

“Restrained eating” vs “dieting”: how are they associated with body weight status, eating behavior and eating frequency among Polish adolescent

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Abstract. *Aim:* This study aimed to assess how dieting and dietary restraint were associated with body weight status and eating frequency of certain food groups in a sample of 874 healthy Polish adolescents and young adults aged 16–18 years. *Methods:* Anthropometric parameters were measured using standardised techniques and instruments. The validated food frequency questionnaire was used to assess habitual dietary intakes. Eating behaviour was assessed with the Three-Factor Eating Questionnaire. The physical activity was assessed by the International Physical Activity Questionnaire. *Results:* The odds ratio (OR) for overweight and obesity was 1.81 (CI95%:1.22;2.70, p=0.003) times higher among current dieters than nondieters. The odds of being overweight or obese were significantly lower with female sex [OR=0.40 (CI95%:0.27;0.59, p<0.001)]. BMI z-score and WHtR were significantly higher by 0.32 (CI95%:0.18;0.47, p<0.001) and 0.02 (CI95%:0.01;0.02, p<0.001) among dieters than nondieters respectively. Those variables did not differ among restrained and nonrestrained eaters. Dieters were more restrained by 1.71 (CI95%:1.35;2.07, p<0.001) and they had significantly higher disinhibition scores than nondieters did by 0.71 (CI95%:0.33;1.09, p<0.001). Dieters (especially males) declared less frequent eating of meats & eggs, milk & dairy products, sweets, snacks & fast foods, and sweetened beverages. Restrained eaters (especially females) limited the frequency of eating most unhealthy food items. *Conclusions:* Effective nutrition education programmes targeted at weight management in adolescents should be gender-specific and pay attention not only to common dietary mistakes but also to possible uncontrolled eating behavior, that may contribute to the development of eating disorders in this target population.

Key words: adolescents, dieting, restrained eaters, disinhibition, eating behavior

Introduction

Nowadays, the cult of the body has been culturally imposed upon us. This affects not only adults but also adolescents. Fear of obesity and dissatisfaction with their own appearance and weight are the reason why young people attempt to lose weight (1). Moreover, young people are an exceptionally sensitive group susceptible to fad diets and the pressure of

social media and peers (2). Therefore dieting is popular among adolescents (3). Dieting is a behaviour that suggests an intentional, often temporary, change in eating habits to achieve weight loss, and sometimes weight gain (usually in the form of muscle) (4). Since dieting has different meanings to patients and professionals, common dietary guidelines such as “eat less fatty foods” may be misinterpreted by adolescents to mean “consume less nutrient-dense food items” (e.g.

milk, meat and fish). Such a dietary behaviour leads to poor intake of nutrients essential for optimal development and proper health status of young individuals (5). Therefore, dieting without proper supervision may contribute to eating disorders (6). At times, dieting leads also to weight gain when youths beginning a diet, often highly restrictive, quickly give up and eat more than they would if they were not dieting (7). Dietary restraint, on the other hand, is described as an intention to restrict food intake (8) and therefore may be used to achieve weight loss or prevent weight gain (7). Hence, this eating style is under cognitive rather than physiological control. Nevertheless, dietary restraint has often been associated with a restriction in calorie intake, but also with disinhibited overeating as a consequence of a loss of control over eating which may increase the risk of eating disorders and/or weight gain (9). Although dieting and dietary restraint sound similar, dieting refers to an intentional, often temporary changes in eating habits for the purpose of weight control. By contrast, dietary restraint refers to a cognitive process employed to attempt to eat less than one would like (10).

It is worth noting that the above eating behaviours seem to be associated with eating disorder risk due to counterregulatory eating, especially if pursued during adolescence (11,12). Dietary restraint and dieting are believed to be associated with eating disorders caused by counterregulatory eating. This is because restraint creates a sense of perceived deprivation, which in turn increases the risk of binge eating (10).

Nowadays, little is known which dietary strategy i.e. dieting or restrained eating may be more effective, healthy and flexible for weight control in a group of adolescents. Therefore, this study aimed to assess how dieting and dietary restraint were associated with body weight status and frequency of eating certain food groups in a sample of 874 adolescents.

Methods

874 healthy Polish adolescents and young adults living in the Wielkopolska region in Poland within the age range of 16-18 years were chosen from randomly selected secondary schools from a three-step cluster

randomisation plan. The following exclusion criteria were applied: a diagnosed psychiatric illness (e.g. anorexia and bulimia) that might result in body mass index $< 15\text{kg/m}^2$ and practicing competitive sports. Of the enrolled subjects, 3 individuals were excluded from assessment because of being professional athletes, leaving 874 participants: 462 female (52.9 %) and 412 male (47.1 %) in the analysed population sample. The present study was conducted according to the guidelines laid down in the Declaration of Helsinki, approved by the Ethics Committee of Poznań University of Medical Sciences (ref. 873/07). Written informed consent was obtained from participants' parents or legal guardians. The study was compliant with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.

The participants first completed a self-administered questionnaire for information about sex, age, place of living, existing diagnosed eating disorders, and participation in competitive sports.

Habitual dietary intakes were measured by a self-administered, Food Frequency Questionnaire (FFQ) with 199 food items. The FFQ was tested for comparative validity against 24-hour food recalls in a previous study (13). The frequency of consumption was quantified approximately in terms of the number of times per month the food was consumed. In preparation for further analysis, food items from the FFQ were divided into 12 food groups: 1) meat and eggs, 2) fish, 3) dairy products, 4) grains, 5) fruits, 6) vegetables, 7) nuts and seeds, 8) fats, 9) sweets, 10) snacks and fast foods, 11) sweetened beverages and 12) water. Eating behaviour was assessed with the Polish version of the Three-Factor Eating Questionnaire (TFEQ).

We assessed dieting status with the question: "Are you trying to lose weight by dieting currently?" (yes/no).

Professional and leisure-time physical activity (PA) was assessed by the International Physical Activity Questionnaire (IPAQ – short) in the short self-administered Polish version to cover the last 7 days (14). Height was measured using a standard height scale to within 0.1 cm. Body weight was recorded in participants wearing light underwear, without shoes, to the nearest 0.05 kg, using a digital medical scale (WPT 200.0 model from RadWag, Poland) to the nearest 0.1 kg in light clothing. Waist circumference

was measured midway between the iliac crest and the lower rib margin at the end of normal expiration. Hip circumference was measured at the widest portion of the hips. Waist and hip circumferences were measured using an inelastic tape and were recorded to the nearest 0.1 cm (Seca, Hamburg, Germany). Waist circumference-to-Height Ratio (WHtR) was calculated by dividing waist circumference (cm) by height (cm). Body mass index (BMI) was calculated according to the formula $BMI = \text{body mass (kg)}/\text{height (m)}^2$, and transformed into BMI z-scores, which were derived using a WHO 2007 calculator (based on World Health Organization growth references) (15). Subsequently z-scores were categorised as follows: normal weight BMI z-score > -2 SD and $\leq +1$ SD, excessive body weight BMI z-score $> +1$ SD (16)

Statistical analyses were conducted using the STATISTICA software (TIBCO Software Inc. 2017, version 13). Continuous variables are presented as means and standard deviations (SD) and categorical variables as proportions. The normality of the continuous variables' distribution was verified using the Shapiro-Wilk test. Differences in z-scores and other continuous variables between dieters and nondieters and restrained and unrestrained eaters were compared by multiple regression using contrast codes for dieting status (controlling for restraint) and level of dietary restraint (controlling for dieting status). Categorical variables between dieters and nondieters as well as restrained and unrestrained eaters were compared using a chi-square test. Results were considered statistically significant at $p < 0.05$.

Results

874 adolescent participants took part in this study: 462 (52.9%) females and 412 (47.1%) males; 552 of them lived in Poznań city and the remaining 322 lived in smaller towns or villages of the region. On average, they were 18 years old, weighed 65.6 kg (41.5–126.5 kg) and were 172.3 cm tall; 269 (31%) participants declared to be on a diet at the time. The respondents were classified according to dieting status (yes/no) and dietary restraint (high/low by median split of TFEQ restraint scale scores, median score 7) as restrained eaters

($n=194$;22.2%) and unrestrained dieters ($n=75$;8.6%), as well as restrained nondieters ($n=314$;35.9%) and unrestrained nondieters ($n=291$;33.3%; Table 1). Table 1 shows differences between dieters and nondieters and restrained and unrestrained eaters. Restrained eaters were slightly older than unrestrained eaters by 0.14 years (CI95% 0.03;0.25; $p < 0.05$). BMI, Z-score value and WHtR ratio were significantly higher by 0.97 (CI95%:0.50; 1.44; $p < 0.001$), 0.32 (CI95%: 0.18;0.47; $p < 0.001$) and 0.02 (CI95% 0.01; 0.02; $p < 0.001$), respectively only among dieters as compared with nondieters. Dietary restraint and disinhibition scores were significantly higher among dieters than nondieters by 1.71 and 0.71 (both $p < 0.001$), respectively, when the dietary hunger scores were significantly 0.68 lower ($p < 0.01$). Among dieters, consumption of meat & eggs was significantly less frequent by -3.57 times/month (CI95%: -5.58;-1.56; $p < 0.001$, milk and dairy products by -3.93 times/month (CI95% -6.35; -1.51; $p < 0.01$), snacks & fast foods by -3.09 times/month (CI95% -4.97; -1.22; $p < 0.01$), sweets by -3.44 times/month (CI95% -5.58;-1.30; $p < 0.01$) and sweetened beverages by -3.76 times/month (CI95% -6.24; -1.29, $p < 0.01$) than among nondieters. At the same time, restrained eaters were characterised only by lower frequency of intake of sweetened beverages by -3.22 times/month (CI95% -5.53; -0.90; $p < 0.01$) compared to unrestrained eaters. There were significant differences in proportions of adolescents in three PA categories between restrained and unrestrained eaters ($p = 0.009$).

The Table 2 shows respondents classified as restrained dieters - females ($n = 132$; 15.1%), unrestrained dieters - females ($n = 36$; 4.1%), restrained nondieters - females ($n = 165$; 18.9%), and unrestrained nondieters - females ($n = 129$; 14.8%) as well as restrained dieters - males ($n = 62$; 7.1%), unrestrained dieters - males ($n = 39$; 4.5%), restrained nondieters - males ($n = 149$; 17.0%), and unrestrained nondieters - males ($n = 162$; 18.5%). The restrained females were slightly older than the unrestrained counterparts by 0.17 year ($p < 0.05$) and dieting females had significantly ($p < 0.001$) higher body weight than nondieting counterparts by 4.05 kg. BMI value and z-score was significantly higher among group of dieting females by 1.39 (CI95% 0.79; 1.99; $p < 0.001$) and 0.42 (CI95% 0.24; 0.59; $p < 0.001$), sequentially and dieting males by 0.76

Table 1. Differences between adolescents dieters and nondieters with high or low levels of dietary restraint^a.

Parameters	Total samples		Dieting adolescents		No dieting adolescents		Dieting		Restraining	
	Mean (SD)	Mean (SD)	restrained	unrestrained	restrained	unrestrained	Mean differences ^b (95% CI)	Mean differences ^c (95% CI)	Mean differences ^c (95% CI)	Mean differences ^c (95% CI)
N (%)	874		194 (22)	75 (9)	314 (36)	291 (33)				
Age (years)	18.1 (0.8)	18.2 (0.8)	18.2 (0.8)	18.1 (0.8)	18.2 (0.8)	18.1 (0.9)	-0.05 (-0.17; 0.07)		0.14 (0.03; 0.25) [*]	
Body weight (kg)	65.6 (12.4)	65.6 (11.8)	65.6 (11.8)	68.8 (13.8)	65.1 (12.3)	65.2 (12.4)	1.53 (-0.28; 3.35)		-0.92 (-2.62; 0.78)	
Body weight range (kg)	41.5 – 126.5	45 – 106.5	45 – 106.5	47 – 126.5	43 – 105.5	41.5 – 104.5	-		-	
BMI (kg/m ²)	22.0 (3.2)	22.7 (3.3)	22.7 (3.4)	22.7 (3.4)	21.8 (3.0)	21.6 (3.3)	0.97 (0.50; 1.44) ^{***}		0.13 (-0.31; 0.57)	
BMI z-score	0.04 (0.97)	0.28 (0.94)	0.28 (0.94)	0.27 (0.97)	-0.02 (0.92)	-0.10 (1.01)	0.32 (0.18; 0.47) ^{***}		0.06 (-0.07; 0.19)	
WHR	0.43 (0.05)	0.44 (0.05)	0.44 (0.05)	0.44 (0.06)	0.42 (0.04)	0.43 (0.05)	0.02 (0.01; 0.02) ^{***}		-0.004 (-0.01; 0.003)	
Dietary restraint	7.8 (3.8)	11.8 (3.6)	11.8 (3.6)	4.5 (1.5)	9.1 (2.4)	4.7 (1.3)	1.71 (1.35; 2.07) ^{***}		5.24 (4.90; 5.57) ^{***}	
Dietary disinhibition	4.9 (2.6)	5.6 (3.2)	5.6 (3.2)	4.9 (2.2)	4.6 (2.3)	4.7 (2.5)	0.71 (0.33; 1.09) ^{***}		0.10 (-0.25; 0.45)	
Dietary hunger	5.6 (2.9)	5.3 (2.8)	5.3 (2.8)	4.7 (2.3)	5.9 (2.9)	5.7 (3.2)	-0.68 (-1.11; -0.25) ^{***}		0.29 (-0.11; 0.70)	
Frequency of food intake (times/month)										
Meat & eggs	12.6 (13.8)	10.0 (9.6)	10.1 (6.9)	10.1 (6.9)	13.4 (15.9)	14.2 (14.8)	-3.57 (-5.58; -1.56) ^{***}		-0.63 (-2.51; 1.25)	
Fish	6.2 (15.2)	5.6 (10.3)	5.5 (15.7)	5.5 (15.7)	6.7 (16.6)	6.4 (16.2)	-1.07 (-3.29; 1.15)		0.32 (-1.76; 2.40)	
Milk and dairy products	24.8 (16.6)	21.2 (14.9)	23.9 (14.8)	23.9 (14.8)	26.1 (16.2)	25.9 (18.2)	-3.93 (-6.35; -1.51) ^{**}		-0.61 (-2.88; 1.66)	
Grains	12.6 (15.2)	12.4 (12.0)	9.4 (8.6)	9.4 (8.6)	13.6 (16.6)	12.6 (16.6)	-1.85 (-4.07; 0.37)		1.49 (-0.59; 3.56)	
Fruits	23.3 (20.7)	25.8 (22.6)	18.2 (12.7)	18.2 (12.7)	22.5 (20.0)	24.0 (21.6)	0.28 (-2.75; 3.31)		0.89 (-1.95; 3.72)	
Vegetables	15.2 (15.4)	16.6 (16.2)	13.1 (13.3)	13.1 (13.3)	14.9 (15.6)	15.0 (15.1)	0.48 (-1.77; 2.74)		0.88 (-1.23; 2.99)	
Nuts & seeds	8.2 (15.8)	9.5 (15.3)	5.5 (10.0)	5.5 (10.0)	7.9 (16.1)	8.4 (16.8)	0.18 (-2.13; 2.49)		0.70 (-1.46; 2.86)	
Fats	16.6 (21.4)	15.1 (21.1)	15.9 (17.7)	15.9 (17.7)	15.6 (20.1)	18.7 (23.5)	-1.26 (-4.39; 1.87)		-2.48 (-5.40; 0.45)	
Sweets	13.2 (14.7)	10.6 (12.9)	10.6 (9.4)	10.6 (9.4)	13.5 (15.2)	15.2 (16.1)	-3.44 (-5.58; -1.30) ^{**}		-1.25 (-3.25; 0.75)	
Snacks & Fast foods	6.9 (12.9)	4.9 (8.2)	4.2 (5.0)	4.2 (5.0)	7.4 (14.5)	8.4 (14.6)	-3.09 (-4.97; -1.22) ^{**}		-0.59 (-2.35; 1.17)	
Sugar-sweetened beverages	10.2 (17.1)	6.4 (10.5)	9.1 (12.2)	9.1 (12.2)	9.9 (17.8)	13.3 (20.1)	-3.76 (-6.24; -1.29) ^{**}		-3.22 (-5.53; -0.90) ^{**}	
Water	63.4 (53.0)	65.1 (53.4)	64.7 (53.1)	64.7 (53.1)	61.1 (51.9)	64.5 (54.1)	2.70 (-5.06; 10.47)		-2.37 (-9.63; 4.90)	
PA n(%)^d										
PA (<600MET/min/week)	76 (9)	12 (6)	15 (20)	15 (20)	20 (6)	29 (10)	27 (10) vs 49 (8)		32 (6) vs 44 (12)	
PA (600–1499MET/min/week)	220 (25)	50 (26)	11 (15)	11 (15)	86 (28)	73 (25)	61 (23) vs 159 (26)		136 (27) vs 84 (23) ^{**}	
PA (≥1500MET/min/week)	578 (66)	132 (68)	49 (65)	49 (65)	208 (66)	189 (65)	181 (67) vs 391 (66)		340 (67) vs 340 (65)	

BMI – body mass index; WC: Waist Circumference; WHtR: Waist to Height Ratio; PA: Physical Activity; METs: Metabolic equivalents

^a Participants were classified as dieters if they answered “yes” to the question, “Are you trying to lose weight at the present time?” and as restrained eaters if they scored at or above the median Three-Factor Eating Questionnaire restraint scale score of 7.

^b Difference (95% confidence interval [CI]) between dieters and nondieters (controlling for dietary restraint), significant at ^{*}p<0.05; ^{**}p<0.01, ^{***}p<0.001.

^c Difference (95% CI) between restrained and unrestrained eaters (controlling for dieting status), significant at ^{*}p<0.05; ^{**}p<0.01, ^{***}p<0.001.

^d Categorical variables between dieters and nondieters as well as restrained and unrestrained eaters were compared using a chi-square test, significant at ^{*}p<0.05; ^{**}p<0.01, ^{***}p<0.001.

Table 2. Differences between dieters and nondieters females and males with high or low levels of dietary restraint^a.

Parameters	Dieting females		No dieting females		Dieting males		No dieting males		Dieting		Restraining	
	restrained	unrestrained	restrained	unrestrained	restrained	unrestrained	restrained	unrestrained	females	males	females	males
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean difference ^b (95% CI)	Mean difference ^b (95% CI)	Mean difference ^c (95% CI)	Mean difference ^c (95% CI)
N (%)	132 (29)	36 (8)	165 (38)	129 (28)	62 (15)	39 (10)	149 (36)	162 (39)				
Age (years)	18.2 (0.8)	18.1 (0.8)	18.2 (0.8)	18.0 (0.9)	18.0 (0.7)	18.0 (0.8)	18.2 (0.8)	18.1 (0.8)	-0.01 (-0.17;0.15)	-0.11 (-0.30; 0.07)	0.17 (0.01; 0.33)*	0.09 (-0.06; 0.25)
Body weight (kg)	61.7 (10.1)	61.1 (9.6)	57.6 (7.0)	57.3 (9.9)	73.9 (10.9)	75.8 (13.3)	73.4 (11.6)	71.5 (10.5)	4.05 (2.29; 5.81)***	2.10 (-0.45; 4.65)	0.41 (-1.36; 2.17)	0.97 (-1.23; 3.17)
Body weight range (kg)	45 - 92.9	47 - 95	43 - 86.4	41.5 - 101	51.9 - 106.5	55 - 126.5	51.5 - 105.5	47.5 - 104.5	-	-	-	-
BMI (kg/m ²)	22.5 (3.4)	21.9 (3.1)	21.9 (2.4)	20.7 (3.4)	23.1 (3.0)	23.5 (3.6)	22.6 (3.2)	22.3 (3.0)	1.39 (0.79; 1.99)***	0.76 (0.05; 1.47)*	0.31 (-0.29; 0.92)	0.25 (-0.36; 0.86)
BMI z-score	0.24 (0.94)	0.11 (0.86)	-0.18 (0.75)	-0.31 (0.99)	0.36 (0.93)	0.42 (1.05)	0.15 (1.05)	0.06 (0.99)	0.42 (0.24; 0.59)***	0.27 (0.05; 0.50)*	0.14 (-0.04; 0.31)	0.05 (-0.15; 0.25)
WHR	0.44 (0.05)	0.44 (0.06)	0.41 (0.03)	0.42 (0.05)	0.45 (0.05)	0.45 (0.07)	0.44 (0.05)	0.44 (0.04)	0.02 (0.01; 0.03)***	0.01 (-0.001; 0.02)	-0.005(-0.01; 0.004)	0.001 (-0.01; 0.01)
Dietary restraint	12.2 (2.6)	4.3 (1.5)	9.8 (2.8)	4.4 (1.4)	11 (3.3)	4.6 (1.4)	8.4 (1.6)	4.8 (1.3)	1.67 (1.13; 2.20)***	1.43 (1.00; 1.86)***	6.07 (5.53; 6.61)***	4.24 (3.86; 4.61)***
Dietary disinhibition	5.8 (3.2)	5.0 (2.5)	4.9 (2.4)	5.1 (2.5)	5.2 (3.1)	4.9 (1.9)	4.4 (2.2)	4.5 (2.4)	0.63 (0.11; 1.16)*	0.67 (0.12; 1.22)*	0.07 (-0.45; 0.60)	0.02 (-0.46; 0.49)
Dietary hunger	5.4 (2.8)	4.7 (2.3)	5.6 (2.9)	5.3 (3.2)	5.3 (2.7)	4.8 (2.3)	6.2 (2.8)	6.0 (3.2)	-0.35 (-0.91; 0.22)	-1.04 (-1.70; -0.38)**	0.42 (-0.15; 0.99)	0.24 (-0.33; 0.81)
Frequency of food intake (times/month)												
Meat & eggs	9.4 (10.4)	9.3 (7.4)	9.4 (7.3)	11.4 (10.0)	11.5 (7.4)	10.9 (6.3)	17.8 (21.0)	16.4 (17.4)	-0.59 (-2.36; 1.18)	-5.98 (-9.84; -2.12)**	-1.43 (-3.21; 0.34)	1.20 (-2.12; 4.52)
Fish	5.0 (9.8)	2.4 (2.0)	4.8 (7.6)	4.3 (5.4)	6.9 (11.3)	8.3 (21.4)	8.9 (22.6)	8.0 (21.0)	-0.39 (-1.86; 1.07)	-1.05 (-5.69; 3.60)	1.03 (-0.44; 2.50)	0.42 (-3.58; 4.42)
Milk & dairy products	20.1 (14.2)	20.4 (15.5)	22.1 (13.9)	24.0 (18.3)	23.5 (16.1)	27.2 (13.6)	30.5 (17.5)	27.5 (18.1)	-2.44 (-5.45; 0.57)	-4.20 (-8.11; -0.28)*	-1.44 (-4.46; 1.58)	1.43 (-1.94; 4.79)
Grains	11.9 (11.7)	9.3 (9.5)	11.8 (10.1)	12.6 (12.9)	13.5 (12.7)	9.6 (7.8)	15.6 (21.5)	12.6 (19.0)	-0.86 (-3.08; 1.36)	-2.48 (-6.66; 1.70)	0.11 (-2.13; 2.34)	3.20 (-0.40; 6.79)
Fruits	26.2 (23.5)	18.8 (13.9)	22.9 (18.8)	22.5 (20.8)	24.9 (20.4)	17.6 (11.6)	22.0 (21.3)	25.2 (22.1)	1.33 (-2.68; 5.34)	-1.44 (-6.18; 3.29)	2.37 (-1.65; 6.40)	-0.73 (-4.80; 3.35)
Vegetables	16.1 (16.1)	14.4 (17.0)	13.8 (11.3)	14.9 (14.5)	17.7 (16.3)	11.9 (8.8)	16.1 (19.3)	15.0 (15.6)	1.46 (-1.30; 4.22)	-0.40 (-4.18; 3.38)	-0.32 (-3.09; 2.46)	2.21 (-1.05; 5.46)

Table 2 (Continued)

Parameters	Dieting females		No dieting females		Dieting males		No dieting males		Dieting		Restraining	
	restrained	unrestrained	restrained	unrestrained	restrained	unrestrained	restrained	unrestrained	females	males	females	males
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean difference ^b (95% CI)	Mean difference ^b (95% CI)	Mean difference ^c (95% CI)	Mean difference ^c (95% CI)
Nuts & seeds	9.2 (15.4)	5.1 (12.6)	5.9 (8.1)	6.7 (13.2)	10.2 (15.2)	5.8 (7.0)	10.0 (21.7)	9.7 (19.1)	1.96 (-0.45; 4.37)	-1.50 (-5.76; 2.76)	0.62 (-1.80; 3.04)	1.25 (-2.42; 4.91)
Fats	12.6 (18.8)	14.0 (17.4)	13.3 (18.7)	18.1 (22.4)	20.4 (24.7)	17.7 (18.1)	18.2 (21.4)	19.2 (24.5)	-1.62 (-5.47; 2.23)	0.67 (-4.51; 5.85)	-3.82 (-7.69; 0.05)	-0.13 (-4.59; 4.33)
Sweets	10.3 (14.3)	9.0 (7.2)	11.6 (10.0)	15.7 (14.3)	11.1 (9.3)	12.2 (11.0)	15.5 (19.2)	14.7 (17.4)	-2.81 (-5.26; -0.37)*	-3.63 (-7.40; 0.15)	-2.51 (-4.96; -0.06)*	0.34 (-2.90; 3.59)
Snacks & Fast foods	4.1 (7.5)	4.0 (5.6)	4.9 (5.6)	7.8 (12.6)	6.5 (9.4)	4.4 (4.4)	10.2 (19.9)	9.0 (16.1)	-1.62 (-3.30; 0.06)	-4.04 (-7.70; -0.38)*	-2.06 (-3.74; -0.38)*	1.44 (-1.71; 4.59)
Sugar-sweetened beverages	5.9 (10.9)	8.4 (12.0)	6.4 (10.0)	11.6 (16.7)	7.3 (9.6)	9.8 (12.5)	13.9 (23.1)	14.6 (22.4)	-1.23 (-3.69; 1.23)	-5.82 (-10.46; -1.19)*	-4.48 (-6.95; -2.01)**	-1.17 (-5.16; 2.81)
Water	66.3 (52.9)	60.8 (53.3)	60.1 (51.3)	60.4 (54.5)	62.4 (54.6)	68.4 (53.3)	62.3 (52.6)	67.7 (53.7)	4.59 (-5.71; 14.89)	0.34 (-11.75; 12.43)	1.34 (-9.00; 11.68)	-5.55 (-15.96; 4.85)
PA n(%)^d												
PA (<600MET/min/week) ^d	9 (7)	6 (17)	13 (8)	15 (12)	3 (5)	9 (23)	7 (5)	13 (8)	15 (9) vs 28 (10)	12 (12) vs 21 (7)	22 (7) vs 21 (13)	10 (5) vs 23 (11)
PA (600–1499MET/min/week)	35 (27)	5 (14)	39 (14)	30 (23)	15 (24)	6 (15)	47 (31)	43 (27)	40 (24) vs 69 (23)	21 (21) vs 90 (29)	74 (25) vs 35 (21)	62 (29) vs 49 (24)*
PA (≥1500MET/min/week)	88 (67)	25 (69)	113 (68)	84 (65)	43 (71)	24 (62)	95 (64)	105 (65)	113 (67) vs 197 (67)	68 (67) vs 200 (64)	201 (68) vs 109 (66)	139 (66) vs 129 (64)

BMI – body mass index WC: Waist Circumference HC: Hip Circumference WHtR: Waist to Height Ratio PA: Physical Activity; METs: Metabolic equivalents

^a Participants were classified as dieters if they answered “yes” to the question, “Are you trying to lose weight currently?” and as restrained eaters if they scored at or above the median of Three-Factor Eating Questionnaire restraint scale score of 7.

^b Difference (95% confidence interval [CI]) between dieters and nondieters males or females (controlling for dietary restraint), significant at *p<0.05; **p<0.01, ***p<0.001.

^c Difference (95% CI) between restrained and unrestrained males or females (controlling for dieting status), significant at *p<0.05; **p<0.01, ***p<0.001.

^d Categorical variables between dieters and nondieters as well as restrained and unrestrained eaters were compared using a chi-square test, significant at *p<0.05; **p<0.01, ***p<0.001

(CI95% 0.05; 1.47; $p < 0.05$) and 0.27 (CI95% 0.05; 0.50; $p < 0.05$), sequentially, than nondieting counterparts. The WHtR was higher by 0.023 among dieting females only than nondieting counterparts ($p < 0.001$). Dieters – both females and males – had higher dietary disinhibition scores by 0.63 (CI95% 0.11; 1.16; $p < 0.05$) and 0.67 (CI95% 0.12; 1.22; $p < 0.05$), respectively than nondieting counterparts. In turn, dietary hunger scores were significantly lower by 1.04 ($p < 0.01$) only between dieting and nondieting males.

Dieting females, in comparison to nondieting ones, and also dietary restrained females as compared to unrestrained counterparts had a similarly lower frequency of consumption of sweets by 2.81 ($p < 0.05$) and 2.51 times/month ($p < 0.05$), respectively. However, the restrained females also consumed less frequently snacks and fast foods by -2.06 times/month (CI95% -3.74; -0.38; $p < 0.05$) and sweetened beverages by -4.48 times/month (CI95% -6.95; -2.01; $p < 0.001$). In contrast, dieting males ate meat & eggs less frequently by -5.98 times/month (CI95% -9.84; -2.12; $p < 0.01$), snacks & fast foods by -4.04 times/month (CI95% -7.70; -0.38; $p < 0.05$), sweetened beverages by -5.82 times/month (CI95% -10.46; -1.19; $p < 0.05$) and dairy by -4.20 times/month (CI95% -8.11; -0.28; $p < 0.05$) than nondieting counterparts. Restrained males did not differ from unrestrained males in frequency of intake of any food group. There were significant differences in proportions of males in three PA categories between restrained and unrestrained eaters ($p = 0.019$).

Table 3 shows the effects of gender, dieting and other covariates on the probability of being overweight and obese (OW/OB) among adolescents. These effects were adjusted for a PA level. Compared to those who currently were not trying to lose their

weight, the dieters had odds ratios (OR) for OW/OB 1.81 (CI95%: 1.22; 2.70, $p = 0.003$) times higher. The odds for being OW/OB were significantly lower with female sex [OR = 0.40 (CI95%: 0.27; 0.59), $p < 0.001$, table 3].

Discussion

Currently, the prevalence of OW/OB in adolescents worldwide is high and varies, among other things, according to gender (higher among males) (17). The results of the survey conducted on over 17,000 Polish adolescents showed that 14.6–19.4% and 10.3–13.0%, boys and girls, respectively, had excessive body weight (OW/OB) (18). Therefore, excessive weight but also dissatisfaction with their own appearance are the reasons why young people attempt to lose weight (1). In a study conducted by Goluch-Koniuszy, 2015 it was observed that slimming diets were undertaken by 13.1% of Polish adolescents, consisting mainly of 1000–1300 kcal diets, vegetarian diets or the ones recommended by a physician (19). In our study, one-third of adolescents declared a current weight-loss effort. However, the odds of being OW/OB were significantly higher among current dieters while being a female was associated with a lower odds for OW/OB. Some authors provide one possible explanation as to why dieters are more prone to be obese. For example, Neumark-Sztainer et al., 2007 showed that dieting in adolescents is associated with weight gain because, in the case of females, diet is inherently associated with binge eating episodes, as well as skipping breakfast (11). Dieting males, on the other hand, in addition to overeating and avoiding breakfast, also

Table 3. Effect of dieting, gender, and other covariates on the weight status of adolescents (n=874).

Risk factors	OW/OB			
	Odds ratio ^a	Lower CI95%	Upper CI95%	p-value
Sex (females)	0.40	0.27	0.59	<0.001
Are you trying to lose weight by dieting currently? (yes)	1.81	1.22	2.70	0.003
Place of residence (small town or villages)	0.81	0.54	1.20	0.292
Restraint eaters (yes)	1.49	0.99	2.24	0.054

^aAdjusted for PA

limited their PA. Dulloo et al., 2015 found that weight gain after dieting may be due to the temporary desynchronisation of the restoration of adipose tissue and lean mass, which may result in a state of hyperphagia that persists until equilibrium (20).

We found out that some anthropometric parameters such as BMI z-score and WHtR were significantly higher among dieters than among nondieters, while those variables did not differ among restrained and unrestrained eaters. The lack of differences in anthropometric variables between restrained and unrestrained eaters suggests that most normal weight highly restrained eaters restrict their consumption to prevent weight gain rather than to lose weight. Dieters were also more restrained and simultaneously had higher disinhibition scores than nondieters did, while highly restrained eaters had significantly higher dietary restraint scores than their unrestrained counterparts, but not disinhibition scores. This finding that disinhibition is higher among dieters than nondieters, but it is not related to restraint behaviours was reported in the literature (21) and suggests that dieting and dietary restraint are not equivalent. "Disinhibited eating" appears when dieters feel that they ruined their diet by eating - in their opinion - food that is not allowed on the diet (22). This behaviour (disinhibited eating) occurs the more often the stiffer dietary boundaries the dieter sets. It is therefore more advantageous to approach the diet more flexibly and set less rigid boundaries (23). Savage et. al also observed that being highly restricted on a diet can be an effective, albeit risky method only for short-term weight loss (6). It was seen in our study that dieters declared less frequent eating of food items with a nutrient-rich profile (e.g. meats & eggs, milk and dairy products), and food items typically excluded from the diet when people are trying to losing weight (e.g. sweets and snacks and fast foods, sweetened beverages). In turn, restrained eaters as compared with unrestrained counterparts limited only the consumption of sugar-sweetened beverages. As sugar-sweetened beverages are the second most frequently consumed kind of beverage in Europe, after water alone, and since those beverages had the largest contribution to energy intake of any beverages (24), consideration should be given to whether reducing intake of these beverages may globally be

sufficient for maintaining reduced body weight. The differences in the frequency of eating of some food groups between dieters and non-dieters and restrained and unrestrained eaters had different patterns depending on gender. Restrained females limited the frequency of eating most unhealthy food items such as sugar-sweetened beverages, sweets, snacks & fast food, compared to unrestrained counterparts, which also may be a reasonable way to maintain appropriate body weight or to prevent weight gain. No differences in the frequency of eating of any food group were seen between restrained and unrestrained males. In turn, dieting females limited the frequency of eating only sweets, but dieting males apart from limiting the consumption of snacks & fast foods and sugar-sweetened beverages (but not sweets), reduced also the intake of food items with a nutrient-rich profile such as meats & eggs, milk and dairy products. In the case of dieting females eliminating only sweets from their diet seems to be an insufficient option for successful weight loss. Indeed dieting females had significantly higher weight status than their non-dieting counterparts. It was seen that for some dieters with higher BMIs attractive food cues trigger the hedonic goal of eating other appealing food items (25), which can explain why females significantly limited the frequency of eating only sweets but not snacks & fast-food or sugar-sweetened beverages. In the case of dieting males, they manifested unhealthy dieting practices by overly restricting certain food categories, both healthy (dairy food items and eggs) and unhealthy (sugar-sweetened beverages, snacks and fast food). The study conducted by Goluch-Koniuszy et al. also showed that 6.7% of the dieting males gave up eating meat, while the same restriction was applied by only 0.8% of female ones (19). Interestingly, none of the males who wanted to lose excess body weight completely gave up eating sweets, which was done by 12% of females. For example, a dairy-free diet over an extended period of time is insufficient for calcium, vitamin D, and protein which is improper for bone health and peak bone mass, especially in adolescent age. Moreover, a lack of dietary knowledge regarding the proper balance of a diet with no or limited meat content and supplementing it with vegetable protein can lead to anaemia, lowered PA, intellectual disorders and menstrual dysfunction in females (18). The elimination

of dairy products or meat from the diet is probably associated with the embodiment of these products as high in fat and lactose and therefore unhealthy.

A strength of our study was its relatively large sample size ($n = 874$) and using a validated FFQ as a tool to assess habitual dietary intakes. The advantage of our study is also that it is the first study to compare the consumption of particular food groups not only between genders but also between dieters and restrained eaters. The limitations of our study are that we do not know if our dieters were chronic dieters or tried to lose weight for the first time. Moreover, all data was collected at one-time point, so we did not know anything about changes in participants' body weight. We also did not measure other eating behaviour outcomes, for example breakfast skipping, timing of meals, snacking behaviour, etc. We are aware that these outcomes would let us understand better how dieting and restrained eating (considered independently) influence the eating habits of our studied groups. The next limitation is the fact that our study group comes from a homogeneous ethnic group and consists only of teenagers from Poland, which may affect the external generalisability of that findings. We also did not take into account sociocultural pressures associated with social comparisons, internalization of a thinness ideal, or over-emphasis on the importance of appearance from different sources such as parents, peers, or social media (26). Another limitation of the present study is that data on eating habits and behaviour were only self-reported, which may generate some response set biases, due to social desirability or social approval (27). However, a self-report study allows for larger samples and greater generalisation of findings on adolescents' eating habits and behaviour and so was deemed appropriate for the aims of this study. Moreover, we are conscious that being on diet is not the same as losing weight. Additionally, in future research, particular attention should be paid to obtaining more detailed information on actual weight loss. Adolescents dieters (as considered independently of restraint eaters) had higher BMI z-score, and WHtR, were more restrained and disinhibited eaters and they limited (especially males) the consumption of typical unhealthy food items (sugar-sweetened beverages, sweets, snacks & fast food) but also of some nutritious foods such as

meats & eggs, milk and dairy products. These eating restrictions may lead to nutritional deficiencies and serious health problems and may be a risk factor for future weight gain. In general, restrained eaters (as considered independently of dieting participants) limited their intake of sugar-sweetened beverages, but taking into consideration both sexes it was seen that restrained females limited the frequency of consuming most unhealthy food items (sweets, sugar-sweetened beverages, snacks and fast food) while the frequency of eating particular food items did not differ between restrained and unrestrained males. The tendency to be restrained eaters is rather beneficial for nutritional status in the studied sample (especially among females) as it comes down to targeted and rational changes in their diet, including limiting the frequency of consumption of products containing simple sugars and saturated fats. This finding suggests that effective nutrition education programmes targeted at weight management in adolescents should be gender-specific and pay attention not only to common dietary mistakes but also to possible uncontrolled eating behaviour, that may contribute to the development of eating disorders in this target population.

Conflict of Interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

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