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ORIGINAL ARTICLE

HOW DO ADOLESCENTS PERCEIVE THEIR WEIGHT? THE IMPACT OF VARIOUS PSYCHOSOCIAL FACTORS ON BODY WEIGHT ESTIMATION – A PILOT STUDY

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ABSTRACT

Background. Body image perception among adolescents is crucial for their mental health and is influenced by a variety of factors. Incorrect body weight estimation is common among this population and is usually overestimated by females and underestimated by males.

Objective. This study aimed to evaluate body weight perception and related factors among adolescents aged 11 and 14.

Material and Methods. This pilot study was based on data collected from the Polish health program "A program for the early detection of risk factors for lifestyle diseases SOPKARD-Junior" from the years 2015, 2017, 2019, 2021, and 2022. According to the BMI and weight perception, a total of 315 adolescents aged 11 and 14 were divided into three groups: "underestimating their weight", "properly estimating their weight", and "overestimating their weight". These data were then compared to different psychosocial variables, such as parental education, life satisfaction, parental weight assessment, dieting, Family Affluence Scale (FAS), and subjective health.

Results. Males underestimated their weight more often than females, while females overestimated their weight more frequently than males (all $p < 0.001$). These results were most prevalent for 14-year-olds. Dieting was observed in both age and sex groups, even despite being of normal weight. Moreover, dieting, parental weight assessment, and parental education were statistically significant factors related to children's weight estimation.

Discussion. Body weight misperception is prevalent among Polish teenagers aged 11 and 14. Factors, such as parental weight assessment or parental education, influence teenagers' weight perception and should be investigated further.

Conclusions. Incorrect weight perception is common among adolescents. Teachers, parents, and medical professionals, such as doctors or nurses, should be aware of this problem and provide proper education and support.

Keywords: *adolescents, dieting, psychosocial factors, body, weight perception, parents*

INTRODUCTION

It is well known that adolescence is a critical period for personal development and brain maturity [1]. That period of life between childhood and adulthood has been broadly discussed over the years, and the age range of this life phase has been changing. It has been observed that puberty nowadays starts earlier than years ago, which is associated with better overall child health [2].

Adolescence is crucial for developing body image and weight perception, both of which have an impact on mental health [3-5]. The concept of body image refers to the perception of the body in terms of seeing, feeling, and thinking about it [4]. The development of body image perception is related to everyday challenges and coping mechanisms [6]. Incorrect body image, particularly throughout adolescence, is important in terms of the development of eating disorders or obesity [4]. The many factors impacting body image perception include social, physical, cultural, and psychological. Relationships and support from parents and peers also deserve special attention in this regard [4]. Furthermore, widespread and problematic use of social media may affect it [6, 7].

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Body image dissatisfaction is, in general, related to a negative assessment of one's appearance [8]. According to previous studies, body image dissatisfaction is more prevalent in young females, is associated with a higher risk of emotional and behavioral problems, and causes weight loss behaviors more often than in young males [9-12]. Moreover, a significant percentage of girls present extreme weight behavior at least once a week or more [12].

Body weight perception refers to the personal assessment of the body weight, regardless of the actual value [10]. Usually, body weight perception is not correctly associated with the actual weight status of teenagers [10], with overestimation being more common in girls and underestimation being more prevalent in boys [11, 13, 14]. Moreover, misperception of body weight is less likely in males in general [14, 15]. Adolescents who overestimate their weight report higher body dissatisfaction, disordered eating, lower happiness levels, depressive symptoms, suicidal ideation, and suicide planning [5, 13, 14]. Weight overestimation and underestimation are also associated with cigarette smoking, alcohol consumption, and binge drinking among teenagers [14, 16].

This study aimed to evaluate body weight perception and related factors among adolescents aged 11 and 14.

MATERIAL AND METHODS

This retrospective analysis used data from a health program, "A program for the early detection of risk factors for lifestyle diseases SOPKARD-Junior" (SOPKARD-Junior), aimed at children and adolescents attending elementary schools in Sopot, Northern Poland. SOPKARD-Junior is a program held regularly every one or two years by the medical professionals and students. It includes anthropometric measurements, electrocardiogram (ECG), medical examinations, and health questionnaires completed by children and their parents or legal guardians. All participants had to obtain written consent from their parents or legal guardians. The study was approved by the local ethical committee (UCC107/2021). It was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Ethics Committee.

This was a pilot study. The representative sample included students aged 11 (n = 149) and 14 (n = 166) from grades six and eight, respectively. For a wider research sample, data were collected from 2015, 2017, 2019, 2021, and 2022 for 315 students, including 139 females and 176 males. Statistical analysis employed R version 3.6.3 R (R Core Team, version 3.6.3), with *Chi*-squared tests used to evaluate differences between categorical variables.

Body mass index

Qualified medical professionals estimated body mass index (BMI; weight [kg]/height [m^2]) using a verified WPT 100/200 scale (Radwag, Radom, Poland), with 100 g accuracy, and a Leicester Height Measure (1 mm accuracy), used in a standing position without shoes. According to World Health Organization (WHO) recommendations and its cut-off z-scores for age and gender, BMI was classified as underweight (thinness), normal weight, overweight, or obese [17].

Health Behavior in School-Aged Children Questionnaire

Data was obtained from the Polish version of the HBSC (Health Behavior in School-Aged Children) questionnaire completed by the child or their parents or legal guardians. The HBSC is a cross-national study supported by the WHO to investigate and track teenage health behaviors and their determinants. Data from the HBSC are used in an International Report every four years [18, 19]. Specific questions from the HBSC related to body weight and mental health were selected for this study, including demographic data of children and their parents (legal guardians), weight estimation, diet, and other aspects of children's mental and physical health.

The study questions asked if the adolescents used any diet ("yes" or "no") and how students rated their weight (weight perception defined as individual's assessment of weight, regardless of actual body mass), with responses ranging from "perceived underweight," "perceived normal weight," to "perceived overweight." The next question concerned life satisfaction and used Cantril's Ladder, an instrument with a rating scale from 0 (the worst possible life) to 10 (the best possible life). The responses were classified as low life satisfaction (0-5), average life satisfaction (6-8), or high life satisfaction (9-10) [20]. Children also subjectively rated their health as "excellent", "good" or "poor" which is a validated measure of physical health in adults and adolescents [21].

The FAS (Family Affluence Scale) section of the HBSC questionnaire evaluated the children's family wealth. Since 2013/2014, FAS III has been widely utilized. According to the answers to specific questions, FAS indicates "lower family affluence" (0-6 points), "medium family affluence" (7-9 points), and "higher family affluence" (10-13 points) [20, 22].

Assessment of the education level of mothers and fathers (or legal guardians) was divided into "lower than high school", "high school" and "university level". Furthermore, parents were asked to rate their child's weight as "underweight", "normal weight" or "overweight".

Weight perception

Subjects were classified as "underweight", "normal weight" or "OWOB" (overweight or obese) based on their BMI and further categorized according to their weight perception as "perceived underweight", "perceived normal weight" or "perceived overweight". The children were then stratified based on sex, age, and the estimation of their weight into "underestimating their weight" (OWOB and perceived normal weight or underweight; normal weight and perceived underweight), "properly estimating their weight" (normal weight and perceived normal weight; OWOB and perceived overweight; underweight and perceived underweight), and "overestimating their weight" (underweight and perceived overweight or normal weight; normal weight and perceived overweight). Weight estimation groups were then compared to parental education, children's life satisfaction, parental assessments of their child's weight, the use of any diet, FAS, and subjective health.

RESULTS

According to the BMI findings, 65.7% of respondents were of normal weight, 26.9% were OWOB, and 7.3% were underweight. Furthermore, males were more likely to be OWOB (29.6% vs. 23.7%) or underweight (8% vs. 6.5%) than females, though none of the data was statistically significant. Medium family affluence was recorded for 47.9% of

Table 1. The total characteristics of the group

Characteristics	Girls	Boys	Total	p-value
BMI				0.220
Number of subjects	139	176	315	
Underweight	9 (6.5%)	14 (8.0%)	23 (7.3%)	
Normal weight	97 (69.8%)	110 (62.5%)	207 (65.7%)	
Overweight	18 (12.9%)	19 (10.8%)	37 (11.7%)	
Obese	15 (10.8%)	33 (18.8%)	48 (15.2%)	
FAS				0.941
Number of subjects	129	169	298	
Lower family affluence	41 (31.8%)	54 (32.0%)	95 (31.9%)	
Medium family affluence	60 (46.5%)	81 (47.9%)	141 (47.3%)	
Higher family affluence	28 (21.7%)	34 (20.1%)	62 (20.8%)	
Life's satisfaction				0.035*
Number of subjects	126	169	295	
Low	40 (31.7%)	34 (20.1%)	74 (25.1%)	
Average	47 (37.3%)	62 (36.7%)	109 (36.9%)	
High	39 (31.0%)	73 (43.2%)	112 (38.0%)	
Subjective health				0.023*
Number of subjects	129	170	299	
Poor	22 (17.1%)	17 (10.0%)	39 (13.0%)	
Good	72 (55.8%)	83 (48.8%)	155 (51.8%)	
Excellent	35 (27.1%)	70 (41.2%)	105 (35.1%)	
Mother education level				0.930
Number of subjects	123	152	275	
Lower than high school	11 (8.9%)	12 (7.9%)	23 (8.4%)	
High school	40 (32.5%)	52 (34.2%)	92 (33.5%)	
University level	72 (58.5%)	88 (57.9%)	160 (58.2%)	
Father education level				0.855
Number of subjects	114	142	256	
Lower than high school	24 (21.1%)	28 (19.7%)	52 (20.3%)	
High school	38 (33.3%)	44 (31.0%)	82 (32.0%)	
University level	52 (45.6%)	70 (49.3%)	122 (47.7%)	

FAS – Family Affluence Scale; * statistically significant ($p < 0.05$) values

boys and 46.5% of girls, while life satisfaction was high for boys (43.2%) and average for girls (37.3%) (p = 0.035). Subjective health was rated as good in 55.8% of girls and 48.8% of boys (p = 0.023). Most of the parents (legal guardians) had a university-level education in both sex groups. Table 1 presents group characteristics, with characteristics by age available in the supplementary materials.

Overall, 25% of boys underestimated their weight, 60.7% properly estimated their weight, and 14.3% overestimated it. In the group of girls, 12.7% underestimated their weight, 61.1% estimated their weight accurately, and 26.2 % overestimated it.

In the 11-year-old male group (n = 79), 21.5% (n = 17) underestimated, 65.8% (n = 52) properly estimated, and 12.6% (n = 10) overestimated their weight. In the group of 14-year-old males (n = 89), 28% (n = 25) underestimated, 56.2% (n = 50) correctly estimated, and 15.7% (n = 14) overestimated their weight.

In the 11-year-old female sample (n = 61), 16.3% underestimated their weight, 70.5% properly estimated their weight, and 13.1% overestimated their weight. Meanwhile, the 14-year-old female (n = 65) weight data showed that 9.2% (n = 6) underestimated, 52.3% (n = 34) accurately estimated, and 38.5% (n = 25) overestimated their weight. Tables 2 and 3 describe the exact data on weight perception, and Tables 4 and 5 present diet usage findings.

Table 6 provides weight estimation in relation to different psychosocial factors in the males aged 11 and 14. In both age groups, most parents/legal guardians had a university-level education. Among the 11-year-old boys, most respondents in all weight estimation groups had high life satisfaction, while most 14-year-olds had average life satisfaction. In the group of 11-year-olds, most parents assessed their child's weight as normal, which was also observed in the group of 14-year-olds. Diet was used by 23.1% of 11-year-olds

Table 2. Boys' weight perception according to the BMI

Age	Perceived underweight (N = 38)	Perceived normal weight (N = 80)	Perceived overweight (N = 54)	Total (N = 172)	p-value
11 years					< 0.001*
Number of subjects	17	38	24	79	
Underweight	5 (29.4%)	3 (7.9%)	0 (0.0%)	8 (10.1%)	
Normal weight	11 (64.7%)	30 (78.9%)	7 (29.2%)	48 (60.8%)	
OWOB	1 (5.9%)	5 (13.2%)	17 (70.8%)	23 (29.1%)	
14 years					< 0.001*
Number of subjects	20	40	29	89	
Underweight	3 (15.0%)	3 (7.5%)	0 (0.0%)	6 (6.7%)	
Normal weight	17 (85.0%)	29 (72.5%)	11 (37.9%)	57 (64.0%)	
OWOB	0 (0.0%)	8 (20.0%)	18 (62.1%)	26 (29.2%)	

OWOB – overweight or obese; * statistically significant (p < 0.05) values

Table 3. Girls' weight perception according to the BMI

Age	Perceived underweight (N = 15)	Perceived normal weight (N = 59)	Perceived overweight (N = 56)	Total (N = 130)	p-value
11 years					< 0.001*
Number of subjects	10	32	19	61	
Underweight	3 (30.0%)	1 (3.1%)	0 (0.0%)	4 (6.6%)	
Normal weight	7 (70.0%)	28 (87.5%)	7 (36.8%)	42 (68.9%)	
OWOB	0 (0.0%)	3 (9.4%)	12 (63.2%)	15 (24.6%)	
14 years					< 0.001*
Number of subjects	5	25	35	65	
Underweight	4 (80.0%)	0 (0.0%)	0 (0.0%)	4 (6.2%)	
Normal weight	1 (20.0%)	20 (80.0%)	25 (71.4%)	46 (70.8%)	
OWOB	0 (0.0%)	5 (20.0%)	10 (28.6%)	15 (23.1%)	

OWOB – overweight or obese; * statistically significant (p < 0.05) values

Table 4. Diet usage among boys according to the BMI

Age	Not using a diet (N = 142)	Using a diet (N = 31)	Total (N = 173)	p-value
11 years				0.002*
Number of subjects	64	15	79	
Underweight	8 (12.5%)	0 (0.0%)	8 (10.1%)	
Normal weight	43 (67.2%)	5 (33.3%)	48 (60.8%)	
OWOB	13 (20.3%)	10 (66.7%)	23 (29.1%)	
14 years				0.083
Number of subjects	75	15	90	
Underweight	6 (8.0%)	0 (0.0%)	6 (6.7%)	
Normal weight	51 (68.0%)	7 (46.7%)	58 (64.4%)	
OWOB	18 (24.0%)	8 (53.3%)	26 (28.9%)	

OWOB – overweight or obese; * statistically significant ($p < 0.05$) values

Table 5. Diet usage among girls according to the BMI

Age	Not using a diet (N = 106)	Using a diet (N = 23)	Total (N = 129)	p-value
11 years				0.025*
Number of subjects	51	10	61	
Underweight	4 (7.8%)	0 (0.0%)	4 (6.6%)	
Normal weight	38 (74.5%)	4 (40.0%)	42 (68.9%)	
OWOB	9 (17.6%)	6 (60.0%)	15 (24.6%)	
14 years				0.188
Number of subjects	54	11	65	
Underweight	4 (7.4%)	0 (0.0%)	4 (6.2%)	
Normal weight	40 (74.1%)	6 (54.5%)	46 (70.8%)	
OWOB	10 (18.5%)	5 (45.5%)	15 (23.1%)	

OWOB – overweight or obese; * statistically significant ($p < 0.05$) values

who properly estimated their weight and 30% of those who overestimated their weight ($p = 0.036$). Meanwhile, around 8% of 14-year-olds underestimating their weight used a specific diet, 14% of properly estimating weight used any diet, and 42.9 % of those overestimating their weight used a diet ($p = 0.021$).

Table 7 presents data on 11 and 14-year-old females and shows that most parents or legal guardians of 11-year-olds had a university-level education. For the 14-year-old girls who underestimated their weight, most mothers/legal guardians had a high school education (66.7%), while a university-level education was most prevalent in those accurately estimating and overestimating their weight (63.3% and 78.9%, respectively) ($p = 0.018$). A similar situation was observed for fathers' education, with a high school education most common for those underestimating their weight (80%) and a university-level education frequently found for those accurately estimating and overestimating weight (46.4% and 72.2%, respectively) ($p = 0.031$). Life satisfaction was generally high among the 11-year-old girls and mostly low for the 14-year-olds.

Most parents/legal guardians assessed their child's weight as normal in both age groups across all weight estimation groups, which was statistically significant for the 11-year-old female group ($p = 0.039$).

For 11-year-old girls, any diet was used by 18.6% of those properly estimating their weight and 25% overestimating their weight. In the 14-year-old group, 16.7% who underestimated, 11.8% who accurately estimated, and 24% who overestimated their weight were using any diet. FAS and subjective health were not statistically significant in either gender or age group.

DISCUSSION

The study evaluated the perception of body weight by adolescents aged 11 and 14 and compared it with various psychosocial factors.

Table 6. Boys' weight estimation in relation to different psychosocial factors

Age	Psychosocial factors	Underestimating (N = 42)	Properly estimating (N = 102)	Overestimating (N = 24)	Total (N = 168)	p-value
11 years	Mother education level					0.584
	Number of subjects	15	45	9	69	
	Lower than high school	2 (13.3%)	2 (4.4%)	1 (11.1%)	5 (7.2%)	
	High school	3 (20.0%)	13 (28.9%)	3 (33.3%)	19 (27.5%)	
	University level	10 (66.7%)	30 (66.7%)	5 (55.6%)	45 (65.2%)	
	Father education level					0.232
	Number of subjects	14	43	6	63	
	Lower than high school	5 (35.7%)	5 (11.6%)	2 (33.3%)	12 (19.0%)	
	High school	3 (21.4%)	13 (30.2%)	2 (33.3%)	18 (28.6%)	
	University level	6 (42.9%)	25 (58.1%)	2 (33.3%)	33 (52.4%)	
	Life's satisfaction					0.792
	Number of subjects	17	50	10	77	
	Low	1 (5.9%)	4 (8.0%)	1 (10.0%)	6 (7.8%)	
	Average	4 (23.5%)	19 (38.0%)	3 (30.0%)	26 (33.8%)	
	High	12 (70.6%)	27 (54.0%)	6 (60.0%)	45 (58.4%)	
	Parental weight assessment					0.066
	Number of subjects	17	42	9	68	
	Underweight	6 (35.3%)	3 (7.1%)	2 (22.2%)	11 (16.2%)	
	Normal weight	7 (41.2%)	30 (71.4%)	6 (66.7%)	43 (63.2%)	
	Overweight	4 (23.5%)	9 (21.4%)	1 (11.1%)	14 (20.6%)	
	Diet usage					0.036*
	Number of subjects	17	52	10	79	
	No	17 (100.0%)	40 (76.9%)	7 (70.0%)	64 (81.0%)	
	Yes	0 (0.0%)	12 (23.1%)	3 (30.0%)	15 (19.0%)	
	FAS					0.680
	Number of subjects	16	51	9	76	
	Lower family affluence	6 (37.5%)	14 (27.5%)	2 (22.2%)	22 (28.9%)	
	Medium family affluence	5 (31.2%)	26 (51.0%)	5 (55.6%)	36 (47.4%)	
	Higher family affluence	5 (31.2%)	11 (21.6%)	2 (22.2%)	18 (23.7%)	
	Subjective health					0.156
	Number of subjects	17	51	10	78	
	Poor	0 (0.0%)	3 (5.9%)	1 (10.0%)	4 (5.1%)	
	Good	11 (64.7%)	20 (39.2%)	2 (20.0%)	33 (42.3%)	
	Excellent	6 (35.3%)	28 (54.9%)	7 (70.0%)	41 (52.6%)	

Age	Psychosocial factors	Underestimating (N = 42)	Properly estimating (N = 102)	Overestimating (N = 24)	Total (N = 168)	p-value
14 years	Mother education level					0.716
	Number of subjects	22	37	12	71	
	Lower than high school	3 (13.6%)	2 (5.4%)	2 (16.7%)	7 (9.9%)	
	High school	9 (40.9%)	16 (43.2%)	5 (41.7%)	30 (42.3%)	
	University level	10 (45.5%)	19 (51.4%)	5 (41.7%)	34 (47.9%)	
	Father education level					0.677
	Number of subjects	22	35	10	67	
	Lower than high school	6 (27.3%)	5 (14.3%)	2 (20.0%)	13 (19.4%)	
	High school	6 (27.3%)	15 (42.9%)	3 (30.0%)	24 (35.8%)	
	University level	10 (45.5%)	15 (42.9%)	5 (50.0%)	30 (44.8%)	
	Life's satisfaction					0.124
	Number of subjects	25	49	14	88	
	Low	7 (28.0%)	14 (28.6%)	7 (50.0%)	28 (31.8%)	
	Average	7 (28.0%)	24 (49.0%)	3 (21.4%)	34 (38.6%)	
	High	11 (44.0%)	11 (22.4%)	4 (28.6%)	26 (29.5%)	
	Parental weight assessment					0.381
	Number of subjects	19	38	12	69	
	Underweight	7 (36.8%)	5 (13.2%)	2 (16.7%)	14 (20.3%)	
	Normal weight	9 (47.4%)	25 (65.8%)	8 (66.7%)	42 (60.9%)	
	Overweight	3 (15.8%)	8 (21.1%)	2 (16.7%)	13 (18.8%)	
	Diet usage					0.021*
	Number of subjects	25	50	14	89	
	No	23 (92.0%)	43 (86.0%)	8 (57.1%)	74 (83.1%)	
	Yes	2 (8.0%)	7 (14.0%)	6 (42.9%)	15 (16.9%)	
	FAS					0.883
	Number of subjects	24	50	14	88	
	Lower family affluence	9 (37.5%)	17 (34.0%)	3 (21.4%)	29 (33.0%)	
	Medium family affluence	11 (45.8%)	25 (50.0%)	8 (57.1%)	44 (50.0%)	
	Higher family affluence	4 (16.7%)	8 (16.0%)	3 (21.4%)	15 (17.0%)	
	Subjective health					0.006*
	Number of subjects	24	50	13	87	
	Poor	1 (4.2%)	6 (12.0%)	5 (38.5%)	12 (13.8%)	
	Good	10 (41.7%)	33 (66.0%)	5 (38.5%)	48 (55.2%)	
	Excellent	13 (54.2%)	11 (22.0%)	3 (23.1%)	27 (31.0%)	

FAS – Family Affluence Scale; * statistically significant ($p < 0.05$) values

Table 7. Girls' weight estimation in relation to different psychosocial factors

Age	Psychosocial factors	Underestimating (N = 16)	Properly estimating (N = 77)	Overestimating (N = 33)	Total (N = 126)	p- value
11 years	Mother education level					0.578
	Number of subjects	10	39	6	55	
	Lower than high school	0 (0.0%)	6 (15.4%)	0 (0.0%)	6 (10.9%)	
	High school	5 (50.0%)	11 (28.2%)	2 (33.3%)	18 (32.7%)	
	University level	5 (50.0%)	22 (56.4%)	4 (66.7%)	31 (56.4%)	
	Father education level					0.553
	Number of subjects	9	36	6	51	
	Lower than high school	2 (22.2%)	8 (22.2%)	3 (50.0%)	13 (25.5%)	
	High school	2 (22.2%)	14 (38.9%)	1 (16.7%)	17 (33.3%)	
	University level	5 (55.6%)	14 (38.9%)	2 (33.3%)	21 (41.2%)	
	Life's satisfaction					0.449
	Number of subjects	9	41	7	57	
	Low	2 (22.2%)	5 (12.2%)	2 (28.6%)	9 (15.8%)	
	Average	4 (44.4%)	18 (43.9%)	1 (14.3%)	23 (40.4%)	
	High	3 (33.3%)	18 (43.9%)	4 (57.1%)	25 (43.9%)	
	Parental weight assessment					0.039*
	Number of subjects	10	41	7	58	
	Underweight	3 (30.0%)	4 (9.8%)	0 (0.0%)	7 (12.1%)	
	Normal weight	7 (70.0%)	25 (61.0%)	7 (100.0%)	39 (67.2%)	
	Overweight	0 (0.0%)	12 (29.3%)	0 (0.0%)	12 (20.7%)	
	Diet usage					0.308
	Number of subjects	10	43	8	61	
	No	10 (100.0%)	35 (81.4%)	6 (75.0%)	51 (83.6%)	
	Yes	0 (0.0%)	8 (18.6%)	2 (25.0%)	10 (16.4%)	
	FAS					0.653
	Number of subjects	9	43	8	60	
	Lower family affluence	3 (33.3%)	16 (37.2%)	1 (12.5%)	20 (33.3%)	
	Medium family affluence	4 (44.4%)	15 (34.9%)	5 (62.5%)	24 (40.0%)	
	Higher family affluence	2 (22.2%)	12 (27.9%)	2 (25.0%)	16 (26.7%)	
	Subjective health					0.627
	Number of subjects	9	43	8	60	
	Poor	1 (11.1%)	3 (7.0%)	0 (0.0%)	4 (6.7%)	
	Good	5 (55.6%)	24 (55.8%)	3 (37.5%)	32 (53.3%)	
	Excellent	3 (33.3%)	16 (37.2%)	5 (62.5%)	24 (40.0%)	

Age	Psychosocial factors	Underestimating (N = 16)	Properly estimating (N = 77)	Overestimating (N = 33)	Total (N = 126)	p- value
14 years	Mother education level					0.018*
	Number of subjects	6	30	19	55	
	Lower than high school	1 (16.7%)	1 (3.3%)	2 (10.5%)	4 (7.3%)	
	High school	4 (66.7%)	10 (33.3%)	2 (10.5%)	16 (29.1%)	
	University level	1 (16.7%)	19 (63.3%)	15 (78.9%)	35 (63.6%)	
	Father education level					0.031*
	Number of subjects	5	28	18	51	
	Lower than high school	1 (20.0%)	4 (14.3%)	2 (11.1%)	7 (13.7%)	
	High school	4 (80.0%)	11 (39.3%)	3 (16.7%)	18 (35.3%)	
	University level	0 (0.0%)	13 (46.4%)	13 (72.2%)	26 (51.0%)	
	Life's satisfaction					0.173
	Number of subjects	6	34	25	65	
	Low	1 (16.7%)	13 (38.2%)	15 (60.0%)	29 (44.6%)	
	Average	2 (33.3%)	13 (38.2%)	7 (28.0%)	22 (33.8%)	
	High	3 (50.0%)	8 (23.5%)	3 (12.0%)	14 (21.5%)	
	Parental weight assessment					0.076
	Number of subjects	4	26	20	50	
	Underweight	1 (25.0%)	6 (23.1%)	1 (5.0%)	8 (16.0%)	
	Normal weight	3 (75.0%)	16 (61.5%)	19 (95.0%)	38 (76.0%)	
	Overweight	0 (0.0%)	4 (15.4%)	0 (0.0%)	4 (8.0%)	
	Diet usage					0.489
	Number of subjects	6	34	25	65	
	No	5 (83.3%)	30 (88.2%)	19 (76.0%)	54 (83.1%)	
	Yes	1 (16.7%)	4 (11.8%)	6 (24.0%)	11 (16.9%)	
	FAS					0.154
	Number of subjects	6	34	25	65	
	Lower family affluence	3 (50.0%)	9 (26.5%)	7 (28.0%)	19 (29.2%)	
	Medium family affluence	1 (16.7%)	17 (50.0%)	16 (64.0%)	34 (52.3%)	
	Higher family affluence	2 (33.3%)	8 (23.5%)	2 (8.0%)	12 (18.5%)	
	Subjective health					0.504
	Number of subjects	6	34	25	65	
	Poor	2 (33.3%)	7 (20.6%)	8 (32.0%)	17 (26.2%)	
	Good	2 (33.3%)	21 (61.8%)	14 (56.0%)	37 (56.9%)	

FAS – Family Affluence Scale; * statistically significant ($p < 0.05$) values

Compared to previous similar studies, the number of OWOB kids in the current study was higher, while the number of underweight students was lower [10, 23]. According to the World Health Organization, the number of overweight children and adolescents has increased more than twice in the last 30 years [24]. Previous studies have indicated that even up to 80% of obese adolescents will remain obese in adulthood, experiencing many comorbidities of this disease. Moreover, being obese during adolescence has a negative impact on mental health, such as altered self-image or difficulties with social functioning [25]. Even though the global problem of being underweight is decreasing, obesity is becoming more frequent in many countries than it was in the late 90s [26].

We have found that 14-year-old males underestimated their weight over three times more often than girls of the same age. Overall, girls (11 and 14-year-olds) overestimated their body weight nearly twice as much as boys of the same age, with girls aged 14 overestimating their weight by over 20% more than 14-year-old boys. According to a Polish study on adolescents aged 15 and 17, 43.9% of girls and 17.1% of boys overestimated their weight, while 9% of girls and 37.2% of boys underestimated it [6]. These findings are comparable to our study, with the noticeable propensity for females to overestimate their weight and males to underestimate it. Similar results were found in an Israeli study in which boys underestimated their body weight more frequently than girls (25.6% vs. 15.1%), and girls overestimated their weight more often than boys (27.7% vs. 15.2%) [23].

In the previously mentioned Polish study, 48.6% of all teenagers properly estimated their weight, while 61.1% of girls and 60.7% of boys did so in the current study. Furthermore, underestimating body weight was three times higher in boys than in girls, which is consistent with our findings [6].

Underestimation was particularly prevalent in the boys with normal weight and perceived underweight. In the female group, those with normal weight and perceived overweight overestimated their weight most often. According to a previous study, 48% of girls with normal weight and 50% of those underweight overestimated their body weight, which was not observed in the present study [6]. Indeed, only 3.1% of 11-year-old underweight girls and none of the 14-year-old underweight girls overestimated their weight.

We investigated the use of any diet in both age and sex groups and discovered that over one-third of boys and two-fifths of girls aged 11 who were dieting were of normal weight. This trend has also been reported in previous research, in which more than one-third of adolescent girls used a diet, despite being of normal weight [27]. Some studies have shown that dieting frequency increases with age; however, our study found statistical significance in the younger group of girls [28].

Another relevant investigation considered diet use based on weight perception and found dieting in 30% of 11-year-old and 42.9% of 14-year-old boys overestimating their weight. As previously mentioned, studies have shown that dieting is usually more common in girls and older children, especially among those who are not overweight [11, 29, 30], which may be related to the fact that adolescent girls are more dissatisfied with their bodies than boys, and is positively related to BMI [12]. Furthermore, other characteristics associated with dieting among teenagers have been investigated, including body image dissatisfaction, depression or anxiety, experiencing chronic illness, and family and environmental factors [28]. According to our findings, male adolescents and their attitudes regarding weight perception and diet should also be taken into consideration, and future research should be expanded to include this population of young boys.

In general, adolescent girls believe that being thinner would positively impact their lives, while boys see this as a negative [12]. Dieting is associated with perceived poor health by adolescents, but is also a risk factor for eating disorders [29, 31]. Other factors, such as exercising, smoking, consuming alcohol, and somatic and psychological health problems, are also associated with dieting [29, 30]. Moreover, body dissatisfaction is generally associated with unhealthy weight control behaviors and binge eating in boys and girls [32].

Some other significant factors associated with the estimation of children's body weight were parental weight assessment in the 11-year-old girls and parental or legal guardian education level in the 14-year-old female group. For 11-year-old girls who underestimated their weight, 70% of parents rated their children's weight as normal. Furthermore, all parents of children who overestimated their weight assessed their child's weight as normal. However, these results have not been compared to the actual weight of adolescents. According to a previous study, almost one-third of parents cannot correctly asses the weight of their children, with 25% underestimating and 6% overestimating [33].

Mothers and fathers of 14-year-old girls who overestimated their weight mostly had a university-level education. A previous study reported that boys who were dissatisfied with their weight were more likely to have a mother with a higher education, indicating the impact of parental education on children's weight perception and satisfaction [34].

Other characteristics not investigated in our study but found to influence teenagers' weight estimation in previous studies include family and teacher support,

which make students less likely to overestimate their weight [23]. What is interesting, adolescents from high-income families are more likely to overestimate their weight [35]. In this study, we did not find that a child's family wealth (measured by FAS) had a significant impact.

Misperceptions of body weight, on the other hand, can have an impact on teenagers' mental health in general, with body weight misperception and negative body image associated with unhealthy eating behaviors and eating disorders [4, 15]. Gu et al. [36] investigated weight-related factors and mental health problems in Chinese adolescents. Their study found that both underestimation and overestimation of body weight may result in depression, anxiety, and loneliness. Moreover, a Norwegian study discovered that misperceptions regarding adolescent weight are associated with increased anxiety and depressive symptoms [37]. In our study, we did not look at the impact of weight misperception on overall mental health, although past research has shown that it is a significant area of concern that needs further investigation.

Limitations of the study

The main limitation of this study is its relatively small sample size, as well as the fact that some of the findings are based on a small number of cases. It mostly considers individual groups of respondents, 11- and 14-year-old boys/girls, which may be at potential risk of bias. Therefore, to validate the results of this pilot study, further research on a larger group should be conducted in the future. Moreover, this is a pilot study, and our results should be considered as preliminary, requiring further research on a larger population.

In this study, we focused only on a few psychosocial factors that may influence body weight estimation. Those factors were provided by the globally applied HBSC questionnaire. Our study aimed at identifying the main factors contributing to body weight estimation. In the future, it should be tested whether there are other important factors associated with this problem. We chose questions related to body weight, diet, and basic demographic data of adolescents and their parents/legal guardians, which we considered significant.

Furthermore, according to previous research, although the Cantril Ladder is a reliable and valid instrument for measuring life satisfaction, its validity may be lower when used as a single scale. Nevertheless, reliability is assessed as high; however, this aspect should be taken into consideration [38].

CONCLUSIONS

Body weight misperception was prevalent among Polish teenagers aged 11 and 14, with boys being more likely to underestimate their weight and girls being more likely to overestimate it. Both sexes dieted despite being of a normal weight, with females being more susceptible. However, many boys who overestimated their weight used dieting.

Adolescence is a critical period for the development of many mental disorders. Understanding the impact of body weight perception may be one of the key variables in understanding mental health in this population. Parents, teachers, and medical professionals, such as doctors or nurses, should also be aware of how teenagers perceive their weight for a better approach. Furthermore, educational programs on body perception, dieting, and the physical and psychological health impact of weight assessment should be implemented in teenagers' environments. To summarize, a comprehensive understanding of adolescence and the various factors that affect young people during this period can provide valuable insight into the challenges and difficulties that may arise in adult life.

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Conflict of interest

The authors report there are no competing interests to declare.

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