

Letter to the Editor

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

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

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

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Word count: 489 words (500 word limit)

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

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

However, subsequent correspondence from van Breda *et al.* (3) regarding the CORP statement raised a point worthy of discussion, as their final conclusion states that “‘short constant-work rate verification phase’ after the steep-ramp test...is, at least in a clinical setting, unrealistic and unethical in certain patient populations” (pp. 1370). We disagree with this statement, as evidence has consistently shown that a verification phase is crucial if clinicians are to have confidence in the determination of $\dot{V}O_{2max}$. For example, we (2) have shown that a further increase in $\dot{V}O_2$ can be elicited by performing supramaximal verification, which also improves test-retest reliability and eliminates dependence on inadequate secondary criteria (heart rate, respiratory exchange ratio, blood lactate etc.), in paediatric patients with CF. Our group has also been utilising such cardiopulmonary exercise testing (CPET) within applied clinical practice for over five years with both adults and children with chronic respiratory diseases, and it provides a key component of the annual review process. Since March 2015, upon the employment of a full-time, clinically trained, exercise technician, 110 CPETs have been undertaken with 74 patients in a single CF Centre. Our group has subsequently deployed this two-stage protocol in a further three CF Centres, and additional clinical teams in the United Kingdom are interested in adopting this CPET methodology.

Given the prognostic value of $\dot{V}O_{2max}$ in clinical groups, being able to discriminate between ‘day-to-day variation’ and clinically meaningful changes, due to disease progression and/or therapeutic intervention, is essential. This supramaximal protocol is affordable, accepted by patients and most importantly, safe when performed correctly. In our laboratory, and clinic, no adverse events have been reported across a full range of patients with varying degrees of clinical severity.

We agree with van Breda *et al.* (3) that “the concepts of aerobic/anaerobic and ventilatory thresholds encompass important clinical information”, as they indeed hold essential utility (both functional and potentially prognostic). However, it should be noted such parameters should be normalised to a percentage of $\dot{V}O_{2max}$, which is meaningful only when an accurate measurement is obtained.

In clinical practice, tracking changes in aerobic capacity over time will only be meaningful if the most accurate methodology is used. It is for this very reason of accurately establishing $\dot{V}O_{2max}$ (and with it the submaximal parameters of aerobic function) that our group and associated clinical teams fully support the methodological recommendation of utilising a supramaximal verification bouts as part of a CPET. Indeed, previous clinical studies have suggested their own conclusions may be limited by the lack of supramaximal verification testing, highlighting the need to heed the advice presented in the original CORP statement (1).

References

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