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Science Letter

The Duke Activity Status Index compared with cardiopulmonary exercise testing in patients undergoing pre-operative assessment for cancer surgery

Assessment of cardiorespiratory fitness is routinely carried out in the pre-operative period. Cardiopulmonary exercise testing (CPET) is the gold standard for assessing functional capacity [1], but in centres where CPET is not routinely performed, alternative methods are recommended such as the Duke Activity Status Index (DASI). This self-reported questionnaire equates physical activity scores with an associated metabolic equivalent of task (MET) and, thus, oxygen consumption (VO_2), and was developed in heart failure patients [2]. Previous research has suggested that the DASI correlates well with fitness and has good predictive ability in the peri-operative period [3]. However, concerns remain, and it has been suggested that self-reported functional capacity should not be used as a surrogate marker of peak VO_2 [4]. We hypothesised that the DASI would correlate poorly when compared with CPET-assessed peak VO_2.

We retrospectively reviewed data collected between December 2019 and February 2023 for all patients referred for CPET as part of their routine pre-assessment for major surgery. All patients gave written informed consent for inclusion in our CPET research database. Local research ethics committee approval was given for the collection of

Table 1 Characteristics of patients included in the study. Values are number (proportion) or median (IQR [range]).

	n = 623
Sex; male	436 (70%)
Age; y	66 (57–73 [19–88])
BMI; $kg.m^{-2}$	26.5 (23.3–30.8 [14.8–53.2])
Past medical history	
Myocardial infarction	37 (6%)
Ischaemic heart disease	56 (9%)
Hypertension	264 (42%)
Cerebrovascular disease	33 (5%)
Diabetes	125 (20%)
Haemoglobin; $g.l^{-1}$	129 (115–141 [74–176])
Surgical procedures	
Urology	366 (59%)
Head and neck	215 (35%)
Upper gastro-intestinal	14 (2%)
Lower gastro-intestinal	11 (2%)
Thoracic	9 (1%)
Gynaecology	8 (1%)

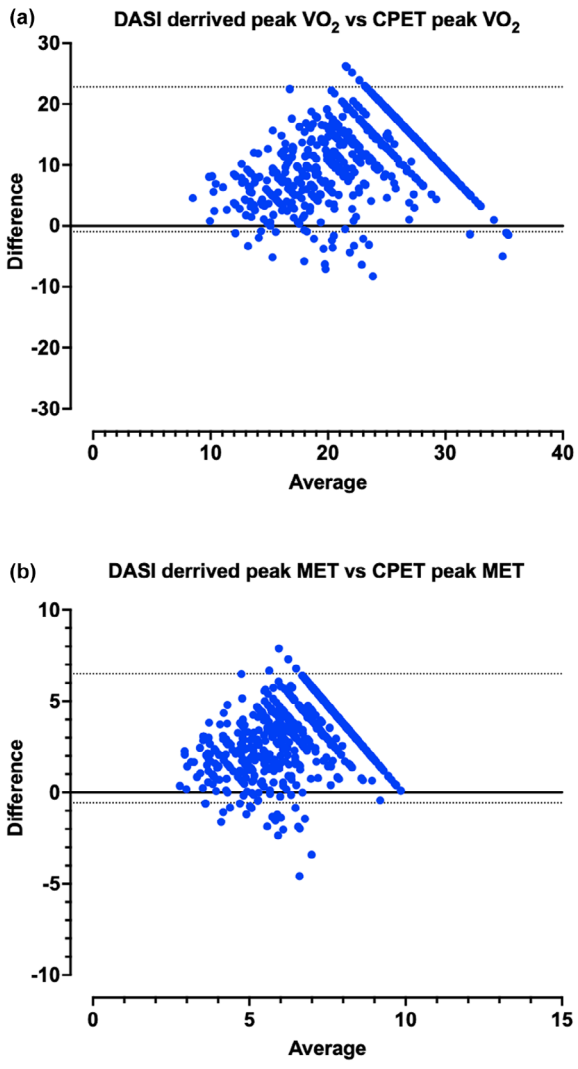

Figure 1 Bland–Altman analysis for (a) DASI-derived peak VO_2 ($ml.kg^{-1}.min^{-2}$) and CPET-derived peak VO_2 ($ml.kg^{-1}.min^{-2}$); and (b) DASI-derived peak MET and CPET-derived peak MET in the 623 paired measurements.

CPET data on an institutional database. All CPET was performed in accordance with Peri-operative Exercise Testing and Training Society and American Thoracic Society/American College of Chest Physicians guidelines [5]. In addition, the DASI questionnaire was completed before CPET. Differences in objectively measured peak VO_2 measured from gas analysis and predicted peak VO_2 derived from the DASI questionnaire were compared. All analyses were performed using Prism (v9.5.1, GraphPad, Boston, MA, USA) and the Shapiro–Wilk test was used to assess normality. Correlations were assessed using Spearman's ρ, and differences were compared using the Wilcoxon matched-pairs test and Bland–Altman analysis.

A total of 623 patients were referred for CPET and patient characteristics are presented in Table 1. The DASI-derived peak VO_2 showed a moderate correlation ($r = 0.53$, $p < 0.001$) and was significantly different compared with the median (IQR [range]) peak VO_2 measured by CPET, 28.9 (21.9–34.6 [10.4–34.6]) $ml.kg^{-1}.min^{-2}$ vs. 16.0 (13.1–19.4 [5.5–37.4]) $ml.kg^{-1}.min^{-2}$, respectively, $p < 0.001$. The DASI-derived median (IQR [range]) peak MET showed a poor correlation ($r = 0.48$, $p < 0.001$) and was significantly different from the CPET-derived peak MET 8.3 (6.3–9.9 [3.0–9.9]) MET vs. 4.7 (3.9–5.8 [1.5–9.8]) MET, respectively, $p < 0.001$. Bland–Altman plots demonstrated poor agreement (Fig. 1) between DASI-derived peak VO_2 and CPET-measured peak VO_2, as well as DASI-derived MET and CPET-measured MET. Bland–Altman analysis demonstrated a large degree of bias; DASI-derived fitness measures systematically overestimated VO_2 peak and METs compared with objectively assessed gold standards and caution should be taken when using DASI-derived fitness measures to inform patient care.

Functional assessment is key and CPET is costly compared with questionnaires such as DASI and there may be a place for using DASI in low-risk populations, or to identify those who need further functional capacity testing using CPET [6]. However, the large bias must be highlighted and addressed. A revised equation to better predict fitness measures should be researched and would help to address current issues. Other measures of aerobic fitness that correlate well with CPET-derived peak VO_2 should be investigated for functional assessment in the pre-operative period in centres where CPET is not clinically available.

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