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Is bodyweight affecting posturography in children aged between 9 and 11 years? Evidences of a pilot intervention

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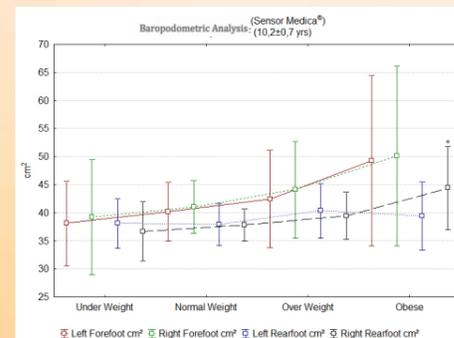
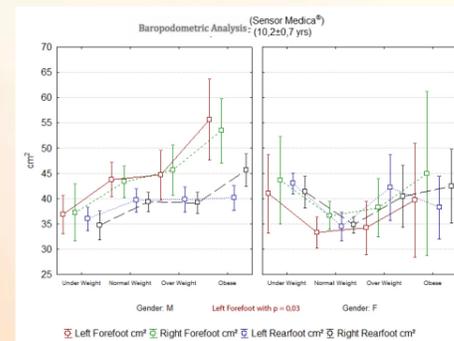


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Aim. The present investigation aimed at the evaluation of the posturographic parameters in a sample of children of both sexes with the aim to better understand if posturography can be adopted and useful during school age period.

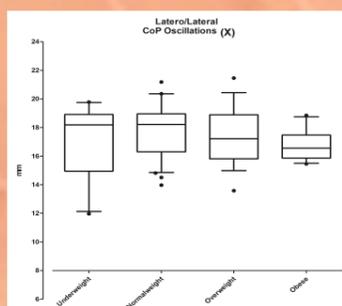
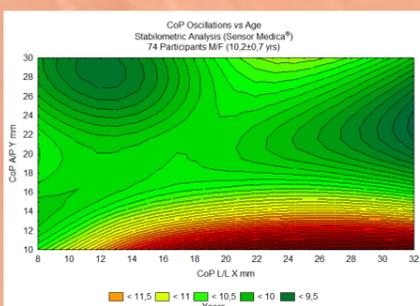
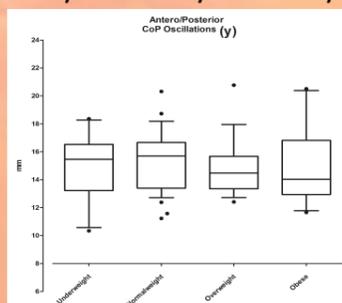
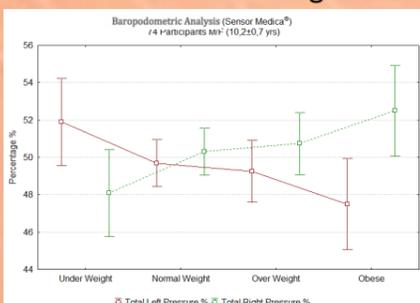
Methods. A number of 74 children (10,2±0,7 yrs; 145,7±8,7 cm; 42,2±9,9 kg;) attending 6th grade school have been involved during one week data collection period (October, 2015). All children were invited to participate at static baropodometric and stabilometric analyses carried out through a force platform freeStep[®] and a computer software freeMed[®] provided by Sensor Medica[®] (Guidonia, Montecelio, Roma, Italy). The following variables were recorded: 1) Anthropometric characteristics; 2) Baropodometric parameters and stabilometric parameters. The data were analyzed with STATISTICA 8.0 software and the One-way ANOVA analysis and/or T-test analysis were adopted when appropriate.

Results. Participants were categorized first in Males (N 51; 10,2±0,7 yrs; 145,6±9,0 cm; 41,9±9,0 kg) and Females (N 23; 10,3±0,8 yrs; 145,9±8,3 cm; 43,0±11,8 kg). Baropodometric parameters comparison showed a left forefoot plantar surface significantly different (0.03) in males (44,5±17,1 cm²) compared to females (35,6±13,0 cm²). No differences were found in total left (males 49,8±7,9%; females 49,1±6,0%) and right (males 50,2±7,9%; females 50,9±5,9%) plantar pressure distribution; the data were normalized according with the participants' foot length in centimeters (24,4±1,1 in males vs 23,5±1,7 in females – 0.001). The stabilometric analysis did not showed significant differences between genders (CoP - Latero/Lateral Oscillations 15,5±3,1 mm in males; CoP - Latero/Lateral Oscillations 14,8±2,1 mm in females; CoP - Antero/Posterior Oscillations 17,6±2,5 in males; CoP - Antero/Posterior Oscillations 17,3±2,1 in females). In a second time, participants were categorized in weight status categories according to the international cut off points for children's body mass index provided by Cole et al, (BMJ volume 320, 6 may 2000). From underweight category up to obese category (including so also normal weight and overweight) the One-way analysis of variance was performed for all posturographic parameters. In stabilometric analysis, we found no significant differences between categories, but interestingly in baropodometric evaluations we found one completely different load distribution (left-right) while watching from underweight category up to obese category. In addition, during the t-tests comparisons we found a significant difference (0.003) between right rearfoot plantar surface in underweight children (M/F 36,7±7,4 cm²) when compared with rearfoot plantar surface of obese children (M/F 44,4±10,3 cm²). This last result confirms the interesting trend already shown by the analysis of variance (1 x 4).



Variable	All Sample (N 74)	Males (N 51)	Females (N 23)	t-test for independent samples (p)	t-test for independent samples (p)
Age, yrs	10,2±0,7	10,2±0,7	10,3±0,8	0,80747	0,37093
Height, cm	145,7±8,7	145,6±9,0	145,9±8,3	0,87709	0,80240
Weight, kg	42,2±9,9	41,9±9,0	43,0±11,8	0,47200	0,20296
Left Surface, cm ²	85,5±23,7	83,3±24,4	73,3±20,9	0,07804	0,50759
Right Surface, cm ²	81,6±23,7	83,3±23,9	77,3±21,0	0,27011	0,50399
Left Forefoot, cm ²	41,3±16,4	44,5±17,1	35,6±13,0	0,03049	0,24174
Right Forefoot, cm ²	42,8±16,2	44,4±16,4	39,3±15,5	0,21438	0,40453
Left Rearfoot, cm ²	38,6±9,7	39,3±9,3	37,6±10,3	0,49456	0,59195
Right Rearfoot, cm ²	38,9±8,8	39,6±8,9	38,6±8,9	0,51952	0,31311
Total Left Pressure, %	49,6±7,3	49,8±7,9	49,1±6,0	0,70076	0,80225
Total Right Pressure, %	50,4±7,3	50,2±7,9	50,9±5,9	0,70056	0,80225
CoP	15,3±2,8	15,5±3,1	14,8±2,1	0,33887	0,40298
Antero/Posterior, X mm	17,3±2,1	17,6±2,5	17,3±2,1	0,44735	0,48408

Variable	Underweight (N 16)	Normalweight (N 25)	Overweight (N 25)	Obese (N 8)	Upper tail (p)	One way analysis of variance (p)
Left Surface, cm ²	76,3±12,0	76,3±12,0	82,6±21,8	88,3±21,3	0,001	0,001
Right Surface, cm ²	76,3±12,0	76,3±12,0	81,2±21,5	84,4±21,3	0,001	0,001
Left Forefoot, cm ²	38,1±10,5	40,2±11,2	42,5±10,8	49,3±12,2	0,001	0,001
Right Forefoot, cm ²	39,2±10,5	41,3±11,7	41,1±11,8	50,3±12,4	0,001	0,001
Left Rearfoot, cm ²	38,1±10,5	37,9±10,8	40,4±10,1	38,6±8,3	0,001	0,001
Right Rearfoot, cm ²	38,1±10,5	37,9±10,8	39,5±8,8	44,6±10,3	0,001	0,001



Conclusions The posturographic evaluation (plantar pressure and centre of pressure oscillations) seems to be feasible and useful even at early age of 9-11 yrs. We found interesting the fact that there are intra-categories variances. Those results can help professionals to better understand underweight and obese children ontogenesis and can contribute to proper intervention plans in order to prevent musculoskeletal disorders and chronic diseases in adult age. This pilot intervention needs to be confirmed by further investigations with a larger sample and a proper investigation able to provide normative values and standardized operating procedures (SOPs) for children.

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