

## Original Papers

# Unnecessary Dieting Intention and Behavior among Female Students in Naha City, Japan

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**Abstract:** Weight concerns and dieting are prevalent among female adolescents both in Western and Asian countries. They can result in negative psychological and physiological consequences. This study aimed to examine the relative importance of social and personal factors in the decision to diet among female adolescent students in Japan, applying the Theory of Planned Behavior. Data were collected from five junior high schools and three high schools in Naha City, Okinawa Prefecture, in 2010, through self-administered questionnaires. The data of 756 female students were assessed. The independent variables included social factor variables (norms) and personal factor variables (attitude to dieting, perceived behavior control, body esteem, body-figure discrepancy and past dieting). The dependent variables were dieting intention and behavior. Hierarchical multiple regression analyses were performed to examine three models: model 1 (age and obesity index), model 2 (social factor variables with age and obesity index) and model 3 (all variables). Although model 2 failed to explain a substantial proportion of the variance, model 3 explained approximately a half of the variance for intention ( $R^2 = 0.507$ ) and more than one third of the variance for behavior ( $R^2 = 0.376$ ). Past experience of dieting was the best predictor of both dieting intention and behavior. Body esteem was the second best predictor for dieting behavior. In conclusion, personal factors are more likely than social factors to drive the dieting decision. Diet education programs should consider targeting frequent dieters and those with poor body esteem.

**Key words:** Dieting, adolescents, body esteem, Japan

## INTRODUCTION

Parallel to the rising obesity epidemic is the pressure to be thin, which can lead to abnormal weight control behaviors, especially among young girls in developed nations [1–3]. This is also the case with young girls in some tropical countries [4, 5]. Unnecessary diet restriction, especially in the adolescent period, is associated with nutritional deficiency, growth deceleration, secondary amenorrhea, and reduced bone mass and eating disorders [6, 7]. Therefore, thinning behaviors should be carefully monitored and prevention strategies employed to protect young girls from subsequent health problems.

In Japan, thinness is idealized among many young girls. National nutritional statistics showed that 41% of un-

derweight women at the age of 15–19 years were trying to lose weight [8], and the prevalence of dieting behaviors was 68.6% among girls of normal weight in this age group [9]. Social influences have been regarded as important risk factors for such behaviors. Influences from family, peers and media (television and magazines) messages have been shown to affect body image and cause eating disturbances in Japanese female university students [10]. Female junior high school students and high school students were encouraged to diet by friends and family members, especially mothers [11]. In addition to these social influences, personal factors, such as body dissatisfaction, eating attitudes and low body esteem, were frequently identified as mediators of dieting behavior among Japanese adolescents [12, 13].

The question that naturally follows is, “How do social

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and personal factors affect the dieting behaviors of young girls?" The Theory of Planned Behavior (TPB) provides a useful theoretical framework for examining the perceptions and decisions to diet among female adolescent students, with respect to perceived social pressure and personal desire to be thin. According to TPB, there are two more personal factors; attitude and perceived behavior control (PBC) to drive the behavior in question. As the behavior is repeatedly performed, it becomes habitual and becomes a consistent predictor of future behavior and in some cases, past behavior has been included to improve the prediction of future behavior [14]. The Integrative Behavior Model measures past experience and habits in addition to the existing TPB constructs.

The TPB has been applied to a variety of behaviors, including healthy eating in adolescents [15, 16]. There are a number of examples that demonstrate that a TPB-based approach can help to change risky behaviors in adolescents [17–19]. Given these empirical results, TPB-based information on adolescent dieting holds encouraging potential for the examination of unnecessary dieting among adolescents.

Nejad *et al.* identified three important social norms for disorder eating behavior. We also consider the importance of these norms for dieting [20]. They are injunctive norms, descriptive norms and media norms. Injunctive norms are based on the same concept as subjective norms, meaning perceptions of the opinions of others with regard to dieting. Descriptive norms are perceptions relating to what others actually do (perceptions of others' dieting or not). Finally, media norms refer here to the promotion of the "thin ideal" by media personalities.

In this study we examined the relative importance of social and personal factors on the decision to diet among female adolescent students in Japan, using the extended TPB.

## METHODS

### Participants and procedure

This cross-sectional study was conducted in September and October 2010 in Naha City, Okinawa Prefecture. Students from five public junior high schools and three public high schools participated in the study. These schools were selected according to geographical distribution to represent the student population in Naha. The eligible participants were all female junior high and high school students who attended school and were aged between 12 and 17 years. They completed the self-administered Japanese-language questionnaires anonymously either at home or at school. The students were informed of voluntary participa-

tion and study withdrawal in the front page of the questionnaire and were allowed to proceed after fully comprehending the nature of the study. Completing the questionnaires took approximately 20 minutes. After completion, students sealed the questionnaires in envelopes that had been provided, and handed them to either the class teacher or the school health teacher before the set deadline.

In total, 561 female junior high school students and 479 female high school students submitted the questionnaire. Of these, 259 (24.9%) were excluded due to missing data on dependent variables. Furthermore, questionnaires from 25 overweight (Obesity Index > +20%, 2% of participants) respondents were excluded as this study aimed to assess unnecessary dieting behavior among normal-weight and underweight female students. After applying these exclusion criteria, data from 360 female junior high and 396 female high school students were assessed.

### Measures

To measure the TPB variables, the questionnaire originally developed by Conner *et al.* [21] was translated into Japanese. To validate it for use in Japan, the translated version underwent a few stages such as forward and back translation and a review by experts as well as ten female junior high school and high school students to check for wording, arrangement and comprehensibility. It was pre-tested in one junior high school and one high school in Mainland Japan. Data from 30 female students from each group were analyzed. The discriminate validity and internal consistency of the Japanese questionnaire covering the TPB variables were assessed using factor analysis, assessing inter-item correlations, corrected item-total correlations and Cronbach's alpha.

The final version of the Japanese questionnaire of the TPB consisted of the following five components: (1) attitude (overall attitude about dieting behavior); (2) descriptive norm (beliefs that one's peers are dieting); (3) injunctive norms (people of influence think that one should diet multiplied by motivation to do so); (4) representative norms (perception of media personalities' thinness multiplied by motivation to be like them); and (5) perceived control over dieting if one chooses to diet. Attitude and perceived behavior control were considered to be personal factors and norms were considered to be social factors.

Three more variables, namely body esteem, body dissatisfaction and past dieting, were added to the TPB framework, in order to assess more personal factors. These factors are extensively discussed as influencing factors for dieting in previous studies [22–24]. Body esteem refers to self-evaluation of one's body or appearance. Dieters were found to have lower body esteem than the non-dieters [22].

Incidentally, desire for thinness and body image concerns could be closely related to low body esteem in the Japanese population [23, 24]. Body dissatisfaction was assessed by body-figure discrepancy, which is the difference between one’s ideal and real body image. Adolescents with body dissatisfaction tend to pursue dieting in order to be thinner [25].

With the exception of single-item measures, scores were averaged into one single index for each variable. With the exception of body dissatisfaction, higher scores reflected a stronger presence of the variable. The conceptual framework for the variables is described in Figure 1, and question items for key measures are listed in Table 1.

**Background variables**

The participants were asked to indicate their height and weight up to one decimal point. The self-reported height and weight values were then converted to an obesity index by the formula: (body weight in kg – standard weight for height in kg) / (standard weight for height in kg × 100%). Standard weight for age was calculated by the following formula: standard weight for height in kg = a × height in cm – b; where ‘a’ and ‘b’ are age specific coefficients. The formula and coefficients were derived from the standard table of age-specific coefficients used by the Japanese Annual School Health Survey.

**Dependent variables**

**Dieting behavior**

To assess dieting behaviors, a short (six-item) version of a validated dieting behavior scale was used. The items in the dieting behavior scale assessed whether the girls restricted food intake or ate less than desired. The original questionnaire is a 10-item scale developed by Imada [26] from the Japanese version of the restraint scale of the Dutch Eating Behavior questionnaire. Using the data from the pilot study, factor analysis and reliability testing were conducted and the six-item version of the scale was used. The average score ranged from 1 = No to 5 = Yes (Cronbach’s alpha = 0.90).

**Dieting intention**

Dieting intention was measured by a single item: “I intend to diet in the next one month” [26], anchored with a five-point Likert scale, where 1 = strongly disagree and 5 = strongly agree.

**Independent variables**

**Attitude**

Three items measured attitude (Cronbach’s alpha = 0.91). The items were assessed based on the five-point response format using a bipolar scale ranging from –2 to +2. Summed scores ranged from –6 to +6 with a positive score indicating positive attitude towards dieting behavior [21].

**Perceived behavior control over dieting**

Perceived behavior control over dieting was measured

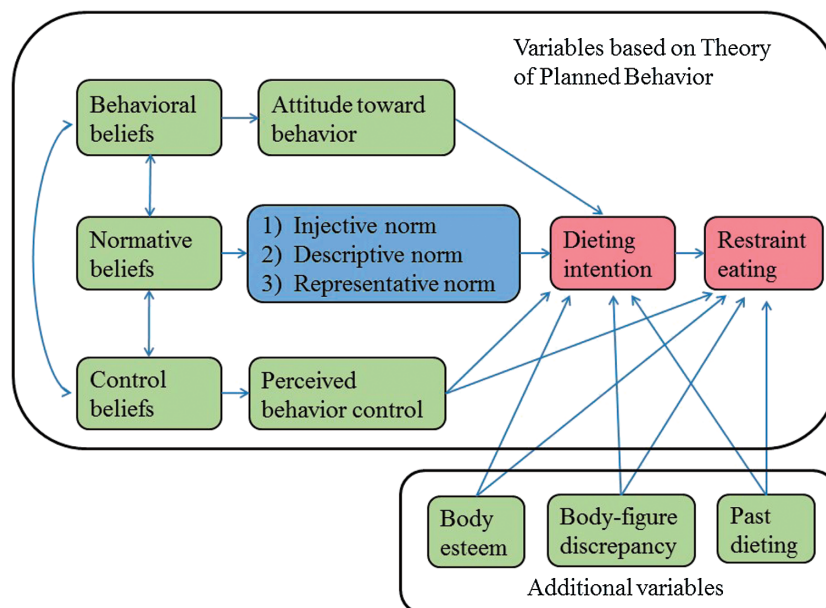


Fig. 1. Conceptual framework. Personal factor variables are highlighted in green; Social factor variables are highlighted in blue; Dependent variables are highlighted in red. (Source: Adapted from Icek Ajzen, 2006; <http://people.umass.edu/ajzen/tpb.diag.html>)

Table 1. Question items for key measures

Constructs	Question items
Dieting behavior	Do you watch exactly what you eat? How often do you try not to eat between meals because you are watching your weight? When you have eaten too much, do you eat less than usual on the following days? Do you deliberately eat less in order not to become heavier? Do you deliberately eat foods that are slimming? If you have put on weight do you eat less than you usually do?
Dieting intention	I intend to diet in the next 1 month
Past dieting	I underwent dieting when I intended to
Body-esteem	It would be better if I lose weight My looks upset me Some people laugh at the way I look I would be more confident if I lose weight I am quite worried about the way I look I wish I were thinner I would not get happy because of my recent body figure My weight makes me unhappy
Attitudes	To me, going on a diet is... bad or good To me, going on a diet is... harmful or beneficial To me going on a diet is... unpleasant or pleasant
Perceived control over dieting	For me to diet in the near future would be... easy or difficult I am confident that if I went on a diet that I could keep to it.
Descriptive norms	My best friend frequently diets The girls in my class diet
Injunctive norms	My mother thinks I should diet x I would like to do what my mother thinks My sister thinks I should diet x I would like to do what my sister thinks My brother thinks I should diet x I would like to do what my brother thinks My best friend thinks I should diet x I would like to do what my best friend thinks My female classmates thinks I should diet x I would like to do what my female classmates think My male classmates thinks I should diet x I would like to do what my male classmates think
Representative norms	The models in food advertisements are very thin x Looking like these models would be bad or good The models in magazines are very thin x Looking like these models would be bad or good My favorite television personalities are very thin x Looking like them would be bad or good My favorite female singer is very thin x Looking like her would be bad or good

through self-control to undergo dieting and consisted of two items (Pearson correlation = 0.60). The average score range was 2 to 10 with higher scores reflecting a greater level of perceived behavior control over dieting [21].

#### **Body dissatisfaction**

To assess body dissatisfactions, a simple seven-point body-figure scale was adapted from the body dissatisfaction scale [27]. This consists of seven schematic silhouettes (scored 1 to 7) ranging from very thin to very obese, left to right. The ideal figure score minus current body-figure score yielded the score for body dissatisfaction. This

body-figure discrepancy score ranged from -6 to +6, with negative scores indicating that the individual's ideal body-figure is smaller than their current body-figure (Not listed in Table 1).

#### **Body esteem**

A short (eight-item) version of the Body-Esteem Scale was used to measure body esteem [24]. The items in the scale assessed how girls perceived their body. A short version was used for this study in order to simplify the process of filling out the questionnaire. The response ranged from 1 = strongly disagree to 5 = strongly agree.

Lower scores were indicative of lower body esteem (Cronbach's alpha = 0.91).

#### **Past dieting behavior**

Past dieting was measured by a single item, "I underwent dieting when I intended to [28]," anchored with a five-point Likert scale, where 1 = No and 5 = Yes.

#### **Social factors**

To elicit normative social pressure, three types of norms, namely, descriptive norms, injunctive norms and representative norms were measured [21]. Two items assessed the descriptive norms. The average score ranged from 1 to 5 and the items were assessed separately instead of seeking a combined score. Injunctive norms were measured by paired items (for example, "My mother thinks I should diet" and "I would like to do what my mother thinks") for six referents: mother, sister, brother, best friend, female classmates and male classmates. The perceptions of what each referent thinks about dieting were scored from -2 to +2 and the respondent's respective motivation to comply was scored from 1 to 5. Each paired item ranged from -10 to +10 with higher scores indicating greater injunctive pressure to diet (Cronbach's alpha = 0.73). Representative norms were measured through the participants' perceived pressure from "thin ideal" promulgated by media personalities and the motivation to be like them. The media personalities assessed were models in food advertisements, models in magazines, favorite television personalities, and favorite singers. The items were scored in a way similar to the injunctive beliefs-motivation to comply items. Each paired item score ranged from -10 to +10, with higher scores indicating greater perceived pressure to be as thin as the media personalities (Cronbach's alpha = 0.82).

#### **Data analysis**

A t-test was performed to assess the mean differences in available independent variables between students who were excluded due to missing data on dependent variables and those who were not. In addition to students who had data missing on height and/or weight, overweight students were excluded. Descriptive statistics were used to calculate demographic and weight-related variables to determine means, standard deviations and proportions. Pearson correlations were performed to determine the association between independent variables and dependent variables. Multiple regression analysis was used to assess which variable holds the greatest predictive power for dieting intention and dieting behavior. Hierarchical regression analyses were performed for (1) dieting intention and (2) dieting behavior. Age and obesity index were entered in the first (model 1), followed by the social norms (model 2). To as-

sess the predictive power of personal variables over social norms, the personal variables were entered in the final step (model 3). The assumptions of multiple regressions were checked by residual scatterplots. The level of significance was set at  $p < 0.05$  for all statistical tests. The software package SPSS for Windows version 15.0 (SPSS Inc., Chicago) was used to perform statistical tests.

#### **Ethical considerations**

The front page of the questionnaire provided an explanation covering the nature and purpose of the study, confidentiality, voluntary participation and study withdrawal. Informed consent was not obtained from study participants because, according to the Ethical Guidelines for Epidemiological Research in Japan, informed consent from participants is not necessary for an observational study that does not use human biological specimens [29]. The parents or guardians of study participants were also informed about the nature and purpose of the study, confidentiality and the voluntary nature of participation. Ethical approval was obtained from the Research Ethics Committee of the University of Tokyo.

## RESULTS

#### **Characteristics of the participants**

The characteristics of the participants are shown in Table 2. The proportion of underweight female junior high and high school students was 5.3% (40/756). Regarding dieting intention, 15.3% (55/360) of junior high school students and 19.4% (77/396) of high school students indicated their intention to diet within one month. Nearly one-third (28.3%, 102/360) of junior high school students had dieting experience and approximately forty percent (37.1%, 147/396) of high school students had dieted before. A similar pattern was seen with current dieting (32.5% in junior high school students and 42.2% in high school students). Regarding body figure, nearly three quarters of the students (74.5%, 563/756) expressed a desire to be thinner, and among them 2.5% (14/563) were underweight.

#### **Characteristics of excluded students**

For junior high school students, there was no statistically significant difference between students who were excluded due to missing data on dependent variables and those who were not. For high school students, however, the excluded students were significantly more likely to have lower body esteem ( $p = 0.044$ ) and larger body-figure discrepancy ( $p = 0.001$ ), compared to the students who were not excluded.

### Correlations among the variables of interest

Correlations are examined among dieting intention, dieting behavior, the measures of the TPB constructs, body esteem and body-figure discrepancy and past dieting (Table 3). Among the TPB measures, the following were found to have significant positive associations with dieting intention and behavior: 1) attitude to dieting, 2) injunctive norm, 3) descriptive norm, 4) representative norm and 5)

perceived behavior control over dieting. The past dieting experience also showed a positive association with dieting intention and dieting behavior. Body esteem and body-figure discrepancy were negatively associated with both dieting intention and behavior.

### Prediction of dieting intention

As shown in Table 4, age and the obesity index could

Table 2. Characteristics of participants

	Total sample (N = 756)		Junior high school girls (N = 360)		High school girls (N = 396)	
	n	%	n	%	n	%
Age						
12–15 years	414	54.8	360	100	54	13.6
16–17 years	342	45.2	0	0	341	86.1
Obesity index						
Underweight	40	5.3	18	5	22	5.6
Normal weight	716	94.7	342	95	374	94.4
Body-figure discrepancy						
Ideal < actual image	563	74.5	249	69.2	314	79.3
Ideal = actual image	142	18.8	86	23.9	56	14.1
Ideal > actual image	51	6.7	25	6.9	26	6.6
Intention to diet within 1 month						
Yes <sup>a</sup>	132	17.5	55	15.3	77	19.4
No <sup>b</sup>	624	82.5	305	84.7	319	80.6
Past dieting						
Yes <sup>a</sup>	249	32.9	102	28.3	147	37.1
No <sup>b</sup>	507	67.1	258	71.7	249	62.9
Current dieting (restraint eating)						
Yes <sup>a</sup>	284	37.6	117	32.5	167	42.2
No <sup>b</sup>	472	62.4	243	67.5	229	57.8

<sup>a</sup>: - mean score > 3

<sup>b</sup>: - mean score ≤ 3

Table 3. Means, standard deviations, and intercorrelations for TPB and additional variables

	1	2	3	4	5	6	7	8	9	10	11	Mean	SD	Range
1 Attitude toward dieting	1	.100**	.214**	.436**	.402**	.235**	.513**	.403**	-.627**	-.456**	.510**	0.98	3.21	-6 to +6
2 Descriptive norm 1		1	.273**	.299**	.142**	0.024	.163**	.084*	-.179**	-.094**	.167**	-2.12	4.01	-2 to +2
3 Descriptive norm 2			1	.284**	.224**	.156**	.278**	.199**	-.225**	-.139**	.291**	-0.13	3.83	-2 to +2
4 Injunctive norms				1	.214**	.080*	.369**	.269**	-.495**	-.336**	.364**	-6.15	10.50	-60 to +60
5 Representative norms					1	.096**	.283**	.230**	-.441**	-.289**	.267**	13.77	15.07	-40 to +40
6 Perceived behavior control						1	.470**	.370**	-.146**	-0.07	.435**	4.45	2.01	2 to 10
7 Dieting intention							1	.494**	-.460**	-.363**	.623**	2.32	1.29	1 to 5
8 Restraint eating								1	-.474**	-.317**	.538**	15.92	6.55	6 to 30
9 Body-esteem									1	.560**	-.487**	23.96	7.92	8 to 40
10 Body-figure discrepancy										1	-.334**	-0.95	1.09	-6 to +6
11 Past dieting											1	2.74	1.45	1 to 5

\*\* $p < 0.01$ , N = 756 for restraint eating

Table 4. Multiple regression results for dieting intention and restraint eating

Independent variables	Dieting intention			Restraint eating		
	Beta coefficients			Beta coefficients		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Age	0.117**	0.035	0.019	0.147***	0.097**	0.065
Obesity Index	0.128**	0.083*	-0.004	0.147***	0.113***	0.043
Injunctive norms	—	0.268***	0.080*	—	0.190***	-0.012
Representative norms	—	0.184***	0.031	—	0.163***	-0.001
Descriptive norm 1	—	0.011	0.027	—	-0.036	-0.031
Descriptive norm 2	—	0.149***	0.046	—	0.095*	0.011
Attitude towards dieting	—	—	0.157***	—	—	0.013
Perceived behavior control	—	—	0.267***	—	—	0.200***
Body esteem	—	—	-0.043	—	—	-0.261***
Body-figure discrepancy	—	—	-0.098**	—	—	-0.044
Past dieting	—	—	0.315***	—	—	0.292***
R <sup>2</sup>	0.027***	0.202***	0.507***	0.040***	0.127***	0.376***

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

predict some variance ( $R^2 = 0.027$ ) in dieting intention in model 1. After the addition of social norms variables, the age variable lost its significance and only the obesity index variable continued to have a significant effect. Model 2 explained approximately one-fifth of the variance in dieting intention ( $R^2 = 0.202$ ). The injunctive norm was the most influential predictor, followed by representative and descriptive norm, i.e. perceptions of peer dieting. Adding the personal variables in the next step increased the predictive power of the independent variables with the variance increasing to 30% ( $R^2 = 0.507$ ). In model 3, previous dieting behavior was the strongest predictor for dieting intention ( $\beta = 0.315$ ,  $p < 0.001$ ), and perceived behavior control was also revealed to be a significant mediator ( $\beta = 0.267$ ,  $p < 0.001$ ).

#### Prediction of dieting behavior

In model 1, age and the obesity index could predict some variance ( $R^2 = 0.040$ ). In model 2 ( $R^2 = 0.127$ ), the age and obesity index variables continued to have a significant effect, but injunctive norms and representative norms were more influential predictors than the age and obesity index variables. Adding the personal variables in the next step increased the predictive power of the model ( $R^2 = 0.376$ ). In this final model, previous dieting, body esteem and perceived behavior control were found to be significant predictors for dieting behavior. Among them, the strongest mediator is past dieting ( $\beta = 0.292$ ,  $p < 0.001$ ), followed by body esteem ( $\beta = -0.261$ ,  $p < 0.001$ ). Among the TPB derived variables, the perceived behavior control

over the dieting component had a significant effect on dieting behavior ( $\beta = 0.200$ ,  $p < 0.001$ ).

## DISCUSSION

Although social influences are known contributors in the prediction of dieting intention and behavior, the present study identified personal factors as being more important. This may be because norms exert their effects indirectly through other mediators, especially through body esteem. The associations among the scale items suggest that the norms were moderately correlated with the body esteem component. This is reasonable, since norms can affect people's attitude toward their body. Therefore, when analyzing and attempting to influence body esteem, norms should also be considered, as they may affect the decision to diet. In a previous study on TPB in dieting behavior in Japan, subjective norm was found to be the best predictor of dieting [28]. In contrast to three norms we measured, the authors of the previous study measured perceptions of body figure as a mediator of the subjective norm component of TPB.

The conceptual framework accounted for approximately 50% of the variance in predicting dieting intention and 40% of the variance in dieting behavior, after adding personal variables such as body esteem, body-figure discrepancy and past experience, which yielded the best model for explanation. The additional factors were found to contribute most as mediators of other factors. The findings indicate that additional mediators should be considered for particular behaviors when applying the TPB.

Previous dieting was the strongest predictor of dieting intention and current dieting behavior among the participants in the present study. Specifically, adolescents with a history of dieting were more likely to repeat dieting. Past experience of a behavior such as dieting can create a kind of self-confidence and self-control in regard to the performance of the behavior [30]. As a result, girls with past experience of dieting may become motivated to diet repetitively. Another possibility for frequent dieting is failure to achieve an ideal body image or rebound weight gain after a successful diet. Given that frequent dieters are at increased risk for the development of eating disorders [13], dietary education programs should aim to discourage repetitive dieting by paying more attention to adolescents with a history of dieting.

Body esteem was shown to be the best predictor for dieting behavior. In other words, the worse a young girl's perception of her body image was, the more likely she was to diet. Thus, interventions to improve the body esteem of female students may be effective to prevent unhealthy dieting behavior. Several school-based intervention studies aiming to improve body esteem have indicated the effectiveness of this approach in improving dieting behaviors among adolescents in Austria and Canada [31, 32]. Hence, a similar intervention could be effective in the female junior high school and high school students in Japan. As previously discussed, social influences seem to exert an effect on body esteem. Therefore, interventions using sources of influence such as social media, family and peers should be implemented in improving body esteem.

Body esteem was an important predictor of dieting behavior but not of the dieting intention. Conversely, body-figure discrepancy is an important predictor of dieting intention but not of dieting behavior. Given that body-figure discrepancy is a temporary and less strongly held perception than body esteem, it may be more likely to mediate its effects on temporary decisions such as the intention to diet. Body esteem, however, is perceived so deeply that it can become a driving force for actual behavior. A different finding was observed with attitude, i.e., perceptions of dieting as a positive behavior, as it was an important predictor for dieting intention but not for dieting behavior. Those positive perceptions lead to a stronger intention to diet.

Perceived behavior control over dieting was a constant predictor of both dieting intention and behavior. Specifically, a belief in the ability to diet was strongly associated with both dieting intention and the actual behavior. Dieting can be an easy behavior to perform and the respondents may have little to no resistance to this behavior. Limiting the conditions allowing for the easy

performance of this behavior could be effective. This may be accomplished through various means such as promoting parental care with regard to daily food habits and schools taking steps to ensure that girls are receiving sufficient nutrition.

In summary, social factors rarely exerted a direct effect on dieting behavior. Rather, they may have an indirect effect through the influence on some other important mediators, thereby making them strong enough to perceive and to influence the performance of the behavior. The social factors may shape a person's beliefs, perceptions and habits. However, it seems that the respondents in the present study were more likely to make the decision to diet based on their immediate perception, past experience and self-control. Indeed, the social identity approach proposes that dieting intention is context-dependent, which is the interaction of self-identity and social identity (social influence) [33]. Determining identity salience using the social identity approach will have implications for future studies.

The present study has several limitations. First, the height and weight data were based on students' self-report. However, the discrepancy between self-reported and actual height and weight in the Japanese population is much smaller than in other studies [34, 35]. The students would be able to accurately report their height and weight because these measurements are recorded annually as part of the health checks that are performed at the start of each academic year in Japanese schools. Second, since the data collection was confined to Naha City in Okinawa Prefecture, the samples of this study cannot be said to reflect the entire adolescent female population in Japan. However, as other cities in Okinawa have the similar social and demographic settings, differences in adolescent characteristics seem to be small. Third, the associations found in this study did not reveal the direction of causality as the data are cross-sectional. A prospective longitudinal study would be necessary to confirm the causal relationship. Finally, as we excluded a considerable number of students who had missing data on dependent variables, we should consider the possible impact of this exclusion on the associations found in this study. For high school students, the excluded students were significantly more likely to have lower body esteem and lower satisfaction with their bodies, compared to students who were not excluded. Hence, there is a possibility that our results under-estimate the importance of personal factors on dieting intention and restraint eating.

Despite these limitations, this study was notable in being the first to use the TPB to examine the relative importance of social and personal factors for dieting intention and behavior in junior high school and high school students in Japan. A previous study using the TPB examined



young female university students, and the findings did not necessarily apply to adolescents [28]. In addition, this is the first study to examine the mediation of past dieting experience and three important social norms in the application of the Theory of Planned Behavior. Therefore, the results of this study may contribute valuable insights for designing interventions to prevent unnecessary dieting among adolescents.

In conclusion, dieting was more closely related to personal factors such as past dieting experience and poor body esteem than to social factors. Thus, the identification and targeting of repeat dieters and those with poor body esteem might be important in implementing behavioral change programs. If repeaters have a tendency to frequent dieting, efforts should be made to counsel adolescents before they start taking up the behavior or when they are in the intention stage. This might be achieved by limiting the easy performance of such behavior as well as education on perceptions of body image and dieting. It also raises potential challenges to existing dietary education programs. More research could test pre-existing health education programs to evaluate whether information is disseminated correctly and properly to the most vulnerable population.

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