

# Agreement between body weight perception and body weight status among late adolescents in Kuantan, Malaysia

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## ABSTRACT

**Objectives:** Body weight perception may determine the practice of proper weight management. The objective of this study was to measure the agreement between body weight perception and actual body weight status and its associated factors among late adolescents in Kuantan, Malaysia.

**Methods:** A cross-sectional study was conducted from April to October 2018 among 479 adolescents aged 17-19 years old from seven institutions of higher learning in Kuantan. Body weight status was described as body mass index (BMI). Weight and height were measured, and BMI was calculated. Validated, self-administered Figure Rating Scale (FRS) questionnaires were used. Agreement between BMI and body weight perception was calculated using Kappa statistics. Logistic regression was employed to examine the association between body weight perception and socio-demographic variables.

**Results:** More than one-third (35.3%) of the respondents misjudged their own body weight. More than one third of the respondents (38.7%) who were underweight, misperceived themselves as having normal weight whilst 31.7% of obese respondents identified themselves as overweight. The agreement between body weight perception and body mass index was moderate ( $k=0.46$ ,  $p<0.01$ ).

**Conclusion:** Body weight perception was in moderate agreement with actual weight in late adolescents. Accurate body weight perception is an important factor in late adolescent's weight management behaviour. Hence, health education related to body weight management should be emphasized among this age group.

## KEY WORDS:

*body weight, perception, body mass index, adolescents*

## INTRODUCTION

Body weight perception is defined as subjective evaluation of one's actual weight status.<sup>1</sup> Body weight perception is a crucial underlying psychological factor that correlates with actual body weight. Overemphasis on thin physique among adolescents can lead to poor dieting practices and eating

disorders, whereas underestimation of body weight may increase the risk of becoming overweight and obesity.<sup>2</sup> Misperception of the body weight is frequently being reported to occur among adults and adolescents. Most of the time, adults and adolescents tend to underestimate their weight. This should trigger concern as incorrect perception will cause lack of interest to seek proper intervention. As a result, it may increase morbidity and mortality rate thus becoming a burden not only to the community, but also the nation. The National Health and Morbidity Survey (NHMS) III conducted in 2015 revealed that there is tremendous increase in the percentage of obesity among young adolescent to late adolescent from 9.6% to 20.2%.<sup>3</sup>

Not only that underestimation of body weight will create problems, adolescents who overemphasize on thinner body figure can cause unhealthy dieting practices and eating disorders such as anorexia and bulimia nervosa. This scenario is commonly seen among female adolescents, especially to those who just enter college or university.<sup>4</sup> Complicating the picture is the robust relationship of these behaviour with low self-esteem, depression, suicidal ideation and substance abuse.<sup>5</sup>

Late adolescent is a crucial period as it is a transitional period from being a childhood toward adulthood. At this age, most of them start entering institutions of higher learning. For the majority of them, this is the first time that they are living away from home.<sup>6</sup> They become independent and develop new lifestyle behaviour with the potential of weight gain.<sup>7</sup> Current national health strategies are more focused on modifying dietary habit and encouraging healthy lifestyle behaviour, but minimal effort had been done to correct the misperception of body image, especially among late adolescent.

The prevalence of body weight perception in Malaysia has been reported by a few studies. A study in Peninsula and East Malaysia among adolescents aged 10 to 17 years old showed that 13.8% of them underestimated their weight while 35% overestimated it.<sup>8</sup> Another study reported that more than half of the underweight participants (55.9%) wrongly perceived their body weight as normal.<sup>9</sup> However, these two studies were done among school going adolescents. Meanwhile,

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**Table I: Patients' characteristics (N=296)**

Patients' characteristics	n	%
<b>Gender</b>		
Female	211	71.3
Male	85	28.7
<b>Age, years (mean, SD)</b>	34.53, SD 0.759	
<b>Age groups (years)</b>		
12-19	31	10.5
20-39	171	57.8
40-59	76	25.7
>60	18	6.1
<b>Ethnicity</b>		
Kadazandusun	111	37.5
Bajau	75	25.3
Chinese	34	11.5
Others	16	5.4
Brunei	12	4.1
Malay	9	3
Suluk	6	2
Rungus	5	1.7
Sungai	5	1.7
Bisaya	5	1.7
Data not available	5	1.7
Bugis	3	1
Iban	3	1
Murut	2	0.7
Indian	2	0.7
Indonesian	1	0.3
Kadayan	1	0.3
Jawa	1	0.3
<b>Cycle of biopsy</b>		
First biopsy	235	79.4
Second biopsy	59	19.9
Data Not Available	2	0.7

another study that was done among undergraduates in the University Malaysia Sarawak in 2011 found that 55.4% of normal BMI subjects identified their body weight as underweight.<sup>10</sup>

Previous researchers have also reported the relationship between body weight perception and body weight status. A study among African-American school-aged adolescents showed that there was poor kappa agreement among boys and was significantly higher among girls.<sup>11</sup> In addition, a study done in Hong Kong among young to middle adolescents also found that body weight perception was not in agreement with the actual BMI among the mentioned group. Yet, while most of the studies focusing on that dual relationship among young and middle adolescent, little have been found regarding how body weight perception actually related to body weight status in late adolescents group especially in the local setting.

Body weight perception is highly influenced by familial, social and cultural factors.<sup>2</sup> Studies also reported that gender, races, socio-economic status and smoking were among factors significantly associated with body weight perception.<sup>10,12-14</sup>

When considering its various factors, it is essential to identify the misperception especially among late adolescents in order

to plan an effective strategy to correct this. Late adolescent was chosen as our group of interest due to the tremendous increase of the prevalence of obesity among this age group, rising concern not only to the nation but also globally. Apart from obesity, late adolescent also tends to develop metabolic syndrome, depression and eating disorders. In addition, this group is in the transitional period before entering adulthood and therefore it would be interesting to know the accuracy of their self-perceived body weight. Compared to younger adolescents, we expect this group to have more maturity and they should be able to appropriately perceive their own body weight.

This study was aimed to determine the prevalence of perception of correct body weight among late adolescents from higher learning institutions and its associated factors, as well as to find out the agreement between body weight perception and their actual body weight.

**MATERIALS AND METHODS**

*Population, setting and sample size calculation*

This was a cross-sectional study conducted at seven governmental higher learning institutions in Kuantan, Malaysia from April 2018 to October 2018. The inclusion criteria were late adolescents (17-19 years old). The exclusion criteria were those who were pregnant during the period of study and those with known eating disorders such as

anorexia nervosa and bulimia nervosa.

The sample size was determined using following formula,

$$n = \frac{\left(\frac{\alpha}{2}\right)^2 p(1-p)}{d^2}$$

where  $p$  is the expected outcome,  $d$  is the precision required and  $z$  is the value (using  $z$  distribution) for confidence at  $\alpha$  confidence level. Usually  $\alpha$  is set to 0.05 and therefore  $z$  value at  $0.05/2$  is 1.96. The sample size was calculated by assuming the prevalence of body weight perception of 46.5 % based on a local study.<sup>10</sup> Considering 20% non-response rate, the final sample size is  $383+77=460$ . Therefore, the final minimum sample size required was calculated to be 460.

All governmental higher learning institutions in Kuantan district, Malaysia were identified and a total of seven higher learning institutions were selected using purposive sampling. List of possible respondents from each selected institution was obtained from the respective institutional principals who granted permission to participate in this study. A minimum of 65 respondents from each institution were selected using simple random sampling technique to achieve the total sample size required. Eventually, 479 participants were recruited. Informed consent form together with participant information sheet was administered and consented respondents were included.

Even though the calculation of sample size was based on the prevalence of body weight perception, we also calculated the sample size to ensure it is enough for agreement analysis. By assuming proportion of each category is assumed at proportionate, ( $K_1=0.5$ ,  $K_2=0.6$ ,  $0.7$ ,  $0.8$ ,  $\text{power}=0.8$ ,  $\alpha=0.05$ ) the minimum sample size required for kappa was 243. Thus, the pre-calculated sample size is adequate for kappa agreement analysis.<sup>15</sup>

#### Data collection and research instrument

The data collection for this study comprised of three parts namely socio-demographic profile questionnaire, figure rating scale and anthropometric measurements. Socio-demographic profile questionnaire consisted of the age, gender, parental income and smoking status. The Figure rating scale was adapted from Stunkard figure rating scale.<sup>16</sup> Respondent were asked to rate how they perceive their current body weight by selecting a silhouette that corresponds to their figure on a scale ranging from 1 to 9. The 9 scales were interpreted as underweight, normal weight, overweight and obese. This scale showed good test-retest reliability and validity.<sup>17</sup>

Body weight of respondents was measured using SECA weigh scale Model 762 (Germany). It was taken to the nearest 0.1kg after removing shoes, emptying pockets and wearing light clothing. The height was measured using a portable SECA Body metre Model 206 (Germany). The measuring instrument was set against the wall, to ensure the subject's accurate posture. The precision of this instrument was up to 0.05 centimetre. BMI ( $\text{kg}/\text{m}^2$ ) was calculated by dividing weight (kg) by the height squared ( $\text{m}^2$ ). We used the 2007 WHO growth charts and the software Anthroplus (version 1.0.4) to define the following: underweight (BMI-for-age: <

-2SD), normal weight (BMI-for-age:  $\geq -2\text{SD}$  to  $\leq +1\text{SD}$ ), overweight (BMI-for-age:  $> +1\text{SD}$  to  $\leq +2\text{SD}$ ) and obese (BMI-for-age:  $> +2\text{SD}$ ).<sup>18</sup>

#### Data analysis

All statistical analysis was done using IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corp. The socio-demographic characteristics were reported as descriptive statistics using frequencies and percentages. Kappa statistic was used to measure the strength of agreement between selected independent (BMI) and dependent (body weight perception) variable. The values of kappa agreement interpreted as in Table I. Binary logistic regressions were used to determine independent associated factors with body weight perception. Statistical significance is set at  $p < 0.05$ .

## RESULTS

Four hundred and seventy-nine respondents from seven government higher learning institutions in Kuantan district, Malaysia completed the survey. The respondents background is presented in Table II. The mean age was 17.8 years. The ratio of female and male respondents was almost identical. Malays (91.6%) forms the largest number of respondents. More than half of the participants' parents had a monthly income of <RM3000. Ten per cents of the respondents were active smoker. Majority of respondents had normal BMI (64.3%). In addition, the majority (64.7%) of them correctly perceived their own body weight.

Table III shows that more than one-third of the respondents (38.7%) whose BMI were underweight misperceived themselves as having normal weight. Noteworthy of the real overweight participants (9.1%) misperceived themselves as having normal weight, whilst significant numbers of true obese respondents (31.7%) perceived themselves as overweight. It also showed that the body weight perception was in moderate agreement with their actual BMI ( $k$  0.46,  $p < 0.01$ ).

Further analysis was done using binary logistic regression (Table IV) to determine associated factors for correct body weight perception. The analysis showed that there is no significant association between socio-demographic profiles and body weight perception.

## DISCUSSION

One-third of the respondents inaccurately perceived their body weight. This is consistent with a study done among a large population of adolescents in France.<sup>20</sup> However, the percentage was low in comparison to a local study which found that almost half of the respondents misperceived their body weight.<sup>8</sup> The reason for the contrast finding may be due to the different range of adolescent's age where the latter participated by school-aged adolescents in which most of the time, dieting pattern and lifestyle were much influenced by the parents or families.

Our study showed that more than half of the actual underweight respondents correctly perceived themselves as underweight. However, one-third of them wrongly perceived

**Table I: Interpretation of Kappa value.<sup>19</sup>**

Value of Kappa	Level of agreement
0- 0.20	Poor
0.21-0.39	Fair
0.40-0.60	Moderate
0.60-0.80	Good
0.80-1.00	Very good

**Table II: Background characteristics of the respondents**

	Frequency (n)	Percentage (%)
<b>Age</b>	17.8 (0.68)*	
<b>Gender</b>		
Male	230	48.0
Female	249	52.0
<b>Race</b>		
Malay	439	91.6
Others	40	8.4
<b>Parental income</b>		
<RM3000	256	53.4
≥RM3000	223	46.6
<b>Smoking status</b>		
Smoker	48	10.0
Non-smoker	431	90.0
<b>Body Mass Index (BMI)#</b>		
Underweight	31	6.5
Normal weight	308	64.3
Overweight	77	16.1
Obese	63	13.2
<b>Body weight perception</b>		
Correct perception	310	64.7
Incorrect perception	169	35.3

\*Mean (SD)

**Table III: Body mass index (BMI) in relation to body weight perception**

BODY MASS INDEX (BMI)	BODY WEIGHT PERCEPTION								*Kappa value	p-value
	UNDERWEIGHT		NORMAL WEIGHT		OVERWEIGHT		OBESE			
	n	%	n	%	n	%	n	%		
UNDERWEIGHT	18	58.1	12	38.7	1	3.2	0	0	0.46	<0.01
NORMAL WEIGHT	63	20.5	187	60.7	56	18.2	2	0.6		
OVERWEIGHT	0	0	7	9.1	62	80.5	8	10.4		
OBESE	0	0	0	0	20	31.7	43	68.3		

\*Kappa=Kappa agreement coefficient

**Table IV: Logistic regression to determine independent associated factors for correct body weight perception**

Socio-demographic profiles	n (%)		Adjusted odd ratio (95% CI)
	Correct body perception	Incorrect body perception	
<b>Age</b>	17.8 (0.68)*	17.8 (0.67)*	0.96 (0.73-1.27)
<b>Gender</b>			
Male (ref)	150 (65.2)	80 (34.8)	0.89
Female	160 (64.3)	89 (35.7)	(0.59-1.34)
<b>Race</b>			
Malay	286 (65.1)	153 (34.9)	1.29
Others	24 (60.0)	16 (40.0)	(0.66-2.53)
<b>Parental income</b>			
<RM3000 (ref)	167 (65.2)	89 (34.8)	0.95
≥RM3000	143 (64.1)	80 (35.9)	(0.65-1.39)
<b>Smoking status</b>			
Smoker (ref)	29 (60.4)	19 (36.6)	1.33
Non-smoker	281 (65.2)	150 (34.8)	(0.69-2.56)

\*Mean (SD)

themselves as having normal weight. None of the underweight respondents valued themselves as obese but one of them perceived themselves as overweight. The findings were homogenous to a local study among school-aged adolescents.<sup>8</sup> However, it was dissimilar to another local study among undergraduate students in which none of the underweight participants misperceived themselves as overweight or obese.<sup>10</sup>

Majority of the real normal weight respondents correctly perceived themselves as normal weight (60.7%) rather than perceived themselves as underweight (20.5%), overweight (18.2%) and obese (0.6%). The result was consistent with other studies from Bahrain, India, China and United State.<sup>2,21-23</sup> However, the result ironically was not identical to the data from a study in Iran involving female college students where most of the actual normal weight respondents chose to have underweight figure instead of normal weight.<sup>24</sup> This could suggest female gender has different weight perceptions compare to their counterpart.

Despite most of the real overweight respondents in our study accurately perceived themselves as overweight (80.5%), noteworthy percentage of the mentioned group inaccurately saw themselves as having normal weight (9.1%) and obese (10.4%). The outcome was similar to the findings from other studies.<sup>11,23</sup> Hypothesized factors that would lead to underestimation of body weight comprised of educational aspect, cultural reason as well as different lifestyle among respondents.<sup>25</sup>

One of the positive aspects from the results of our study was that none of the respondents who were obese underestimated their body weight neither as underweight nor normal weight. This is good considering those who underestimated their body weight have better tendencies to practice unhealthy dieting pattern as evidenced by high daily intake of fast food and weight gaining snacks.<sup>26</sup> Surprisingly, most of the past studies found out that certain percentage of the participants from their study inaccurately perceived themselves as having normal weight or underweight, despite the fact that they were actually obese.<sup>10,11,23</sup> The findings from their studies have a crucial impact as the majority of them were unlikely to participate in weight control practices. The different findings in our study could mean our respondents who were obese have better insight and self-awareness that they were actually obese.

Further statistical analysis done using Cohen's Kappa coefficient statistic revealed that body weight perception was only in moderate agreement with their actual BMI. This was similar to a study among African-American adolescents.<sup>11</sup> However, it was different from a local study as well as a study in Hong Kong where both studies reported poor agreement between body weight perception and body mass index.<sup>5,8</sup> A possible explanation for this could be the younger age group of respondents recruited in the previous local study compared to our study which involved late adolescents. This could suggest that age may play an important role in the way respondents perceive their body weight.

We further analysed the relationship between socio demographic profile and correct body weight perception and

found that there was no significant association between socio-demographic profile with their body weight perception. To date, there was no local report discussing thoroughly the impact of races on body weight perception among adolescents. However, there was a study among Malaysian women revealed that Chinese women described themselves as being heavier than their Malay or Indian counterparts.<sup>12</sup> Another local study also highlighted substantial ethnic dissimilarity in term of weight loss attitudes.<sup>27</sup>

One study reported about how commencement and maintenance of smoking can affect body weight perception and weight control behaviours.<sup>14</sup> Another study found that adolescent females who smoked were more interested and anxious regarding their body weight as compared to those who did not smoke.<sup>28</sup> However, our study failed to show any significant relationship between smoking and body weight perception among respondents. Nevertheless, continuous health educations related to smoking prevention and cessation are undoubtedly compulsory towards this age group as smoking itself may cause so many other harmful effects other than related to their body weight status.

Our study also revealed no significant difference between respondents from the high and low socio-economic family status with regards to accurately perceiving their body weight. Some of the preceding studies in the United States of America and Korean also reported that there were no associations between the socio-economic status of the family and weight status misperception.<sup>29,30</sup> However, a study in India showed that there was relationship between socioeconomic status and inaccurate body weight perception.<sup>13</sup> A larger-scale study is necessary to investigate this association among adolescents in Malaysia.

#### *Strength and limitation*

The results of this study gave us an idea of how late adolescents perceived their body weight. It also reflected how good the agreement between body weight perception and actual body weight status which was based on the calculated BMI for age. Another strength of this study was multi-centres involvement of the participants. Instead of involvement of a single study place, we recruited participants from seven institution of higher learning.

Our study also has some limitations. Firstly, our study only consists of late adolescents in the age range of 17- to 19-year-old. Therefore, the outcomes cannot be generalised to the whole adolescent's age group. In addition, our study used a figure rating scale which only validated oversea and not in the local setting. However, as it just uses figures with no description using different languages, we considered it universally accepted including in our local setting. Lastly, most of our participants were Malays with only 8% non-Malays. This means that our results may not represent the non-Malay population.

#### **CONCLUSION**

This study showed that one-third of the respondents inaccurately perceived their own body weight. Our study also found that body weight perception was only in moderate agreement with actual BMI among late adolescents. Malay

respondents were found to be more accurately perceived their body weight. More efforts are necessary to focus on raising awareness among adolescents in Malaysia of their weight management. This should be achieved before they reach adulthood. Health education including promoting healthy eating habit and healthy lifestyle needs should be emphasised among adolescents.

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#### ETHICAL APPROVAL

This study was approved by the International Islamic University Malaysia Research Ethics Committee (IREC) (IREC 2018-079) on 13th April 2018 prior to commencement of the study.

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