

**Supplementary Materials:**

**Table S1. Correlation statistics for all source-detector separations**, including Pearson's R, concordance correlation coefficient, and associated p-value. The linear model used to describe the relationship between the NIRS-only arterial occlusion measure ( $VO_{2AO}$ ) and the NIRS-only venous occlusion measure ( $VO_{2VO}$ ) is described by the slope (standard error) and intercept (standard error).

Source-detector separation				
	3.5 cm	3 cm	2.5 cm	2 cm
$VO_{2VO}$ vs. $VO_{2i}$	$R^2 = 0.16$ $p = 0.021$	$R^2 = 0.052$ $p = 0.202$	$R^2 = 0.056$ $p = 0.184$	$R^2 = 0.024$ $p = 0.390$
$VO_{2AO}$ vs. $VO_{2VO}$	$R^2 = 0.31$ $p < 0.001$ CCC = 0.40 Slope = 1.01(0.26) Intercept = 0.01(0.01)	$R^2 = 0.19$ $p = 0.008$ CCC = 0.32 Slope = 0.79(0.27) Intercept = 0.02(0.01)	$R^2 = 0.15$ $p = 0.021$ CCC = 0.25 Slope = 0.75(0.31) Intercept = 0.02(0.01)	$R^2 = 0.09$ $p = 0.075$ CCC = 0.21 Slope = 0.51(0.28) Intercept = 0.02(0.01)
$VO_{2AO}$ vs. $VO_{2i}$	$R^2 = 0.33$ $p < 0.001$	$R^2 = 0.33$ $p < 0.001$	$R^2 = 0.28$ $p = 0.002$	$R^2 = 0.27$ $p = 0.002$
BF vs. BFI	$R^2 = 0.61$ $p < 0.001$	$R^2 = 0.58$ $p < 0.001$	$R^2 = 0.61$ $p < 0.001$	$R^2 = 0.62$ $p < 0.001$

**Table S2. Repeatability of oxygen metabolism and blood flow measurements for all source-detector separations.** Intraclass correlation coefficients (ICC) and coefficient of variation (CV) for oxygen metabolism measured during arterial occlusion and venous occlusion ( $VO_{2AO}$  and  $VO_{2VO}$ , respectively), as well as oxygen metabolism index ( $VO_{2i}$ ), blood flow measured during venous occlusion (BF), and blood flow index (BFI). Note that only one source-detector separation was used for BFI (2.5 cm).

Source-detector Separation		$VO_{2AO}$	$VO_{2VO}$	$VO_{2i}$	BF	BFI
3.5 cm	ICC	0.88	0.85	0.77	0.83	NA
	CV	$0.19 \pm 0.13$	$0.24 \pm 0.13$	$0.24 \pm 0.09$	$0.27 \pm 0.12$	NA
3 cm	ICC	0.81	0.84	0.76	0.85	NA
	CV	$0.24 \pm 0.18$	$0.27 \pm 0.18$	$0.24 \pm 0.10$	$0.29 \pm 0.13$	NA
2.5 cm	ICC	0.69	0.77	0.77	0.85	0.62
	CV	$0.31 \pm 0.22$	$0.31 \pm 0.22$	$0.24 \pm 0.10$	$0.32 \pm 0.16$	$0.25 \pm 0.11$
2 cm	ICC	0.68	0.78	0.78	0.85	NA
	CV	$0.34 \pm 0.20$	$0.31 \pm 0.20$	$0.25 \pm 0.10$	$0.32 \pm 0.23$	NA