

## Overestimation of own body weights in female university students: associations with lifestyles, weight control behaviors and depression

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### Abstract

The study aimed to analyze the lifestyles, weight control behavior, dietary habits, and depression of female university students. The subjects were 532 students from 8 universities located in 4 provinces in Korea. According to percent ideal body weight, 33 (6.4%), 181 (34.0%), 283 (53.2%), 22 (4.1%) and 13 (2.5%) were severely underweight, underweight, normal, overweight and obese, respectively, based on self-reported height and weight. As much as 64.1% and only 2.4%, respectively, overestimated and underestimated their body weight status. Six overweight subjects were excluded from overestimation group for the purpose of this study, resulting in overestimation group consisting of only underweight and normal weight subjects. Compared to those from the normal perception group, significantly more subjects from the overestimation group were currently smoking ( $P=0.017$ ) and drank more often than once a week ( $P=0.015$ ), without any significant differences in dietary habits. Despite similar BMIs, subjects who overestimated their own weight statuses had significantly higher weight dissatisfaction ( $P=0.000$ ), obesity stress ( $P=0.000$ ), obsession to lose weight ( $P=0.007$ ) and depression ( $P=0.018$ ). Also, more of them wanted to lose weight ( $P=0.000$ ), checked their body weights more often than once a week ( $P=0.025$ ) and had dieting experiences using 'reducing meal size' ( $P=0.012$ ), 'reducing snacks' ( $P=0.042$ ) and 'taking prescribed pills' ( $P=0.032$ ), and presented 'for a wider range of clothes selection' as the reason for weight loss ( $P=0.039$ ), although none was actually overweight or obese. Unlike the case with overestimating one's own weight, being overweight was associated with less drinking ( $P=0.035$ ) and exercising more often ( $P=0.001$ ) and for longer ( $P=0.001$ ) and healthier reasons for weight control ( $P=0.002$ ), despite no differences in frequency of weighing and depression. The results showed that weight overestimation, independent of weight status, is associated with risky lifestyles, weight control behaviors, and mental conditions. Preventive interventions should focus not only on obesity, but also on body weight overestimation.

**Key Words:** Overweight, misperception, weight control, depression, college students

### Introduction

Overweight and obesity are known to increase mortality and morbidity related to a wide range of chronic diseases, including diabetes mellitus, cardiovascular diseases and, several cancers. Serious psycho-social consequences, such as a negative self esteem, depression and high-risk behaviors are also associated to obesity [1,2].

Although obesity is a disease which should be treated, many are trying to lose weight which is not necessary. For example, approximately 46% of US college students from 1995 National College Health Risk Behavior Survey were currently trying to lose weight, while only 35% were overweight or obese [3]. This may result partly from the messages from the media and culture that being thin means being beautiful and successful. As a result, not only obesity and overweight but also excessive dieting to lose weight has become a focus of concern worldwide [4]. It is consistently shown that, while females are less likely than

males to be overweight, they are more likely to overestimate their weight, be dissatisfied with weight, and have attempted to lose weight [5]. According to the results of International Health & Behaviors Study [6] with 18,512 university students, 51% of the females were currently on dieting compared to 25% of the males. Meanwhile, the portion who was currently on dieting was as much as 77% in Korean female students, which was the highest among males and females of all 22 countries that participated.

Unjustified weight dissatisfaction due to a distorted body image has been attributed to unnecessary attempts to lose weight, which are consequently associated with psychological malfunctions. Among female university students, only 56.5% in the normal weight group thought to have normal weight, while as much as 42.0% thought to be fat, resulting in that more than half were unsatisfied with their weight and 79.5% had been on diet [7]. There are some studies suggesting "feeling fat" to be more important than "being fat" by showing that mental health indicators are more closely associated with the body weight perception

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rather than self-reported or measured weight statuses [8].

On the other hand, there were not many studies reporting the association of weight misperception, especially overestimation, with lifestyles, weight control behavior, dietary habits, and psychological factors on Korean females, to date. The studies on body image perception by gender [9] and BMI [10] were on adolescents. Early adulthood, such as the period attending university, is the life span in which one might take care of diet and health at the least throughout whole life, partly due to a newly obtained independency. Excessive dieting not only harms females' own health now and later in life, but also may put the next generation's health at risk, through fetal imprinting [11].

Therefore, lifestyles, dietary habits and weight loss behaviors, as well as psychological aspects, such as the obsession to weight loss, obesity stress and depression were compared in female university students, according to body weight perceptions as well as weight statuses.

## Subjects and Methods

### Study subjects

In September 2010, subjects consisting of 532 female students from 8 universities in Seoul, Gyung-sang-do, Chungcheong-do, Jolla-do and Gyeonggi-do, Korea participated, after incomplete questionnaires were discarded

### Questionnaire development

A four-paged self-administered questionnaire was developed, consisting of 7 sections: general information including self-reported height and weight, dietary habits, lifestyles, obesity stress, obsession to lose weight, psychological statuses, and weight loss behaviors. Body image perception was determined by asking students to mark their own body shape as 'very thin', 'somewhat thin', 'normal', 'somewhat fat' and 'very fat'. Dietary habits were determined by asking students to respond "often (6-7 days/week)", "sometimes (3-5 days/week)" and "rarely (0-2 days/week)" to each dietary habits, which were encoded as 5, 3, and

1, respectively [12]. The negative dietary habits were encoded reversely. Questions on lifestyle were hours spent in watching TV and using the computer, smoking, drinking, and frequency and duration of exercise. Questions about weight control behaviors regarded weight satisfaction, weight standard, the method experienced to lose weight, dieting experience, reason and direction of weight control, and frequency of weighing. Weight satisfaction was determined by asking students to mark "satisfied very much", "somewhat satisfied", "average", "somewhat dissatisfied", and "dissatisfied very much", of their own weight, which were encoded as 5, 4, 3, 2, and 1, respectively.

Obsession to lose weight was determined by eleven questions out of twenty-six items of the Eating Attitudes Test-26, which was developed as a diagnosing tool for eating disorders by Linda and Michael [13] and standardized by Won [14]. Subjects were asked to answer "never", "rare", "sometimes", "often", "very often" and "always", which were encoded as 0 to 5, respectively. Stress level from obesity was determined by 11 questions of the Body Attitudes Questionnaire-11, which were developed to diagnose obesity stress by Ben and Walker [15] and translated by Cho and Kim [16]. Subjects were asked to answer "strongly disagree", "tend to disagree", "average", "tend to agree", "strongly agrees", which were encoded as 0 to 4, respectively. Beck Depression Inventory- Korean version (K-BDI) which was developed by Beck [17] and standardized after translation by Lee and Song [18] was used to determine the degree of depression.

### Grouping into subgroups

Since body mass index categorizes weight status into only four groups, percent ideal body weight (PIBW) was used in this study to categorize weight perception as well as weight status. Table 1 summarizes the distribution of subjects according to five categories of weight status and five categories of body image perception. By using ideal body weight calculated with modified Broca method, PIBW were used to diagnose body weight into severe underweight (< 80%), underweight (80%-90%), normal (90%-110%), overweight (110-120), and obese (> 120%). Characteristics according to weight status were compared between underweight (< 90%), normal weight (90%-110%), and

Table 1. Distribution of weight status and weight perception

(N : %)

Subjective weight perception	Weight status					Total
	Severe underweight (below 80%)	Underweight (80-90%)	Normal (90-110%)	Overweight (110-120%)	Obese (Above 120%)	
Very thin	12 (36.4) <sup>a</sup>	6 (3.3) <sup>c</sup>	-	-	-	
Somewhat thin	18 (54.5) <sup>b</sup>	53 (29.3) <sup>a</sup>	3 (1.1) <sup>c</sup>	-	-	
Normal	1 (3.0) <sup>b</sup>	101 (55.8) <sup>b</sup>	88 (31.1) <sup>a</sup>	-	-	
Somewhat fat	2 (6.1) <sup>b</sup>	19 (10.5) <sup>b</sup>	179 (63.3) <sup>b</sup>	16 (72.7) <sup>a</sup>	4 (30.8)	
Very fat	-	2 (1.1) <sup>b</sup>	13 (4.6) <sup>b</sup>	6 (27.3) <sup>bd</sup>	9 (69.2) <sup>a</sup>	
Total	33 (6.2)	181 (34.0)	283 (53.2)	22 (4.14)	13 (2.4)	532 (100)

<sup>a</sup> 178 (33.5%) of total 532 recognized own weight status correctly

<sup>b</sup> 341 (64.1%) of total 532 overestimated own weight status

<sup>c</sup> 13 (2.4%) of total 532 underestimated own weight status, all of whom were not included for further analysis

<sup>d</sup> Six subjects excluded from the statistics for the purpose of the study

overweight (> 120%).

Subjects in the severe underweight, underweight, normal, overweight, and obese groups who perceived their weight as “very thin” (n = 0), “somewhat thin” (n = 41), “normal” (n = 208), “somewhat fat” (n = 70) and “very fat” (n = 28), respectively, were categorized as correct perception group. And characteristics of the correct perception group were compared to those of the overestimation group. The overestimation group categorizes subjects in the severely underweight group who perceived their own weight as ‘somewhat thin’ (n = 2), those in the underweight group who did as ‘normal’ (n = 15) and ‘somewhat fat’ (n = 1), those in normal weight group who did as ‘somewhat fat’ (n = 70) and ‘very fat’ (n = 7) and those in overweight group who did as ‘very fat’ (n = 10). Six subjects in the overestimation group who were overweight and all 13 subjects in the underestimation group were excluded from the further analysis due to the purpose of this study, which was to identify the characteristics of students who had distorted body image perception by overestimation without being overweight. Therefore, the overestimation group consisted of non-overweight subjects, while the normal perception group consisted of all five weight categories.

#### Statistical analysis

The data were examined for significant associations using SPSS 18.0 K for Windows. The anthropometry, age, dietary habits, and psychological data were reported as mean  $\pm$  standard deviation. The differences between overestimation group and correct perception group were analyzed for the statistical significance by Students’ t-test at  $P < 0.05$ . After the analysis of variance, the significances of the differences among three weight groups were tested using Duncan multiple range tests at  $P < 0.05$ . Distribution of grade and gender and weight control behaviors were reported as frequency (%), and significances of differences were analyzed using  $\chi^2$ -test at  $P < 0.05$ .

## Results

#### Distribution of weight status and misperception

Table 1 shows that 53.2% and 34.0% of the subjects belong to normal weight and underweight groups, respectively. As much

as 54.5% of the severely underweight group perceived their own weight as ‘somewhat thin’ and 3.0% and 6.1% did even as ‘normal’ and ‘overweight’. As a result, only 33.5% of the subjects in this study perceived their own weights in the correct weight group, while as much as 64.1% and as little as 2.4% overestimated and underestimated own weight, respectively. There were no significant differences in height, weight and BMI as well as age between groups according to weight misperception (Table 2).

#### Lifestyle

The overweight subjects had several desirable lifestyles, compared to those with normal weight: more of overweight group never drank (38.7% vs. 17.1%, respectively,  $P = 0.035$ ); exercised more frequently than once a week (51.6% vs. 2.4%, respectively,  $P = 0.001$ ) and for longer than 30 minutes/time (74.2% vs. 52.9%, respectively,  $P = 0.000$ ) (Table 3). Compared to correct perception group, more of the overestimation group drank more often than once a week (23% vs. 11.8%, respectively,  $P = 0.015$ ) and were currently smoking (7.8% vs. 1.7%, respectively,  $P = 0.017$ ).

#### Dietary habits

Table 4 shows that there were no significant differences in dietary habits between groups according to weight statuses as well as weight misperception, except for that overweight subjects had significantly lower score for “enjoying meals at pleasant atmosphere” than normal weight (2.29 vs. 3.01, respectively,  $P = 0.022$ ).

#### Weight control behaviors

Table 5 summarizes the weight control behaviors, obesity stress, and obsession to losing weight between subgroups. Compared to subjects with normal weight, significantly more overweight subjects had experiences of dieting through reducing meal size (83.9% vs. 79.3%, respectively,  $P = 0.000$ ), increasing exercise (71.0% vs. 63.9%, respectively,  $P = 0.003$ ), choosing lower-calorie foods (51.6% vs. 41.4%, respectively,  $P = 0.004$ ), and skipping dinner (45.2% vs. 32.5%, respectively,  $P = 0.001$ ). Overweight subjects had significantly lower weight satisfaction (1.23 vs. 1.72, respectively,  $P = 0.000$ ) and higher obesity stress

**Table 2.** Distribution of the subjects according to weight status and weight misperception

Variables	Weight status			P	Weight misperception		P
	Underweight (n = 208)	Normalweight (n = 280)	Overweight (n = 31)		Correct perception (n = 178)	Overestimation (n = 335)	
Age (yr)	20.71 $\pm$ 2.46	20.60 $\pm$ 2.58	20.13 $\pm$ 1.91	0.476	20.84 $\pm$ 2.65	20.52 $\pm$ 2.43	0.161
Height (cm)	162.21 $\pm$ 5.17	162.41 $\pm$ 4.77	161.94 $\pm$ 4.15	0.823	162.17 $\pm$ 4.43	162.33 $\pm$ 5.15	0.732
Weight (kg)	47.88 $\pm$ 3.83	55.43 $\pm$ 4.50	67.36 $\pm$ 6.72	0.000***	52.94 $\pm$ 7.76	52.97 $\pm$ 5.92	0.970
Body mass index	18.18 $\pm$ 0.93	21.00 $\pm$ 1.16	25.70 $\pm$ 2.56	0.000***	20.14 $\pm$ 2.91	20.08 $\pm$ 1.81	0.778

\*\*\* Significantly different at  $P < 0.001$ .

**Table 3.** Lifestyle by weight status and body image distortion

Lifestyle	Weight status			<i>P</i>	Weight misperception		<i>P</i>
	Underweight (n = 208)	Normalweight (n = 280)	Overweight (n = 31)		Correct perception (n = 178)	Overestimation (n = 335)	
Screen-viewing							
< 1 hour	30 (14.4)	38 (13.6)	4 (12.9)	0.833	28 (15.7)	44 (13.1)	0.718
1-2 hours	79 (38.0)	99 (35.4)	9 (29.0)		62 (34.8)	122 (36.4)	
> 2 hours	99 (47.6)	143 (51.1)	18 (58.1)		88 (49.4)	169 (50.4)	
Drinking							
Never	47 (22.6)	48 (17.1)	12 (38.7)	0.035*	45 (25.3)	59 (17.6)	0.015*
Sometimes	131 (63.0)	168 (60.0)	15 (48.4)		112 (62.9)	199 (59.4)	
1-3 times/week	24 (11.5)	58 (20.7)	3 (9.7)		19 (10.7)	66 (19.7)	
4-5 times/week	3 (1.4)	4 (1.4)	1 (3.2)		2 (1.1)	6 (1.8)	
Everyday	3 (1.4)	2 (0.7)	0 (0.0)		0 (0)	5 (1.5)	
Frequency of exercise							
Never	79 (38.0)	64 (22.9)	3 (9.7)	0.001**	46 (25.8)	99 (29.6)	0.076
Sometimes	67 (32.2)	97 (34.6)	12 (38.7)		69 (38.8)	106 (31.6)	
1-2 times/week	36 (17.3)	62 (22.1)	8 (25.8)		26 (14.6)	78 (23.3)	
3-5 times/week	16 (7.7)	48 (17.1)	5 (16.1)		28 (15.7)	39 (11.6)	
Everyday	10 (4.8)	9 (3.2)	3 (9.7)		9 (5.1)	13 (3.9)	
Duration of exercise							
< 30 min	135 (64.9)	132 (47.1)	8 (25.8)	0.000**	86 (48.3)	186 (55.1)	0.056
≥ 30 min	73(35.1)	148(52.9)	23(74.2)		92 (51.7)	147 (43.9)	
Smoking							
Never	187 (89.9)	247 (88.2)	29 (93.5)	0.574	166 (93.3)	291 (86.9)	0.017*
Past smoker	11 (5.3)	14 (5.0)	2 (6.5)		9 (5.1)	18 (5.4)	
Current smoker	10 (4.8)	19 (6.8)	0 (0.0)		3 (1.7)	26 (7.8)	

**Table 4.** Dietary habits according to weight status and weight misperception

Dietary habit	Weight status			<i>P</i>	Weight perception		<i>P</i>
	Underweight (n = 208)	Normalweight (n = 280)	Overweight (n = 31)		Correct perception (n = 178)	Overestimation (n = 335)	
Protein intake	2.77 ± 1.45	2.82 ± 1.37	2.48 ± 1.26	0.439	2.82 ± 1.43	2.77 ± 1.39	0.683
Vegetable intake	2.21 ± 1.42	2.21 ± 1.32	2.10 ± 1.45	0.899	2.22 ± 1.41	2.21 ± 1.34	0.920
Vegetable oil intake	2.53 ± 1.26	2.59 ± 1.23	2.55 ± 1.34	0.852	2.61 ± 1.33	2.55 ± 1.20	0.637
Milk/dairy intake	2.63 ± 1.53	2.46 ± 1.49	2.68 ± 1.56	0.446	2.65 ± 1.53	2.46 ± 1.50	0.178
Fruit intake	2.76 ± 1.54	2.57 ± 1.45	2.87 ± 1.54	0.283	2.69 ± 1.56	2.64 ± 1.46	0.753
Seaweed intake	2.09 ± 1.35	2.04 ± 1.37	1.77 ± 1.33	0.487	1.94 ± 1.33	2.11 ± 1.37	0.186
Regular meals	2.34 ± 1.41	2.11 ± 1.36	2.42 ± 1.57	0.141	2.31 ± 1.36	2.16 ± 1.41	0.227
Proper meal size	3.02 ± 1.47	2.81 ± 1.31	2.48 ± 1.15	0.064	2.91 ± 1.34	2.87 ± 1.40	0.746
Pleasant meal time	3.03 ± 1.49 <sup>b</sup>	3.01 ± 1.38 <sup>b</sup>	2.29 ± 1.22 <sup>a</sup>	0.022*	2.90 ± 1.37	3.02 ± 1.45	0.344
Balanced diet	2.59 ± 1.45	2.65 ± 1.47	2.23 ± 1.33	0.301	2.66 ± 1.40	2.58 ± 1.48	0.521
Not skipping breakfast	2.90 ± 1.62	2.69 ± 1.67	3.13 ± 1.71	0.185	2.78 ± 1.66	2.79 ± 1.66	0.918
Processed foods	2.82 ± 1.22	2.86 ± 1.17	2.94 ± 1.32	0.839	2.89 ± 1.18	2.82 ± 1.22	0.550
Eating out	3.00 ± 1.60	2.99 ± 1.61	3.00 ± 1.79	0.995	2.91 ± 1.64	3.04 ± 1.59	0.401
Cholesterol intake	3.14 ± 1.35	3.07 ± 1.36	3.32 ± 1.38	0.575	3.12 ± 1.40	3.10 ± 1.34	0.861
Sodium intake	3.29 ± 1.44	3.49 ± 1.41	3.65 ± 1.40	0.209	3.48 ± 1.42	3.39 ± 1.43	0.472
Sweets intake	2.86 ± 1.44	2.87 ± 1.35	3.26 ± 1.69	0.320	2.98 ± 1.44	2.84 ± 1.38	0.309
Caffeine intake	3.79 ± 1.47	3.67 ± 1.58	4.03 ± 1.62	0.392	3.82 ± 1.50	3.69 ± 1.56	0.372
Total	47.75 ± 10.21	46.91 ± 10.14	47.19 ± 9.60	0.662	47.70 ± 10.41	47.05 ± 10.06	0.492

\* Significantly different at  $P < 0.05$ .Values with the different superscripts are significantly different at  $P < 0.05$ .

(39.03 vs. 33.96, respectively  $P = 0.000$ ) and obsession to lose weight (17.68 vs. 12.76, respectively,  $P = 0.000$ ).

Despite similar BMIs, subjects who overestimated their own

weights had significantly lower weight satisfaction (1.91 vs. 2.46, respectively,  $P = 0.000$ ), and higher obesity stress (33.12 vs. 28.84, respectively,  $P = 0.000$ ) and obsession to lose weight

**Table 5.** Weight control behaviors, obesity stress, and obsession to losing weight

N (%)

Variables	Weight status			P	Weight perception		P
	Underweight N = 208	Normalweight N = 280	Overweight N = 31		Correct perception N = 178	Overestimation N = 335	
Obesity stress	27.57 ± 8.73 <sup>a</sup>	33.96 ± 8.08 <sup>b</sup>	39.03 ± 8.54 <sup>c</sup>	0.000***	28.84 ± 9.41	33.12 ± 8.58	0.000***
Obsession to losing weight	8.19 ± 6.96 <sup>a</sup>	12.76 ± 6.74 <sup>b</sup>	17.68 ± 6.17 <sup>c</sup>	0.000***	9.97 ± 7.74	11.81 ± 7.03	0.007**
Weight satisfaction	2.71 ± 1.04 <sup>a</sup>	1.72 ± 0.74 <sup>b</sup>	1.23 ± 0.56 <sup>c</sup>	0.000***	2.46 ± 1.10	1.91 ± 0.90	0.000***
Reason to lose weight							
To look better	97 (46.6)	159 (58.8)	12 (38.7)	0.002**	89 (50.0)	175 (52.2)	0.039*
For a easier movement	36 (17.3)	41 (14.6)	7 (22.6)		31 (17.4)	52 (15.5)	
For a wider range of clothe selection	27 (13.0)	44 (15.7)	5 (16.1)		17 (9.6)	59 (17.6)	
To be healthier	28 (13.5)	21 (7.5)	7 (22.6)		28 (15.7)	27 (8.1)	
Pushed by others	3 (1.4)	6 (2.1)	0 (0.0)		2 (1.1)	7 (2.1)	
Aware of opposite sex	0 (0.0)	4 (1.4)	0 (0.0)		2 (1.1)	2 (0.6)	
The others	17 (8.2)	5 (1.8)	0 (0.0)		9 (5.1)	13 (3.9)	
Frequency of weighing							
Once a day	31 (14.9)	52 (18.6)	7 (22.6)	0.247	34 (19.1)	55 (16.4)	0.025*
1-5 times/week	96 (46.2)	145 (51.8)	14 (45.2)		73 (41.0)	180 (53.7)	
< once a month	81 (38.9)	83 (29.6)	10 (32.3)		71 (39.9)	100 (29.9)	
Direction of weight control							
To lose	126 (60.6)	275 (98.2)	31 (100.0)	0.000***	128 (71.9)	298 (89.0)	0.000***
To maintain	51 (24.5)	3 (1.1)	0 (0.0)		29 (16.3)	25 (7.5)	
To gain	15 (7.2)	1 (0.4)	0 (0.0)		12 (6.7)	4 (1.2)	
No interest	16 (7.7)	1 (0.4)	0 (0.0)		9 (5.1)	8 (2.4)	
Method used for weight control							
Smaller meal size	131 (63.0)	222 (79.3)	26 (83.9)	0.000***	118 (66.3)	255 (76.1)	0.012*
Less snacks	122 (58.7)	192 (68.6)	16 (51.6)	0.029*	104 (58.4)	223 (66.6)	0.042*
More exercise	104 (50.0)	179 (63.9)	22 (71.0)	0.003**	101 (56.7)	198 (59.1)	0.336
Low-calorie foods	60 (28.8)	116 (41.4)	16 (51.6)	0.004**	60 (33.7)	129 (38.5)	0.164
Skipping supper	42 (20.2)	91 (32.5)	14 (45.2)	0.001**	46 (25.8)	98 (29.3)	0.238
Meal substitute	34 (16.3)	68 (24.3)	9 (29.0)	0.060	31 (17.4)	78 (23.3)	0.075
Skipping meals	35 (16.8)	53 (18.9)	8 (25.8)	0.468	34 (19.1)	61 (18.2)	0.446
Prescribed pills	3 (1.4)	17 (6.1)	2 (6.5)	0.035*	3 (1.7)	18 (5.4)	0.032*
Commercial program	7 (3.4)	21 (7.5)	0 (0.0)	0.053	6 (3.4)	22 (6.6)	0.092
Weight control center	3 (1.4)	15 (5.4)	1 (3.2)	0.074	3 (1.7)	16 (4.8)	0.059
Laxatives/diuretics	3 (1.4)	2 (0.7)	0 (0.0)	0.612	1 (0.6)	4 (1.2)	0.434

\*\*\* Significantly different at  $P < 0.05$ ,  $P < 0.01$ ,  $P < 0.001$ .

Values with the different superscripts are significantly different at  $P < 0.05$ .

(11.81 vs. 9.97, respectively,  $P = 0.007$ ). More of them wanted to lose weight (89.0% vs. 71.9%, respectively,  $P = 0.000$ ), had dieting experiences using reducing meal size (76.1% vs. 66.3%, respectively,  $P = 0.012$ ), reducing snacks (66.6% vs. 58.4%, respectively,  $P = 0.042$ ) and taking prescribed pills (5.4% vs. 1.7%, respectively,  $P = 0.012$ ) and presented “for a wider range of clothes selection for purchase” as the reason for weight loss ( $P = 0.039$ ).

The most frequently answered reason to lose weight was “to look better for self-confidence” (51.6%) throughout all the groups, followed by “for the easier movement” (16.2%), “for a wider range of clothes selection for purchase” (16.1%), and “to be healthier” (10.8%). Approximately, twice as more subjects who overestimated their own weight as those who perceive own weight status correctly presented “for a wider range of clothes

selection for purchase” as the main reason to lose weight (17.6% vs. 9.6%, respectively), while only a half of them did “to be healthier” (8.1% vs. 15.1%, respectively) ( $P = 0.039$ ). On the other hand, three times as more in the overweight group as the normal weight group answered that they wanted to lose weight mainly “to be healthier” (22.6% vs. 7.5%, respectively), while those answered to have “for a wider range of clothes selection for purchase” were not different according to weight status.

Compared to their counterparts, more of overestimation group checked their body weight more often than once a week (70.1% vs. 60.1%, respectively,  $P = 0.025$ ), but it was not the case of overweight subjects.

**Table 6.** Scores of depression by weight status and weight misperception

Depression	Weight status			P	Weight perception		P
	Underweight N = 208	Normal weight N = 280	Overweight N = 31		Correct perception N = 178	Overestimation N = 335	
Sadness	0.29 ± 0.48	0.26 ± 0.50	0.29 ± 0.53	0.812	0.22 ± 0.43	0.30 ± 0.52	0.093
Desperation	0.40 ± 0.52	0.45 ± 0.54	0.45 ± 0.51	0.622	0.40 ± 0.49	0.45 ± 0.55	0.348
Loser	0.20 ± 0.53	0.31 ± 0.65	0.16 ± 0.45	0.076	0.17 ± 0.46	0.31 ± 0.66	0.009**
Dissatisfaction	0.62 ± 0.68	0.62 ± 0.71	0.55 ± 0.72	0.855	0.57 ± 0.70	0.64 ± 0.70	0.312
Guiltiness	0.20 ± 0.43	0.22 ± 0.46	0.39 ± 0.67	0.102	0.20 ± 0.46	0.23 ± 0.47	0.567
Punishment	0.27 ± 0.58	0.32 ± 0.59	0.32 ± 0.54	0.697	0.20 ± 0.46	0.35 ± 0.63	0.005**
Hatred	0.50 ± 0.61	0.55 ± 0.60	0.58 ± 0.56	0.616	0.44 ± 0.58	0.59 ± 0.61	0.010*
Misfortune	0.48 ± 0.59	0.53 ± 0.60	0.52 ± 0.57	0.641	0.46 ± 0.59	0.54 ± 0.60	0.136
Suicide	0.29 ± 0.52	0.29 ± 0.49	0.29 ± 0.53	1.000	0.30 ± 0.51	0.29 ± 0.50	0.811
Crying	0.24 ± 0.48	0.21 ± 0.53	0.29 ± 0.64	0.706	0.22 ± 0.49	0.23 ± 0.53	0.822
Annoyed	0.61 ± 0.73	0.56 ± 0.65	0.65 ± 0.80	0.683	0.56 ± 0.69	0.60 ± 0.69	0.525
Concern	0.50 ± 0.65	0.55 ± 0.66	0.65 ± 0.76	0.454	0.50 ± 0.65	0.56 ± 0.67	0.370
Decision-making	0.59 ± 0.66	0.57 ± 0.64	0.55 ± 0.57	0.926	0.52 ± 0.63	0.61 ± 0.65	0.149
Ugliness	0.46 ± 0.64	0.60 ± 0.79	0.68 ± 0.87	0.071	0.47 ± 0.73	0.59 ± 0.75	0.092
Work	0.37 ± 0.57	0.40 ± 0.60	0.58 ± 0.67	0.171	0.39 ± 0.62	0.40 ± 0.59	0.782
Sleep	0.28 ± 0.49	0.35 ± 0.63	0.35 ± 0.71	0.407	0.29 ± 0.53	0.35 ± 0.61	0.248
Fatigue	0.78 ± 0.64	0.75 ± 0.62	0.84 ± 0.64	0.682	0.69 ± 0.61	0.81 ± 0.64	0.049*
Sum	7.08 ± 5.44	7.55 ± 5.60	8.13 ± 6.21	0.489	6.61 ± 5.01	7.84 ± 5.83	0.018*

\*, \*\*, \*\*\* Significantly different at  $P < 0.05$ ,  $P < 0.01$  and  $P < 0.001$ .

Values with the different superscripts are significantly different at  $P < 0.05$ .

### Depression degree by weight status and body image distortion

Table 6 shows no significant differences in depression between weight status groups, while the overestimation group had a significantly higher score for “loser” (0.31 vs. 0.17, respectively,  $P = 0.009$ ), “punishment” (0.35 vs. 0.20, respectively,  $P = 0.005$ ), “hatred” (0.59 vs. 0.44, respectively,  $P = 0.010$ ), and “fatigue” (0.81 vs. 0.69, respectively,  $P = 0.049$ ) as well as the total depression score (0.31 vs. 0.17, respectively,  $P = 0.018$ ).

### Discussion

The most distinctive result of this study is that, despite of similar BMIs, overestimating one’s own weight showed a significantly higher weight dissatisfaction, obesity stress and obsession to weight loss, and even worse, higher depression level than being overweight did. Also overestimating was associated with unhealthy reason for and method of weight control, along with undesirable lifestyles, compared with those of the correct perception group.

It is notable to find several desirable aspects in the overweight female students in this study: better lifestyles and healthier reasons for losing weight compared to their counterpart. More subjects from the overweight group drank less than once a week and exercised more frequently and for a longer time, although in the previous study on female college students [19] reported no differences in exercise frequency and duration of exercise. Most importantly, overweight subjects were less depressed than normal weight subjects, despite a higher weight dissatisfaction

as well as obsession and obesity stress. In fact, obesity stress and obsession to lose weight may be not only reasonable to have, but also may be necessary to achieve healthier weight. The significantly higher obsession to lose weight in overweight (13.36 vs. 11.70, respectively) as well as in the group who perceived themselves as “fat” (13.36 vs. 11.70, respectively) was also reported in the previous study with female university students in the Gunsan area [7]. On their review on the relation between obesity and body dissatisfaction, self esteem, and depression, they concluded that few among overweight and obese children and adolescents were significantly depressed, although they had a significantly higher body dissatisfaction than their normal-weight counterpart, consistent to the present study [1].

Only 33.5% of subjects in this study recognized their own body weight group correctly, which is lower than 44.8% reported from Male and female together in Iksan [20]. This higher tendency of girls to have distorted body image has been reported elsewhere [5].

The most frequently answered methods to lose weight in each group in this study were “reducing meal size” and “reducing snacking”, followed by “increasing exercise”, which is consistent to the previous studies [21,22], but inconsistent to the results in another study, in which more subjects answered “increasing exercise” than “reducing meal size” and “reducing snacking” [19]. Dieting with only reducing caloric intake without exercise should be avoided since it may lead to worse psychological malfunctions due to failure to weight loss resulting from muscle loss. Programs to increase students’ awareness of healthy weight management methods should emphasize the importance of physical activity combined with a healthy diet. Considering that

nobody was overweight, it is surprising that as much as 5.4% of the overestimation group experienced taking prescribed pills to lose weight. It is doubtful whether the prescription is currently made by a correct diagnosis of obesity.

The result that “to be healthier” is the 4th frequently answered main reason to lose weight is consistent to the previous studies, which found “external feature” is always more important than “to be healthier” as the reason to lose weight [23,24], which is not the case in male students [19]. Reports [25] stating that people who answered that they want to lose weight “to look better” rather than “to be healthier” were more likely to use unhealthy methods for losing weight emphasize the importance of nutrition education regarding healthy weight.

The depression score of the subjects in this study was lower than the 15.2 reported in female high school girls [26], in which the overweight group had a significantly higher depression level than underweight and normal weight, which is inconsistent to the present study.

The number of subjects who overestimated their weight is twice as many as that of subjects who recognized their own body weight correctly (64.1% vs. 33.5%) in this study, similar to 65.0% and 31.5%, respectively in Iksan [20] and 62.2% and 35.8%, respectively in Gunsan [7], suggesting the urgency to educate female college students to have a correct perception of their weight. However, compared to this study, a lesser proportion of female college students overestimated their weight, in which 46.2% overestimated their weight while 51.9% recognized their weight statuses correctly in the previous study reported in 2006 [27].

There are some limitations in this study. First, the subjects' weight and height were self-reported and not measured. According to a previous study, self-reported heights and weight tended to be higher in underweight and normal weight, while higher height and lower weight in overweight group. Also, the percent ideal weight which was used to divide subjects into subgroups could misclassify people who carry more weight as fat-free mass. Given its cross-sectional design, we cannot reach causal conclusions that the overestimation of body weight is responsible for the undesirable lifestyles, weight dissatisfaction and psychological disturbances.

Conclusively, the results showed that weight overestimation may be more associated with unhealthy lifestyles, weight control behaviors and mental conditions, compared with being overweight. Preventive interventions should focus not only on obesity, but also on body weight misperception.

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