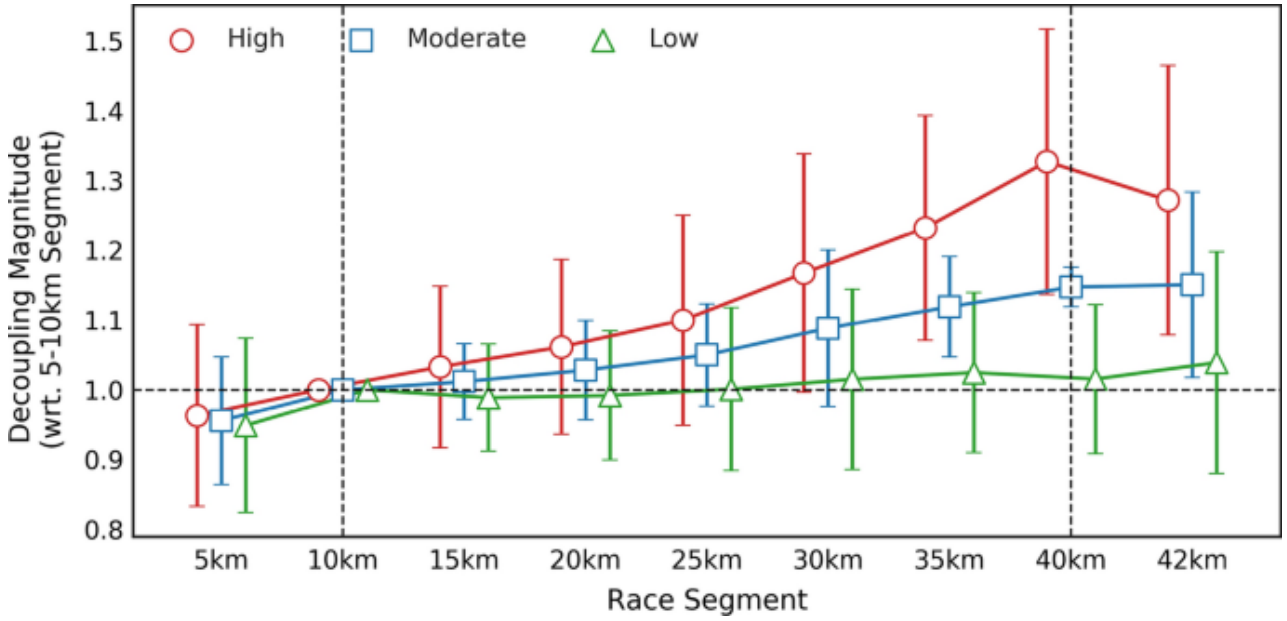
# Background

Decoupling has been used to quantify durability in the field (Smyth et al., 2022, De Pauw et al., 2024)

Defined as internal-to-external workload ratio (e.g., HR to speed)

Athletes with better durability finished marathons faster

Unclear whether this holds true under more controlled conditions




Smyth et al (2022)

**Finish Times**
High: 238.5 ± 30.7 mins
Moderate: 224.9 ± 31.7 mins
Low: 217.3 ± 33.1 mins

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# Aims

Examine changes to $\dot{V}O_{2max}$, fractional utilisation of $\dot{V}O_{2max}$ at LT, and running economy following a prolonged run.

Examine whether the durability of these measures is associated with marathon performance.

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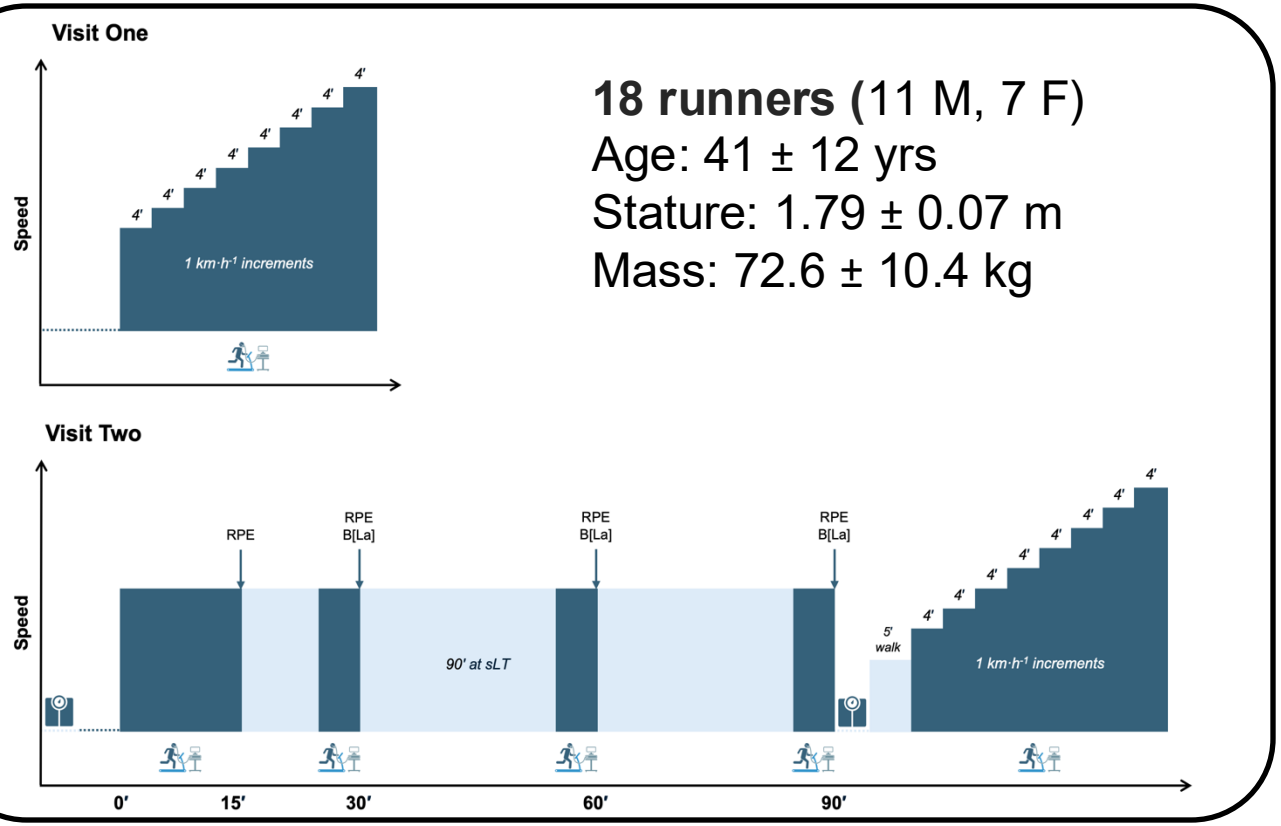
# Method




**18 runners** (11 M, 7 F)
Age: 41 ± 12 yrs
Stature: 1.79 ± 0.07 m
Mass: 72.6 ± 10.4 kg

T-test for differences between fresh (PRE) and fatigued (POST)

Pearson r to test for relationships

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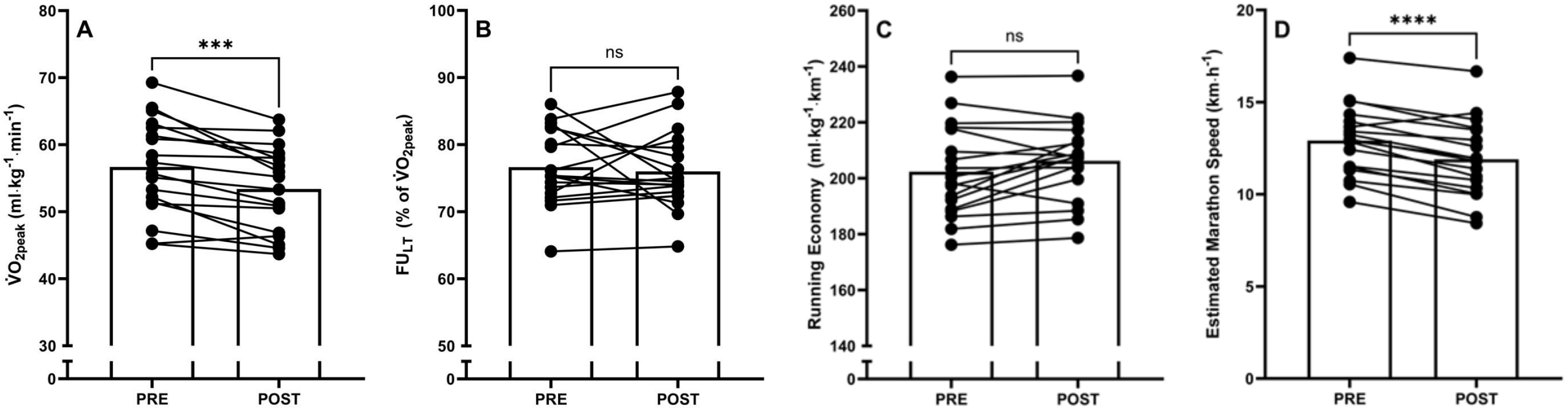
# Changes to Traditional Markers Following 90-min Run



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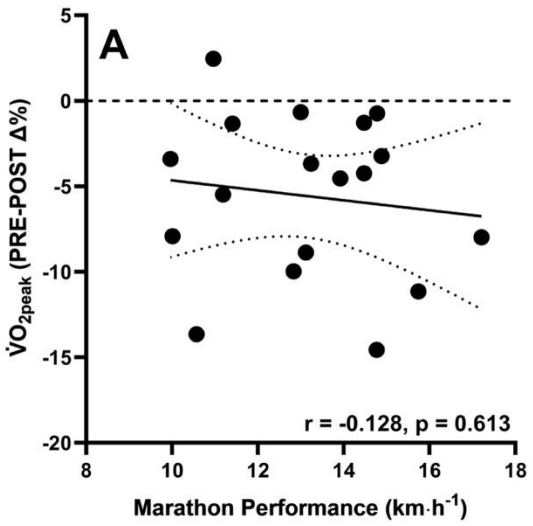
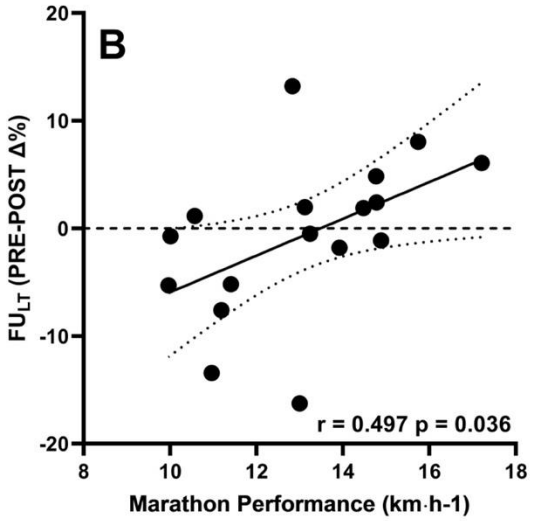
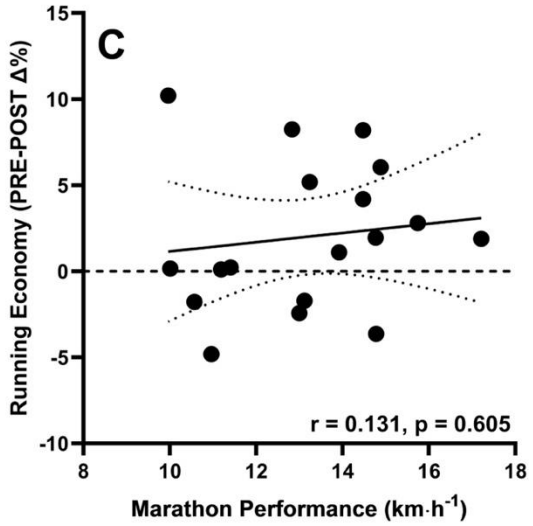
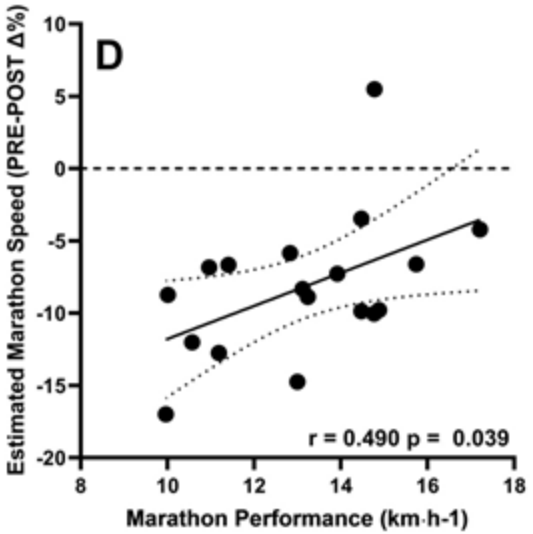
# Associations Between Durability and Marathon Performance



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# Durability Considered as the “Fourth Dimension” of Endurance Performance?

Reductions in physiological parameters demonstrated inter-individual variation.

The magnitude of LT and Joyner deterioration was associated with marathon performance.

However, relationships were weaker than respective traditional rested markers.

Findings suggest marathon runners and coaches consider durability when conducting physiological profiling or aiming to predict performance.

Future research should examine best practices to permit durability profiling and interventions to improve it.

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# Thank you


**Dr Ben Hunter**

@benshunter.bsky.social

b.hunter@londonmet.ac.uk

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# Appendix: Associations with Marathon Performance

| | Marathon Performance from Fresh Measures | Marathon Performance from % diff. between PRE and POST |
|---|---|---|
| **Relative $\dot{V}O_{2peak}$** | 0.809 *** | -0.128 |
| | [0.549, 0.926] | [-0.561, 0.361] |
| **$FU_{LT}$** | -0.102 | 0.497 * |
| | [-0.543, 0.383] | [0.039, 0.782] |
| **$\dot{V}O_2$ at LT** | 0.693 ** | 0.543 * |
| | [0.876,0.335] | [0.801,0.089] |
| **RE** | -0.471 * | 0.131 |
| | [-0.769, -0.006] | [-0.358, 0.563] |
| **Joyner** | 0.901 *** | 0.490 * |
| | [0.750, 0.963] | [0.030, 0.779] |
| **sLT** | 0.937 *** | 0.680 ** |
| | [0.835, 0.977] | [0.312, 0.871] |