

## Supplementary material

**Table S1** Median of pupillometry parameters according to the several body mass criteria.

Pupillometry	CDC				WHO				IOTF				Percentage of Body fat			
	Underweight and Normal weight	Overweight	Obese	p value	Underweight and Normal weight	Overweight	Obese	p value	Underweight and Normal weight	Overweight	Obese	p value	Under fat and Normal fat	Overfat	Obese	p value
Initial pupil diameter (mm)	5.30 (4.70-5.90)	5.30 (4.70-5.70)	5.40 (4.70-5.90)	0.579	5.30 (4.70-5.90)	5.30 (4.70-5.90)	5.30 (4.70-5.90)	0.985	5.30 (4.70-5.90)	5.30 (4.70-5.85)	5.20 (4.70-5.80)	0.929	5.30 (4.70-5.80)	5.40 (4.60-6.20)	5.40 (4.80-5.90)	0.800
Final pupil diameter (mm)	3.40 (3.00-3.80)	3.30 (3.00-3.70)	3.40 (2.90-3.70)	0.752	3.40 (3.00-3.80)	3.40 (2.90-3.80)	3.40 (3.00-3.70)	0.970	3.40 (3.00-3.80)	3.40 (3.00-3.80)	3.40 (2.90-3.70)	0.982	3.40 (3.00-3.80)	3.40 (2.90-4.00)	3.40 (3.00-3.80)	0.961
Constriction amplitude (%)	35.00 (32.00-39.00)	35.00 (32.00-38.00)	35.00 (32.00-38.00)	0.828	35.00 (33.00-39.00)	35.00 (32.00-38.00)	35.00 (32.00-38.00)	0.613	35.00 (32.00-39.00)	35.00 (32.00-38.00)	35.00 (32.00-38.00)	0.609	35.00 (32.00-39.00)	35.00 (32.00-38.00)	35.00 (32.00-39.00)	0.757
ACV (mm/s)	4.04 (3.57-4.44)	3.89 (3.49-4.34)	4.08 (3.65-4.40)	0.291	4.04 (3.57-4.44)	3.93 (3.45-4.39)	4.04 (3.66-4.42)	0.452	4.03 (3.56-4.44)	3.99 (3.62-4.40)	4.04 (3.51-4.36)	0.946	4.03 (3.55-4.42)	3.92 (3.57-4.39)	4.06 (3.62-4.40)	0.676
MCV (mm/s)	5.33 (4.74-5.88)	5.18 (4.52-5.82)	5.36 (4.83-5.99)	0.346	5.33 (4.74-5.86)	5.25 (4.58-5.99)	5.31 (4.85-5.99)	0.728	5.33 (4.72-5.87)	5.27 (4.72-5.99)	5.22 (4.65-5.99)	0.908	5.31 (4.69-5.86)	5.24 (4.70-5.83)	5.36 (4.81-5.99)	0.535
ADV (mm/s)	1.13 (0.97-1.31)	1.20 (0.96-1.33)	1.25 (1.10-1.42)	<b>0.003</b>	1.13 (0.97-1.31)	1.19 (1.01-1.36)	1.24 (1.08-1.40)	<b>0.003</b>	1.13 (0.97-1.31)	1.22 (1.05-1.33)	1.30 (1.07-1.47)	<b>0.007</b>	1.13 (0.97-1.30)	1.21 (0.98-1.32)	1.27 (1.09-1.45)	<b>&lt;0.001</b>
T75 (s)	1.64 (1.20-2.13)	1.67 (1.17-2.17)	1.85 (1.23-2.22)	0.506	1.64 (1.14-2.13)	1.67 (1.20-2.13)	1.84 (1.25-2.22)	0.372	1.64 (1.17-2.13)	1.82 (1.23-2.28)	1.60 (1.14-2.10)	0.154	1.64 (1.17-2.10)	1.76 (1.29-2.28)	1.70 (1.17-2.19)	0.234

Data reported as median (25th, 75th percentile). Significant differences are in bold. CDC, US Centers for Disease Control and Prevention; WHO, World Health Organization; IOTF, International Obesity Task Force; ACV, average constriction velocity; MCV, maximum constriction velocity; ADV, average dilation velocity; T75, the total time taken by the pupil to recover to 75% of the initial resting pupil size after it reached the constriction peak.

**Table S2** Association between body mass criteria and pupillometry parameters

	Initial pupil diameter		Final pupil diameter		Constriction amplitude		ACV		MCV		ADV		T75	
	$\beta$ (CI 95%)		$\beta$ (CI 95%)		$\beta$ (CI 95%)		$\beta$ (CI 95%)		$\beta$ (CI 95%)		$\beta$ (CI 95%)		$\beta$ (CI 95%)	
	Model 0	Model 1	Model 0	Model 1	Model 0	Model 1	Model 0	Model 1	Model 0	Model 1	Model 0	Model 1	Model 0	Model 1
<b>CDC</b>	-0.029 (-0.124; 0.066)	0.051 (-0.064; 0.166)	-0.009 (-0.076; 0.057)	0.054 (-0.027; 0.136)	-0.334 (-0.870; 0.202)	-0.505 (-1.182; 0.171)	-0.025 (-0.100; 0.050)	-0.012 (-0.103; 0.079)	-0.003 (-0.107; 0.100)	0.026 (-0.099; 0.152)	<b>0.042</b> <b>(0.005; 0.078)</b>	<b>0.053</b> <b>(0.005; 0.101)</b>	0.051 (-0.035; 0.137)	0.076 (-0.030; 0.183)
<b>WHO</b>	-0.012 (-0.102; 0.078)	0.066 (-0.044; 0.176)	0.001 (-0.063; 0.064)	0.056 (-0.022; 0.133)	-0.346 (-0.856; 0.164)	-0.390 (-1.036; 0.255)	-0.022 (-0.093; 0.049)	0.002 (-0.084; 0.089)	0.010 (-0.089; 0.108)	0.064 (-0.056; 0.184)	<b>0.041</b> <b>(0.007; 0.075)</b>	0.045 (-0.001; 0.091)	0.056 (-0.025; 0.137)	0.089 (-0.011; 0.188)
<b>IOTF</b>	-0.035 (-0.143; 0.073)	0.055 (-0.077; 0.188)	-0.008 (-0.084; 0.068)	0.063 (-0.031; 0.156)	-0.477 (-1.088; 0.133)	-0.671 (-1.448; 0.106)	-0.043 (-0.128; 0.041)	-0.024 (-0.128; 0.080)	-0.035 (-0.153; 0.083)	0.009 (-0.135; 0.153)	<b>0.046</b> <b>(0.003; 0.088)</b>	0.055 (-0.001; 0.111)	0.038 (-0.061; 0.137)	0.059 (-0.065; 0.182)
<b>Percentage of Body fat</b>	0.009 (-0.079; 0.098)	0.069 (-0.041; 0.179)	0.004 (-0.058; 0.067)	0.055 (-0.023; 0.133)	-0.124 (-0.625; 0.377)	-0.324 (-0.970; 0.322)	5.658E-5 (-0.069; 0.069)	0.023 (-0.063; 0.109)	0.019 (-0.077; 0.116)	0.054 (-0.064; 0.173)	<b>0.053</b> <b>(0.018; 0.087)</b>	<b>0.063</b> <b>(0.016; 0.109)</b>	0.047 (-0.033; 0.127)	0.081 (-0.020; 0.181)

Significant differences are in bold. CDC, US Centers for Disease Control and Prevention; WHO, World Health Organization; IOTF, International Obesity Task Force; ACV, average constriction velocity; MCV, maximum constriction velocity; ADV, average dilation velocity; T75, the total time taken by the pupil to recover to 75% of the initial resting pupil size after it reached the constriction peak. Model 0: crude model; Model 1: adjusted for age, sex, parental education, physical activity, energy intake, sleep duration and asthma.

**Table S3** Association between BMI z-scores and pupillometry parameters

	Initial pupil diameter $\beta$ (CI 95%)		Final pupil diameter $\beta$ (CI 95%)		Constriction amplitude $\beta$ (CI 95%)		ACV $\beta$ (CI 95%)		MCV $\beta$ (CI 95%)		ADV $\beta$ (CI 95%)		T75 $\beta$ (CI 95%)	
	Model 0	Model 1	Model 0	Model 1	Model 0	Model 1	Model 0	Model 1	Model 0	Model 1	Model 0	Model 1	Model 0	Model 1
<b>CDC z-scores</b>	-0.030 (-0.090; 0.030)	0.013 (-0.060; 0.085)	-0.009 (-0.051; 0.033)	0.023 (-0.028; 0.074)	-0.297 (-0.637; 0.042)	-0.381 (-0.806; 0.044)	-0.048 (-0.095; 0.001)	-0.035 (-0.092; 0.022)	-0.046 (-0.111; 0.020)	-0.030 (-0.109; 0.049)	<b>0.023 (-0.001; 0.046)</b>	<b>0.030 (-0.001; 0.059)</b>	0.033 (-0.020; 0.086)	0.034 (-0.030; 0.098)
<b>WHO z-scores</b>	-0.026 (-0.077; 0.026)	0.013 (-0.051; 0.076)	-0.008 (-0.045; 0.028)	0.021 (-0.024; 0.066)	-0.251 (-0.544; 0.043)	-0.327 (-0.697; 0.042)	-0.037 (-0.078; 0.003)	-0.026 (-0.076; 0.023)	-0.034 (-0.091; 0.022)	-0.019 (-0.088; 0.049)	<b>0.021 (0.001; 0.041)</b>	<b>0.027 (0.001; 0.053)</b>	0.030 (-0.016; 0.076)	0.031 (-0.025; 0.088)

Significant differences are in bold. CDC, US Centers for Disease Control and Prevention; WHO, World Health Organization; ACV, average constriction velocity; MCV, maximum constriction velocity; ADV, average dilation velocity; T75, the total time taken by the pupil to recover to 75% of the initial resting pupil size after it reached the constriction peak. Model 0: crude model; Model 1: adjusted for age, sex, parental education, physical activity, energy intake, sleep duration and asthma.