

1 **Letter to the Editor**

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4 **Letter to the Editor: Measurement of $\dot{V}O_{2max}$ in clinical groups is feasible and**
5 **necessary.**

6 **Response to: Measurement of the maximum oxygen uptake $\dot{V}O_{2max}$: $\dot{V}O_{2peak}$ is no longer**
7 **acceptable**

8 **(Poole and Jones, *J Appl Physiol*, 122: 997 – 1002)**

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20 Short Title: $\dot{V}O_{2max}$ and clinical application

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35 We commend the recent CORP statement by Poole and Jones (1) where they advocate the use
36 of a supramaximal bout to verify maximal oxygen uptake ($\dot{V}O_{2max}$) obtained during
37 incremental exercise. The authors cite research that supports this approach, particularly in
38 clinical populations, where exercise testing provides important prognostic information, such
39 as individuals with cystic fibrosis (CF).

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41 However, subsequent correspondence from van Breda *et al.* (3) concluded that ‘the short
42 constant-work rate verification phase after the steep-ramp test...is, at least in a clinical
43 setting, unrealistic and unethical in certain patient populations’ (pp. 1370). We disagree with
44 this statement, as evidence has consistently shown that a verification phase is crucial if
45 clinicians are to have confidence in the determination of $\dot{V}O_{2max}$. In paediatric patients with
46 CF, we have shown that a further increase in $\dot{V}O_2$ can be elicited by performing
47 supramaximal verification (2), which also improves test-retest reliability and eliminates
48 dependence on secondary criteria (heart rate, respiratory exchange ratio, blood lactate etc.).
49 Our group has been utilising cardiopulmonary exercise testing (CPET) with supramaximal
50 verification in our routine adult and paediatric clinical practice for over five years. It is
51 included in our portfolio of annual review investigations and we have performed 110 in the
52 last 2 years. We are aware that the two-stage protocol is preferred in a further three UK CF
53 Centres, and others have expressed interest in adopting the same methodology. The
54 supramaximal protocol is affordable, accepted by patients and most importantly safe when
55 performed correctly. We have not had any adverse events with any of our CPET testing
56 across a full range of clinical severity.

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58 Given the prognostic value of $\dot{V}O_{2max}$, being able to discriminate between ‘day-to-day
59 variation’ and clinically meaningful changes, due to disease progression and/or therapeutic
60 intervention, is essential. Indeed, previous clinical studies have suggested their own
61 conclusions may be limited by the lack of supramaximal verification testing, highlighting the
62 need to heed the advice presented in the CORP statement (1).

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64 We agree with van Breda *et al.* (3) that “the concepts of aerobic/anaerobic and ventilatory
65 thresholds encompass important clinical information”. However, it should be noted such
66 parameters should be normalised to a percentage of $\dot{V}O_{2max}$, which therefore warrants
67 accurate determination.

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69 In clinical practice, tracking changes in aerobic capacity over time will have more precision
70 and meaning if the most accurate methodology is used. It is for this very reason that our
71 group and associated clinical teams fully support the methodological recommendation of
72 utilising supramaximal verification as part of CPET.

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75 **References**

- 76 1. **Poole DC, and Jones AM.** Measurement of the maximum oxygen uptake $\dot{V}O_{2max}$:
77 $\dot{V}O_{2peak}$ is no longer acceptable. *Journal of Applied Physiology* 122: 997-1002, 2017.
- 78 2. **Saynor ZL, Barker AR, Oades PJ, and Williams CA.** A protocol to determine valid
79 $\dot{V}O_{2max}$ in young cystic fibrosis patients. *Journal of Science and Medicine in Sport* 16:
80 539-544, 2013.
- 81 3. **van Breda E, Schoffelen PFM, and Plasqui G.** Clinical $\dot{V}O_{2peak}$ is "part of the deal".
82 *Journal of Applied Physiology* 122: 1370, 2017.

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