

# Food intake, physical activity and quality of life among children and youth

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## Abstract.

**BACKGROUND:** The health-related quality of life construct (QoL) implies a relationship with eating habits (EA) and physical activity (PA). Sociodemographic and anthropometric variables (gender, age and Body Mass Index - BMI) are highlighted in the definition of healthy lifestyle habits promotion strategies.

**OBJECTIVE:** We aim to characterize and relate PA, EA and QoL in children/youth and explore gender, age and BMI influences.

**METHODS:** It is a non-experimental study, with 337 children/youth, ages between 8 and 17 years ( $12.61 \pm 2.96$ ), mostly from the rural inland of Portugal. In data collection we used a sociodemographic and anthropometric questionnaire, a weekly register table of EA and Kid-Kindl (QoL). Statistical analysis ( $p < 0.05$ ) were performed in SPSS-IBM 25.

**RESULTS:** Lower BMI was associated with better EA ( $p < 0.001$ ), PA ( $p < 0.05$ ) and self-esteem ( $p < 0.01$ ) and worse scores on family subscale of QoL. Female showed higher fruit intake ( $p < 0.05$ ). The older has shown better results. PA is positively correlated with QoL ( $p < 0.01$ ) and EA ( $p < 0.05$ ).

**CONCLUSIONS:** It is important to explore other relevant social and family dimensions, to promote intervention programs with parents, school and community, as well as healthy practices policies. The intervention in these age groups is critical for a longer-term impact in improving healthy life habits.

Keywords: Eating habits, exercise, general well-being, childhood/adolescence

## 1. Introduction

Eating habits (EH) and physical activity (PA) have been established to have an important impact on children and youth's quality of life (QoL). The relationship that these factors have with obesity presents a central public health problem in developed and developing countries [1]. So, the construct of quality of life

refers to health related QoL, given the relevance to its relationship with variables such as eating habits and physical activity.

Many studies have tried to identify the risk factors for overweight and obesity. It is generally agreed that overweight and obesity are multifactorial and result from interactions of multiple genetic and environmental factors [1]. So, obesity is inextricably linked with lifestyle changes, especially in food consumption (diet and location of food service), physical activity and sedentary propensities [2]. Regarding food consumption, the literature highlights two simultaneous tendencies: an increase of high-caloric foods and beverages and a decrease of

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natural and healthy foods (fruits, vegetables, legumes and whole grains) [3]. Additionally, general and fast food restaurants, school cafeterias and other outside home food services are linked with overconsumption of calories and non-healthy foods [2, 4]. According to the WHO, the risk of death from diseases secondary to obesity is extremely high, but the risk of death associated with insufficient physical activity is higher compared to those meeting the minimum weekly practice recommendations. Indeed, regular PA reduces the risk of cardiovascular, metabolic, and some cancers and, in 2014, it was found that 81% of teens aged 11–17 did not engage in enough physical activity, and young women were less active [5]. Attaining the recommended physical activity for health benefits (physical, mental, emotional and social) is imperative for overall well-being in adults, adolescents, and children [6, 7]. In fact, several studies prove this association, pointing out that higher levels of physical activity are associated with better health-related quality of life among children and adolescents. Otherwise, the increased time of sedentary behaviour is linked to lower health-related quality of life [8, 9]. Furthermore, quality of life is significantly lower for obese compared to normal weight children and higher in children who are physically active [10].

Although worldwide obesity has doubled in the last forty years, the increase of obesity in children and adolescents is an extremely worrying trend. Even more, adolescence is a critical age for adopting definitive and healthy habits which will affect the state of health in adulthood [11].

The association between physical activity and healthy eating is so strong that no internationally recognized organization makes recommendations about one without referring to another. The American Academy of Paediatrics, for example, establishes daily dietary strategies that include: the balance of dietary calories with physical activity (60 minutes of moderate to vigorous aerobic or physical activity); consuming vegetables and fruits; restricting fruit juice intake; the preference for vegetable oils and soft margarines low in saturated fat and trans fatty acids compared to butter or other animal fats; choosing whole-grain breads and cereals as alternatives to refined-grain products; reducing consumption of sugar-sweetened beverages and food, electing for fat-free or low-fat milk and dairy products; eating more fish, especially oily fish, broiled or baked and reducing salt intake (including from processed foods) [12].

Despite the consensual and current recommendations for daily PA (at least 150 minutes/week of

moderate or vigorous activity) its protective effect on health was detected from even very low levels of activity [6] although more studies are needed to quantify the type, frequency, duration, and intensity of physical activity needed to change quality of life in youth [13]. However, evidence from many scientific studies shows that a healthy eating plan is key to a balanced and varied diet and maintaining a good nutritional state, as well as developing a daily physical activity level.

Health-related quality of life is a multidimensional construct, applicable and relevant to all people, regardless of ethnicity, culture, gender and age, that measures the impact of health or disease on physical and psychosocial functioning. The literature suggests the existence of relations of this variable with several behavioural variables, such as BMI, physical activity and sedentary behaviour, as well as food behaviour, in children and adolescents. In fact, fewer healthy and adequate behaviours translate into lower values of quality of life [14]. Thus, this study proposes to analyse possible relationships between these behavioural variables, sociodemographic variables (age and gender) and quality of life. We intent to reflect on the results and their implications to support specificities in the socio-educational intervention.

## 2. Methods

This is a non-experimental and ex post facto study and we started from the following research questions: how are the children's and youth's eating habits, physical activity and quality of life characterized and related? What is the influence of age, gender and BMI on these dimensions?

### 2.1. Participants

A sample of 337 children and youth, aged 8 to 17 ( $12.61 \pm 2.96$ ), mostly from Portugal inland (79.8%) and rural areas (56.6%) of which 58.2% are female, participated in this study. Regarding academic qualifications, 21.3% completed the first cycle of basic education, 22.2% the second, 26% the third and 30.5% completed secondary education. Parents of the sample have mostly secondary education (fathers 32.9% and mothers 35.9%). Lunch is mostly away from home (64.4%), while practically everyone dines at home (96.1%). Only 10 were found to have both meals away from home. It was noted that 34% were underweight while 6% were overweight.

## 2.2. Measures

A socio-demographic and anthropometric questionnaire with questions about weight, height, time (minutes) sitting and walking daily (physical activity measure), a weekly food ingestion record table (lunch and dinner) and the Portuguese version of Kid-Kindl (a quality of life questionnaire), validated by Ferreira et al. [15], were used in data collection. The walking time, in the absence of reference values, because it is a questionnaire constructed for this purpose, was corrected by analogy with International Physical Activity Questionnaire - IPAQ [16]: only values of 10 or more minutes of activity were included, based on the scientific evidence that episodes of at least 10 minutes are required to achieve health benefits; and the time exceeding 3 hours (180 minutes) was re-coded to 180 minutes. Food consumption was scored in weekly consumption frequency at lunch and dinner, including various categories of food and beverages, as well as types of confectionery. Weekends were excluded. The Kid-Kindl is a short and psychometrically valid and reliable 24-item measurement instrument that evaluates six health-related QoL dimensions (physical well-being, emotional well-being, self-esteem, family, friends, and school) in children and youth. All questions in the instrument refer to the temporal universe of the week prior to completion and were answered on a scale of 1 to 5, with 1 never, 2 rarely, 3 sometimes, 4 often and 5 always. There are partial (by dimension) and global scores (0–100 scale) where higher means better QoL.

## 2.3. Procedure

The data collection was done through direct administration in domiciliary visits, during December of 2016 and the ethical care guarantees regarding any research process were ensured, including a signed informed consent by the legal guardians of the participants. Authorization of the authors of the instrument was also guaranteed. Parents completed the sociodemographic and anthropometric questionnaire and the food intake registration table. The Kid-Kindl has been completed by the children/youth.

## 2.4. Data analysis

Descriptive (average, standard deviation, frequencies and percentages) and inferential parametric (One Sample *t*-Test) and non-parametric (Mann-Whitney Test, Spearman's rho and Wilcoxon Test) analyses,

since there is no resistance to normality criteria, were performed using SPSS-IBM 25, with an established significance of  $p \leq 0.05$ .

## 3. Findings and discussion

### 3.1. Descriptive analysis

Regarding BMI, the participants are distributed in 3 levels (see Table 1). Similarly, Morales-Suarez-Varela, Julve, and Gonzalez [17] found percentages of 57.3% and 7.4% normal weight and obesity, respectively, in Spanish children aged 5 to 15. Also, Grosso et al. [18] found percentages of 46.7 in normal weight, 41.1 overweight and 11.2 obesity in children and adolescents (4–16 years old) from a rural area of Sicily (Italy). An Asiatic study (Northeast China city), with 3205 students (aged 7–18 years), showed 71.8% of normal weight, 12.5% of overweight and 15.7% of obesity [2].

In terms of eating habits (Table 2) meat is the preferred food of the participants, followed by fish and eggs with low consumption (only 2-3 times a week). 35 individuals reported eating meat at lunch and dinner, at least 5 times a week, while only 4 and 1 eat fish and eggs, respectively. Most (91.2%) consume carbohydrates at lunch (vs 78.4% at dinner), but 246 (74.5%) do so at both meals. Only 2 individuals reported never consuming carbohydrates at lunch and dinner simultaneously. Less than 50% consume soup, at least in one of the meals considered, although it is preferred at lunch (46.4 vs 33.9). However, there are 7% (20) who never eat soup at both meals. The preferred type was vegetables soup (73% at lunch and 66% at dinner).

We highlight the reduced consumption of vegetables. Daily, only 31 individuals consume vegetables at lunch and 19 at dinner, while 83 (25.1%) participants never consume vegetables at any of these meals. In Colombia, Campo-Ternerera et al. [19] also obtained a high rate (17.5%), although lower, of children and adolescents who never consume vegetables. Also, fruit intake should be improved, as fruit consumption is reported daily by about 35% at lunch or

Table 1  
Descriptive statistics: BMI levels

BMI - labels	Freq	%
Low weight	113	34,5
Normal weight	195	59,5
Overweight	20	6,1

Table 2  
Descriptive statistics: eating habits (daily consumes or never at lunch and dinner)

	N	Daily meal	%	Lunch and dinner daily	Never	%	Never at lunch and dinner
Bread at lunch	335	123	36.7	50	122	36.4	94
Bread at dinner	332	84	25.3		157	47.3	
Water at lunch	336	223	66.3	163	19	5.7	9
Water at dinner	334	184	55.0		28	8.4	
Natural juices at lunch	334	22	6.5	12	152	45.5	117
Natural juices at dinner	334	27	8.0		162	48.5	
Soft drinks at lunch	336	15	4.4	6	206	61.3	172
Soft drinks at dinner	334	20	5.9		209	62.6	
Soup at lunch	336	156	46.4	82	48	14.3	24
Soup at dinner	333	113	33.9		59	17.7	
Fish at lunch	334	25 (4–5x)	7.5	4	14	4.2	6
Fish at dinner	329	34	10.3		30	9.1	
Meat at lunch	334	105	31.4	35	3	0.9	3
Meat at dinner	329	68	20.6		7	2.1	
Charcuterie at lunch	333	2 (3x)	0.6	0	248	74.5	157
Charcuterie at dinner	327	2 (3–4x)	0.6		215	65.7	
Eggs at lunch	334	13 (2–3x)	3.9	1	226	67.7	150
Eggs at dinner	328	19 (2x)	5.8		214	65.2	
Carbohydrates at lunch	331	302	91.2	246	9	2.7	2
Carbohydrates at dinner	326	255	78.4		6	1.8	
Horticultural at lunch	331	31	9.3	13	126	38.1	83
Horticultural at dinner	326	19	5.8		151	46.3	
Fried food at lunch	327	8 (4x)	2.4	0	82	25.1	40
Fried food at dinner	321	6 (4x)	1.8		90	28.0	
Fruit at lunch	332	119	35.8	75	25	7.5	19
Fruit at dinner	331	115	34.7		56	16.9	
Sweet desserts at lunch	332	11 ( $\geq 4x$ )	3.3	5	89	26.8	53
Sweet desserts at dinner	330	18 ( $\geq 4x$ )	5.4		124	37.6	
Yogurt at lunch	319	2 (4x)	0.6	2	260	81.5	242
Yogurt at dinner	316	4 ( $\geq 4x$ )	1.2		277	87.7	

Note. The results are about, at least, 5 days a week, except when the consumption is lowest (duly noted).

dinner, but only 23% in both meals. On the other hand, there is a positive note of the reduced consumption of sweet desserts during the week and only 5 individuals consume sweet desserts in the 2 meals. 53 participants do not consume sweets during the 5 days of the week, which can mean that they are reserved for weekend, or less. Borrmann, Mensink and Group [20] conclude that only 12.2% of a sample of German girls and 9.4% of boys consume the recommended five portions of fruits and vegetables per day; on average, girls and boys consume 2.7 and 2.4 portions a day.

Yogurt is not the option of the participants, for lunch and dinner, 5 days a week, since 76% never consume yoghurt. However, this should be an option up to the point that it does not interfere with iron intake, because calcium may reduce the iron absorption. However, the inhibitory effect may be of short duration because the studies on long-term calcium supplementation do not show any adverse effects on iron status [21]. Hence, foods rich in calcium, such dairy, must be part of the diet, but not simultaneously

with meals where the iron intake is key (lunch and dinner).

At lunch and dinner, 66.3% and 55% drink water, respectively. However, only 48.6% drink water in these two meals while 9 people never drink water at all. It would make sense to see if water intake occurs at other times of the day or falls short of what is desirable (1.5–2L/day).

The participants reported drinking more natural juices than soft drinks (6.5–8.0% and 4.4–5.9%) at lunch and dinner, but the differences are not very marked. The study by Campo-Tertera et al. [19] showed higher percentages of soft drinks than ours (16.9%).

Bread is preferred at lunch, with approximately 40% of respondents opting for different types. Here too, one can intervene to promote this behaviour. Current nutritional recommendations suggest that about a third of food intake should come from the food group comprising bread, rice, potatoes, pasta and other starchy foods [22]. However, common consumer

Table 3  
Descriptive statistics: quality of life (Kid Kindl) by gender and age

Kid Kindl	8–12 years				13–17 years				Global	
	Female (n = 59)		Male (n = 47)		Female (n = 65)		Male (n = 39)			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Physical well-being	82.79	12.04	80.31	13.12	75.14	14.24	77.94	10.68	78.93	13.06
Emotional well-being	82.45	18.34	87.55	11.02	80.37	13.88	82.82	12.34	88.99	14.61
Self-esteem	69.32	18.92	69.36	15.52	65.75	14.57	67.94	12.06	67.96	15.69
Family	81.18	12.70	79.46	11.62	78.69	18.56	82.56	14.50	80.28	14.84
Friends	85.84	15.48	89.45	9.32	77.80	15.64	76.41	15.51	82.35	15.25
School	64.05	11.71	67.65	14.05	61.07	14.51	58.71	12.86	62.44	14.51
Global score	77.38	10.57	78.49	9.08	73.05	8.61	74.40	9.22	75.73	9.61
Physical activity										
Minutes sitting									411.05	147.25
Minutes walking									97.03	66.77

perceptions that starchy foods are potentially fattening and have a high glycaemic index are eventual barriers to the consumption of such foods [23].

Several cooking techniques, excluding frying, both at lunch and dinner, are already used by about 70% of the participants. There is evidence that frying presents a higher content of fat than the other techniques [24]. García-González, Achón, Alonso-Aperte and Varela-Moreiras [25] concluded, with a Spanish adult sample, that the cooking techniques most frequently used were grilling (66%), stewing (49%), and baking (42%) while 20% preferred deep frying.

Considering PA (Table 3), we highlight the minutes walking daily, whose mean ( $97.3 \pm 66.7$ ) is highest than the minimum of 60 minutes recommended by the WHO [26] and adopted by the European Union. However, the dispersion is high, (standard deviation), and there are 31.8% who walk less than an hour and 13.5% less than half an hour. Campo-Ternera et al. [19] found 65.4% walk daily less than an hour in Colombian children and adolescents. In addition, the mean of almost 7 hours sitting per day is very high and contributes, largely, to the dangers of sedentary lifestyle. We would like to draw attention to the point that this information is only about the time the sample walk per day and these young people can do, concomitantly, other physical activities of moderate intensity. Hulteen et al. [7], in a review article, point out that walking was not classified as a top five activity in Europe. European children and adolescents prefer swimming, running and team sports.

Regarding QoL (Table 3), the scores are higher than those of the Portuguese validation [15], independently of gender and age, but there is similarity in the highest and lowest values, both the global scale and the subscales. Positively, the participants have high scores in health-related quality of life dimensions,

but almost all the means are lower in older participants. We highlight the lower values of self-esteem and at the school dimension. In the group aged 8–12, the friend's dimension is higher than the family, but this relationship is reversed in the older age group. It may be related to the influence of the group associated with sociomoral development, in the youngest participants. Also, in cultural adaptation and validation studies, Ferreira et al. [15] found this progress, although in the group of 13 to 16 years, there was an approximation, but without inversion.

### 3.2. Inferential analysis

There are statistical differences between lunch and dinner eating habits (Table 4), with the higher consumption at lunch in most foods, regardless of whether they are healthy. This must be related to an association between greater need for energy consumption at lunch, due to the tasks still to be performed and an association between higher energy intake at lunch with a lower risk of weight gain [27].

Table 4  
Statistically significant comparisons (Wilcoxon) between dietary intakes at lunch and dinner

Dinner-lunch consumption	N	Z	p
Bread (L)	332	4124.5	0.000
Water (L)	334	8513.5	0.001
Natural juices (D)	332	8617.5	0.047
Soup (L)	333	10241.5	0.000
Fish (L)	328	9286.0	0.011
Meat (L)	328	7592.0	0.000
Charcuterie (D)	325	6858.5	0.016
Carbohydrates (L)	325	3638.5	0.000
Horticultural (L)	325	7852.5	0.006
Fruit (L)	328	10029.0	0.001
Sweet desserts (L)	327	8287.0	0.001

Note. L– more ate lunch; D– more at dinner.

In addition, since most meals out of house are at lunch, the preparation of the dishes quantities is not carried out by the sample and is intended for standard consumers. On the positive side, we highlight the higher consumption of water, soup, fruit and vegetables; while negatively, the consumption of sweet desserts. At dinner, there is more charcuterie consumption, but the consumption of natural juices also stands out.

Negatively, at home, the participants consume more soft drinks ( $U = 10362.0, p = 0.001$ ), charcuterie ( $U = 10763.0, p = 0.005$ ) and fried food ( $U = 10509.5, p = 0.029$ ) and consumption outside of the home, includes sweet desserts ( $U = 14705.5, p = 0.007$ ). In addition, the intake of eggs is more at home if the meal is the lunch ( $U = 10207.5, p = 0.000$ ), but at dinner, is higher when eating out ( $U = 2599.5, p = 0.049$ ). Generally, according to Shonkoff et al. [4], restaurant food and beverages are linked to overconsumption of calories, sodium, total and saturated fat, and sugar-sweetened beverages as well as under-consumption of milk, fruits, vegetables, and vitamins, in children. Also, Andegiorgish et al. [2], in a cross-sectional observation, conclude that overweight children consumed significantly more sweet foods and often use food services outside of the home (general and fast-food restaurants or school cafeterias) rather than normal weight children.

Relatively to the statistically significant comparisons between QoL (global score and subscales) means obtained in our study and in the validation sample, our results are generally high. The main differences are in the female group; only in one age group or both (self-esteem and school dimensions). The differences in the males are all favourable to our sample and are verified in the global score ( $t = 2.724; p = 0.010$ ) and in the dimensions of self-esteem ( $t = 8.278; p = 0.000$ ), school ( $t = 2.718; p = 0.010$ ) and friends ( $t = 7.563; p = 0.000$ ). Only the last one refers to the younger age group and is also exclusive to males, while among the females there are differences in all other scales: aged 13–17, in global score ( $t = 5.795; p = 0.000$ ), physical well-being ( $t = 3.452; p = 0.001$ ), self-esteem ( $t = 8.347; p = 0.000$ ), family ( $t = 2.450; p = 0.017$ ) and school ( $t = 8.278; p = 0.000$ ). In self-esteem, there are differences also in the female younger group ( $t = 5.561; p = 0.000$ ). It would be interesting to explore why the scores of younger female children contradict the tendency towards superior results to those of validation sample in the emotional well-being ( $t = 2.241; p = 0.029$ ), and school ( $t = 6.155; p = 0.000$ ) dimensions.

We found statistical differences in PA, EH and QoL regarding the BMI levels. Hence, the low weight group performed better than the normal weight group, in minutes walking ( $X^2KW(2) = 9.06, p = 0.011$ ), and also consumes more soup ( $X^2KW(2) = 11.6435, p = 0.003$ , at lunch, and  $X^2KW(2) = 16.519, p = 0.000$ , at dinner), fruit ( $X^2KW(2) = 10.838, p = 0.004$ ), fish ( $X^2KW(2) = 10.279, p = 0.006$ ), carbohydrates ( $X^2KW(2) = 25.206, p = 0.000$ ) and water ( $X^2KW(2) = 10.958, p = 0.004$ ). The literature highlights that the food intake and physical activity are the two primary factors which determine body weight and focused the impact of decreased consumption of fresh fruits and vegetables on weight of children [2]. The results may eventually eliminate the myth of carbohydrate consumption associated to the overweight. This food group is essential in a balanced diet, if the recommendations are met. Recommendations for calorie and macronutrient intake in school-age children includes 45–65% of total daily calories by carbohydrates, with no more than 10% from simple sugars - white bread, candy, chips [28]. Also, the low weight group has more self-esteem ( $X^2KW(2) = 13.365, p = 0.001$ ), but in the family dimension of QoL, the scores are highest in overweight ( $X^2KW(2) = 8.194, p = 0.017$ ). Considering that the dimension ‘self-esteem’ includes being proud of oneself, having felt “the greatest” or satisfied with oneself, we recall the importance, in these ages, of the body image, often associated negatively with being overweight. The ‘family’ dimension measures the relationship of the child / adolescent with the family, having had, in the last week, well-being with their parents, having felt good or having had discussions at home, beyond whether parents have let them to do anything (children) or feel limited/controlled by their parents (adolescents). Thus, parental control of food can often be a factor of lower well-being and potentially conflicting.

There are no gender differences in physical activity and quality of life. In eating habits, there is a difference favouring girls in the consumption of fruit in nature or ready-made fruit ( $U = 11234.0; p \leq 0.05$ ), perhaps contemptible, because isolated. However, Hoy, Goldman and Moshfegh [29] showed gender significant differences in estimates of fruit and vegetables intake, higher among females. Galán et al. [6] highlight the positive effect on health produced by PA higher in females compared to males.

In the older group (13–17 years), the results in all variables (QoL, EH and PA) are the lowest (Table 5). In relation to the QoL, this was expected, considering the validation data for the Portuguese population

Table 5  
Statistically significant (Mann-Whitney) comparisons in QoL, EH and PA, by age groups (8–12 and 13–17 years)

QoL (KK)	N	U	P
Physical well-being	212	4280.00	0.003
Emotional well-being	212	4413.00	0.006
Friends	210	3180.50	0.000
School	209	4109.50	0.002
Global score	210	3844.00	0.000
PA (physical activity)	N	U	P
Walking minutes daily	323	5007.50	0.000
EH (eating habits)	N	U	P
Bread at lunch	335	11618.50	0.005
Water at lunch	336	12190.50	0.028
Soup at lunch	336	9204.000	0.000
Soup at dinner	333	10934.50	0.001
Fish at lunch	334	11830.00	0.012
Carbohydrates at lunch	331	11772.00	0.010
Carbohydrates at dinner	326	11182.50	0.010
Horticultural at lunch	331	11825.50	0.026
Fruit at lunch	332	10453.50	0.000
Fruit at dinner	331	10837.50	0.001
Sweet desserts at lunch	332	12109.50	0.048
Yogurt at lunch	319	10978.00	0.002
Yogurt at dinner	316	11439.00	0.027

[15]. The authors refer to the coincidence at this stage of growth (adolescence) in which individuals become more interested in everything concerning their health. The increased awareness of diseases and changes in their health status, and consequently worst self-perceptions of QoL, may be because they were more preoccupied about health.

The younger walk more minutes per day. Similarly, Chen et al. [14] found more physical activities or less sedentary behaviour in younger South Australian children and adolescents. Also, Benitez-Porres, Alvero-Cruz, Sardinha, Lopez-Fernandez and Carnero [30] found that children achieved better results than adolescents in the total steps/day. Relatively to the eating habits, Borrmann et al. [20] observed that younger participants consume significantly more portions of fruits than older participants. In contrast, Grosso et al. [18] point out that the older age group was associated with a higher consumption of fruit and vegetables, as well as higher weekly physical activity. We are convinced that if the major concerns about weight gain inherent in the adolescent body image may be associated with fears about more food intake, is also true that it is a period in which the relationship with peers (including love relationship) may consume time which was once used in physical activity. So, differences between these age stages could be expected because adolescents experience several changes in social influences which affect their PA pattern.

Table 6  
Statistically significant correlations (Spearman's Rho) between PA, EH and QoL

PA related variables	N	Rho	P
Soup			
Lunch	322	0.171	0.003
Sweet desserts			
Lunch	318	0.132	0.021
Dinner	316	0.144	0.012
Yogurt			
Lunch	293	0.124	0.034
Kid-Kindl			
Global score	194	0.197	0.006
Physical well-being	195	0.167	0.020
Friends	193	0.253	0.000

We found positive associations between PA and QoL (Table 6) which concur in other several studies: Finne, Bucksch, Lampert and Kolip [31] found, in a German representative sample of children and adolescents (aged 11–17 years) higher frequency of PA in people with higher scores of quality of life in relation to health; Galán et al. [6] also reported this association in a national sample of Spanish children and adolescents; and Lacy et al. [32] already highlighted this association in Australian adolescents. Those and other 28 studies with similar results were systematically reviewed by Wu et al. [8] founding associations between physical activity and/or sedentary behaviour and health-related quality of life among children and adolescents (3–18 years), from databases of MEDLINE, EMBASE, PSYCINFO and PubMed, between 1946 and January 2017. The main conclusions drawn were that the observed associations between PA and QoL in children and adolescents are consistent irrespective of sociodemographic, anthropometric and socioeconomic characteristics.

From the positive correlations of PA with food consumption, we highlight those obtained with sweet desserts, found in both meals (lunch and dinner) which may be attributed to the compensation of energy intake. In fact, Andegiorgish et al. [2] concluded that students who ate sweet desserts more frequently have higher BMI compared with those who ate less frequently.

#### 4. Conclusion

The adverse changes of eating and PA habits among younger children have contributed decisively to obesity [3, 33] and have made children and adolescents susceptible to develop chronic and disabling

diseases that influence the health related QoL. Childhood obesity has increased 60% since 1990 and excess weight in children is associated with reduced quality of life [11]. In fact, globalisation has had a direct influence on changes in diet patterns where the carbohydrates and fibre were exchanged for a diet rich in fats and sugars. There was an inappropriate increase of meat and dairy products, salt and sugar leading to malnutrition resulting in a negative impact on health, mainly in the area of cardiovascular risk [17].

Our analysis reveals a high percentage of overweight children and adolescents and the higher BMI can be associated with bad dietary habits and low PA. Even though no obesity was detected in the participants, there was, however, a high percentage of low weight, which can mean an excessive concern about weight gain, which, in turn, can lead to inadequate practices of physical activity and poor eating habits.

In the EH, we highlight the inappropriate, or excessive intake of meat in disfavour of fish and eggs and the necessity to increase soup, vegetables and fruit consumption. It is important to know if the intake of water and fruit happens at other times of the day. Positive indications are the use of several cooking techniques and the frying exclusion. Age is a differentiator of food behaviour, and it remains to be seen to what extent higher consumption corresponds to better nutrition. Additionally, it is crucial to explore the differences between lunch and dinner consumption. Only an evaluation that includes portions allows for the assessment of the food intake quality.

Also important is the high percentage of walking below the minimum recommended levels and the almost 7 hours sitting a day. However, we don't know anything about the practice of other physical or sport activities. The younger children (8–12 years) have highest minutes walking. It's necessary to study the reasons that lead to a decrease in the walking time with age, in addition to those associated to the development diversification of interests (amorous relationships, peer groups, vocational and academic choices, etc.), trying to find strategies that reverse this trend. Júnior, Lopes, Mota and Hallal [34] also concluded that the transition from the initial phase (11–12 years) to the second phase of adolescence (14–15 years) represents a critical period for the young physical activity reduction.

The QoL results are encouraging, because they are higher than the reference scores used (Portuguese validation). According to expectations, the adolescents (aged 13–17) perform worse than children. These

results are probably due to the PA and QoL relationship reported in the literature and reinforced by our results. Thus, promoting the practice of physical activity can be an important path to improve the QoL. Additionally, there were few statistic PA correlations with food intake. The only positive association was between walking time and intake of sweet desserts. This may be related to a compensation of the possible weight gain caused by the ingestion of sweets desserts through the physical activity practice.

Finally, gender did not reveal an impact on the PA and QoL. In the EH, females consumed more fruit than males, perhaps revealing more feminine care with the fruit role in the diet and simultaneously the need for greater concern with the males in the intervention for changing these behaviours.

There is no doubt about the relationship between PA, EH and QoL, as well as the need to increase the levels of physical activity practice and improve dietary behaviour in favour of QoL. However, it is imperative to know the characteristics of both behaviours (PA and EH), since the variables used here (frequency of consumption at lunch and dinner and daily minutes of walking) serve as exploratory but fall short of what is necessary to identify program interventions directed at modifying behaviours. However, there seems to be a need to consider different intervention strategies depending on age and BMI. Gender seems to have a marginal importance, despite the background of the literature, which highlights this sociodemographic variable, as a discriminator factor.

The limitations derived for inherent features of characteristics and size of the sample used in this study justify empirical deepening. Its fundamental to continue analysing sociodemographic variables (including gender), but also family and social factors with relevance in this scope, to outline socio-educational intervention strategies with impact on the quality of life, preventing eventual future health problems. However, intervention should integrate the results of the best scores profile identified in this study in order to reinforce the positive behaviours and change only the others.

PA and EH are fundamental variables for health and QoL, mainly because of their relationship with obesity and noncommunicable diseases that affect public health. Despite the urgency of improving these behaviours throughout life, it becomes crucial to consolidate them at a time when they develop, that is, in childhood and adolescence. Indeed, modifying these behaviours when installed (adulthood) is much more difficult than intervening at the time of its



development, in addition to the adverse and often irreversible effects which have since been produced.

The rationale for early intervention requires research into the factors that determine these behaviours in order to promote intervention programs with parents, school and the community, as well as in the development of policies for healthy practices. So, and corroborating the understanding of Schneider et al. [1], it is imperative that approaches to the promotion of quality of life take place at the micro level (with alteration of each individual's lifestyle), at the meso level (with the local political power creating the conditions to stimulate active living) and at the macro level with the central power producing a regulatory framework that favours healthy living and eating habits (e.g. by legislating to lower salt and sugar levels in foods and implement food label literacy programs). Only in this way it will be possible to create environments that induce healthy living and quality of life. Ultimately, its crucial to promote these behaviours so that they become standards of conduct with repercussions on health and quality of life, but also on the economies and sustainability of countries.

### Conflict of interest

None to report.

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