

## Health Education: The Influences of the Obesity-Related Stereotypes on Evaluations of Different Body Shapes in High School Girls

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### Abstract

**Background:** Obesity is an important problem of health in teenagers. However, health problem is not the only problem but also a society problem with who gets obese. The obesity-related stereotypes become more important issue nowadays, which gets the idea that the person is lazy, sporting less, greedy etc.

**Objective:** To establish an obesity-related stereotypes scale and to examine the effect of the obesity-related stereotypes among Taiwan and Macau senior high school girls are the aims.

**Methods and Results:** Pilot study (N=138) selects an appropriate figure scale and the standard and obesity figures were occupied in main experiment. Then, the main experiment (N=221; 103 Taiwan & 118 Macau girls) conduct a Chinese-version Obesity-related Stereotype Scale with three factors (with 13 items): Unwell Personal Performance (6 items), Poor Interpersonal Perception (4 items), and Inappropriate Life Style (3 items). Results show that: 1. Girls in stereotype activation condition show high scores of stereotype scores; 2. There is no significant difference between Taiwan and Macau sample; 3. Girls with underweight and normal-weights tempt to expect lower body weight rather than standard body weight group, but ones with overweight did not.

**Conclusion:** The senior high school girls do have the obesity-related stereotypes. While stereotypes have been activated by using the obesity figures, girls will show obvious stereotype on the scale. There is no difference between Taiwan and Macau girls.

**Keywords:** Obesity; Psychology; Hyperglycemia; Hypertension

### Introduction

Food is easier to get these days, and people always consume over than needs and leading the society to be obese. In recent years, the problem of being obese is getting more serious in the younger generation. In Nutrition and Health Survey in Taiwan (NAHSIT; 2005-2008) carried out from Department of Health, Executive Yuan, R.O.C (TAIWAN) [1,2], found that overweight ratio in males is growing from 33.4% to 50.8%, which in females from 31.7% to 36.9% in a decade year. This indicates that both males and females are getting over weight nowadays.

Obesity will bring out the health risk in a biological way such as hypertension or hyperglycemia. In addition, it also endangers in psychological way, such as being obese would tend to have lower self-confidence, easier to be neglected from the society, bullying, or discrimination. Media, educational, commercial, and medical professions all advocate slimmer trendy.

Therefore, being fat is not good has been developed unconsciously, which turns into a stigma of obesity. Obese child or teenagers are found to have some problems, such as low self-esteem, mood disorders, and social withdrawal and so on. In other words, obesity would bring oneself stressful in different cultures.

Undergraduate girls in a research on item self-body shape cognition and worrying about body shape show that those girls who even get a normal weight always feel they are fatter, and would worry about their body shape in more serious way [3]. Therefore, obesity could bring long-term problems in both biological and psychological ways.

In campus, overweight students might receive some discrimination, such as the overweight student is lazier than the average one, having bad learning attitude, or getting rejections from classmates [4]. Therefore, those thoughts made the overweight students be bullied [5,6].

All kinds of media and advertisement are overly conveying that slim is beauty and this atmosphere has already been received in campus. The authorities should have a special policy to build a friendly multi-body shapes school network, in case of the students be led by the media or make a world of losing weight is health, being fat is bad further.

Moreover, the theory of Developmental Psychology mentions that girls pay more attention than boys about changes in body shape in adolescence [7]. In convey of Taiwanese, one of the findings discovered that students (age 10-18) are more likely to use inappropriate ways to lose weights to reach an ideal body shape, such as having vomit induced, fast eating, or drugs abused [8].

Therefore, this study aims at testing the obesity-related stereotype prevalence among high school girls in Taiwan.

## Obesity and Overweight

As we know, the body mass index (BMI), or Quetelet index, is a heuristic proxy for human body fat based on an individual's weight and height. The formula universally used in medicine produce a unit of measure of kg/m<sup>2</sup>. BMI is an indicator commonly used to illustrate oneself who is fat or thin. The higher the value, the more fat it represents. Department of Health, Executive Yuan, R.O.C (TAIWAN) use BMI up to 24 as a mark of overweight, and BMI up to 27 as obesity.

Thus, BMI less than or equal to 24 and less than 27 as overweight, BMI less than or equal to 27 and less than 30 as mild obese, BMI less than or equal to 30 and less than 35 moderate obese, and BMI more than 35 as severe obese.

BMI is a calculator tool for health research originally, when we need to know whether obesity is a cause of some illness or not, we can calculate patient's height and weight into BMI to test the relationship between disease incidence and BMI.

However, BMI value is just a reference value in present day, if using this reference value to discuss obesity-related stereotype or stigma, clear demarcation point might not be necessary.

Hence, this study chooses to use images showing to represent "obesity" and "normal" conditions for lowering the cognition of the definition of fat. For classifying healthy or unhealthy in medical way, ideal BMI is conducted.

BMI range from 18.5 to 22.9 is considered to be normal, while beyond this range is considered to be risk in health. Health is the most important thing in life, so normal BMI standard should be the common used as everyone's ideal BMI in medical or societal way.

Therefore, this study also examines the actual and ideal BMI among Asian girls to see if there is any difference. Furthermore, some important researches point out that the obesity and overweight individuals are need to be consider the usage of nutraceuticals and dyslipidemia, and the risk about the morphological and functional vascular changes in childhood obesity [9,10].

More biological and physical index for certain research purpose regarding obesity is necessary.

## Obesity Related Stereotype

In Chinese, being plump is a symbol of wealthy, status, vigorous and graceful long time ago. In Tang Dynasty of china, plump was a standard of beauty. But nowadays, aesthetic standard is changed by Western culture and Hollywood stars, which turn into "slim is beauty" concept.

And "obesity" gradually become a negative word represented lazy, stupid, lack of discipline and confidence; have low rate of morality or willpower, and unhappy etc. these thoughts of obesity form the real obesity-related stereotypes, or may probable change people's behaviors into discrimination actions.

Moreover, obesity-related stereotypes not simply exist in students, or maybe in grand ages including youth, middle-aged, or elders. Children were found to choose a standard to thin body shape partner

to stay along with in a selectable situation, and try to avoid one who is fat [11].

A questionnaire research towards coaches ran by Department of Physical Education, Hong Kong Baptist University (HKBU) in 2007, found that 75% of coaches having bad personal impression towards fat kids, such as lazy, foolish, lack of discipline and willpower etc.

The younger the coach, the much worse impression towards fat kids was. In additions, more than 60% of male coaches think that fat kids are lazier, lack of motivation of learning, and expect their behaviors worse than the normal [12].

Otherwise, a study found that when using different words, such as fat people, gay, or Muslim, in the same time to do filling the blanks task, discovered that oneself would be influenced by weight bias more than gay and Muslim bias [13].

Most of all, obesity-related stereotypes did exist in everywhere, but there is seldom be discussed in Asia. In addition, in Taiwan there are a few studies focusing on the impacts of obesity-related stereotypes, too.

## Obesity Related Stereotype and Cross-culture

In social psychology, stereotype impacts in different ways and it doing different cultures. Most of the researches in obesity-related stereotype, as authors know, are conducted in western countries; the results might not be the same caused by different attitude among eastern countries. Even in eastern countries, different areas may show difference in difference ways.

For example, with teenager students, there is a study [14] comparing the WISC-IV (the Wechsler Intelligence Scale for Children-fourth Edition) score among different areas (i.e., China, Hong Kong, Macau, and Taiwan). It does find there is cognition difference among areas and Taiwan results show huge gap between Taiwan and Macau samples.

Although Chen et al., focused on the cognitive responses, doing a further research between different culture areas is quite important, too. So this study focuses on the Taiwan and Macau area and chosen senior high school girls to take part in the study, for the reason that two countries were very close in the geographical location, and both were using the same traditional Chinese as a main language in written among high school girls.

Therefore, two countries would be compared to discuss whether there is some difference between them. In the beginning of this study, a pilot study taken for confirming the images could be used in two countries was the first step, and stereotype was being compared in next step further.

## The Impact of Obesity-related Stereotype

The impacts of obesity-related stereotypes will be explained in following four parts separately, such as influences in educational system, medical system, workplace, and social issues inducing:

### Educational system

The preference of choosing people in different body shape during social interaction between children was investigated to be very different, such as avoid staying along with a fat kid. Undergraduate students, in another study, were found to generally think that overweight individuals were much lazier than normal [15].

Otherwise, teachers' expectation of different body shape students would influence other students' reaction, and made the stigma of obesity ingrained. One finding was that stereotypes did influence teachers into different teaching and feedback among different body shape students, thus made the performances different between them [12,16,17].

Moreover, news about bullying in campus was usually to find, and most of the victims were eliminations, bullying, or been treated unfairly because of their body weight. One finding in an international research, fat kids were easily found bullied, regardless of race or sex [5].

According to above findings, campus has been flooded with negative stereotypes of the weight already, and that may influence related type of students being bullied in the past and future.

### Medical system

Obesity patients were expected to need more time to be cured than normal weight patients among medical professions [18,19]. This manner might cause the treatment different and affected the doctors giving confidence and recommendations towards patients in curing, thus making the real curing different.

### Workplace

Employee's salary and wage are mysterious related to their body shape. When a study using telephone, polling carried out a research, 60% of United States people were found having experienced discrimination because of the body shapes, including unemployed, unable to get promotion, incorrectly dismissed [20]. Thus, stigma of the weight subconsciously influences the workplace rules and forms an unfair treatment in any workplaces.

### Social issues

Researches indicate that teenagers are unsatisfied with their appearances in general and are sensitive with that issue [21-23]. They compare with each other easily, and may be influenced by media or close friends, to form a negative thinking about their appearance and finally acting in an incorrect way to change the body shapes.

In fact, whatever teenager girls' body shape is actually thin or fat; they all have eating problems and may harm their health. In addition, high school girls were found to pay more attentions to their physical appearance than boys did, but also feel more unsatisfied and evaluated in a low evaluation to themselves rather than boys [24].

Otherwise, Bulimia nervosa is popularly to be found out in late adolescence and early adulthood; most are happened in girls. There are 13% of students having tried emetic to lose weight; emetic rate in male reaches 16% while female is 10%; emetic in pupils is 15.9%, junior high school students 15% and high school students 7.5%. In other words, teenagers are more easily to become unsatisfied with their body shape and become anxiety, and may probably using kinds of actions to change, such as drugs abused, fast and emetic inducing.

In a short summary, the obesity-related stereotypes have influenced the functioning of the society; kind of researches all verify the effect of stigma of weight, and this may be an issue needed to be facing. In the western cities, lots of researches have been published to discuss obesity-related stereotype. However, in Taiwan or other eastern

countries, there is not much study about obesity-related stereotypes to be done.

Whether the first impression of obesity or slim would affect social relationship or not is seldom to be discussed neither. Therefore, the influence of obesity-related stereotype is needed to be investigated in eastern countries.

### Manipulation of Obesity Related Stereotype

When one have a regular attitude or concept in meeting the same type of people or situation, one would give out a fixed reaction or concept either. With Taiwan samples, Suen's (2006) indicate that there are six manipulation methods and can successfully activate stereotypes:

(a) When individuals realize them are in a being assessed situation; (b) Explicit individuals' groups identification; (c) Declare that ongoing tasks would have different performance between groups; (d) Indicate different groups definitely behave different in pros and cons; (e) Compare between groups; (f) Establish a simulated testing situation that accompany with other group members.

In this research, article reading is being used to indicate the groups' identification, and in order to initiate the identification of the participants in belonging groups.

For example, by asking participants to complete a questionnaire following an article reading [25,26], the reason why using reading is to induce the related identification of groups and stereotype, and measure the related behaviors further.

Otherwise, article reading is not only used in this study to induce the obesity-related stereotypes, an appropriate female body shape image is added beside the article to lower the difference of cognition between participants. In the past researches, body shape scale images in using mainly came from 1983 of Stunkard, Sorensen, and Schulsinger, which is a scale of ladies with the same hairstyle or dressing, colored in black and white, and range in thin to fat from left to right side [27].

And that scale was firstly used in Fallon and Rozin's research to investigate the related body shape issue in university girls [28].

However, that scale has been developed from a long time ago, whether it is appropriate to use nowadays in high school girls studying in Taiwan and Macau is unknown. Thus that scale is being discussed with other scales from internet which are anonymous in pilot study, for choosing the appropriate one to use in further experiment.

### Pilot Study: Scale Selection

In order to select an appropriate image scales using in following studies with Taiwan and Macau samples, pilot study was set up and recruited 138 (66 Taiwanese and 75 Macanese) senior high school girls in total as participants.

### Method

Three different body shape scales with 7-point Likert-typed scale were being evaluated, which were non-dressing body shape scale with blue background from the internet [29] (renamed as "Scale A" for easily reading); ladies dressing in green color from the internet [30] (renamed as "Scale B" easily reading); and Stunkard's figural rating scale for women [27] (renamed as "Scale C" easily reading) (Figure 1).

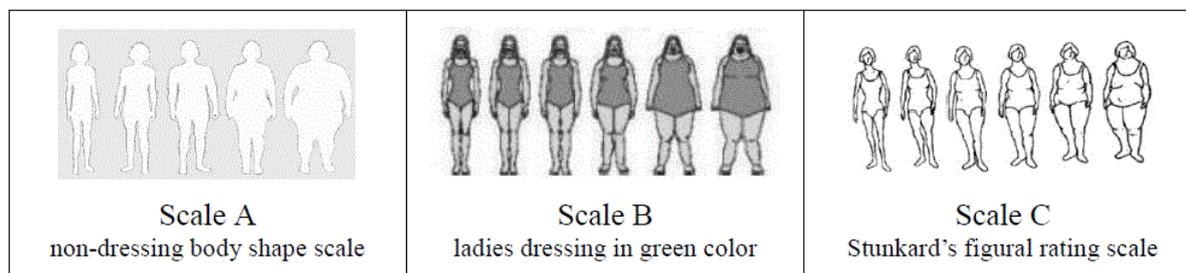


Figure 1: Image scale selection in pilot study.

Otherwise, a 2 (Country: Taiwan vs. Macau)/3 (Scale: A vs. B vs. C) mixed-participant design was conducted and the last one is a within-participant valuable by counterbalancing manipulation in order to avoid order. Either Taiwan or Macau participants were recruited for a “body image scale” research in a class and were randomly assigned to six types of questionnaires, which were the same three scales with different orders of scales (e.g., A>B>C; A>C>B; B>A>C; etc.).

Same statements were asked below each scale, which was what level did the images scales could represent senior high school girls in Likert-type scale with 7-point range from “strongly disagree” to strongly agree”. In addition, one more question asked to choose one of scales to represent senior high school girls’ body shape at a brief way.

At the end, all participants were asked to complete the personal demographic and given debrief and thanks. The same researches have been done in both Macau and Taiwan senior high school, and aim at finding out an appropriate image scales in order to use in both samples.

## Result

In order to select which scale is the most appropriate one to be used to indicate different obesity types, a mixed designed with two-way ANOVAs shows a significant interaction effect between area and scale was found ( $F(2,139)=5.55, p<0.05, \eta^2=0.038, power=0.85$  (Table 1), and two analysis of simple main effects show that in Taiwan samples scale B ( $M=5.00, SD=1.62$ ) was higher than scale C ( $M=4.06, SD=1.54$ ) and scale A ( $M=3.29, SD=1.65$ ). On the other hand, in Macau samples, scale A ( $M=3.48, SD=1.70$ ) was found significantly lower than scale C ( $M=4.06, SD=1.45$ ) and B ( $M=4.13, SD=1.49$ ) (Table 2).

Therefore, scale B seems to be the most appropriate to be used in both Macau and Taiwan samples and images within “green” scale of “obesity body image” and “normal body image” was chosen out to use in main experiment (Table 2).

Source	SS	df	MS	F	p	$\eta^2$	power
Country	5.23	1	5.23	1.54	0.217	0.011	0.234
Scale	98.95	2	49.47	24.49	0.000***	0.15	1
Country*Scale	22.44	2	11.22	5.55	0.004**	0.038	0.852
Within-subject	724.66	278	-	-	-	-	-
Block	471.77	139	3.39	-	-	-	-
Error	252.89	139	1.82	-	-	-	-
Total	851.27	283	-	-	-	-	-

Table 1: Summary of two-way ANOVA analysis in pilot study [Country: (Macau vs. Taiwan); Scale: (A,B vs. C) \* $p<0.05$  (2-tailed), \*\* $p<0.01$  (2-tailed), \*\*\* $p<0.001$  (2-tailed)].

Main Effect	SS	df	MS	F	p	$\eta^2$	power	Post-Hoc
<b>Scale</b>								
at Taiwan	97.04	2	48.52	20.37	0.000***	0.239	1	B>C=A
at Macau	19.39	2	9.69	5.69	0.004**	0.071	0.86	A<C=B
Error (residual)	561.57	278	4.08	-	-	-	-	-
<b>Country</b>								

at scale A	1.296	1	1.296	0.46	0.498	-	-	-
at scale B	26.369	1	26.369	10.95	0.001**	-	-	-
at scale C	0.001	1	0.001	0	0.981	-	-	-
Error(residual)	724.657	278	2.607	-	-	-	-	-

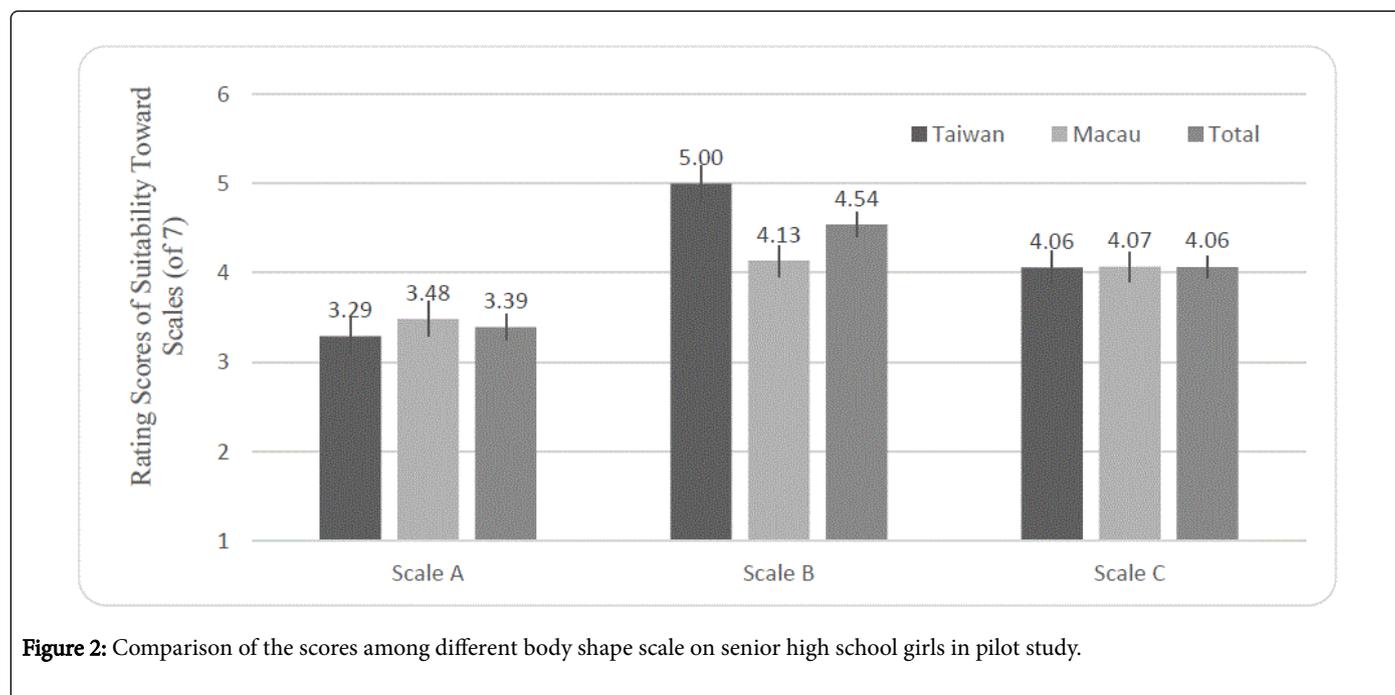
**Table 2:** Summary of variance analysis of main effect [Note: \*p<0.05 (2-tailed) \*\*p<0.01 (2-tailed), \*\*\*p<0.001 (2-tailed)].

In addition, an obviously significant main effect of scales is found ( $F(2,139)=24.49, p<0.001, \eta^2=0.15, \text{power}=1.0$ ) and Post-Hoc analysis shows that scale B ( $M=5.00, SD=1.62$ ) is separately higher than scale C ( $M=4.06, SD=1.54, p<0.001$ ) and scale A ( $M=3.29, SD=1.65, p<0.001$ ) in Taiwan; while scale A ( $M=3.48, SD=1.70$ ) is lower than scale B ( $M=4.13, SD=1.49, p<0.01$ ) and scale C ( $M=4.07, SD=1.45, p<0.01$ ) in Macau.

Moreover, there is no significant main effect on area variable and this shows the rating scores of scale A in Taiwan samples ( $M=3.29,$

$SD=1.65$ ) is similar to Macau samples ( $M=3.48, SD=1.70, p=0.498$ ), while scale C in Taiwan samples ( $M=4.06, SD=1.54$ ) is similar to Macau samples ( $M=4.07, SD=1.45, p=0.981$ ).

However, only scale B in Taiwan samples ( $M=5.0, SD=1.62$ ) is not similar to Macau samples ( $M=4.13, SD=1.49, p=0.001$ ). The results, thus, show that scale B is the most appropriate scales and there is no country difference, and support the results above (Figure 2).



**Figure 2:** Comparison of the scores among different body shape scale on senior high school girls in pilot study.

## Discussion

Although, using self-reported scale sometimes has their limitation, this research still need to find out an appropriate scale to be used in order to do the further study. According to the results of pilot study, scale B seems to be the best scale using to represented high school girls body shape image in both Taiwan and Macau.

Senior high school girls evaluate in a consistence low score in Scale A, which is a female body shape scale without faces and cloths with the shape shown only. Likewise, girls rated scale C, which was developed by Stunkard, in a little bit less than scale B, was a black and white color scale.

However, Scale B from the internet, which has faces, dressing with green color clothes, might be nice for girls feeling when scanning three scales in the same time. Although Scale B originally has faces such as

smiling on each image of the scales, faces would be cover in the main experiment for controlling the feeling towards the image by participants.

Furthermore, images of Obesity and Normal Weight body shape would be extracted from Scale B to use in main experiment instead of asked the participants the feeling of the shape.

## Main Experiment-The Evaluations of Obesity-related Stereotypes

In order to find out the obesity-related stereotypes in Taiwan and Macau, this main experiment aims to set up a Chinese version of questionnaire about obesity-related stereotypes and to prove typical it in senior high school girls. To test whether obesity-stereotype appear

in these two places, new kind of questionnaire was established to use in there.

Because of teenage girls are more sensitive to their appearance and evaluations negative to them in Western [21-23], thus main experiment looking forward to see whether Asia senior high school girls were the same as past researches.

**Methods**

According to “Fat Stereotype Questionnaire, FSQ” [31], this study draw out an obesity-related stereotype questionnaire with eight items about obesity are extracts from FSQ, in which three items are contracted into one because of describing the same situation about social relationship and several items are added to fulfill this study. Statements about each item are used in a 7-point Likert-typed scales in a paper-and-pencil questionnaire, which was given to 221 senior high school girls in Taiwan (N=103) and Macau (N=118) as participants.

Participants were recruited for a “body image” study and were randomly assigned to stereotype threat or control condition. In threat condition, participants were asked to fulfill the questionnaire with an obesity female body image beside the statements. On the other hand, in control condition, participants finished the same questionnaire with a normal weight female body image at the same place of the form sheet. And the accumulated scores of 16 items (total score) would become as one dependent variance of the questionnaire. The participants were then debriefed on propose of this study and new questionnaire of were giving. Questionnaire was introduced and instruction was further told.

Moreover, different images selected from the pilot study are shown to participants instead of asking about the feeling of obesity for lowering the cognitive inaccuracy between participants, therefore threat or control condition differences on which image was shown (obesity image for threat group and normal weight image for control). Personal demographic part filling after the sixteen items questionnaire, which was asked to fill their body weight, ideal body weight and actual height, and score of satisfaction of self-body shape. After completing the whole questionnaire, they were informed with debrief. Item analysis and factor analysis were given following the data collection.

**RESULTS**

**Demographic outcomes**

In regard to demographic characteristics, the average age was 17.03 years (from 15 to 19; SD=0.89). In actual BMI, 27.7% were

underweight, 59.1% were normal weight, 11.4% were overweight, 1.4% was mild obesity, and 0.5% was moderate obesity.

**Item analysis**

In order to do the following factor analysis, top 27% and bottom 27% of the 206 senior high school girls in both Macanese and Taiwanese were first taken to conduct an item-analysis. The t test is used to find out Critical ratio (CR). Result showed that 16 items were almost significant up to.001 level or CR>3.0. Therefore, each item had a good discrimination in the study (Table 3).

Items	CR	Item	CR
1	7.044***	9	3.486**
2	7.649***	10	9.956***
3	3.703***	11	8.915***
4	3.318**	12	5.031***
5	5.994***	13	8.663***
6	5.648***	14	7.387***
7	9.469***	15	9.452***
8	9.165***	16	5.160***

**Table 3:** The Critical ratio of each item in total questionnaire [Note.\*p<0.05 (2-tailed); \*\*p<0.01 (2-tailed); \*\*\*p<0.001 (2-tailed)].

**Factor analysis**

An examination of the Kaiser-Meyer Olkin measure of sampling adequacy suggested that the sample was factorable (KMO=0.777; Bartlett’s test of sphericity=1173.76, p<0.001). A Principal Component Analysis (PCA) with a Varimax (orthogonal) rotation of 16 Likert-typed Scale questions from this questionnaire were conducted on data gathered from 221 participants.

Result showed that four factors were extracted to explain 61.92% variances of the whole questionnaire. All factor loadings were more than 0.43; however the last factor included just only one item, item 15, it should be moved out to get a better result. In addition, item 6 got a similar factor loading (variance less than 0.25) between two factors (Table 4).

Therefore, two items were removed and second factor analysis was conducted in the following step (Table 4).

Likert-typed Scale question No.	Items	Factor a	Factor b	Factor c	Factor d
9	She is smart	0.84	-0.17	-0.07	-0.02
3	She performs very well in academics	0.76	-0.14	-0.1	0.1
7	She is active	0.75	0.26	0.01	0.08
5	She is happy	0.69	0.09	0.01	0
1	She has lots of friends	0.59	-0.03	-0.01	0.59
13	She can control her behaviour	0.55	0.16	0.12	0.34

8	She dislikes doing exercise	-0.04	0.84	-0.04	0.17
10	She is uncontrollable in eating	-0.03	0.8	0.2	0.09
2	She is lazy	0.17	0.68	0.34	-0.42
11	She is healthy	0.23	0.57	-0.16	0.39
16	She is uneasy to get along with	-0.01	0.02	0.79	0.1
4	She is not good to be	0.02	-0.09	0.76	-0.13
12	She lacks of responsibility	0	0.16	0.72	-0.15
14	She does not like to keep clean	-0.06	0.18	0.71	0.29
6	She needs help from others	-0.1	0.42	0.43	0.15
15	Her appearance is attractive	0.18	0.41	0.14	0.69

**Table 4:** First factor analysis.

The same factor analysis was conducted in the second factor analysis, which included 14 Likert scale questions. The examination of KMO measure of sampling adequacy (KMO=0.762, Bartlett's test of sphericity=1009.03,  $p < 0.001$ ) suggested that sample was factorable to conduct a factor analysis also.

Result of analysis revealed that three factors were extracted to explain 58.54% variances of the whole questionnaire without item 6

and 15 (Table 5). Factor loadings were more than 0.43 also, but item 2 turned to have a similar loading among two factors, which difference variance less than 0.25.

Therefore, item 2 was removed to conduct a further factor analysis for getting a better reasonable result (Table 5).

Likert-typed Scale question No.	Items	Factor a	Factor b	Factor c
9	She is smart	0.8	-0.04	-0.19
3	She performance very well in academic	0.77	-0.1	-0.15
7	She is active	0.73	0.03	0.25
1	She has lots of friend	0.72	-0.05	0.07
5	She is happy	0.67	0	0.07
13	She can control her behavior	0.62	0.12	0.26
16	She is uneasy to get along with	0.01	0.8	0.03
4	She is not good to be	-0.02	0.77	-0.16
12	She lacks of responsibility	-0.05	0.75	0.14
14	She does not like to keep clean	0.02	0.7	0.25
8	She dislikes doing exercises	-0.01	-0.01	0.87
10	She is uncontrollable in eating	-0.02	0.21	0.8
11	She is healthy	0.31	-0.14	0.65
2	She is lazy	0.02	0.41	0.57

**Table 5:** Second factor analysis.

After removing item 2, 6, and 15, the last factor analysis was conducted. The data were still considered suitable for following the multiple rules that included the Kaiser-Meyer Olkin measure of sampling adequacy (KMO=0.754, and Bartlett's test of sphericity=898.03,  $p < 0.001$ ).

Analysis of rest 13 items of the whole questionnaire revealed that three factors with eigenvalue above 1, accounting for 60.09% of the total variance. Items with loadings greater than 0.61 were used to characterize the factor solutions.

Following the Varimax rotation, the items were examined to be assigned to a factor using the above guides were discarded (Table 6).

Likert-typed Scale question No.	Items	Factor 1	Factor 2	Factor 3
9	She is smart	0.81	-0.07	-0.21
3	She performance very well in academic	0.77	-0.12	-0.16
7	She is active	0.73	0.03	0.24
1	She has lots of friend	0.72	-0.03	0.12
5	She is happy	0.67	0	0.07
13	She can control her behavior	0.61	0.14	0.29
16	She is uneasy to get along with	0.01	0.81	0.02
4	She is not good to be	-0.02	0.75	-0.21
12	She lacks of responsibility	-0.05	0.75	0.1
14	She does not like to keep clean	0.01	0.73	0.27
8	She dislikes doing exercises	-0.02	0.02	0.86
10	She is uncontrollable in eating	-0.03	0.24	0.78
11	She is healthy	0.3	-0.11	0.68
Eigen values		3.32	2.65	1.84
Percentage variance		25.55	20.38	14.17
Cumulative % of the total variance				-60.09
Correlation Coefficient			-0.21	0.177**
			-	0.119

**Table 6:** Third factor analysis [Factor 1=Unwell Personal Performance; Factor 2=Poor Interpersonal Perception; Factor 3=Inappropriate Life Style (\*p<0.05, \*\*p<0.01, \*\*\*p<0.001)].

The three factors were descriptively labeled as follows. Factor 1 was named as “Unwell Personal Performance”, 6 items were included, with the loadings ranging from 0.61 to 0.81 (explained variance 25.55%). The top item within the factor was “she is smart” (loading 0.81). And factor 1 including the attitude for personal performances such as well performance of academic, being active, lots of friends, happy, and able to control ones behavior. Because most of the six items were in reverse asking in the questionnaire, the more the scores, the higher the stereotypes were. These components illustrated the factor labeling as “Unwell Personal Performance”.

Factor 2 was named as “Poor Interpersonal Perception”. There were 4 items that loaded on this factor, with loadings ranging from 0.73 to 0.81 (explained variance 20.38%). The top item within the factor was “she is uneasy to get along with” (loading 0.81). Factor 2 included characteristics such as lack of responsibility, one is not good to be, and one who does not like to keep clean. These characteristics emphasized the factor labeling as “Poor Interpersonal Perception”. In addition, Factor 3 was named as “Inappropriate Life Style”. There were three items concluded in this factor, with the loading ranging from 0.68 to 0.86 (explained variance 14.17%). The top item within the factor was “she dislikes doing exercises” (loading 0.86).

Factor 3 included characteristics such as uncontrollable of eating and unhealthy. These characteristics illustrated the factor labeling as “Inappropriate Life Style”.

Furthermore, Cronbach’s  $\alpha$ -coefficient was used to assess the internal consistency of each of the three factors identified from the last PCA. All of the three factors were above 0.70, demonstrating a good internal consistency between factors. Result showed that Factor 1 ( $\alpha=0.81$ ), Factor 2 ( $\alpha=0.75$ ), Factor 3 ( $\alpha=0.73$ ), and Total Scale ( $\alpha=0.71$ ) was adequate.

### Relation among stereotype threat group and control group

Participants were first randomly assigned to threat or control group with the same questionnaire, conditions depended on the image shown in the corner of the questionnaire form. Obesity female body shape image for threat condition and normal weight female body shape image for control condition, in which images were chosen from the pilot study. Within the questionnaire, 13 items were accumulated as a total score to investigate the difference between two conditions.

Moreover, score of each item belonged to the relevant factor was accumulated to a factor score, and three factor scores were conducted.

Two-way ANOVAs results of total score and factor scores showed that no significant interaction effect existed among scales in different types of images used in questionnaire and countries (all  $F_s < 0.81$ , all  $p_s > 0.088$ ). In addition, on all scores there was also no significant main effect in country ways (all  $F_s < 3.49$  all  $p_s > 0.063$ ), revealing that ratings between Taiwan and Macau was similar.

For main effect of condition, the total score in obesity-related stereotype threat group ( $M=50.37$ ,  $SD=7.70$ ) was very significant

higher than one in normal weight control group ( $M=43.72$ ,  $SD=8.24$ ;  $F(1, 207) = 35.89$ ,  $p < 0.001$ ). Besides the total score, a significant main effect of condition ( $F(1, 207) = 177.92$ ,  $p < 0.001$ ) in the Inappropriate Life Style factor also shows scores in threat group ( $M=15.80$ ,  $SD=3.02$ ) are higher than ones in control condition ( $M=10.13$ ,  $SD=3.09$ ). Of note, the Unwell Personal Performance scale and the Poor Interpersonal Perception scale did not shows main effect of condition (both  $F_s < 1.39$ , both  $p_s > 0.239$ ) (Table 7).

Score	Source	SS	df	MS	F	p	$\eta^2$	power
Total Scale	country <sup>1</sup>	193.88	1	193.88	3.07	0.081	0.01	0.41
	condition <sup>2</sup>	2269.79	1	2269.79	35.89	0.000***	0.15	1
	country X condition	3.53	1	3.53	0.06	0.814	0	0.06
Unwell Personal Performance	country <sup>1</sup>	107.05	1	107.05	3.49	0.063	0.02	0.46
	condition <sup>2</sup>	42.69	1	42.69	1.39	0.239	0.01	0.22
	country X condition	41.71	1	41.71	1.36	0.245	0.01	0.21
Poor Interpersonal Perception	country <sup>1</sup>	1.38	1	1.38	0.09	0.761	0	0.06
	condition <sup>2</sup>	0.23	1	0.23	0.02	0.902	0	0.05
	country X condition	37.22	1	37.22	2.51	0.114	0.01	0.35
Inappropriate Life Style	country <sup>1</sup>	22.57	1	22.57	2.43	0.12	0.01	0.34
	condition <sup>2</sup>	1651	1	1651	177.92	0.000***	0.46	1
	country X condition	4.99	1	4.99	0.54	0.464	0	0.11

**Table 7:** Two-way AONVA analysis summary [Note 1: country (Taiwan vs. Macau); 2: condition (Threat vs. Control) \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ ].

### Relationship of ideal weights and standard weights

For more analysis of body weights, each participant's standard weight was calculated by using their heights and the mean from normal BMI 21.3. Ideal weights and standard weights were analyzed by two way ANOVAs to test their relationship.

However, the result found a significant main effect of BMI category ( $F(2,216)=38.64$ ,  $p < 0.001$ ) (Table 8) and Post-Hoc analysis showed that

underweight group ( $M=43.43$ ,  $SD=3.09$ ) got lower weights score than normal group ( $M=46.85$ ,  $SD=3.86$ ,  $p < 0.001$ ) and then the overweight group ( $M=55.31$ ,  $SD=7.30$ ,  $p < 0.001$ ) groups in ideal weights, when the different situation happen in standard weights which was underweight group ( $M=54.64$ ,  $SD=3.20$ ,  $p < 0.050$ ) and normal group ( $M=53.97$ ,  $SD=3.22$ ,  $p < 0.010$ ) group were significant lower than the overweight groups ( $M=56.31$ ,  $SD=4.14$ ) (Table 8).

Source	SS	df	MS	F	$\eta^2$	power
BMI Category	1871.06	2	935.53	38.64***	0.26	1
Self-evaluation of BMIs	3169.42	1	3169.42	581.26***	0.73	1
BMI category X Self-Evaluation of BMIs	1029.09	2	514.55	94.37***	0.47	1
Within subjects	6407.54	432	-			
Between-Subjects (Block)	5229.76	216	24.21	-		
Error	1177.78	216	5.45	-		
<b>Total</b>	<b>12477.11</b>	<b>437</b>	<b>-</b>			

**Table 8:** Two-way ANOVA on weights among underweight, normal and overweight groups [BMI category include underweight (n=61), normal (n=130), and overweight (n=29), Weights include standard weights and ideal weights, \*\*\* $p < 0.001$ ].

Furthermore, there is an obvious interaction effect ( $F(2,432)=94.37$ ,  $p < 0.001$ ) (Table 8). A simple main effect of weights showed ( $F(1,216)=3169.42$ ,  $p < 0.001$ ) (Table 9) and Post Hoc analysis indicated that the ideal weight ( $M=43.43$ ,  $SD=3.09$ ) was smaller than the standard weights ( $M=54.62$ ,  $SD=3.22$ ) in underweight group. The same situation between ideal weights ( $M=46.85$ ,  $SD=3.86$ ) and standard weights ( $M=53.97$ ,  $SD=3.22$ ) happened in normal weight group. However, there is no difference between the ideal weight ( $M=55.31$ ,  $SD=7.30$ ) and standard weight ( $M=56.31$ ,  $SD=4.14$ ) in overweight group ( $F(1,216) = 2.65$ ,  $p=0.316$ ).

Above results reveals that girls in the underweight and normal weights groups tempt to expect lower body weight rather than standard body weight group. In addition, a simple main effect of BMI

category shows that, in standard weight, weights of overweight group ( $M=56.31$ ,  $SD=4.14$ ) is higher than normal group ( $M=53.97$ ,  $SD=3.22$ ,  $p < 0.010$ ) (Table 9) and underweight group ( $M=54.62$ ,  $SD=3.22$ ,  $p < 0.050$ ). Then there is no difference between normal group and underweight group ( $p=0.201$ ).

However, in ideal weight, a simple main effect of BMI category shows that, weights of overweight group ( $M=55.31$ ,  $SD=7.30$ ) (Table 9) is higher than normal group ( $M=46.85$ ,  $SD=3.86$ ,  $p < 0.001$ ) and normal group is higher than underweight group ( $M=43.43$ ,  $SD=3.09$ ,  $p < 0.001$ ). This result interestingly reveal that in standard weights of underweight girls who expect to be having similar body weight as normal-weight ones (Table 9).

Main Effect		SS	df	MS	F	Post-Hoc
Weights	Underweight	3754.07	1	3754.1	688.82***	Ideal<Standard
	Normal	3302.97	1	3303	606.05***	Ideal<Standard
	Overweight	14.443	1	14.44	2.65	Ideal=Standard
	<b>Error (residual)</b>	1177.78	216	5.45	-	
BMI Category	Standard weights	131.689	2	65.85	4.44**	u=n<o
	Ideal weights	2768.91	2	1384.5	93.36***	u<n<o
	<b>Error (residual)</b>	6407.54	432	14.83	-	

**Table 9:** Summary of variance analysis of simple main effect [Note: u: underweight group; n: normal group; o: overweight group; \* $p < 0.05$  (2-tailed), \*\* $p < 0.01$  (2-tailed), \*\*\* $p < 0.001$  (2-tailed)].

## Discussion

Main experiment aims at establishing an evaluation scales to be used in further research in the future. The results show that three factors might be unsuitable to use in two countries and thirteen items are kept at last. Moreover, three factors are extracted from kept items, which implied that putting all items into one scale might be not appropriate in consideration.

On the other hand, the result of main experiment supports that obesity-related stereotype even could be induced even by images or pictures scanning. Stereotype is found much more in threat group by an obesity female body shape image. And no matter which country participants are in, the tendency of non-favor of obese are both existed in Taiwan and Macau.

An important and interesting finding is that underweight and normal-weight girls expect lower body weight rather than standard body weight; this reveals that skinny girls expect to be skinnier, but those girls who were overweight would not.

## General Discussion, Conclusion and Suggestion

This pilot study and main experiment aim to set up an evaluation scales. They are used to test the obesity-related stereotype in Chinese version. Furthermore, they are tools for further research of senior high school girl in related stereotype as well. The current study employed questionnaire with 7-point Likert-typed scale to examine related stereotype and three factors are extracted from thirteen items. These are “Unwell Personal Performance”, “Poor Interpersonal Perception”,

and “Inappropriate Life Style”. Those factors all contain adequate internal consistency.

According to the pilot study and main experiment, this research importantly develops/examines/evaluates an appropriate body-shape scale and finds out the existence of the obesity-related stereotypes in Taiwan and Macau high school girls, which matching the western researches that weight-related stereotype does exist across different cultures.

### Body shape scales

According to the results of pilot study, appropriate scale is chosen by both Taiwan and Macau senior high school girls coming from past researches and internet. Result showed that the colorful female body shape image scale dressing in green clothes with a smiling face is the best suitable in representing. And for control of the feeling of that smiling in images, the face of each image is covered to avoid the influence from it. At last, obesity and normal weight body shape image are extracted to use in main experiment.

### Obesity-related stereotypes

According to the scores of the threat group and control group, strong stereotype is presented in threat group, which putting obesity female image next to the scales. The result showing that girls dislike with it consistently without any words of describing the image, girls show a consistent dislike with it. The same situation does not present in Normal body weight image control group. Thus, it implied that instead of word describing, images could induce the stereotype.

## Consistence between cross-culture

According to the scores of the threat group and control group, no significant difference is found between Taiwan and Macau which implies that two counties culture might be similar because of the nearby location and both using traditional Chinese writing. Moreover, media could be easier to transfer within each other's, such as books, newspaper, and internet, that made the culture tend to be similar.

## Suggestions and Limitations

### Health team in hospital

Previous research have indicated that the overweight/obese individual might has dyslipidemia and morphological and functional vascular damage [9,10]. Thus, a strong cooperative and collaborative team is necessary to help and improve the health caring. For example, the Project Leonardo was successfully conducted by using a team-based approach to disease management with care managers (specially trained nurses), physicians, and specialist working together as "partners" of the patient [32]. The care managers and their supervisor are expected to consider the patient's preferences and request, and accommodated the patient needs.

### Education support in school

The result of this research implied that senior high school girl does carry weight-related bias or belief that "lose weight is health, fat is bad". Girls keep such concept might hurt each other unconsciously. Because it is clear that obesity is a health problem but not a psychological problem. Thus, such belief can be re-educated by educational system, schools and teachers could be better giving a more effort to improve such phenomenon. In addition, school officer can offer more supports in school and organized professional team as previous research [32] to help girls. For instance, in Taiwan, school can ask clinical and counseling psychologist to offer some helps like care managers as above.

### Media

Education may be not the only one role to blame at for the prevalence of the obesity-related stereotype. Media also can give support for chancing this social phenomenon. For instance, using normal weight or overweight body shape people as model or presenter in different kind of media, such as in television, internet, magazine, catwalk show, newspaper.

### Others

In addition, for chancing the social phenomenon in Taiwan or Macau, further research of obesity-related stereotype needed to be done to investigative its influence. In this study, there is having some research limitations, which have not been controlled perfectly, for example:

- **Sample of participants**

All the participants were high school girls. However, boys of obesity-related stereotype might be different in other ways, so the result covered towards boys may be unsuitable.

- **Self-reported scales**

This research aims at finding an appropriate self-reported scale and it has been done. However, by using this kind of self-reported scale (or questionnaires) is still having some interference variable need to be considered. For example, the social desirability bias, lack of flexibility-lowers reliability, question may be misunderstood, and evaluation apprehension effect those are might be the interference variable.

- **Cross-culture difference**

Cultures were different among different Asia countries, and only two countries were taken part in, inferring the result to other Asia countries might not be inappropriate.

- **Further analysis**

Due to no confounding factors have been collected in this study and these research goals, only ANOVA analysis have been used. However, if researchers aim at testing other goals or evaluating the role of confounding factors, a multivariate regression analysis can be actually used to find out the rest purposed on these kinds of topics.

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