

Supplementary material

High-intensity interval training to promote cerebral oxygenation and affective valence during exercise in individuals with obesity

RESULTS

Participants' characteristics

Anthropometrics and body composition data of individuals with obesity, randomly assigned to moderate-intensity continuous exercise training (MICT) or high-intensity interval training (HIIT) before and after 8 weeks of exercise training, are provided in **Table S1**. Anthropometrics and body composition did not significantly differ between groups at baseline and were not significantly altered by exercise training in either groups (all $p>0.05$).

Near-infrared spectroscopy during cardiopulmonary exercise testing

Changes in oxyhemoglobin (HbO₂) and deoxyhemoglobin (HHb) concentration as a function of exercise intensity for MICT and HIIT are shown in **Figure S1**. No significant difference between groups before exercise training or from before to after exercise training was observed (all $p>0.025$).

Correlations between variables during cardiopulmonary exercise testing

Post-pre exercise training changes in left prefrontal cortex (PFC) difference in hemoglobin (HbDiff) at peak exercise correlated with training-induced changes in peak work rate (% predicted; $r=0.46$; $p=0.044$) and oxygen uptake (mL/kg/min, $r=0.44$; $p=0.049$; *left panels, Figure 3, main document*) in our sample of 20 participants. No other association was found between NIRS parameters (right PFC

included) and training-induced changes in exercise capacity (all $p>0.05$, data shown in **supplementary Table S2**).

At absolute work rates corresponding to peak exercise before exercise training, scores of affective valence after exercise training correlated with post-pre exercise training difference in left PFC HbDiff ($r=0.45$; $p=0.048$) and HbO₂ ($r=0.46$; $p=0.044$; *right panels, Figure 3, main document*) concentration at peak exercise in our sample of 20 participants. Similar associations were found at absolute work rates corresponding to VT₁ before exercise training: scores of affective valence after exercise training correlated with post-pre exercise training difference in left PFC HbO₂ ($r=0.55$; $p=0.012$), HbTot ($r=0.50$; $p=0.026$) and HbDiff ($r=0.61$; $p=0.005$). No significant association was found between exercise-training induced changes in right PFC oxygenation and post-exercise training affective valence regardless of exercise intensity (all $p>0.05$, data shown in **supplementary Table S3**).

Table S1. Anthropometrics and body composition of individuals with obesity randomly assigned to moderate-intensity continuous exercise training (MICT) or high-intensity interval training (HIIT) before and after 8 weeks of exercise training.

	MICT (n=10)		HIIT (n=10)	
	<i>Before exercise training</i>	<i>After exercise training</i>	<i>Before exercise training</i>	<i>After exercise training</i>
Weight (kg)	110.2 ± 26.5	110.2 ± 27.1	102.9 ± 18.0	103.1 ± 17.2
BMI (kg m ⁻²)	33.5 [11.4]	34.2 [11.4]	31.9 [5.7]	32.6 [7.5]
Waist circumference (cm)	116.9 ± 13.0	116.1 ± 13.5	114.1 ± 12.9	111.6 ± 11.5
Hip circumference (cm)	106.8 [22.0]	106.0 [24.5]	107.3 [14.5]	106.3 [14.5]
Body composition				
Total lean mass (%)	61.2 ± 9.7	61.2 ± 9.5	62.7 ± 6.4	62.5 ± 6.5
Total fat mass (%)	38.8 ± 9.7	38.8 ± 9.5	37.3 ± 6.4	37.5 ± 6.5

Data are presented as mean ± SD for normally distributed continuous variables or as median [interquartile range] for non-normally distributed continuous variables. BMI: body mass index. No significant difference was found between MICT and HIIT before exercise training, or from before to after exercise training (all $p>0.05$).

Table S2. Relationships between exercise-training induced changes (post-pre exercise training difference) in left and right prefrontal cortex oxygenation and exercise capacity in individuals with obesity.

	WR _{peak} (W)	WR _{peak} (% pred)	VO _{2peak} (L/min)	VO _{2peak} (% pred)	VO _{2peak} (mL/kg/min)
Left prefrontal cortex					
HbO ₂ (μmol)	r=0.23; p=0.340	r=0.31; p=0.189	r=0.22; p=0.359	r=0.26; p=0.279	r=0.28; p=0.226
HHb (μmol)	r=-0.05; p=0.831	r=-0.05; p=0.839	r=-0.05; p=0.830	r=-0.04; p=0.853	r=-0.08; p=0.748
HbTot (μmol)	r=0.14; p=0.555	r=0.20; p=0.402	r=0.13; p=0.573	r=0.17; p=0.482	r=0.17; p=0.469
HbDiff (μmol)	r=0.35; p=0.135	<i>r=0.46; p=0.044</i>	r=0.33; p=0.150	r=0.37; p=0.103	<i>r=0.44; p=0.049</i>
Right prefrontal cortex					
HbO ₂ (μmol)	r=0.11; p=0.648	r=0.23; p=0.339	r=0.11; p=0.653	r=0.20; p=0.397	r=0.18; p=0.446
HHb (μmol)	r=-0.13; p=0.590	r=-0.03; p=0.896	r=-0.12; p=0.603	r=-0.03; p=0.890	r=-0.09; p=0.696
HbTot (μmol)	r=0.03; p=0.895	r=0.15; p=0.539	r=0.13; p=0.894	r=0.13; p=0.591	r=0.09; p=0.695
HbDiff (μmol)	r=0.26; p=0.259	r=0.37; p=0.108	r=0.26; p=0.270	r=0.33; p=0.152	r=0.35; p=0.132

HbDiff: difference in hemoglobin; HbO₂: oxyhemoglobin; HbTot: total hemoglobin; HHb: deoxyhemoglobin; VO₂: oxygen uptake; WR: work rate. Significant relationships are bold and italicized for clarity.

Table S3. Relationships between exercise-training induced changes (post-pre exercise training difference) in left and right prefrontal cortex oxygenation and post-exercise training affective valence at absolute work rates corresponding to the first ventilatory threshold and peak exercise before exercise training in individuals with obesity.

	Affective valence (Feeling Scale) First ventilatory threshold	Affective valence (Feeling Scale) Peak exercise
Left prefrontal cortex		
HbO ₂ (μmol)	<i>r=0.55; p=0.012</i>	<i>r=0.46; p=0.044</i>
HHb (μmol)	r=0.28; p=0.229	r=0.25; p=0.285
HbTot (μmol)	<i>r=0.50; p=0.026</i>	r=0.41; p=0.070
HbDiff (μmol)	<i>r=0.61; p=0.005</i>	<i>r=0.45; p=0.048</i>
Right prefrontal cortex		
HbO ₂ (μmol)	r=0.27; p=0.252	r=0.12; p=0.629
HHb (μmol)	r=0.44; p=0.050	r=0.05; p=0.848
HbTot (μmol)	r=0.40; p=0.080	r=0.10; p=0.688
HbDiff (μmol)	r=-0.04; p=0.870	r=0.14; p=0.551

HbDiff: difference in hemoglobin; HbO₂: oxyhemoglobin; HbTot: total hemoglobin; HHb: deoxyhemoglobin. Significant relationships are bold and italicized for clarity.

Figure S1. Normal p-p plots for muscle (vastus lateralis) oxygenation parameters [oxy- (HbO₂), deoxy- (HHb), total (HbTot) and oxy-deoxy hemoglobin difference (HbDiff)] assessed by near-infrared spectroscopy during incremental cycling tests in individuals with obesity undertaking moderate-intensity continuous training or high-intensity interval training.

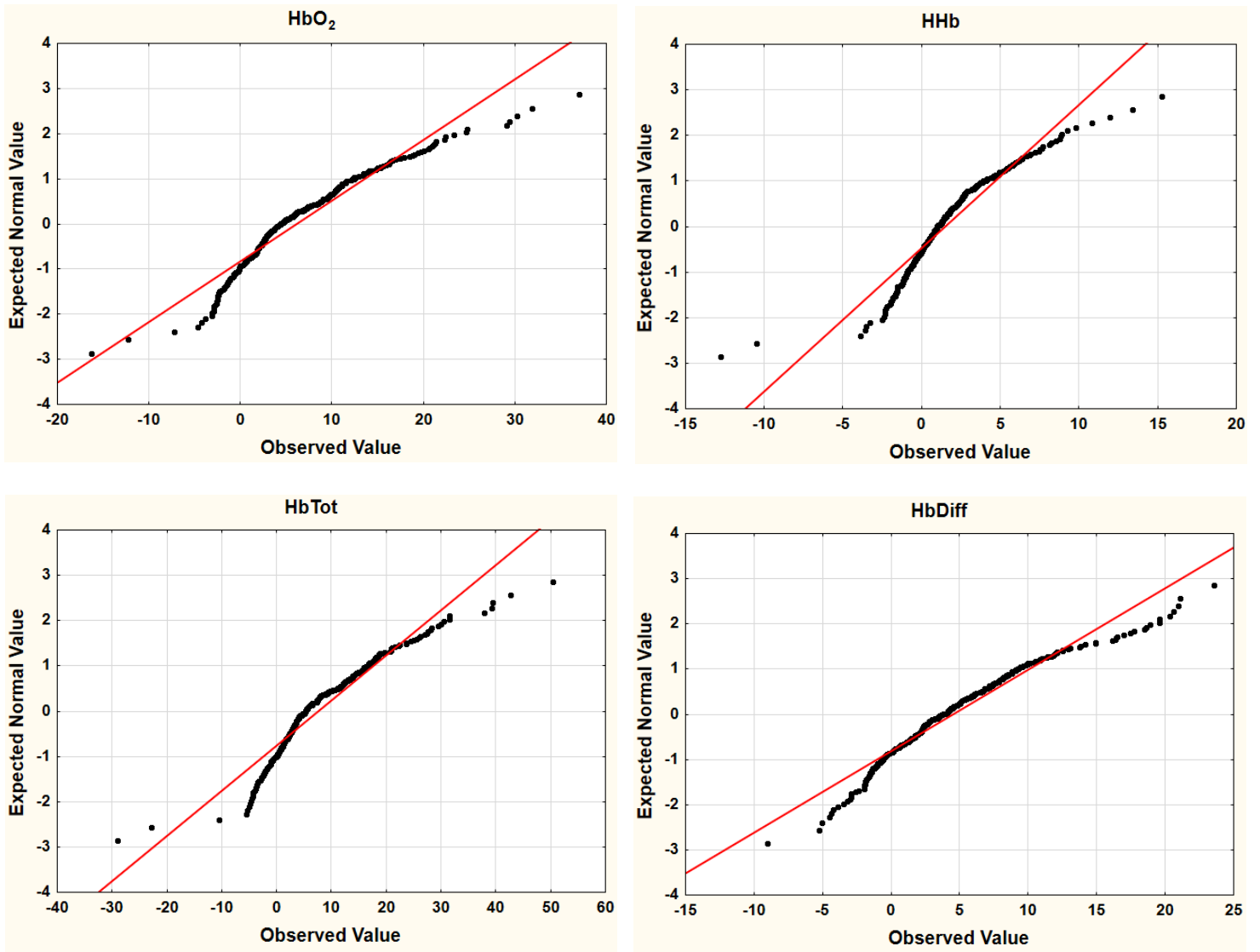
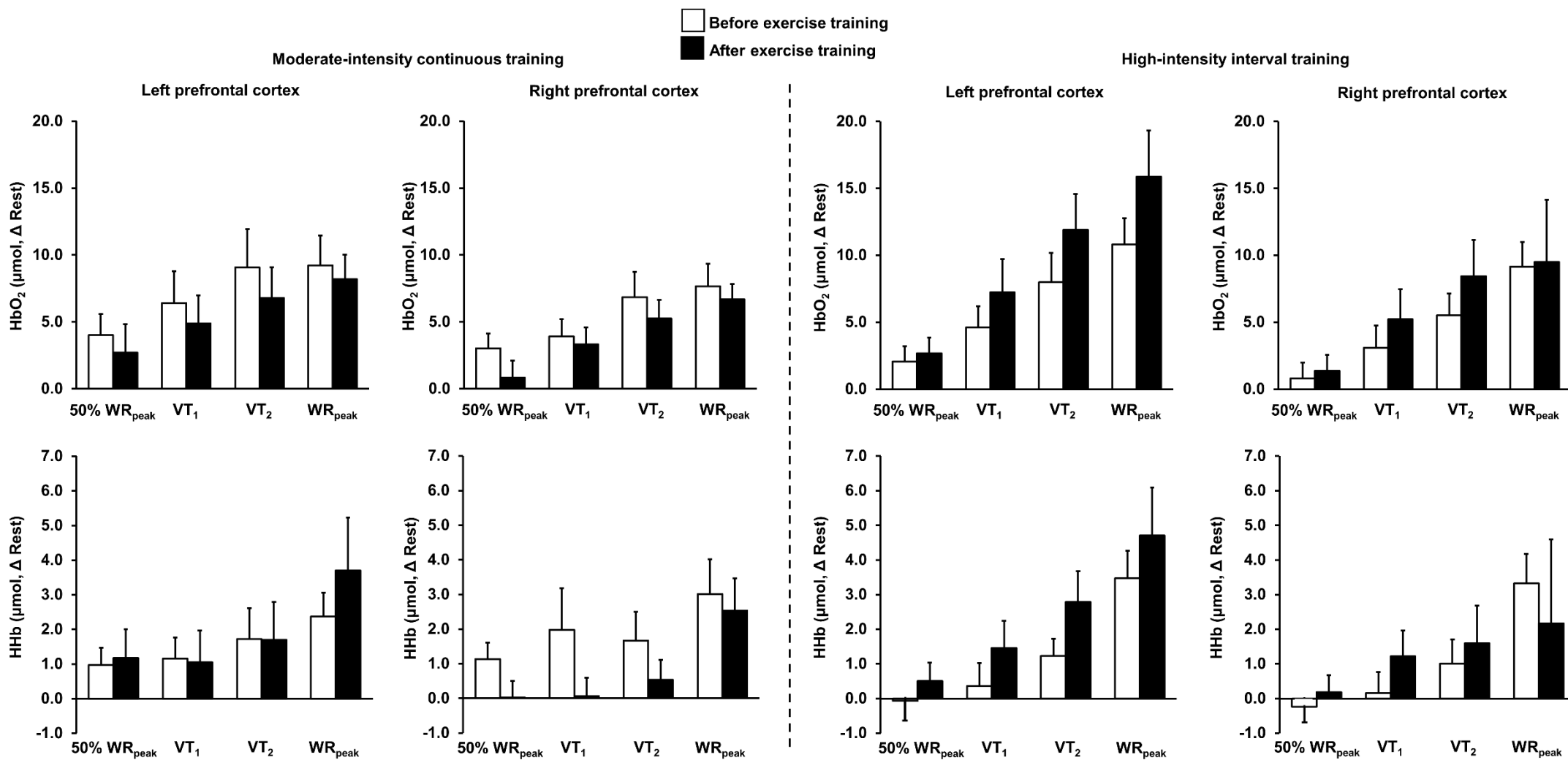


Figure S2. Changes in left and right prefrontal cortex oxy- (HbO₂) and deoxyhemoglobin (HHb) concentration as a function of exercise intensity during incremental cycling tests in individuals with obesity undertaking moderate-intensity continuous training or high-intensity interval training.



Data are presented as mean \pm SEM for clarity purposes. White and black bars depict data obtained before and after exercise training, respectively. VT₁: first ventilatory threshold; VT₂: second ventilatory threshold; WR: work rate. Statistical significance was set at $p < 0.025$ due to the number of comparisons over time being made (see Statistical analysis for further details). No significant difference was found between MICT and HIIT before exercise training, or from before to after exercise training (all $p > 0.025$).