

Cardiopulmonary exercise testing (CPET)

Dane B. Cook, PhD



WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON

RUTGERS
New Jersey Medical School



U.S. Department of Veterans Affairs CSR&D: I01 CX0011329 (Cook/Falvo)

*The contents of this presentation do not reflect the views of the Department of Veterans Affairs or the U.S. Government.

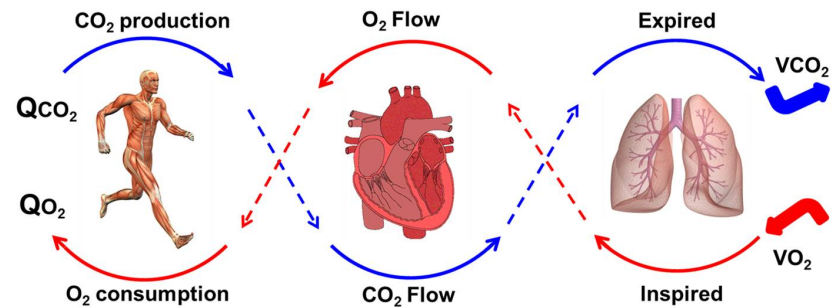
Rationale for CPET



Multi-site study:



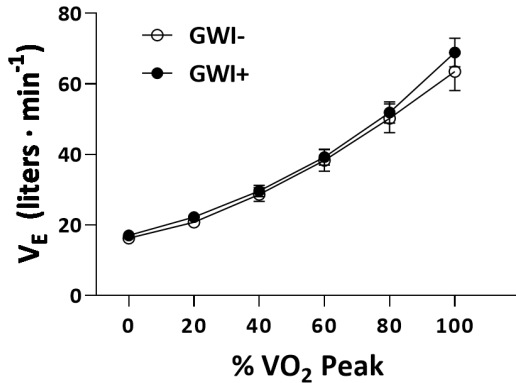
CPET is a critical element:



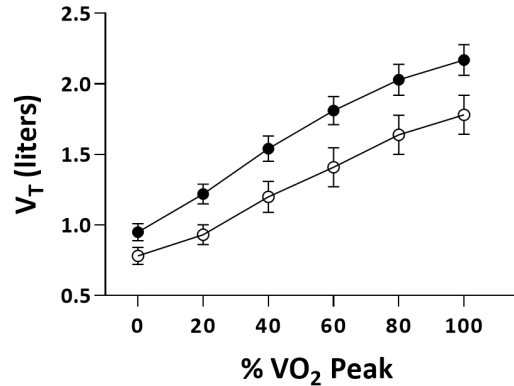
Measures & Indications

DIRECT MEASURES	INDIRECT MEASURES	INDICATIONS/EVALUATION
Oxygen Consumption ($\dot{V}O_2$)	$VE/\dot{V}O_2$ & $VE/\dot{V}CO_2$	Exercise Tolerance
Carbon Doxide Production ($\dot{V}CO_2$)	Oxygen Pulse ($\dot{V}O_2/HR$)	Heart and Lung Disease/Symptoms
Ventilation [$VE: (Bf \& T_v)$]	$\dot{V}O_2/WR$	Impairment/Disability
Heart Rate (HR)		safety/Prescription for Rehabilitation
Work Rate (WR)		
Oxygen Saturation		

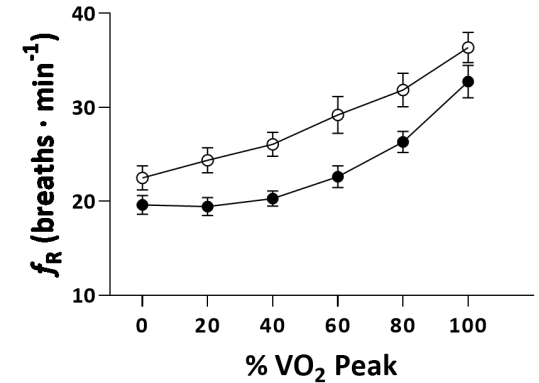
Veterans with GWI show distinct respiratory patterns during maximal exercise (Lindheimer et al., 2019)



NS



Sig diff 20-100%
Hedges' (0.68-0.92)

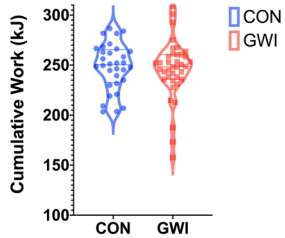


Sig diff 20-80%
Hedges' (-0.61-1.05)

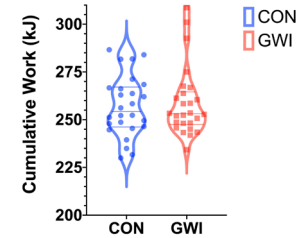
	GWI+ (n=20)	GWI- (n=14)
Age (years)	50.4 (6.89)	52.1 (5.72)
Body Mass Index	28.1 (3.61)	29.5 (5.34)
Physical Activity (min · wk ⁻¹)	102.8 (182.18)	113.8 (122.61)
Fatigue Severity Score	44.2 (15.7)	20.8 (12.4)

Veterans with GWI show gas exchange inefficiency during submaximal exercise

Cumulative Work (kJ)



Cumulative Work (kJ)

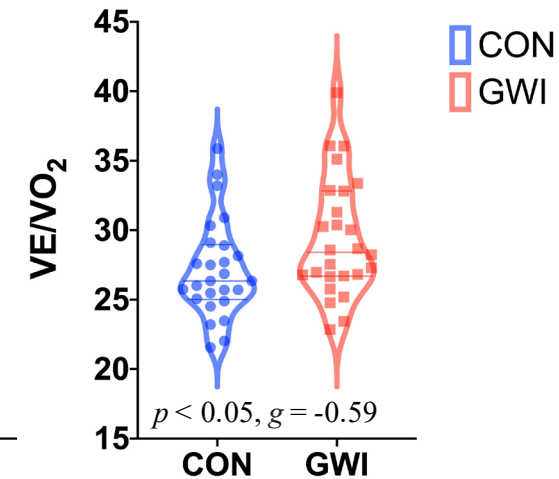
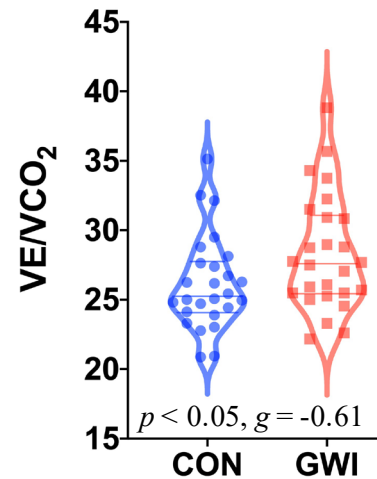
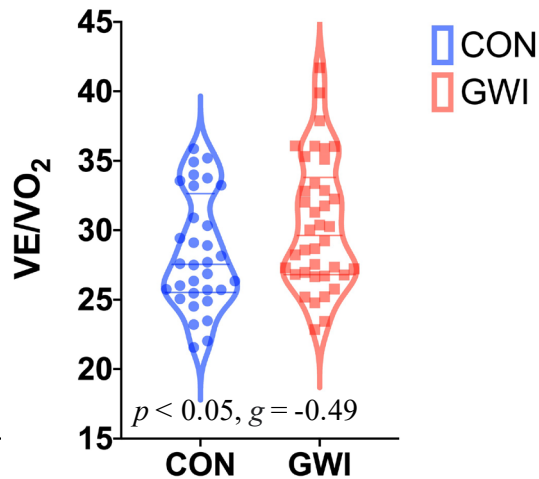
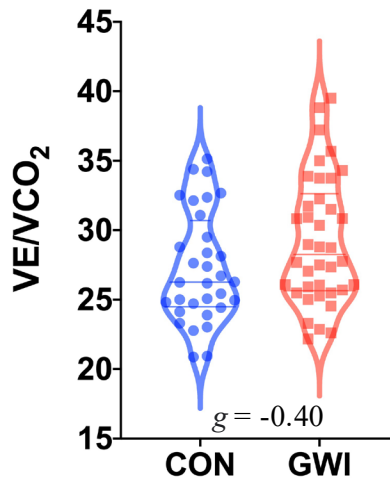


VE/VCO_2

VE/VO_2

VE/VCO_2

VE/VO_2



Biomarker Potential

Clinical Indications
Exercise Tolerance
Heart and Lung Disease/Symptoms
Impairment/Disability
Safety/Prescription for Rehabilitation

GWJ Indications	Biomarker Type?
Distinguish between GWI+ and GWI-	Yes?
Exercise Intolerance/Metabolic Abnormality	Monitoring
Exercise Dose	Prognostic
Therapeutic Outcome/Dynamic	Response

VA



U.S. Department of Veterans Affairs
Veterans Health Administration



WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON



RUTGERS
New Jersey Medical School



William S. Middleton Memorial
Veterans Hospital

- Dane Cook, PhD (PD/PI)
- Aaron Stegner, PhD
- Jake Lindheimer, PhD
- Nick Gretzon
- Jake Ninneman
- Neda Almassi
- Susan Schroeder
- Stephanie Van Riper, MS

- Mike Falvo, PhD (PI)
- Glenn Wylie, DPhil
- Jorge Serrador, PhD
- Jackie Klein-Adams, MS
- Duncan Ndirangu, BS
- Tom Alexander, MS
- Matt Watson, MS
- Bishoy Samy, MS
- Holly Klecha, BS
- Wei Qian, MS
- Nancy Eager, BS



Choose VA

VA



U.S. Department
of Veterans Affairs