



Eating behaviour styles in Irish teens: a cross-sectional study

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Abstract

Objectives: To describe the eating behaviour styles of Irish teens and to explore the relationships between demographic factors, BMI and dietary intake and these eating behaviour styles.

Design: Cross-sectional data from the Irish National Teens' Food Survey (2005–2006). The Dutch Eating Behaviour Questionnaire assessed three eating behaviour styles in teens: restrained, emotional and external eating. Data were stratified by sex and age groups.

Setting: The Republic of Ireland.

Participants: Nationally representative sample of teens aged 13–17 years (n 441).

Results: The highest scoring eating behaviour style was external eating (2.83 external *v.* 1.79 restraint and 1.84 emotional). Girls scored higher than boys on all three scales (Restraint: 2.04 *v.* 1.56, $P < 0.001$, Emotional: 2.15 *v.* 1.55, $P < 0.001$ and External: 2.91 *v.* 2.76, $P = 0.03$), and older teens scored higher than younger teens on the Emotional (1.97 *v.* 1.67, $P < 0.001$) and External scales (2.91 *v.* 2.72, $P = 0.01$). Teens classified as overweight/obese scored higher than those classified as normal weight on the Restraint scale (2.15 *v.* 1.71, $P < 0.001$) and lower on the External scale (2.67 *v.* 2.87, $P < 0.03$). Daily energy intake was negatively correlated with the Restraint ($r = -0.343$, $P < 0.001$) and Emotional scales ($r = -0.137$, $P = 0.004$) and positively correlated with the External scale ($r = 0.110$, $P = 0.02$).

Conclusions: External eating is the predominant eating behaviour style among Irish teens, but sex, age, BMI and dietary differences exist for each eating behaviour style. Including measures of eating behaviour styles into future dietary research could help understand both *how* and *why* as well as *what* people eat.

Keywords

Teens

Teenagers

Adolescents

Eating behaviours

Restrained eating

Emotional eating

External eating

Dutch Eating Behaviour Questionnaire

Irish teens have one of the highest rates of overweight and obesity in Europe⁽¹⁾. It is widely accepted that providing knowledge on healthy eating alone is not enough to change and sustain eating behaviours^(2,3). However, health promotion messages are one of the best, low-cost interventions available, with the potential to be highly cost effective when targeted at younger people⁽⁴⁾. To address this issue of obesity, it is important to find new ways to make healthy eating messages more effective and relevant to the target population. There is a need to understand more about what motivates and influences people to choose the foods they eat. Habits developed during adolescence tend to persist into adulthood, particularly in relation to eating behaviours⁽⁵⁾. Therefore, addressing eating behaviours among teens may help support them to start making positive and healthy food choices during the stage in life where they

are learning autonomy and beginning to form their own lifestyle habits⁽⁶⁾.

Irish teens currently consume more energy, higher levels of fat and lower levels of fibre than recommended^(7–9). A recent report on health behaviours among teens showed that only 23 % of Irish teens consume fruit and 21 % consume vegetables more than once a day, with girls and younger teens more likely to report daily fruit and vegetable consumption⁽¹⁰⁾. However, several dietary changes have been observed in a recent research in Irish school-aged children, for example, decreases in salt and fat intakes between 2004 and 2019⁽¹¹⁾. This shows that some positive changes are occurring in Irish dietary intakes. Daily sweet and soft drink consumption has decreased slightly in Irish teens since 2014, but 21 % of teens still consume sweets daily and 7 % drink soft drinks daily⁽¹⁰⁾. However, we do

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not fully understand the mechanisms influencing these recent positive changes. Whilst measuring dietary intake is a crucial aspect to understand diet and health, more work is needed to fully understand the elements affecting both how and why teens eat and what they eat, specifically regarding eating behaviours which make them more prone to obesity.

Much research in relation to food choices and eating behaviours in Irish teens has come from qualitative work, looking into the effects of the school environment^(12,13) and other social, economic and time-related factors influencing food choices^(13–17). Taste^(14,15), price/convenience^(15,16) and social desirability^(13,15,17) are commonly noted factors influencing teen's food choices. There are mixed findings in relation to knowledge and perceptions of healthy eating, whereby teens themselves feel that they have sufficient knowledge to make healthy food choices but struggle to do so within their food environment, whereas their corresponding adult figures believe knowledge alone is the key limiting factor in teen food choices⁽¹³⁾. Furthermore, for teens, competing interests for taste and other sensory rewards take preference over the healthfulness of the food⁽¹⁷⁾. Little research has focused on the specific motivations teens have towards healthy eating and the more internal considerations that occur when making food choices, such as choosing foods based on their surrounding environment, current mood or sensory expectations for the food.

Several questionnaires have been developed to classify and quantify the eating behaviour styles of population groups. The Dutch Eating Behaviour Questionnaire (DEBQ) is a commonly used tool to measure three styles of eating behaviour, namely emotional eating, restrained eating and external eating⁽¹⁸⁾. Emotional eating in this questionnaire refers to eating more than usual in response to predominantly negative emotions, restrained eating refers to actively avoiding certain foods in case they will make you gain weight or become fat, and external eating refers to eating in response to aspects such as the smell, taste or sight of food or being around others who are eating a certain type of food. This tool has been tested and validated in multiple populations^(19–25), including teen-aged groups^(26–29). Sex and age differences appear consistently in the responses to the DEBQ questions^(19,20,22,25,27–30), as do differences between people of different BMI categories, with people of higher BMI showing higher scores on the Restraint and Emotional scales and lower scores on the External scale^(19,22,24–26,28,29). Dietary intake associations have been reported, varying per scale. Most commonly, the Restraint scale tends to be associated with lower energy and nutrient intakes, the External scale associated with higher intakes and the Emotional scale varies in its associations^(27–29,31).

Numerous factors play a role in determining the eating behaviour styles of population subgroups, which highlights the importance of understanding how and why our teen population of interest eats. If we know more about the eating behaviour styles associated with overweight and

obesity, we can work on targeting interventions more appropriately to encourage and support teens to establish positive diet and lifestyle habits early in life. The current research aims to describe and understand the eating behaviour styles of Irish teens, as determined by the three DEBQ categories. The main objectives of the current study were to describe the eating behaviour styles in the Irish teen cohort and to explore the relationships between demographic factors, BMI and dietary intake with these eating behaviour styles.

Methods

Survey methods

The analyses were conducted on data from the Irish National Teens' Food Survey, a cross-sectional study that was carried out between September 2005 and September 2006 by the nutrition units in University College Cork and University College Dublin, which form part of the Irish Universities Nutrition Alliance (IUNA). The survey investigated habitual food and drink consumption, health and lifestyle characteristics and assessed body weight status of teenagers aged 13–17 years (224 males and 217 females) in Ireland. Participants were recruited with an opt-in approach from thirty-two secondary schools throughout the Republic of Ireland. The overall survey response rate was 63%. The analysis of the demographic features of this sample has shown it to be a representative sample of the Irish teenagers with respect to age, sex, social class, socio-economic group and geographical location when compared with census data⁽³²⁾. Written informed consent was provided by the participants, as well as their parents/guardians. Further detail on the full survey methodologies is available at www.iuna.net⁽⁷⁾.

Eating Behaviour Questionnaires

The Eating Behaviour Questionnaire was completed by the teens, and data from the DEBQ section were analysed in the current research. The DEBQ contains thirty-three items, which make up three scales⁽¹⁸⁾. The Restraint scale contains ten items and the questions relate to restraining or limiting the amount and type of food eaten to prevent gaining weight (e.g. Do you watch exactly what you eat? and Do you deliberately eat foods that are slimming?). The Emotional scale contains thirteen items and the questions relate to increased eating in response to predominantly negative emotions (e.g. Do you have a desire to eat when you are disappointed? and Do you have a desire to eat when someone lets you down?). The External scale contains ten items and the questions relate to outside factors which may encourage food consumption and appeal to the senses, such as the sight or smell of food, or physically being near food (e.g. If you see others eating, do you also have a desire to eat? and If food smells and looks good, do you eat more than usual?). All items are answered on a five-point Likert scale, with response



options being Never, Seldom, Sometimes, Often or Very often. Mean scores are calculated by dividing the sum of responses by the number of items in the scale, the highest score being 5, making the three scales comparable. In some cases where an item was missing an answer, the sum of the scores was divided by the number of answers given. If >2 answers were missing, the data were excluded from the analysis. Scores were analysed on a continuous basis rather than being classified as high, medium or low scores.

Health and Lifestyle Questionnaires

Parents of the participants completed a self-reported Health and Lifestyle Questionnaire which included information on parental socio-economic status, education level and attitudes to their own diet. This questionnaire was administered to both parents and guardians when possible. The teen was assigned the higher social class and education level category of both parents and guardians.

Anthropometric measurements

Anthropometric measurements for the teen participants were taken by trained researchers during data collection visits. Weight was measured to the nearest 0.1 kg using a Seca 770 digital personal weighing scale (Chasmores Ltd). Height was measured to the nearest 0.1 cm using the Leicester portable height measure (Chasmores Ltd) with the respondent's head positioned in the Frankfurt Plane. BMI was used to indirectly assess adiposity and was calculated as kg/m². The International Obesity Task Force (IOTF) age- and sex-specific categories were used to define weight status⁽³³⁾. These cut-offs are linked to BMI cut-offs for adult populations and facilitate international comparisons and are recommended for children aged 2–18 years⁽³³⁾.

Dietary intake measurements

Dietary intake data were collected through a 7-d weighed food diary, with respondents weighing all food and beverages consumed using a portable food scales (Tanita). Other food quantification methods (e.g. food atlas photos and manufacturer's information) were used where weighing was not possible, as outlined in the IUNA report⁽⁷⁾. Nutrient intake data were generated using WISP (Tinuveil Software), with data from McCance and Widdowson's The Composition of Food, along with newly generated recipes of composite dishes, supplements and generic Irish foods commonly consumed on the market⁽⁷⁾.

Variables

The mean scores for each of the three eating behaviour scales were used as separate, continuous dependent variables in bivariate analyses. Independent variables included in the association analyses were chosen based on previous research and potential relevance to the eating behaviour styles. Associations were assessed using both correlation and comparative analyses.

Demographic

Sex and age are common factors associated with teen behaviours and were therefore included in the bivariate analysis and as principle factors in the stratified analysis. Age groups were classified as younger (13–14 years) and older (15–17 years), as determined by the National Teens' Food Survey protocol⁽⁷⁾. Geographical location variables were categorised as Open Country, Small town, Large Town and City, and parents' social class variables were categorised as Professional Worker, Non-Manual, Skilled Manual and Unskilled, both as per IUNA reporting⁽⁷⁾.

Anthropometric

BMI was included as a continuous variable in the correlation analysis and as a categorical variable to assess differences in mean scores between BMI categories. Due to low numbers of participants classified as overweight and/or obese, these categories were combined in the analysis to make a normal weight group and an overweight/obese group.

Dietary intake

The dietary intake variables were included as continuous variables in the correlation analysis. The variables chosen were total daily energy intake (kJ) and daily fat, protein and carbohydrate (CHO) intakes, expressed as a percentage of total daily energy intake (%TE).

Statistical analyses

The External scale was normally distributed, but the Restraint and Emotional scales were not; therefore, non-parametric analyses were conducted on these two scales. Differences in mean scores were tested for each of the variables outlined above on each of the three eating behaviour scales. Independent samples *t* tests and one-way ANOVA with *post hoc* Tukey analysis were run for the normally distributed scale (i.e. External). Wilcoxon–Mann–Whitney *U* tests and Kruskal–Wallis tests were run for the non-normally distributed scales (i.e. Restraint and Emotional). Homogeneity of variance was assessed using Levene's test. Pearson's and Spearman's correlations were run to assess the relationship between the three eating behaviour scales and age, BMI and the four dietary intake variables, all as continuous variables. Data were analysed for the whole group and stratified by sex and age groups. Unadjusted significance was set at $P < 0.05$. Due to the multiple analyses conducted ($n = 9$ variables), a Bonferroni correction was applied, adjusting the significance to $P < 0.006$. The statistical software package IBM SPSS Statistics version 26.0 was used for all analyses in the current study.

Results

Description of the population characteristics and eating behaviour styles

The study population had an equal sex balance (Table 1), and there was a slightly larger proportion of older teens

**Table 1** Descriptive characteristics of the study sample of nationally representative Irish teens aged 13–17 years, National Teens' Food Survey (2005–2006)

	Total		Boys	Girls
	<i>n</i>	%	<i>n</i>	<i>n</i>
Total	441	100	224	217
Sex				
Male	224	50.8	–	–
Female	217	49.2	–	–
Age range (years)				
13–14	188	42.6	95	93
15–17	253	57.4	129	124
Geographic location				
Open country	137	31.1	72	65
Small town	80	18.1	42	38
Large town	62	14.1	27	35
City	162	36.7	83	79
Parents' social class*				
Professional worker	215	50.0	109	106
Non-manual worker	79	18.4	43	36
Skilled manual worker	85	19.8	44	41
Unskilled worker	51	11.9	24	27
Teen BMI*				
Normal weight	360	81.6	183	177
Overweight/obese	80	18.2	41	39
Dietary intakes	Mean	SD	Mean	Mean
Daily energy (kJ)	8325.3	2441.7	9484.3	7128.9
Protein (%TE)	14.8	2.6	15.2	14.3
Fat (%TE)	35.7	5.0	35.5	35.9
CHO (%TE)	49.0	5.1	48.7	49.3

CHO, carbohydrate; TE, total energy.

*Missing data: Parent's Social Class *n* 11; Teen BMI *n* 1.

than younger teens in the population (57.4 *v.* 42.6%). The largest proportion of the study population lived in cities (36.7%), followed by the open country (31.1%), and half of the population had parents within the professional social class group (Table 1). The study sample was predominantly white (97%), and therefore, race was not included in any analyses⁽⁷⁾. The majority of the teens in the sample had a normal BMI (81.6%), with a low prevalence of obesity at 2.7%. Mean daily energy intake for the full group was 8325.3 kJ/d. The percentage of total energy from protein, fat and CHO was 14.8, 35.7 and 49.0%, respectively.

The Eating Behaviour Questionnaire scales are reported in Table 2. The individual DEBQ scale scores ranged from 1.00 to 4.80, with all mean scores remaining below the mid-point of 3.00. The highest mean score from the DEBQ was on the External scale, which was 2.83 compared with 1.79 on the Restraint scale and 1.84 on the Emotional scale.

Factors associated with the eating behaviour styles

Demographic

Sex was associated with differences in mean scores on all three DEBQ scales, with girls consistently scoring higher than boys, most strongly on the Restraint and Emotional scales (Table 3a). A significant positive correlation was seen between age and the Emotional scale ($r=0.164$,

$P=0.001$) and the External scale ($r=0.138$, $P=0.004$). When categorised into age groups, older teens scored significantly higher than younger teens on the Emotional and External scales (Table 3b). No significant associations were observed between geographic location or social class and any of the three scales (see online supplementary material, Supplemental Table S1).

Overall, the age- and sex-stratified analyses followed the same trends as the full-group analysis. Young females scored higher than young males on all three scales, and older females scored higher than older males on the Restraint and Emotional scales (Table 3a). Older males scored higher than younger males on the Emotional and External scales, whereas older females scored higher than younger females on the Restraint and Emotional scales (Table 3b). There were no associations between the eating behaviour scores and either geographic location or social class variables among the stratified data.

Anthropometric

BMI was positively correlated with the Restraint ($r=0.279$, $P<0.001$) and Emotional ($r=0.104$, $P=0.03$) scales and negatively correlated with the External scale ($r=-0.127$, $P=0.01$). Comparing mean scores across BMI categories showed significantly higher scores for the overweight/obese group on the Restraint scale and significantly lower scores on the External scale, but no significant differences existed on the Emotional scale (Table 4). The stratified analyses reflected that of the whole group results on the Restraint scale, with overweight/obese males, females, younger and older teens all scoring significantly higher than their normal weight counterparts (Table 4).

Dietary intake

Daily energy intake was negatively correlated with the Restraint and the Emotional scales and positively correlated with the External scale (Table 5). Energy intake from protein was negatively correlated with the Emotional scale, energy intake from fat was negatively correlated with the Restraint scale and energy intake from CHO was positively correlated with both the Restraint and Emotional scales (Table 5). No macronutrient intake was associated with the External scale in the full-group analysis.

The stratified dietary analysis showed that daily energy intake was negatively correlated with the Restraint scale for all sex and age subgroups (see online supplementary material, Supplemental Table S2). Energy intake was positively correlated with the External scale for girls and older teens and was negatively correlated with the Emotional scale in older teens only. Older teens showed associations with energy intake from all three macronutrients; energy from protein was negatively correlated with the Emotional scale, energy from fat was negatively correlated with the Restraint scale and energy from CHO was positively associated with the Emotional scale. Energy from CHO intake was

Table 2 Scores for the three scales in the Dutch Eating Behaviour Questionnaire (DEBQ) from a nationally representative sample of Irish teens aged 13–17 years, National Teens' Food Survey (2005/2006)

DEBQ scale	<i>n</i>	Mean score	SD	Range	Skewness	Distribution
Restraint	438	1.79	0.85	1.00–4.60	1.26	Non-normal
Emotional	437	1.84	0.80	1.00–4.70	1.12	Non-normal
External	438	2.83	0.72	1.10–4.80	0.19	Normal

Table 3a Differences in mean scores from the Dutch Eating Behaviour Questionnaire (DEBQ) scales, across sex for younger and older teens in the nationally representative sample of Irish teens aged 13–17 years, National Teens' Food Survey (2005/2006)

DEBQ scale		Boys			Girls			<i>P</i>
		<i>n</i>	Mean	SD	<i>n</i>	Mean	SD	
Restraint†‡	All	223	1.56	0.66	215	2.04	0.95	<0.001**
	13–14	95	1.52	0.61	92	1.86	0.84	0.01*
	15–17	128	1.59	0.70	123	2.18	1.00	<0.001**
Emotional†‡	All	223	1.55	0.58	214	2.15	0.88	<0.001**
	13–14	95	1.42	0.47	92	1.93	0.80	<0.001**
	15–17	128	1.64	0.63	122	2.32	0.90	<0.001**
External‡	All	223	2.76	0.71	215	2.91	0.72	0.03*
	13–14	95	2.62	0.66	92	2.83	0.65	0.03*
	15–17	128	2.86	0.74	123	2.97	0.76	0.24

†Non-parametric analysis values reported.

‡Parametric analysis values reported.

*Uncorrected significance level is $P < 0.05$.

**Bonferroni corrected value is $P < 0.006$.

Table 3b Differences in mean scores from the Dutch Eating Behaviour Questionnaire (DEBQ) scales, across age groups for boys and girls in the nationally representative sample of Irish teens aged 13–17 years, National Teens' Food Survey (2005/2006)

DEBQ scale		Younger (13–14)			Older (15–17)			<i>P</i>
		<i>n</i>	Mean	SD	<i>n</i>	Mean	SD	
Restraint†‡	All	187	1.69	0.75	251	1.88	0.91	0.05
	Boys	95	1.52	0.61	128	1.59	0.70	0.63
	Girls	92	1.86	0.84	123	2.18	1.00	0.02*
Emotional†‡	All	187	1.67	0.70	250	1.97	0.85	<0.001**
	Boys	95	1.42	0.47	128	1.64	0.63	0.01*
	Girls	92	1.93	0.80	122	2.32	0.90	0.001**
External‡	All	187	2.72	0.66	251	2.91	0.75	0.01*
	Boys	95	2.62	0.66	128	2.86	0.74	0.01*
	Girls	92	2.83	0.65	123	2.97	0.76	0.16

†Non-parametric analysis values reported.

‡Parametric analysis values reported.

*Uncorrected significance level is $P < 0.05$.

**Bonferroni corrected value is $P < 0.006$.

also positively correlated with the Emotional scale for boys (see online supplementary material, Supplemental Table S2).

Discussion

Numerous factors can influence health and eating behaviours, encompassing aspects of the individual, family and social relationships, the home environment, wider society and value systems^(6,34). The current analysis follows on from other published papers from the National Teens' Food Survey, which predominantly described and examined

dietary intake data^(7,8,35,36). Understanding the dietary intakes of Irish teens is a first step towards making improvements to the national health and nutrition status. However, to make positive and sustained improvements to their diets, we need a more comprehensive understanding of *how* and *why* teens eat and not just *what* they eat, as previously reported^(7,8,35,36). The current research aimed to shed some light on factors relating to the eating behaviour styles of Irish teens from the National Teens' Food Survey cohort.

The eating behaviour data showed that Irish teens have a low–medium level of the three eating behaviour styles determined from the DEBQ, with all mean scores being

**Table 4** Differences in mean scores from the Dutch Eating Behaviour Questionnaire (DEBQ) scales, across BMI categories for boys, girls, younger and older teens in the nationally representative sample of Irish teens aged 13–17 years, National Teens' Food Survey (2005/2006)

DEBQ scale		Normal weight			Overweight/obese			P
		n	Mean	SD	n	Mean	SD	
Restraint†	All	357	1.71	0.79	80	2.15	0.99	<0.001**
	Boys	182	1.48	0.58	41	1.91	0.89	0.003**
	Girls	175	1.96	0.91	39	2.40	1.04	0.02*
	13–14	143	1.59	0.68	38	2.02	0.92	0.01*
	15–17	202	1.80	0.86	40	2.27	1.06	0.004**
Emotional‡	All	356	1.82	0.79	80	1.93	0.86	0.30
	Boys	182	1.54	0.57	41	2.79	0.72	0.57
	Girls	174	2.11	0.86	39	2.31	0.95	0.27
	13–14	143	1.63	0.71	38	1.75	0.66	0.11
	15–17	201	1.97	0.82	40	2.12	0.99	0.59
External‡	All	357	2.87	0.71	80	2.67	0.74	0.03*
	Boys	182	2.79	0.72	41	2.60	0.66	0.12
	Girls	175	2.94	0.70	39	2.75	0.81	0.12
	13–14	143	2.74	0.69	38	2.62	0.58	0.31
	15–17	202	2.97	0.72	40	2.72	0.86	0.06

†Non-parametric analysis values reported.

‡Parametric analysis values reported.

*Uncorrected significance level is $P < 0.05$.**Bonferroni corrected value is $P < 0.006$.**Table 5** Correlations between the Dutch Eating Behaviour Questionnaire (DEBQ) scales and dietary intake variables for teens in the nationally representative sample of Irish teens aged 13–17 years, National Teens' Food Survey (2005/2006)

	Restraint†		Emotional‡		External‡	
	r	P	r	P	r	P
Energy (kJ)	-0.343	<0.001**	-0.137	0.004**	0.110	0.02*
Protein (%TE)	-0.020	0.683	-0.118	0.01*	-0.057	0.23
Fat (%TE)	-0.113	0.02*	-0.080	0.09	0.012	0.81
CHO (%TE)	0.100	0.04*	0.123	0.01*	-0.004	0.94

CHO, carbohydrate; TE, total energy.

†Spearman correlation values.

‡Pearson correlation values.

*Uncorrected significance level is $P < 0.05$.**Bonferroni corrected value is $P < 0.006$.

slightly lower than the midpoint score of 3.00. Our score ranges reflected those found in other research using the DEBQ in teens, all similarly observing the highest scores on the external scale and lower scores on the restraint and emotional scales^(27–29). This suggests that teens do not display extreme responses to factors relating to restrained or emotional eating when making their food and eating choices, and other external factors may be at play to influence their choices. Among our population of Irish teens, the highest score was on the external eating scale, suggesting that food choices among Irish teens tend to be influenced more by external factors, such as the smell and taste of food, the sight of food or being around others who are eating a certain type of food. This supports the general understanding that teens are influenced by a range of factors, including their physical and social environment^(6,34). The food that is present in their immediate environment will often be chosen, which

coincides with qualitative research in teens which frequently reports the food environment, food availability, convenience and the taste or sensory appeal of food as factors determining their food choices^(13,15,37,38). Peer influences and social desirability also play a role in food choice, becoming stronger as teens age⁽⁶⁾, with negative social connotations associated with 'weird' healthy type foods^(37,38). Scores on both the Restraint and the Emotional scales suggest that the Irish teen cohort displays a low level of both eating behaviour styles, which is similar to teens from other European countries^(27–29).

The results from our data for sex- and age-group differences in DEBQ responses corroborate other research using the DEBQ tool^(19,22,27–29) and suggest that females tend to be more emotional and restrained eaters, and older teens tend to respond more to their emotions and external factors than younger teens when making eating decisions. We also observed that older males are more emotionally



and externally motivated than younger males, older females are more restrained and emotional than younger females and both younger and older females are more restrained and emotional than younger and older males, which again corroborates other findings in teen cohorts^(27–29). These sex- and age-related associations suggest that overall, female teens and older teens in the Irish population relate to different factors and cues for eating than their male or younger counterparts, and this could be taken into consideration for health promotion programmes.

BMI is commonly associated with the DEBQ scales for eating behaviours, where those with a higher BMI display higher restrained eating and higher emotional eating, but lower external eating scores^(19,22,26,28,29). The results of the current study are in agreement with these findings, with BMI being positively associated with the Restraint scale and negatively associated with the External scale. Although not significant, we also observed higher scores for teens classified as overweight/obese on the Emotional scale. When we look specifically at the dietary associations with the eating behaviour styles, we see the strongest correlations for daily energy intake. As would be expected from the description of the eating behaviour styles, daily energy intake is lower in those who are more restrained eaters and is higher in those who are more external eaters, and similar results have been found with other teens^(27–29).

There is an inverse association between the DEBQ scales with BMI and the dietary energy intake data, where the scales show a positive association with BMI but a negative association with energy intake, and vice versa. As reported by McConnon *et al.*⁽³⁹⁾ in this same group of teens, there was a high level of body dissatisfaction, particularly among overweight teens. This may have influenced their desire to restrict dietary intakes in an attempt to control or change their body size. In the context of the restrained eating theory as a whole, it certainly seems that restrained eating or dieting may not lead to a lower body weight and therefore is not an appropriate weight management strategy^(40,41). These findings corroborate previous work on the idea that those who are more overweight tend to be more aware of what they are eating and the effect it may have on their bodies and therefore make specific food choices to prevent gaining extra weight^(27–29). Similarly, we reflect other findings that the external eating scale is negatively associated with BMI but positively associated with energy intake^(27,28). External eaters often eat based on the presence or sensory qualities of food, and since they often have a normal BMI, they are less likely to feel the need to restrict their consumption. Again, we cannot draw conclusions on the causal nature of these relationships, but the consistency of the relationship among this and other teen groups is worth noting. Future research could focus on specific foods or food groups which may be associated with these eating behaviour styles, to understand more on whether the lower energy intake is associated with

lower intakes of high fat, sugar and salt foods (i.e. a healthy restriction) or an unhealthy overall restriction, and should include a larger proportion of participants with overweight or obesity.

Given the differences between male and female, and younger and older teens in their responses to these scales, different approaches could be taken to encourage healthy eating behaviour styles, based on the characteristics of the target population. As females, older teens and those with a higher BMI consistently showed stronger associations with restrained eating, health promotion messages addressing the issues with dieting and promoting overall healthy eating may be most appropriate for these groups. Addressing eating in response to emotions would also be important among these groups. On the contrary, since males were found to be more external eaters, health promotion messages relating to the sensory aspects of food or physical changes to the food environment may be more effective to improve their diet. Both nutrition education and environmental-based interventions are common approaches to improving diet and health^(42,43), and incorporating a more targeted approach based on the different eating behaviour styles of subgroups could help to make these more effective. These approaches could be tested in future research aiming to improve the eating behaviours and food choices among specific teen-aged groups.

Strengths and limitations

A key strength of the current research is that rigorous data collection methods with validated questionnaire tools were used, and the data set is nationally representative⁽⁷⁾. However, the analysis was conducted on secondary data collected 15 years ago and therefore may not be directly relevant to society today. As a second iteration of the National Teens' Food Survey is currently underway, the current research provides the basis for a comparison between the previous and current data set to allow any changes in eating behaviour styles to be assessed over the past 15 years in Ireland.

Second, whilst the DEBQ tool has been consistently shown to be valid in several adult and teen-aged populations, the initial purpose of the tool was to address issues of overweight and obesity. The low rate of obesity in the current study population may be a limitation of using this tool in this specific cohort. The opt-in approach for recruitment may have resulted in teens with a higher BMI choosing to not be involved in a nutrition-specific survey, thereby affecting the obesity rates reported. The questions may not be fully relevant to a general population where the prevalence of overweight and obesity is relatively low, which may explain the relatively low scores reported on each scale. Similarly, the questions on the DEBQ relate to general food situations, some of which the respondents may not have experienced personally, which may have resulted in some response bias from perhaps choosing the mid-range value for convenience. Despite the low rate of obesity



in this cohort, the DEBQ has been validated in general populations^(19–21), and therefore, it was the best tool available at the time of data collection.

It is important to note that the DEBQ is one of the several tools now available to measure eating behaviour styles. Some criticisms on the validity of the scales have arisen over the years^(44,45); however, the tool has been found to remain fit for purpose and valid in the multiple population groups^(31,46). In relation to emotional eating, the scale is somewhat limited as it only measures responses to negative emotions and only addresses overeating, and therefore cannot ascertain any undereating responses to emotions, or eating in response to positive emotions. The results from this scale should be interpreted with that in mind. There has been evidence of correlations between the Restraint scale and the Emotional scale, which suggests that restrained eating in response to these negative emotions likely exists^(20,24), and this correlation was observed in the present Irish cohort as well (data not shown).

Whilst any eating behaviour questionnaire can quantify and categorise a range of eating behaviour styles in a population group, they are predominately designed with the aim of preventing overeating and the development or progression of obesity. The questionnaires themselves can only provide information for predetermined characteristics regarding eating behaviours, but they lack the ability to comprehensively determine many other aspects relating to eating behaviours and food choices. This highlights the importance of combining qualitative research with quantitative survey methods in future research for understanding food choice and eating habits or behaviours.

Conclusion

Differences in the eating behaviour styles of teens exist based on several factors including sex, age and BMI and dietary energy intake have a different relationship with each eating behaviour style. Future population-based nutrition surveys should aim to include a measure of eating behaviour styles within the research methodology, to enhance the level of understanding on the dietary behaviours of the population. Assessing eating behaviour styles allows an understanding on *how* and *why* people eat, and not just *what* they eat. These aspects should be considered when designing healthy eating messages or programmes to teens, so that messages are phrased through a sex- and age-specific lens, focusing on aspects that are most relevant to the specific teen groups rather than using a 'one-size-fits-all' model. This could help inform health promotion messages tailored to the needs of this sub-population, and by phrasing the messages through the same lens as their motivations, it may help to make the interventions more effective.

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Supplementary material

For supplementary material accompanying this paper visit <https://doi.org/10.1017/S1368980020003055>

References

1. OECD/European Observatory on Health Systems and Policies (2019) *Ireland: Country Health Profile 2019, State of Health in the EU, OECD Publishing, Paris/European Observatory on Health Systems and Policies*. Brussels. doi: 10.1787/2393fd0a-en.
2. Tombor I & Michie S (2017) Methods of health behavior change. *Oxford Res Encycl Psychol*, 1–26. doi: 10.1093/acrefore/9780190236557.013.
3. Gill TP & Boylan S (2012) Public health messages: why are they ineffective and what can be done? *Curr Obes Rep* **1**, 50–58.
4. Merkur S, Sassi F & McDaid D (2013) *Promoting Health, Preventing Disease: Is There an Economic Case?* Copenhagen, Denmark: WHO Regional Office for Europe.
5. Craigie AM, Lake AA, Kelly SA *et al.* (2011) Tracking of obesity-related behaviours from childhood to adulthood: a systematic review. *Maturitas* **70**, 266–284.
6. Viner RM, Ozer EM, Denny S *et al.* (2012) Adolescence and the social determinants of health. *Lancet* **379**, 1641–1652.
7. Irish University Nutrition Alliance (IUNA) (2007) *The National Teen's Food Survey (2005–2006)*; available at <https://www.iuna.net/surveyreports> (accessed February 2020).
8. Joyce T, Wallace AJ, McCarthy SN *et al.* (2009) Intakes of total fat, saturated, monounsaturated and polyunsaturated fatty acids in Irish children, teenagers and adults. *Public Health Nutr* **12**, 156–165.
9. Rippin HL, Hutchinson J, Jewell J *et al.* (2019) Child and adolescent nutrient intakes from current national dietary surveys of European populations. *Nutr Res Rev* **32**, 38–69.



10. Költő A, Gavin A, Molcho M *et al.* (2020) *The Irish Health Behaviour in School-aged Children (HBSC) Study 2018*. Galway: Department of Health and National University of Ireland.
11. Irish University Nutrition Alliance (IUNA) (2019) *National Children's Food Survey II Summary Report*; available at <https://www.iuna.net/surveyreports> (accessed February 2020).
12. Kelly C, Callaghan M, Molcho M *et al.* (2019) Food environments in and around post-primary schools in Ireland: associations with youth dietary habits. *Appetite* **132**, 182–189.
13. Browne S, Barron C, Staines A *et al.* (2019) 'We know what we should eat but we don't . . .': a qualitative study in Irish secondary schools. *Health Promot Int* **20**, 1–10.
14. Michelle Share (2008) Choice and resistance young people's perspectives on food and eating at school. *Youth Stud Irel J* **3**, 18–36.
15. Fitzgerald A, Heary C, Nixon E *et al.* (2010) Factors influencing the food choices of Irish children and adolescents: a qualitative investigation. *Health Promot Int* **25**, 289–298.
16. Share M & Stewart-Knox B (2012) Determinants of food choice in Irish adolescents. *Food Qual Prefer* **5**, 57–62.
17. Stevenson C, Doherty G, Barnett J *et al.* (2007) Adolescents' views of food and eating: identifying barriers to healthy eating. *J Adolesc* **30**, 417–434.
18. van Strien T, Frijters JER, Bergers GPA *et al.* (1986) The Dutch Eating Behavior Questionnaire (DEBQ) for assessment of restrained, emotional, and external eating behavior. *Int J Eat Disord* **5**, 295–315.
19. Barrada JR, van Strien T & Cebolla A (2016) Internal structure and measurement invariance of the Dutch Eating Behavior Questionnaire (DEBQ) in a (nearly) representative Dutch community sample. *Eur Eat Disord Rev* **24**, 503–509.
20. Cebolla A, Barrada JR, van Strien T *et al.* (2014) Validation of the Dutch Eating Behavior Questionnaire (DEBQ) in a sample of Spanish women. *Appetite* **73**, 58–64.
21. Bozan N, Bas M & Asci FH (2011) Psychometric properties of Turkish version of Dutch Eating Behaviour Questionnaire (DEBQ): a preliminary results. *Appetite* **56**, 564–566.
22. Brunault P, Rabemampianina I, Apfeldorfer G *et al.* (2015) The Dutch Eating Behavior Questionnaire: further psychometric validation and clinical implications of the French version in normal weight and obese persons. *Presse Med* **44**, e363–e372.
23. Baños RM, Cebolla A, Etchemendy E *et al.* (2011) Validation of the Dutch eating behavior questionnaire for children (DEBQ-C) for use with Spanish children. *Nutr Hosp* **26**, 890–898.
24. Caccialanza R, Nicholls D, Cena H *et al.* (2004) Validation of the Dutch Eating Behaviour Questionnaire parent version (DEBQ-P) in the Italian population: a screening tool to detect differences in eating behaviour among obese, overweight and normal-weight preadolescents. *Eur J Clin Nutr* **58**, 1217–1222.
25. Lluch A, Kahn J, Stricker-Krongrad A *et al.* (1996) Internal validation of a French version of the Dutch eating behaviour questionnaire. *Eur Psychiatry* **11**, 198–203.
26. Snoek HM, Engels RCME, van Strien T *et al.* (2013) Emotional, external and restrained eating behaviour and BMI trajectories in adolescence. *Appetite* **67**, 81–87.
27. Snoek HM, van Strien T, Janssens JMAM *et al.* (2007) Emotional, external, restrained eating and overweight in Dutch adolescents. *Scand J Psychol* **48**, 23–32.
28. Lluch A, Herbeth B, Mejean L *et al.* (2000) Dietary intakes, eating style and overweight in the Stanislas Family Study. *Int J Obes* **24**, 1493–1499.
29. Wardle J, Marsland L, Sheikh Y *et al.* (1992) Eating style and eating behaviour in adolescents. *Appetite* **18**, 167–183.
30. Burton P, Smit HJ & Lightowler H (2007) The influence of restrained and external eating patterns on overeating. *Appetite* **49**, 191–197.
31. van Strien T, Herman CP & Anschutz D (2012) The predictive validity of the DEBQ-external eating scale for eating in response to food commercials while watching television. *Int J Eat Disord* **45**, 257–262.
32. Central Statistics Office (CSO) (2003) *Census 2002 Principal Demographic Results*. Dublin: The Stationery Office.
33. Cole TJ, Bellizzi MC, Flegal KM *et al.* (2000) Establishing a standard definition for child overweight and obesity worldwide: international survey. *Br Med J* **320**, 1240–1243.
34. Bronfenbrenner U & Morris P (2006) The bioecological model of human development. In *Theoretical Models of Human Development Handbook of Child Psychology 1*, pp. 793–828 [RMV Lerner, W Damon and RMS Lerner, editors]. Hoboken, NJ: Wiley.
35. Hearty ÁP & Gibney MJ (2013) Dietary patterns in Irish adolescents: a comparison of cluster and principal component analyses. *Public Health Nutr* **16**, 848–857.
36. Lyons J, Walton J & Flynn A (2015) Food portion sizes and dietary quality in Irish children and adolescents. *Public Health Nutr* **18**, 1444–1452.
37. Neumark-Sztainer D, Story M, Perry C *et al.* (1999) Factors influencing food choices of adolescents: findings from Focus-Group Discussions with Adolescents. *J Am Diet Assoc* **99**, 929–937.
38. Wills W, Backett-Milburn K, Gregory S *et al.* (2005) The influence of the secondary school setting on the food practices of young teenagers from disadvantaged backgrounds in Scotland. *Health Educ Res* **20**, 458–465.
39. McConnon Á, Burke SJ, McCarthy SN *et al.* (2008) Body size (dis)satisfaction in Irish teenagers (abstract only). *Proc Nutr Soc* **67**, 2008–2009.
40. Hibscher JA & Herman CP (1977) Obesity, dieting, and the expression of obese characteristics. *J Comp Physiol Psychol* **91**, 374–380.
41. Herman CP & Mack D (1975) Restrained and unrestrained eating. *J Personal* **43**, 647–660.
42. Salam RA, Hooda M, Das JK *et al.* (2016) Interventions to improve adolescent nutrition: a systematic review and meta-analysis. *J Adolesc Heal* **59**, S29–S39.
43. Belogianni K & Baldwin C (2019) Types of interventions targeting dietary, physical activity, and weight-related outcomes among university students: a systematic review of systematic reviews. *Adv Nutr* **10**, 848–863.
44. Jansen A, Nederkoorn C, Roefs A *et al.* (2011) The proof of the pudding is in the eating: is the DEBQ: external eating scale a valid measure of external eating? *Int J Eat Disord* **44**, 164–168.
45. Domoff SE, Meers MR, Koball AM *et al.* (2014) The validity of the Dutch Eating Behavior Questionnaire: some critical remarks. *Eat Weight Disord* **19**, 137–144.
46. van Strien T (1999) Success and failure in the measurement of restraint: notes and data. *Int J Eat Disord* **25**, 441–449.