



***“Soccer as a novel therapeutic approach to pediatric obesity.
A randomized controlled trial of its effects on fitness, body composition,
cardiometabolic and oxidative markers”***

Final Report

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Summary

Childhood obesity is increasing dramatically and is associated with the several cardiometabolic comorbidities. Physical activity has been accepted as an important mean for its prevention. However, only few studies have investigated the impact of a team sports intervention on cardiometabolic risk factors (CMRF), inflammatory markers and cardiorespiratory fitness in obese children. The purpose of the present study was to examine the effects of a 6-month intervention of soccer practice on the body composition, CMRF and inflammatory markers, cardiorespiratory fitness and psychological status of obese children. Eighty eight boys (8-12 yrs; body mass index [BMI] > than CDC 95th percentile) were randomly assigned to 6-months' exercise or non-exercised program: 29 were assigned to a soccer program (SG), 29 were assigned to a traditional physical activity program (TG) and 30 were assigned as a control group (CG). The soccer and traditional physical activity programs involved sessions 60-90 min, 3 times/week; average intensity >70-80%HRmax. Both groups participated in two sessions of 45-90-minutes physical education per week at school. Height, body mass, waist circumference, blood pressure, fasting blood glucose, high-density lipoprotein-cholesterol, triglycerides, insulin, adiponectin, leptin, resistin, C-reactive protein, tumor necrosis factor alpha, oxidized low density lipoprotein cholesterol and maximal oxygen consumption (VO_{2max}) were evaluated according to standardized procedures. Body composition was assessed by DXA. Indicators of perceived psychological status included body image, self-esteem, attraction to participation in physical activity, perceived physical competence and quality of life measured with standardized questionnaires. Physical activity levels was monitored with accelerometers for 7 days. From baseline through 6 months, the two physical activity groups (SG and TG) showed improvements in body composition, lipid profile, insulin sensitivity, CMRF and inflammatory status, cardiorespiratory fitness and psychological status compared to the CG. The improvement in some variables was more apparent in SG than TG. These findings provide evidence that soccer as a highly popular socially and culturally meaningful sport accessible to all social strata is a highly effective medium for the prevention/reduction of childhood obesity and for the enhancement of body composition, cardiometabolic health, cardiorespiratory fitness and associated psychological status of obese youth.

I. INTRODUCTION

Childhood overweight and obesity have reached epidemic proportions [1]. Approximately 25% of children in developed countries are currently overweight or obese. Prevalence has doubled in Portugal in the last two decades [2]. The increasing prevalence of childhood obesity is associated with an increase in cardiovascular and metabolic risk and comorbidities [3]. Evidence also has suggested that cardiovascular and metabolic risk factors (CMRF) in youth may persist throughout life even in the presence of improved nutritional status and may compromise quality of life as well as life expectancy [4].

For all these reasons, childhood obesity and CMRF represent serious health conditions that need treatment in order to prevent the development of additional health consequences. Physical activity has been accepted as an important means for its prevention [5, 6]. Evidence concerning the effectiveness of physical activity interventions to tackle childhood obesity and CMRF has been reviewed [6-8]. These studies have shown positive effects of physical activity on CMRF, body composition and associated psychological consequences in overweight and obese children. Though interesting, these studies emphasize a need for further research for three reasons. First, results are not entirely congruent across studies. Second, sample sizes varied considerably among studies. And third, physical activity programs varied in intensity, duration, type and setting. Intervention physical activity programs for overweight and obese children have generally incorporated a variety of aerobic and resistance activities accommodating individual differences in physical activity interests (running and walking), and rarely link children's interests to team-games and sport activities (see, for example, [7, 9-11].

Current recommendations from select panels and international health organizations [12] suggest that children should accumulate at least 60 minutes or more of aerobic moderate- to vigorous-intensity physical activity per day, and to perform muscle and bone-strengthening activities at least 3 days per week. Participation in activities that are appropriate for age and enjoyable, and offer variety is recommended [13]. In Portugal, more than 60% of the children do not reach the recommendations [14]. Factors responsible for this low compliance are not well understood. A plausible explanation is probably linked to limited possibilities of undertaking recommended physical activity (i.e., type, duration, frequency and intensity) in many school and community settings. Another

possible explanation is that children perceive prescribed physical activity as not enjoyable because it is superimposed by others and not self-chosen. The data for Portugal are generally consistent with the increasing prevalence of physical inactivity among children worldwide; it is estimated that about two-thirds of the child population are insufficiently physically active [15].

Soccer is a popular, affordable, and widely practiced team-sports worldwide and has been recently suggested as a very effective “tool” in reducing CMRF in adults [16]. Traditionally played as 11 vs. 11, but also as small-sided games (e.g. 3v3, 5v5, 7v7), football is associated with relatively high energy expenditure and a high aerobic component, with mean heart rates (HR) of 75-85% of maximum HR [17, 18]. Recreational soccer also involves high impact activities which stimulate the muscular-skeletal system. The efficacy of a recreational soccer program on health and fitness of overweight children has been recently investigated [19, 20]. While no detailed CMRF were assessed, this novel data suggested that soccer has a high positive effect in weight control. Given this novelty, we believe that soccer being a highly popular sport, socially and culturally meaningful and accessible to all social strata has an increased potential to operate as a highly effective “medicine” for the prevention/reduction of childhood obesity and CMRF.

Thus, based on a 6-month randomized trial design, this study aimed to provide adequate answers to the following hypotheses:

- (1) Systematic practice of recreational soccer has a significant effect in reducing CMRF and percentage of body fat, and in improving muscle and bone mass, cardiorespiratory fitness and associated psychological consequences;
- (2) Systematic practice of recreational soccer has a greater effect than other traditional physical activity intervention program in increasing energy expenditure, reducing CMRF, and improving body composition, cardiorespiratory fitness and associated psychological consequences;
- (3) With recreational soccer as the template for regular physical activity or reducing the expression of CMRF, new subsets of markers with greater sensitivity and predictive and clinical utility will be developed.

II. STATE OF THE ART

The increasing prevalence of childhood obesity [1] is associated with an increase in CMRF and comorbidities [3]. Evidence also suggests that CMRF in youth may persist (track) throughout life even in the presence of improved nutritional status [21] compromising the quality of life and its expectancy [4]. Abdominal obesity, high blood pressure, elevated triglycerides and glucose, and reduced levels of high-density lipoprotein are commonly clustered as the metabolic syndrome [22]. Although variably defined, prevalence of metabolic syndrome has increased recently and has reached 15-17% among Portuguese obese children [2, 23]. If risk factor aggregation, rather than traditional criteria for metabolic syndrome, is used, more than one-half of obese children have two or more risk factors [24]. This approach suggests that classical markers may not be sufficiently sensitive at pediatric ages and highlight a need to consider other markers of CMRF. Recent research suggested the existence of other biological markers associated with pro-inflammatory and pro-oxidant states which are expressed at earlier ages with greater sensitivity [24, 25]. These novel markers are adiponectin and its isoforms, leptin, resistin, high sensitivity C- reactive protein (CRP), tumor necrosis factor alpha (TNF- α) and lipoprotein particularly its oxidized high-density (LDL-ox). Cytokines are precocious markers of CMRF associated with obesity. Some have a pro-inflammatory action (TNF- α , IL-6), are significantly higher in the plasma of obese patients and triggers an increased synthesis of hsCRP [26]. This inflammation may promote CMRF comorbidities of obesity, namely dislipidemia, insulin resistance and endothelial dysfunction. This is the reason why obesity may be regarded as a state of low grade inflammation and atherosclerosis. In contrast, adiponectin decreased plasma concentration in obese is associated with an anti-inflammatory status and an antiatherogenic and antidiabetic profile, meaning that adiponectin acts as a precocious and independent biomarker of metabolic syndrome [27].

Childhood obesity and CMRF represent serious health conditions that must be treated in order to prevent the development of additional health consequences. Physical activity has been accepted as an important means for its prevention [23]. The evidence concerning the effectiveness of PA interventions to tackle childhood obesity and CMRF has been reviewed [6-8]. These studies have shown positive effects of physical activity on body composition, CMRF, cardiorespiratory fitness and psychological status in obese children. However, there is a consistently call for future research centered on

intervention novelty and innovative biological markers. The inconsistency of available data involved a wide range in sample sizes, physical activity programs with different intensities, durations, frequencies and types of activities. Intervention physical activity programs for obese children have generally incorporated a variety of aerobic and resistance activities accommodating individual differences in physical activity interests (running and walking), and rarely link children's interests to team-games and sport activities [6, 7].

Current recommendations from select panels and national health organizations [12, 13] suggested that children should accumulate at least 60 minutes or more of aerobic moderate-to-vigorous intensity physical activity per day, and to perform muscle and bone-strengthening activities at least 3 days a week. Participation in activities that are age appropriate and enjoyable, and offer variety is recommended [13]. In Portugal, more than 60% of the children do not reach these recommendations [14]. Responsible factors for this low compliance are not well understood. A plausible explanation is probably linked to limited possibilities of undertaking recommended physical activity (type, duration, frequency and intensity) in many school and community settings. Another possible explanation is that children perceive prescribed PA as not enjoyable because it is superimposed by others and not self-chosen. Children tend to participate in relatively short bouts of physical activity. Heart rate (HR) monitoring demonstrates that recreationally active children perform primarily short bouts of activities (<5min) and seldom participate in long-sustained activities (>20min) [17].

By inference, physical activity proposed in intervention studies should closely represent the natural pattern of spontaneous physical activity among the children, thus increasing enjoyment of the participants. Soccer is one of the most popular, affordable, and widely practiced team-sports worldwide and has been recently suggested as a very effective "tool" in reducing CMRF in adults [16]. Traditionally played as 11vs11, but also conducted as small-sided games (3vs3, 5vs5), it is associated with relatively high energy expenditure and has a high aerobic component (HR>75max) [17]. Recreational soccer also involves high impact activities which stimulate the muscular-skeletal system [18]. The efficacy of a recreational soccer program on health and fitness of overweight children has been recently investigated [19, 20]. While no detailed CMRF were assessed, this novel data suggested that soccer has a high positive effect in weight control. Given this novelty, we believe that soccer being a highly popular sport, socially

and culturally meaningful and accessible to all social strata has an increased potential to operate as an effective “medicine” for the prevention of childhood obesity and CMRF.

Given this small number of studies that use soccer as a strategy to prevent childhood obesity, the next paragraphs intend to summarize the main results that are known about the effectiveness of physical activity programs on body composition, cardiorespiratory fitness, CMRF and inflammatory markers in overweight and obese children and adolescents.

Effect of physical activity on body composition and cardiorespiratory fitness

Table 1 summarizes the effects of physical activity interventions on body composition and cardiorespiratory fitness variables. Twenty-two studies quantified the impact of physical activity on BMI [7, 11, 28-46]. Fifteen of these studies were effective in reducing the BMI [7, 28, 30, 31, 33-40, 42, 46, 47], six studies did not report any significant change [11, 29, 32, 41, 43, 45], and only one study showed a BMI increase after the intervention [44]. Of the nineteen studies that measured the percentage of body fat [7, 11, 28-30, 32, 33, 35-40, 42-46], twelve studies have reported a decrease [28-33, 35, 37, 38, 40, 42, 43] and seven studies no change [7, 11, 36, 39, 44-46]. Nine of the 10 studies that measured waist circumference showed significant improvements after the intervention programs [7, 11, 31, 33, 38-40, 42, 43]. Only ten studies assessed changes in cardiorespiratory fitness [29, 31-35, 39-41, 43]. Seven of these studies showed an improvement in cardiorespiratory fitness [31-33, 35, 39, 40, 43], while three studies did not report any significant difference pre and post intervention program [29, 34, 41].

Table 1. Effect of interventions on body composition and cardiorespiratory fitness.

Study	BMI	Body fat (%)	WC	Cardiorespiratory fitness
Flores [34]	↓	NE	NE	↔
Neumark-Sztainer, Story [41]	↔	NE	NE	↔
Bayne-Smith, Fardy [29]	↔	↓	NE	↔
Watts, Beye [45]	↔	↔ (↓Tr. ↓ Ab.)	↔	NE
Carrel, Clark [32]	↔	↓	NE	↑
Balagopal, George [28]	↓	↓	NE	NE
Nassis, Papantakou [11]	↔	↔	↓	NE
Meyer, Kundt [7]	↓	↔	↓	NE
Melnyk, Small [47]	↓	NE	NE	NE
Kim, Im [38]	↓	↓	↓	NE
Johnston, Tyler [36]	↓	↔	NE	NE
Wong, Chia [46]	↓	↔	NE	NE
Foschini, Araújo [35]	↓	↓	NE	↑
Tjonna, Stolen [43]	↔	↓	↓	↑
Lee, Shin [39]	↓	↔	↓	↑
Van Der Heijden, Wang [44]	↑	↔	NE	NE
Ben Ounis, Elloumi [30]	↓	↓	NE	NE
Johnston, Tyler [37]	↓	↓	NE	NE
Shih, Janckila [42]	↓	↓	↓	NE
Buchan, Ollis [31]	↓	↓	↓	↑
Lee, Bacha [40]	↓(st) ↔(at)	↓(st) ↓(at)	↓(st) ↓(at)	↑(st) ↑(at)
Farah, Ritti-Dias [33]	↓	↓	↓	↑

BMI, Body mass index; WC, Waist circumference; ↓, Significant decrease in the mean value; ↔, No significant change in the mean value; ↑, Significant increase of the mean value; Tr., Percentage of fat in the trunk; Ab., Percentage of fat in the abdomen; NE, Not evaluated st, strength training; at, aerobic training.

Effect of physical activity on CMRF

Table 2 exhibits the effects of physical activity interventions on blood pressure (BP) and heart rate (HR). Data on resting BP were available from ten studies [7, 29, 31, 33, 35-38, 43, 46]. Seven of the nine studies showed significant decreases in systolic BP (SBP) after the intervention [7, 29, 31, 33, 35, 43, 46], while three studies did not report significant changes [36-38]. Ten studies examined the diastolic BP (DBP) [7, 29, 31, 33, 35-38, 43, 46]. Three of them observed a reduction in their values [29, 35, 43], but the other seven did not report significant changes [7, 31, 33, 36-38, 46]. Only seven studies

measured the HR at rest or during submaximal exercise [11, 33, 34, 37, 38, 45, 46]. Four of them showed a reduction due to the intervention [11, 33, 34, 46], while the other three did not find significant differences [37, 38, 45].

Table 2. Effect of physical activity interventions on blood pressure variables.

Study	SBP	DBP	HR
Flores [34]	NE	NE	↓
Bayne-Smith, Fardy [29]	↓	↓	NE
Watts, Beye [45]	NE	NE	↔
Nassis, Papantakou [11]	NE	NE	↓
Meyer, Kundt [7]	↓	↔	NE
Kim, Im [38]	↔	↔	↔
Johnston, Tyler [36]	↔	↔	NE
Wong, Chia [46]	↓	↔	↓
Foschini, Araújo [35]	↓	↓	NE
Tjonna, Stolen [43]	↓	↓	NE
Johnston, Tyler [37]	↔	↔	↔
Buchan, Ollis [31]	↓	↔	NE
Farah, Ritti-Dias [33]	↓ (lit)	↔ (lit)	↔ (lit)
	↓ (hit)	↔ (hit)	↓ (hit)

BP, Systolic blood pressure; DBP, Diastolic blood pressure; HR, heart rate; ↓, Significant decrease in the mean value; ↔, No significant change in the mean value; ↑, Significant increase of the mean value; NE, Not evaluated; lit, low intensity training; hit, high intensity training.

Studies investigating the effects of physical activity on metabolic markers are shown in table 3. Of the twelve studies that measured insulin level [7, 11, 32, 33, 35, 36, 38-40, 43-45], six reported a decrease [7, 11, 32, 35, 39, 43] and seven did not detect significant changes [35, 36, 38, 39, 43, 45, 46]. Plasma glucose levels were measured in ten studies [11, 32, 35, 36, 38-40, 43, 44, 46], most of them reporting significant improvements. Nine studies examined the response of high-density lipoprotein cholesterol (HDL) to physical activity interventions and no significant change was reported [7, 35-38, 43, 44, 46]. However, of the seven studies that measured low-density lipoprotein cholesterol (LDL) levels [7, 35-38, 44, 46], four showed a significant decrease [7, 35-37], while three did not report significant changes [38, 44, 46]. Five studies showed a decrease in the total cholesterol level [7, 35-37, 39], but other five did not observe significant changes [29, 38, 44-46].

Table 3. Effect of physical activity interventions on metabolic variables.

Study	Insulin	Glucose	HDL	LDL	Total cholesterol
Bayne-Smith, Fardy [29]	NE	NE	NE	NE	↔
Watts, Beye [45]	↔	NE	NE	NE	↔
Carrel, Clark [32]	↓	↔	NE	NE	NE
Nassis, Papantakou [11]	↓	↔	NE	NE	NE
Meyer, Kundt [7]	↓	NE	↔	↓	↓
Kim, Im [38]	↔	↓	↔	↔	↔
Johnston, Tyler [36]	↔	↔	↔	↓	↓
Wong, Chia [46]	NE	↔	↔	↔	↔
Foschini, Araújo [35]	↓	↔	↔	↓	↓
Tjonna, Stolen [43]	↓	↓	↔	NE	NE
Lee, Shin [39]	↓	↑	↔	NE	↓
Van Der Heijden, Wang [44]	↔	↔	↔	↔	↔
Johnston, Tyler [37]	NE	NE	↔	↓	↓
Lee, Bacha [40]	↔(st)	↔(st)	NE	NE	NE
	↔(at)	↔(at)	NE	NE	NE
Farah, Ritti-Dias [33]	↔	NE	NE	NE	NE

HDL, High density lipoprotein; LDL, Low density lipoprotein; ↓, Significant decrease in the mean value; ↔, No significant change in the mean value; ↑, Significant increase of the mean value; NE, Not evaluated; st, strength training; at, aerobic training.

Effect of physical activity on inflammatory markers

As shown in Table 4, few studies have investigated the effects of physical activity on inflammatory markers in overweight and obese children and adolescents. Of the seven studies that evaluated C-reactive protein (CRP) levels [7, 11, 28, 30, 38, 42, 46], three showed a reduction [28, 30, 42], three did not report significant changes [11, 38, 46] and only one study reported an increase after the intervention [7]. Five studies have examined the response of interleukin-6 (IL-6) to physical activity [11, 28, 30, 38, 42], three of them showing a significant decrease in their levels [28, 30, 42] and two reporting no significant change [11, 38]. Three studies evaluated the adiponectin levels [11, 38, 43], two of them detecting an increase in the basal levels [38, 43]. Among the two studies that measured the fibrinogen levels [7, 28], one reported a reduction [28], but one showed an increase after the intervention [7].

Table 4. Effect of physical activity interventions on inflammatory markers.

Study	CRP	IL-6	Adiponectin	Fibrinogen
Watts, Beye [45]	NE	NE	NE	NE
Balagopal, George [28]	↓	↓	NE	↓
Nassis, Papantakou [11]	↔	↔	↔	NE
Meyer, Kundt [7]	↑	NE	NE	↑
Kim, Im [38]	↔	↔	↑	NE
Wong, Chia [46]	↔	NE	NE	NE
Tjonna, Stolen [43]	NE	NE	↑	NE
Ben Ounis, Elloumi [30]	↓	↓	NE	NE
Shih, Janckila [42]	↓	↓	NE	NE

CRP, C-reactive protein; IL-6, interleukine-6; ↓, Significant decrease in the mean value; ↔, No significant change in the mean value; ↑, Significant increase of the mean value; NE, Not evaluated.

III. TASKS AND ACTIVITIES

In order to provide adequate answers to the above hypotheses, we proposed a timeline with several tasks and activities to develop throughout the project. Therefore, this report will present different tasks and activities implemented.

Table 5. Timeline with tasks and activities developed throughout the project.

	June 2013 to March 2014											
Tasks denomination	1	2	3	4	5	6	7	8	9	10	11	12
(1) Contacts with CUF Hospital and Faculty of Sport administration, parents and children												
(2) Baseline data collection												
(3) Soccer and individual intervention programs												
(4) Post intervention programs												
(5) Writing final report (Main findings)												

3.1. TASK 1 - Contacts with CUF Hospital (Pediatric Unit) and Faculty of Sport administrations, parents and children

Activity 1 - Contacts with the CUF Hospital (Pediatric Unit) and Faculty of Sport administrations

The CUF Hospital and the Faculty of Sport of the University of Porto administrations were contacted to discuss the project, its importance and relevance in terms of Public Health and Education. During the meeting an extensive package with all information concerning the project was provided. In addition, it was discussed the timeline and involvement of the Pediatric Unit of CUF Hospital and Faculty of Sport in all the project phases.

Results achieved: Pediatric Unit of CUF Hospital and Faculty of Sport have authorized to conduct the project.

Resources allocated to this task: Material related to secretarial work.

Date of task conclusion: May 31th, 2013

Activity 2 - Contacts with the parents and children. Sample selection

A total of 200 children from the Pediatric Unit of the CUF Hospital – Porto were invited for participation in this project. In order to be included in this study, children had to be between 8 to 12 years of age, and to have a BMI greater than CDC 95th percentile for sex and age-specific [48]. Children using a medication or with diagnosed medical conditions that would limit their ability to perform activities (e.g., cardiovascular disease, type I diabetes, renal insufficiency, liver disease) were excluded. Children who participated in a structured exercise, nutrition and/or weight loss program for at least 1 year prior to the study were also excluded. Of these 90 obese children agreed to participate. Sample size calculations were performed a priori for repeated measures ANOVA using the G*Power software 3.1.9.2. Hypothesizing an effect size (Cohen's d) of 1.0 [49] for a required power of 95% at $p < 0.05$, a sample size of at least eighteen in each group was required. Therefore, a larger sample size should provide adequate power for detecting both differences.

This study was ethically reviewed and approved by the research committee of the Faculty of Sport of the University of Porto and by hospital authorities (#12/2013). It was conducted in compliance with the declaration of Helsinki. All participating children and their legal representatives received information sheets and filled out written consent forms.

Results achieved: Parents and ninety children followed in the Pediatric Unit of CUF Hospital Porto gave their authorization consents agreed to participate in this study.

Resources allocated to this task: Material related to secretarial work.

Date of task conclusion: June 30th, 2013

3.2. TASK 2 - Baseline data collection, entering data, screening, statistical analysis and randomization of the intervention groups

Activity 1 - Baseline data collection

The evaluation of the children participating in this project required the completion of two assessments (baseline and final). The baseline assessment was conducted in the first week of September 2013 to all participating children at the Faculty of Sport - University of Porto. The final assessment was conducted in the first two weeks of March 2014 to all participating children at the Faculty of Sport - University of Porto. The methodology of this project, although very diverse, focused on seven major areas: (1) anthropometry; (2) body composition; (3) biological maturity status; (4) CMRF; (5) cardiorespiratory fitness; (6) perceived psychological status; (7) physical activity and dietary intake. Each child was tested on two occasions. Anthropometric and body composition measures, CMRF, and psychological measures were assessed during the initial visit whereas cardiorespiratory fitness was assessed during the second visit.

(1) Anthropometry

Body mass, height and waist circumference were measured following standardized procedures. Body mass was measured using a physician's digital scale (Tanita®, BC-418MA, USA) and height using a fixed stadiometer (Holtain Ltd., UK) and waist circumference with a metallic tape (Holtain Ltd.). BMI (kg/m²) was calculated. The

children were classified as obese if they had a BMI greater than CDC 95th percentile for sex and age-specific [48].

(2) Body composition

Body composition was measured by dual-energy X-ray absorptiometry (DXA) (Hologic QDR 4500A, Hologic Inc., Waltham, MA, USA), which segments the body into the 3 compartments of fat mass, bone mass, and fat-free mass. The equipment was calibrated according to the manufactures instruction and well-trained technician made the exams. Children were scanned in supine position and the scans were performed in high resolution. Bone mineral content (BMC) and density (BMD) were measured for the whole body and the lumbar spine (L1–L4) using standard protocols. The same investigator analysed all total body scans. The principles behind body composition analyses with DXA are explained elsewhere [50].

(3) Biological maturity status

Stage of pubic hair (PH) was the indicator of biological maturity status. Stage of PH based on the criteria of [51] was evaluated at clinical examination by a pediatrician experienced in the assessment of secondary sex characteristics.

(4) Cardiometabolic risk factors

After an overnight fast, between 8.00 and 10.00 a.m. at Faculty of Sport - University of Porto, blood samples were collected by venipuncture in EDTA containing tubes and processed within 2 hours of collection, from all participants at baseline and after six months. Aliquots of plasma were made and stored at -80°C until assayed. Analysis of baseline and follow up samples were performed in the same day. All blood samples were analyzed for fasting blood glucose (FBG), high-density lipoprotein-cholesterol (HDL-c), triglycerides (TRG), fasting insulin, adiponectin (Adip) , leptin (Lept), resistin (Resit), C-reactive protein (CRP), tumor necrosis factor alpha (TNF- α), and oxidized low density lipoprotein cholesterol (LDL-ox). TC and TRG concentrations were determined by enzymatic colorimetric tests (CHOD-PAP and GPO-PAP methods, Roche, respectively). HDL-c was measured using a specific enzymatic colorimetric test (Direct HDL cholesterol, Roche). Low-density lipoprotein-cholesterol (LDL-c) concentration was calculated using Friedewald formula [52]. The determination of circulating levels of glucose and insulin was performed by using routine automated technology (Roche). CRP was determined by a imunoturbidimetry test (Roche). The degree of

insulin resistance was estimated with the use of the homeostatic model assessment for insulin resistance (HOMA-IR) and calculated as the product of the fasting plasma insulin ($\mu\text{U/ml}$) and the fasting plasma glucose (mg/dl) divided by 405 [53]. Plasma concentration of Adip, Lept, Resist (e-Bioscience) and LDL-ox (Mercodia) were evaluated by commercial enzyme-linked immunoassays (ELISA). Blood samples were collected by qualified nurses of CUF Hospital. Breakfast was provided to all children immediately following sampling in the Faculty.

Resting blood pressure (BP) was determined using a digital sphygmomanometer (OMRON M6) after subjects had been seated for 10 min of rest. Two measures were taken with a 3-min interval between successive measurements. If the difference between the first and second measurement, either diastolic blood pressure (DBP) or systolic blood pressure (SBP), are greater than 10mmHg, a third measurement was taken. Children were classified according to sex, height and age-specific charts.

(5) Cardiorespiratory fitness

To assess the maximal oxygen uptake ($\text{VO}_{2\text{max}}$), all children were submitted to a continuous progressive treadmill exercise. Children were instructed to walk/run until exhaustion, according to a standardized exercise protocol [54, 55]. The exercise protocol started at 4km/h without inclination and maintained for 3 min so that children could adapt to the treadmill. After 3 min, speed was increased to $8\text{km}\cdot\text{h}^{-1}$. When 5 min were completed, the inclination was raised to 3%. After 7 and 9 min, the inclination was increased to 6% and 9%, respectively. If children were able to endure more, the speed was increased to 9 km/h after 1 min and then 10 km/h after 13 min.

(4) Perceived psychological status

A reduced version of the children's attraction to physical activity scale (CAPA) developed by Brustad [56] was utilized to measure interest in engaging in physical activity. The Portuguese-language version includes 14 items designed to measure the extent of children's interest in engaging in physical activity. The CAPA includes five dimensions of attraction to participation in physical activity including attraction to participate in vigorous physical activity; perceived importance of participating in physical activity; liking of games and sports; assessments of whether physical exertion is perceived to be fun or important; and attraction due to perceived peer acceptance in games and sports. The CAPA was scored on a 4 point format (one to four) using a "structured-alternative" [57]

approach. Children were presented with two opposing choices and asked to decide which statement best reflected their own feelings. This format was used as a means of reducing “social desirability” tendencies that often occur in responses of children to questionnaires. Once children made their choice, they then had select if it was “somewhat true” or “really true”.

Body image was examined using Collins’ child figure drawings scale [58]. The scale includes seven silhouette figures of boys and girls ranging from very thin to obese. The children were asked to indicate the figure that best represented how they currently looked (perceived) and how they wanted to look (ideal). Body dissatisfaction was the difference between the perceived and ideal scores. Negative and positive scores indicated a desire to be fatter or thinner respectively. Moderate to high test–retest reliability and validity have been previously shown for the scale in children [59].

Self-esteem was measured using Rosenberg’s self-esteem scale [60]. The responses to the 10 items were rated on a 4-point scale (strongly disagree to strongly agree), yielding scores between 10 and 40, with higher scores indicating higher self-esteem. This scale is the most widely used measure of global self-esteem and is valid and reliable for students in third to eighth grades [61].

The self-perception profile for children [62] was also used to assess children’s perceived self-competence. The scale is composed of five specific self-concept domains (scholastic competence, athletic competence, social competence, physical appearance, and behavioral conduct) and a separate global self-worth (or self-esteem) subscale. There are a total of 36 items, six for each subscale. The response to each item is scored from 1 to 4, where a score of 1 represents a low perceived competence and a score of 4 indicates a high perceived competence. The response scale is presented in a structured alternative format in order to overcome the children’s tendency to give socially desirable responses. For each statement the child is first asked to decide which kind of kids he/she is most like, those described on the left or those described on the right. Once having made this decision, the child next decides one of these options “really true for me” or “sort of true for me”.

The pediatric quality of life inventory version 4.0 [63] was used to assess health-related quality of life. It is based on a modular approach with generic and disease-specific

instruments. The generic core scales were specifically designed to measure the core health dimensions outlined by the World Health Organization, covering physical, emotional, social and school functioning. For children ages 8-18 years, items are rated on a 5-point likert response scale, ranging from 0 (never) to 4 (almost always), to indicate how much the child has problems with these areas of functioning. From these four core scales, three summary scores can be calculated: a total quality of life score, a physical health score, and a psychosocial health score (emotional, social, and school functioning scales combined).

(7) Physical activity and dietary intake measures

Daily PA was measured using an ActiGraph accelerometer, model GT3X (Pensacola, FL USA) at the baseline and at the conclusion of the study. This is a small, lightweight, triaxial device. This accelerometer produces “raw” output in activity counts per minute (cpm), which gives information about the total amount of physical activity [64]. The accelerometer output can also be interpreted using specific count cut-points, which categorizes activity counts as either sedentary, light, moderate, or vigorous PA. Data reduction, cleaning, and analyses of accelerometer data were performed as described elsewhere [65, 66]. For the present study, data were analyzed using specific cut-points, which have been validated for children and adolescents: ≥ 2296 cpm for moderate to vigorous PA [67]. In this study, the epoch duration was set to 5 seconds, which seems to be more accurate and suitable concerning to the spontaneous and intermittent activities of the young children [68]. The study was conducted on 7 consecutive days (Monday to Sunday). A minimum of 10 hours per day was considered as valid data for the analysis. Parents were instructed to attach the accelerometer when the child awoke and to remove it when they went to bed. The accelerometer was firmly adjusted at the child’s hip by an elastic waist belt under their school clothing. Activities were not prescribed or directed by the teachers or researchers. All children participated in normal activities with their classmates.

Dietary intake was assessed at the baseline and at the conclusion of the study from a three-day dietary record, including two weekdays and one weekend day, completed by parents. Foods portion size and beverages consumed were estimated using household measures (cups, glasses, spoons, slices, food wrappers or containers etc.) as an aid in determining serving sizes. A description of each food and beverage consumed was recorded, including the method of preparation, the time (to the nearest 5 minutes),

location and if appropriate the brand name of the product. The nutrient analysis was performed using the software Food Processor SQL (ESHA Research Inc., Salem, OR, US). This program uses nutritional information from the United States that has been adapted for use with typical Portuguese foods and beverages. Nutrient means of the three days was used in the analysis. At enrollment all children had a meeting with a nutritionist where appropriate food choices were discussed such as the reduction intake of energy dense foods by substituting by healthier alternatives and the increase consumption of fresh fruits and vegetables. Furthermore, one hour session in a small group was led by a nutritionist about energy balance and healthy diet concepts.

Results achieved: Baseline data in all items of the study were collected.

Resources allocated to this task: materials related to secretarial work (questionnaires), breakfast food (bread, ham, cheese, yogurt, and water), material and equipment to blood analysis (specific kits conceived in specialized laboratories).

Date of task conclusion: September 8th, 2013

Activity 2 - Entering data, screening and statistical analysis

After data collection, it was entering data, screening and statistical analysis. Descriptive statistics (means and standard deviations) were calculated for both groups at the baseline. None of the anthropometric, body composition, CMRF, inflammatory markers, cardiorespiratory fitness and psychological measures showed significant deviations from a normal distribution (Kolmogorov-Smirnov normality test). Baseline differences in mean anthropometric, body composition, CMRF, cardiorespiratory fitness and psychological characteristics between groups were tested with one-way analysis of variance (ANOVA) and chi-square tests (biological maturity status). Effect size was calculated using partial eta-squared (η^2) and interpreted as small (≥ 0.01), medium (≥ 0.06), or large (≥ 0.14) [49]. The significance level in all analyses was set at 0.05. Statistical analyses were conducted using SPSS version 21.0.

An individual report including all test results and a brief interpretation were provided to the children's parents (see appendix).

Results achieved: at the end of this task it was obtained all the baseline information needed, data entry, screening and statistical analysis.

Resources allocated to this task: Two graduate students in Sport Sciences, under the guidance of the principal investigator were selected to punching and screening data.

Date of task conclusion: September 8th, 2013

Activity 3 - Randomization of the intervention groups

After completing the baseline measures, data entering, screening and statistical analysis, ninety children were randomly assigned to different training groups: the first group was designated has the soccer group (SG) (n=30); the second group has the traditional physical activity group (TG) (n=30); and the third group comprised children who were not interested to participate in any intervention and whose physical activities were limited to those included in the compulsory physical education curriculum at school and was defined as control group (CG) (n=30) (2 sessions per week, 45-90 min each). Children were assigned to intervention groups on the basis of the day of the week in which they have the possibility to attend the training sessions. Children who attended on tuesday, thursday and saturday were assigned to the SG and those on monday, wednesday and friday to the TG. Figure 1 provide a detailed schematic of the study design and children flow.

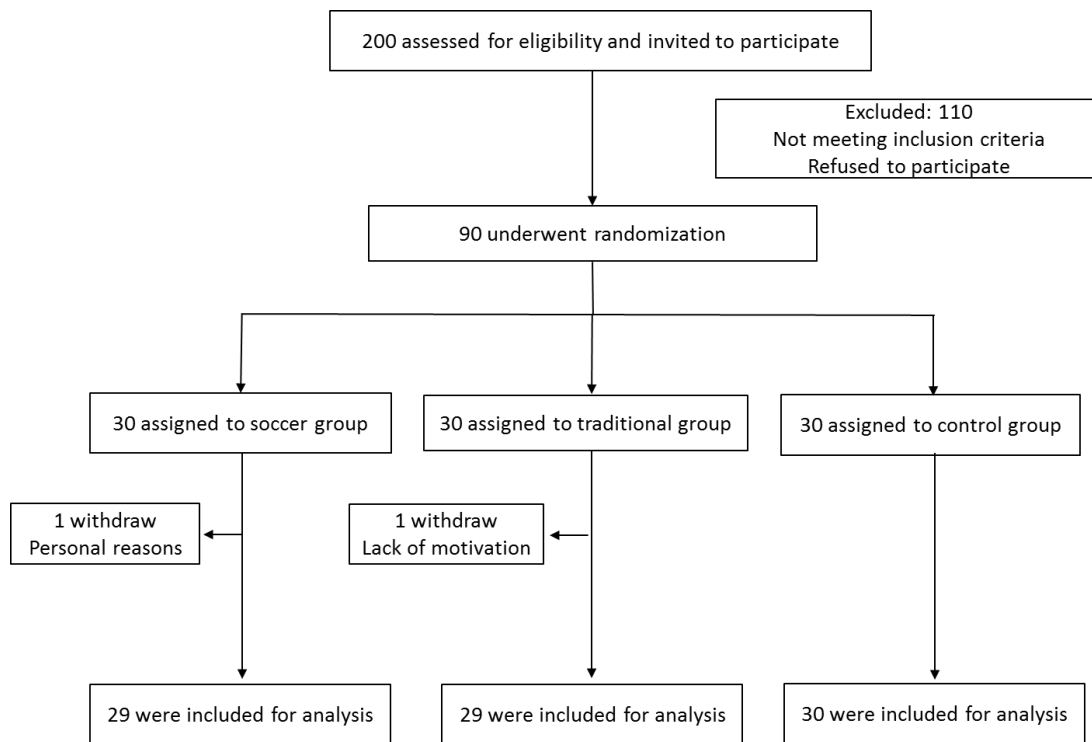


Figure 1. Participant flow diagram.

Results achieved: randomization of the intervention groups.

Resources allocated to this task: Principal investigator.

Date of task conclusion: September 8th, 2013

3.3. TASK 3 - Soccer and individual intervention programs

Activity 1 - Soccer and traditional intervention programs

The soccer intervention program consisted of a warm-up (10-20 min), different technical drills and small-sided games (40-60 min), and a cool-down (10 min). The detailed contents and types of exercises of soccer intervention program is summarized in Table 6. The soccer intervention program was carried out at the facilities of the Faculty of Sport - University of Porto three times a week (tuesday and thursday, 18:30-20:00 hours; saturday, 10:00-11:30).

Table 6. Contents and types of exercises of soccer intervention program.

Contents	Types of Exercises
Tactical - Technical	
Individual tasks	1st Phase - small sided games (1v0; 2v0; 3v0+Gk; 1v1+Gk)
Passing	
Reception	
Shooting	2nd Phase - attack v defense (2v1+Gk; 2v2+Gk; 3v2+Gk; 4v3+Gk; 6v5+Gk)
Dribbling	
Intercept	
Basic marking/ Open-up	3rd Phase - small sided games (Gr+3v3+Gr; Gk+4v4+Gr; Gk+6v6+Gk)
Elementar Colective tasks	
Defensive and offensive principles	
Combinations	
Physical fitness	
Aerobic	Games and drills with and without ball
Anaerobic	
Muscular strength	
Coordination	
Agility	
Flexibility	

The traditional intervention program was multidimensional, since it was designed to develop aerobic endurance, strength, flexibility, coordination and balance. In each session we try to provide routines with activities and exercises as varied as possible, in accordance with the recommendations of [12]. The physical activity program was also designed to develop the enjoyment and body awareness, looking to long-term changes in behavioural patterns. All sessions consisted of a generalized type of physical activity that is usually offered to this age group and that include: a warm-up (10-20 min), different kind of activities such as walking, running, gymnastics, and exercises to improve coordination, flexibility, and strength training (40-60 min), and cool-down (10 min). The traditional physical activity intervention program was carried out at the facilities of the Faculty of Sport - University of Porto three times a week (monday, wednesday and friday, 18:30-20:00 hours).

The training intensities for both intervention programs were designed to keep the heart rate (HR) > 70-80% of maximum heart rate as confirmed by heart rate monitoring (Polar

Team 2 Pro System, Polar Electro, Kempele, Finland). The training sessions were conducted by two physical education teachers. Both intervention programs training sessions were supervised by two graduates in Sport Sciences, under the guidance of principal investigator. Both intervention programs were initiated on September 9th, 2013 and finished on March 9th 2014. In the first two weeks of March 2014 were held the final assessments.

Children that composed the CG did not have any intervention and followed the compulsory physical education curriculum at school (n=30) (2 sessions per week, 45-90 min each).

Results achieved: To conclude soccer and traditional intervention programs.

Resources allocated to this task: Two physical education teachers, under the guidance of the principal investigator, supervised intervention programs training sessions.

Date of task conclusion: March 9th, 2014

3.4. TASK 4 - Post intervention data collection, entering data, screening and statistical analysis

Activity 1 - Final data collection

Post intervention data collection was structured in the same manner as baseline assessment.

Results achieved: Post intervention data in all items of the study were collected.

Resources allocated to this task: materials related to secretarial work (questionnaires), breakfast food (bread, ham, cheese, yogurt, and water), material and equipment to blood analysis (specific kits conceived in specialized laboratories).

Date of task conclusion: March 16th, 2014

Activity 2 - Entering data, screening and statistical analysis

After post intervention data collection, we started data entry, screening and statistical analysis. Descriptive statistics (means and standard deviations) were calculated for both groups at the conclusion of the study. None of the anthropometric, body composition, CMRF, inflammatory markers, cardiorespiratory fitness and perceived psychological measures showed significant deviations from a normal distribution (Kolmogorov-Smirnov normality test). The intervention effects were evaluated with, a repeated measures analysis of variance (ANOVA). For each characteristic, percentage of change (% Δ) between baseline and after 6-months was also calculated; the difference was then divided by baseline value. Pearson correlation coefficients were calculated to examine which CMRF and inflammatory markers were associated with BMI z-score, percentage of body fat and WtHR at the baseline and at the conclusion of the study. The significance level in all analyses was set at 0.05. Statistical analyses were conducted using SPSS version 21.0.

Results achieved: at the end of this task it was obtained all the post intervention information needed, data entry and statistical analysis. For financial reasons three inflammatory and oxidative markers (ghrelin, IL-6 and TBARS) were not determined. However, many others, such as oxLDL, CPR, leptin, resistin, adiponectin and TNF- α were determined.

Resources allocated to this task: Two graduate students in Sport Sciences, under the guidance of the principal investigator were selected to data entry and screening data.

Date of task conclusion: March 24th, 2014

3.5. TASK 5 - Main Findings

Adherence

Of the 90 children participants in this project, 88 completed their assigned intervention. Two children (one each in SG and TG) did not complete the study because of personal reasons (SG) and lack of motivation (TG) (Figure 1). An average of 72 sessions were conducted in each intervention group. Adherence measured by the number of sessions attended during the intervention programs was higher >85% for both groups. The

average training durations and heart rate (HR) were similar between the SG (84.4±6.5 min/session; 156.3±6.4 bpm, ≈ 78%HRmax) and TG (80.1±8.3 minutes; 155.3±7.8 bpm, ≈ 75%HRmax).

Baseline differences

There were no significant differences between groups for baseline variables (p>0.05) (Table 7).

Table 7. Baseline characteristics of participants by intervention assignment.

Variables	Intervention		CG	p value	Effect size
	SG	TG			
<i>Anthropometry/body composition</i>					
Age (years)	10.5 (1.5)	10.7 (1.2)	10.0 (1.3)	0.110	0.079
Maturity status				0.505	0.094
PH1	14	7	12		
PH2	11	12	12		
PH3	3	7	4		
PH4	1	3	2		
Height (cm)	147.5 (11.9)	148.0 (9.2)	145.3 (9.3)	0.712	0.012
Weight (kg)	52.5 (13.6)	55.7 (9.8)	53.6 (14.2)	0.719	0.012
BMI (kg/m ²)	24.0 (2.8)	24.8 (3.4)	25.0 (3.8)	0.391	0.034
BMI z-score	2.4 (0.5)	2.5 (0.8)	2.7 (0.9)	0.264	0.048
Body fat (%)	34.3 (5.6)	38.3 (7.8)	35.9 (7.3)	0.110	0.079
Fat mass (kg)	18.3 (7.3)	21.5 (6.7)	18.8 (8.3)	0.384	0.035
Muscle mass (kg)	17.9 (4.7)	18.3 (4.1)	17.8 (4.8)	0.970	0.001
BMC (g)	31.4 (11.6)	29.3 (5.8)	29.1 (6.5)	0.679	0.016
BMD z-score	0.7 (1.4)	0.1 (1.0)	0.6 (1.1)	0.195	0.081
Waist circumference (cm)	83.6 (9.4)	89.6 (8.3)	85.7 (11.7)	0.169	0.064
WtHR	0.56 (0.04)	0.61 (0.06)	0.59 (0.06)	0.017	0.140
<i>Cardiometabolic risk factors</i>					
SBP (mm Hg)	111.0 (12.4)	109.9 (7.8)	109.1 (15.3)	0.908	0.004
DBP (mm Hg)	57.6 (8.6)	57.4 (7.8)	54.9 (10.3)	0.631	0.019
Insulin (mU/mL)	9.2 (4.3)	10.3 (5.6)	7.5 (3.3)	0.301	0.056
Glucose (mmol/L)	80.6 (5.5)	85.1 (4.8)	82.6 (7.0)	0.085	0.177
HOMA-IR	1.7 (0.9)	2.2 (1.3)	1.55 (0.7)	0.196	0.070
Triglycerides (mg/dl)	70.9 (31.8)	88.3 (55.2)	61.8 (26.5)	0.212	0.068
Total cholesterol (mg/dl)	171.6 (42.7)	161.3 (26.6)	166.4 (21.3)	0.704	0.015
HDL cholesterol (mg/dl)	53.6 (9.5)	49.2 (13.4)	49.7 (8.0)	0.401	0.040
LDL cholesterol (mg/dl)	104.3 (42.2)	94.5 (31.9)	104.3 (21.1)	0.665	0.018

<i>Inflammatory markers</i>					
oxLDL (U/L)	58.8 (25.2)	54.7 (16.2)	58.5 (18.9)	0.827	0.008
CRP (mg/L)	2.1 (2.3)	1.4 (1.3)	0.6 (0.4)	0.061	0.117
Leptin (ng/ml)	21.6 (16.1)	27.1 (21.0)	23.0 (20.5)	0.617	0.016
Resistin (ng/ml)	4.6 (1.5)	4.7 (1.2)	5.1 (1.3)	0.573	0.024
Adiponectin (µg/ml)	11.2 (4.9)	8.4 (3.4)	11.4 (3.9)	0.098	0.096
TNF-α (pg/ml)	0.25 (0.07)	0.22 (0.05)	0.25 (0.10)	0.408	0.038
<i>Cardiorespiratory fitness</i>					
Self-esteem	31.2 (4.7)	29.6 (4.7)	29.8 (5.8)	0.572	0.023
Attraction to PA	43.5 (5.3)	43.6 (5.2)	42.3 (5.9)	0.752	0.013
Perceived competence	100.8 (13.8)	95.2 (13.1)	100.9 (13.8)	0.307	0.050
Body image	2.7 (1.1)	1.9 (1.1)	1.9 (0.8)	0.082	0.126
Quality of Life	2.8 (0.9)	2.8 (0.7)	2.8 (0.7)	0.963	0.001
<i>Physical fitness</i>					
Time VO ₂ máx (min)	8.63 (2.43)	7.86 (2.50)	8.51 (2.67)	0.536	0.024
VO ₂ max (ml/kg/min)	44.7 (8.5)	43.1 (8.7)	48.6 (11.5)	0.328	0.047
MVPA (min/day)	112.2 (52.9)	103.0 (52.1)	107.4 (41.1)	0.772	0.006
Energy intake (kcal/d)	1701.1 (218.7)	1620.4 (195.0)	1712.8 (145.6)	0.131	0.047

SG, soccer group; TG, traditional group; CG, control group; WtHR, waist to height ratio; MVPA, moderate to vigorous physical activity

Intervention effects on anthropometric characteristics, body composition, CMRF and inflammatory markers, cardiorespiratory fitness and psychological status

Changes in anthropometric characteristics, body composition, CMRF and inflammatory markers, cardiorespiratory fitness and psychological measures in each group are shown in Tables 8 to 10.

Anthropometric characteristics and body composition

- Children involved in physical activity intervention programs decreased significantly their BMI z-score, fat mass, percentage of body fat, WC and WtHR ($p<0.05$) and increase their muscle mass, BMC and BMD z-score ($p<0.05$).
- Children participants in the CG only showed a significant improve in muscle mass and BMC between baseline and the end of the study ($p<0.05$). In contrast, a significant increase in fat mass and percentage of body fat was observed ($p<0.05$).

CMRF and inflammatory markers

- SG showed appreciable decreases in total cholesterol, HDL cholesterol, LDL cholesterol, and DBP ($p<0.05$).
- Triglycerides decreased significantly in the two groups involved in sport activities ($p<0.05$).
- Changes in SBP, glucose levels, insulin and HOMA-IR were not significantly different between groups ($p>0.05$).
- Leptin decreased significantly in the two groups involved in sport activities ($p<0.05$).
- Resistin and oxLDL decreased significantly in the SG ($p<0.05$).
- Adiponectin concentrations improved in both groups ($p<0.05$), with a greater increase in the two groups involved in sport activities (SG: 23.6%; TG: 19.4%).
- Circulating concentrations of CRP decreased in children in both intervention groups ($p>0.05$).

Psychological measures and cardiorespiratory fitness

- Significant greater changes was observed in perceived psychological status in both intervention groups compared to CG.
- Children involved in physical activity intervention programs improved their body image, self-esteem, and quality of life, perceived themselves as more successful and physically competent, and were more attracted to participate in PA ($p<0.05$).

Association between CMRF and inflammatory markers and BMI z-score, percentage of body fat and WtHR

The association between CMRF and inflammatory markers and BMI z-score, percentage of body fat and WtHR in each group are shown in Tables 11 to 13.

- Leptin concentrations were significantly associated with BMI z-score, percentage of body fat and WtHR in both groups at the conclusion of the study ($p<0.05$).
- CRP was positively associated with percentage of body fat in both groups at the conclusion of the study ($p<0.05$).
- Adiponectin was negatively associated with BMI z-score, percentage of body fat and WtHR in children participants in the CG at the conclusion of the study ($p<0.05$).
- oxLDL was positively associated with BMI z-score and WtHR in children participants in the CG ($p<0.05$).

Table 8. Changes in anthropometric characteristics and body composition of participants by intervention assignment.

Variables	Soccer group		Traditional group		Control group		Repeated measures ANOVA		
	Post	%Δ*	Post	%Δ*	Post	%Δ*	G	T	G*T
Height (cm)	148.0 (12.1)	0.8	151.1 (8.7)	1.3	146.9 (9.4)	1.1	0.531	<0.001	0.074
Weight (kg)	52.1 (13.6)	0.6	57.2 (7.6)	0.6	55.5 (14.5)	3.4	0.430	0.010	0.052
BMI (kg/m ²)	23.4 (2.6)	-1.1	25.1 (3.3)	-0.5	25.3 (4.3)	0.6	0.169	0.958	0.531
BMI z-score	2.2 (0.5)	-8.7*	2.3 (0.8)	-14.3*	2.7 (0.9)	-5.5	0.164	<0.001	0.238
Body fat (%)	32.4 (5.4)	-7.4*	34.2 (10.4)	-17.2*	37.6 (10.5)	5.7*	0.363	0.046	<0.001
Fat mass (kg)	17.4 (6.7)	-5.6	19.7 (7.4)	-17.3*	22.5 (10.4)	9.3*	0.263	0.680	<0.001
Muscle mass (kg)	19.1 (4.8)	7.3*	20.5 (4.2)	8.6*	19.4 (5.1)	5.7*	0.717	<0.001	0.160
BMC (g)	32.7 (13.6)	5.5*	32.7 (7.3)	7.3*	29.0 (4.7)	3.9*	0.529	<0.001	0.060
BMD z-score	0.8 (1.3)	12.5	0.3 (0.9)	66.6	0.5 (1.1)	-20.0	0.275	0.227	0.009
WC (cm)	79.7 (9.5)	-5.3*	86.0 (7.7)	-5.2*	85.5 (12.3)	-0.5	0.078	<0.001	0.001
WtHR	0.53 (0.54)	-4.2*	0.57 (0.06)	-7.5*	0.58 (0.07)	-1.6	0.039	<0.001	0.002
Maturity status [†]									
PH1	9		5		8				
PH2	14		8		15				
PH3	4		12		5				
PH4	2		3		2				

*significant different from baseline ($p < 0.05$); [†] $p = 0.200$; G, group effect; T, time effect; G*T, interaction effect; WtHR, waist to height ratio

Table 9. Changes in CMRF and inflammatory markers of participants by intervention assignment.

Variables	Soccer group		Traditional group		Control group		Repeated measures ANOVA		
	Post	% Δ^*	Post	% Δ^*	Post	% Δ^*	G	T	G*T
CMRF									
SBP (mm Hg)	111.4 (10.6)	-0.2	114.8 (12.3)	3.1	110.5 (8.9)	-0.6	0.897	0.420	0.425
DBP (mm Hg)	53.7 (7.5)	-9.2*	52.6 (7.9)	-8.5	56.7 (6.2)	0.8	0.693	0.108	0.309
Insulin (mU/mL)	8.3 (3.8)	-7.8	10.3 (4.6)	-9.8	9.5 (3.8)	15.3	0.307	0.629	0.297
Glucose (mmol/L)	83.4 (8.1)	3.3	88.1 (7.6)	2.3	82.5 (5.3)	-0.1	0.020	0.073	0.389
HOMA-IR	2.0 (1.0)	-19.4	2.2 (0.9)	-8.6	1.6 (0.7)	14.8	0.242	0.207	0.680
Triglycerides (mg/dl)	54.9 (15.9)	-28.9*	65.3 (25.9)	-33.7*	74.0 (44.6)	0.8	0.406	0.086	0.026
Total cholesterol (mg/dl)	159.6 (32.1)	-7.2*	152.9 (31.2)	-5.9	173.1 (25.3)	3.4	0.573	0.096	0.022
HDL cholesterol (mg/dl)	57.7 (12.1)	5.7*	51.7 (13.7)	3.4	52.0 (8.7)	3.7	0.277	0.013	0.764
LDL cholesterol (mg/dl)	90.9 (32.3)	-14.3*	88.1 (29.6)	-10.8	106.3 (27.2)	0.3	0.519	0.029	0.067
Inflammatory markers									
oxLDL (U/L)	51.4 (18.4)	-12.4*	51.8 (17.1)	-7.2	60.0 (18.4)	1.9	0.703	0.018	0.014
CRP (mg/dl)	1.5 (1.7)	-132.4*	2.5 (4.5)	-19.3	0.7 (0.4)	2.4	0.125	0.682	0.251
Leptin (ng/ml)	16.1 (13.3)	-60.0*	20.9 (19.8)	-66.9*	23.4 (19.3)	-11.4	0.620	0.039	0.300
Resistin (ng/ml)	4.2 (1.2)	-8.5*	4.6 (1.2)	-4.5	5.4 (1.3)	3.5	0.178	0.544	0.111
Adiponectin (μ g/ml)	15.0 (6.8)	23.6*	11.3 (4.8)	19.4*	14.0 (5.4)	16.9*	0.135	<0.001	0.463
TNF- α (pg/ml)	0.28 (0.12)	14.6	0.27 (0.07)	27.5	0.33 (0.14)	46.8*	0.290	0.003	0.380

*significant different from baseline ($p < 0.05$); G, group effect; T, time effect; G*T, interaction effect.

Table 10. Changes in psychological measures and cardiorespiratory fitness of participants by intervention assignment.

Variables	Soccer group		Traditional group		Control group		Repeated measures ANOVA		
	Post	%Δ*	Post	%Δ*	Post	%Δ*	G	T	G*T
<i>Psychological measures</i>									
Self-esteem	34.0 (4.4)	6.7*	33.2 (5.1)	9.7*	26.6 (6.8)	-14.8	0.015	0.167	0.019
Body image	1.7 (1.4)	1.4*	1.2 (0.8)	0.9*	1.5 (1.2)	0.4	0.185	<0.001	0.392
Perceived competence	109.4 (11.7)	7.3*	102.8 (18.3)	5.8*	95.0 (19.6)	-7.1	0.264	0.054	0.014
Attraction to PA	47.4 (3.8)	8.2*	46.6 (4.8)	6.2*	40.9 (8.5)	-6.8	0.061	0.005	0.057
Quality of life	3.2 (0.5)	10.1*	3.2 (0.6)	10.3*	2.9 (0.8)	2.7	0.660	0.007	0.438
<i>Cardiorespiratory fitness</i>									
Time VO ₂ máx (min)	10.11 (2.22)	14.0*	9.34 (2.05)	16.0*	8.52 (3.29)	-4.0	0.485	<0.001	0.062
VO ₂ max (ml/kg/min)	50.4 (5.6)	11.6*	48.1 (8.4)	9.7*	50.7 (13.9)	1.6	0.474	<0.001	0.385
MVPA (min/day)	114.8 (48.7)	3.3	105.7 (51.4)	3.2	108.1 (40.3)	1.0	0.761	0.061	0.666
Energy intake (kcal/d)	1647.9 (259.2)	-4.3	1622.9 (223.0)	-0.3	1682.1 (164.9)	-2.5	0.296	0.098	0.377

*significant different from baseline (p<0.05); G, group effect; T, time effect; G*T, interaction effect.

Table 11. Association between BMI z-score and CMRF and inflammatory markers of participants by intervention assignment.

Explanatory variable	Soccer group		Traditional group		Control group	
	Baseline	Post	Baseline	Post	Baseline	Post
SBP (mm Hg)	0.06	0.24	0.38	0.38	0.28	0.23
DBP (mm Hg)	-0.13	0.14	0.29	0.25	-0.14	0.01
Insulin (mU/mL)	-0.07	0.06	-0.22	0.67*	0.32	0.62*
Glucose (mmol/L)	-0.19	0.32	-0.19	-0.18	0.45	0.35
HOMA-IR	-0.19	0.35	-0.24	0.64*	0.34	0.64*
Triglycerides (mg/dl)	0.22	0.33	0.17	0.52*	0.36	0.24
Total cholesterol (mg/dl)	0.03	-0.12	-0.37	-0.16	0.34	0.72*
HDL cholesterol (mg/dl)	0.15	-0.04	-0.10	-0.37	-0.39	-0.23
LDL cholesterol (mg/dl)	-0.03	-0.13	-0.43	-0.09	0.40	0.67*
oxLDL (U/L)	-0.20	-0.38	-0.27	-0.02	0.66*	0.75*
CRP (mg/dl)	0.45*	-0.02	0.72*	0.37	0.76*	0.41
Leptin (ng/ml)	0.52*	0.61*	0.87*	0.82*	0.34	0.65*
Resistin (ng/ml)	0.49*	0.51*	0.23	0.27	-0.09	-0.03
Adiponectin (µg/ml)	-0.22	-0.31	0.45	0.27	-0.50	-0.58*
TNF-α (pg/ml)	-0.06	-0.08	-0.43	0.01	0.21	0.06

*p<0.05

Table 12. Association between percentage of body fat and CMRF and inflammatory markers of participants by intervention assignment.

Explanatory variable	Soccer group		Traditional group		Control group	
	Baseline	Post	Baseline	Post	Baseline	Post
SBP (mm Hg)	0.37	0.22	0.28	0.33	0.30	0.41
DBP (mm Hg)	0.26	0.29	0.40	0.34	-0.07	0.34
Insulin (mU/mL)	0.36	0.03	-0.29	0.61*	0.32	0.25
Glucose (mmol/L)	-0.32	0.33	-0.15	-0.03	0.14	0.32
HOMA-IR	0.18	0.15	-0.31	0.60*	0.29	0.28
Triglycerides (mg/dl)	0.26	0.22	0.28	0.58*	0.58	0.16
Total cholesterol (mg/dl)	-0.03	-0.15	-0.21	0.07	0.56	0.50
HDL cholesterol (mg/dl)	0.08	0.09	-0.09	-0.38	-0.50	-0.15
LDL cholesterol (mg/dl)	-0.07	-0.20	-0.30	0.15	0.61*	0.46
oxLDL (U/L)	-0.19	-0.44*	-0.02	0.27	0.73*	0.42
CRP (mg/dl)	0.69*	0.45*	0.84*	0.61*	0.54	0.86*
Leptin (ng/ml)	0.68*	0.64*	0.75*	0.76*	0.64*	0.70*
Resistin (ng/ml)	0.45*	0.31	0.16	0.19	-0.01	0.09
Adiponectin (µg/ml)	-0.13	-0.16	0.37	0.23	-0.40	-0.62*
TNF-α (pg/ml)	-0.13	-0.15	-0.51	-0.05	0.43	0.12

*p<0.05

Table 13. Association between WtHR and CMRF and inflammatory markers of participants by intervention assignment.

Explanatory variable	Soccer group		Traditional group		Control group	
	Baseline	Post	Baseline	Post	Baseline	Post
SBP (mm Hg)	0.38	0.38	0.47	0.26	0.20	0.09
DBP (mm Hg)	-0.02	0.18	0.51*	0.24	-0.02	-0.09
Insulin (mU/mL)	0.24	0.07	-0.28	0.49	0.57	0.40
Glucose (mmol/L)	-0.22	0.37	-0.29	-0.14	0.30	0.03
HOMA-IR	-0.03	0.43	-0.31	0.47	0.56	0.38
Triglycerides (mg/dl)	0.47*	0.24	0.21	0.52*	0.60*	0.31
Total cholesterol (mg/dl)	-0.06	-0.19	-0.25	-0.01	0.51	0.79*
HDL cholesterol (mg/dl)	0.17	-0.03	-0.13	-0.39	-0.66*	-0.63*
LDL cholesterol (mg/dl)	-0.14	-0.21	-0.30	0.08	0.61*	0.84*
oxLDL (U/L)	-0.22	-0.33	-0.01	0.11	0.67*	0.80*
CRP (mg/dl)	0.75	0.31	0.82*	0.43	0.55	0.48
Leptin (ng/ml)	0.54*	0.68*	0.68*	0.72*	0.46	0.84*
Resistin (ng/ml)	0.56*	0.35	0.30	0.17	-0.13	0.21
Adiponectin (µg/ml)	-0.16	-0.31	0.33	0.19	-0.42	-0.62*
TNF-α (pg/ml)	-0.17	-0.25	-0.44	-0.12	0.44	0.09

*p<0.05

3.6. Dissemination of the present project in Portuguese community

University of Porto

http://noticias.up.pt/pessoas_da_up/andre-seabra/#.UeRNphn2uZ4.facebook

Jornal de Notícias (newspaper)

http://ciafel.fade.up.pt/files_download/uefa_ciafel.pdf

EXPRESSO (newspaper)

<http://expresso.sapo.pt/uefa-financia-estudo-da-universidade-do-porto=f816953>

A BOLA TV

<http://www.youtube.com/watch?v=E2MPntL3BTg>

Record (newspaper)

http://www.record.xl.pt/Futebol/interior.aspx?content_id=829043

University of Minho

<http://umonline.uminho.pt/ModuleLeft.aspx?mdl=~/Modules/Clipping/NoticiaView.ascx&ItemID=94992&Mid=111&lang=pt-PT&pageid=1&tabid=0>

CUF Hospital

http://www.desportocuf.pt/DestaqueDetalhe/HCP_UEFA%20financia%20projecto

Boas Notícias (online newspaper)

http://boasnoticias.sapo.pt/noticias_UPorto-Futebol-no-combate-%C3%A0-obesidade-intantil_16294.html?page=0

RTP (Portuguese Radio Television)

<http://www.youtube.com/watch?v=s7RBbFbzOxM>

Given the enormous interest that the Portuguese public opinion and academic community has shown with regard to this project, we will organize on 4 to 5 of June 2014 an international conference on “Soccer as a strategy to promote health and quality of life”. The idea is to inform and discuss that Soccer can be an important strategy for promoting health and quality of life, regardless of nutritional status, age, sex, socio-economic status and ethnicity of their participants.

In addition to the presentations of the team members associated with this project, other Portuguese and International academic researchers and personalities related with soccer were also invited to present a communication. It would be a great honor for us to have the UEFA participation in this conference with the presentation of a lecture on a topic related to Soccer and Health. As soon as possible we send you a preliminary program of this conference.

Conference date: June 4th and 5th, 2014

V. CONCLUSIONS

Childhood obesity is associated with several adverse physical, cardiometabolic and psychological health consequences [69, 70]. The potential of physical activity interventions to alleviate the burden of obesity and to improve the weight status, body composition and cardiometabolic and perceived psychological status of obese children is thus significant to public health. The present study was designed in this context and specifically examined the effects of a 6-month recreational soccer intervention program on the body composition, cardiometabolic risk factors (CMRF), inflammatory markers, perceived psychological status and cardiorespiratory fitness (CRF) of obese children.

The first research hypothesis addressed in the study was the following: “Systematic practice of recreational soccer has a significant effect in reducing CMRF and percentage of body fat, and in improving muscle and bone mass, cardiorespiratory fitness and associated psychological consequences”.

The 6-month recreational soccer intervention program (60-90 min, three times per week, intensity >70-80% HRmax) resulted in beneficial changes in body composition, CMRF, inflammatory markers, perceived psychological status and CRF of obese children.

The soccer intervention program showed a positive effect on all parameters of body composition and nutritional status. After the 6-month intervention, participants in the soccer intervention experienced significant reduction in percentage of body fat (-7.4%), and improvement in muscle (+7.3%) and bone mass (+5.5%), with negligible change in BMI (-1.1%). In addition, WC (-5.3%) and WtHR (-4.2%) declined. The latter indicators are highly predictive for CMRF [71]. There is strong evidence that beneficial effects on muscle and bone mass may be achieved by promoting participation in high impact sports, which impose high levels of muscular contractions and submit the growing skeleton to frequent mechanical stresses and strains [72-74]. Soccer is an activity that activates a wide range of the body's musculature to meet the physical demands of the game, such as numerous changes of the speed running, kicking the ball and body contacts [75]. Further, since soccer involves a high number of jumps and other movements requiring abrupt changes of the position of the body center of mass, it can be considered a weight-bearing sport [75]. Results of the present study reinforce these concepts and highlight the positive contribution of soccer to augment muscle (+7.3%) and bone (+5.5%) mass.

Beneficial effects of regular physical activity on CMRF, inflammatory markers and CRF are well-established in obese children and adolescents [7, 28, 32, 33]. Most of the studies have used traditional endurance activities (walking, jogging or bicycling) and occasionally group activities. To our knowledge, no studies have addressed the effects of an intense intermittent soccer intervention on CMRF, inflammatory markers and CRF in obese children. Findings of the present study indicated significant improvements in CMRF (-28.9% to 5.7%) and inflammatory markers (-132.4% to 23.6%) and also CRF (+11.6%) over the course of the soccer intervention program.

The soccer intervention program was also associated with beneficial changes in psychological status in obese children. SG participants experienced significant improvements in body image, self-esteem, attraction to participate in PA,

perceived physical competence and quality of life. The results were consistent with other studies highlighting the importance of physical activity in enhancing perceived psychological status of obese children [8, 79]. The present findings thus suggested that participation in soccer was an effective strategy to reverse and perhaps enhance perceived psychological status associated with obesity in late childhood/early adolescence (8-12 years). The results also suggested an increase in the likelihood of the adoption and maintenance of physical activity among the soccer participants [80]. In addition to these aspects is important to note that soccer is the most popular and preferred sport at all ages and across social and economic strata of the population [81]. Since soccer is a relatively inexpensive, accessible, and easy sport to learn, it may offer obese children opportunities for enjoyable physical activity that has potential psychological benefits. As a team-based activity, soccer probably has more chances to enhance perceived psychological status of participants than many individual physical activities. The team/group format includes teammates (peers) who provide encouragement and also who serve as a buffer when things break down during game play. In contrast, it is suggested that participation in most forms of individual activities/sports provides limited interactions with other youth. Individual activities also encourage the development of a strong sense of mastery or individual accomplishment whereas team sports provide a fertile ground for self-esteem enhancement associated with the group nature of the activities. Team activities also provide opportunities for children to engage with peers and adults in an effort to achieve collective goals (39). Other research has also noted that children involved in team sports reported greater body satisfaction than children participating in individual activities (40). Since team activities/sports focus on the group in contrast to the individual, they may provide a buffer to individual social evaluation as the focus is on the group. Individual activities/sports, in contrast, offer more opportunities for one-on-one comparisons, which may heighten levels of body dissatisfaction (40). Thus, soccer appear to have the potential to promote teamwork and sharing, and provide opportunities to enhance attraction to participate in physical activity, self-esteem, self- and body-satisfaction, perceived physical competence and quality of life.

In summary, the soccer intervention resulted in significant improvements in body composition, CMRF and cardiorespiratory fitness and perceived psychological

status of obese children. Soccer as a highly popular sport, socially and culturally meaningful and accessible to all social strata thus has potential to operate as a highly effective tool for the prevention and reduction of childhood obesity and associated consequences for health and fitness.

The second research hypothesis addressed in the study was the following: “Systematic practice of recreational soccer has a greater effect than other traditional physical activity intervention program in increasing energy expenditure, reducing CMRF, and improving body composition, cardiorespiratory fitness and associated psychological consequences”.

To our knowledge, this study may be the first which compared a soccer intervention (SG) with a traditional physical activity program (TG) and a control group (CG). The three groups did not differ in lipid profile, markers of glucose metabolism, inflammatory markers, CRF, and indicators of psychological status at baseline.

After the 6-month intervention period, CG showed significant changes in body composition, specifically an increase in body fat, fat mass, muscle mass and BMC, but no significant changes in lipid profile. Rather, the trend in means suggested a worsening of the lipid profile (except for HDLc), inflammatory markers (increased CRP and TNF- α), oxidative stress (higher oxLDL) and glucose metabolism (increased insulin, HOMA-IR, resistin; decreased leptin). In contrast this pattern was almost reversed in SG and TG who presented a general improvement in the body composition and CMRF profile compared to the CG. This improvement, however, was more apparent in SG than TG.

Obese and sedentary individuals often present a more atherogenic lipid profile than non-obese and physical active individuals. In the present study, physical activity, as in SG and TG, was associated with improvements in plasma lipids (reduced TC, LDL-c, oxLDL; increased HDL-c) and reductions in triglycerides. The results for oxLDL are of particular relevance, as oxidized LDL particles play a major role in the formation of atherosclerotic plaques. The reduction in oxLDL and triglycerides together with an increase in HDL-c is associated with a slowing of the atherogenic process.

Obesity is often described as a state of chronic low grade inflammation, characterized by an increase in pro-inflammatory mediators and a reduction in anti-inflammatory defenses. SG and TG both presented a decrease in the pro-inflammatory mediator leptin, a marker of adiposity and insulin resistance, and an increase in adiponectin, an anti-inflammatory mediator associated with positive changes in insulin sensitivity, lipid profile and oxidative stress. Both groups also showed a reduction (only statistically significant in the SG) in the acute-phase protein CRP, a sensitive marker of inflammation and of cardiovascular risk. SG group also showed a reduction in resistin, a mediator traditionally linked to insulin resistance.

Insulin resistance is a major issue in obesity, and is associated with dyslipidemia and increased inflammation and oxidative stress. Although changes in markers of glucose metabolism (glucose, insulin and HOMA-IR) were not significant, the data suggested an increase in insulin sensitivity (reduction in insulin and HOMA-IR) in both SG and TG in contrast to CG. The improvement in insulin resistance is consistent with the observed increase in adiponectin and the reduction in leptin and resistin. These results may have contributed to the favorable changes observed in the lipid profile.

The present study showed that both physical activity interventions (SG and TG) were effective in improving cardiorespiratory fitness and psychological status. Significant improvements in VO_{2max} occurred in both intervention groups. Participants in the SG experienced an 11.6% improvement in VO_{2max} and a 1.4 to 10.1% improvement in their psychological status whereas participants in the TG group experienced a 9.7% and a 0.9 to 10.3% improvement in both the VO_{2max} and psychological status. Evidence suggests that lower cardiorespiratory fitness has been associated to an increase in CVD risk markers, CVD morbidity and mortality. To oppose this evidence, international health organizations suggest that children should accumulate at least 60 minutes or more of aerobic MVPA per day [12]. The recommendations also specify that the MVPA should be developmentally appropriate and enjoyable, and should include a variety of activities. Although the duration of the both intervention programs implemented in the present study (60-90 min, 3 times/week) were less than current recommendations, it seems that the intensity (average intensity >70-80%HRmax) were appropriate to induce significant improvements in cardiorespiratory fitness.

It is important to note that obese children complied well with the both intervention programs, resulting in high attendance rates (>85%). For all these reasons, present study demonstrates the potential of both interventions as a means of improving cardiorespiratory fitness and psychological status in obese children. However, given that soccer is a highly popular sport, relatively inexpensive, accessible, and easy to learn may be a better mode of exercise for obese children of this age group.

In summary, the two physical activity intervention groups (SG and TG) showed improvements in lipid profile, insulin sensitivity, inflammatory status, cardiorespiratory fitness and psychological status compared to the control group (CG). The improvement in some variables was more apparent in SG than TG.

The third research hypothesis addressed in the study was the following: “With recreational soccer as the template for regular physical activity or reducing the expression of CMRF, new subsets of markers with greater sensitivity and predictive and clinical utility will be developed”.

Cardiovascular morbidity and mortality of obesity is associated with classic risk factors, namely dyslipidemia, hypertension and impaired glucose metabolism [22]. However, classical markers may not be sufficiently sensitive at pediatric ages and highlight a need to consider other markers of CMRF. Recent research suggested the existence of other biological markers associated with pro-inflammatory and pro-oxidant states which are expressed at earlier ages with greater sensitivity [24, 25]. These novel markers are adiponectin and its isoforms, leptin, resistin, high sensitivity C- reactive protein (CRP), tumor necrosis factor alpha (TNF- α) and lipoprotein particularly its oxidized high-density (LDL-ox).

Previous studies examining the association between CMRF and obesity and body composition components in children have reported conflicting results. However, some of them have reported positive or negative associations and others have reported no associations. The results of the present study showed a significant and positive association between leptin concentrations and BMI z-score, percentage of body fat and WtHR. High levels of leptin were associated with an increase in obesity and percentage of body fat in obese children. Leptin

acts in the hypothalamus and helps to control energy intake and expenditure in lean individuals. In obese, however, a state of resistance to leptin actions (similar to what occurs for insulin) appears, leading to an increase in its circulating levels [83]. The absence of leptin increases appetite and decreases energy expenditure, leading to obesity. Many previous studies have discussed the effects of regular physical activity on leptin concentrations [84-85], but uncertainty remains as to how circulating leptin reacts to exercise training since previous studies have produced inconsistent results. However, the results of the current study showed a 60 to 66.9% decrease in leptin levels among children who participated in physical activity intervention programs suggesting that obese children can decrease leptin production and secretion in response to physical activity participation and subsequent changes in body composition.

Another important finding was the inverse association between adiponectin levels and BMI z-score, percentage of body fat and WtHR that was observed in the CG participants at the conclusion of the study. Lower levels of plasma adiponectin were significantly associated with obesity and body composition components in the obese CG participants. Adiponectin is an adipocytokine with multiple positive effects on metabolism, such as regulation of satiety carbohydrate and lipid metabolism, increasing insulin sensitivity and reducing oxidative stress, inflammation, atherogenesis and vascular remodeling [26]. Obesity increases the production of adipocytokines that cause insulin resistance but decreases the production of adiponectin, which reduces insulin resistance [82]. Previous studies examining the effects of exercise training on adiponectin levels have also reported conflicting results

Although previous studies have shown that adiponectin levels seems to be already reduced in young obese subjects the effects of physical activity in their production and secretion have reported conflicting results. The present study demonstrated that physical activity induce significant improvements in adiponectin levels among obese children.

In summary, although more studies are needed to understand the association between CMRF and inflammatory markers and obesity, the use of leptin and adiponectin in routines clinical analyses could help to identify children with increased risk of obesity and obesity-associated comorbidities.

The *TAKE HOME MESSAGE* of the present study was the following:
“Soccer as a highly popular socially and culturally meaningful sport accessible to all social strata is a highly effective medium for the prevention/reduction of childhood obesity and for the enhancement of body composition, cardiometabolic health, cardiorespiratory fitness and associated psychological status of obese youth”.

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Appendix 1: Children questionnaire



FUTEBOL É SAÚDE

PROJECTO UEFA



DATA AVALIAÇÃO: _____

NOME: _____

DATA DE NASCIMENTO: _____ SEXO: M () F ()

TANNER 1: A ☐ P ☐ M ☐

PESO: _____ ALTURA: _____ ALTURA SENTADO: _____

P Cintura: _____ P Anca: _____

TAS 1: _____ TAD 1: _____ FC 1: _____ MAP: _____

TAS 2 : _____ TAD 2: _____ FC 2: _____ MAP: _____

(TAS 3 : _____ TAD 3: _____ FC 3: _____ MAP: _____)

(TAS 4 : _____ TAD 4: _____ FC 4: _____ MAP: _____)

Lista de verificação

- ☐ Idade, Peso, Altura, Altura Sentado
- ☐ Perímetro Cintura e Anca
- ☐ InBody
- ☐ Tanner
- ☐ Tensão arterial (2 vezes sem diferença de 2mmHg)
- ☐ Sangue
- ☐ DEXA
- ☐ KTK
- ☐ VO₂máx
- ☐ Questionários



Este 2 questionários enquadram-se no Projeto **“Futebol é Saúde”**, no qual o seu filho/a está a participar.

Estimamos que, na sua totalidade, demore cerca de **20** minutos a ser preenchido.

Obrigada pela atenção dispensada.

Quem preencheu o questionário:

☐ Mãe ☐ Pai

☐ Outro: _____

CARACTERÍSTICAS DO SEU/SUA FILHO/A:

Data de Nascimento | | | | . | | | | . | | | |
dia mês ano

	A que horas se deita:	A que horas se levanta:
Em média, num <u>dia normal de semana</u>	Horas Min	Horas Min
Em média, num <u>dia de fim-de-semana</u>	Horas Min	Horas Min

Em média, quanto tempo é que o seu filho passa a ver TV, jogar videojogos e no computador?(some todos os momentos)

Num <u>dia normal de semana</u>	☐ <30min ☐ 30 min ☐ 1h ☐ 2h ☐ 3h ☐ >3h
Num <u>dia de fim de semana</u>	☐ <30min ☐ 30 min ☐ 1h ☐ 2h ☐ 3h ☐ >3h

De acordo com o Boletim de Saúde: (se preferir pode anexar uma fotocópia da página 2 e 3 do *Boletim de Saúde Infantil e Juvenil* do seu filho(a))

	<u>Peso</u>	<u>Comprimento/Altura</u>
à Nascimento	, kg	, cm
1 ano	, kg	, cm
2 anos	, kg	, cm
3 anos	, kg	, cm
4 anos	, kg	, cm
5 anos	, kg	, cm
6 anos	, kg	, cm
7 anos	, kg	, cm
8 anos	, kg	, cm
9 anos	, kg	, cm
10 anos	, kg	, cm

Pratica Atividade Física organizada fora da escola? ☐ Sim ☐ Não

Se Sim, qual/quais:

<u>Tipo de Atividade</u>	<u>Nº de vezes por semana</u>							<u>Duração de cada sessão</u>				<u>Dia(s) da semana</u>
	1x	2x	3x	4x	5x	6x	7x	30`	45`	1h	1h30	
	1x	2x	3x	4x	5x	6x	7x	30`	45`	1h	1h30	
	1x	2x	3x	4x	5x	6x	7x	30`	45`	1h	1h30	

Exemplo:

Karaté 1x 2x **3x** 4x 5x 6x 7x 30` 45` **1h** 1h30 Segunda e Sexta

Qual o transporte que utiliza para ir para a escola?

☐ carro ☐ autocarro ☐ mota ☐ a pé ☐ Outro: _____
quanto tempo demora no percurso casa-escola? _____ minutos

Qual o seu tipo de habitação:

☐ apartamento ☐ moradia ☐ Outro: _____

No local onde vive, é possível que o seu filho brinque no exterior? ☐ SIM ☐ NÃO

Se Sim, onde? ☐ na rua ☐ num parque junto à sua casa ☐ no quintal/jardim de casa ☐ no parque infantil

Se não, qual o motivo? ☐ não tem quintal/jardim em casa ☐ a rua tem muito tráfego ☐ não há parque infantil

☐ a rua é perigosa em termos criminais, Outro: _____

	NUNCA	RARAMENTE	OCASIONALMENTE	FREQUENTEMENTE	SEMPRE
o meu/minha filho/a é naturalmente muito ativo	☐	☐	☐	☐	☐
o meu/minha filho/a precisa de mim para ter motivação para brincar	☐	☐	☐	☐	☐
o meu/minha precisa de companhia (amigos, Irmãos, pais) para ter motivação para brincar	☐	☐	☐	☐	☐

Comparando com crianças da mesma idade, considera o seu/sua filho/a:

- ☐ MUITO MAIS ACTIVO
☐ MAIS ACTIVO
☐ IGUAL
☐ MENOS ACTIVO
☐ MUITO MENOS ACTIVO

O/A seu/sua filho/a com quem vive: ☐ PAI ☐ MÃE ☐ IRMÃOS ☐ AVÓ ☐ AVÔ ☐ OUTROS: _____

Quantas horas por dia, o/a seu/sua filho/a passa na escola? |__|_| Horas |__|_| Min

Quantos televisores têm em sua casa? ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ >4

O seu/sua filho/a tem televisão no quarto? ☐ SIM ☐ NÃO

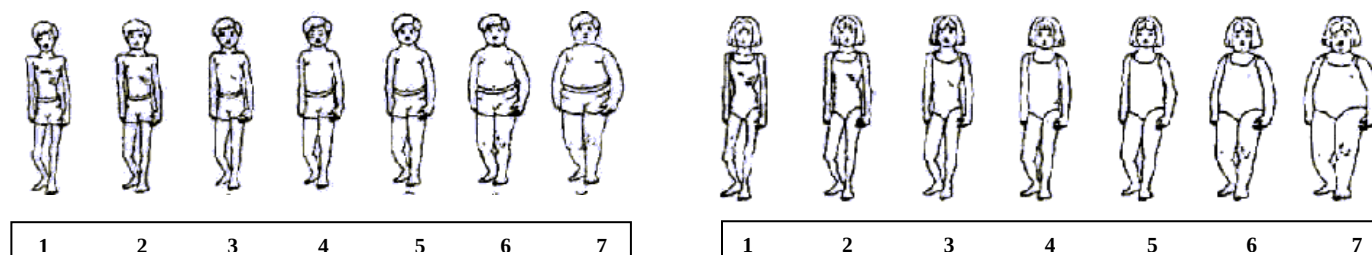
Tem computadores (fixos e portáteis) em sua casa? ☐ SIM ☐ NÃO **Se sim, quantos** _____

Tem videojogos (nitendo, playstation, wii, gameboy) em sua casa? ☐ SIM ☐ NÃO **Se sim, quantos** _____

Durante as refeições a televisão está ligada e a atenção está centrada na televisão? ☐ SIM ☐ NÃO

Acha que seu filho tem, neste momento, um Peso ☐ Muito Baixo ☐ Baixo ☐ Ligeiramente Magro ☐ Normal
☐ Ligeiramente com excesso de peso ☐ Excesso Peso ☐ Obesidade

Qual destas figuras é semelhante ao seu filho(a)?



(COLOQUE UM CIRCULO NO NUMERO QUE SE ENCONTRA ABAIXO DA FIGURA ESCOLHIDA)

Organização do Sono (BISQ)

Por favor, coloque apenas uma resposta (a mais apropriada) em cada questão.

O seu filho/a dorme: ☐ em quarto próprio ☐ no quarto dos pais ☐ na cama dos pais
☐ em quarto partilhado com o irmão(s) ☐ OUTRO: _____

Em que posição o seu filho/a dorme a maior parte do tempo? ☐ de barriga para baixo ☐ de lado ☐ de costas

Quanto tempo o seu filho/a dorme durante a NOITE (entre as 19h da tarde e as 7h da manhã)?	_ _ _ Horas _ _ _ Min
Quanto tempo o seu filho/a dorme durante o DIA (entre as 7h da manhã e as 19h da tarde)?	_ _ _ Horas _ _ _ Min
Quanto tempo durante a noite o seu filho/a está acordado (entre as 22h da noite e as 6h da manhã)?	_ _ _ Horas _ _ _ Min
Quanto tempo é que o seu filho/a demora a adormecer?	_ _ _ Horas _ _ _ Min
A que horas o seu filho vai dormir?	_ _ _ Horas _ _ _ Min

Número de vezes o seu filho/a acorda por noite: ? ☐ nunca acorda ☐ 1 vez ☐ 2 vezes ☐ ≥3 vezes

Como é q o seu filho/a adormece? ☐ enquanto toma o biberão ☐ embalado ☐ com ajuda
☐ na cama sozinho ☐ na cama junto aos pais ☐ OUTRO: _____

Acha q o seu filho/a tem problemas de sono? ☐ problemas muito sérios
☐ pequenos problemas
☐ Não tem problemas

Escala de Regulação Emocional (ERRS)

Por favor, classifique o seu filho de acordo com as descrições abaixo, colocando um círculo no número mais adequado. O número 4 que está sublinhado no centro representa o ponto médio no qual a criança se poderá situar nesse item. Por favor esteja à vontade para usar todas as possíveis opções de resposta..

	Não é provável						Muito provável
1. Depois de receber de alguém um presente que não gosta, qual a probabilidade do seu filho fingir que gosta do presente?	1	2	3	<u>4</u>	5	6	7
2. Depois de ver alguém tropeçar ou cair de uma forma engraçada, qual a probabilidade do seu filho rir à gargalhada?	1	2	3	<u>4</u>	5	6	7
3. Depois do seu filho comer algo que lhe sabe mal, qual a probabilidade dele cuspir a comida ou reagir negativamente?	1	2	3	<u>4</u>	5	6	7
4. Num contexto mais sério, como uma igreja ou um funeral, qual a probabilidade do seu filho entender e se comportar adequadamente à situação?	1	2	3	<u>4</u>	5	6	7
5. Se lhe for pedido para guardar um segredo (p. ex., não falar ao irmão sobre a festa de aniversário surpresa), qual a probabilidade do seu filho manter o segredo?	1	2	3	<u>4</u>	5	6	7
6. Qual a probabilidade do seu filho ajudar os outros (p. ex., amigo / irmão) a manter um segredo de forma a evitar um castigo? (p. ex., não contar à mãe que um irmão partiu um vaso)	1	2	3	<u>4</u>	5	6	7

CARACTERÍSTICAS DOS PAIS

	<u>PAI</u>	<u>MÃE</u>
IDADE	_ _ ANOS	_ _ ANOS
PESO ATUAL	_ _ , _ KG	_ _ , _ KG
ALTURA ATUAL	_ , _ M (COLOCAR O VALOR QUE ESTÁ NO BILHETE DE IDENTIDADE)	_ , _ M (COLOCAR O VALOR QUE ESTÁ NO BILHETE DE IDENTIDADE)
FUMA?	☐ SIM ☐ NÃO	☐ SIM ☐ NÃO
SE SIM, FUMA DENTRO DE CASA?	☐ SIM ☐ NÃO	☐ SIM ☐ NÃO
ANO ESCOLARIDADE PAI:	☐ 1ª, 2ª, 3ª OU 4ª CLASSE ☐ 10º, 11º OU 12º ANO	☐ 5º OU 6º ANO ☐ 7º, 8º OU 9º ANO ☐ BACHARELATO OU CURSO SUPERIOR
ANO ESCOLARIDADE MÃE:	☐ 1ª, 2ª, 3ª OU 4ª CLASSE ☐ 10º, 11º OU 12º ANO	☐ 5º OU 6º ANO ☐ 7º, 8º OU 9º ANO ☐ BACHARELATO OU CURSO SUPERIOR
PROFISSÃO PAI:	_____	
PROFISSÃO MÃE:	_____	

QUESTÕES RELACIONADAS COM A GRAVIDEZ:

Idade que tinha quando engravidou do/da seu/sua filho/a? _____

Quantos filhos tem? _____ Que idade têm? _____

Recorde-se da alimentação do bebé no 1º ano de vida, durante quanto tempo foi amamentado, **só com leite materno**?

☐ Não foi amamentado _

☐ Foi amamentado: quanto tempo: _____ dias **ou** _____ semanas **ou** _____ meses

Em que altura (dias, meses ou semanas), lhe introduziu **outro alimento**, além leite materno?
_____ dias **ou** _____ semanas **ou** _____ meses

Que alimento foi? (assinale com uma cruz)

☐ Leite de vaca ☐ Leite de lata ☐ Papas ☐ Sopa ☐ Outro: Qual? _____

Qual o seu peso no início da Gravidez do seu filho? _____ Kg e no final? _____ Kg

Quantos quilos no total, aumentou no seu peso, durante a gravidez? _____ Kg

Teve **diabetes gestacional**? ☐ Sim ☐ Não

Teve **pré-eclampsia**? ☐ Sim ☐ Não
(tensão arterial elevada)

Teve de alteração a sua alimentação durante a gravidez? ☐ Sim ☐ Não Se sim, motivo? _____

O/A seu/sua filho/a nasceu com quantos meses ou semanas de gestação: _____ semanas (**Ex: 38 semanas**)

Tipo de Parto? ☐ Parto Normal ☐ Cesariana

Fumou durante a Gravidez? ☐ Sim ☐ Não Se Sim, quantos por dia? _____

Manteve ou reduziu o consumo de tabaco? _____

ACTIVIDADE FÍSICA HABITUAL DOS PAIS

Questionário Internacional de Atividade Física (IPAQ)

As questões que lhes vou colocar, referem-se à semana imediatamente anterior, considerando o tempo em que esteve fisicamente ativo/a. Por favor, respondam a todas as questões, mesmo que não se considerem pessoas fisicamente ativas. Vou colocar-lhes questões sobre as atividades desenvolvidas na vossa atividade profissional e nas vossas deslocações, sobre as atividades referentes aos trabalhos domésticos e às atividades que efetuam no vosso tempo livre para recreação ou prática de exercício físico / desporto.

Ao responder às seguintes questões considerem o seguinte:

Atividades físicas vigorosas referem-se a atividades que requerem um esforço físico intenso que fazem ficar com a respiração ofegante.

Atividades físicas moderadas referem-se a atividades que requerem esforço físico moderado e tornam a respiração um pouco mais forte que o normal.

	PAI	MÃE
Q.1 Diga-me por favor, nos últimos 7 dias, em quantos dias fez atividades físicas vigorosas , como por exemplo, levantar objetos pesados, cavar, correr, ginástica aeróbica, nadar, jogar futebol/basquete, andar de bicicleta a um ritmo rápido, fazer exercícios domésticos pesados (ex: esfregar o chão)?	____ DIAS	____ DIAS
Q.2 Nos dias em que pratica atividades físicas vigorosas pelo menos 10 minutos seguidos , quanto tempo em média dedica normalmente a essas atividades (por dia)?	____ HORAS ____ MIN.	____ HORAS ____ MIN.
Q.3 Diga-me por favor, nos últimos 7 dias, em quantos dias fez atividades físicas moderadas como por exemplo, carregar objetos leves, caçar, ginástica manutenção, trabalhos de doméstico (ex: varrer, aspirar, ...), trabalhos de carpintaria, andar de bicicleta a um ritmo normal ou ténis de pares? Por favor NÃO inclua o "andar" .	____ DIAS	____ DIAS
Q.4 Nos dias em que faz atividades físicas moderadas pelo menos 10 minutos seguidos , quanto tempo em média dedica normalmente a essas atividades (por dia)?	____ HORAS ____ MIN.	____ HORAS ____ MIN.
Q.5 Diga-me por favor, nos últimos 7 dias, em quantos dias <u>andou</u> pelo menos 10 minutos seguidos em casa ou no trabalho, por lazer, por prazer ou como exercício?	____ DIAS	____ DIAS
Q.6 Quanto tempo no total, despendeu num desses dias, a andar/caminhar?	____ HORAS ____ MIN.	____ HORAS ____ MIN.
Q.7 Diga-me por favor, num dia normal da semana quanto tempo passa sentado? Isto pode incluir o tempo que passa a uma secretária (estudar, computador), a visitar amigos, a ler, a estudar, a brincar com os filhos, a ver televisão. (some todos os momentos)	____ HORAS ____ MIN.	____ HORAS ____ MIN.

ACTIVIDADE FÍSICA ORGANIZADA DOS PAIS

		Pai	Mãe
Pratica regularmente Atividade Física organizada?		☐ Sim ☐ Não	☐ Sim ☐ Não
Tipo de atividade		_____	_____
Se Sim	Horas por semana	<1h 1-2h 2-3h 3-4h >4h	<1h 1-2h 2-3h 3-4h >4h
	Duração de cada sessão	<1h 1-2h 2-3h 3-4h >4h	<1h 1-2h 2-3h 3-4h >4h

Código Postal da sua área de residência: _____ - _____

Muito Obrigada pela Colaboração

Appendix 2: Informed consent

**O Futebol como uma nova abordagem terapêutica no combate
ao excesso de peso e obesidade pediátrica**

CONSENTIMENTO INFORMADO

Eu, abaixo-assinado, _____,
na qualidade de representante legal do educando _____,
fui informado de que o estudo de investigação acima mencionado
se destina a avaliar a influência da prática de futebol em indicadores cardiometabólicos, na
aptidão física e no bem-estar psicológico de crianças. Tomei conhecimento que irá ser oferecida,
de forma gratuita, a oportunidade de praticar exercício físico regular sob a orientação de
profissionais. Sei que está prevista a realização de duas avaliações, no início e no final do
estudo, relacionadas com a aptidão física e a saúde, que incluem:

- a) Colheita de sangue (9 mL) por punção venosa. A colheita de sangue permitirá realizar a
avaliação de diversos marcadores de risco cardiometabólico pelo que os participantes
beneficiarão de um estudo analítico mais alargado, através do seu médico responsável.
Alguns dos estudos que vão ser efectuados são estudos genéticos, respeitando o
estabelecido no Decreto-Lei 12/2005, de 26 de Janeiro. No caso de serem descobertos
dados relevantes será facultada aos participantes a possibilidade de os conhecer e de ter
o devido aconselhamento médico e acompanhamento psicológico. Sei que uma parte do
sangue vai ser utilizada de imediato para fazer algumas análises e que outra parte vai
ser armazenada (cerca de dois anos) para ser analisada posteriormente;
- b) Avaliação da composição corporal e da densidade mineral óssea através da medição do
perímetro da cintura, e recorrendo a uma balança de bio-impedância e densitometria
(DXA). O DXA apesar de emitir radiação (Raio-x), a sua dosagem é extremamente
reduzida, equivalendo a um dia de exposição solar normal, não havendo qualquer
contraindicação de aplicação em crianças a partir dos 3 anos de idade;
- c) Avaliação do estágio maturacional através da escala de Tanner;
- d) Medidas de pressão arterial, frequência cardíaca e variabilidade cardíaca em repouso;
- e) Avaliação do volume de oxigénio máximo ($VO_{2máx}$) avaliado através de um protocolo de
exercício incremental num tapete rolante.

Foi-me garantido que todos os dados relativos à identificação dos participantes neste estudo
são confidenciais e que a utilização das amostras será apenas no âmbito do estudo.

Sei que posso recusar-me a autorizar a participação ou interromper a qualquer momento a
participação no estudo do menor de idade de que sou responsável, sem nenhum tipo de
penalização por este facto. Compreendi a informação que me foi dada, tive oportunidade de
fazer perguntas e as minhas dúvidas foram esclarecidas.

Autorizo de livre vontade a participação daquele que legalmente represento no estudo acima
mencionado. Concordo que sejam efetuados os exames e a colheita de amostras de sangue
para realizar as análises que fazem parte deste estudo. Também autorizo a divulgação dos
resultados obtidos no meio científico, garantindo o anonimato.

Assinatura _____ **Data[Ano/mês/dia]** 20__ / ____ / ____.

Appendix 3: Children's attraction to physical activity questionnaire (CAPA)

Atração para a Atividade Física

Item	Exactamente como eu	Como eu				Exactamente como eu	Como eu
1	☐	☐	Alguns alunos divertem-se mais a jogar ou a praticar desportos do que a fazer outras coisas	MAS	Outros alunos gostam mais de fazer outras coisas	☐	☐
2	☐	☐	Alguns alunos não gostam muito de praticar jogos e desportos	MAS	Outros alunos gostam muito de praticar jogos e desportos	☐	☐
3	☐	☐	Alguns alunos têm colegas que lhes dizem que eles não são muito bons a praticarem jogos e desportos	MAS	Outros alunos têm colegas que lhes dizem que eles são bons a praticarem jogos e desportos	☐	☐
4	☐	☐	Alguns alunos são gozados por outros quando praticam jogos e desportos	MAS	Outros alunos não são gozados por outros quando praticam jogos e desportos	☐	☐
5	☐	☐	Alguns alunos pensam que quantos mais jogos e desportos fizerem melhor	MAS	Outros alunos pensam que não é bom fazer demasiados jogos e desportos	☐	☐
6	☐	☐	Alguns alunos não gostam muito de praticar jogos e desportos	MAS	Outros alunos gostam muito de praticar jogos e desportos	☐	☐
7	☐	☐	Alguns alunos não gostam muito de correr	MAS	Outros alunos gostam muito de correr	☐	☐
8	☐	☐	Alguns alunos não gostam de ficar com falta de ar depois de se esforçarem muito a jogar	MAS	Outros alunos não gostam de ficar cansados e com falta de ar depois de se esforçarem muito a jogar	☐	☐
9	☐	☐	Alguns alunos pensam que é muito importante estar sempre em boa forma	MAS	Outros alunos pensam que não é assim tão importante estar sempre em boa forma	☐	☐
10	☐	☐	Para alguns alunos jogos e desportos são a sua atividade favorita	MAS	Outros alunos gostam mais de outras atividades do que de jogos e desportos	☐	☐
11	☐	☐	Alguns alunos são mais conhecidos entre outros alunos quando praticam jogos e desportos	MAS	Alguns alunos não são tão populares entre outros alunos quando praticam jogos e desportos	☐	☐
12	☐	☐	Alguns alunos estão sempre desejosos de praticar jogos e desportos	MAS	Outros alunos não estão sempre desejosos de praticar jogos e desportos	☐	☐
13	☐	☐	Alguns alunos não gostam mesmo de praticar jogos e desportos	MAS	Outros alunos gostam mesmo de praticar jogos e desportos	☐	☐
14	☐	☐	Alguns alunos sentem-se mal quando correm muito rápido	MAS	Outros alunos sentem-se bem quando correm muito rápido	☐	☐

15	☐	☐	Alguns alunos esforçam-se muito para ter boa forma	MAS	Outros alunos não se esforçam muito para ter boa forma	☐	☐
----	--------------------------	--------------------------	--	------------	--	--------------------------	--------------------------

Appendix 4: Quality of life questionnaire



Este 2 questionários enquadram-se no Projeto **“Futebol é Saúde”**, no qual o seu filho/a está a participar.

Estimamos que, na sua totalidade, demore cerca de **20** minutos a ser preenchido.

Obrigada pela atenção dispensada.

Quem preencheu o questionário:

☐ Mãe ☐ Pai

☐ Outro: _____

CARACTERÍSTICAS DO SEU/SUA FILHO/A:

Data de Nascimento | | | | . | | | | . | | | |
dia mês ano

	A que horas se deita:	A que horas se levanta:
Em média, num <u>dia normal de semana</u>	Horas Min	Horas Min
Em média, num <u>dia de fim-de-semana</u>	Horas Min	Horas Min

Em média, quanto tempo é que o seu filho passa a ver TV, jogar videojogos e no computador? *(some todos os momentos)*

Num <u>dia normal de semana</u>	☐ <30min ☐ 30 min ☐ 1h ☐ 2h ☐ 3h ☐ >3h
Num <u>dia de fim de semana</u>	☐ <30min ☐ 30 min ☐ 1h ☐ 2h ☐ 3h ☐ >3h

De acordo com o **Boletim de Saúde**: (se preferir pode anexar uma fotocópia da página 2 e 3 do *Boletim de Saúde Infantil e Juvenil* do seu filho(a))

	<u>Peso</u>	<u>Comprimento/Altura</u>
à Nascimento	, kg	, cm
1 ano	, kg	, cm
2 anos	, kg	, cm
3 anos	, kg	, cm
4 anos	, kg	, cm
5 anos	, kg	, cm
6 anos	, kg	, cm
7 anos	, kg	, cm
8 anos	, kg	, cm
9 anos	, kg	, cm
10 anos	, kg	, cm

Pratica Atividade Física organizada fora da escola? ☐ Sim ☐ Não

Se Sim, qual/quais:

<u>Tipo de Atividade</u>	<u>Nº de vezes por semana</u>							<u>Duração de cada sessão</u>				<u>Dia(s) da semana</u>
	1x	2x	3x	4x	5x	6x	7x	30`	45`	1h	1h30	
	1x	2x	3x	4x	5x	6x	7x	30`	45`	1h	1h30	
	1x	2x	3x	4x	5x	6x	7x	30`	45`	1h	1h30	

Exemplo:

Karaté	1x	2x	3x	4x	5x	6x	7x	30`	45`	1h	1h30	Segunda e Sexta
--------	----	----	----	----	----	----	----	-----	-----	----	------	-----------------

Qual o transporte que utiliza para ir para a escola?

☐ carro ☐ autocarro ☐ mota ☐ a pé ☐ Outro: _____
quanto tempo demora no percurso casa-escola? _____ minutos

Qual o seu tipo de habitação:

☐ apartamento ☐ moradia ☐ Outro: _____

No local onde vive, é possível que o seu filho brinque no exterior? ☐ SIM ☐ NÃO

Se Sim, onde? ☐ na rua ☐ num parque junto à sua casa ☐ no quintal/jardim de casa ☐ no parque infantil

Se não, qual o motivo? ☐ não tem quintal/jardim em casa ☐ a rua tem muito tráfego ☐ não há parque infantil

☐ a rua é perigosa em termos criminais, Outro: _____

	NUNCA	RARAMENTE	OCASIONALMENTE	FREQUENTEMENTE	SEMPRE
o meu/minha filho/a é naturalmente muito ativo	☐	☐	☐	☐	☐
o meu/minha filho/a precisa de mim para ter motivação para brincar	☐	☐	☐	☐	☐
o meu/minha precisa de companhia (amigos, Irmãos, pais) para ter motivação para brincar	☐	☐	☐	☐	☐

Comparando com crianças da mesma idade, considera o seu/sua filho/a:

- ☐ MUITO MAIS ACTIVO
☐ MAIS ACTIVO
☐ IGUAL
☐ MENOS ACTIVO
☐ MUITO MENOS ACTIVO

O/A seu/sua filho/a com quem vive: ☐ PAI ☐ MÃE ☐ IRMÃOS ☐ AVÓ ☐ AVÔ ☐ OUTROS: _____

Quantas horas por dia, o/a seu/sua filho/a passa na escola? |__|_| Horas |__|_| Min

Quantos televisores têm em sua casa? ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ >4

O seu/sua filho/a tem televisão no quarto? ☐ SIM ☐ NÃO

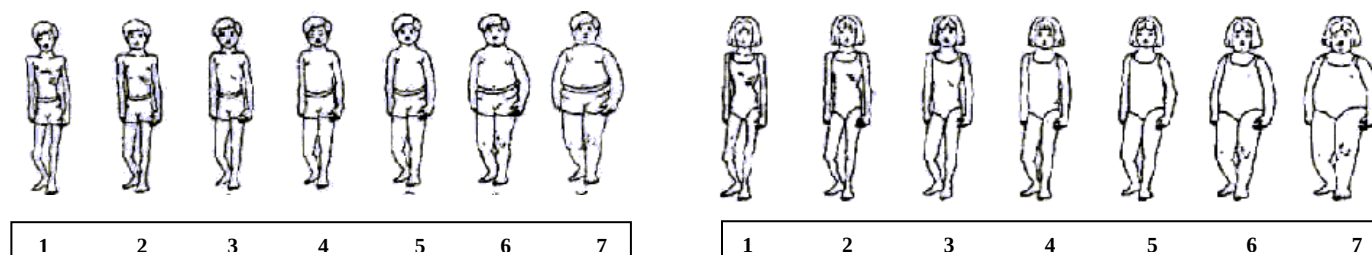
Tem computadores (fixos e portáteis) em sua casa? ☐ SIM ☐ NÃO **Se sim, quantos** _____

Tem videojogos (nitendo, playstation, wii, gameboy) em sua casa? ☐ SIM ☐ NÃO **Se sim, quantos** _____

Durante as refeições a televisão está ligada e a atenção está centrada na televisão? ☐ SIM ☐ NÃO

Acha que seu filho tem, neste momento, um Peso ☐ Muito Baixo ☐ Baixo ☐ Ligeiramente Magro ☐ Normal
☐ Ligeiramente com excesso de peso ☐ Excesso Peso ☐ Obesidade

Qual destas figuras é semelhante ao seu filho(a)?



(COLOQUE UM CIRCULO NO NUMERO QUE SE ENCONTRA ABAIXO DA FIGURA ESCOLHIDA)

Organização do Sono (BISQ)

Por favor, coloque apenas uma resposta (a mais apropriada) em cada questão.

O seu filho/a dorme: ☐ em quarto próprio ☐ no quarto dos pais ☐ na cama dos pais
☐ em quarto partilhado com o irmão(s) ☐ OUTRO: _____

Em que posição o seu filho/a dorme a maior parte do tempo? ☐ de barriga para baixo ☐ de lado ☐ de costas

Quanto tempo o seu filho/a dorme durante a NOITE (entre as 19h da tarde e as 7h da manhã)?	_ _ _ Horas _ _ _ Min
Quanto tempo o seu filho/a dorme durante o DIA (entre as 7h da manhã e as 19h da tarde)?	_ _ _ Horas _ _ _ Min
Quanto tempo durante a noite o seu filho/a está acordado (entre as 22h da noite e as 6h da manhã)?	_ _ _ Horas _ _ _ Min
Quanto tempo é que o seu filho/a demora a adormecer?	_ _ _ Horas _ _ _ Min
A que horas o seu filho vai dormir?	_ _ _ Horas _ _ _ Min

Número de vezes o seu filho/a acorda por noite: ? ☐ nunca acorda ☐ 1 vez ☐ 2 vezes ☐ ≥3 vezes

Como é q o seu filho/a adormece? ☐ enquanto toma o biberão ☐ embalado ☐ com ajuda
☐ na cama sozinho ☐ na cama junto aos pais ☐ OUTRO: _____

Acha q o seu filho/a tem problemas de sono? ☐ problemas muito sérios
☐ pequenos problemas
☐ Não tem problemas

Escala de Regulação Emocional (ERRS)

Por favor, classifique o seu filho de acordo com as descrições abaixo, colocando um círculo no número mais adequado. O número 4 que está sublinhado no centro representa o ponto médio no qual a criança se poderá situar nesse item. Por favor esteja à vontade para usar todas as possíveis opções de resposta..

	Não é provável						Muito provável
1. Depois de receber de alguém um presente que não gosta, qual a probabilidade do seu filho fingir que gosta do presente?	1	2	3	<u>4</u>	5	6	7
2. Depois de ver alguém tropeçar ou cair de uma forma engraçada, qual a probabilidade do seu filho rir à gargalhada?	1	2	3	<u>4</u>	5	6	7
3. Depois do seu filho comer algo que lhe sabe mal, qual a probabilidade dele cuspir a comida ou reagir negativamente?	1	2	3	<u>4</u>	5	6	7
4. Num contexto mais sério, como uma igreja ou um funeral, qual a probabilidade do seu filho entender e se comportar adequadamente à situação?	1	2	3	<u>4</u>	5	6	7
5. Se lhe for pedido para guardar um segredo (p. ex., não falar ao irmão sobre a festa de aniversário surpresa), qual a probabilidade do seu filho manter o segredo?	1	2	3	<u>4</u>	5	6	7
6. Qual a probabilidade do seu filho ajudar os outros (p. ex., amigo / irmão) a manter um segredo de forma a evitar um castigo? (p. ex., não contar à mãe que um irmão partiu um vaso)	1	2	3	<u>4</u>	5	6	7

CARACTERÍSTICAS DOS PAIS

	<u>PAI</u>	<u>MÃE</u>
IDADE	_ _ ANOS	_ _ ANOS
PESO ATUAL	_ _ , _ KG	_ _ , _ KG
ALTURA ATUAL	_ , _ M (COLOCAR O VALOR QUE ESTÁ NO BILHETE DE IDENTIDADE)	_ , _ M (COLOCAR O VALOR QUE ESTÁ NO BILHETE DE IDENTIDADE)
FUMA?	☐ SIM ☐ NÃO	☐ SIM ☐ NÃO
SE SIM, FUMA DENTRO DE CASA?	☐ SIM ☐ NÃO	☐ SIM ☐ NÃO
ANO ESCOLARIDADE PAI:	☐ 1ª, 2ª, 3ª OU 4ª CLASSE ☐ 10º, 11º OU 12º ANO	☐ 5º OU 6º ANO ☐ 7º, 8º OU 9º ANO ☐ BACHARELATO OU CURSO SUPERIOR
ANO ESCOLARIDADE MÃE:	☐ 1ª, 2ª, 3ª OU 4ª CLASSE ☐ 10º, 11º OU 12º ANO	☐ 5º OU 6º ANO ☐ 7º, 8º OU 9º ANO ☐ BACHARELATO OU CURSO SUPERIOR
PROFISSÃO PAI:	_____	
PROFISSÃO MÃE:	_____	

QUESTÕES RELACIONADAS COM A GRAVIDEZ:

Idade que tinha quando engravidou do/da seu/sua filho/a? _____
 Quantos filhos tem? _____ Que idade têm? _____

Recorde-se da alimentação do bebé no 1º ano de vida, durante quanto tempo foi amamentado, **só com leite materno**?
☐ Não foi amamentado _
☐ Foi amamentado: quanto tempo: _____ dias **ou** _____ semanas **ou** _____ meses

Em que altura (dias, meses ou semanas), lhe introduziu **outro alimento**, além leite materno?
 _____ dias **ou** _____ semanas **ou** _____ meses

Que alimento foi? (assinale com uma cruz)
☐ Leite de vaca ☐ Leite de lata ☐ Papas ☐ Sopa ☐ Outro: Qual? _____

Qual o seu peso no início da Gravidez do seu filho? _____ Kg e no final? _____ Kg
 Quantos quilos no total, aumentou no seu peso, durante a gravidez? _____ Kg

Teve **diabetes gestacional**? ☐ Sim ☐ Não Teve **pré-eclampsia**? ☐ Sim ☐ Não
 (tensão arterial elevada)

Teve de alteração a sua alimentação durante a gravidez? ☐ Sim ☐ Não Se sim, motivo? _____

O/A seu/sua filho/a nasceu com quantos meses ou semanas de gestação: _____ semanas (**Ex: 38 semanas**)

Tipo de Parto? ☐ Parto Normal ☐ Cesariana

Fumou durante a Gravidez? ☐ Sim ☐ Não Se Sim, quantos por dia? _____
 Manteve ou reduziu o consumo de tabaco? _____

ACTIVIDADE FÍSICA HABITUAL DOS PAIS

Questionário Internacional de Atividade Física (IPAQ)

As questões que lhes vou colocar, referem-se à semana imediatamente anterior, considerando o tempo em que esteve fisicamente ativo/a. Por favor, respondam a todas as questões, mesmo que não se considerem pessoas fisicamente ativas. Vou colocar-lhes questões sobre as atividades desenvolvidas na vossa atividade profissional e nas vossas deslocações, sobre as atividades referentes aos trabalhos domésticos e às atividades que efetuam no vosso tempo livre para recreação ou prática de exercício físico / desporto.

Ao responder às seguintes questões considerem o seguinte:

Atividades físicas vigorosas referem-se a atividades que requerem um esforço físico intenso que fazem ficar com a respiração ofegante.

Atividades físicas moderadas referem-se a atividades que requerem esforço físico moderado e tornam a respiração um pouco mais forte que o normal.

	<u>PAI</u>	<u>MÃE</u>
Q.1 Diga-me por favor, nos últimos 7 dias, em quantos dias fez atividades físicas vigorosas , como por exemplo, levantar objetos pesados, cavar, correr, ginástica aeróbica, nadar, jogar futebol/basquete, andar de bicicleta a um ritmo rápido, fazer exercícios domésticos pesados (ex: esfregar o chão)?	____ DIAS	____ DIAS
Q.2 Nos dias em que pratica atividades físicas vigorosas pelo menos 10 minutos seguidos , quanto tempo em média dedica normalmente a essas atividades (por dia)?	____ HORAS ____ MIN.	____ HORAS ____ MIN.
Q.3 Diga-me por favor, nos últimos 7 dias, em quantos dias fez atividades físicas moderadas como por exemplo, carregar objetos leves, caçar, ginástica manutenção, trabalhos de doméstico (ex: varrer, aspirar, ...), trabalhos de carpintaria, andar de bicicleta a um ritmo normal ou ténis de pares? Por favor NÃO inclua o "andar" .	____ DIAS	____ DIAS
Q.4 Nos dias em que faz atividades físicas moderadas pelo menos 10 minutos seguidos , quanto tempo em média dedica normalmente a essas atividades (por dia)?	____ HORAS ____ MIN.	____ HORAS ____ MIN.
Q.5 Diga-me por favor, nos últimos 7 dias, em quantos dias <u>andou</u> pelo menos 10 minutos seguidos em casa ou no trabalho, por lazer, por prazer ou como exercício?	____ DIAS	____ DIAS
Q.6 Quanto tempo no total, despendeu num desses dias, a andar/caminhar?	____ HORAS ____ MIN.	____ HORAS ____ MIN.
Q.7 Diga-me por favor, num dia normal da semana quanto tempo passa sentado? Isto pode incluir o tempo que passa a uma secretária (estudar, computador), a visitar amigos, a ler, a estudar, a brincar com os filhos, a ver televisão. (some todos os momentos)	____ HORAS ____ MIN.	____ HORAS ____ MIN.

ACTIVIDADE FÍSICA ORGANIZADA DOS PAIS

		<u>Pai</u>	<u>Mãe</u>
Pratica regularmente Atividade Física organizada?		☐ Sim ☐ Não	☐ Sim ☐ Não
Tipo de atividade		_____	_____
Se Sim	Horas por semana	<1h 1-2h 2-3h 3-4h >4h	<1h 1-2h 2-3h 3-4h >4h
	Duração de cada sessão	<1h 1-2h 2-3h 3-4h >4h	<1h 1-2h 2-3h 3-4h >4h

Código Postal da sua área de residência: _____ - _____

Muito Obrigada pela Colaboração

Appendix 5: Self-esteem questionnaire

Rosenber M (1965) Society and the adolescent self-image.

Princeton NJ: Princeton University Press

Preencha as questões (itens) utilizando a seguinte escala:

1	2	3	4
Discordo completamente			Concordo

1. No geral, estou satisfeito comigo próprio (a).

1	2	3	4
---	---	---	---

2. Às vezes penso que não valho nada.

1	2	3	4
---	---	---	---

3. Sinto que tenho bastantes qualidades.

1	2	3	4
---	---	---	---

4. Sou capaz de fazer coisas tão bem como as outras pessoas.

1	2	3	4
---	---	---	---

5. Sinto que não tenho muito para me sentir orgulhoso (a).

1	2	3	4
---	---	---	---

6. Por vezes, sinto-me um (a) inútil.

1	2	3	4
---	---	---	---

7. Sinto que sou uma pessoa digna, pelo menos num nível igual ao das outras pessoas.

1	2	3	4
---	---	---	---

8. Desejava ter mais respeito por mim próprio (a).

1	2	3	4
---	---	---	---

9. Em geral, a minha vida leva-me a sentir que sou um fracasso.

1	2	3	4
---	---	---	---

10. Tomo atitudes positivas em relação a mim próprio (a).

1	2	3	4
---	---	---	---

Appendix 6: Self perception profile for children questionnaire

Versão Portuguesa do
Self Perception Profile for Children

Versão Original de Susan Harter (1984)

Adaptação de Castro, Monteiro, Rebelo e Sá (1992)

Instruções

Na página seguinte está uma lista de situações. Por favor diz-nos a tua opinião sobre cada uma delas. Seguidamente tens um exemplo, para te ajudar a compreender a prova.

Não há respostas correctas ou incorrectas.

Se não entendes uma pergunta, por favor pede ajuda

Exemplo:

Sou mesmo assim	Sou mais ou menos assim				Sou mais ou menos assim	Sou mesmo assim
☐	☐	Alguns adolescentes nos seus tempos livres preferem brincar fora de casa	MAS	Outros adolescentes preferem ver televisão	☐	☐

Como é que eu sou?

	Sou mesmo assim	Sou mais ou menos assim			Sou mais ou menos assim	Sou mesmo assim
1.	☐	☐	Algumas crianças acham que são muito <u>boas</u> a fazer o trabalho da escola	Outras crianças muitas vezes <u>duvidam</u> se conseguirão fazer o trabalho da escola	☐	☐
2.	☐	☐	Algumas crianças acham <u>difícil</u> fazer amigos	Outras crianças acham bastante <u>fácil</u> fazer amigos	☐	☐
3.	☐	☐	Algumas crianças são muito <u>boas</u> em todo o tipo de desportos	Outras crianças <u>não</u> se acham muito boas no desporto	☐	☐
4.	☐	☐	Algumas crianças estão <u>satisfeitas</u> com a sua aparência	Outras crianças <u>não</u> estão <u>satisfeitas</u> com a sua aparência	☐	☐
5.	☐	☐	Algumas crianças <u>não gostam</u> da forma como se comportam	Outras crianças geralmente <u>gostam</u> da forma como se comportam	☐	☐
6.	☐	☐	Algumas crianças <u>nunca estão</u> <u>satisfeitas</u> consigo	Outras crianças geralmente <u>estão</u> <u>satisfeitas</u> consigo	☐	☐
7.	☐	☐	Algumas crianças acham que são <u>tão</u> <u>espertas</u> como os da sua idade	Outras crianças <u>duvidam</u> se serão tão espertas como as da sua idade	☐	☐
8.	☐	☐	Algumas crianças têm <u>muitos</u> amigos	Outras crianças <u>não têm</u> muitos amigos	☐	☐
9.	☐	☐	Algumas crianças <u>gostavam de ser</u> melhores no desporto	Outras crianças <u>acham</u> <u>que são</u> suficientemente boas no desporto	☐	☐
10.	☐	☐	Algumas crianças estão <u>satisfeitas</u> com a altura e o peso que têm	Outras crianças gostavam de ter uma altura ou peso <u>diferente</u>	☐	☐

Como é que eu sou?

Sou mesmo assim	Sou mais ou menos assim			Sou mais ou menos assim	Sou mesmo assim
11. ☐	☐	Algumas crianças <u>quase sempre</u> fazem aquilo que devem	Outras crianças <u>quase nunca</u> fazem aquilo que devem	☐	☐
12. ☐	☐	Algumas crianças <u>não gostam</u> da forma como a vida lhes corre	Outras crianças <u>gostam</u> da forma como a vida lhes corre	☐	☐
13. ☐	☐	Algumas crianças são bastante <u>lentas</u> a fazer os trabalhos de casa	Outras crianças conseguem fazer o trabalho da escola <u>depressa</u>	☐	☐
14. ☐	☐	Algumas crianças <u>gostavam de ter</u> mais amigos	Outras crianças <u>já têm</u> todos os amigos que queriam	☐	☐
15. ☐	☐	Algumas crianças acham que <u>são capazes</u> de fazer à primeira qualquer desporto que nunca tenham tentado	Outras crianças <u>têm receio</u> de não se sair bem em desportos que nunca experimentaram	☐	☐
16. ☐	☐	Algumas crianças gostariam que o seu corpo fosse <u>diferente</u>	Outras crianças <u>gostam</u> do seu corpo tal como é	☐	☐
17. ☐	☐	Algumas crianças <u>comportam-se quase sempre</u> de acordo com o que se sabem que se espera deles	Outras crianças <u>quase nunca se comportam</u> da forma que é esperada	☐	☐
18. ☐	☐	Algumas crianças <u>estão contentes</u> consigo próprias como pessoas	Outras crianças <u>quase nunca estão contentes</u> consigo próprias	☐	☐
19. ☐	☐	Algumas crianças <u>esquecem</u> muitas vezes o que aprenderam	Outras crianças <u>conseguem lembrar-se</u> das coisas com facilidade	☐	☐
20. ☐	☐	Algumas crianças fazem a maioria das coisas com os <u>amigos</u>	Outras crianças costumam fazer as coisas <u>sozinhas</u>	☐	☐

Como é que eu sou?

	Sou mesmo assim	Sou mais ou menos assim			Sou mais ou menos assim	Sou mesmo assim
21.	☐	☐	Algumas crianças acham que são <u>melhores</u> no desporto do que os outros da sua idade	Outras crianças acham que <u>não conseguem</u> ser tão boas como os da sua idade	☐	☐
22.	☐	☐	Algumas crianças gostavam de ter uma aparência física <u>diferente</u>	Outras crianças <u>gostam</u> da aparência física que têm	☐	☐
23.	☐	☐	Algumas crianças arranjam muitas vezes <u>problemas</u> por causa das coisas que fazem	Outras crianças <u>não fazem</u> coisas que lhes arranjem problemas	☐	☐
24.	☐	☐	Algumas crianças <u>gostam</u> de ser como são	Outras crianças muitas vezes gostariam de ser uma pessoa <u>diferente</u>	☐	☐
25.	☐	☐	Algumas crianças são muito <u>bons alunos</u>	Outras crianças <u>não são</u> muito bons alunos	☐	☐
26.	☐	☐	Algumas crianças <u>queriam</u> que as pessoas da sua idade gostassem delas	Outras crianças acham que a maior parte das pessoas da sua idade gosta <u>delas</u>	☐	☐
27.	☐	☐	Algumas crianças geralmente <u>ficam a ver</u> os jogos e desportos, em vez de jogarem	Outras crianças geralmente <u>entram nos jogos</u> , em vez de ficarem apenas a ver	☐	☐
28.	☐	☐	Algumas crianças gostavam que a sua cara ou o seu cabelo fossem <u>diferentes</u>	Outras crianças <u>gostam</u> da cara e do cabelo que têm	☐	☐
29.	☐	☐	Algumas crianças fazem coisas que sabem que <u>não deviam fazer</u>	Outras crianças <u>quase nunca fazem</u> coisas que sabem que não deviam fazer	☐	☐
30.	☐	☐	Algumas crianças <u>são muito felizes</u> sendo como são	Outras crianças gostavam de ser <u>diferentes</u>	☐	☐

Como é que eu sou?

Sou mesmo assim	Sou mais ou menos assim			Sou mais ou menos assim	Sou mesmo assim
31. ☐	☐	Algumas crianças <u>têm</u> <u>dificuldade</u> em descobrir as respostas às perguntas feitas na aula	Outras crianças <u>conseguem</u> quase sempre descobrir as respostas	☐	☐
32. ☐	☐	Algumas crianças são <u>populares</u> entre os da sua idade	Outras crianças <u>não</u> <u>são</u> muito populares	☐	☐
33. ☐	☐	Algumas crianças <u>não</u> <u>são boas</u> nos jogos de ar livre que não conhecem	Outras crianças <u>fazem logo bem</u> os jogos novos	☐	☐
34. ☐	☐	Algumas crianças acham-se <u>bonitas</u>	Outras crianças <u>não</u> <u>se acham</u> muito bonitas	☐	☐
35. ☐	☐	Algumas crianças comportam-se <u>muito</u> <u>bem</u>	Outras crianças muitas vezes <u>acham</u> <u>difícil comportarem-</u> <u>se bem</u>	☐	☐
36. ☐	☐	Algumas crianças <u>nunca estão satisfeitas</u> com a forma como fazem as coisas	Outras crianças acham que <u>fazem</u> <u>bem</u> as coisas	☐	☐

Castro, P., Sá, I., Monteiro, M. B., & Rebelo, M. (1992). Perfil de auto-percepção para crianças: Estudo de um instrumento de avaliação da auto-estima. Comunicação apresentada no III Simpósio de Investigação em Psicologia. Lisboa, Fundação Calouste Gulbenkian.

Appendix 7: Cardiorespiratory fitness report

Nome: Diogo
 Apelido: Leão
 Identificação: UEFAPER13/1440
 Data Nasc.: 16-09-2002
 Sexo: male
 Idade: 11 Years
 Altura: 156,2 cm
 Peso: 61,6 kg
 IMC: 25,25

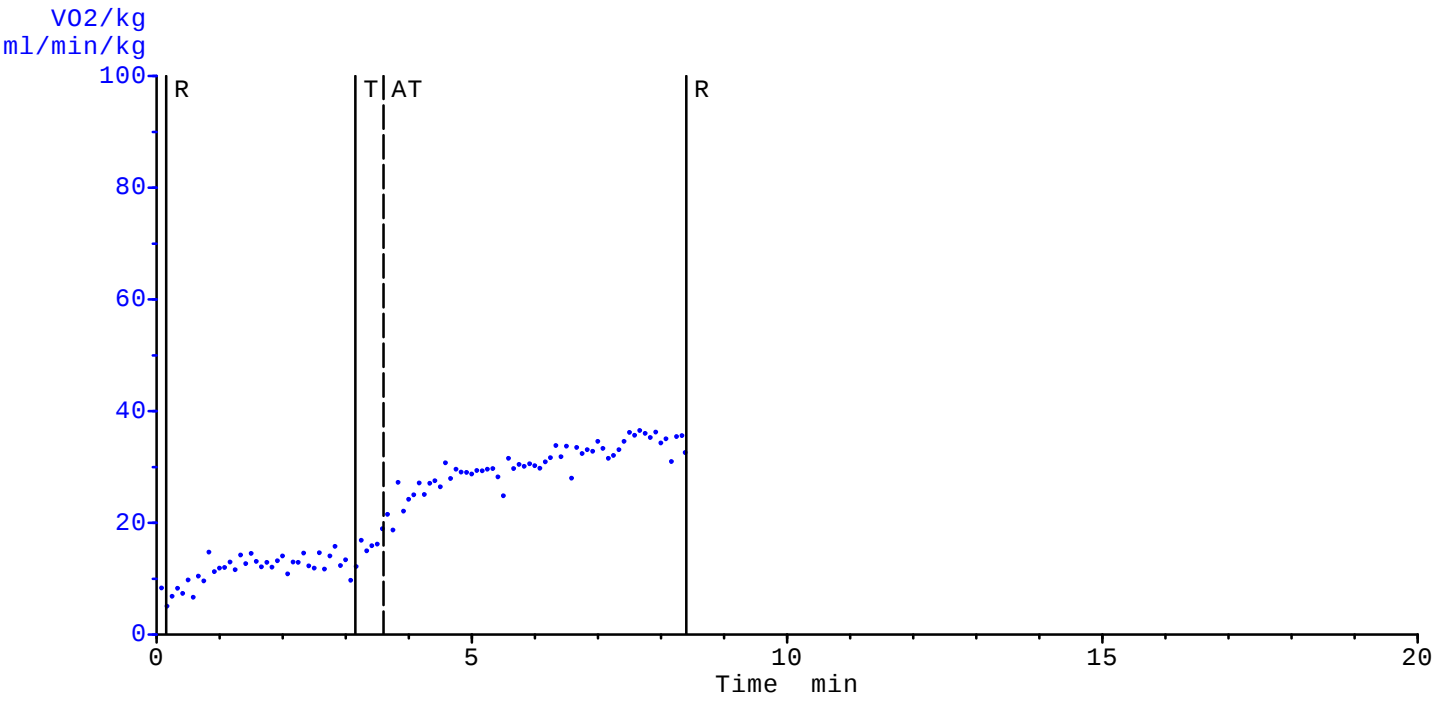
Protocol: TM_ACORDA
 Time: 11:17:20

Date: 03-03-2014

Time min	Speed km/h	Elev. %	V'C02 ml/min	V'O2 ml/min	V02/kg ml/ min/kg	RER	HR 1/min	BF 1/min	V'E L/min
00:04	0.0	0.0	387	512	8.3	0.75	0	24	14
00:10	0.0	0.0	239	310	5.0	0.77	85	14	10
00:15	0.0	0.0	320	420	6.8	0.76	79	17	12
00:20	1.0	0.0	402	508	8.2	0.79	85	14	16
00:25	2.3	0.0	347	453	7.3	0.77	85	21	14
00:30	3.6	0.0	459	600	9.7	0.76	97	19	18
00:35	4.0	0.0	310	409	6.6	0.76	98	21	13
00:40	4.0	0.0	454	643	10.4	0.71	111	16	16
00:45	4.0	0.0	410	588	9.5	0.70	105	23	16
00:50	4.0	0.0	638	907	14.7	0.70	105	22	25
00:55	4.0	0.0	510	691	11.2	0.74	109	22	20
01:00	4.0	0.0	536	731	11.9	0.73	108	26	21
01:05	4.0	0.0	532	737	12.0	0.72	108	25	21
01:10	4.0	0.0	579	796	12.9	0.73	106	26	22
01:15	4.0	0.0	550	715	11.6	0.77	109	19	21
01:20	4.0	0.0	612	876	14.2	0.70	107	20	21
01:25	4.0	0.0	548	782	12.7	0.70	107	28	22
01:30	4.0	0.0	610	892	14.5	0.68	116	29	24
01:35	4.0	0.0	592	804	13.1	0.74	114	32	24
01:40	4.0	0.0	575	745	12.1	0.77	109	22	22
01:45	4.0	0.0	604	795	12.9	0.76	106	25	24
01:50	4.0	0.0	555	740	12.0	0.75	105	22	21
01:55	4.0	0.0	605	812	13.2	0.74	106	25	23
02:00	4.0	0.0	654	865	14.0	0.76	109	25	25
02:05	4.0	0.0	498	666	10.8	0.75	101	20	19
02:10	4.0	0.0	565	799	13.0	0.71	101	28	22
02:15	4.0	0.0	583	794	12.9	0.73	107	25	24
02:20	4.0	0.0	650	896	14.5	0.73	106	24	24
02:25	4.0	0.0	564	755	12.3	0.75	105	24	23
02:30	4.0	0.0	524	732	11.9	0.72	105	21	19
02:35	4.0	0.0	672	900	14.6	0.75	109	24	26
02:40	4.0	0.0	533	720	11.7	0.74	106	26	22
02:45	4.0	0.0	626	864	14.0	0.72	111	32	26
02:50	4.0	0.0	695	969	15.7	0.72	107	33	28
02:55	4.0	0.0	549	761	12.3	0.72	110	22	20
03:00	4.0	0.0	601	824	13.4	0.73	103	21	23
03:05	4.0	0.0	431	595	9.7	0.72	103	21	17
03:10	4.0	0.0	509	749	12.2	0.68	102	19	17
03:15	4.6	0.0	753	1038	16.9	0.72	109	24	30
03:20	5.8	0.0	645	922	15.0	0.70	106	35	25
03:25	6.3	0.0	691	980	15.9	0.71	112	39	30
03:30	7.8	0.0	726	997	16.2	0.73	126	26	28
03:35	7.9	0.0	855	1166	18.9	0.73	147	24	31
03:40	8.0	0.0	894	1323	21.5	0.68	146	48	36
03:45	8.0	0.0	843	1151	18.7	0.73	144	30	32
03:50	8.0	0.0	1236	1675	27.2	0.74	147	39	49
03:55	8.0	0.0	1041	1360	22.1	0.77	156	41	42
04:00	8.0	0.0	1152	1491	24.2	0.77	147	45	47
04:05	8.0	0.0	1251	1538	25.0	0.81	173	44	51
04:10	8.0	0.0	1345	1669	27.1	0.81	165	32	50
04:15	8.0	0.0	1252	1543	25.1	0.81	172	39	49
04:20	8.0	0.0	1371	1667	27.1	0.82	163	40	55
04:25	8.0	0.0	1411	1693	27.5	0.83	173	41	57
04:30	8.0	0.0	1351	1627	26.4	0.83	170	36	53
04:35	8.0	0.0	1561	1893	30.7	0.82	170	43	62
04:40	8.0	0.0	1458	1718	27.9	0.85	172	47	61
04:45	8.0	0.0	1575	1820	29.5	0.87	172	41	65

Time min	Speed km/h	Elev. %	V'C02 ml/min	V'O2 ml/min	V02/kg ml/ min/kg	RER	HR 1/min	BF 1/min	V'E L/min
04:50	8.0	0.0	1534	1790	29.1	0.86	170	46	65
04:55	8.0	0.0	1519	1786	29.0	0.85	176	45	63
05:00	8.0	0.0	1498	1770	28.7	0.85	187	49	63
05:05	8.0	0.0	1571	1808	29.4	0.87	177	45	66
05:10	8.0	0.0	1545	1806	29.3	0.86	178	46	63
05:15	8.0	2.2	1581	1821	29.6	0.87	179	44	66
05:20	8.0	3.0	1595	1828	29.7	0.87	181	45	68
05:25	8.0	3.0	1511	1738	28.2	0.87	177	39	62
05:30	8.0	3.0	1295	1530	24.8	0.85	184	28	47
05:35	8.0	3.0	1647	1943	31.5	0.85	179	38	65
05:40	8.0	3.0	1585	1828	29.7	0.87	178	40	64
05:45	8.0	3.0	1630	1875	30.4	0.87	178	46	68
05:50	8.0	3.0	1633	1853	30.1	0.88	182	42	68
05:55	8.0	3.0	1670	1881	30.5	0.89	185	46	70
06:00	8.0	3.0	1691	1861	30.2	0.91	187	42	70
06:05	8.0	3.0	1634	1832	29.7	0.89	182	53	67
06:10	8.0	3.0	1647	1901	30.9	0.87	186	38	66
06:15	8.0	3.0	1744	1947	31.6	0.90	185	48	75
06:20	8.0	3.0	1890	2082	33.8	0.91	189	48	80
06:25	8.0	3.0	1809	1961	31.8	0.92	188	44	76
06:30	8.0	3.0	1879	2077	33.7	0.90	187	45	80
06:35	8.0	3.0	1534	1724	28.0	0.89	190	32	56
06:40	8.0	3.0	1834	2061	33.5	0.89	186	46	74
06:45	8.0	3.0	1789	1994	32.4	0.90	190	43	74
06:50	8.0	3.0	1820	2037	33.1	0.89	189	44	74
06:55	8.0	3.0	1840	2018	32.8	0.91	188	49	80
07:00	8.0	3.0	1943	2129	34.6	0.91	190	46	82
07:05	8.0	3.0	1871	2049	33.3	0.91	191	48	84
07:10	8.0	3.0	1726	1940	31.5	0.89	192	44	67
07:15	8.0	5.2	1787	1972	32.0	0.91	192	45	76
07:20	8.0	6.0	1841	2037	33.1	0.90	192	45	76
07:25	8.0	6.0	1851	2128	34.5	0.87	193	41	77
07:30	8.0	6.0	2039	2229	36.2	0.91	191	52	91
07:35	8.0	6.0	2050	2194	35.6	0.93	194	51	91
07:40	8.0	6.0	2125	2248	36.5	0.95	195	51	96
07:45	8.0	6.0	2132	2216	36.0	0.96	193	50	97
07:50	8.0	6.0	2080	2172	35.3	0.96	194	50	95
07:55	8.0	6.0	2129	2230	36.2	0.95	195	54	97
08:00	8.0	6.0	2006	2112	34.3	0.95	196	52	91
08:05	8.0	6.0	2067	2156	35.0	0.96	198	51	93
08:10	8.0	6.0	1724	1907	31.0	0.90	193	35	68
08:15	8.0	6.0	2055	2182	35.4	0.94	194	45	88
08:20	8.0	6.0	2098	2193	35.6	0.96	192	49	95
08:23	8.0	6.0	1933	2004	32.5	0.96	191	46	86
08:25	8.0	6.0	1840	1945	31.6	0.95	182	44	80
08:30	8.0	5.4	1876	1983	32.2	0.95	190	43	82
08:35	6.5	1.3	1820	1931	31.4	0.94	189	41	77
08:40	5.6	0.0	1485	1621	26.3	0.92	186	29	57
08:45	5.0	0.0	1319	1474	23.9	0.89	183	28	46
08:50	4.1	0.0	1065	1193	19.4	0.89	180	25	41

Summary		MaxV02	AE	AT Vslope	AT %V02m
Time averaging 5 Seconds					
Time	min	07:40		03:35	
Speed	km/h	8.0		7.9	98
Elev.	%	6.0		0.0	0
V'C02	ml/min	2125		855	40
V'O2	ml/min	2248		1166	52
V02/kg	ml/min/kg	36.5		18.9	52
RER		0.95		0.73	78
HR	1/min	195		147	75
BF	1/min	51		24	46
V'E	L/min	96		31	32



Appendix 8: Body composition report

CENTRO DE INVESTIGAÇÃO ACTIVIDADE FÍSICA SAÚDE E LAZER

R. DR PLÁCIDO COSTA, 91
4200- 450, PORTO

Telephone: 225074700/ 68

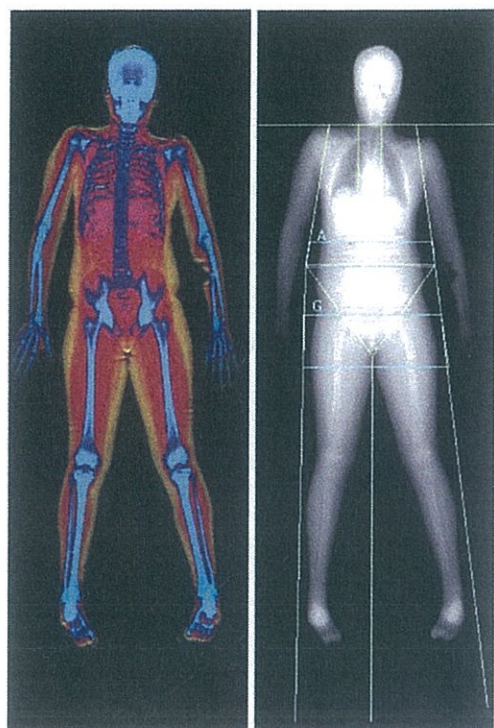
E-Mail: gabrtl@fcdef.up.pt

Fax: 225500689

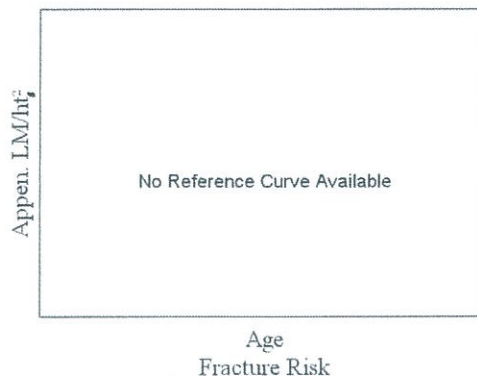
Name: LEAO, DIOGO
Patient ID: 220024
DOB: 16 September 2002

Sex: Male
Ethnicity: Pediatric

Height: 155.0 cm
Weight: 60.7 kg
Age: 11



Appen. Lean Mass/Height²



Source: 2008 NHANES White Male

Body Composition Results

Region	Fat Mass (g)	Lean+ BMC (g)	Total Mass (g)	% Fat	T-score	% Fat Z-score
L Arm	1176	1390	2566	45.8		
R Arm	1275	1685	2960	43.1		
Trunk	7961	14955	22915	34.7		
L Leg	4557	6006	10563	43.1		
R Leg	4476	5957	10433	42.9		
Subtotal	19445	29992	49437	39.3		
Head	1065	3247	4312	24.7		
Total	20510	33239	53749	38.2		1.2
Android	1334	2166	3499	38.1		
Gynoid	3179	4776	7955	40.0		

Adipose Indices

Measure	Result	T-score	Z-score
Total Body % Fat	38.2		1.2
Fat Mass/Height ² (kg/m ²)	8.43		
Android/Gynoid Ratio	0.95		
% Fat Trunk/% Fat Legs	0.81		
Trunk/Limb Fat Mass Ratio	0.69		

Lean Mass Indices

Measure	Result	T-score	Z-score
Lean Mass/Height ² (kg/m ²)	13.7		-0.2
Appen. Lean Mass/Height ² (kg/m ²)	6.18		

CENTRO DE INVESTIGAÇÃO ACTIVIDADE FÍSICA SAÚDE E LAZER

R. DR PLÁCIDO COSTA, 91

4200- 450, PORTO

Telephone: 225074700/ 68

E-Mail: gabrtl@fcdef.up.pt

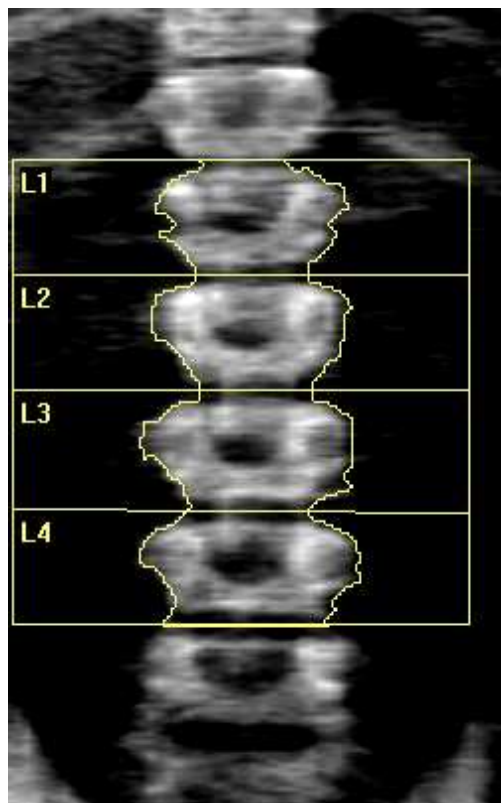
Fax: 225500689

Name: LEAO, DIOGO
Patient ID: 220024
DOB: 16 September 2002

Sex: Male
Ethnicity: Pediatric

Height: 155.0 cm
Weight: 60.7 kg
Age: 11

Referring Physician: UEFA



116 x 118
DAP: 2.5 cGy*cm²

Scan Information:

Scan Date: 03 March 2014 ID: A0303140C

Scan Type: e Lumbar Spine

Analysis: 03 March 2014 18:55 Version 13.2

Lumbar Spine (auto low density)

Operator:

Model: Explorer (S/N 90365)

Comment:

DXA Results Summary:

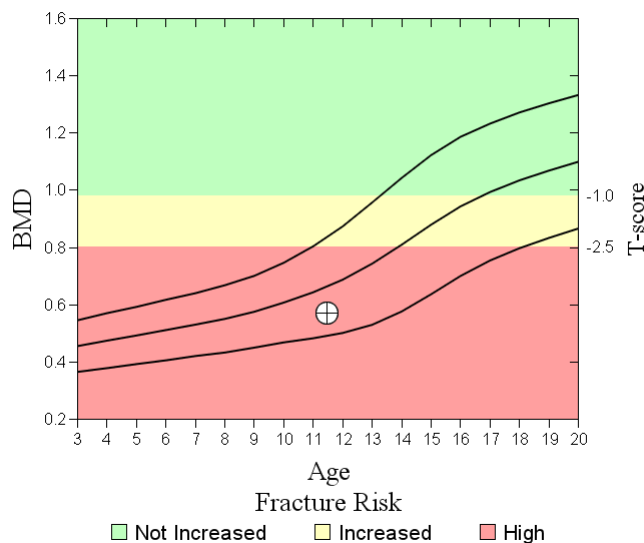
Region	Area (cm ²)	BMC (g)	BMD (g/cm ²)	T - score	PR (%)	Z - score	AM (%)
L1	11.26	5.29	0.470	-4.7	45	-1.5	76
L2	12.12	6.96	0.575	-3.9	52	-1.0	87
L3	13.79	8.42	0.611	-3.9	54	-0.8	89
L4	13.56	8.37	0.618	-3.7	56	-0.6	92
Total	50.73	29.05	0.573	-4.4	52	-1.0	86

Total BMD CV 1.0%

WHO Classification: Osteoporosis

Fracture Risk: High

Total



Comment:

T-score vs. Pediatric Male; Z-score vs. Pediatric Male. Source:Hologic, 2005

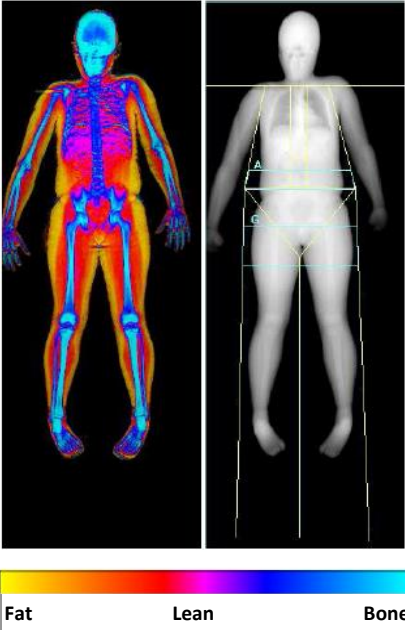
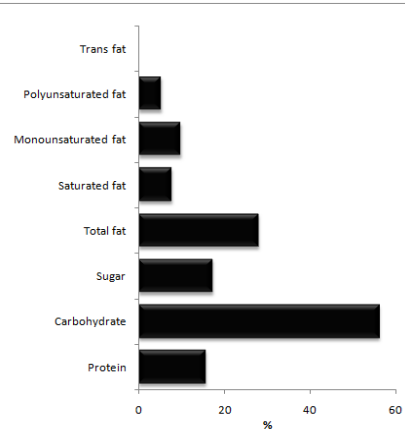
Appendix 9: Final children report

Identificação

Nome: Diogo Leão
Data de Nascimento: 16/set/2002
Idade: 11

Data de Avaliação: 02/09/2013
Sexo: M

Resultados dos Exames

Indicadores Somáticos		Resultado	Valores de Referência	Mensagens
	Altura (cm):	145.8	> P95	
	Peso (kg):	50.7	> P95	
	Índice de massa corporal (IMC)	23.9	< 19.10 - Normal 19.11-22.77 - Sobrepeso > 22.78 - Obesidade	
Composição Corporal	Massa gorda total (%)	41.3	< 20 - Normal 20-25 - Sobrepeso > 25 - Obesidade	
	Massa gorda (kg)	20.9		
	Massa magra (kg)	29.7		
	Conteúdo mineral ósseo (g)	1330.21		
	Densidade mineral óssea (g/cm ²)	0.878		
Nutrição	Consumo energético total (Kcal) = 2131			
	Proteínas (%)	15.7	15-30	
	Hidratos de carbono (%)	56.3	55-75	
	Açúcar (%)	17.3	<10	
	Gordura total (%)	28.0	15-30	
	Gorduras saturadas	7.7	<10	
	Gorduras mono-saturadas (%)	9.8	<9	
	Gorduras poli-saturadas (%)	5.3	6-10	
	Trans (%)	0.0	<1	
	Fibras (g/dia)	21.9	>25	
	Colesterol (mg/dia)	181.6	<300	
Síndrome Metabólica	Perímetro da Cintura (cm)	83.0	< 63.2	
	Triglicerídeos (mg/dl)	77,0	≤150	
	Colesterol HDL (mg/dl)	43.5	>40	
	Glicose (mg/dl)	63,0	≤100	
	Tensão Arterial Sist / Diast (mm Hg)	113-50	< 117-76	
Atividade Física	Semana	Fim Semana	Média	É recomendável realizar diariamente 60 minutos de actividades físicas/desportivas de intensidade moderada a vigorosa. São também recomendados 11000 passos diários.
	Dispêndio Energético (Kcal)	246	243	
	Mod/Vig (min)	97	107	
	Passos	7328	7286	