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Factors Affecting Body Image Discordance Amongst Korean Adults Aged 19–39 Years

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ABSTRACT

Objectives: This study was designed to investigate factors affecting the discordance between body image and body mass index amongst Korean adults aged 19–39 years.

Methods: Data (N = 59,361) from the 2014 Korean Community Health Survey was analyzed using descriptive analysis, chi-square test, and logistic regression analysis.

Results: To examine the factors affecting body image discordance as observed in 43.1% of participants, the group was subdivided into underestimation and overestimation. There were 36.0% of participants that were body image discordant underestimators and 7.1% were overestimators. Multivariate logistic regression analysis showed that the underestimators tended to be men, graduated from high school, married, current/ex-smokers, ex-drinkers, had between 5 to 9 hours sleep (inclusive), had fair to good self-rated health, and demonstrated healthy weight control behavior, relative to the reference group. In comparison, overestimators tended to be in the 19-29 year group and had signs of depression. The OR of individuals who were men, married, and had healthy weight control behavior was significantly lower in the overestimators group.

Conclusion: These findings show that tailored interventions to promote accurate body awareness should be based on the type of body image discordance. In addition, it is necessary to develop and implement a program of body image improvement that considers the factors affecting body weight discordance.

Introduction

Obesity is a risk factor for chronic diseases and a major cause of death [1,2]. It has been attributed to mental and social disorders such as sleep disorders, depression, and low self-esteem [3,4]. The World Health Organization (WHO) classifies obesity as a disorder, and many countries are implementing diverse health policies to prevent it. Nevertheless, the number of obese people is continuously growing globally. In 2016, approximately 13% of the world's adult population was obese [5]. In the populations of countries that form the Organization for Economic Cooperation and Development, 19% of the adult population from these countries was obese [6].

Being underweight means weighing 10% to 20% less than normal body weight, which corresponds to a body mass index (BMI) of < 18.5 kg/m^2 in Asian countries [2,7]. The percentage of underweight adults in South Korea increased from 3.9% in 2010, to 4.7% in 2014 [8]. Being underweight can lead to serious health issues, such as deterioration in body function, decreased bone density, and weak immunity. Underweight women of child-bearing age, can also experience irregular menstrual periods, poor fetus growth, and premature labor [9]. To prevent

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these problems and improve an individual's quality of life, maintaining an adequate weight is critical and can be achieved through appropriate weight control behaviors. Generally this is initiated by a subjective self-perception of body shape (i.e., body image) as opposed to objective physical indices, such as body weight or waist size [10].

The discrepancy between body image and BMI is called body image discordance (BID). Perceiving one's body as slimmer than the actual BMI is categorized as underestimation, whilst perceiving one's body as heavier than the actual BMI is categorized as overestimation. BID leads to body image dissatisfaction and negatively affects mental health, such as lowering self-esteem and increasing depression [11,12].

A previous study reported that people who overestimate typically put more effort into losing weight than those with body image concordance [13]. Women, in particular, engage in unnecessary weight control behaviors by overestimating their body shapes [14]. Whilst 30.9% of the South Korean population is overweight, 63.5% of the total population is trying to lose weight [8], this implies that BID is becoming more serious. Since BID can negatively affect psychosocial issues, it is necessary to elicit appropriate health-promoting behaviors by promoting accurate body image [15].

Adulthood is the time period during which physical maturation is reached. Our body requires different calorific and nutrient content compared to the growth period of youth, therefore, it is crucial to form healthy eating habits from childhood and to manage health. However, a busy lifestyle is often an issue resulting in a lack of physical activity. Furthermore, Westernized diets and the development of convenience foods may hinder the formation of healthy eating habits [16]. Healthy diet habits, and health management in adulthood is important for middle-aged and elderly individuals, therefore, it is imperative to have an appropriate body image and a good health management habit.

In recent years, the prevalence rate of metabolic syndrome for Koreans in their 40s ranged from 19.9% to 30.8%, showing a sharp increase at this age [17]. This highlights the significance of health management during young adulthood. Therefore, this study investigated BID amongst adults aged under 40 years and established baseline data to improve health during adulthood.

The WHO BMI-based criterion to determine obesity amongst Asians was recently modified from an overweight category BMI ≥ 25 kg/m^2, to BMI ≥ 23 kg/m^2 [18]. When this new criterion was applied to Koreans, people who were previously classified as being in a normal weight group, were reclassified as being in a high-risk group for chronic diseases; therefore, it was necessary to study BID using the new criterion. Most studies on BID that were conducted in South Korea did not apply this BMI criterion for Asians [10,11]; therefore, there is a limited understanding of the factors affecting BID among young

Korean adults. Consequently, this study sought to identify the specific factors affecting adults aged 19–39 years to develop an intervention program that encourages appropriate health-promoting behaviors and an accurate body image to improve individuals' quality of life.

Materials and Methods

1. Design

A descriptive study design was used for secondary data analysis.

2. Data collection and participants

Since 2008, the Korean Community Health Survey has been conducted annually in 253 community clinics throughout Korea by the Korean Centers for Disease Control and Prevention. To maintain the representativeness of sample households, an average of 900 samples was extracted and selected using a multi-phase probability sampling method. Data were collected after a 1:1 interview by a trained surveyor. There were 228,712 participants in 2014, including 60,194 adults aged 19–39 years. Data were analyzed from 59,361 participants after excluding 833 adults who had insufficient data (e.g., weight, height) to confirm BID (Figure 1).

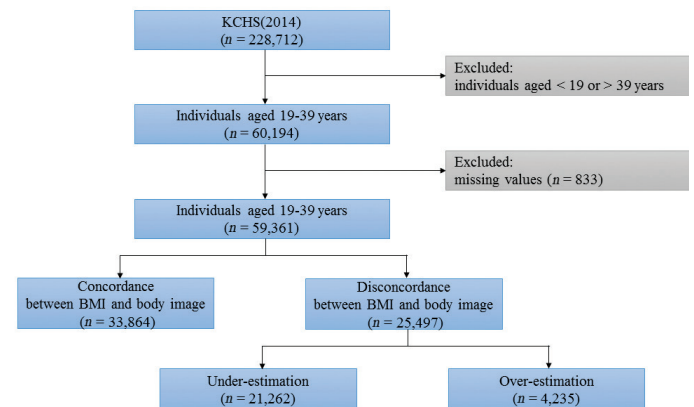Figure 1. Selection process of the study
KCHS = Korean Community Health Survey; BMI = body mass index.

3. Research variables

3.1. General characteristics

We examined participants' general characteristics including gender, age, education level, marital status, and employment status, which were divided as follows: age = "19–29 years," or "30–39 years;" education level = "≤ high school education" or "≥

college education;" marital status = "married" or "single;" and employment status = "employed" or "unemployed."

3.2. Health behaviors

We examined participants' health behaviors including smoking status alcohol consumption, frequency of breakfast consumption, sleep duration, perceived stress, depression, perceived health condition, physical activity, weight control behavior, and obesity, which were divided as follows: smoking = "non-smoker," "ex-smoker," and "currently smoking;" alcohol consumption = "non-drinker," "ex-drinker," and "currently drinking"; breakfast consumption = "≤ 4 times a week" and "over 5 times a week;" sleep duration = "≤ 5 hours," "6–8 hours," and "over 9 hours;" and stress perception = a non-perceived stress group who reported "rarely feeling stressed" in daily life, and a perceived stress group who reported "frequently feeling stressed." For depression, participants who felt sad or depressed for more than 2 consecutive weeks in the last year to the point that it interfered with their daily life were categorized as the "depression" group. For perceived health status, those who reported "good" or "very good" were categorized as the "good health" group; those who reported "fair" were categorized as the "average health" group; and those who reported "poor" or "very poor" were categorized as the "poor health" group. Regarding physical activity level, questions on intense physical activity, moderate level physical activity, and walking were used. Intense physical activity comprised of exercising over 30 minutes/day for at least 5 days/week; moderate level physical activity comprised of exercising over 20 minutes/day for at least 3 days/week; walking comprised of walking over 30 minutes/day for at least 5 days/week. Participants engaged in one of the 3 physical activities were categorized as the "physically active" group. Regarding weight control behaviors, anyone who tried to lose, maintain, or gain weight in the last year was categorized as the "weight control behavior" group. For obesity, the height (m) and weight (kg) of each respondent was used to calculate BMI: < 18.5 kg/m^2 = "underweight", 18.5 kg/m^2–22.9 kg/m^2 = "normal weight", and ≥ 23.0 kg/m^2 = "obese".

For body image, "very thin" was categorized as "slender." "Slightly thin," "average," and "slightly overweight" were categorized as "average." "Extremely overweight" was categorized as "obese." Based on obesity determination and body image, the cases of "underweight-slender," "normal-average," and "obese-obese" were categorized as body image concordance. The remainders were categorized as BID. The BID group was sub-divided based on the obesity determination and body image: "normal-slender," "obesity-slender," and "obesity-average" were categorized as underestimation; "underweight-average," "underweight-obese," and "normal-obese" were categorized as overestimation.

4. Statistical analysis

Data were analyzed considering the complex sampling design. To estimate the population, individual weight was applied. The general characteristics and health behavior-related characteristics were analyzed using frequency analysis. BID discrepancies based on participants' general characteristics were analyzed using a chi-square test. To identify factors affecting BID, multivariable logistic regression analysis was performed. Standard error (SE), odds ratio (OR), 95% confidence interval (CI), and relative frequency (%) were all used to examine the data. Significance level for all tests was set at α = 0.05

5. Ethical considerations

The Institutional Review Board (IRB) of the Korean Centers for Disease Control and Prevention approved the Korean Community Health Survey (2014-08EXP-09-4C-A). The data were disclosed to the public except personal information of participants. This study was also approved by a university IRB (HYI-17-026-1).

Results

1. The general and health behavior-related characteristics according to the type of BID

Table 1 shows the characteristics of the study population. Of the population, 56.9% had body image concordance, 43.1% had discordance (36.0% for underestimation, 7.1% for overestimation). For underestimators, 52.7% were men, 41.7% were in their 30s, and 85.0% were obese. For overestimators, 1.1% were men, 5.2% were in their 30s, and 81.1% were underweight.

2. BID based on general and health behavior-related characteristics

For the underestimators, there were statistically significant differences depending on the following variables: gender (x^2 = 6,133.89, $p < 0.001$), age (x^2 = 725.52, $p < 0.001$), education level (x^2 = 80.45, $p < 0.001$), marital status (x^2 = 381.21, $p < 0.001$), employment status (x^2 = 720.40, $p < 0.001$), smoking status (x^2 = 2,894.53, $p < 0.001$), alcohol consumption (x^2 = 80.81, $p < 0.001$), sleep duration (x^2 = 113.91, $p < 0.001$), perceived depression (x^2 = 35.82, $p < 0.001$), perceived health condition (x^2 = 29.05, $p < 0.001$), and weight control behavior (x^2 = 339.03, $p < 0.001$).

For overestimators, there were statistically significant differences depending on the following variables: gender (x^2 = 1,898.81, $p < 0.001$), age (x^2 = 164.87, $p < 0.001$), education

Table 1. Participants' general and health behavior-related characteristics per body image discordance group (*N* = 59,361).

Characteristics		Total		Discordance between body mass index and body image					
				Concordance		Discordance			
						Under-estimation		Over-estimation	
		N	% (SE)	*n*	% (SE)	*n*	% (SE)	*n*	% (SE)
		59,361	-	33,864	56.9 (0.2)	21,262	36.0 (0.2)	4,235	7.1 (0.1)
Gender	Men	28,100	52.1 (0.2)	12,559	46.2 (0.3)	15,243	52.7 (0.3)	298	1.1 (0.1)
	Women	31,261	47.9 (0.2)	21,305	68.4 (0.3)	6,019	17.8 (0.2)	3,937	13.8 (0.2)
Age (y)	19–29	25,313	48.0 (0.2)	15,554	61.0 (0.3)	7,317	29.8 (0.3)	2,442	9.2 (0.2)
	30–39	34,048	52.0 (0.2)	18,310	53.0 (0.3)	13,945	41.7 (0.3)	1,793	5.2 (0.1)
Education level	≤ High school	14,696	21.6 (0.2)	8,012	54.1 (0.5)	5,789	39.6 (0.5)	895	6.3 (0.2)
	≥ College	44,665	78.4 (0.2)	25,852	57.6 (0.3)	15,473	35.0 (0.3)	3,340	7.4 (0.1)
Marital status	Married	29,401	44.4 (0.2)	16,002	53.5 (0.3)	11,727	40.7 (0.3)	1,672	5.7 (0.2)
	Single	29,960	55.6 (0.2)	17,862	59.5 (0.3)	9,535	32.2 (0.3)	2,563	8.3 (0.2)
Employment status	Employed	38,760	64.6 (0.2)	20,793	53.6 (0.3)	15,541	40.1 (0.3)	2,426	6.3 (0.1)
	Unemployed	20,601	35.4 (0.2)	13,071	62.8 (0.4)	5,721	28.4 (0.4)	1,809	8.8 (0.2)
Smoking status	Currently smoking	14,380	25.3 (0.2)	6,469	45.8 (0.5)	7,616	52.1 (0.5)	295	2.1 (0.1)
	Ex-smoker	5,091	9.2 (0.2)	2,237	44.7 (0.8)	2,740	53.0 (0.8)	114	2.3 (0.2)
	Non-smoker	39,890	65.5 (0.2)	25,158	62.8 (0.3)	10,906	27.3 (0.3)	3,826	9.8 (0.2)
Alcohol consumption	Currently drinking	50,818	87.3 (0.2)	28,747	56.5 (0.2)	18,683	36.8 (0.2)	3,388	6.7 (0.1)
	Ex-drinker	4,824	7.5 (0.2)	2,872	58.4 (0.8)	1,484	31.3 (0.8)	468	10.3 (0.5)
	Non-drinker	3,719	5.2 (0.2)	2,245	60.6 (1.0)	1,095	29.1 (0.9)	379	10.3 (0.6)
Breakfast consumption (d/wk)	≤ 4	29,789	52.1 (0.2)	17,010	56.8 (0.3)	10,605	36.0 (0.3)	2,174	7.2 (0.2)
	≥ 5	29,572	47.9 (0.2)	16,854	56.9 (0.3)	10,657	36.0 (0.3)	2,061	7.1 (0.2)
Sleep duration (h/d)	≤ 5	6,719	12.2 (0.2)	3,701	55.0 (0.7)	2,586	38.7 (0.7)	432	6.3 (0.3)
	6–8	49,721	83.2 (0.2)	28,311	56.7 (0.2)	17,880	36.1 (0.2)	3,530	7.2 (0.1)
	≥ 9	2,921	4.6 (0.2)	1,852	64.1 (1.0)	796	26.5 (0.9)	273	9.4 (0.6)
Perception of stress	Yes	18,783	32.4 (0.2)	10,628	56.3 (0.4)	6,820	36.6 (0.4)	1,335	7.1 (0.2)
	No	40,578	67.6 (0.2)	23,236	57.1 (0.3)	14,442	35.7 (0.3)	2,900	7.2 (0.1)
Perception of depression	Yes	3,540	6.1 (0.2)	2,164	59.7 (0.9)	1,054	30.5 (0.9)	322	9.7 (0.6)
	No	55,821	93.9 (0.2)	31,700	56.7 (0.2)	20,208	36.3 (0.2)	3,913	7.0 (0.1)
Perceived health status	Good	32,060	54.4 (0.2)	18,317	57.1 (0.3)	11,584	36.2 (0.3)	2,159	6.7 (0.2)
	Average	24,233	40.6 (0.2)	13,723	56.1 (0.4)	8,683	36.2 (0.3)	1,827	7.7 (0.2)
	Poor	3,068	5.0 (0.2)	1,824	60.6 (1.0)	995	31.2 (0.9)	249	8.2 (0.6)
Physical activity	Yes	23,803	43.8 (0.2)	13,576	56.9 (0.4)	8,544	36.1 (0.4)	1,683	7.0 (0.2)
	No	35,558	56.2 (0.2)	20,288	56.8 (0.3)	12,718	35.9 (0.3)	2,552	7.3 (0.2)
Weight control behavior	Yes	42,077	72.0 (0.2)	23,553	55.5 (0.3)	16,140	38.7 (0.3)	2,384	5.8 (0.1)
	No	17,284	28.0 (0.2)	10,311	60.3 (0.4)	5,122	29.0 (0.4)	1,851	10.7 (0.3)
Body mass index (kg/ m²)	Underweight	5,046	8.6 (0.1)	937	18.9 (0.6)	0	0	4,109	81.1 (0.6)
	Normal weight	30,031	50.7 (0.2)	29,175	96.9 (0.1)	730	2.7 (0.1)	126	0.4 (0.0)
	Obese	24,284	40.7 (0.2)	3,752	15.0 (0.3)	20,532	85.0 (0.3)	0	0
Body image	Slender	1,680	3.0 (0.1)	937	54.2 (1.4)	743	45.8 (1.4)	0	0
	Average	53,798	90.7 (0.1)	29,175	54.2 (0.2)	20,519	38.2 (0.2)	4,104	7.7 (0.1)
	Obese	3,883	6.3 (0.1)	3,752	96.8 (0.3)	0	0	131	3.2 (0.3)

All percentages were weighted to represent the total population of the 2014 Community Health Survey.
SE = standard error.

Table 2. The associations between concordance and discordance of body image and general and health behavior-related characteristics ($N = 59,361$).

Characteristics	Concordance ($n = 33,864$)	Under-estimation ($n = 21,262$)	χ^2	p	Concordance ($n = 33,864$)	Over-estimation ($n = 4,235$)	χ^2	p
	%(SE)	%(SE)			%(SE)	%(SE)		
Gender								
Men	45.2(0.3)	54.8(0.3)	6,133.89	< 0.001	97.7(0.1)	2.3(0.1)	1,898.81	< 0.001
Women	78.0(0.3)	22.0(0.3)			83.2(0.3)	16.8(0.3)		
Age (y)								
19-29	67.2(0.3)	32.8(0.3)	725.52	< 0.001	86.8(0.3)	13.2(0.3)	164.87	< 0.001
30-39	56.0(0.3)	44.0(0.3)			91.0(0.2)	9.0(0.2)		
Educational level								
≤ High school	57.7(0.5)	42.3(0.5)	80.45	< 0.001	89.5(0.4)	10.5(0.4)	5.04	0.040
≥ College	62.2(0.3)	37.8(0.3)			88.6(0.2)	11.4(0.2)		
Marital status								
Married	56.8(0.3)	43.2(0.3)	381.21	< 0.001	90.3(0.3)	9.7(0.3)	61.21	< 0.001
Single	64.9(0.3)	35.1(0.3)			87.8(0.3)	12.2(0.3)		
Employment status								
Employed	57.2(0.3)	42.8(0.3)	720.40	< 0.001	89.5(0.2)	10.5(0.2)	27.31	< 0.001
Unemployed	68.9(0.4)	31.1(0.4)			87.8(0.3)	12.2(0.3)		
Smoking status								
Currently smoking	46.7(0.5)	53.3(0.5)	2,894.53	< 0.001	95.6(0.3)	4.4(0.3)	596.29	< 0.001
Ex-smoker	45.7(0.8)	54.3(0.8)			95.2(0.5)	4.8(0.5)		
Non-smoker	69.7(0.3)	30.3(0.3)			86.5(0.2)	13.5(0.2)		
Alcohol consumption								
Currently drinking	60.6(0.3)	39.4(0.3)	80.81	< 0.001	89.4(0.2)	10.6(0.2)	78.09	< 0.001
Ex-drinker	65.1(0.8)	34.9(0.8)			85.0(0.7)	15.0(0.7)		
Non-drinker	67.5(1.0)	32.5(1.0)			85.5(0.9)	14.5(0.9)		
Breakfast consumption (d/wk)								
≤4	61.2(0.3)	38.8(0.3)	0.06	0.825	88.7(0.3)	11.3(0.3)	0.39	0.581
≥5	61.3(0.3)	38.7(0.3)			88.9(0.3)	11.1(0.3)		
Sleep duration (h/d)								
≤5	58.7(0.7)	41.3(0.7)	113.91	< 0.001	89.8(0.5)	10.2(0.5)	9.30	0.025
6-8	61.1(0.3)	38.9(0.3)			88.8(0.2)	11.2(0.2)		
≥9	70.8(1.0)	29.2(1.0)			87.2(0.8)	12.8(0.8)		
Perception of stress								
Yes	60.6(0.4)	39.4(0.4)	4.63	0.061	88.9(0.3)	11.1(0.3)	0.05	0.845
No	61.6(0.3)	38.4(0.3)			88.8(0.2)	11.2(0.2)		
Perception of depression								
Yes	66.2(0.9)	33.8(0.9)	35.82	< 0.001	86.0(0.8)	14.0(0.8)	21.71	< 0.001
No	60.9(0.2)	39.1(0.2)			89.0(0.2)	11.0(0.2)		
Perceived health status								
Good	61.2(0.3)	38.8(0.3)	29.05	< 0.001	89.5(0.2)	10.5(0.2)	22.29	< 0.001
Average	60.8(0.4)	39.2(0.4)			88.0(0.3)	12.0(0.3)		
Poor	66.1(1.0)	33.9(1.0)			88.1(0.8)	11.9(0.8)		
Physical activity								
Yes	61.2(0.4)	38.8(0.4)	0.03	0.878	89.1(0.3)	10.9(0.3)	1.98	0.207
No	61.3(0.3)	38.7(0.3)			88.6(0.2)	11.4(0.2)		
Weight control behavior								
Yes	58.9(0.3)	41.1(0.3)	339.03	< 0.001	90.6(0.2)	9.4(0.2)	267.66	< 0.001
No	67.5(0.4)	32.5(0.4)			84.9(0.4)	15.1(0.4)		

SE =standard error.

Table 3. Multivariable logistic regression analysis of factors for underestimation (N = 55,126).

Characteristics	Unadjusted	Adjusted[†]
	OR (95% CI)	OR (95% CI)
Gender		
Men	4.40 (4.21-4.59)*	5.26 (4.98-5.57)*
Women	1.00 (reference)	1.00 (reference)
Age (y)		
19–29	0.62 (0.60-0.65)*	0.74 (0.70-0.78)*
30–39	1.00 (reference)	1.00 (reference)
Education level		
≤ High school	1.21 (1.15-1.26)*	1.21 (1.15-1.28)*
≥ College	1.00 (reference)	1.00 (reference)
Marital status		
Married	1.41 (1.36-1.46)*	1.59 (1.50-1.68)*
Single	1.00 (reference)	1.00 (reference)
Employment status		
Employed	1.66 (1.59-1.73)*	1.00 (0.95-1.06)
Unemployed	1.00 (reference)	1.00 (reference)
Smoking status		
Currently smoking	2.62 (2.50-2.74)*	1.13 (1.07-1.20)*
Ex-smoker	2.73 (2.55-2.92)*	1.15 (1.06-1.24)*
Non-smoker	1.00 (reference)	1.00 (reference)
Alcohol consumption		
Currently drinking	1.36 (1.24-1.48)*	0.97 (0.88-1.08)
Ex-drinker	1.12 (1.00-1.25)	1.25 (1.10-1.42)*
Non-drinker	1.00 (reference)	1.00 (reference)
Breakfast consumption (d/w)		
≤ 4	1.00 (1.00-1.04)	0.96 (0.92-1.01)
≥ 5	1.00 (reference)	1.00 (reference)
Sleep duration (h/d)		
≤ 5	1.71 (1.53-1.90)*	1.15 (1.01-1.30)*
6–8	1.54 (1.40-1.70)*	1.13 (1.01-1.26)*
≥ 9	1.00 (reference)	1.00 (reference)
Perception of stress		
Yes	1.04 (1.00-1.09)	1.02 (0.97-1.07)
No	1.00 (reference)	1.00 (reference)
Perception of depression		
Yes	0.80 (0.73-0.87)*	0.94 (0.85-1.03)
No	1.00 (reference)	1.00 (reference)
Perceived health status		
Good	1.24 (1.13-1.35)*	1.25 (1.12-1.38)*
Average	1.26 (1.15-1.38)*	1.32 (1.18-1.46)*
Poor	1.00 (reference)	1.00 (reference)
Physical activity		
Yes	1.00 (0.96-1.04)	0.96 (0.92-0.99)*
No	1.00 (reference)	1.00 (reference)
Weight control behavior		
Yes	1.45 (1.39-1.52)*	2.05 (1.95-2.16)*
No	1.00 (reference)	1.00 (reference)

*p<0.05.
[†]Adjusted for gender, age, education level, marital status, employment status, smoking status, alcohol consumption, sleep duration, depression, perceived health status, and weight control behavior.
CI = confidence interval; OR = odds ratio.

Table 4. Multivariable logistic regression analysis of factors for overestimation (*N* = 38,099).

Characteristics	Unadjusted	Adjusted[†]
	OR (95% CI)	OR (95% CI)
Gender		
Men	0.12 (0.10-0.13)*	0.09 (0.07-0.10)*
Women	1.00 (reference)	1.00 (reference)
Age (y)		
19–29	1.53 (1.42-1.65)*	1.48 (1.33-1.63)*
30–39	1.00 (reference)	1.00 (reference)
Education level		
≤ High school	0.91 (0.83-0.99)*	1.00 (0.91-1.11)
≥ College	1.00 (reference)	1.00 (reference)
Marital status		
Married	0.77 (0.71-0.83)*	0.67 (0.60-0.74)*
Single	1.00 (reference)	1.00 (reference)
Employment status		
Employed	0.84 (0.78-0.91)*	1.03 (0.96-1.12)
Unemployed	1.00 (reference)	1.00 (reference)
Smoking status		
Currently smoking	0.29 (0.26-0.33)*	1.15 (0.97-1.36)
Ex-smoker	0.32 (0.26-0.41)*	0.83 (0.66-1.05)
Non-smoker	1.00 (reference)	1.00 (reference)
Alcohol consumption		
Currently drinking	0.70 (0.61-0.81)*	0.88 (0.75-1.02)
Ex-drinker	1.04 (0.87-1.24)	1.04 (0.86-1.25)
Non-drinker	1.00 (reference)	1.00 (reference)
Breakfast consumption (d/wk)		
≤ 4	1.02 (0.95-1.10)	1.03 (0.96-1.11)
≥ 5	1.00 (reference)	1.00 (reference)
Sleep duration (h/d)		
≤ 5	0.78 (0.65-0.93)*	0.97 (0.80-1.17)
6–8	0.86 (0.74-0.99)*	1.02 (0.87-1.21)
≥ 9	1.00 (reference)	1.00 (reference)
Perception of stress		
Yes	0.99 (0.92-1.07)	0.93 (0.84-1.01)
No	1.00 (reference)	1.00 (reference)
Perception of depression		
Yes	1.32 (1.16-1.51)*	1.21 (1.05-1.39)*
No	1.00 (reference)	1.00 (reference)
Perceived health status		
Good	0.87 (0.74-1.01)	0.91 (0.77-1.07)
Average	1.01 (0.87-1.18)	0.99 (0.84-1.17)
Poor	1.00 (reference)	1.00 (reference)
Physical activity		
Yes	0.96 (0.89-1.03)	1.02 (0.95-1.10)
No	1.00 (reference)	1.00 (reference)
Weight control behavior		
Yes	0.58 (0.54-0.63)*	0.41 (0.38-0.44)*
No	1.00 (reference)	1.00 (reference)

*$p < 0.05$.
[†]Adjusted for gender, age, education level, marital status, employment status, smoking status, alcohol consumption, sleep duration, depression, and weight control behavior.
CI =confidence interval; OR =odds ratio.

level (x^2 = 5.04 p = 0.040), marital status (x^2 = 61.21, p < 0.001), employment status (x^2 = 27.31, p < 0.001), smoking status (x^2 = 596.29, p < 0.001), alcohol consumption (x^2 = 78.09, p < 0.001), sleep duration (x^2 = 9.30, p = 0.025), perceived depression (x^2 = 21.71, p < 0.001), perceived health condition (x^2 = 22.29, p < 0.001), and weight control behavior [x^2 = 267.66, p < 0.001 (Table 2)].

3. Factors affecting BID

To identify the factors affecting BID, multivariable logistic regression analysis was conducted after univariable analysis for calibrating the variables. The adjusted ORs for BID relative to concordance are shown in Table 3 and 4. For underestimators, participants who were men (OR 5.26, 95% CI 4.98–5.57), had graduated from high school (OR 1.21, 95% CI 1.15–1.28), were married (OR 1.59, 95% CI 1.50–1.68), were current (OR 1.13, 95% CI 1.07–1.20) or ex-smokers (OR 1.15, 95% CI 1.06–1.24), were ex-drinkers (OR 1.25, 95% CI 1.10–1.42), had ≤ 5 (OR 1.15, 95% CI 1.01–1.30) or 6-8 hours of sleep (OR 1.13, 95% CI 1.01–1.26), had good (OR 1.25, 95% CI 1.12–1.38) or fair self-rated health (OR 1.32, 95% CI 1.18–1.46), and had healthy weight control behavior (OR 2.05, 95% CI 1.95–2.16) relative to their reference groups, had significantly higher ORs. Participants who were aged 19–29 years (OR 0.74, 95% CI 0.70–0.78) and were physically active (OR 0.96, 95% CI 0.92–0.99) relative to their reference groups had significantly lower ORs (Table 3). For overestimators, participants who were aged 19–29 years (OR 1.48, 95% CI 1.33–1.63) and had depression (OR 1.21, 95% CI 1.05–1.39) relative to their reference groups had significantly higher ORs. The participants who were men (OR 0.09, 95% CI 0.07–0.10), were married (OR 0.67, 95% CI 0.60–0.74), and had healthy weight control behavior (OR 0.41, 95% CI 0.38–0.44) relative to their reference groups, had significantly lower ORs (Table 4).

Discussion

This study showed that the rate of concordance between BMI and body image was 56.9%. Many previous studies on body image assessed the degree of concordance based on BMI guidelines published by the WHO. Therefore, it is difficult to directly compare them to this study's results. Although our results showed a lower percentage than a study reporting 74.9% body image concordance among adults aged 19–64 years [11], this study had similar results to a study that showed 56.4% body image concordance among women aged 20–30 years [14]. Since this study used the BMI criterion for Asians, these results may more accurately reflect body image concordance and provide a clearer understanding of the factors influencing BID.

Regarding both BID types, the results support a previous finding showing that men tend to underestimate and women tend to overestimate their body shapes [10]. This can be due to differences in the "ideal" body shapes that Korean society has for men and women. While women view a slim, frail, and "Westernized" body shape as ideal, men view a well-built body as ideal. Perhaps it is a social phenomenon that women wish to be slimmer and men wish to be more muscular. Moreover, the greater the BID, the more inappropriate weight control methods women try: disproportionate diets, such as fasting and meal replacements, or drugs, such as antiemetics and diuretics [19]. In contrast, men have a higher tendency than women to underestimate their weight, which often leads to the negligence of weight control behavior [10].

Gender, age, marital status, and weight control behavior all significantly affected both BID types. Participants in their 20s underestimated their body shape less and overestimated more than those in their 30s. This finding matches the claim that younger adults in their 20s and 30s tend to overestimate their body shapes [14,20]; it also supports the assertion that teenagers have more distorted body images than young adults [21]. Moreover, it is consistent with the results that 45% of female and 25% of male college students overestimate their body shapes [22].

Generally, men tend to underestimate their body shapes; however, men aged in their 20s, unlike other male adults, typically control their weight to maintain a good-looking body shape [23]. This appears to reflect the phenomenon that both women and men try to maintain a socially desirable body shape. Therefore, it is necessary to implement an intervention program for young adults in their 20s to develop healthy body images.

Married participants underestimated their body shapes more than single participants, which was consistent with a previous study [14]. Perhaps ideal body images displayed in mass media and advertising target young adults. In comparison, people who are married and have children are less pressured to maintain socially desirable body shapes. Additionally, married people may prefer to maintain an ideal weight for medical and health-related reasons as opposed to social reasons [24,25].

While those who utilize weight control behavior were found to underestimate their body shapes more than their non-control counterparts, it appears that various weight control behaviors improve individuals' self-respect and self-image [26]. For this reason, even obese participants have a high likelihood of underestimating their body weight and possibly consider it ideal.

Furthermore, alcohol consumption, smoking, sleep duration, perceived health condition, and physical activity, significantly affected weight underestimation. Participants with a drinking history underestimated their body image, perhaps due to

weight loss from alcohol withdrawal. In contrast, participants who once smoked or were currently smoking had a higher likelihood of underestimating their body image compared to non-smokers. There is certainly a common notion that smoking is effective for weight loss; however, it is necessary to investigate the correlation between alcohol consumption, smoking, and weight discordance in a follow-up study.

Participants who perceived their health condition as "average" or "good" were more likely to underestimate their body image compared to the "poor" health condition group. Since this could be due to a bias that society views being underweight as healthy, it is necessary to promote the understanding of what a "normal" healthy body shape looks like and to establish a proper understanding of how an individual's body shape changes with the state of health.

Physically active participants were more likely to underestimate body image compared to physically inactive participants. This is consistent with research showing that people who walk and exercise moderately or regularly have a lower OR of underestimation [11,27]. Physical activity is encouraged as a measure to improve body image as they aim to improve health and fitness, which contributes to becoming slim [11].

The participants in this study were not asked to explain the purpose of their physical activities (e.g., physical fitness or weight control). Most participants who underestimated their body shapes in this study were obese (85.0%). If the purpose of their physical activity was to lose weight, participants who underestimated their BMI could have believed that they had normal BMI, thus making it unnecessary to lose weight. Due to difficulty in clarifying a causal relationship, a study determining the relationship between physical activity motivation and body image is required.

Perceived depression also significantly affected the overestimation of body image. These results are consistent with the finding that physical dissatisfaction and depression are closely related [4,28], and that self-perceived obesity amplifies depression [29]. In particular, depression can lead to problems, such as eating disorders, which can lower self-esteem and further increase depression [30]. Therefore, for those who overestimate their body shapes, it is necessary to check for depression and implement an intervention to reduce depression; in doing so, it is possible to promote an appropriate body image.

Underestimation of body image is highly likely to lead to being overweight or obese. In contrast, overestimation can promote unhealthy weight control behaviors, decrease self-esteem, and increase depression or eating disorders [11]. Self-perception of body shape requires not only individual effort, but also a simultaneous social and cultural approach [30]. Public health education on weight control and obesity prevention should be implemented among adults. Furthermore, accurate information about normal weight and body shape should be portrayed in mass media to improve an individual's self-perceived body image.

Appropriate body image during adulthood is closely related to health management behaviors, such as physical activity and eating habits, and psychosocial wellbeing. It forms the basis of healthy living during later adulthood. It has been suggested that development and implementation of a body image improvement program would help to improve BID, taking into account factors such as gender and age. Moreover, a follow-up study should be conducted to survey the specific factors pertaining to BID, such as health management behaviors, eating habits, and socio-psychological factors, and to examine related factors influencing BID among adults aged over40 years.

This study had a key limitation. Since a secondary data analysis was conducted, psychosocial factors of body image, such as self-esteem and self-efficacy, were not addressed. In a follow-up study, these should be included, along with further investigation into the differences in BID in male and female adults to enable the development of a tailored intervention program. Despite this limitation, this study is significant in that it used raw data from a nationally representative, standard survey and identified the important factors affecting young adults' BID.

Conflicts of Interest

All authors have no conflicts of interest to declare.

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