

# A study on body weight perception and weight control behaviours among adolescents in Hong Kong

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**Objective** To examine the relationships between body weight perceptions, estimated body mass index, gender, and weight control behaviours.

**Design** Cross-sectional survey.

**Setting** Three secondary schools in Hong Kong.

**Participants** A total of 1132 secondary school forms 1 and 3 students.

**Main outcome measures** The strength of agreement between perceived weight and estimated body mass index, and the association between perceived weight, estimated body mass index, and weight control behaviours.

**Results** A total of 14% of students were estimated to be overweight or obese. The agreement between actual (estimated) body mass index and perceived weight was poor in females and fair in males (Kappa 0.137 and 0.225, respectively). In females, there was no evidence of a relationship between body mass index and weight control behaviours. However, there was a relationship between perceived weight and weight control behaviours such that females who perceived themselves as overweight were more likely to exercise, restrict caloric intake, self medicate with diet pills, purge, or use laxatives. In males, there was evidence of a relationship between perceived weight, body mass index, and weight control behaviours. Males who perceived themselves as overweight or were overweight, were more likely to exercise or restrict caloric intake.

**Conclusions** Body weight perceptions are not in agreement with actual weight in adolescents. This discrepancy is more marked in females who use a variety of weight control behaviours. These behaviours are motivated by perceived weight rather than actual (estimated) body mass index. Overweight adolescents should be encouraged to adopt appropriate weight control behaviours for their health needs.

## Key words

Adolescent; Body image; Body Weight; Obesity; Weight loss

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## Introduction

Adolescence is a period of immense change. It involves a transition from childhood dependency to adult self-sufficiency. Adolescents make significant developments in physical growth, cognition, identity, family, peers, and sexuality in order to achieve emancipation, identity formation, and assumption of functional roles.

Adolescent obesity has risen significantly in the western world in the last two decades. The percentage of United States adolescents who are overweight has tripled from 5% in 1980 to 15% in 2000.<sup>1</sup> Overweight and obesity are not confined to western countries. Most Asian countries such as Japan, India, Singapore, and Mainland China are seeing an increasing trend.<sup>2</sup> In Hong Kong, the trend towards obesity (weight >120% median weight for height) is rising among primary school students from 16.4% in 1997/98 to 18.7% in 2004/05.<sup>3</sup> Obesity was the second most common health problem among secondary school students, with a detection rate of 15.8% by the Student Health Service. Two thousand students were referred to the Hong Kong Hospital Authority for obesity management in the 2004/2005 academic year (personal communication).

Modernisation has brought changes in dietary pattern and leisure activities. Sedentary behaviours and consumption of fatty and sweetened food and beverages have been recognised

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as causative factors for overweight and obesity. In addition to physical complications, negative social and emotional associations of overweight and obesity such as low self-esteem, being bullied, depression, behavioural and learning problems have been well studied.<sup>4-7</sup>

Cognitive development in adolescents is linked to weight perception and body image. Little is known about the relationship between weight, weight perception, and weight modification behaviours among local adolescents. A study of Chinese adolescents found more boys describe themselves as thin whereas more girls describe themselves as heavy.<sup>8</sup> Weight dissatisfaction is related to media exposure, body perception, and health-risk behaviours.<sup>8</sup> In Hong Kong, overweight children are likely (i) to have more weight concerns, (ii) to diet or (iii) to exercise to lose weight than obese children.<sup>9</sup> More overweight than normal weight children perceive themselves to have more body fat, and lower physical competence and self-esteem.<sup>10</sup>

Weight perception is one of the motivating factors for weight control behaviours<sup>11</sup> and is a better predictor than actual weight for adolescents to diet or exercise.<sup>12</sup> Weight behaviours are multifaceted and complex, and their aetiology is multi-factorial. Some behaviours are causative for overweight or obesity, some develop as a response, and some are associations. These behaviours vary from healthy practices to the extreme forms of self-medication with diet pills, laxatives, diuretics, or purging. Excessive weight concerns and distorted weight perception are associated with health compromising behaviours such as substance use<sup>13</sup> and for adolescent girls, suicidal ideation and attempts.<sup>14</sup> Underweight or normal weight adolescents who perceive themselves to be overweight are at an increased risk for eating disorders such as anorexia nervosa.<sup>11</sup> Thus, it is important to understand what mediates weight control behaviours in adolescents.

Using a sample of adolescents from secondary schools, we tested two hypotheses: (1) that there is a disagreement between actual body weight and perceived body weight, and (2) that perceived body weight, rather than body mass index (BMI), mediates weight control behaviours.

## Methods

The Kwun Tong Health Promoting School Project was first launched in 2001/2002. This is an ongoing project. Each participating school is supported by the project for 3 years. It aims to promote health and well being of school children, staff, and families by a network to target core health issues. Every year, three new member schools are recruited into the project.

A questionnaire was designed in 2003 to examine student health status. It was based on the Youth Risk Behaviour Surveillance of the Centers for Disease

## 關於香港青少年自我認知體重和體重控制行為的研究

目的	研究自我認知體重、估計體重指數、性別和體重控制行為之間的關係。
設計	橫面調查。
安排	香港三間中學。
參與者	1132名中一及中三學生。
主要結果測量	自我認知體重和估計體重指數之間的相符程度，和自我認知體重、估計體重指數和體重控制行為的相互聯繫。
結果	參加者中有14%被評估為超重或肥胖。女生的實際（估計）體重指數和自我認知體重之間相符程度很低，男生則屬一般（卡柏指數分別為0.137和0.225）。沒有證據顯示女生的體重指數和體重控制行為有關係，但自我認知體重和體重控制行為則有關係，例如自我認知過重的女性會更大可能做運動、限制卡路里攝取量、自行食減肥藥物、催便或服食通便劑。男生的自我認知體重、體重指數和體重控制行為則有關係。自我認知過重或確實過重的男生，會更大可能做運動和限制卡路里攝取量。
結論	青少年的自我認知體重和實際體重之間並不相符，此差異對女生尤為明顯。她們會用多種方法控制體重，但其推動力則是自我認知體重大於實際（估計）體重指數。為過重的青少年健康著想，應鼓勵他們採取適當的體重控制行為。

Control and Prevention in the United States with Chinese translation.<sup>15</sup> The questionnaire focuses on personal demographics, safety and violence, family health and community involvement, psychosocial health, risk behaviours, weight concern and behaviours, and diet. It is a self-reported questionnaire. Students were given an instruction sheet before answering the questions. Two project officers were responsible for overseeing administration of the questionnaires to participating students. All Form 1 and Form 3 students from the three new member schools were invited to participate in the survey (n=1132).

This paper reports the results of the analysis of pre-Project data in the academic year of 2003/2004. Post-Project data will be obtained in 2007. Ethics approval for the research was obtained from the Cluster Research Ethics Committee.

The questionnaire addressed self-reported weight (kg) and height (cm), perceived body weight and weight control behaviours. Body mass index was calculated (estimated) as kg/m<sup>2</sup> after metric conversion of self-reported height and weight. Subjects were categorised as overweight if their BMI was >90th percentile for age and sex.<sup>16,17</sup> Body mass index was divided into five categories:

<3rd, 3rd-25th, 25-75th, 75-97th and >97th centiles. Perceived body weight was self-reported as severely under, mildly under, normal, mildly over, or severely over weight. Students were asked in the questionnaire for the presence or absence of weight control behaviours in the 30 days before the survey. Such behaviours included physical exercise, food restriction, use of proprietary diet pills/powders/liquids/laxatives, or purging.

### Sample size planning

Power Analysis and Sample Size software 2004 (PASS version 2004; NCSS Statistical Software, Kaysville [UT], US) was used for sample size calculation. Based on the obesity detection rate of 15.8% among secondary school students by the Student Health Service (personal communication), a sample size of 568 subjects was required with precision of 0.03 and 95% confidence coefficient. The likelihood of weight control behaviours ranged from 28.4 to 37.1%, depending on sex and types of weight control behaviours based on a study by Wong et al.<sup>9</sup> As a result, we chose 0.5 as the safest anticipated prevalence of weight control behaviours. The sample size required was 1068 with precision of 0.03 and 95% confidence interval.

### Data analysis

Data were analysed using the computer software package Statistical Package for the Social Sciences (Windows version 13.0; SPSS Inc, Chicago [IL], US). Descriptive statistics including means, standard deviations, and ranges were used to characterise the study population.

Three different relationships were tested in this study: the agreement between BMI and perceived body weight; the relationship between BMI and weight control behaviours; and the relationship between perceived weight and weight control behaviours.

Analyses of the differences in baseline characteristics between the overweight and non-overweight students were based on *t*-tests for continuous data, and Mann-Whitney *U* tests for ordinal data. Differences in proportions were analysed using the Chi squared test with Yate's correction where appropriate. Kappa statistics were used to measure the strength of agreement between categorical variables.<sup>18</sup> For all inferential tests, a P value of ≤0.05 was considered statistically significant.

## Results

### Subjects

The convenience sample consisted of Form 1 and Form 3 students. Forty-four of the 1132 questionnaires were discarded because of incomplete data. Thus, 1088 valid questionnaires (from 575 boys and 513 girls) were available for further analysis. The mean age of the cohort was 14.07 (standard deviation [SD], 1.44; median, 14; range, 12-18) years. There was no statistically significant difference in gender, mean BMI, ethnicity, and years lived in Hong Kong among the Form 1 and Form 3 students whose median age were 13 and 15 years, respectively.

The mean BMI for the cohort was 21.0 (SD, 7.4) kg/m<sup>2</sup>, with a mean of 21.9 (SD, 8.0) kg/m<sup>2</sup> for boys and 20.1 (SD, 6.6) kg/m<sup>2</sup> for girls. Based on the estimated BMI, 14% were classified as overweight or obese. On this basis, a significantly higher proportion of boys (19%) were overweight than girls (9%) [ $\chi^2(1)=29.010$ ;  $P<0.001$ ].

### Perceived body weight

Data in 22 questionnaires were incomplete. Among the cohort, 43.9% (468/1066) perceived themselves as having a normal weight, 20.5% (218/1066) as mildly or severely underweight, and 35.7% (380/1066) as mildly or severely overweight. Thirty percent of the non-overweight students (41.2% of the girls and 17.2% of the boys) perceived themselves as being overweight. Girls were more likely than boys in this respect [ $\chi^2(4)=41.573$ ;  $P<0.001$ ]. The Figure shows the gender difference in body weight perception.

Table 1 shows the relationship between BMI and weight perception in females. Among females with BMI between the 25th and 75th centile, 45.3% perceived themselves as having a normal weight. However, a higher proportion perceived themselves to be mildly or severely overweight than mildly or severely underweight (48.5% vs 6.2%); 8.3% of girls with a BMI <3rd centile and 9.2% with a BMI between the 3rd and 25th centile 'inaccurately' perceived themselves as overweight.

Table 2 shows that 4.6% of female mild-overweight perceivers and 6.9% of female severe-overweight perceivers had a BMI below the 25th centile. The strength of agreement between BMI and perceived weight was

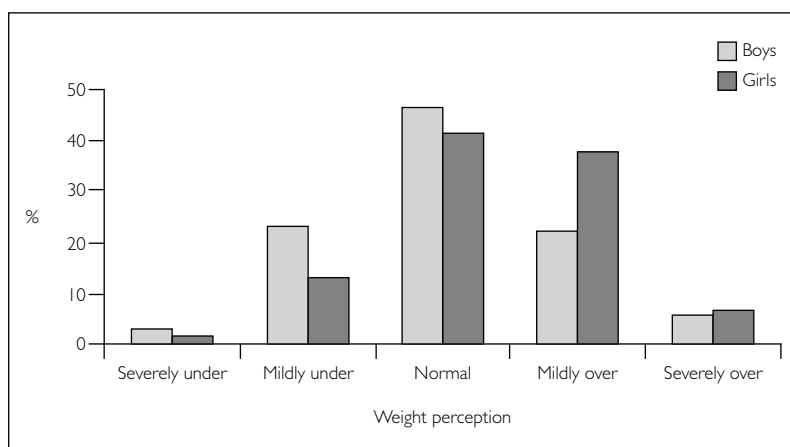


FIG. Weight perception among the cohort (n=1088) by gender

TABLE 1. Weight perception related to estimated body mass index (BMI) centile in females

Weight perception	BMI centile				
	<3rd	3rd-25th	25-75th	75-97th	>97th
Severely underweight	1/24 (4.2%)	2/76 (2.6%)	1/212 (0.5%)	1/63 (1.6%)	0/31 (0%)
Mildly underweight	15/24 (62.5%)	25/76 (32.9%)	12/212 (5.7%)	1/63 (1.6%)	2/31 (6.5%)
Normal weight	6/24 (25.0%)	42/76 (55.3%)	96/212 (45.3%)	10/63 (15.9%)	11/31 (35.5%)
Mildly overweight	2/24 (8.3%)	5/76 (6.6%)	94/212 (44.3%)	42/63 (66.7%)	9/31 (29.0%)
Severely overweight	0/24 (0%)	2/76 (2.6%)	9/212 (4.2%)	9/63 (14.3%)	9/31 (29.0%)

TABLE 2. Estimated body mass index centiles related to weight perception in females

Body mass index centile	Weight perception				
	Severely underweight	Mildly underweight	Normal weight	Mildly overweight	Severely overweight
<3rd	1/5 (20.0%)	15/55 (27.3%)	6/165 (3.6%)	2/152 (1.3%)	0/29 (0%)
3rd-25th	2/5 (40.0%)	25/55 (45.5%)	42/165 (25.5%)	5/152 (3.3%)	2/29 (6.9%)
25-75th	1/5 (20.0%)	12/55 (21.8%)	96/165 (58.2%)	94/152 (61.8%)	9/29 (31.0%)
75-97th	1/5 (20.0%)	1/55 (1.8%)	10/165 (6.1%)	42/152 (27.6%)	9/29 (31.0%)
>97th	0/5 (0%)	2/55 (3.6%)	11/165 (6.7%)	9/152 (5.9%)	9/29 (31.0%)

TABLE 3. Weight control behaviours and overweight status by gender

Weight control behaviour	Overweight females			Overweight males		
	Yes	No	P value	Yes	No	P value
Exercising	30/45 (66.7%)	261/369 (70.7%)	0.537	88/112 (78.6%)	221/326 (67.8%)	<0.05
Food restriction	25/45 (55.6%)	189/368 (51.4%)	0.595	57/109 (52.3%)	90/325 (27.7%)	<0.001
Diet pills	3/45 (6.7%)	13/368 (3.5%)	0.248	8/108 (7.4%)	17/324 (5.2%)	0.405
Purging	1/45 (2.2%)	8/367 (2.2%)	0.651	6/108 (5.6%)	16/324 (4.9%)	0.800

TABLE 4. Weight control behaviours and weight perception by gender

Weight control behaviour	Female overweight perceivers			Male overweight perceivers		
	Yes	No	P value	Yes	No	P value
Exercising	173/225 (76.9%)	178/279 (63.8%)	<0.001	123/155 (79.4%)	273/404 (67.6%)	<0.05
Food restriction	154/225 (68.4%)	103/277 (37.2%)	<0.001	82/152 (53.9%)	95/400 (23.8%)	<0.001
Diet pills	13/225 (5.8%)	5/277 (1.8%)	<0.05	9/151 (6.0%)	21/399 (5.3%)	0.748
Purging	7/224 (3.1%)	2/277 (0.7%)	<0.05	9/152 (5.9%)	17/397 (4.3%)	0.419

poor in females (Kappa=0.137). In males, the strength of the corresponding agreement was fair (Kappa=0.225).

### Weight control behaviours

Among the cohort, more overweight than non-overweight students expressed a desire to lose weight (58.6% vs 40.7%) [ $\chi^2(3)=17.647$ ;  $P<0.001$ ]. Tables 3 and 4 outline

the relationship between weight control behaviours and actual (estimated) overweight status, and between weight control behaviours and weight perception by gender. In females, there was no evidence of a relationship between actual overweight status and weight control behaviours (Table 3). However, there was a significant relationship between perceived weight and weight control behaviours, such that females who perceived themselves as overweight

were more likely to exercise ( $P<0.001$ ), restrict caloric intake ( $P<0.001$ ), self medicate with diet pills ( $P<0.05$ ), purge or use laxatives ( $P<0.05$ ) [Table 4].

In males, there were significant relationships between estimated overweight status and weight control behaviours (Table 3) and between perceived overweight status and weight control behaviours (Table 4). Males who perceived themselves as overweight or who were actually (estimated to be) overweight, were more likely to exercise ( $P<0.05$ ) or restrict caloric intake ( $P<0.001$ ) but not self-medicate or purge.

## Discussion

Body image refers to a person's perceptions, attitudes, and experiences about his/her body. Weight perception is an important part of this concept. Findings from this study concur with research in the United States that body weight perceptions tend to be inaccurate when compared with BMI calculated from either self-reported or measured height and weight.<sup>11,19,20</sup> We further demonstrated a gender difference in the extent of this disagreement in our local adolescent population. Specifically, the agreement between actual (estimated) BMI and perceived weight was poor in females and fair in males. More girls than boys considered themselves to be overweight and more boys than girls considered themselves to be underweight. Understanding the reasons for these gender differences may help health professionals assist adolescents to make appropriate decisions about adopting weight control strategies.

While there are clear health benefits of weight loss in overweight and obesity, our study shows that female adolescents are motivated to adopt a variety of weight control behaviours by their body perception, rather than their actual (estimated) BMI. Females who perceived themselves to be overweight were more likely to exercise, restrict caloric intake, self-medicate, or purge. The use of these behaviours to attain weight control in adolescents is worrisome, particularly when they are based on inaccurate weight perceptions. Complicating the picture is the strong correlation of these behaviours with low self-esteem, depression, suicidal ideation, and substance use.<sup>12,14</sup> Weight control behaviours in males were of less concern, in that they exercise or restrict food intake but do not self-medicate or purge. Furthermore, both perceived weight and actual BMI predicted these behaviours.

This study has several limitations. First, there is an inherent problem in using self-reported data in the metric calculation of BMI. Previous studies have shown

that there is a tendency for adolescents to over-report their height and under-report their weight.<sup>21</sup> However, reported and measured values have been shown to be highly correlated in validity studies from overseas.<sup>22</sup> Moreover, adolescent self-reported height, weight, and BMI calculated from these values have been found to be highly reliable<sup>21</sup> and therefore may be used to study overweight and obesity in adolescents.<sup>23</sup> Although we could not identify any similar studies on this subject from Hong Kong, there is no immediate reason to suspect a difference in our adolescent population.

Because of the cross-sectional nature of this study, causality could not be inferred between perceived weight, actual (estimated) BMI, and weight control behaviours. Future studies could examine this by using a prospective design. Also, since data were from early- to mid-adolescents in Form 1 and Form 3 students, the results cannot be generalised to the whole adolescent age range. It would also be important to replicate this research with other age-groups, as well as in other regions. The mediating factors for behavioural change in weight concern should also be researched further.

Considering the magnitude of the problem of overweight and obesity identified and the potentially harmful weight control behaviours reported by our adolescents, we believe that health promotion programmes should take into account the importance of cultivating a realistic and healthy body image, especially for female adolescents. Healthy behaviours need to be promoted whereas health-compromising behaviours should be discouraged.

The media often blend thinness and beauty. Adolescents are particularly vulnerable because of their developing cognition. Westernisation has fostered women's disordered eating in this part of the world.<sup>24</sup> Therefore, promotion of healthy body perception by schools and health organisations is particularly important to counteract such influences.

To solve the problems of overweight and obesity is beyond the capacity of a single profession. A successful strategy is likely to involve developing skills for behavioural change, building a positive self-image, addressing psychosocial difficulties, and tackling harmful societal norms. Education on what constitutes healthy weight, healthy growth, and development is as important as balancing caloric input and output. In addition, our study has shown that female adolescents are likely to need assistance in selecting appropriate weight control behaviours for their health needs, rather than being guided by their own (often inaccurate) perceptions of their weight.

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