Routledge
Taylor & Francis Group

Ecology of Food and Nutrition

ISSN: 0367-0244 (Print) 1543-5237 (Online) Journal homepage: https://www.tandfonline.com/loi/gefn20

Are eating behaviors related with by body mass index, gender and age?

Nevin Sanlier, Sabriye Arslan, Nuket Buyukgenc & Onur Toka

To cite this article: Nevin Sanlier, Sabriye Arslan, Nuket Buyukgenc & Onur Toka (2018) Are eating behaviors related with by body mass index, gender and age?, Ecology of Food and Nutrition, 57:4, 372-387, DOI: 10.1080/03670244.2018.1493470

To link to this article: https://doi.org/10.1080/03670244.2018.1493470

ECOLOGY OF FOOD AND NUTRITION
2018, VOL. 57, NO. 4, 372–387
https://doi.org/10.1080/03670244.2018.1493470

Routledge
Taylor & Francis Group

Are eating behaviors related with by body mass index, gender and age?

Nevin Sanlier [a], Sabriye Arslan[b], Nuket Buyukgenc[c], and Onur Toka[d]

[a]Faculty of Health Sciences, Nutrition and Dietetics Department, Lokman Hekim University, Ankara, Turkey; [b]Faculty of Health Sciences, Nutrition and Dietetics Department, Gazi University, Ankara, Turkey; [c]Gulhane Training and Research Hospital, Ankara, Turkey; [d]Faculty of Science, Department of Statistics, Hacettepe University, Ankara, Turkey

ABSTRACT

The present study was carried out with parents of 520 healthy children between the ages of 2-12 and their parents who were referred to the diet polyclinic of a hospital in Ankara. The data were collected through personal interviews. The interviews included identifying the characteristics of the child and his/her parents, anthropometric measurements, questions investigating eating status, and the Children's Eating Behavior Questionnaire. According to the body mass index-Z scores, there were differences between subgroups of food responsiveness, emotional overeating, enjoyment of food, food fussiness, and slowness in eating. The gender-based desire to drink score was, on average, higher in boys. No gender-based differences were found in other subgroups, whereas the scores in the food fussiness and slowness in eating and emotional undereating were higher in the preschool group when analyzed by age. In conclusion, eating behaviors of overweight and obese children differ from those of normal and underweight children.

KEYWORDS

CEBQ; eating behaviors; obesity

Childhood obesity is the most serious problem of the twenty-first century and a global public health problem, and the prevalence is alarming. The problem affects many high-, low-, and moderate-income countries. The number of slightly obese children worldwide is more than 42 million as of 2015 (WHO 2016a). Slightly overweight and obese children have an increased risk of being obese in adulthood (Lee and Lee 2000). Chronic diseases such as cardiovascular diseases, cancer, diabetes, respiratory diseases, dementia, and obstructive sleep apnea constitute 60% of all death causes with higher mortality rates (WHO 2015). Development of chronic diseases is affected by many factors, including age, gender, genetic factors, smoking and alcohol use, sedentary lifestyle and unbalanced diet, as well as obesity. Arrangements of lifestyle are modifiable risk factors that contribute to reducing the risk of developing a chronic disease. Obesity, which is one of these

CONTACT Nevin Sanlier nevintekgul@gmail.com, nevin.sanlier@lokmanhekim.edu.tr Faculty of Health Sciences, Nutrition and Dietetics Department, Lokman Hekim University, Ankara, Turkey

This article provides valuable data for studies of child eating behavior, ages, genders, and body weights of the children that are thought to be important for children in the future.

modifiable factors, has been shown to be a factor in the development of diabetes, hypertension, and some types of cancer (WHO 2014).

Obesity and obesity-induced diseases may be prevented to a great extent. Therefore, efforts should be made to prevent childhood fatness (WHO 2016a). Since eating patterns form during the early years, selecting healthy foods for babies and young children is very important (Lee and Lee 2000). A sufficient and balanced diet and regular physical exercise are essential. A healthy lifestyle allows individuals to be energetic and fit, to maintain healthy body weight and to have a suitable body composition. It also reduces the risk of developing chronic diseases. For a healthy lifestyle and body weight control, planned exercise programs or lifestyle changes as well as reducing sedentary lifestyle are all important (WHO 2010). The increasing urbanization and digitalization of the world provide fewer opportunities for physical activities through healthy play (WHO 2016b). The feeding style of parents and eating behaviors of children play an important role during the obesity development process (Webber et al. 2009).

Eating behavior is a complex concept that includes biological and social aspects. Childhood obesity has gradually increased worldwide as an important healthcare problem (WHO 2016a). Problems related to body weight start to appear in the first years of life. A child's eating behavior style is developed around the end of the preschool years and becomes fixed after that (Ashcroft et al. 2008). Eating problems are common during childhood. Although such problems are observed in as many as 25–45% of children, even in healthy children, this increases up to 80% in children with as they age (Linscheid, Budd, and Resnake 2003). Severe eating disorders requiring intensive medical and behavioral therapies are observed in 3–10% of children (Kerwin 1999). Negative attitudes about body weight and a tendency toward underweightness may appear during the preschool years (Tremblay et al. 2011).

Since healthy eating behavior starts to develop during infancy and early childhood, accurate observation of parent–child relationships may provide an idea about the development of eating behaviors (Morin 2006). This increased prevalence is of concern because overweight children are at increased risk for social stigmatization, adult obesity, and chronic disease. Obesity shows familial aggregation; the risk of obesity among children of two obese parents is much higher than for children in families in which neither parent is obese (Birch and Fisher 1998). The most undesired case is eating disorders resulting in growth retardation and malnutrition in the children. Many factors are thought to influence parental food choice; parents with good dietary awareness (or nutrition knowledge) are more likely to make healthy food choices for their children. Nevertheless, adoption of healthy eating behavior in the early ages is important. Selective eating during early childhood is reported to

be associated with eating disorders during adolescence and early adulthood (Nicholls and Bryant-Waugh 2009).

Many studies have detected differences in various subgroups of eating behaviors between obese and nonobese children (Berkowitz et al. 2010; Wardle et al. 2001; Webber et al. 2009). It has been determined that obese children are more susceptible to environmental stimuli (taste, color of foods, etc.) and react less to fullness although they eat more and are not hungry when compared with children who have normal weights and react more to food in general (Berkowitz et al. 2010; Webber et al. 2009). A previous study showed that obese children present with a unique eating behavior: these children are more susceptible to hints of food such as odor when compared with children who have normal weights, and they have more binge-eating episodes (Meule et al. 2014). The overreaction is not limited to food options but also applies to beverages that include sugar, which is associated with weight gain (Malik, Schulze, and Hu 2006). Slightly overweight and obese children consume sweet beverages/beverages with sugar more often and faster (Berkowitz et al. 2010; Ohkuma et al. 2015).

It has been reported that children with eating problems are shorter and more underweight than their peers, and they mature slowly (Deboer, Agard, and Scharf 2015). One study found that 11% of the bodyweight values of 2-year-old children with eating problems are below the fifth percentile (Wright et al. 2007). Selective eating during early childhood is reported to be associated with eating disorders during adolescence and adulthood (Nicholls and Bryant-Waugh 2009). Furthermore, eating may be increased or decreased to overcome different emotional states, such as happiness, anxiety, stress, etc. (Webber et al. 2009). Food selectivity is associated with lower BMI in children (Viana, Sinde, and Saxton 2008). However, another study did not find any association between food selectivity and the BMIs of children (Santos et al. 2011). On the other hand, it was shown that underweight children consume foods in limited portions, and slowly, and they have less interest in the food because of food selectivity (Wardle et al. 2001; Webber et al. 2009).

Treatment of childhood obesity is very difficult. Successful treatment is a result of accurate identification of the causes of obesity. The updated treatment approach for childhood obesity requires a multidisciplinary individual or group approach that includes nutrition treatment, behavioral modification, and exercise. A low-energy weight-loss diet during childhood, when growth and development continue, is not recommended since this may cause a deceleration and even interruption of growth. Early diagnosis of eating behavior disorders is very difficult. Detection of eating behaviors both in healthy and in obese children is quite important. For this purpose, there are many studies to determine eating behaviors, interest in food, and lack of interest in food (Baños et al. 2011; Caccialanza et al. 2004; Sánchez et al. 2016; Wardle et al. 2001).

Research aims

In Turkey as well as worldwide, eating disorders and related behavior are increasing in children. Nevertheless, there are limited studies for the age group 2–12. The sample of our study consists of 520 families and their children. Therefore, this study was aimed to do the following:

(i) Evaluate disordered child eating behavior in different age of the children.
(ii) Determine if child eating behavior score changes according to body weight.
(iii) Identify the relationship between subdimensions of Children's Eating Behavior Questionnaire (CEBQ) and the ages, genders, and body weights of the children.

Materials and method

Participant characteristics

The present study was carried out with 520 healthy children between the ages of 2 and 12 and their parents (mother: 407, father: 113). Some of the mothers of the children participated in the survey and some of the parents participated in the survey. The participants had been referred to the diet polyclinic of a hospital in Ankara (capital city of Turkey). Questions about the children were asked of the parents. Each participant was informed about the research, and an informed consent form was read and signed by all volunteer participants. Children who had any condition that would affect their perception were excluded, along with their parents. The data were collected through personal interviews. The interviews included questions about the characteristics of each child and his or her parents, anthropometric measurements, questions investigating the eating status, and the CEBQ (Wardle et al. 2001).

Before starting to study, approval of the Ethics Committee was obtained from the Gulhane Training and Education Hospital with the decision numbered 50687469–1491-336–16/1648–991 dated 02.04.2016. Clear explanations were provided for the individuals with regard to the purpose of the study, after which written informed consent was obtained from all participants in accordance with the Declaration of Helsinki.

Study plan

The data were collected between April and June 2016. Information about children was collected by asking parents. A survey form, which the researchers prepared, was used in the study and consisted of 15 questions to determine the demographic features and health information of the individuals. In addition to the demographic and anthropometric information of the

participants, all questionnaires were administered in Turkish translations. A pilot study was conducted on 30 participants at the beginning of the study, and minor changes were made to the confusing questions. The individuals that agreed to participate in the study answered the questionnaire in 25 min while sitting in a comfortable place.

Instrumentations

Children's Eating Behavior Questionnaire (CEBQ)

The CEBQ was adapted by Wardle et al. (2001) and translated into the Turkish language by Yılmaz, Esmeray, and Erkorkmaz (2011). It includes questions to be answered by the parents that evaluate the eating behavior habits of the children and was used in the present study. The Cronbach alpha value of the adapted version of the study was .69 (Yılmaz, Esmeray, and Erkorkmaz 2011), and the Cronbach alpha value of the present study was found to be .708. The CEBQ is a Likert-type questionnaire answered by the parents and includes 35 items, where each item is assessed on a scale of five points (1 = never, 5 = always). Eight subdimensions were determined to measure child eating behavior from the scale as follows:

(1) Food responsiveness (FR = 5 expressions),
(2) Emotional overeating (EOE = 4 expressions),
(3) Enjoyment of food (EF = 4 expressions),
(4) Desire to drink (DD = 3 expressions),
(5) Satiety responsiveness (SR = 5 expressions),
(6) Slowness in eating (SE = 4 expressions),
(7) Emotional undereating (EUA = 4 expressions) and
(8) Food fussiness (FF = 6 expressions).

Anthropometric measurements

All measurements were taken by two trained dieticians. Height was measured in the standing position without shoes using a stadiometer. The height was measured to the nearest 0.1 cm. When measuring height, the subjects and controls stood straight with the head positioned such that the Frankfurt plane was horizontal, feet together, knees straight and heels in contact with the vertical surface of the wall, and arms hanging freely at the sides with the palm facing the thighs. Participants' weights were measured by the equipment to the nearest 0.1 kg in light clothing and without shoes. All measurements were taken in the morning after overnight fasting (Gibson 2005). The eating status of each child was evaluated using the BMI-Z score according to the child's age via WHO Anthro Plus software (WHO 2009). The children were classified based on BMI-Z score intersection points according to age by WHO as follows: depending on the BMI-Z score, >3 standard deviation (SD),

fat; >2 SD, mildly overweight; between −1 and 1, normal; >−2 SD, underweight (WHO 2017).

Power analysis was used for sample detection. The information obtained from previous studies was used for reference (Passos et al. 2015; Wardle et al. 2001). Alpha (α) = .05, deviation by 5% and power ($1-\beta$) = .90 were used; it was calculated that the sample should include at least 453 individuals, and 520 individuals were enrolled into the study.

Statistical analysis

All statistical analyses were performed using SPSS (The Statistical Package for Social Sciences) Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Mean and standard deviation were used for continuous variables belonging to the characteristics of the individuals, whereas frequency was used for qualitative characteristics. We used nonparametric tests because of our data were not normally distributed. Kruskal Wallis was utilized in differences of more than two groups, and the Mann–Whitney *U*-test was utilized for differences between two groups. For detailed analysis, BMI-Z score modeling was analyzed through multiple logistic regression analysis according to subscores of eating behavior. All analyses were examined and interpreted at a 95% confidence interval. Coefficient of concordance was used to assess agreement among individuals, and $p < .05$, $p < .001$ were determined as the level of significance for all of the analyses.

Results

Among the participants, 51.5% were boys and 49% were girls. According to age-dependent BMI-Z scores, 13.5% were underweight, 47.5% were normal, 22.5% were overweight, and 16.5% were obese.

The descriptive variables of the children and the parents are provided in table 1.

Table 1. The mean of the descriptive variables and the standard deviation value ($\bar{x}\pm$ SS) for children and parent characteristics.

Characteristics	$\bar{x}$ ± SS
Children's age (years)	6.1 ± 2.27
Children's weight (kg)	23.6 ± 8.21
Children's height (cm)	116.7 ± 15.79
BMI-Z score for age	0.5 ± 1.78
Mother's age (year)	35.0 ± 4.97
Mother's weight (kg)	66.3 ± 12.13
Mother's height (cm)	162.6 ± 5.92
Mother BMI (kg/m^2)	25.1 ± 4.76
Father's age (years)	38.1 ± 4.96
Father's weight (kg)	82.9 ± 11.45
Father's height (cm)	175.8 ± 7.06
Father BMI (kg/m^2)	26.8 ± 3.33

The average age of the children was 6.1 ± 2.27 years, and the age-dependent BMI-Z score average was 0.5 ± 1.78. Mean BMI values of the mothers and the fathers were 25.1 ± 4.76 kg/m^2 and 26.8 ± 3.33 kg/m^2, respectively.

An evaluation of the subdimensions of eating behaviors according to BMI-Z scores, gender, and age is presented in table 2.

A difference was found between the groups in terms of the FR subscore, according to the BMI-Z score ($p < .001$). The mean FR score of the obese children in the subgroups was greater than that of the underweight ($p < .001$), normal ($p < .001$), and overweight ($p < .001$) children. The FR score was found to be higher in overweight individuals than in underweight ($p < .05$) and normal-weighted ($p < .05$) individuals. There was not any statistical difference between underweight and normal individuals ($p > .05$). A difference was found between the EOE subscore and BMI ($p < .001$). Furthermore, the EOE subscore average was greater in obese individuals when compared with underweight ($p < .001$), normal ($p < .001$), and overweight ($p < .05$). EF scores for underweight individuals were detected to be lower than those for normal ($p < .05$), overweight ($p < .001$), and obese ($p < .001$) individuals, whereas the EF scores for individuals with normal body weights were found to be lower than those for overweight ($p < .001$) and obese ($p < .001$) individuals. There was no statistical difference in the DD subscores ($p > .05$), whereas a statistical difference was detected in the BMI-Z score groups in FR and SE subgroup scores ($p < .001$). However, no difference was found between overweight and obese groups ($p > .05$). The SR and SE scores decrease on a scale from underweight individuals to obese individuals. The DD score is greater in male individuals than in females ($p < .05$). There was no difference among other groups in terms of gender; SR ($p < .05$), SE ($p < .001$), and EUE ($p < .001$) scores were greater on average in the preschool group. There was no difference in other eating behavior scores according to age ($p > .05$).

The multiple logistic regression analyses of CEBQ subdimensions according to BMI are presented in table 3.

There is no significant difference between normal and underweight individuals in terms of subdimensions of eating behaviors. The SE score ($p < .05$) and FF score ($p < .05$) have an inverse relationship in overweight group when compared with the underweight group. An increase of one unit in the SE score 1.63 times reduces the likelihood of being overweight; similarly, an increase of one unit in the FF score 1.67 times reduces the likelihood of being overweight. In the obese group, the SR score ($p < .05$) has a positive correlation, whereas the FF score ($p < .05$) has an inverse relationship. An increase of one unit in the SR score increases the likelihood of being overweight 1.35 times, whereas an increase of one unit in the FF score decreases the risk of being overweight 1.79 times.

There is no significance in terms of normal and underweight individuals in the model corrected according to age and gender in BMI-Z score classification as per eating behavior subdimensions. In the overweight group, the EF score ($p < .05$)

Table 2. Children's CEBQ subscales ($\bar{x}\pm$ SS) and significance values for BMI-Z score class corrected by sex and age.

	Food responsiveness (FR)	Emotional overeating (EOE)	Enjoyment of food (EF)	Desire to drink (DD)	Satiety responsiveness (SR)	Slowness in eating (SE)	Emotional undereating (EUE)	Food fussiness (FF)
Underweight (n = 70)	1.76 ± 0.76	1.57 ± 0.65	2.74 ± 0.98	2.71 ± 1.08	3.41 ± 0.82	3.18 ± 0.94	3.07 ± 0.86	2.68 ± 1.07
Normal (n = 247)	1.90 ± 0.77	1.64 ± 0.60	2.99 ± 0.87	2.81 ± 1.04	3.16 ± 0.75	2.80 ± 1.00	3.06 ± 0.81	2.72 ± 0.93
Overweight (n = 117)	2.15 ± 0.87	1.74 ± 0.69	3.44 ± 0.87	2.79 ± 0.98	2.93 ± 0.64	2.37 ± 0.91	2.92 ± 0.83	2.74 ± 0.84
Obese (n = 86)	2.64 ± 1.04	2.05 ± 0.83	3.61 ± 0.94	2.83 ± 1.06	2.93 ± 0.79	2.42 ± 1.00	3.01 ± 0.78	2.83 ± 1.05
p	0.000	0.000	0.000	0.905	0.000	0.000	0.356	0.665
Test value*	49.420	21.619	53.604	0.563	20.423	38.805	3.241	1.576
Gender								
Boy (n = 268)	2.12 ± 0.93	1.75 ± 0.71	3.24 ± 0.95	2.89 ± 1.03	3.08 ± 0.76	2.63 ± 1.02	3.00 ± 0.82	2.70 ± 0.95
Girl (n = 252)	2.00 ± 0.84	1.69 ± 0.66	3.07 ± 0.92	2.69 ± 1.03	3.13 ± 0.76	2.76 ± 0.99	3.05 ± 0.82	2.77 ± 0.95
p**	0.230	0.510	0.058	0.035	0.445	0.106	0.582	0.346
Age								
Preschool age (n = 313)	2.03 ± 0.84	1.67 ± 0.65	3.09 ± 0.90	2.77 ± 1.00	3.18 ± 0.76	2.85 ± 0.99	3.13 ± 0.82	2.68 ± 0.91
School age (n = 207)	2.11 ± 0.96	1.79 ± 0.73	3.27 ± 1.00	2.83 ± 1.08	2.98 ± 0.75	2.45 ± 0.99	2.87 ± 0.79	2.81 ± 1.01
p **	0.657	0.085	0.054	0.667	0.005	0.000	0.000	0.273

*Kruskal Wallis test value.

**Mann–Whitney U-test score.

Table 3. According to multiple logistic regression models, CEBQ subgroups β and standard error values of children according to BMI-Z score classification.

		1. Model				2. Model*				3. Model**		
		B	*SD*	*p*		*B*	*SD*	*p*		*B*	*SD*	*p*
Normal	FR	0.136	0.270	0.615	FR	0.124	0.269	0.646	FR	0.203	0.286	0.478
	EOE	−0.009	0.282	0.975	EOE	0.023	0.283	0.936	EOE	−0.117	0.299	0.695
	EF	0.018	0.254	0.945	EF	−0.003	0.254	0.991	EF	0.084	0.265	0.752
	DD	0.112	0.144	0.437	DD	0.111	0.144	0.439	DD	0.163	0.153	0.287
	SR	−0.369	0.258	0.153	SR	−0.383	0.259	0.139	SR	−0.466	0.265	0.079
	SE	−0.250	0.186	0.179	SE	−0.281	0.189	0.138	SE	−0.187	0.195	0.338
	EUE	0.181	0.176	0.304	EUE	0.162	0.177	0.361	EUE	0.114	0.186	0.541
	FF	−0.200	0.177	0.258	FF	−0.194	0.178	0.275	FF	−0.202	0.186	0.278
Overweight	FR	0.299	0.298	0.316	FR	0.303	0.297	0.308	FR	0.398	0.314	0.205
	EOE	−0.102	0.315	0.747	EOE	−0.126	0.318	0.691	EOE	−0.270	0.332	0.416
	EF	0.553	0.293	0.059	EF	0.577	0.292	0.049*	EF	0.647	0.306	0.035*
	DD	0.052	0.169	0.760	DD	0.039	0.169	0.818	DD	0.084	0.179	0.640
	SR	−0.342	0.301	0.255	SR	−0.368	0.302	0.223	SR	−0.479	0.311	0.123
	SE	−0.484	0.218	0.026*	SE	−0.427	0.221	0.053	SE	−0.323	0.228	0.156
	EUE	0.134	0.209	0.520	EUE	0.168	0.211	0.427	EUE	0.109	0.221	0.621
	FF	−0.514	0.203	0.011*	FF	−0.528	0.203	0.009*	FF	−0.543	0.213	0.011*
Obese	FR	0.976	0.317	0.002	FR	0.971	0.317	0.002*	FR	1.013	0.339	0.003
	EOE	0.183	0.327	0.576	EOE	0.219	0.329	0.505	EOE	0.029	0.348	0.935
	EF	0.523	0.325	0.108	EF	0.497	0.327	0.128	EF	0.584	0.344	0.090
	DD	−0.279	0.191	0.144	DD	−0.265	0.192	0.167	DD	−0.143	0.203	0.483
	SR	−0.200	0.333	0.547	SR	−0.202	0.334	0.546	SR	−0.328	0.349	0.348
	SE	−0.317	0.240	0.186	SE	−0.369	0.245	0.132	SE	−0.288	0.254	0.256
	EUE	0.289	0.236	0.220	EUE	0.238	0.237	0.315	EUE	0.277	0.250	0.267
	FF	−0.580	0.219	0.008	FF	−0.565	0.220	0.010	FF	−0.580	0.232	0.013

*Corrected according to age and sex of the child, **Corrected according to child's age, gender, mother's education, father's education, mother's BMI, and father's BMI.

Reference category: Underweight group according to BMI-Z score.

FR: Food responsiveness, EOE: Emotional overeating, EF: Enjoyment of food, DD: Desire to drink, SR: Satiety responsiveness, SE: Slowness in eating, EUE: Emotional undereating, FF: Food fussiness.

has a positive correlation, whereas the FF score ($p < .05$) has an inverse relationship. An increase of one unit in the EF score increases the risk of being overweight 1.78 times, whereas a one-unit increase in FF score decreases the risk of being overweight 1.70 times. The SR score in the overweight group has a positive relationship with weight and the FF score ($p < .05$) has an inverse relationship. A one-unit increase in the SR score increases the risk of obesity 1.35 times, whereas a one-unit increase in the FF score reduces the risk of obesity 1.76 times.

In the model of the BMI-Z score classification corrected by child's age and gender, the BMI of the parents and the educational level of the parents, according to the subgroups of eating behaviors, there was no difference between the normal and underweight groups. The EF score ($p < .05$) in the overweight group has a positive correlation, whereas the FF score ($p < .05$) has an inverse relationship. For the coefficients according to the odds ratio, a one-unit increase in the EF score increases the likelihood of obesity 1.91 times and reduces the likelihood of being overweight by 1.72 times. In the obese group, the EF score ($p < .05$) has a positive relation, whereas the FF

score ($p < .05$) has an inverse relationship. A one-unit increase in the SR score increases the risk of obesity by 2.75 times, whereas a one-unit increase in the FF score reduces the likelihood of obesity by 1.79 times.

Discussion

Growth is a unique and dynamic process required for every child. Evaluation of the growth of each child is done using standard growth curves, deviations should be detected early on, and precautions should be taken. Growth evaluation enables the evaluator to have an idea about the stage and severity of lack of appetite. The present study detected that the subdimension scores of the overweight children indicating food interest were higher, and the subdimension scores of the children with lower or normal weights indicating food indifference were higher. The FR, which is one of the subdimensions indicating food interest, measures the child's reaction to external stimuli such as odor, appearance and form of serving, and EF measures a general interest in all foods (Wardle et al. 2001). These two characteristics appear significantly more frequently as a child's age increases. The DD reveals the increased desire for against beverages, including sugared beverages, whereas SR is reported to be observed significantly in younger children and to indicate regulation of food intake according to internal fullness symptoms. SE indicates less interest in food. EOE and EUE appear as a response to negative moods such as anger and anxiety (Svensson et al. 2011). In other words, FR, EOE, EF, and DD represent appetite, whereas FR, SE, EUE, and FF indicate the lack of appetite (Erkorkmaz et al. 2013).

But Carnell and Wardle (2008) tend to categorize these eating behaviors as food approach and food avoidant. The SR, which is one of the subdimensions addressing less interest in food, refers to regulation of food intake according to internal fullness symptoms. SE indicates less interest in food. EOE and EUE appear as a response to negative moods such as anger and anxiety (Svensson et al. 2011). As shown in the present study, food interest, through FR, EOE, and EF scores, was found to be significantly higher in obese children, as expected. The FR and SE subdimension scores indicating lack of interest in food were found to be significantly higher in children with lower or normal body weights than in obese and mildly overweight children. Similar results were obtained from previous studies conducted on English, Portuguese, and German children (Braet et al. 2008; Viana, Sinde, and Saxton 2008; Webber et al. 2009). However, in a study performed by Tanofsky-Kraff et al. (2007) using the Emotional Eating Scale, no association was detected between emotional eating and body weight. In the studies carried out using CEBQ, a positive association was found between EUE and BMI (Passos et al. 2015; Santos et al. 2011). Lower SR scores in overweight and obese children when compared with underweight and normal children are explained by overweight children being less successful in regulating food intake, causing an increase in body weight (Carnell and Wardle 2008; Jansen et al. 2012; Webber et al. 2009). Two

experimental studies determined that overweight children take bigger bites and eat faster (Berkowitz et al. 2010; Laessle et al. 2001). Consequently, it was found that subdimensions indicating interest in food are directly proportional to body weight, and the subdimensions indicating indifference to food are reversely proportional to body weight (Spence et al. 2011; Webber et al. 2009). Similarly, it was determined in the present study that higher EF and FR scores increase the risk of obesity, whereas higher FF reduces the risk of being overweight even after adjustments are made according to age, gender, body weight, and educational level of the parents. A one-unit increase in the FR score increases the risk of obesity 2.75 times, whereas a one-unit increase in the FF score reduces the risk of obesity 1.79 times (table 3).

Furthermore, the DD score, which shows an interest in food intake, was not found to be different in mildly overweight/obese children and normal/underweight children. Jansen et al. (2012) detected a significant association between BMI and all parameters of CEBQ and no association between DD and EOE. Accordingly, they reported a poor association between DD and BMI. Some previous studies could not show a significant association between DD and body weight (Spence et al. 2011; Viana, Sinde, and Saxton 2008). This is contradictory to some other studies (Parkinson et al. 2010; Webber et al. 2009). Since the subdimension of DD does not provide exact information regarding what kind of drink is desired, understanding the association between DD and body weight becomes difficult. Sweetman, Wardle, and Cooke (2008) did not detect any association between body weight and DD in children. The DD in children may be related to a sweet sensation in the mouth or satisfying thirst/hunger. Although there was no association between DD and body weight for this sample, DD may contribute to the development of obesity in the long term depending on the type of drink (tables 2 and 3).

In the present study, there was no significant difference between overweight/obese children and underweight and normal children in terms of EUE scores (table 2). Similarly, in a sectional society sample study conducted by Webber et al. (2009) on school-aged children, they showed a positive association between appetite subdimensions of CEBQ and body weight and a negative association between BMI and lack of appetite subdimensions, except for EOE. Another study reported a weak association between EUE and BMI when compared with the association with EOE. Similarly, a study conducted on Brazilian children detected a higher EOE score in overweight and obese children when compared with underweight individuals, and a significant association was detected with EUE (Passos et al. 2015). In a study carried out with Canadian children, there was no significant association detected between body weight and EUE (Spence et al. 2011). Negative moods focus on overeating, whereas the studies on EUE are limited (Oliver and Wardle 1999; Wardle et al. 2001).

Subdimensions indicating appetite are positively proportional to the relative body weight of the children, whereas the subdimensions indicating a lack of appetite are negatively proportional (Spence et al. 2011; Webber et al. 2009). The first step in eating disorders is regulation of the appetite. When a gender-based evaluation was done in the present study, there was no significant difference between genders for eating behavior except in the DD subdimension. Another study found higher DD scores in boys when compared with girls (Passos et al. 2015). Other previous studies support the outcomes of the present study, and there was no significant difference between genders in terms of eating behavior (Viana, Sinde, and Saxton 2008; Wardle et al. 2001). On the other hand, some researchers have suggested that eating behaviors in adolescents present different characteristics in female and male genders (Dubois et al. 2007; Finato et al. 2013). However, the onset age of this difference is not clear (Dubois et al. 2007). The difference in DD scores may cause a difference since girls are more concerned with body image than boys (Finato et al. 2013; Leme and Philippi 2013). Another study showed that eating behavior may differ among girls and boys, and a significant difference was found in FR, EOE, and DD scores in males and the SE subdimension scores in females. It is reported that boys may be offered more to eat during this period of rapid growth, and girls may be affected more by others' pressure to eat less (Yılmaz, Esmeray, and Erkorkmaz 2011). Furthermore, eating and body weight concern decreases in boys and becomes significant in the girls during adolescence (Sleddens, Kremers, and Thijs 2008).

In the present study, the FF, SE, and EUE scores were detected to be particularly higher in preschool-aged children. Similarly, in a previous study, the SE score was found to be higher in children under 6 years of age (Passos et al. 2015). Some studies suggest that the children have more control in selecting the type and quantity of food as they age; therefore, eating behaviors would change and swallowing rate would be increased (Salvy et al. 2011; Viana, Sinde, and Saxton 2008; Wardle et al. 2001). It was expressed in one study that the FF and SE scores of children tend to be lower with increased age of children; food-avoidance behavior may be related to age and reflect the developmental stages (Viana, Sinde, and Saxton 2008). Scores of the FR, EOE, EF, and DD subdimensions were detected to be significantly higher in obese children (Özer et al. 2014).

Consequently, eating behaviors presented by children with higher body weights are different from those in normal and underweight children. An association was determined between an increase in the risk of obesity and EF and FR subgroups, and FF score was associated with a decrease in the risk of obesity. In addition, CEBQ seems to be an effective measuring tool to determine eating behaviors of children that may be related to obesity. Further studies are important to focus on determining the factors affecting

eating behaviors and the precautions that should be taken to prevent obesity. Furthermore, familial communication, family structure and characteristics of the relationships, and interaction in the family are determinative for the appearance and prevention of eating disorders. Therefore, organizational, structural, communicational, interactional, and functional characteristics of the family should be considered when attempting to solve health and nutritional disorders of children.

Limitations

The present study has some limitations. Because the population of this study involves children only from central Ankara, the results should not be generalized to the entire country. The study should be done with more children, including different age and differences between socioeconomic groups also need to be explored further, as level of education and income have been identified as contributory factors. The study should also be replicated around the country. The sectional qualification of the present study limits the establishment of the probability of a cause-and-effect relationship. Therefore, it is not clear if eating behavior is a cause or an outcome of body weight. Furthermore, collection of CEBQ data according to the answers of the parents may cause errors in defining eating behaviors. However, the strong aspects of the present study include the size of the sample and determination of body weight and body length through measurement and use of a reliable and validated scale.

Acknowledgments

The authors thank all the children and their family who devoted their time to participate in this study. They are warmly acknowledged for their helpful and wholehearted cooperation.

Conflict of Interest

Nevin Sanlier declares that she has no conflict of interest. Sabriye Arslan declares that she has no conflict of interest. Nuket Unsal declares that she has no conflict of interest. Onur Toka declares that he has no conflict of interest. The authors alone are responsible for the content and writing of the article.

Funding

No financial support was received for this research.

Informed consent

Informed consent was obtained from all individual participants included in the study.

ORCID

Nevin Sanlier http://orcid.org/0000-0001-5937-0485

References

Ashcroft, J., C. Semmler, S. Carnell, C. H. M. Van Jaarsveld, and J. Wardle. 2008. Continuity and stability of eating behaviour traits in children. *European Journal of Clinical Nutrition* *62*(8):985–90. doi:10.1038/sj.ejcn.1602855.

Baños, R. M., A. Cebolla, E. Etchemendy, S. Felipe, P. Rasal, and C. Botella. 2011. Validation of the Dutch Eating Behavior Questionnaire for Children (DEBQ-C) for use with Spanish children. *Nutrición Hospitalaria* 26(4):890–98. doi:10.1590/S0212-16112011000400032.

Berkowitz, R. I., R. H. Moore, M. S. Faith, V. A. Stallings, T. V. Kral, and A. J. Stunkard. 2010. Identification of an obese eating style in 4-year-old children born at high and low risk for obesity. *Obesity* 18(3):505–12. doi:10.1038/oby.2009.299.

Birch, L. L., and J. O. Fisher. 1998. Development of eating behaviors among children and adolescents. *Pediatrics* 101(Supplement 2):539–49.

Braet, C., L. Claus, L. Goossens, E. Moens, L. Van Vlierberghe, and B. Soetens. 2008. Differences in eating style between overweight and normal-weight youngsters. *Journal of Health Psychology* 13(6):733–43. doi:10.1177/1359105308093850.

Caccialanza, R., D. Nicholls, H. Cena, L. Maccarini, C. Rezzani, L. Antonioli, S. Dieli, and C. Roggi. 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. *European Journal of Clinical Nutrition* 58(9):1217–22. doi:10.1038/sj.ejcn.1601949.

Carnell, S., and J. Wardle. 2008. Appetite and adiposity in children: Evidence for a behavioral susceptibility theory of obesity. *The American Journal of Clinical Nutrition* 88(1):22–29. doi:10.1093/ajcn/88.1.22.

Deboer, M. D., H. E. Agard, and R. J. Scharf. 2015. Milk intake, height and body mass index in preschool children. *Archievs of Disease in Childhood* 100:460–65. doi:10.1136/archdischild-2014-306958.

Dubois, L., A. Farmer, M. Girard, K. Peterson, and F. Tatone-Tokuda. 2007. Problem eating behaviors related to social factors and body weight in preschool children: A longitudinal study. *International Journal of Behavioral Nutrition and Physical Activity* 4(1):9. doi:10.1186/1479-5868-4-9.

Erkorkmaz, Ü., R. Yılmaz, O. Demir, S. Y. Sanisoğlu, İ. Etikan, and M. Özçetin. 2013. Çocuklarda yeme davranışı ile ebeveyn besleme tarzı arasındaki ilişkinin kanonik korelasyon analizi ile incelenmesi. *Turkiye Klinikleri Journal of Medical Sciences* 33(1):138–48. doi:10.5336/medsci.2012-29490.

Finato, S., R. R. Rech, P. Migon, I. C. Gavineski, V. D. Toni, and R. Halpern. 2013. Body image insatisfaction in students from the sixth grade of public schools in Caxias do Sul, Southern Brazil. *Revista Paulista De Pediatria* 31(1):65–70.

Gibson, S. R. 2005. *Principles of nutritional assessment*. New York: Oxford University Press.

Jansen, P. W., S. J. Roza, V. W. Jaddoe, J. D. Mackenbach, H. Raat, A. Hofman, F. C. Verhulst, and H. Tiemeier. 2012. Children's eating behavior, feeding practices of parents and weight

problems in early childhood: Results from the population-based Generation R Study. *International Journal of Behavioral Nutrition and Physical Activity* 9(1):130. doi:10.1186/1479-5868-9-130.

Kerwin, M. E. 1999. Empirically supported treatments in pediatric psychology: Severe feeding problems. *Journal of Pediatric Psychology* 24:193–214.

Laessle, R. G., H. Uhl, B. Lindel, and A. Müller. 2001. Parental influences on laboratory eating behavior in obese and non-obese children. *International Journal of Obesity* 25(S1):S60. doi:10.1038/sj.ijo.0801742.

Lee, S., and A. M. Lee. 2000. Disordered eating in three communities of China: A comparative study of female high school students in Hong Kong, Shenzhen, and rural Human. *International Journal of Eating Disorders* 27(3):317–27. doi:10.1002/(SICI)1098-108X(200004)27:3<317::AID-EAT9>3.0.CO;2-2.

Leme, A. C. B., and S. T. Philippi. 2013. Teasing and weight-control behaviors in adolescent girls. *Revista Paulista De Pediatria* 31(4):431–36. doi:10.1590/S0103-05822013000400003.

Linscheid, T., K. Budd, and L. Resnake. 2003. *Pediatric feeding problems*. In *Handbook of pediatric psychology*, R. Mc. ed. Newyork: Guilford Press.

Malik, V. S., M. B. Schulze, and F. B. Hu. 2006. Intake of sugar-sweetened beverages and weight gain: A systematic review. *The American Journal of Clinical Nutrition* 84(2):274–88. doi:10.1093/ajcn/84.1.274.

Meule, A., A. P. Lutz, C. Vögele, and A. Kübler. 2014. Impulsive reactions to food-cues predict subsequent food craving. *Eating Behaviors 15*(1):99–105. doi:10.1016/j.eatbeh.2013.10.023.

Morin, K. H. 2006. Parental style of infant and child feeding: How influential is it? *MCN: the American Journal of Maternal/Child Nursing* 31(6):388.

Nicholls, D., and R. Bryant-Waugh. 2009. Eating disorders of infancy and childhood: Definition, symptomatology, epidemiology, and comorbidity. *Child and Adolescent Psychiatric Clinics of North America* 18(1):17–30. doi:10.1016/j.chc.2008.07.008.

Ohkuma, T., Y. Hirakawa, U. Nakamura, Y. Kiyohara, T. Kitazono, and T. Ninomiya. 2015. Association between eating rate and obesity: A systematic review and meta-analysis. *International Journal of Obesity (London)* 39(11):1589–96. doi:10.1038/ijo.2015.96.

Oliver, G., and J. Wardle. 1999. Perceived effects of stress on food choice. *Physiology & Behavior* 66(3):511–15. doi:10.1016/S0031-9384(98)00322-9.

Özer, S., H. Bozkurt, E. Sönmezgöz, S. Bilge, R. Yılmaz, and O. Demir. 2014. Obezite Tanılı Çocuklarda Yeme Davranışının Değerlendirilmesi. *Journal of the Child/Çocuk Dergisi* 14(2):66–71.

Parkinson, K. N., R. F. Drewett, A. S. Le Couteur, and A. J. Adamson. 2010. Do maternal ratings of appetite in infants predict later child eating behaviour questionnaire scores and body mass index? *Appetite* 54(1):186–90. doi:10.1016/j.appet.2009.10.007.

Passos, D. R. D., D. P. Gigante, F. V. Maciel, and A. Matijasevich. 2015. Children's eating behavior: Comparison between normal and overweight children from a school in Pelotas, Rio Grande do Sul, Brazil. *Revista Paulista De Pediatria 33*(1):42–49. doi:10.1016/j.rpped.2014.11.007.

Salvy, S. J., A. Elmo, L. A. Nitecki, M. A. Kluczynski, and J. N. Roemmich. 2011. Influence of parents and friends on children's and adolescents' food intake and food selection. *The American Journal of Clinical Nutrition* 93(1):87–92. doi:10.3945/ajcn.110.002097.

Sánchez, U., G. Weisstaub, J. L. Santos, C. Corvalán, and R. Uauy. 2016. GOCS cohort: Children's eating behavior scores and BMI. *European Journal of Clinical Nutrition* 70(8):925–28. doi:10.1038/ejcn.2016.18.

Santos, J. L., J. A. Ho-Urriola, A. González, S. V. Smalley, P. Domínguez-Vásquez, R. Cataldo, M. O. A. M. Obregón, P. Amador, G. Weisstaub, and M. I. Hodgson. 2011. Association

between eating behavior scores and obesity in Chilean children. *Nutrition Journal* 10 (1):108. doi:10.1186/1475-2891-10-108.

Sleddens, E. F., S. P. Kremers, and C. Thijs. 2008. The Children's Eating Behaviour Questionnaire: Factorial validity and association with Body Mass Index in Dutch children aged 6–7. *International Journal of Behavioral Nutrition and Physical Activity* 5(1):49. doi:10.1186/1479-5868-5-29.

Spence, J. C., V. Carson, L. Casey, and N. Boule. 2011. Examining behavioural susceptibility to obesity among Canadian pre-schoolchildren: The role of eating behaviours. *International Journal of Pediatric Obesity* 6(2–2):e501–7. doi:10.3109/17477166.2010.512087.

Svensson, V., L. Lundborg, Y. Cao, P. Nowicka, C. Marcus, and T. Sobko. 2011. Obesity related eating behaviour patterns in Swedish preschool children and association with age, gender, relative weight and parental weight-factorial validation of the Children's Eating Behaviour Questionnaire. *International Journal of Behavioral Nutrition and Physical Activity* 8(1):134. doi:10.1186/1479-5868-8-106.

Sweetman, C., J. Wardle, and L. Cooke. 2008. Soft drinks and 'desire to drink' in preschoolers. *International Journal of Behavioral Nutrition and Physical Activity* 5(1):60. doi:10.1186/1479-5868-5-29.

Tanofsky-Kraff, M., K. R. Theim, S. Z. Yanovski, A. M. Bassett, N. P. Burns, L. M. Ranzenhofer, M. Lisa, D. R. Gasofer, and J. A. Yanovski. 2007. Validation of the emotional eating scale adapted for use in children and adolescents (EES-C). *International Journal of Eating Disorders* 40(3):232–40. doi:10.1002/eat.20362.

Tremblay, L., T. Lovsin, C. Zecevic, and M. Lariviere. 2011. Perceptions of self in 3-5-year-old children: A preliminary investigation into the early emergence of body dissatisfaction. *Body Image* 8:287–92. doi:10.1016/j.bodyim.2011.04.004.

Viana, V., S. Sinde, and J. C. Saxton. 2008. Children's Eating Behaviour Questionnaire: Associations with BMI in Portuguese children. *British Journal of Nutrition* 100(02):445–50. doi:10.1017/S0007114508894391.

Wardle, J., C. A. Guthrie, S. Sanderson, and L. Rapoport. 2001. Development of the children's eating behaviour questionnaire. *Journal of Child Psychology and Psychiatry* 42(7):963–70.

Webber, L., C. Hill, J. Saxton, C. H. M. Van Jaarsveld, and J. Wardle. 2009. Eating behaviour and weight in children. *International Journal of Obesity 33*(1):21–28. doi:10.1038/ijo.2008.219.

WHO. 2009. Accessed December 29, 2016. http://www.who.int/growthref/tools/who_anthroplus_manual.pdf.

WHO. 2010. Global recommendations on physical activity for health. Accessed February 02, 2017. http://www.who.int/dietphysicalactivity/factsheet_recommendations/en/.

WHO. 2014. Global status report on noncommunicable diseases 2014. Accessed January 11, 2017. http://apps.who.int/iris/bitstream/10665/148114/1/9789241564854_eng.pdf?ua=.

WHO. 2015. Chronic diseases and health promotion. Accessed February 03, 2017. http://www.who.int/chp/en/.

WHO. 2016a. Obesity and overweight fact sheet. Accessed January 11, 2017. http://www.who.int/mediacentre/factsheets/fs311/en/.

WHO. 2016b. Report of the commission on ending childhood obesity. Accessed September 25, 2017. http://www.who.int/end-childhood-obesity/publications/echo-report/en/.

WHO. 2017. Child growth standards: BMI-for-age. Accessed February 02, 2017. http://www.who.int/childgrowth/standards/chts_bfa_girls_z/en/.

Wright, C. M., K. N. Parkinson, D. Shipton, and R. F. Drewett. 2007. How do toddler eating problems relate to their eating behavior, food preferences, and growth? *Pediatrics* 120(4): e1069–e1075. doi:10.1542/peds.2006-2961.

Yılmaz, R., H. Esmeray, and Ü. Erkorkmaz. 2011. Çocuklarda yeme davranışı anketinin türkçe uyarlama çalışması. *Anadolu Psikiyatri Dergisi* 1(12):287–94.