SUPPLEMENTARY MATERIAL

SUPPLEMENTARY FIGURE 1: Timeline for the study visits



ANTHROPOMETRIC/ METABOLIC STUDY VISIT

IMAGING STUDY VISIT

INI	TIAL CONTACT 15 min	RELIMINARY SESSION 45 min	BASELINE MRI 45 min	PREP (EMG & IBUTTONS) 30 min	COLD EXPOSURE 60 min	PR 15 1	EP min	POST-COLD MRI 45 min	
0	15	60	10	5 1 (min)	35	195	21	0 255	

<u>SUPPLEMENTARY FIGURE 2:</u> Relationship of the cold-induced percent decline in SCV PDFF and shivering in the trapezius muscle.



The relationship between cold-induced percent decline in SCV PDFF and shivering signal in the trapezius muscle at 20 minutes of cold exposure **(A)**, 30 minutes of cold exposure **(B)**, 40 minutes of cold exposure **(C)**, and 60 minutes of cold exposure **(D)** in boys with normal BMI (black circles) and with overweight/obesity (white cones). \$ - p< 0.05 via Spearman's Correlation. SCV PDFF; supraclavicular proton density fat fraction, EMG RMS_{avg}; electromyogram root-mean-square average.

SUPPLEMENTARY TABLE 1: Shivering measurements.

	All (n=26)	Normal BMI (n=13)	Overweight/obesity (n= 13)	р
Trapezius shivering activity at the end of cold exposure (μ V).	3.6 [1.5, 21.3]	14.7 [3.2, 30.2]	1.9 [1.1, 1.9]	0.035†
Vastus medialis shivering activity at the end of cold exposure (μ V).	1.2 [0.24, 4.1]	2.6 [0.94, 8.3]	0.6 [0.07, 2.6]	0.052
Vastus lateralis shivering activity at the end of cold exposure (μ V).	1.6 [0.11, 4.7]	6.9 (2.4)	1.01 (0.5)	0.034*

Values are presented as mean (SEM) for normally distributed variables or median [IQ1, IQ3] for nonnormally distributed variables. * - p < 0.05 via independent sample t-test; † - p < 0.05 via Mann-Whitney U test.

	Coefficients						Model			
	N	N B	SE	β	95% CI		R ²	R ² Adj	р	
					Lower Bound	Upper Bound				
Waist circumference (cm)							0.246	0.178	0.045*	
Trapezius shiveringactivity		-0.144	0.210	-0.155	-0.580	0.292				
Cold-induced percent decline in SCV PDFF (%)		-1.637	0.946	-0.391	-3.600	0.325				
	25ª									
VAT (cm) ³							0.221	0.150	0.064	
Trapezius shivering activity		-0.147	0.193	-0.175	-0.548	0.254				
Cold-induced percent decline in SCV PDFF (%)	25ª	-1.316	0.869	-0.348	-3.119	0.487				
BMI (kg/m²)							0.207	0.135	0.078	
Trapezius shivering activity		-0.086	0.071	-0.279	-0.233	0.062				
Cold-induced percentdecline in SCV PDFF (%)	25ª	-0.323	0.320	-0.234	-0.986	0.340				

<u>SUPPLEMENTARY TABLE 2:</u> Regression analysis for the prediction of adiposity parameters by coldinduced percent decline in SCV PDFF (%).

^a One participant did not have a measurement for the trapezius shivering at 60 minutes (had 38 minutes of cold exposure). * P < 0.05. VAT; visceral adipose tissue, BMI; body mass index.