

## Body image distortion in fifth and sixth grade students may lead to stress, depression, and undesirable dieting behavior

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### Abstract

The widespread pursuit of a thin physique may have a detrimental impact on the wellbeing of preadolescents. The influence of body image distortions on the lifestyles, dieting behaviors, and psychological factors was investigated in 631 fifth and sixth grade children in Gyeonggi-do, Korea. Children were classified into three weight groups (underweight, normal, and overweight) and three perception groups (underestimation, normal, and overestimation). Necessary information was obtained by questionnaire, and each subject's weight status was determined by the Röhler index calculated from the annual measurement records, which were obtained from the school. According to their current weights, 57.4% of children were normal and 32.2% were overweight or obese, 16.6% of the children overestimated their body weight, and 55.2% had an undistorted body image. Overweight children had desirable lifestyles and dietary habits and presented reasonable weight control behaviors. Compared to those without distortion, the overestimated group had greater interest in weight control ( $P=0.003$ ) and dissatisfaction with their body weights ( $P=0.011$ ), presented unhealthy reasons to lose weight ( $P=0.026$ ), and had higher scores for "feeling sad when comparing own body with others" ( $P=0.000$ ) and for "easily getting annoyed and tired" ( $P=0.037$ ), even though they had similar obesity indices. More subjects from the overestimation group ( $P=0.006$ ) chose drama/movies as their favorite TV programs, suggesting a possible role for the media in body image distortion. These findings suggest that body image distortion can lead preadolescents to develop stress about obesity and unhealthy dieting practices, despite similar obesity indices to those without distorted body images. These results emphasize the importance of having an undistorted body image.

**Key Words:** Preadolescents, body image, depression, dietary habit, obesity stress

### Introduction

Although obesity is a disease that should be treated, too much effort is being given to lose body weight, particularly by the younger generation. Weight reduction efforts may be necessary for those who are overweight; however, it may be harmful particularly for those in growth and developmental stages. Unhealthy weight control behavior often results from weight misperceptions, principally overestimating body weight. Weight misperception is partly due to unrealistic media portrayals [1], and the resulting dissatisfaction with weight associated with low self-esteem, depression, and eating disorders [2]. Various studies have shown that a negative body image is an antecedent to obesity through unhealthy weight-control behaviors such as fasting, vomiting, or laxative abuse [3].

An increasing number of studies indicate the importance of a healthy body image, particularly in association with unhealthy weight control behaviors, eating disorders, and suicidal thoughts

and attempts. Studies around the world, such as those on US adolescents [2,4], Palestinian schoolchildren [5], Dutch adolescents [6], and Chinese adolescents [7], suggest that subjective weight perception, rather than objective weight status, is more associated with an individual's well-being. However, most previous studies in Korea investigated how subjects perceive their bodies, and how this affects a subject's psychological symptoms according to obesity [8-10], gender, and different areas [11], whereas nutritional knowledge, dietary habits, and dieting practices have been assessed based on body dissatisfaction [12]. As a result, no study has assessed the lifestyles, dieting practices, dietary habits, and psychological factors in children according to weight misperceptions, particularly in those who overestimate their weight.

The fifth and sixth grades in elementary school are usually the period when puberty starts. Nutritional imbalance can affect a child's physical and mental growth and development as well as their health status for the rest of their life. The pursuit of

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extreme thinness seems widespread among Korean preadolescents. Among 543 fifth graders in Korea, 55.6% were normal and 29.2% of underweight girls wanted to lose weight [13]. Determining the association between body weight misperceptions and lifestyle, dieting behavior, and psychological aspects of preadolescents will be useful for developing evidence-based nutrition education for these children. Therefore, lifestyles, dietary habits, and weight loss behaviors, as well as psychological aspects were determined in children with different body weights and body weight perceptions.

## Subjects and Methods

### Study subjects

A total of 647 fifth and sixth grade students were recruited from seven elementary schools located in Gyeonggi-do, Korea. Students with uncompleted questionnaires were excluded; thus, 631 students (349 boys and 282 girls) were included. The survey was conducted in November 2009.

### Anthropometry

The heights and weights of the subjects were obtained from the annual measurement records, which were determined between April and May 2009. The Rohrer index, which is the official tool to categorize elementary school children into weight categories in Korea, was calculated by the following formula.

$$\text{Rohrer index} = [\text{weight (kg)} / \text{height (cm}^3)] \times 10^7$$

Rohrer index values < 92, 92-109, 110-140, 141-156 and > 157 were categorized as severe underweight, underweight, normal, overweight, and obese, respectively.

### Subgroup classification

Table 1 summarizes the distribution of subjects according to weight status and body image perception. Subjects who were overweight and obese were categorized into the overweight

group, which was compared to the normal weight group.

As shown in Table 1, subjects were divided into three body-image perception groups. Subjects in the severe underweight, underweight, normal, overweight, and obese group who perceived their own body shape as very thin (n=0), somewhat thin (n=41), normal (n=208), somewhat fat (n=70) and very fat (n=28), respectively, were categorized into the normal perception group. Subjects in the severe underweight group who perceived their own body shape as somewhat thin (n=2), those in the underweight group who perceived their own body shape as normal (n=15) and somewhat fat (n=1), those in normal weight group who perceived their own body shape as somewhat fat (n=70) and very fat (n=7) and those in the overweight group who perceived their own body shape as very fat (n=10) were categorized into the overestimation group. The remaining children were categorized into the underestimation group.

Considering increasing concerns of “being fat” and “feeling fat” compared to underweight or underestimation of body image in this society, variables were compared only between the overestimation group and normal perception groups as well as between the overweight and normal weight groups to identify the characteristics of children who had distorted body image perceptions by overestimation.

### Questionnaire development

A pilot study was conducted to assess the participant’s ability to complete a self-administered questionnaire. A two-page questionnaire consisted of the following sections: general information, lifestyles, dietary habits, psychological status, and dieting practice. Body image perception was determined by asking students to mark their own body shape as very thin, somewhat thin, normal, somewhat overweight, and very fat. Dietary habits were determined by adherence to the Dietary Guidance for Korean Children by asking children to respond always (7 days/week), often (5-6 days/week), average (3-4 days/week), sometimes (1-2) and never (0 days/week), which were coded as 4, 3, 2, 1, and 0, respectively. The Dietary Guidance for Korean Children was developed by the Ministry of Health, Welfare, and Family in 2004 and consists of 11

**Table 1.** Body image perception of subjects by weight status

N (%)

Body image perception	Weight status by actual weights and heights					Total
	Severe underweight	Underweight	Normal	Overweight	Obese	
Very thin	0 (0.0) <sup>1)</sup>	7 (10.9) <sup>3)</sup>	10 (2.8) <sup>3)</sup>	0 (0.0)	0 (0.0)	17 (2.7)
Somewhat thin	2 (100) <sup>2)</sup>	41 (64.1) <sup>1)</sup>	67 (18.5) <sup>3)</sup>	2 (2.0) <sup>3)</sup>	0 (0.0)	112 (17.7)
Normal	0 (0.0)	15 (23.4) <sup>2)</sup>	208 (57.5) <sup>1)</sup>	17 (17.2) <sup>3)</sup>	4 (3.8) <sup>3)</sup>	244 (38.7)
Somewhat fat	0 (0.0)	1 (1.6) <sup>2)</sup>	70 (19.3) <sup>2)</sup>	70 (70.7) <sup>1)</sup>	71 (68.3) <sup>3)</sup>	212 (33.6)
Very fat	0 (0.0)	0 (0.0)	7 (1.9) <sup>2)</sup>	10 (10.1) <sup>2)</sup>	29 (27.9) <sup>1)</sup>	46 (7.3)
Total	2 (0.3)	64 (10.1)	362 (57.4)	99 (15.7)	104 (16.5)	631 (100)

<sup>1)</sup> Normal perception group

<sup>2)</sup> Overestimation group

<sup>3)</sup> Underestimation group

positive and three negative dietary habits. The negative dietary habits were reversely coded.

Questions for lifestyle were hours spent watching TV and computer activities, favorite TV programs, and engagement in other activities while eating. Interest in dieting, satisfaction with their body weight, reasons for dieting, weighing frequency, and the route of obtaining dieting information were asked for weight control behaviors.

Four questions were selected from 11 questions of the Body Attitudes Questionnaire-11, which were developed to diagnose obesity stress [14,15]. Subjects were asked to answer strongly disagree, tend to disagree, average, tend to agree, and strongly agrees, which were coded as 0-4, respectively. Three typical questions were selected from 21 items of Beck Depression Inventory-Korean version, which was developed by Beck to determine the degree of depression [16] and standardized after translation by Lee and Song [17].

#### Statistical analysis

Data were analyzed using SPSS 12.0K (Chicago, IL, USA). Anthropometry, age, adherence to the Dietary Guidelines, and psychological data were reported as means  $\pm$  standard deviations, and the differences between means were tested using Student's *t*-test with a significance set at  $P < 0.05$ . Grade, gender, and dieting related characteristics are reported as frequencies (%), and the differences among groups were analyzed using the  $\chi^2$ -test with significance set at  $P < 0.05$ .

## Results

### General subject characteristics

Table 2 shows the distribution of body image perceptions according to gender and actual weight status. More girls (23.0%) than boys (11.5%) were categorized into the overestimation group. Among girls in the overestimation group, 73.3% were normal weight, and 9.5% were overweight or obese. Significantly more boys underestimated their body weights than girls (35.8% of boys vs. 18.8% of girls).

The overestimation group was significantly taller than that of the normal group ( $147.5 \pm 7.29$  cm vs.  $149.5 \pm 7.17$  cm) despite similar weights, resulting in a lower Rohrer index ( $127.68 \pm 14.95$  vs.  $132.00 \pm 20.65$ , respectively). But, resulting in similar obesity indices by body mass index (BMI) ( $19.11 \pm 2.55$  vs.  $19.49 \pm 3.28$ , respectively) (Table 2).

### Lifestyles

Comparisons of lifestyle characteristics according to weight status and body image perception are shown in Table 4. More children in the overweight group watched TV on the weekend for  $< 1$  hour per day, compared to those who were normal weight (37.9% vs. 27.9%, respectively,  $P = 0.005$ ). Favorite TV programs were significantly different between the two body image perception groups ( $P = 0.006$ ), but no significant difference was observed between the two weight status groups. Drama and movies were chosen more often as favorite TV programs in the overestimation group compared to those in the normal perception group (32.4% vs. 21.8%, respectively), whereas show/entertainment

**Table 2.** Distribution of subject's body image perception according to gender and weight status

Body image Perception	Total	Gender		Weight status		
		Boys	Girls	Underweight <sup>1)</sup>	Normal	Overweight
Underestimation	178 (28.2) <sup>1)</sup>	125 (35.8)	53 (18.8)	7 (10.6) <sup>3)</sup>	77 (21.3)	94 (48.7)
Normal perception	348 (55.2)	184 (54.3)	164 (58.2)	41 (62.1)	208 (57.5)	99 (51.3)
Overestimation	105 (16.6)	40 (11.5)	65 (23.0)	18 (27.3)	77 (21.3)	10 (4.9)
Total	631 (100.0)	339 (100.0)	275 (100.0)	66 (100.0)	362 (100.0)	203 (100.0)
<i>P</i>		0.000*** <sup>2)</sup>		0.000***		

<sup>1)</sup> N (%)

<sup>2)</sup> Significantly different between genders or between weight status at \*\*\*  $P < 0.001$ .

**Table 3.** Anthropometric indices of subjects according to gender and body image distortion

Variables	Total (n = 631)	Gender		<i>P</i>	Body image perception		<i>P</i>
		Boys (n = 349)	Girls (n = 282)		Normal perception (n = 348)	Overestimation (n = 105)	
Weight (kg)	43.20 $\pm$ 10.35 <sup>1)</sup>	43.63 $\pm$ 10.80	42.66 $\pm$ 9.76	0.24	42.82 $\pm$ 9.66	43.13 $\pm$ 8.65	0.767
Height (cm)	147.01 $\pm$ 7.64	146.64 $\pm$ 7.61	147.47 $\pm$ 7.66	0.172	147.5 $\pm$ 7.29	149.5 $\pm$ 7.17	0.015*
BMI (kg/m <sup>2</sup> )	19.81 $\pm$ 3.67	20.11 $\pm$ 3.91	19.43 $\pm$ 3.31	0.021* <sup>2)</sup>	19.49 $\pm$ 3.28	19.11 $\pm$ 2.55	0.277
Age (year)	11.57 $\pm$ 0.77	11.59 $\pm$ 0.72	11.55 $\pm$ 0.82	0.509	11.59 $\pm$ 0.796	11.47 $\pm$ 0.797	0.304
Rohrer index (kg/m <sup>3</sup> )	134.67 $\pm$ 23.73	137.09 $\pm$ 25.57	131.68 $\pm$ 23.73	0.004**	132.00 $\pm$ 20.65	127.68 $\pm$ 14.95	0.047*

<sup>1)</sup> Mean  $\pm$  SD

<sup>2)</sup> Significantly different between genders or between body image perception groups at \*  $P < 0.05$ , \*\*  $P < 0.01$ , respectively.

**Table 4.** Lifestyle characteristics according to weight status and body image distortion

Lifestyle characteristics		Weight status			Body image perception		
		Normal (n = 362)	Overweight (n = 203)	<i>P</i>	Normal perception (n = 348)	Overestimation (n = 105)	<i>P</i>
Hours in using computer	< 1 hr	157 (43.4) <sup>1)</sup>	83 (40.9)	0.764	144 (41.4)	48 (45.7)	0.675
	1-2 hr	145 (40.1)	82 (40.4)		152 (43.7)	44 (41.9)	
	> 2 hr	60 (16.6)	38 (18.7)		52 (14.9)	13 (12.4)	
Weekday hours in watching TV	< 1 hr	71 (19.6)	43 (21.2)	0.311	78 (22.4)	18 (17.1)	0.404
	1-2 hr	163 (45.0)	101 (49.8)		157 (45.1)	47 (44.8)	
	> 2 hr	128 (35.4)	59 (29.1)		113 (32.5)	40 (38.1)	
Weekend hours in watching TV	< 1 hr	101 (27.9)	77 (37.9)	0.005 <sup>**2)</sup>	101 (29.0)	32 (30.5)	0.100
	2-4 hr	180 (49.7)	100 (49.3)		184 (52.9)	45 (42.9)	
	> 4 hr	81 (22.4)	25 (12.8)		63 (18.1)	28 (26.7)	
Favorite TV program	Entertainment	144 (39.8)	90 (46.6)	0.319	156 (44.8)	34 (32.4)	0.006 <sup>**</sup>
	Drama/Movie	86 (23.8)	33 (17.1)		76 (21.8)	34 (32.4)	
	Kids	65 (18.0)	32 (16.6)		56 (16.1)	10 (9.5)	
	The others	38 (18.5)	23 (19.6)		60 (17.2)	27 (26.1)	
Activity during meal	Talking	129 (35.6)	86 (42.4)	0.029 <sup>*</sup>	122 (35.1)	48 (45.7)	0.085
	Watching TV	131 (36.2)	60 (29.6)		131 (37.6)	28 (26.7)	
	Reading	2 (0.6)	6 (3.1)		8 (2.3)	0 (0.0)	
	Computer	0 (0.0)	1 (0.5)		1 (0.3)	0 (0.0)	
	Only eating	100 (27.6)	48 (24.6)		86 (24.7)	29 (27.6)	

<sup>1)</sup> N (%)<sup>2)</sup> Significantly different between weight status at \* *P* < 0.05, \*\* *P* < 0.01, respectively.**Table 5.** Adherence to the Korean Dietary Guidance for children according to weight status and body image distortion

Guidance	Weight status			Body image perception		
	Normal (n = 362)	Overweight (n = 193)	<i>P</i>	Normal perception (n = 348)	Overestimation (n = 105)	<i>P</i>
Rice more than 2/day	3.44 ± 0.96 <sup>1)</sup>	3.35 ± 1.00	0.351	3.46 ± 0.95	3.39 ± 1.00	0.534
A variety of vegetables	2.48 ± 1.11	2.58 ± 1.08	0.220	2.45 ± 1.04	2.66 ± 1.18	0.082
Milk more than 2 cups/day	1.92 ± 1.30	2.20 ± 1.29	0.014 <sup>2)</sup>	1.98 ± 1.31	1.83 ± 1.34	0.3121
Protein intake	2.17 ± 1.07	2.06 ± 1.12	0.253	2.17 ± 1.07	2.22 ± 1.10	0.681
Bean/tofu intake	1.86 ± 1.12	1.95 ± 1.10	0.332	1.88 ± 1.08	1.88 ± 1.16	0.961
Fruit/milk as snack	2.47 ± 1.16	2.39 ± 1.12	0.437	2.46 ± 1.15	2.39 ± 1.17	0.576
Wash hands before eating	3.23 ± 0.98	3.30 ± 0.94	0.473	3.25 ± 0.96	3.25 ± 0.90	0.996
Served only proper amount	2.50 ± 1.08	2.65 ± 1.08	0.133	2.49 ± 1.10	2.55 ± 1.03	0.479
Table manner	2.22 ± 1.09	2.47 ± 1.03	0.010 <sup>*</sup>	2.37 ± 1.05	2.28 ± 1.10	0.439
Recognize ideal height and weight	2.72 ± 1.21	2.42 ± 1.27	0.007 <sup>**</sup>	2.60 ± 1.27	2.70 ± 1.15	0.507
Physically active	2.13 ± 1.34	1.99 ± 1.16	0.197	2.06 ± 1.24	1.87 ± 1.31	0.168
Balanced diet	2.14 ± 1.17	2.47 ± 1.08	0.001 <sup>***</sup>	2.18 ± 1.11	2.30 ± 1.15	0.333
Street foods	2.37 ± 1.15	2.46 ± 1.09	0.404	2.41 ± 1.13	2.29 ± 1.17	0.347
Processed foods	2.22 ± 1.04	2.38 ± 0.99	0.082	2.27 ± 0.97	2.22 ± 1.15	0.652

<sup>1)</sup> Mean ± SD<sup>2)</sup> Significantly different between weight status at \* *P* < 0.05, \*\* *P* < 0.01, \*\*\* *P* < 0.001, respectively.

was chosen as the favorite program for 44.8% of the normal perception group. Fewer subjects from the overestimation group answered kid's programs as their favorite program compared with those from the normal perception group (10.5% vs. 16.1%, respectively). Table 4 also shows that significantly more children in the overweight group were engaged in talking (42.0%) during mealtime, whereas 36.2% of children in the normal weight group were watching TV during mealtime (*P* = 0.029).

### Dietary habits

Dietary habits of the subjects are shown in Table 5. Compared with the normal weight group, the overweight group had significantly better dietary habits, including daily milk intake (2.20 vs. 1.92, *P* = 0.014), table manners (2.47 vs. 2.22, *P* = 0.010), and a balanced diet (2.47 vs. 2.14, *P* = 0.001). Body image perception did not significantly affect dietary habits.

**Table 6.** Dieting practices according to weight status and body image distortion

Variable	Weight status			Body image perception			
	Normal (n = 362)	Overweight (n = 203)	<i>P</i>	Normal perception (n = 348)	Overestimation (n = 105)	<i>P</i>	
Interest in weight control	Very much	57 (15.7) <sup>1)</sup>	45 (23.3)	0.000*** <sup>3)</sup>	57 (16.4)	33 (31.4)	0.003**
	A little	187 (51.7)	122 (63.2)		194 (55.7)	51 (48.6)	
	No	118 (32.6)	26 (13.5)		97 (27.9)	21 (20.0)	
Reason for dieting	To be healthier	197 (54.4)	97 (50.3)	0.007**	195 (56.0)	40 (38.1)	0.026*
	To move easier	50 (13.8)	35 (18.1)		50 (14.4)	27 (25.7)	
	For a easier clothing	16 (4.4)	20 (10.4)		19 (5.5)	7 (6.7)	
	To look better	31 (8.6)	13 (6.7)		27 (7.8)	12 (11.4)	
	Pushed by others	10 (2.8)	12 (6.2)		7 (2.0)	3 (2.9)	
	Aware of opposite gender	5 (1.4)	2 (1.0)		6 (1.7)	0 (0.0)	
	None	22 (6.1)	4 (2.0)		22 (6.3)	65.7	
	The others	58 (16.1)	16 (8.3)		50 (14.3)	16 (15.2)	
Weight satisfaction	3.48 ± 1.03 <sup>2)</sup>	2.78 ± 0.98	0.000***	3.37 ± 1.01	3.08 ± 1.12	0.011*	

<sup>1)</sup> N (%)<sup>2)</sup> Mean ± standard deviation<sup>3)</sup> Significantly different between weight status or between body image perception groups at \*  $P < 0.05$ , \*\*  $P < 0.01$ , \*\*\*  $P < 0.001$ , respectively.**Table 7.** Obesity stress and depression according to weight status and body image distortion

Item	Weight status			Body image perception			
	Normal (n = 362)	Overweight (n = 193)	<i>P</i>	Normal perception (n = 348)	Overestimation (n = 105)	<i>P</i>	
Obesity stress	Others' talking about my weight	0.93 ± 1.07 <sup>1)</sup>	1.40 ± 1.12	0.000*** <sup>2)</sup>	1.09 ± 1.07	1.13 ± 1.12	0.752
	Sad when see thin people	0.79 ± 1.14	1.66 ± 1.29	0.000***	0.96 ± 1.15	1.51 ± 1.51	0.000**
	Will succeed if I look better	1.32 ± 1.18	1.35 ± 1.08	0.750	1.33 ± 1.13	1.43 ± 1.13	0.450
Depression	Unhappy always	0.79 ± 0.88	0.74 ± 0.89	0.531	0.72 ± 0.83	0.90 ± 0.94	0.061
	Disappointed with myself	0.72 ± 0.85	0.68 ± 0.88	0.597	0.69 ± 0.79	0.79 ± 0.92	0.2696
	Annoyed easily	1.23 ± 0.99	1.13 ± 0.97	0.215	1.19 ± 0.97	1.42 ± 1.97	0.037*

<sup>1)</sup> Mean ± SD<sup>2)</sup> Significantly different between weight status at \*  $P < 0.05$ , \*\*  $P < 0.01$ , \*\*\*  $P < 0.001$ , respectively.

### Dieting practices

Overweight subjects had less weight satisfaction ( $2.79 \pm 0.98$  vs.  $3.48 \pm 1.08$ ,  $P = 0.000$ ) and were more interested in dieting (23.3% vs. 15.7, respectively,  $P = 0.000$ ) than those of normal weight subjects. Subjects in the overestimation group had less weight dissatisfaction ( $3.08 \pm 1.12$  vs.  $3.37 \pm 1.01$ ,  $P = 0.011$ ) and were more interested in dieting (31.4% vs. 16.4%, respectively,  $P = 0.003$ ) compared to those in the normal perception group. More subjects in the overestimation group answered “for easier movement” (25.7% vs. 14.4%, respectively) and “to look better” (11.4% vs. 7.8%, respectively), and fewer for “to be healthier” (38.1% vs. 56.0%, respectively) as the reason for dieting compared to those without a distorted body image ( $P = 0.026$ ). In contrast, more subjects in the overweight group answered for “easier movement” (18.1% vs. 13.8%, respectively) and for “easier clothes shopping” (10.4% vs. 4.4%, respectively) as the reason for dieting, compared to those who were not overweight ( $P = 0.007$ ).

### Obesity stress and depression symptoms

Table 7 shows that the overweight group had significantly higher scores for two out of three questions asked about stress

related to obesity. The average score for “others seems to talk about my weight” were 1.40 in the overweight group, which was significantly higher than the 0.93 in the normal weight group ( $P = 0.000$ ). The average score for “feeling sad when I compare my body with others” was 1.66, which was significantly higher than the 0.79 in the overweight and normal weight groups ( $P = 0.000$ ). The overestimation group had a significantly higher score for the item of “feeling sad when I compare my body with others” (1.51 vs. 0.96, respectively,  $P = 0.0002$ ), when asked to determine obesity stress despite a similar average BMI to the normal perception group.

The overestimation group had a significantly higher score for “easily get tired and annoyed” when asked to determine depression symptoms (1.42 vs. 1.19, respectively,  $P = 0.037$ ). However, being overweight did not affect the scores for any of the three questions asked to determine depression symptoms.

### Discussion

Our results showed that physical and psychological wellbeing of pr-adolescents can be harmed by overestimating one's weight

more than by being overweight. Children who overestimated their own weight had significantly greater weight dissatisfaction and interest in losing weight than those with a normal weight perception despite a similar BMI to the normal weight perception group. Moreover, they answered “to look better” and “for easier movement” as reasons for dieting, which could be unhealthy and unreasonable, considering similar BMIs to those in the normal perception group. Subjects who overestimated their own weights had significantly higher scores for “easily get annoyed and tired” than those without a distorted body image, suggesting an association between unjustified overestimation of their weight with at least one of the depression symptoms. Lee and Song [17] also reported that psychological symptoms are associated with perceived weight status, but not with the actual weight status in 1144 Chinese adolescents (10-17 years).

In contrast, the overweight group did not have higher scores for any depression symptoms compared with those in the normal weight group. Wardle and Cooke [18] also reported that overweight and obese children do not have significant depression symptoms despite that they were more dissatisfied with their body size. The significantly higher dissatisfaction with their body, higher interest in losing weight, and higher scores for two questions on obesity stress in the overweight group seemed to be understandable and necessary for their weight problems, as inaccurate perception of one’s weight status is a risk factor for obesity. Students who were overweight or at risk for overweight but did not perceive themselves as such were unlikely to engage in weight control practices [19]. Therefore, results from this study call for a focus on the high tendency for boys to underestimate their body image. As much as 35.8% of male subjects in this study underestimated their body weights, whereas about half (48.7%) of them were actually overweight. The proportion of middle school boys who underestimated their body weight was almost twice that of those who overestimated their body weight (27.1% vs. 15.3%, respectively) (recalculated from Table 4 of Kim and Min 2008). Similarly, from a study on 87,418 high school students, girls were more likely to overestimate their weight, whereas boys were more likely to underestimate it [20].

It was notable to find several desirable aspects in the overweight group, including significantly more children in the overweight group spending less time watching TV on weekends; better dietary habits such as milk intake, balanced diet, and better table manner; and talking rather than watching TV during mealtime. Better dietary habits in the overweight group compared with those in the normal weight group were also reported in a study conducted with middle school students [21]. However, more studies have reported that overweight children and adolescents have undesirable dietary habits and lifestyles [10].

Significant positive associations between time spent watching TV and the various obesity indices have been reported [22,23]. Therefore, the observation that the more children in the overweight group spent less time watching TV and talking rather than watching TV during mealtime compared with those in the normal

weight group remains to be explained.

Results from this study suggest that overestimating one’s body weight may be associated with what is watched on TV not with how long TV is watched. Entertainment programs were the favorite TV programs for subjects in the normal perception group, whereas the overestimation group watched drama and movies. Findings from a meta-analysis that examined experimental and correlation studies support the notion that exposure to media depicting a thin-ideal body is related to body image concerns in women [24]. Anschutz *et al.* [1] and Hawkins *et al.* [25] found stronger negative effects on body satisfaction after subjects were exposed to slim model images.

These findings provide limited information because of a small sample size, the observational study design, and the use of incomplete measures for obesity stress and depression. We asked three questions for stress related to obesity and three for depression, rather than using the original tools consisting of 11 questions for obesity stress and 26 questions for depression. Additionally, perception of body weight status may not be suitable as a measure of body image distortion considering the suggestion that body image is a multi-dimensional construct [26]. Nevertheless, our results provides evidence that efforts to improve physical and psychological wellbeing in this generation should include not only monitoring of BMI but also monitoring of perceived weight.

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