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Introduction

Individuals born small-for-gestational age (SGA), especially those who experience postnatal catch-up growth, are at increased risk for developing endocrine-metabolic abnormalities before puberty. In adults, brown adipose tissue (BAT) has been associated with protection against metabolic disorders, such as obesity, type 2 diabetes and dyslipidaemia.

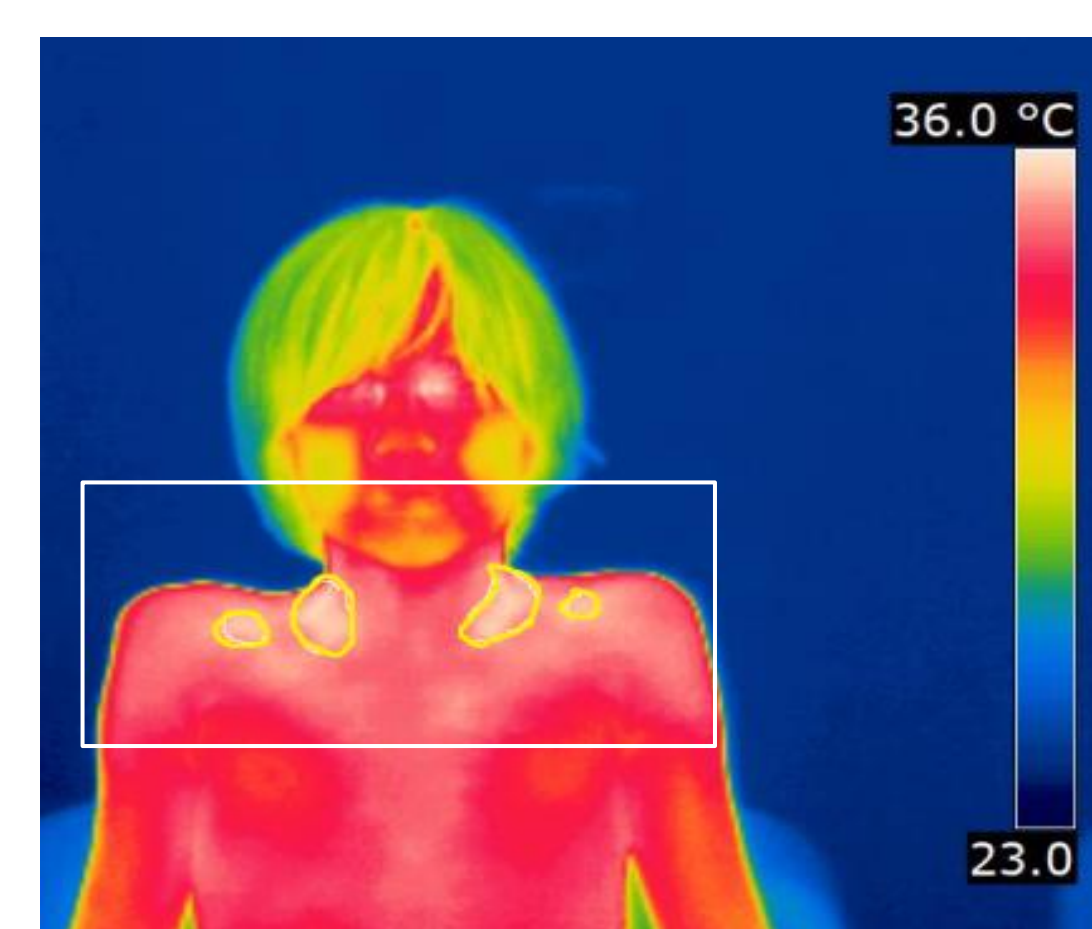
AIM

To assess for the first time whether BAT activation differs between prepubertal children born SGA or appropriate-for-gestational age (AGA).

Subjects and Methods

The study population consisted of 86 prepubertal children [41 AGA and 45 SGA; age (mean ± SEM), 8.5 ± 0.1 yr], recruited into two prospective longitudinal studies. The temperature at the supraclavicular region (SCR) before and after a cold stimulus was measured by infrared thermal imaging, and the area of thermally active SCR (increase after cold challenge, $\Delta\text{Area}_{\text{SCR}}$) was calculated as a surrogate index of BAT activation. The results were correlated with clinical, endocrine-metabolic and inflammation variables, and with visceral and hepatic adiposity (assessed by Magnetic Resonance Imaging).

Baseline:
Time 0

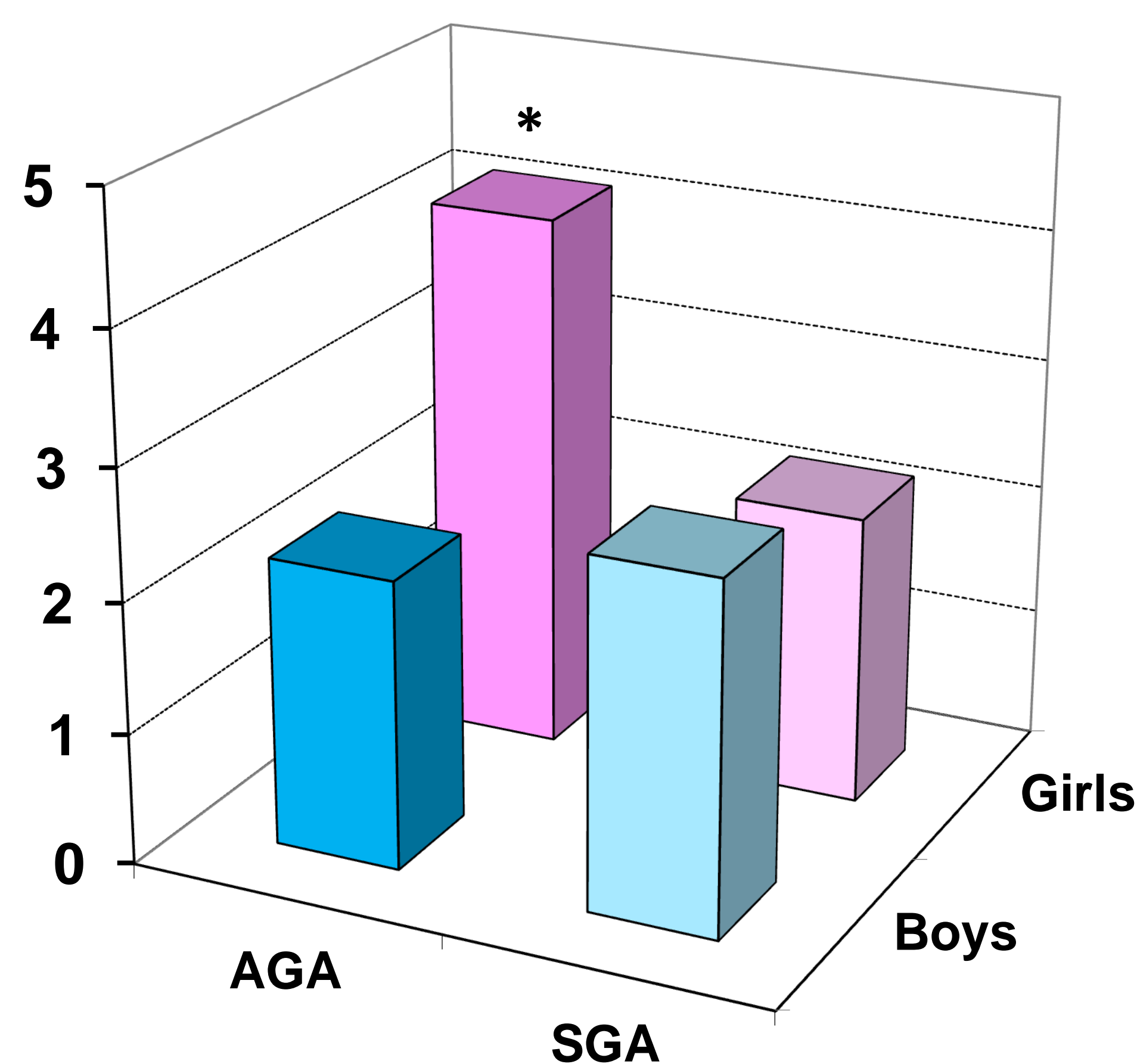


After cold challenge:
Time 5'



Results

Change in the surface area of the thermally active supraclavicular region ($\Delta\text{Area}_{\text{SCR}}$)



* P < 0.05 for the interaction birth weight group x gender group from a general linear model

- Cold-induced increase in $\Delta\text{Area}_{\text{SCR}}$ did not differ significantly between AGA and SGA children.
- After cold induction, AGA girls significantly increased the $\Delta\text{Area}_{\text{SCR}}$ as compared to AGA boys; this response was not observed in SGA girls vs SGA boys.

Association between $\Delta\text{Area}_{\text{SCR}}$ and clinical, endocrine-metabolic and abdominal fat results

	$\Delta\text{Area}_{\text{SCR}}$	
	β	P
Endocrine-Metabolic Variables		
Glucose (mg/dL)	-0.325	0.008
Insulin (mIU/mL)	-0.341	0.003
HOMA-IR	-0.348	0.002
IGF-I (ng/mL)	0.112	0.313
HMW adiponectin (mg/L)	0.058	0.667
SHBG (nmol/L)	-0.189	0.133
Inflammation markers		
Hepatocyte growth factor (pg/mL)	-0.244	0.055
us-CRP ($\mu\text{g/L}$)	-0.418	<0.0001
Abdominal MRI		
Liver volume (mL)	-0.301	0.006
Liver fat (%)	-0.240	0.007
Visceral fat (cm^2)	-0.194	0.077
Subcutaneous fat (cm^2)	-0.243	0.034

Cold-induced $\Delta\text{Area}_{\text{SCR}}$ negatively correlated with HOMA-IR, us-CRP, liver volume and liver fat.

Conclusions

- BAT activity is similar in prepubertal AGA and SGA children.
- As compared to SGA girls, prepubertal girls born AGA appear to have a surplus of BAT vs their gender counterparts, that is inversely related to central (ectopic) adiposity.

Int J Obes 2018 (in press)