Differences in unhealthy weight control behaviors and depression in Korean adult women: the roles of body mass index and body weight perception

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ABSTRACT

This study examined the associations of body mass index (BMI) and body weight perception (BWP) with unhealthy weight control behaviors (UWCBs) and depression among 8,581 Korean women aged 20-64 years who completed the 2001 Seoul Citizens Health Indicator Survey. We found that BWP partially functions as a mediate between BMI and UWCBs and between BMI and depression. Women with both extreme BMI and BWP are at greatest and lowest risk of UWCBs. Contrary to UWCBs, women having actually overweight while perceiving themselves to be obese are at greatest depression, while women whose BMI and BWP are all normal are at lowest of depression. Particularly, having either underestimation or overestimation of body weight predicts the likelihood and extent of UWCBs and depression, regardless of BMI. Further, women with lower BMI are more likely to rely on BWP than those with higher BMI if they are exposed to UWCBs and depression.

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INTRODUCTION

Korea has undergone a rapid nutritional transition with economic growth during the past three decades, and as a result, there has been significantly increasing in body mass index (BMI) as already experienced in the developed countries (Kim et al., 2000). Along with economic growth, Western culture that values and idealizes a slim physique for women population has been naturally introduced in Korean culture and, in turns, promotes an increase in body image concerns as well (Un, 2007; Jung & Lee, 2006). However, there has been a substantial difference in the increasing rate between overweight BMI and self-perception of being overweight among Korean adult women in recent years (Ministry of Health and Welfare, 2006): i.e., the former has increased slightly (27.9% in 2001 and 28.0% in 2005), while the latter has increased markedly (34.4% in 2001 and 39.4% in 2005). This phenomenon for women population can be fundamentally attributable to be self-contradictory from a cultural and clinical point of view: an ideal and healthy physique clinically determined is *normal BMI*, whereas that culturally desired is *thinness* (Jee et al., 2006; Paquette & Kim, 2004). Particularly, Korean women have lower BMI but higher prevalence of perceived overweight than do other Asian and Western women, consequently the number of Korean women who are obsessed with dieting to lose weight has increased steadily (Jung & Lee, 2006; Lee et al., 2006; Wardle et al., 2006; Kim et al., 2000). Despite the fact, this population, including their BMI, body weight perception (BWP), health status, and health-related behaviors, has still been understudied.

Body image is an important part of the evaluation of ourselves and others in social interactions (Jung & Lee, 2006). Not only overweight or obese women who deviate greatly from the cultural ideal of body type but also those of normal-weight are

likely vulnerable to distorted BWP that denotes a negative body image or body weight dissatisfaction (Meland et al., 2007; Annis et al., 2004; Jones, 2004; Olmsted & McFarlane, 2004; Xie et al., 2003; Friedman et al., 2002). When persistent, distorted BWP leads them to adopt unhealthy weight control behaviors (UWCBs), such as fasting, self-induced vomiting, taking diet pills, and using laxatives, as well as a healthy diet and exercise (Neumark-Sztainer, 2006; Heywood & McCabe, 2006; Eisenberg et al., 2005). It has been also reported that distorted BWP and UWCBs are indirectly and directly related to higher depressive symptoms (ter Bogt et al., 2006; Daniels, 2005; Xie et al., 2003; Friedman et al., 2002). Although these previous studies are noteworthy, since they are also limited by the focus on high-risk study population, such as adolescents (a period of rapid and intense emotional and physical change compared to any other ages) and overweight/obese adults who participated in weight-loss treatment programs (a higher probability of being dissatisfied with body weight, depressed, or exposed to UWCBs compared to non-clinical samples of adults), so we do not clearly know if such phenomenon exists among the general female adult population. Eaton et al. (2005) have suggested that UWCBs as a confounder that may decrease the likelihood of significant association of BMI and BWP with suicidal ideation should be considered. Moreover, numerous studies have suggested that BMI, BWP, UWCBs, and depressive symptoms are highly and mutually correlated (Meland et al., 2007; Daniels, 2005; Eisenberg et al., 2005; Xie et al., 2003), to our knowledge, there has been little effort to consider four items simultaneously in the analysis. From the above evidences, if BWP functions as a mediator between BMI and depression, and UWCBs also plays an important predictor of depression, it is also necessary to analyze the mediating role of BWP between BMI and UWCBs to better understand the difference in UWCB and

depression according to BMI and BWP. In prior studies of adolescent with a cross-sectional design, BWP as either underweight or overweight has been related to higher depressive symptoms, particularly the pattern has been clearly observed in individuals who are actually normal BMI but perceive themselves to be overweight compared to their counterpart of normal BMI and good BWP (Daniels, 2005; Xie et al., 2003). Compared to adolescent population, we believe that adult women may show different patterns due to a diverse range of ages, BMI, and socioeconomic status. In order to identify who at greater risk of UWCBs and depression and the role of BWP in relation to UWCBs and depression can provide further information about BWP so as to increase our understanding of women's experience with UWCBs and depression.

Using a large representative sample of Korean adult women, this study aimed (1) to examine the mediating function of BWP in the relationship between BMI and UWCBs and between BMI and depression, (2) to investigate the comparison of BWP differences in UWCBs and depression according to BMI, and (3) to uncover who is at the greatest risk of UWCBs and depression among 10 different combination groups of BMI and BWP, controlling for various individual characteristics that are well-known to be associated with both UWCBs and depression (Ohayon, 2007; Kim, 2006; Ryu et al., 2003; Wardle and Griffith, 2001).

METHODS

Data and participants

Data from the 2001 Seoul Citizens Health Indicator Survey (SCHIS) conducted by the Seoul Metropolitan government, and also officially approved by the Korea National Statistical Office (KNSO Certificate Number: 20108), were analyzed. The

SCHIS used a stratified multistage sampling design from 20,981 households in 25 examination *KUs* (districts) throughout Seoul, consequently 19,360 (females 10,604 & males 8,756) residents participated the survey (the response rate is 92.3%). Trained interviewers made house-to-house visit and conducted face-to-face interviews with participants, from July 15 through October 14, 2001. Further details regarding the survey design and methods have been given elsewhere (Metropolis of Seoul & Korean Institute for Health and Social Affairs, 2002). Of the females as the study population, those aged 65 and older were excluded from the analysis in order to avoid a potential overestimation of the results because elderly females tend to report their height or weight less accurately and to consider being chubby as an healthy and ideal body image (Spencer et al., 2002; White et al., 1997). Consequently, information from 8,581 women aged 20-64 (37.3 years±1.8) residing in Seoul was available for analysis. Since Seoul is not only the capital of Korea where is a quarter of the total national population but also the core of Korean culture, politics, and economics, we believe that a selected population for this study may be generalizable to a broad population of Korean adult women.

Measures: dependent variables

We had two dependent variables: UWCBs and depression. As indicated by a number of previous studies (Neumark-Sztainer et al., 2006; Talamayan et al., 2006; Eaton et al., 2005; Eisenberg et al., 2005), the former is measured by the question, "Have you ever engaged in at least one of the following methods during the past year, such as skipping meals, taking diet pills/products, using laxatives/diuretics, and weight loss surgeries?" Responses were dichotomized into "yes" if they had used any of these

methods and “no” if none had been done. The latter was ascertained by asking, “How often they feel depressed during the past year?” with using a four-point answer scale: always, sometimes, seldom, and never. The responses were also divided into a dummy-variable for the analysis: the “always (7.6%)” category was only regarded as “depression”, not the “sometimes” category because most (59.4%) answered this category.

Measures: independent variables

The SCHIS asked participants to self rate their BWP by using a five-point answer: very underweight, slightly underweight, about the right (normal), slightly overweight, and very overweight (obese). Since only few participants selected “very underweight (0.7%)”, the category was collapsed into the “slightly underweight” category, and so four BWP categories were determined. The SCHIS included information on self-reported weight and height without clothes and shoes which are used for the BMI calculation (kg/m^2). The Asian-Pacific BMI criterion suggested by WHO (Weisell, 2002) was used for the analysis, because multiple risks of health associated with obesity occur at a lower BMI in Asian populations compared to Caucasians. BMI was classified into four groups: underweight (<18.5), normal weight (18.5 to 22.9), overweight (23.0 to 24.9), and obese (≥25.0). From the combination of BMI and BWP, 10 different categories were produced as shown in the Figure 1. For instances, the category of normal BMI and normal BWP indicates if women who have actually normal BMI and perceive their weight to be normal, and the category of normal BMI and overestimation BWP implies if women who have actually normal BMI but perceive themselves as heavier than their actually are.

Categorization for other covariates such as demographic characteristics (age and marital status), socioeconomic status (educational attainments, household income, and employment status) and health-related behaviors (cigarette smoking, alcohol consumption, and physical activity) was conventional and straightforward as shown in the Table 1.

-- Figure 1 about here --

Statistical analysis

To test the mediating role of BWP between BMI and both outcomes, the following conditions proposed by Baron and Kenny (1986) must be required: 1st condition is that BMI must be related to both outcomes (see Table 1), 2nd condition is that BMI must be related to the mediator (see Table 2), and 3rd condition is that the mediator must be related to both outcomes, controlling for BMI, and the significant relationships must be weaker when the mediator is added into the model 2 of logistic regression (see Table 3 & 4).

Multivariate analyses were carried out to examine the greatest risk of UWCBs (see the model 3 in Table 3) and depression (see the model 4 in Table 4), controlling for covariates (i.e., demographic/SES characteristics and health behaviors). Although UWCBs and depression were both response variables, we included the former as a control in predicting the latter. In the identification of the BWP differences in UWCBs and depression according to BMI, small frequency responses to each BMI category that may lead to biased inferences were deleted in the analysis. All analyses were done with the SAS (version 9.1).

RESULTS

Descriptive analysis of UWCBs and depression

Table 1 provides the percentage distributions and crude odds ratios (95% confidential intervals) of all variables of interest used in the current study by UWCBs and depression. Majority women (58.9%) are within the normal BMI ranges, followed by the overweight (17.7%), the obese (13.7%), and the underweight (9.7%). Although the order of magnitudes for BWP is the same as BMI, the distributions slightly differ between them: e.g., normal (50.0%), overweight (33.8%), obese (6.3%), and underweight (9.9%). From the combination of BMI and BWP, over half have an adequate BWP of their BMI, while approximately 42.0% have distorted BWP (19.7% underestimate and 21.2% overestimate their weight, compared to their actual BMI).

The higher BMI women have, the more likely they are to be exposed to UWCBs and depression. This finding supports the 1st condition. BWP also shows a similar fashion, except for the association between underweight BWP and depression. The highest proportion of UWCBs is observed in women having overweight BMI while perceiving themselves as obese. For depression, such pattern is more observable in those with obese BMI and BWP. Indeed, women at risk for UWCBs tend to be more depressed than those non-UWCBs counterpart, albeit not significant (p=0.0932). The findings and explanations of other individual profiles significantly associated with UWCBs and depression are not given in the subsequent tables and the discussion because their associations are largely consistent with what have been found by previous studies of a similar nature (Ohayon, 2007; Kim, 2006; Ryu et al., 2003; Wardle and Griffith, 2001). Table 2 supports the 2nd condition, showing the significant association between BMI and BWP.

--Table 1 & 2 about here--

Multivariate analysis of UWCBs

Table 3 presents multivariate logistic regression analyses, in the forms of odds ratios (ORs) and 95% confidence intervals (CIs), for the association between BMI and UWCBs without (model 1) and with (model 2) BWP, controlling for demographic/SES characteristics and health-related behaviors. Model 1 shows that the patterns of BMI are similarly observed as shown in the descriptive analysis. Although overall the associations between individual profiles and UWCBs do not change in their magnitudes and significances (not shown in table), the association between BMI and UWCBs is considerably weaker when BWP is included in Model 2 than when BWP is not included (the 3rd condition is accepted), indicating that BWP partially mediates the association between BMI and UWCBs. Model 3 includes the combination of BMI and BWP to identify who is most vulnerable at risk of UWCBs. Note that among 10 different categories, the category of normal BMI and normal BWP is used as a reference in the analysis. It shows that women simultaneously having both extreme BMI and BWP are at greatest (OR, 6.12 [95% CI, 4.70-7.95]) and lowest (OR, 0.22 [95% CI, 0.12-0.38]) risk of UWCBs, even women having normal BMI while perceiving as being overweight or obese are more likely to use UWCBs than their counterpart, controlling for other risk factors included in the previous models.

-- Table 3 about here--

Multivariate analysis of depression

Table 4 provides findings of multivariate logistic regression analyses for the

association between BMI and depression without (model 1) and with (model 2) BWP. Contrary to the Model 1 of UWCBs, Model 1 of depression contains age only because the significant association between BMI and depression are disappeared after controlling for other covariates, and as a result, we can not identify whether the net function of BWP between them. Model 1 shows that obese women are more likely to be depressed than their normal-weight counterpart. The odds ratio of the association between obese BMI and depression decreases from 1.25 (95% CI, 1.01-1.56) to 0.92 (95% CI, 0.69-1.23) when BWP is added in Model 2 (the 3rd condition is accepted). The analysis also implies that BWP completely meditate between BMI and depression among obese women. However, we cannot say that BWP would strongly contribute more to depression than to UWCBs due to the different covariates controlled between them. In other words, depression may be more significantly associated with individual disadvantage in demographic/SES characteristics and health behaviors than with either BWP or BMI among general adult women. On the one hand, Model 3 that considered UWCBs as a covariate illustrates that the magnitude and significance of UWCBs in relation to depression not only increase but become significant. Unlike observed in the descriptive analysis, Model 4 shows that women having overweight BMI while perceiving to be obese are most likely to be depressed than their normal BMI and BWP counterpart, even higher than those whose BMI and BWP are all obese, controlling for individual risk factors including UWCBs. Further, even women who having normal BMI while perceiving to be heavier than they were tend to be also at higher risk of depression than their counterparts as well, albeit marginally significant (p=0.0940).

--Table 4 about here--

Multivariate analysis of the BWP differences in UWCBs and depression according to BMI

In Table 3 and 4, notable differences in UWCBs and depression between 4 different BMI categories (A) and 10 different combination groups of BMI and BWP (B) are found. For an example, when comparing women whose BMI and BWP are all obese in (B) with those of obese BMI in (A) (see the model 1, where BWP is not considered), women in (B) has a greater risk of UWCBs and depression than those in (A). Further, compared to those in (A), the likelihood of both outcomes increases or decreases when they overestimate or underestimate their body weight. However, since women in (A) and (B) cannot be directly compared, it is necessary to examine the BWP differences in UWCBs and depression according to BMI category. Thus, Table 5 provides the result of this issue, controlling for all covariates. Note that the category with the same BWP as a BMI category is used as a reference in each BMI category. For UWCBs, its odds ratios increase or decrease when perceiving to be heavier (former) or smaller (latter) than BMI (reference). For depression, the patterns are similar to UWCBs, but the associations between normal BWP and underweight BMI and between underweight BWP and normal BMI are exceptional, even though not statistically significant.

--Table 5 about here--

DISCUSSION will be completed

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<table>
<tr><td></td><td></td><td colspan="4">Body Mass Index (BMI)</td></tr>
<tr><td></td><td></td><td>Unweight</td><td>Normal</td><td>Overweight</td><td>Obese</td></tr>
<tr><td rowspan="4">Body Weight Perception (BWP)</td><td>Underweight</td><td>(2) Underweight BMI & Underweight BWP</td><td>(5) Normal BMI & Underweight BWP</td><td rowspan="2">(6) Overweight BMI & Underestimation of BWP</td><td rowspan="3">(7) Obese BMI & Underestimation of BWP</td></tr>
<tr><td>Normal</td><td rowspan="3">(8) Underweight BMI & Overestimation of BWP</td><td>(1) Normal BMI & Normal BWP (reference)</td></tr>
<tr><td>Overweight</td><td rowspan="2">(9) Normal BMI & Overestimation of BWP</td><td>(3) Overweight BMI & Overweight BWP</td></tr>
<tr><td>Obese</td><td>(10) Overweight BMI & Overestimation of BWP</td><td>(4) Obese BMI & Obese BWP</td></tr>
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Figure 1. Combination of body mass index and body weight perceptiom

Table 1. Percentage distributions and crude odds ratios (95% confidential intervals) of Body mass index (BMI), body weight perception (BWP), combination of BMI and BWP, demographic/socioeconomic characteristics, and health behaviors by unhealthy weight control behaviors (UWCBs) and depression in Korean adult women (n=8,581)

	UWCBs			Depression			Total N
	%†	Crude OR	(95% CI)	%†	Crude OR	(95% CI)	
BMI							
[Normal]	13.5			6.8			5,053
Underweight	8.4	0.58**	(0.45-0.76)	6.6	0.96	(0.72-1.29)	837
Overweight	15.6	1.18*	(1.01-1.39)	9.2	1.39**	(1.13-1.71)	1,516
Obese	21.9	1.79**	(1.53-2.10)	19.6	1.72**	(1.39-2.12)	1,175
BWP							
[Normal]	10.1			6.4			4,285
Underweight	3.2	0.31**	(0.21-0.46)	9.1	1.46**	(1.12-1.90)	853
Overweight	21.2	2.40**	(2.10-2.74)	8.6	1.36**	(1.14-1.62)	2,901
Obese	31.6	4.11**	(3.34-5.06)	12.6	2.08**	(1.57-2.76)	542
Combination of BMI and BWP							
[Normal BMI - Normal BWP]	10.0			6.3			3,337
Underweight BMI - Underweight BWP	3.2	0.29**	(0.17-0.51)	7.8	1.26	(0.86-1.86)	412
Overweight - Overweight	17.0	1.83**	(1.49-2.24)	9.3	1.53**	(1.18-1.99)	938
Obese BMI - Obese BWP	30.0	3.84**	(3.02-4.90)	12.9	2.22**	(1.60-3.08)	387
Normal BMI - Underestimation BWP‡	3.8	0.35**	(0.21-0.59)	10.1	1.69**	(1.20-2.39)	424
Overweight BMI - Underestimation BWP‡	8.2	0.80	(0.57-1.13)	8.4	1.37	(0.97-1.95)	476
Obese BMI - Underestimation BWP‡	17.9	1.96**	(1.58-2.42)	10.3	1.72**	(1.31-2.24)	788
Underweight BMI - Overestimation BWP‡	13.4	1.39*	(1.03-1.88)	5.4	0.86	(0.55-1.33)	425
Normal BMI - Overestimation BWP‡	25.7	3.10**	(2.62-3.67)	7.1	1.15	(0.89-1.48)	1,292
Overweight BMI - Overestimation BWP‡	37.3	5.32**	(3.51-8.07)	12.8	2.19*	(1.20-3.98)	102
Age							
[20-29]	22.3			5.2			2,113
30-39	14.8	0.61**	(0.52-0.70)	5.6	1.08	(0.84-1.39)	2,665
40-49	11.9	0.47**	(0.40-0.56)	7.1	1.39*	(1.07-1.80)	1,916
50-64	8.1	0.31**	(0.25-0.61)	14.6	3.11**	(2.47-3.91)	1,888
Marital status							
[Married]	12.3			6.6			5,768
Unmarried	23.7	2.23**	(1.95-2.54)	5.2	0.79*	(0.63-0.99)	1,813
Divorced/separated/widowed	10.9	0.88	(0.71-1.09)	19.7	3.50**	(2.90-4.22)	1,000
Educational attainment							
[College or more]	17.4			4.0			3,061
High school graduate	14.5	0.81**	(0.71-0.92)	6.8	1.76**	(1.41-2.21)	3,562
Less than high school	10.0	0.53**	(0.44-0.63)	15.7	4.54**	(3.65-5.65)	1,958
Monthly Household income							
[3,001 or more]	18.8			3.9			978
2,001-3,000	16.3	0.84	(0.69-1.03)	4.1	1.05	(0.71-1.56)	1,910
1,001-2,000	13.6	0.68**	(0.56-0.82)	6.6	1.74**	(1.22-2.46)	3,600
1,000 or less	12.6	0.62**	(0.51-0.76)	15.2	4.43**	(3.14-6.26)	2,093
Employment status							
[Non-manual]	19.9			4.1			1,528
Manual	13.6	0.63**	(0.53-0.75)	9.8	2.52**	(1.89-3.36)	2,199
Unemployed	13.3	0.62**	(0.53-0.72)	8.1	2.04**	(1.56-2.68)	4,854
Smoking status							
[Never smoker]	13.9			7.1			7,927
Ex-smoker	30.3	2.71**	(1.89-3.88)	11.7	1.75*	(1.05-2.92)	145
Smoker	20.4	1.60**	(1.28-2.00)	18.3	2.94**	(2.31-3.74)	509
Alcohol intake							
[Never drinker]	9.6			9.6			3,509
Moderate drinker	17.2	1.96**	(1.71-2.24)	5.6	0.59**	(0.50-0.70)	4,646
Heavy drinker	26.3	3.37**	(2.64-4.29)	14.6	1.61**	(1.21-2.16)	426
Physical exercise							
[4 or more days per week]	13.9			6.3			1,131
1-3 days per week	13.6	0.98	(0.81-1.17)	5.7	0.91	(0.65-1.26)	1,416
Sometimes or never	19.0	1.46**	(1.17-1.80)	8.6	1.40**	(1.09-1.81)	6,034
Engaging in UWCBs							
[No]				7.6			7,335
Yes				9.0	1.20	(0.97-1.48)	1,246
Total N	1,246			670			8,581

Note: Reference category for each variable is in [ ]

†Positive responses (%) to each independent variable by dependent variables were described

‡Underestimation means when she perceives herself as smaller than her BMI; Overestimation means when she perceives herself as heavier than her BMI

Table 2. Percentage distributions and adjusted odds ratios (95% confidential intervals) of Body mass index (BMI) on underweight and overweight/obese body weight perception (BWP) in Korean adult women

	Underweight BWP [normal BWP]*			Overweight/obese BWP [normal BWP]*		
	%	OR	(95% CI)	%	OR	(95% CI)
BMI [Normal]	11.3			75.3		
Underweight	50.7	10.72**	(8.81-13.05)	5.7	0.01**	(0.01-0.02)
Overweight	2.7	0.16**	(0.09-0.28)	98.8	43.42**	(24.48-77.02)
Obese	4.5	0.23**	(0.08-0.64)	99.6	183.48**	(67.39-499.55

Note: Reference category for each variable is in [ ]

* Adjusted for age, marital status, educational attainment, monthly household income, occupational class, smoking status, alcohol intake, and physical exercise

** p<.01

Table 3. Adjusted odds ratios† for the effects of BMI, body weight perception (BWP), combination of BMI and BWP (BMI-BWP), demographic/socioeconomic characteristics, and health behaviors on unhealthy weight control behaviors (UWCBs) in Korean adult women (n=8,581)

	Model 1		Model 2		Model 3	
	OR	95% CI	OR	95% CI	OR	95% CI
BMI [Normal]						
Underweight	0.39**	(0.30-0.50)	0.72*	(0.54-0.96)		
Overweight	1.84**	(1.54-2.18)	1.09	(0.91-1.32)		
Obese	3.32**	(2.77-3.99)	1.46**	(1.17-1.82)		
BWP [Normal]						
Underweight			0.34**	(0.27-0.51)		
Overweight			2.47**	(2.11-2.88)		
Obese			3.91**	(3.00-5.09)		
Combination of BMI and BWP [Normal BMI - Normal BWP]						
Underweight BMI - Underweight BWP					0.22**	(0.12-0.38)
Overweight - Overweight					2.61**	(2.10-3.24)
Obese BMI - Obese BWP					6.12**	(4.70-7.95)
Normal BMI - Underestimation BWP					0.42**	(0.25-0.70)
Overweight BMI - Underestimation BWP					1.38	(0.96-1.98)
Obese BMI - Underestimation BWP					3.43**	(2.71-4.33)
Underweight BMI - Overestimation BWP					0.84	(0.62-1.15)
Normal BMI - Overestimation BWP					2.71**	(2.27-3.22)
Overweight BMI - Overestimation BWP					4.99**	(3.22-7.75)
Adjusted R^2	0.1189		0.1597		0.1594	

Note: Reference category for each variable is in [ ]

* p<0.05; ** p<0.01.

†Aadjusted for age, marital status, educational attainment, monthly household income, occupational class, smoking status, alcohol intake, and physical exercise

Table 4. Adjusted odds ratios† for the effects of BMI, body weight perception (BWP), combination of BMI and BWP (BMI-BWP), and unhealthy weight control behaviors (UWCBs) on depression in Korean adult women (n=8,581)

	Model		Model 2		Model 3		Model 4	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
BMI [Normal]								
Underweight	1.16	(0.86-1.58)	1.06	(0.76-1.49)	1.10	(0.78-1.56)		
Overweight	1.12	(0.90-1.38)	1.00	(0.80-1.27)	0.91	(0.72-1.16)		
Obese	1.25*	(1.01-1.56)	0.92	(0.69-1.23)	0.79	(0.59-1.06)		
BWP [Normal]								
Underweight			1.44*	(1.08-1.93)	1.36*	(1.00-1.83)		
Overweight			1.30*	(1.05-1.59)	1.30*	(1.05-1.61)		
Obese			2.03**	(1.42-2.89)	1.99**	(1.38-2.87)		
Engaging in UWCBs [No]								
Yes					1.39**	(1.10-1.76)	1.40**	(1.10-1.77)
Combination of BMI and BWP [Normal BMI - Normal BWP]								
Underweight BMI - Underweight BWP							1.44	(0.96-2.17)
Overweight - Overweight							1.18	(0.90-1.56)
Obese BMI - Obese BWP							1.51*	(1.06-2.16)
Normal BMI - Underestimation BWP							1.35	(0.94-1.94)
Overweight BMI - Underestimation BWP							0.84	(0.58-1.21)
Obese BMI - Underestimation BWP							1.00	(0.75-1.33)
Underweight BMI - Overestimation BWP							1.14	(0.71-1.81)
Normal BMI - Overestimation BWP							1.26	(0.96-1.64)
Overweight BMI - Overestimation BWP							2.24*	(1.19-4.20)
Adjusted R^2	0.0398		0.0451		0.1252		0.1253	

Note: Reference category for each variable is in [ ]

* p<0.05; ** p<0.01.

†Model 1 and 2 were adjusted for age; Model 3 and 4 were adjusted for age, marital status, educational attainment, monthly household income, occupational class, smoking status, alcohol intake, and physical exercise

Table 5.Adjusted odds ratios for the effects of body weight perception (BWP) on unhealthy weight control behaviors (UWCBs) and depression in Korean women (n=8,563) by each BMI category

	Underweight (n=836)				Normal (n=5,053)				Overweight (n=1,503)				Obese (n=1,171)			
	UWCBs†		Depression‡		UWCBs		Depression		UWCBs		Depression		UWCBs		Depression	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
BWP																
Underweight	1.00		1.00		0.43**	(0.26-0.72)	1.38	(0.96-1.99)	NA		NA		NA		NA	
Normal	3.39**	(1.76-6.51)	0.57	(0.29-1.10)	1.00		1.00		0.51**	(0.35-0.75)	0.68	(0.45-1.04)	0.46*	(0.24-0.90)	0.69	(0.33-1.48)
Overweight	19.69**	(6.71-57.79)	4.07**	(1.27-13.03)	2.65**	(2.22-3.17)	1.31*	(1.00-1.71)	1.00		1.00		0.56**	(0.41-0.76)	0.60*	(0.39-0.91)
Obese	NA		NA		2.53**	(1.35-4.73)	1.53	(0.58-4.04)	2.12**	(1.32-3.40)	2.05*	(1.04-4.06)	1.00		1.00	

* p<0.05; ** p<0.01.

Note: A reference category by each BMI group presented 1.00; Problematic statistical analysis due to small frequency responses to each BMI category was excluded and described as "not available (NA)"

† UWCBs was adjusted for age, marital status, educational attainment, monthly household income, employment statsu, smoking status, alcohol intake, and physical exercise

‡ Depression was adjusted for age, marital status, educational attainment, monthly household income, employment statsu, smoking status, alcohol intake, physical exercise, and engaging in UWCBs