SUPPLEMENTAL DIGITAL CONTENT 3 (Supplemental results)

This supplement presents results for assessment of residual association and conformation to the normal distribution for all CRF parameters. With our models, we were able to diminish the residual association for the peak O_2pulse, the peak workload, OUES and V_e/VCO_2 slope with BMI-for-age, puberty stage, age, height, body mass and age-adjusted waist circumference (Figures S1-S4). Table S1 illustrates the slopes and the p-values of the t-statistic for linear association between the CRF Z scores and body size variables. Overall, we found very little residual associations of CRF parameters Z scores with height, body mass, pubertal stage, age, and BMI-for-age. Exception to this is the slight negative association with some CRF Z score with waist circumference. Such association was however not seen with BMI-for-age. Two CRF parameters (workload at VAT and OUES) had statistically significant residual association with age. The association was however weak and close to zero (Figure S5). Table S2 shows the p-value for departure from a normal distribution with a mean of zero and a standard deviation of one and percentage of participants with Z scores > 2.0 or < -2.0. All the CRF parameters Z scores were normally distributed, except V_e/VCO_2 at VAT. Although statistical significance was reached, the distribution was visually close to a normal distribution (Figure S6).

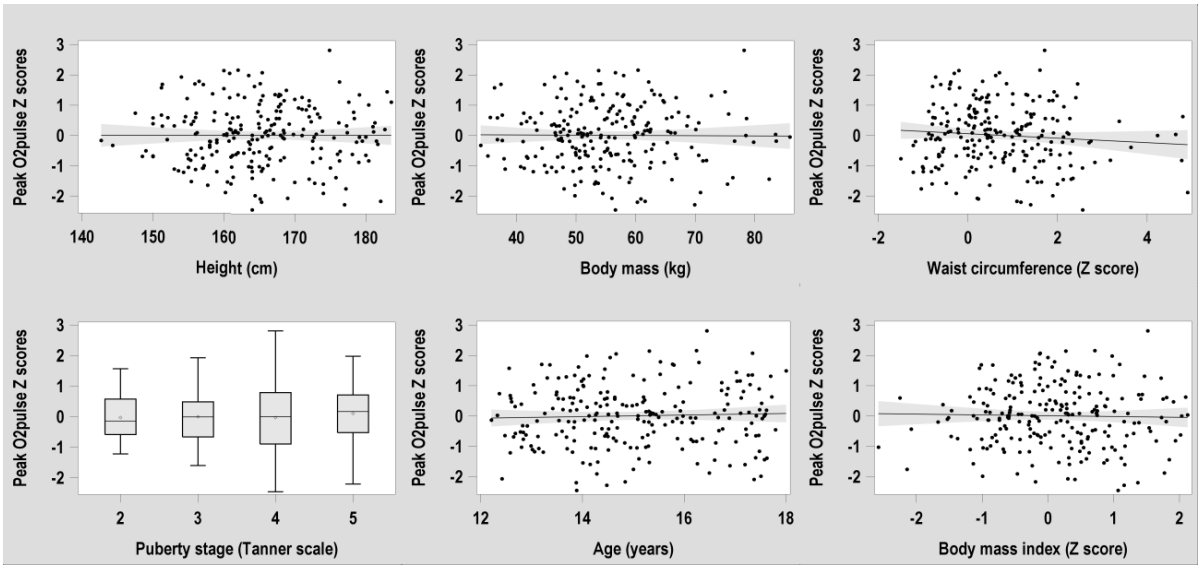

Figure S1. Absence of residual associations with height, body mass, puberty stage, age, waist circumference and body mass index with Peak O_2pulse.

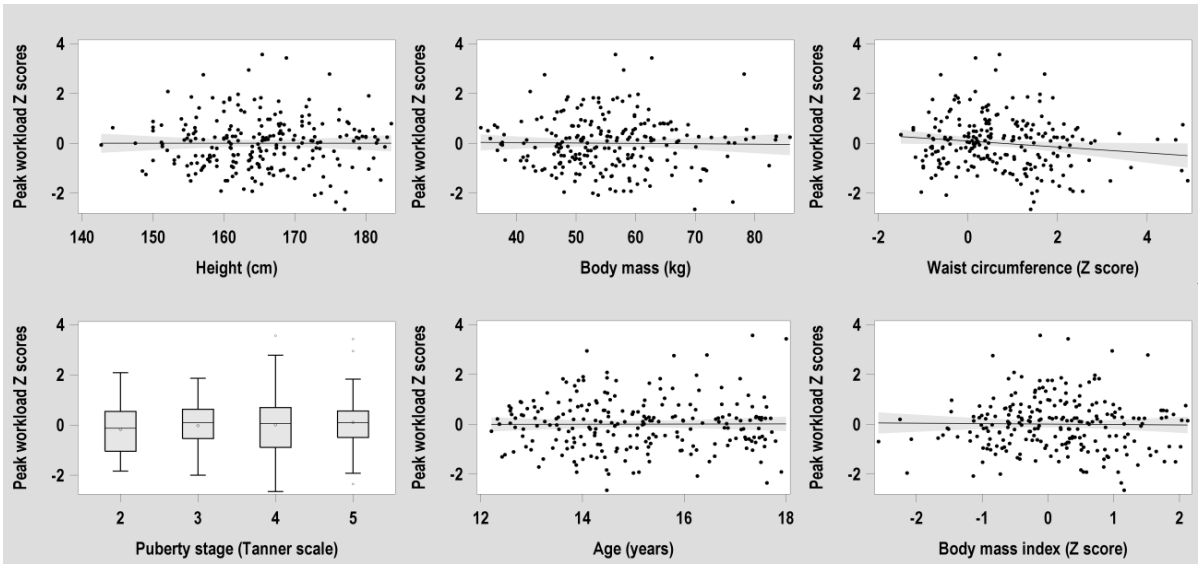

Figure S2. Absence of residual associations with height, body mass, puberty stage, age, waist circumference and body mass index with Peak workload.

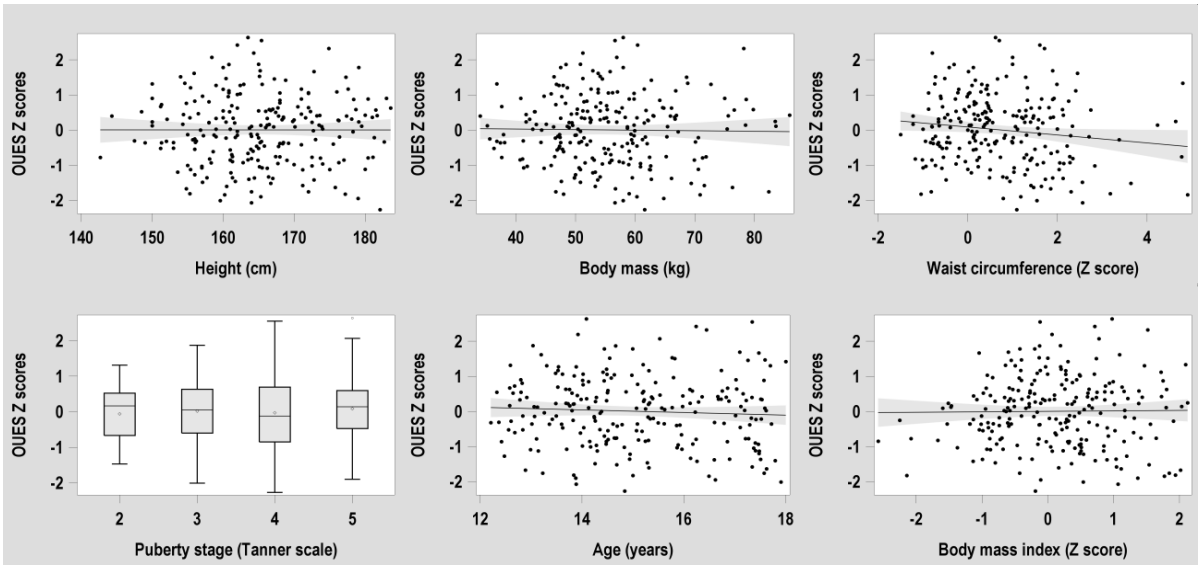

Figure S3. Absence of residual associations with height, body mass, puberty stage, age, waist circumference and body mass index with OUES.

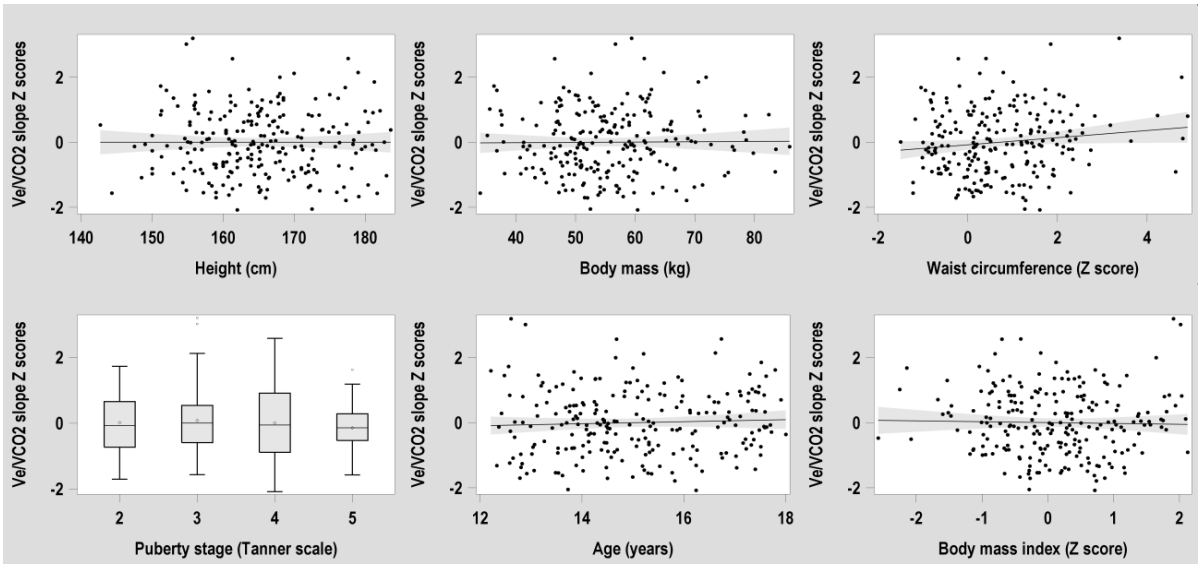

Figure S4. Absence of residual associations with height, body mass, puberty stage, age, waist circumference and body mass index with V_e/VCO_2 slope.

Table S1. Residual association for cardiorespiratory fitness parameters

CRF Parameters	Residual associations									
	Height		Body mass		BMI-for -age		Age		Waist circumference	
	Slope	*p value*	Slope	*p value*	Slope	*p value*	Slope	*p value*	Slope	*p value*
Maximal parameters										
Peak VO_2	<.001	1.00	<.001	0.89	0.087	0.22	-0.083	0.10	-0.061	0.28
Peak O_2pulse	<.001	0.99	-0.001	0.86	0.075	0.30	-0.072	0.09	-0.074	0.19
Peak workload	<.001	0.99	-0.004	0.56	-0.019	0.80	-0.016	0.71	-0.119	0.04
Peak V_e	<.001	0.99	<.001	0.92	0.039	0.59	-0.009	0.82	0.018	0.75
Peak HR	<.001	1.00	<.001	0.91	-0.007	0.93	0.001	0.98	0.040	0.46
RER	<.001	0.99	-0.002	0.72	-0.021	0.77	-0.005	0.92	-0.049	0.37
Submaximal parameters										
OUES	<.001	0.99	-0.003	0.69	0.086	0.24	-0.113	0.02	-0.113	0.04
OUES below VAT	<.001	0.95	-0.002	0.72	0.049	0.50	-0.065	0.13	-0.125	0.07
V_e/VCO_2 slope	<.001	1.00	0.004	0.53	0.020	0.79	0.040	0.36	0.110	0.05
V_e/VCO_2 below VAT	<.001	0.98	0.004	0.54	0.038	0.61	-0.002	0.97	0.144	0.01
V_e/VCO_2 at VAT	<.001	1.00	0.004	0.53	0.027	0.73	0.012	0.80	0.108	0.07
VO_2 at VAT	<.001	0.99	-0.001	0.82	0.024	0.74	-0.010	0.82	-0.049	0.38
VO_2/Work slope	<.001	1.00	0.003	0.71	0.079	0.30	-0.042	0.34	-0.006	0.92
Workload at VAT	<.001	1.00	-0.001	0.84	0.081	0.28	-0.101	0.02	-0.078	0.17
O_2p/Work slope	<.001	0.98	<.001	0.91	0.016	0.83	-0.002	0.96	-0.077	0.30
O_2pulse increase (%)	<.001	0.98	-0.000	0.96	-0.003	0.97	0.002	0.97	-0.070	0.22
HRR1	<.001	0.99	<.001	0.99	0.004	0.96	-0.004	0.93	0.033	0.58
HRR2	<.001	0.99	0.002	0.78	0.031	0.70	0.002	0.96	0.072	0.22

HR: Heart rate; HRR: Heart rate recovery; O_2p: O_2pulse; OUES: Oxygen uptake efficiency slope; RER: Respiratory exchange ratio; VAT: Ventilatory anaerobic threshold

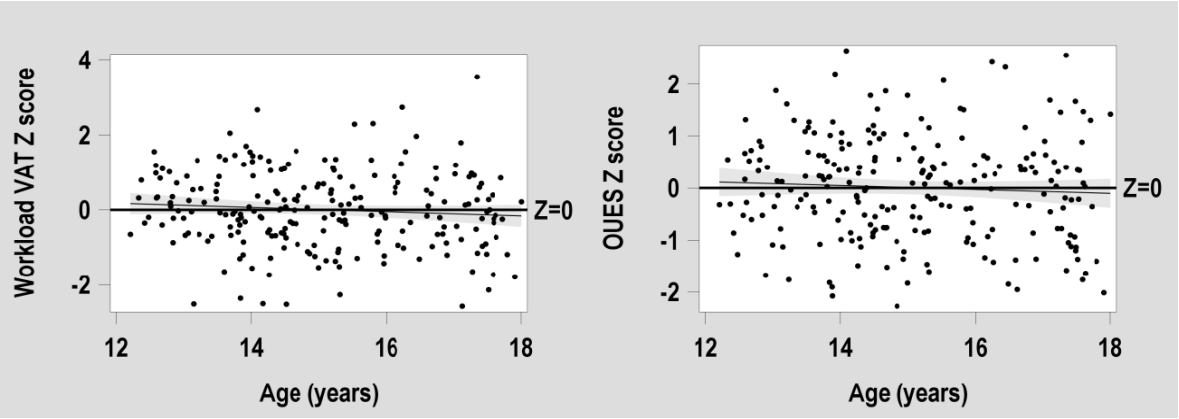

Figure S5. Residual associations with age with Workload at VAT and OUES.

Table S2. Assessment for departure from a standard normal distribution

CRF Parameters	Normal distribution	
	p value for normal distribution	% of Z values < -2 or > 2
Maximal parameters		
Peak VO_2	0.59	3.51
Peak O_2pulse	0.83	4.04
Peak workload	0.06	3.94
Peak V_e	0.13	5.26
Peak HR	0.20	3.14
RER	0.38	5.70
Submaximal parameters		
OUES	0.49	4.82
OUES below VAT	0.38	3.56
V_e/VCO_2 slope	0.07	3.56
V_e/VCO_2 below VAT	0.66	4.89
V_e/VCO_2 at VAT	<.001	7.89
VO_2 at VAT	0.07	4.44
VO_2/Work slope	0.13	6.58
Workload at VAT	0.42	4.89
O_2p/Work slope	0.08	5.26
O_2pulse increase (%)	0.54	4.93
HRR1	0.06	1.06
HRR2	0.37	3.26

HR: Heart rate; HRR: Heart rate recovery; O_2p: O_2pulse; OUES: Oxygen uptake efficiency slope; RER: Respiratory exchange ratio; VAT: Ventilatory anaerobic threshold

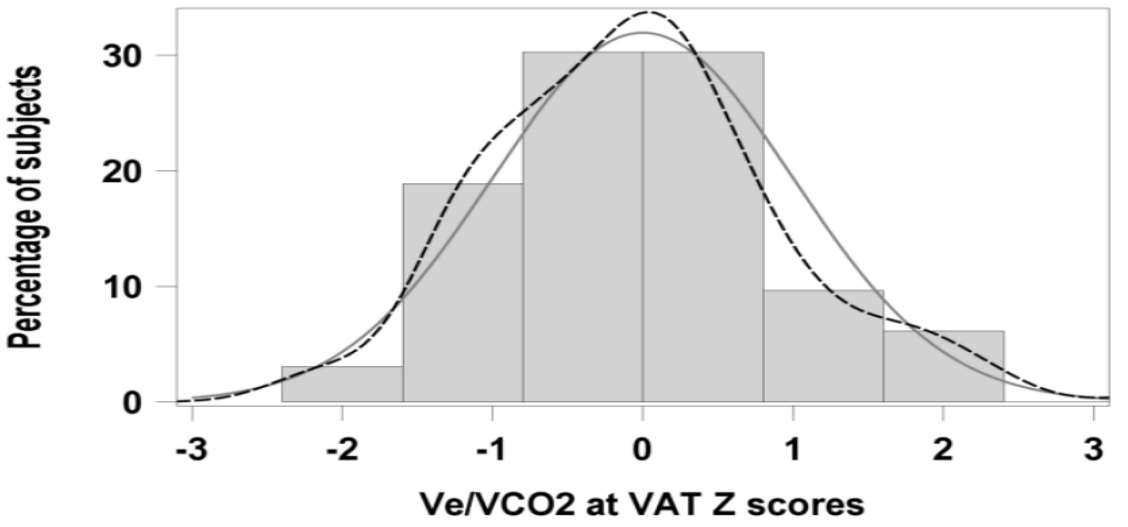

Figure S6. Distribution for V_e/VCO_2 at VAT Z scores (black dotted line) compared to a normal distribution (light grey).

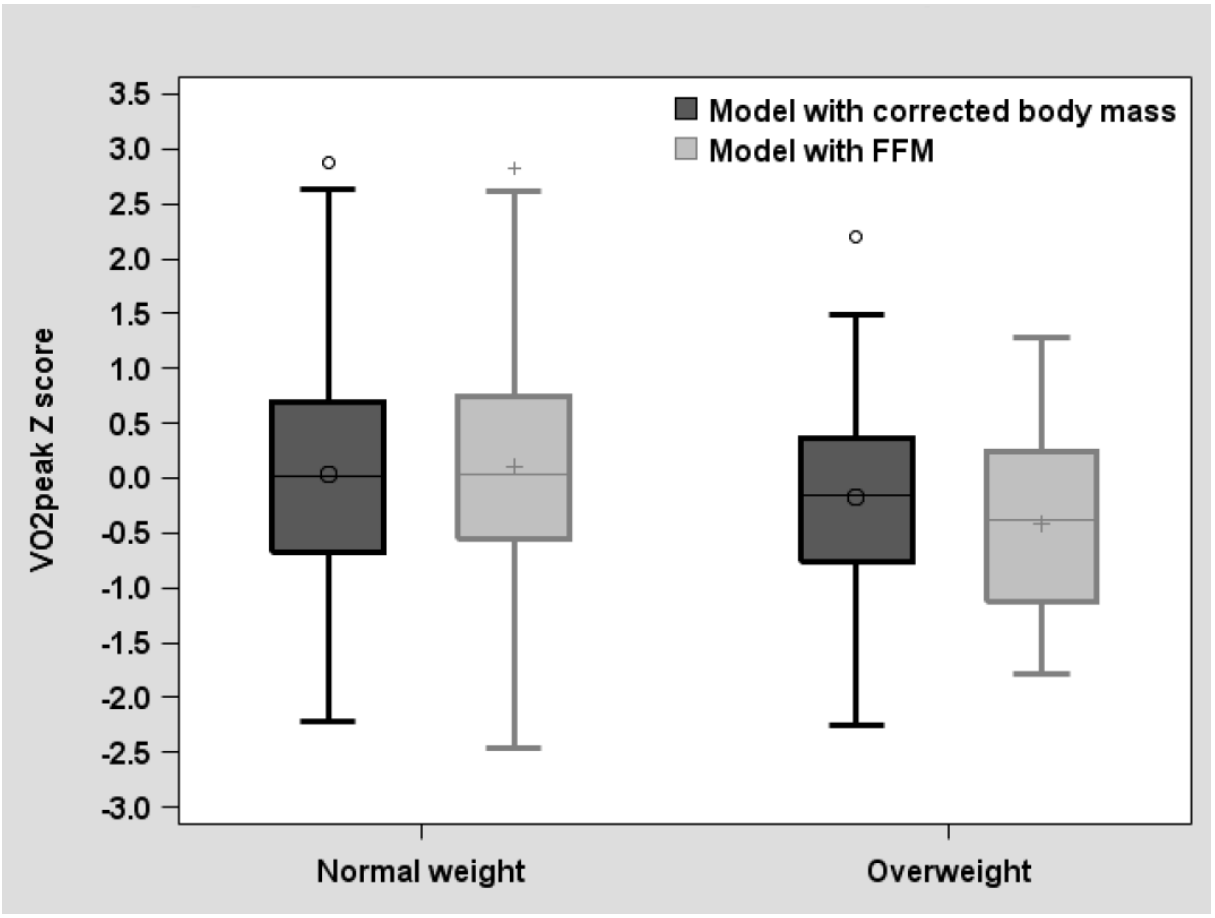

Figure S7. Mean peak VO_2 Z score calculated with corrected body mass or fat-free-mass, stratified for normal weight or overweight participants

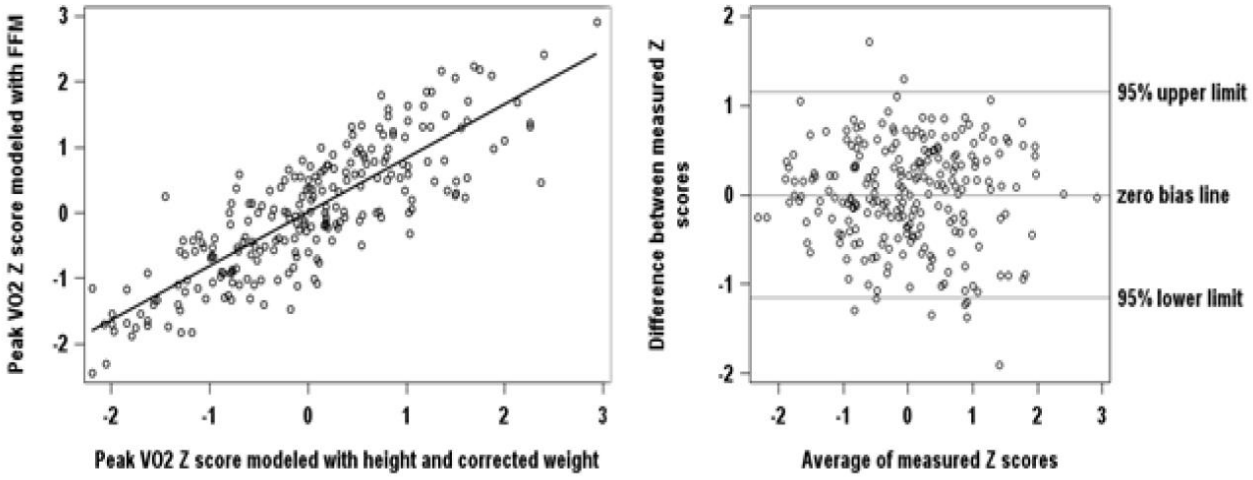

Figure S8. Relationship and agreement between the Z score of the peak VO_2, modeled with the FFM and modeled with height and corrected weight

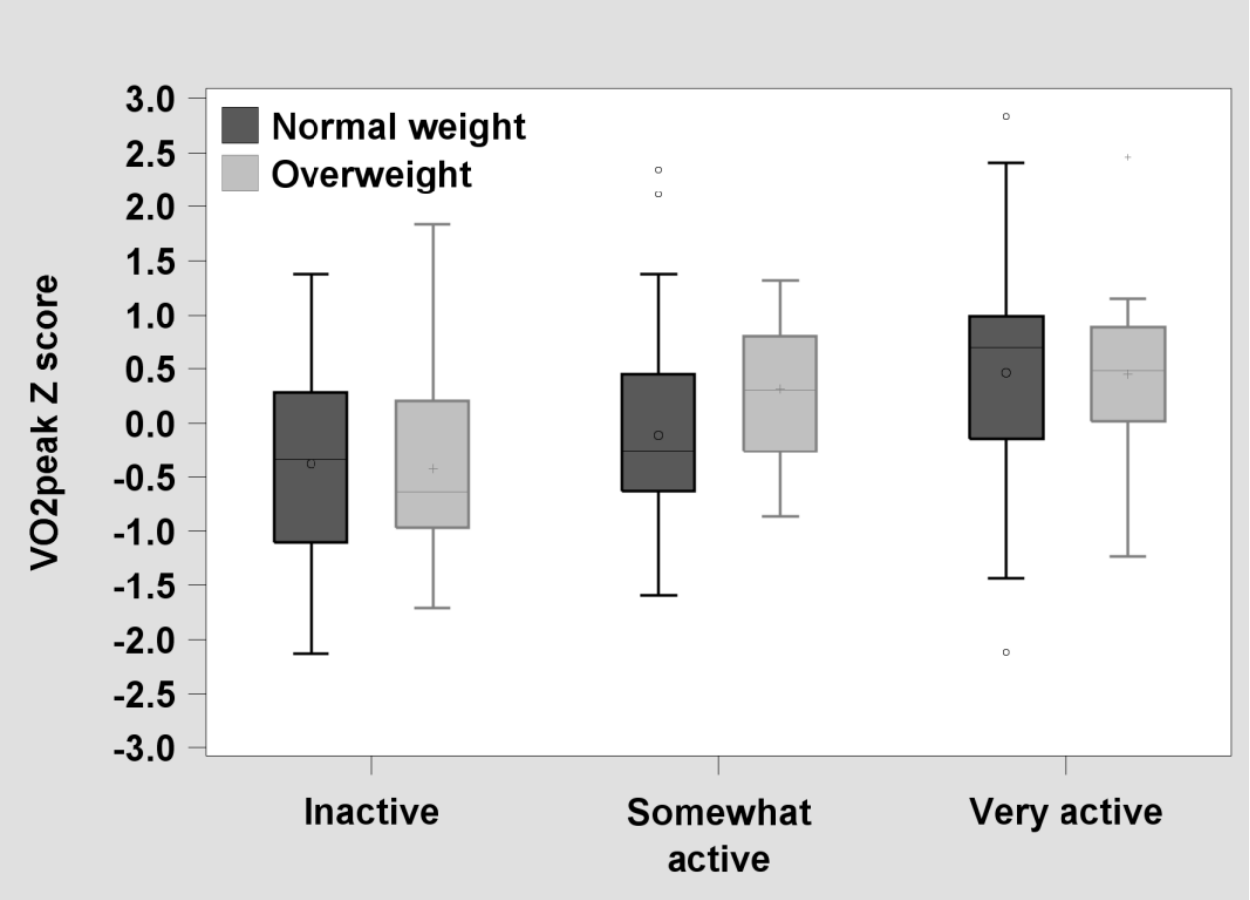

Figure S9. Peak VO_2 Z scores stratified by level of habitual physical activity for normal weight and overweight participant