The influence of physical activity and physical fitness in the metabolic profile and microcirculation of children 5 to 12 y of age eutrophic and with excess weight (P3-899)

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Background: Obesity is a worldwide epidemic affecting adults and children. Overweight children already show a low grade systemic inflammation as well as important and premature markers of increased cardiovascular risk, as the endothelial function.

Aims: To assess if activity level affects the low grade inflammation and the endothelial function in children.

Objectives: To evaluate and compare the influence of physical activity and physical fitness in the metabolic profile and microcirculation of prepubertal or early pubertal children and correlate with body mass index.

Methods: The study was an observational, cross-sectional study involving children aged 5 to 12 years old, pre-pubertal or in early puberty (Tanner 2). Body Mass Index per age (BMI/age) was evaluated in z-scores (WHO 2006, WHO 2007). The study was approved by Ethics and Research Committee of the University and an informed consent was signed by the parent/guardian.

In the Child Obesity Clinic of Pediatric Endocrinology Service of HUPE-UERJ, weight was assessed by a digital scale with resolution of 100 g. Height was measured with a wall mounted stadiometer with resolution of 1mm. Waist circumference was measured at the midpoint between the last costal arch and the iliac crest.

All blood samples were collected in the morning after a 12-h fasting.

Venous occlusion plethysmography Subjects remained in a temperature controlled room (20-22°C) at supine position. Forearm blood flow (FBF), in ml/min/100 ml tissue, was measured in the non-dominant forearm or leg, kept above the heart level, with a mercury-in-silastic strain gauge placed on the proximal third of the member at its maximum circumference. Measurements of the baseline flow and during reactive hyperemia response after 5 min forearm arterial occlusion were performed. There was a 20 min interval between the reactive hyperemia response and the second baseline flow measurement. The mean of the first 4 measurements in each recording period was used for analysis.

Percent body fat was evaluated by DXA.

The physical activity score was assessed by the PAQ-C questionnaire which investigates moderate and intense physical activity in the previous 7 days .

Yoyo Intermittent Endurance Test. The evaluation of the physical fitness was made by hardens yo-yo Intermittent Endurance Test Level 1 which consists of 2x20-m bouts of progressive speed shuttle-running, interspersed by 5 seconds of active recovery. The subject had to run following the beeps emitted by CD player. The signal was based on the speed in kilometers per hour (km/h), starting at 8 km/h and increasing 0,5 km/h each minute.

Statistical analysis

Differences in the anthropometric and physiological parameters between the three groups were tested through non-parametric Kruskal-Wallis ANOVA. The Dunn post-hoc test was used to identify specific differences between groups. Comparisons between eutrophic and weight excess group (overweight + obese groups) were carried out through Mann-Whitney U test. Correlations between variables among the groups were obtained through Spearman's Rho, as well as, the Partial Correlation analyses. Statistical significance level was set to alpha=0.05.

Conclusions: Sedentary young children already have metabolic abnormalities. Physical fitness improves these changes although one of the main drives for these abnormalities could be excess weight. Based on this data we must raise efforts to stimulate the regular practice of exercises besides nutrition counselling and weight monitoring.

Table 1 – Characteristics of children assisted at Child Obesity Clinic, Rio de Janeiro, Brazil.

	Eutrophic (27)	Overweight (10)	Obese (25)	p-value	Wt excess (OW+O)	p-value
age (y)	8,0 (5,0-11,0)	8,9(6,0-11,0)	8,5(5,0-9,0)	0,4656	8,6(5,0-9,0)	0,26
BMI (z-score)	-0,3(-2,4-0,9)	1,4(1,0-2.0)	3,1(2,1-2,8)	**0,0001**	2,6(1,0-2,5)	**<0,0001**
Waist Circ (cm)	58,9(47,5-75,8)	70,8(62,0-91,0)	85,4(34,5-84,0)	**0,0001**	81,26(82,0-34,5)	**<0,0001**
% body Fat	26,0(16,8-37,9)	34,4(24,5-41.3)	45,3(32,6-45,2)	**0,0001**	42,2(24,5-43,3)	**<0,0001**
PAQ-C Z-score	4,5(2,3-7.6)	4,3(2,61-9.1)	3,91(2,1-3,80)	0,1684	4,0(3,75-2,07)	0,06
Yoyo test (m)	290,4(100-640)	246,6(120-400)	192,2(40-160)	**0,02**	206,6(40-195)	**0,01**
TGL (mg/dL)	59.5(44-73)	85(60-109)	100(80-121)	**0,001**	93.5(74.5-114)	**0,0001**
LDL (mg/dl)	88 (76-107.5)	94 (84-140)	102 (92-113)	0,09	102 (87-114)	**0,04**
HDL (mg/dL)	55.5(47-6.5)	45(45-47)	44(37-51)	**0,01**	45(38.5-50.5)	**0,001**
HOMA-IR	1.1(1.0-1.9)	2,4(1,7-4.1)	3.64(2.7-6.8)	**0,001**	3.3(2.2-5.7)	**0,0001**
IL-6 (ng/ml)	2.2(1,50-4.4)	1,53(1,5-1,9)	3.9(2.4-6.0)	**0,03**	3.0(11.5-5.2)	0,54
Adiponectin (µg/ml)	13,3(11.1-15.7)	8.57(7.5-12.7)	6.91(5.5-11.0)	**0,001**	8(5.6-11.8)	**0,0001**
Leptin (ng/ml)	3.6(2.9-5.4)	12.87(4.9-30.7)	29.8(25.7-43.4)	**<0,0001**	29.6(13.0-37.3)	**<0,0001**

Table 2 - Comparison of forearm blood flow (mL/min/100mL tissue) in baseline and after reactive hyperemia

	Eutrophic	Overweight	Obese	p-value	Weight Excess	p-value
Baseline Flow	2.6(1.9-3.1)	2.2(2.0-3.3)	2.15(1.8-3.0)	0,6645	2.15(1.9-3.0)	0,37
Post occlusive reactive hyperemia	5.6(4.9-6.6)	4.92(4.5-5.5)	4.7(3.4-5.7)	**0,04**	4.71(3.7-5.5)	**0,01**

Figure 1 Correlation between endothelial function and body composition markers and leptin

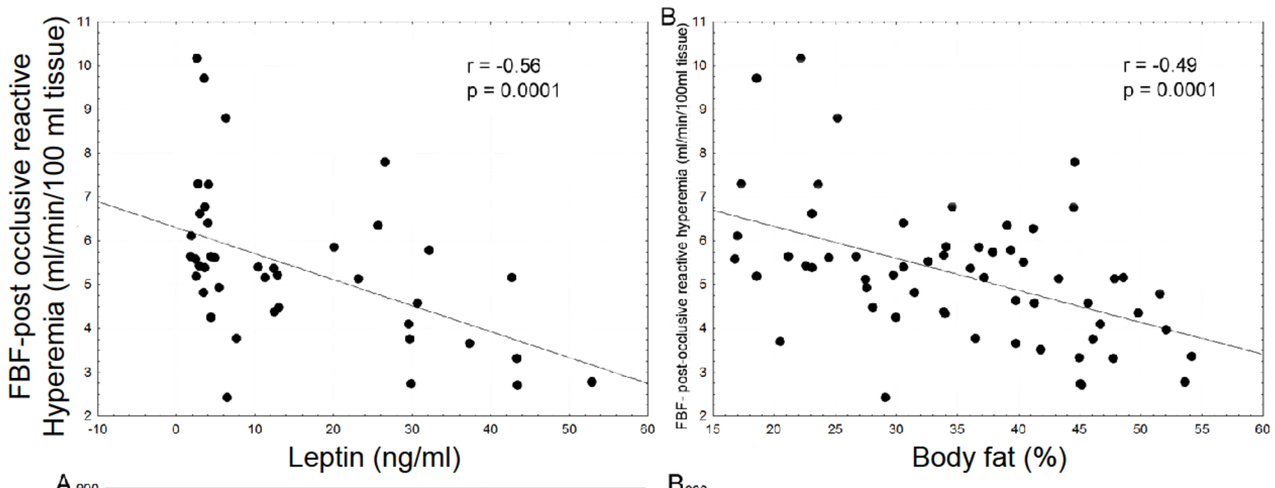

Figure 2 Correlation between activity level and body composition

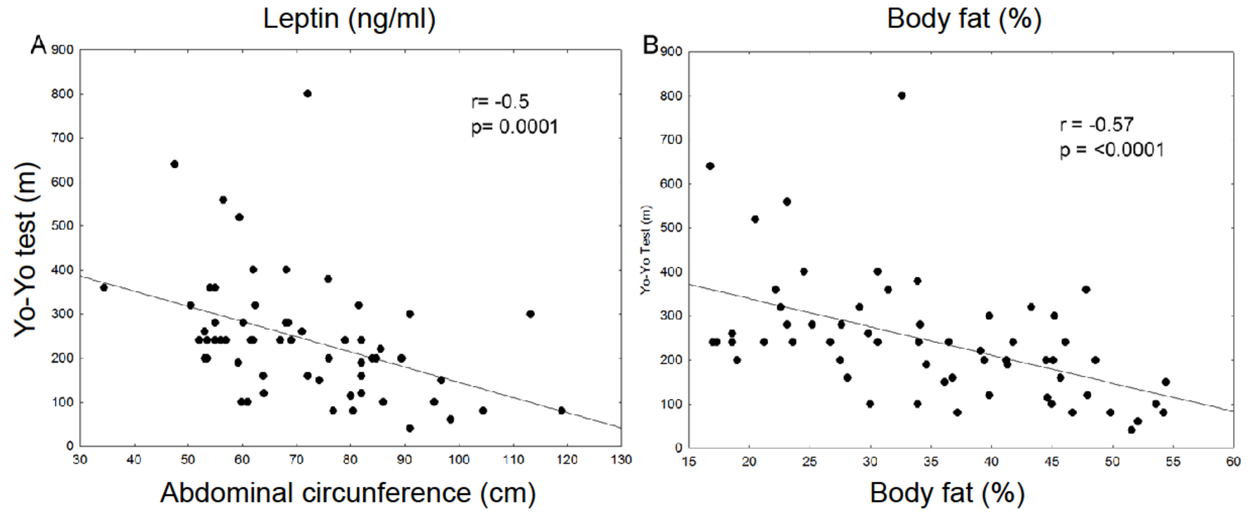

Table 3 - Analysis of non parametric partial correlation between PAQ-C z-score and cardiovascular risk factors, with adjustment for the BMI z-score.

	Partial Correlation with PAQ-C z-score	Adjustment to BMI z-score
TGL (mg/dL)	(r = -0,18;p = 0,18)	(r = -0,01;p = 0,97)
HDL (mg/dL)	(r = 0,18;p = 0,17)	(r = 0,06;p = 0,67)
HOMA-IR	**(r= -0,42;p = 0,01)**	(r = -0,22;p = 0,15)
IL-6 (ng/ml)	(r = -0,02;p = 0,87)	(r = 0,06;p = 0,69)
Adiponectin (µg/ml)	**(r = 0,32;p = 0,02)**	(r = 0,12;p = 0,42)
Leptin (ng/ml)	**(r = -0,50;p = 0,001)**	(r = -0,13;p = 0,42)
Baseline Flow (mL/min/100mL tissue)	(r = -0,03;p = 0,83)	(r = -0,06;p = 0,64)
Flow post occlusive reactive hyperemia	(r = -0,13;p = 0,34)	(r = 0,02;p = 0,90)

Table 4 - Analysis of non parametric partial correlation between yoyo test and cardiovascular risk factors, with adjustment for BMI z-score.

	Partial Correlation with yoyo test	Adjustment to BMI z-score
TGL (mg/dL)	(r = -0,19;p = 0,17)	(r = 0,1;p = 0,46)
HDL (mg/dL)	**(r = 0,41;p = 0,01)**	**(r = 0,28;p = 0,03)**
HOMA-IR	**(r = -0,38;p = 0,01)**	(r = 0,02;p = 0,92)
IL-6 (ng/ml)	**(r = -0,26;p = 0,07)**	(r = -0,21;p = 0,15)
Adiponectin (µg/ml)	(r = 0,13;p = 0,37)	(r = -0,15;p = 0,30)
Leptin (ng/ml)	**(r = -0,40;p = 0,01)**	(r = -0,04;p = 0,82)
Baseline Flow (mL/min/100mL tissue)	(r = -0,10;p = 0,45)	(r = -0,15;p = 0,27)
Flow post occlusive reactive hyperemia	(r = 0,15;p = 0,25)	(r = - 0,06;p = 0,68)

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Fat 2

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