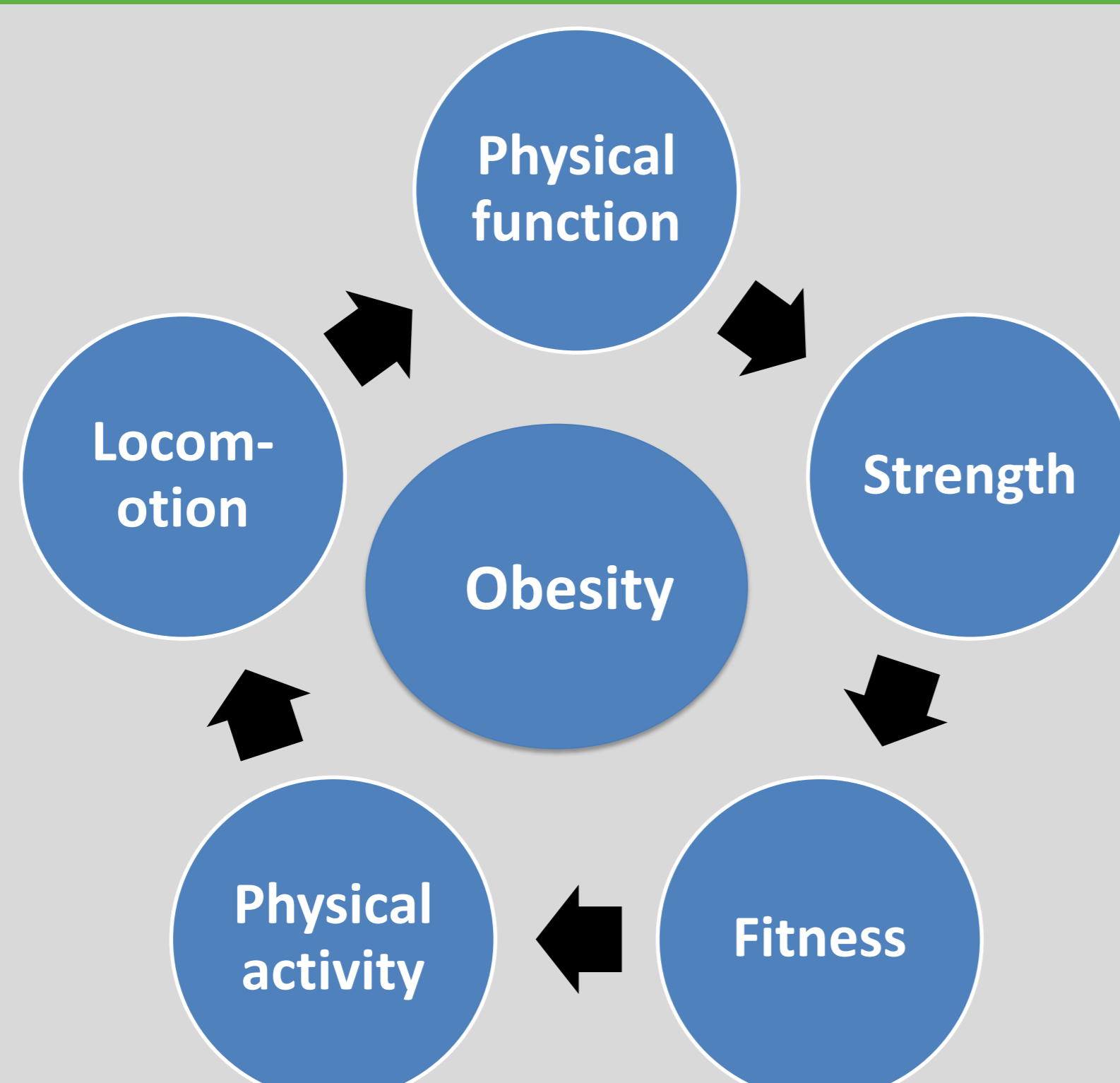


# Relationships between physical function, strength and obesity in children: Implications for physical fitness and activity

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## Introduction



This research aims to investigate the relationships between childhood obesity with physical function, locomotion and strength.

## Methods

Nine overweight/obese (OWB) and nine sex-, age- and height-matched healthy weight (HW) children (mean age  $9.69 \pm 0.63$  years) participated in the study (IOTF cut-offs).

Measures:

- Physical function – Six Minute Walk Time (6MWT) and timed chair rise
- Strength – hip, knee and ankle isometric flexion/extension dorsiflexion (DF)/plantarflexion (PF) hand-held dynamometer
- Locomotion – medial/lateral (ML) and anterior/ posterior (AP) Centre of Pressure (CoP) excursions during first contact (FC), metatarsal contact (MC), foot flat (FF), heel off (HO), last contact (LC) stance phase of walking

Independent t-tests for between group differences.

Bi-variate correlation among variables (Spearman's)

Multivariable linear regression with BMI z-score as dependent variable.

## Results

Group differences - compared to HW, OWB:

- Weaker hip and knee flexors (Table 1)
- Greater medial and posterior CoP excursions (Figure 1)
- Less distance in 6MWT ( $451.33 \pm 69.13$ m and  $379.11 \pm 65.01$ m for HW and OWB respectively)

Table 1. Group mean  $\pm$  standard deviation of maximal force ( $N \cdot kg.^{.67}$ ).

\*significant difference between OWB and HW groups ( $p < .05$ )

	OWB	HW
Hip extension	$1.27 \pm 0.17$	$1.31 \pm 0.47$
Hip flexion	$1.01 \pm 0.13^*$	$1.49 \pm 0.64^*$
Knee extension	$1.24 \pm 0.27$	$1.63 \pm 0.62$
Knee flexion	$1.14 \pm 0.42^*$	$1.91 \pm 0.65^*$
Ankle dorsiflexion	$1.14 \pm 0.16$	$1.19 \pm 0.51$
Ankle plantarflexion	$1.75 \pm 0.32$	$1.74 \pm 0.80$

## Correlations:

Table 2. Correlation matrix of selected variables of interest. \* significant correlation,  $p < .05$

	BMI Z-Score	6MWT	CoP ML	CoP AP	Hip flexion	Knee flexion	Ankle DF
6MWT	-.378						
CoP ML	-.666* to -.077	-.304 to .102					
CoP AP	-.578* to .213	-.470* to -.072	-.148 to .477*				
Hip flexion	-.442*	.450*	-.556* to -.036	.448* to .042			
Knee flexion	-.517*	.524*	-.623* to .093	-.441* to .138	.930*		
Ankle DF	.119	.221	-.490* to -.192	-.330 to -.009	.486*	.407	
Ankle PF	.172	.191	-.555* to -.081	-.416 to .115	.625*	.399	.931*

## Multiple regression:

BMI z-score was significantly associated with: CoP ML excursion MC to FF, CoP AP excursion FC to MC, and maximal hip flexion force (Table 3).

Table 3. Multiple linear regression of Centre of Pressure, strength and physical function variables with BMI z-score (dependent variable).

Predictor	Beta	SE	P (predictor)	Model R <sup>2</sup>	P (model)
CoP ML excursion between MC and FF	-0.84	0.28	.011*	0.66	.004*
CoP AP excursion between FC and MC	-0.76	0.29	.024*		
Maximal hip flexion force	-0.78	0.36	.037*		

## Discussion/Conclusion

This study presents novel information on CoP data in OWB children and the relationships to physical function and strength. The findings indicate altered physical function and reduced flexor strength in OWB children compared to HW peers<sup>1,2,3</sup>. This has implications for musculoskeletal health as well as physical fitness and activity initiatives used as part of weight loss programmes.

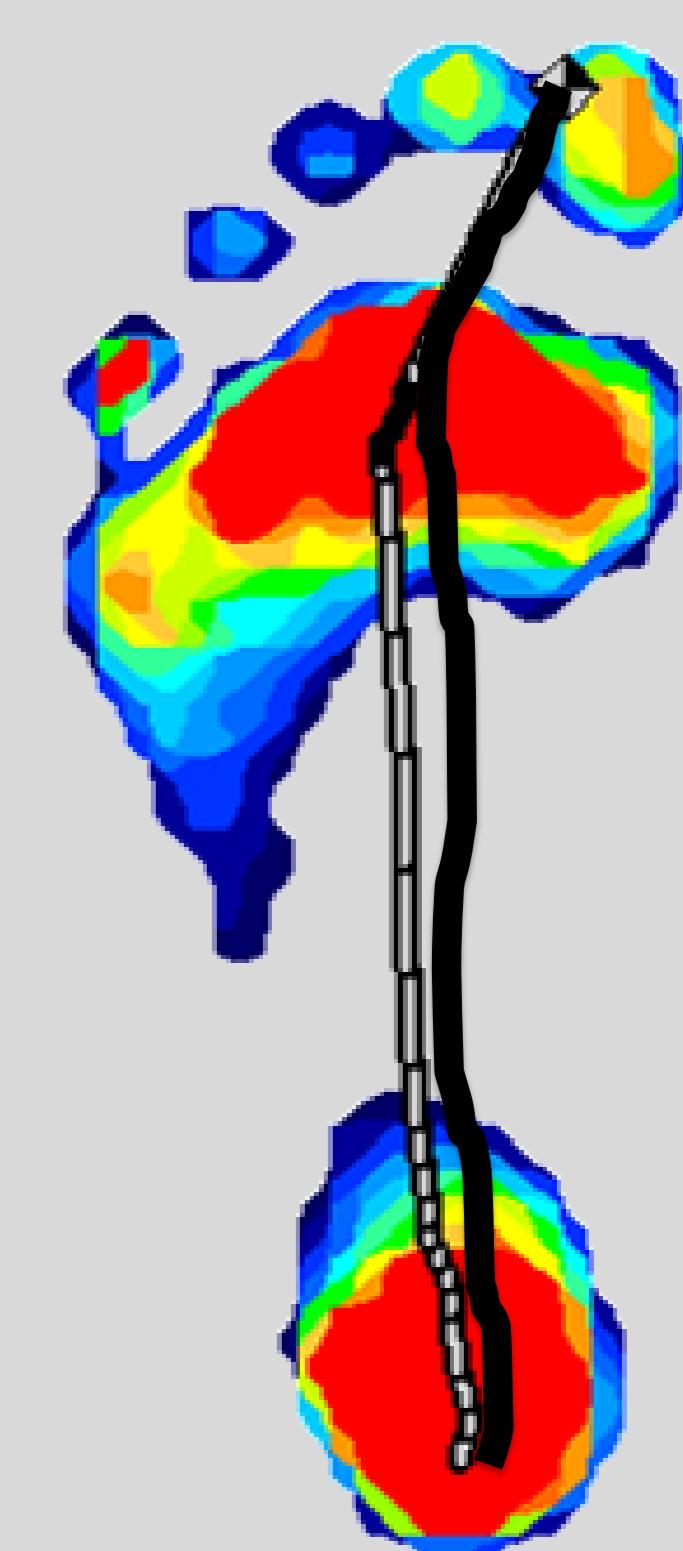


Figure 1. Centre of Pressure trace in HW (white line) and OWB (black line)

## References

- BMC Musculoskelet Disord. 2009;10:47.
- J Neuroeng Rehabil. 2014;11:82.
- Pediatric Phys Ther. 2013;25(2):130-8