Nine panel plot

The nine panel plot displays the measurements made during cardiopulmonary exercise testing. Each of the plots focuses on a different aspect of physiology occurring during exercise. The resulting patterns differ among normal subjects and various disease states and allow pathophysiology to be identified.

The usual design of each panel is detailed below. Data are often best averaged over 10 or 15 second periods for presentation purposes.

Panel number	x-axis	y-axis	Additional y-axis	Other comments
1	Time (min)*	Minute ventilation (VE) (liters min^{-1})	-	
2	Time (min)*	Heart rate (HR) (min^{-1})	Oxygen pulse (VO_2/HR) (ml $beat^{-1}$)	
3	Time (min)*	Minute oxygen consumption (VO_2) and carbon dioxide production (VCO_2) (both liters min^{-1})	Work rate (W)	The scaling of the work rate axis should be 100 times that of the VO_2 axis. This means that the slope of the VO_2 – time relationship will be parallel to the slope of the work rate – time relationship provided the VO_2 – work rate relationship is the normal of 10 ml min^{-1} W^{-1}, i.e. for every 100 W increase in work rate, VO_2 should increase by approximately 1 liter min^{-1}. A reduction in the VO_2 – work rate slope occurs in some diseases and can be easily identified if the graphs are scaled as above. Work rate can really only be plotted with cycle ergometry exercise.
4	Minute carbon dioxide production (VCO_2)	Minute ventilation (VE)	-	
5	Minute oxygen consumption (VO_2) (liters min^{-1})	Heart rate (min^{-1})	Minute carbon dioxide production (VCO_2) (liters min^{-1})	To help identify the lactic acidosis threshold, the VO_2 and VCO_2 axes should be of identical absolute length and scaling. With the use of a right-angled triangle, this scaling makes it easy to

				recognize the point at which the relationship exceeds a slope of 1.0. A point may be marked, corresponding to the predicted maximum heart rate and VO_2 for the subject.
6	Time (min)*	Ventilatory equivalents for oxygen and carbon dioxide (VE/VO_2 and VE/VCO_2)	-	
7	Minute ventilation (VE) (liters min^{-1})	Tidal volume (VT) (liters)	-	Horizontal lines are added showing vital capacity (VC), and inspiratory capacity (IC) both measured at rest. A vertical line shows maximal voluntary ventilation (MVV), also determined at rest. This makes it easy to see how tidal volume increases in relationship to VC and IC, and how ventilation increases in relation to MVV. These relationships are important in diseases causing ventilation limitation to exercise.
8	Time (min)*	Respiratory exchange ratio (VCO_2/VO_2) (R)	-	Because of changing gas stores during incremental exercise, the respiratory exchange ratio is not equal to the respiratory quotient. The abbreviation R, not RQ, is used.
9	Time (min)*	End-tidal oxygen and end-tidal carbon dioxide ($P_{ET}O_2$ and $P_{ET}CO_2$) (mmHg). If arterial blood gases have been measured, arterial O_2 and CO_2 values can be added (P_aO_2 and P_aCO_2). If pulse oximetry has been used, this can also be displayed (S_pO_2) (%).	-	

*In all of the panels with time on the x-axis, the beginning and end of exercise is marked e.g. by vertical lines.

Figure legend

The example shown is of a normal subject performing 20 W min^{-1} continuous incremental (ramp) cycle ergometry exercise. The period of incremental exercise was preceded by 3 min. unloaded cycling. Data points were produced by averaging data over 10-second periods. Arterial haemoglobin saturation was measured by pulse oximetry (S_pO_2). Direct arterial blood gas measurements were not made.