

Making a Difference: Putting Consumer Citizenship into Action

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*“The test of our progress is not whether we add more to the abundance of those who have
much; it is whether we provide enough for those who have too little”*
Franklin D. Roosevelt 1937

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Psychometric Evaluation of Child Eating Behaviour: A Tool to Improve Education Regarding Children's Food Consumption

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1. Introduction

Several recent surveys have suggested that significant numbers of European school-age children are suffering overweight and obesity (Lobstein, Baur and Uaut, 2004, Lobstein and Frelut, 2003). Within the enlarged European Union of 2006 (EU-25), there are estimated to be almost 22 million overweight or obese children (about 30 % of all children) and this figure is increasing by around 1.2 million each year. Of these children, 5.1 million are obese and that figure is rising by some 300.000 children each year (Jackson-Leach and Lobstein, 2006). However, these risks are not uniform between European member states with children at particular risk in the countries around the Mediterranean and in the British Islands, although rising prevalence rates are occurring in all countries. Using International Obesity Task Force (IOTF) criteria (Dietz and Bellizzi, 2003) rates of overweight and obesity in childhood are currently estimated at 10-20 % in northern Europe, and 20-40 % in Mediterranean countries of southern Europe (Lobstein and Frelut, 2003). In Portugal, particularly, the prevalence of overweight and obesity children has been reported at 31.5 % (of these, 11.3 % were classified as obese, Padez *et al.*, 2004). The study shows that the prevalence of overweight/obesity in Portuguese children (between the ages of 7 and 9 years) following the IOTF cut-offs is high when compared to other European countries, following the trend of other socio-cultural similar countries such as Spain, Italy and Greece.

Obesity is associated with significant health problems in children, posing an increasing risk of them developing chronic disease with a significant likelihood of some children having multiple risk factors for cardiovascular diseases, Type 2 diabetes and other co-morbidities before or during early adulthood (Dunger *et al.*, 2005; Reilly, 2005; Weiss and Caprio, 2005; Sorof *et al.*, 2002). However, the damaging consequences for children with obesity are not confined to coping with physical symptoms; there are also implications for psycho-social development and well-being. Children and adolescents with obesity have moderate levels of body dissatisfaction (Wardle and Cooke, 2005) and are depressed or have low self-esteem (Strauss, 2000). In this context, childhood obesity research and interventions should therefore be a priority for the public health agenda.

2. Eating behaviour and obesity: the emergency of measuring behavioural susceptibility to obesity

Obesity develops when unconsumed energy, cause by excess intake, reduced expenditure, or most likely both, gradually accumulates as fat tissue (Rennie *et al.*, 2005). Obesity in children arises from a complex interplay between genetic susceptibility and behaviour, relating to

dietary habits and physical activity. Genetic susceptibility helps to explain inter-individual differences in weight gain (Wardle et al., 2008; Farooqi and O’Rahilly, 2007; Farooqi, 2005; Snyder et al., 2004). However, the rapid recent increase in the overall prevalence of obesity in children demonstrates that environmental factors are central to the causation of obesity (the “obesogenic environment”). In fact, over the last few decades, there has been a radical change in how people obtain their food as well as in the composition of food itself (Cunha and Moura, 2004) and in how people decide their food choices (Moura and Cunha, 2005). Food technology, food availability, variety, price, manipulation of taste, packaging, and aggressive marketing (supply perspective) and changes in lifestyles (greater number of women in the labour force, the downfall of family meal occasions and increased snacking), urbanisation and socioeconomic development are contributing to the creation of what is termed “obesogenic environments” that are nurturing over-eating and inactive lifestyles (see figure 1). In fact, children are vulnerable to the social and environmental pressures that raise the risk of obesity (Lobstein et al., 2004). The food preferences among children have shifted to those that are more energy dense, such as, cereals, French fries and soft drinks, which is not surprising, these higher energy density food are described as more palatable (Drewnowski, 1998), leading to overeating in children and adolescents. In other words, children are faced with convenient, cheap and tasty food products backed by massive marketing campaigns that equate food with fun and happiness in order to generate sales. On the other one, considering the energy expenditure, it is generally accepted that activity patterns of children have changed dramatically worldwide, shifting to sedentary behaviour. Various factors contribute to inactive children lifestyles such as increasing television viewing and other media (computers, video games), extensive school curricula, neighbourhood structure and safety (insecure streets and gardens to play and walk) and parental perceptions and time (Maziak et al., 2007; Rennie et al., 2005; Lobstein et al., 2004).

As a result, there is a need to identify aspects of behaviour that underpin the proneness to excessive energy intake or inadequate energy expenditure. These include physical activity and inactivity, dietary choices and eating behaviour (Rennie et al., 2005). In this context, the Children’s Eating Behaviour Questionnaire (CEBQ) developed by Wardle et al. (2001) was designed as an instrument to capture individual differences in aspects of eating style that have been hypothesised to contribute both to underweight and overweight. The CEBQ is a multi-dimensional, parent-report questionnaire measuring children’s eating behaviour containing eight sub-scales (35 items on a 5-point scale: 1 = “never” to 5 = “always”): *Satiety responsiveness* (SR) *Slowness in eating* (SE); *Food fussiness* (FF); *Food responsiveness* (FR); *Enjoyment of food* (EF); *Desire to drink* (DD); *Emotional over eating* (EOE) and *Emotional under eating* (EUE), as presented in table 1.

The scales EF and FR address children’s general appetite for food or desire to eat. The EF scale aims to capture normal variation in general appetite whereas the FR items are designed to detect levels of appetite which could be viewed as maladaptive (e.g., “given the opportunity, my son would eat most of the time”), and have been associated with overweight. The FR also captures the more pronounced responsiveness to environment food cues (a palatable ice-cream). On contrary, the sub-scales SR, SE and FF reflect a lack of enjoyment and interest in food and have been associated with underweight. Responsiveness to satiety has been hypothesised to be low in obese individuals leading them to fail to regulate their energy intake and consequently to overeat (Carnell and Wardle, 2007). EOE and EUE represent emotionally reactive eating behaviours that would theoretically have opposing weight outcomes: an increasing (or decreasing) in appetite in a range of emotional states (e.g., parental feeding style characterised by restriction of palatable foods, and pressure to eat healthy foods may be linked to EOE). Finally, higher consumption of soft drinks (sub-scale:



Figure 1 Child's environment influences on obesity.

Source: Adapted from Maziak et al., 2007.

Desire to drink , DD) has been found to be associated with higher total energy intake, suggesting that children who frequently drink soft drinks may be at higher risk of developing obesity (Carnell and Wardle, 2007). In sum, the obesogenic environment to which children

are exposed enhance their individual responsiveness to food and eating (Viana *et al.*, 2008; Carnell and Wardle, 2007; Wardle *et al.*, 2001).

The aim of this study is to measure behavioural traits conferring susceptibility to the obesogenic environment in Portuguese children at form 4 (age 9-10 years) and associate them to the children characteristics such as sex, age or BMI.

3. Methodology

From a number of psychometric tools available to assess children's eating behaviour the Portuguese translated version of the Children's Eating Behaviour Questionnaire (Viana *et al.*, 2008) was chosen and applied, from April to May 2007, to 518 children, aged 9-10 years and answered by their mothers, while registering their weight and height. Children were chosen through multistage cluster sampling (Malhotra, 2004) by randomly selecting 29 primary schools, out of 97 from the Council of Vila Nova de Gaia, Portugal. In each school one class from Form 4 was randomly selected and all attending children were evaluated.

Regarding the validity of the different CEBQ scales, although an underlying structure different from the original work by Wardle *et al.* (2001) was obtained (data not shown), the original structure was applied following previous studies (Viana *et al.*, 2008; Sleddens, *et al.*, 2008), for future ease of comparison. Overall, the structure and internal reliability of the final model, and the correlations between the sub-scales, corresponded very closely to the original CEBQ, which confirms the suitability of using this questionnaire in the present sample.

From reported children's weight and height the Body Mass Index (BMI, kg/m²) was calculated. BMI values were converted into BMI z-scores following the American Centers for Disease Control reference data (CDC, 2000) adjusted for age and sex. Further, resulting values were classified into four groups according to their position on the CDC's BMI distributions: "underweight" (< 5th centile), "normal weight" (≥ 5th to ≤ 85th centile), "overweight" (> 85th to ≤ 95th centile) and "obese" (> 95th centile).

4. Results and discussion

Out of the 518 distributed questionnaires 459 were collected. However, only 321 were analysed due to lack of answered questions. The later correspond to 9 % of all children attending Form 4 at the Council public schools. Table 2 presents demographic data of the sample.

Characteristic	Values	No.	%
Sex	Girls	165	51.4
	Boys	156	48.6
Age (years)	9	196	61.1
	10	107	33.3
	11	16	5.0
	12	2	0.6
Average age (± s. d.)	9.4 years ± 0.6 years		
Maternal education	Primary education or less (up to age 9 years)	77	24.3
	Second and third level of basic education or less (9 to 15 years)	130	41.0
	General/vocational secondary education or less (15 to 18 years)	70	22.1
	University/polytechnic degree or frequency (> 18 years)	40	12.6
Maternal occupation*	G01	10	3.1
	G02	38	11.8
	G03	67	20.9
	G04	63	19.6
	G05	143	44.5

	2	14	4.4
<i>Household dimension</i>	3	32	10.0
	4+	80	24.9
	n.a.	195	60.7

Table 2 Social-demographic characteristics of the sample ($n = 321$). *Occupational groups (GO1-highest to GO5 – lowest) according to the Portuguese National Bureau of Statistics – INE. n.a. – not acquired.

Calculation of BMI z-scores and application of the CDC classifications has shown (see table 3) a total of 112 (34.9 %) children with excessive weight or obese, which is slightly higher than the value reported by Padez *et al.* (2004) for the Portuguese children aged 7-9 years. It is worth of notice the strong unbalance regarding boys with excessive weight in comparison with girls.

BMI classification	N	%	Sex	
			Boys	Girls
Underweight	5	1.6		
Normal weight	204	63.6	57.1 %	72.7 %
Overweight	61	19.0		
Obese	51	15.9	42.9 %	27.3 %
Total	321	100		

Table 3 CDC's weight classification (CDC, 2000) according to BMI z-scores

Regarding children with excessive weight (overweight and obese), there is a tendency for their mothers to present lower educational and occupational levels (see table 4), which is in line with Drewnowsky's (2004) findings for the U.S. population that obesity is strongly correlated with poverty and lower education.

Characteristic	Values	Child weight group								
		Underweight (n = 5)			Normal weight (n = 204)			Overweight (n = 61)		
		Mean	s.d.	N (%)	Mean	s.d.	N (%)	Mean	s.d.	N (%)
BMI (kg/m ²)		13.60	0.50		17.15	1.46		20.47	0.76	
BMI z-scores		-2.10	0.40		0.11	0.74		1.30	0.14	
Weight (kg)		27	2.10		33.48	4.47		40.13	4.04	
Age		9.80	0.45		9.51	0.66		9.25	0.43	
Sex	Boys			2 (40)			87 (42.6)			36 (59)
	Girls			3 (60)			117 (57.4)			25 (41)
Maternal education	Primary education or less (up to age 9 years)			-			45 (22.3)			13 (21.7)
	Second and third level of basic education or less (9 to 15 years)			4 (80)			85 (42.1)			22 (36.7)
	General/vocational secondary education or less (15 to 18 years)			-			44 (21.8)			17 (28.3)
	University/polytechnic degree or frequency (> 18 years)			1 (20)			28 (13.9)			8 (13.3)
Maternal occupation*	G01			-			8 (3.9)			1 (1.6)
	G02			-			28 (13.7)			8 (13.1)
	G03			2 (40)			45 (22.1)			13 (21.3)
	G04			3 (60)			38 (18.6)			12 (19.7)
	G05			-			85 (41.7)			27 (44.3)

Table 4: Anthropometric and social-demographic characteristics of the sample, according to BMI classification groups

*Occupational groups (GO1- highest to GO5 – lowest) according to the Portuguese National Bureau of Statistics – INE.

Obese (n = 51)		
Mean	s.d.	N (%)
24.09	2.02	
1.88	0.22	
50.78	7.78	
9.43	0.61	
		31 (60.8)
		20 (39.2)
		19 (38.0)
		19 (38.0)
		9 (18.0)
		3 (6.0)
		1 (2.0)
		2 (3.9)
		7 (13.7)
		10 (19.6)
		31 (60.8)

Table 4 (continued)

CEBQ sub-scales may be divided into two major groups: “food approach” sub-scales and “food avoidant” sub-scales. The first will include FR, EF, EOE and DD, while the second will include SR, SE, EUE and FF. As depicted on figure 2, “food approach” sub-scales are positively related with weight group.

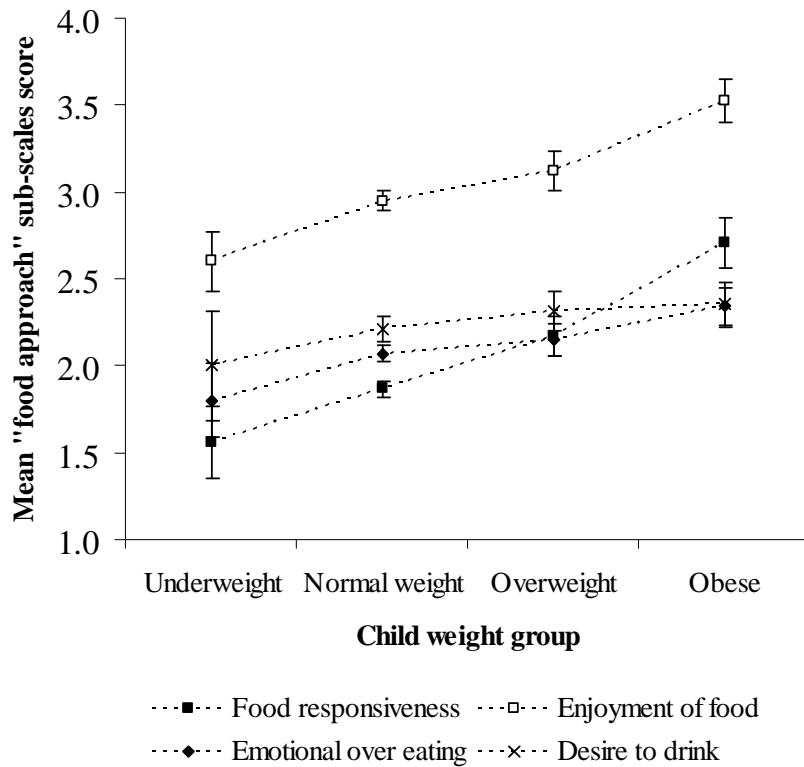


Figure 2 Mean “food approach” scores by CDC’s BMI category, regarding CEBQ sub-scales: FR, EF, EOE and DD. Vertical lines represent standard error of means

Inversely, “food avoidant” sub-scales tend to correlate negatively with weight group (see figure 3). Moreover, hierarchical linear regression analyses relating each CEBQ sub-scales with BMI z-scores, while controlling for sex, age, maternal education and maternal occupation, was performed. As expected, there were significant positive associations between all “food approach” sub-scales and BMI z-score, with FR accounting for over 10 % of the variance, while “food avoidant” sub-scales showed significant negative associations, with SR and SE emerging as the most significant explaining each 13 % of the variance in BMI z-scores.

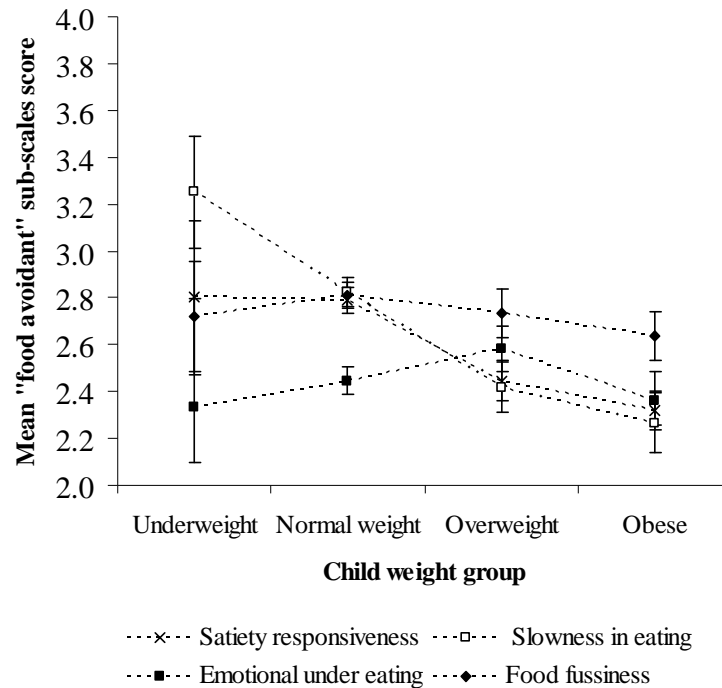


Figure 3 Mean “food avoidant” scores by CDC’s BMI category, regarding CEBQ sub-scales: SR, SE, EUE and FF. Vertical lines represent standard error of means.

When contrasting the way children perceive their own body weight with the CDC’ BMI distribution (see table 5) there is a clear tendency for heavier children to consider themselves as with excessive weight. Nevertheless it is important to notice that 38 % of the obese children answering this question consider themselves as normal or underweight, while the majority (77 %) of overweight children consider themselves to present a normal weight.

Child own weight perception	Child weight group			
	Underweight (n = 5)	Normal weight (n = 197)	Overweight (n = 60)	Obese (n = 45)
Excessive weight	-	14 (7 %)	14 (23 %)	28 (62 %)
Normal weight	4 (80 %)	166 (84 %)	46 (77 %)	16 (36 %)
Underweight	1 (20 %)	17 (9 %)	-	1 (2 %)

Table 5 Relationship between child’s perception of weight and their weight group classification according to CDC’ BMI z-scores

No significant association was found between CDC’ BMI groups and the practice of sports out of the school.

5. Conclusions and further research

‘Food approach’ sub-scales and ‘food avoidant’ sub-scales were related to Body Mass Index, child’s eating habits and TV viewing. Results were evaluated according to children sex, socio-economic level and maternal education level. Major results have shown a strong relationship between child eating behaviour and overweight or obesity.

The findings of the present study are in line with previous ones, suggesting that the CEBQ is a valuable instrument for identifying specific eating styles, which can be seen as important and modifiable determinants implicated in the development and maintenance of overweight and obesity.

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