

Load carriage and kinematic adaptations in overweight and healthy-weight schoolchildren

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INTRODUCTION

- Recommended backpack load is between 10-15% of child's body weight (BW).¹
- Previous studies suggested that overweight children should carry less than 10% BW in their backpacks.^{2,3}
- No previous studies have included the effect of pulling a school trolley in obese/overweight kids.



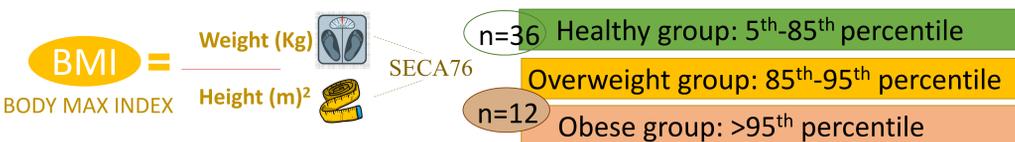
Aim

To analyse the postural adaptations for obese/overweight & healthy students while carrying a backpack or a school trolley with various loads.

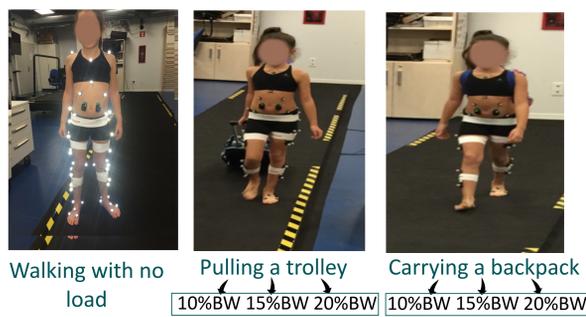
METHODS



48 students (6-12 years old)



EXPERIMENTAL CONDITIONS



Walking with no load (control) | Pulling a trolley (10%BW 15%BW 20%BW) | Carrying a backpack (10%BW 15%BW 20%BW)

- ✓ 9 Oqus 400 at 250 Hz
- ✓ 48 reflective markers
- ✓ 1 minute walking per condition
- ✓ Self-selected speed
- ✓ Conditions were randomized
- ✓ 3 min of rest between conditions

Visual3D v6 Professional → Mean and standard deviation (in degrees) from: flexion/extension, adduction/abduction, and internal/external rotation of **thorax, hip and knee**.

STATISTICAL ANALYSIS



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RESULTS

Table 1. F (p value) for the main and interactive effects of body mass index (BMI), load and schoolbag (Sbag). Significant effects are in bold.

		BMI	Load*BMI	Sbag*BMI	Load*Sbag*BMI
THORAX	Sagittal	0.03 (0.91)	0.82 (0.49)	3.11 (0.08)	1.36 (0.51)
	Frontal	0.15 (0.74)	1.71 (0.31)	0.08 (0.77)	0.36 (0.78)
	Transverse	0.87 (0.39)	0.59 (0.62)	3.29 (0.07)	1.57 (0.21)
HIP	Sagittal	2.07 (0.15)	2.49 (0.07)	0.51 (0.47)	2.22 (0.10)
	Frontal	0.06 (0.81)	0.34 (0.79)	2.04 (0.16)	1.71 (0.18)
	Transverse	13.8 (0.001)	1.69 (0.18)	11.7 (0.001)	3.97 (0.01)
KNEE	Sagittal	0.09 (0.77)	0.41 (0.75)	0.00 (0.99)	0.48 (0.70)
	Frontal	10.3 (0.002)	1.49 (0.22)	1.47 (0.23)	0.62 (0.61)
	Transverse	2.98 (0.09)	0.49 (0.68)	0.81 (0.36)	1.23 (0.31)

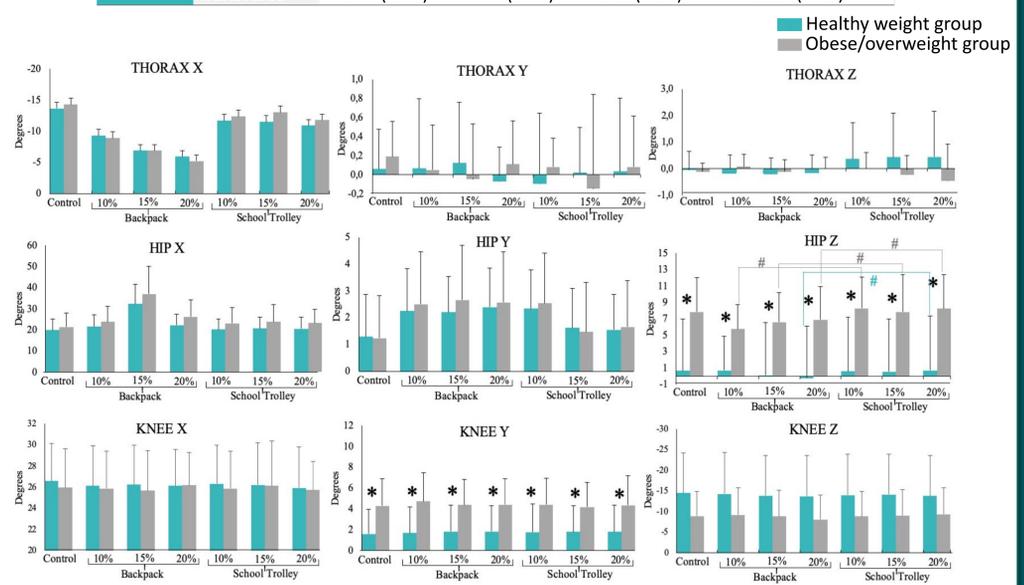


Figure 1. Mean and SD of the sagittal (X), frontal (Y) and transverse plane (Z). *p=0.01 between BMI groups; #p>0.05 between backpack-trolley in ob/overw group; #p>0.05 between backpack-trolley in healthy group

DISCUSSION

- Although a previous study did not obtain differences in the sagittal, frontal, or transverse plane between overweight and normal-weight participants,⁵ our study reported that obese/overweight children had higher internal hip rotation and knee adduction values than healthy counterparts.⁶
- These differences between BMI groups under control conditions were also consistent under load carriage conditions.
- The use of the school trolley allows obese/overweight children to maintain closer kinematics to no-load conditions, and could be considered as a good alternative as previous studies reported in healthy students.^{7,8}

CONCLUSIONS

SoWhat?

- ✓ Obese/overweight children walked with higher internal hip rotations and knee adduction than healthy ones, although this was independent from load carriage.
- ✓ Recommendations for backpack/school trolley load should be equal in overweight/obese and healthy students based on kinematic results.
- ✓ The school trolley seems a viable alternative for overweight/obese children.