JOURNAL OF ADOLESCENT HEALTH 1992;13:528–532

Self-Reported Weight and Height in Adolescents and Their Parents

PRASONG TIENBOON, B.Med.Sc., M.C.N., M.D., Ph.D.,
MARK L. WAHLQVIST, B.Med.Sc., M.D., AND
INGRID H. E. RUTISHAUSER, B.Sc., M.Sc.

Self-reported and measured weight and height were compared in a sample of adolescents aged 15 years (109 boys; 95 girls) and their parents (135 fathers; 190 mothers) recruited from secondary schools in the urban area of Geelong, Victoria, Australia. On average the adolescents' self-reported weight and height did not differ to a greater extent from the measured values than did that of their parents for their own weight and height but differences for individuals were much more variable. Self-reported weight was significantly underestimated and height overestimated by both adolescents and parents. Body size had little effect on the extent of underestimation of weight and overestimation of height. The precision of reporting varied both with age and sex, while reporting bias in the parents, but not the adolescents', was influenced by father's occupation score. The educational level of the parents, however, had no statistically significant effect on reporting bias. The extent to which weight was underestimated and height overestimated was no greater than that observed in adults and suggests that group means reported for weight and height are likely to be as valid a measure of actual weight and height as in adults.

KEY WORDS:
Self
Body weight
Body height
Adolescence
Education
Occupation
Parents

From the Department of Human Nutrition, Deakin University, Geelong (P.T., I.H.E.R.), and the Department of Medicine, Monash Medical Centre, Clayton Campus, Melbourne (M.L.W.), Australia.

Address reprint requests to: Ingrid H. E. Rutishauser, B.Sc., M.Sc., Department of Human Nutrition, Deakin University, Geelong 3217, Australia.

Manuscript accepted February 28, 1992.

Population data on relative body weight and the prevalence of overweight in adults are often based on self-reported weight and height. Although there is consensus that self-reported weight and height are among the most reliable questionnaire data (1) there is also evidence for differences between individuals of different age, sex, and body size (2–5). Compared with adults, there are few data on the validity of self-reported weight and height for adolescents. In this article, the accuracy and precision of adolescents' self-reported weight and height is compared with that of their parents.

Methods

The data presented here are from a prospective study of the determinants of risk factors for coronary heart disease and fatness in early life which included both a questionnaire and a physical examination. The project was approved by the Deakin University Ethics Committee and the Victorian State Department of Education. Families with an adolescent child aged 14–15 years were recruited from all secondary schools in the urban area of Geelong, a regional center of approximately 150,000 people 80 km southwest of Melbourne, Victoria, Australia. The sample consisted of 204 adolescents, 190 mothers, and 135 fathers from 213 families. The 213 families constituted a 1 in 6 sample of families with adolescents of this age attending schools in Geelong. The average age of the adolescents was 14.9 (SD, 0.2) years and 44.8 (SD, 5.9) years and 41.8 (SD, 5.3) years, respectively, the average ages for the fathers and mothers.

0154-139X/92/$5.00

Published by Elsevier Science Publishing Co., Inc., 655 Avenue of the Americas, New York, NY 10010

Adolescents and their parents completed a questionnaire about their own weight and height without being aware that measurements were to be made. Weight and height could be reported in either metric or imperial units. All subjects were examined and measured by the same observer, a physician (P.T.) after completion of the questionnaire. Weight (WT) was measured in a swimming costume or hospital gown to the nearest 0.1 kg using a digital platform scale (Soehnle) and height (HT) to the nearest 0.1 cm with a Harpenden anthropometer. Body mass index (BMI) was calculated as kilograms per meter of height squared.

In the present study, the Daniel score (6), which is a measure of occupational prestige, was used as a measure of socioeconomic status. Daniel scores range from 1.2 for the highest socioeconomic status occupations to 6.7 for the lowest. Parents education level was classified into three categories according to the highest qualification obtained, e.g., school, technical (TAFE), or university.

Pearson correlation coefficients for measured and reported values were calculated solely for the purpose of comparison of the present data with other studies where these have been used and not as a measure of agreement between measured and reported values. For this purpose the difference between the measured and reported value for each subject was calculated as recommended by Gore and Altman (7). The mean of these differences gives a measure of the accuracy (or bias) and their standard deviation a measure of the precision of the reported data. The significance of the mean differences between measured and reported values were assessed using the one sample or paired *t* test. One-way analysis of variance was used to test the significance of differences in reporting bias between groups according to occupational and educational status.

Results

Accuracy and Precision of Reported Data

The means and standard deviations for measured and reported weight and height and the means and standard deviations of the difference between measured and reported weight and height are shown in Table 1. As a group, the adolescents underestimated their weight by an average of 0.8 kg and overestimated their height by 1.1 cm. Both these biases were significantly different from zero ($p < 0.05$); however, because the standard deviations of the differences (Sd) between reported and measured weight and height for adolescents of both sexes were relatively large in comparison with the mean difference, 4–6 kg for weight and from 6 to 8 cm for height, the only bias that was significant ($p < 0.05$) when analyzed separately for boys and girls was the overestimation of height by girls by an average of 1.5 cm (95% confidence interval, 0.45–2.61 cm). Because the adolescents both underestimated their weight and overestimated their height the BMI calculated from the reported measurements was 0.4 kg/m^2 lower and also a significant underestimate ($p < 0.05$).

Table 1. Comparison of Measured With Reported Values for Weight and Height in Adolescents and Their Parents

		Measured		Reported				
	n	Mean	SD	Mean	SD	Bias	Sd	*p*
Boys								
WT (kg)	109	59.1	10.6	58.2	12.0	−0.9	6.0	0.12
HT (cm)	109	168.9	8.7	169.6	12.1	0.8	7.7	0.31
BMI (kg/m^2)	107	20.6	2.8	20.3	3.7	−0.3	2.7	0.27
Girls								
WT (kg)	95	54.7	7.2	54.0	7.7	−0.6	3.8	0.10
HT (cm)	81	161.6	5.5	163.2	7.8	1.5	5.9	0.02
BMI (kg/m^2)	80	21.1	2.5	20.5	2.9	−0.6	2.2	0.02
Fathers								
WT (kg)	135	79.7	10.7	79.6	10.6	−0.3	3.0	0.18
HT (cm)	121	173.1	6.5	176.0	7.0	2.9	2.2	<0.001
BMI (kg/m^2)	121	26.5	3.0	25.6	3.0	−1.0	1.2	<0.001
Mothers								
WT (kg)	190	65.7	12.9	64.5	12.6	−1.2	2.5	<0.001
HT (cm)	180	160.1	6.5	161.8	7.1	1.7	2.3	<0.001
BMI (kg/m^2)	178	25.4	4.5	24.5	4.5	−1.0	1.2	<0.001

Bias, mean difference (reported − measured); Sd, standard deviation of the difference between reported and measured values; *p*, probability of the observed bias occurring under the null hypothesis; WT, weight; HT, height; BMI, body mass index.

In the parents, the mothers on average underestimated weight to a greater extent than the fathers (1.1 kg and 0.3 kg, respectively), while the fathers overestimated their height to a greater extent than the mothers (2.9 cm and 1.7 cm, respectively). All these biases were highly significant ($p < 0.001$) because, in contrast to the adolescents, the standard deviations of the differences (Sd) between reported and measured weight and height in the parents were much smaller, 3 kg or less for weight and less than 3 cm for height. The overestimation of height and the underestimation of weight by the parents also resulted in a highly significant ($p < 0.001$) underestimation of the parents' BMI by 1.0 kg/m^2 when calculated from the reported data.

Table 2 highlights the differences in the precision

Table 2. Percentage of Subjects for Whom the Difference Between Reported and Measured Weight, Height, and Body Mass Index (BMI), When Rounded to the Nearest Integer, Differed by No More Than the Amount Specified

Difference	Boys (n = 109)	Girls (n = 95)	Fathers (n = 135)	Mothers (n = 190)
Weight (kg)				
1	33.0	56.8	34.1	43.2
2	48.6	67.4	67.4	69.0
3	67.9	74.7	82.2	84.7
4	76.2	81.1	91.1	90.5
5	81.7	89.5	92.6	93.7
Height (cm)				
1	21.1	18.5	20.7	36.1
2	33.9	35.8	40.5	58.3
3	52.3	49.4	57.9	77.8
4	57.8	64.2	73.6	88.3
5	64.2	67.9	80.0	94.4
BMI (kg/m^2)				
1	56.1	61.3	68.6	66.9
2	74.8	76.3	89.3	87.6
3	85.1	88.8	98.4	98.9
4	92.5	92.5	99.2	100.0
5	93.5	97.5	100.0	—

of reporting between the sexes and by adolescents as compared with their parents. It shows the percentage of boys, girls, fathers, and mothers for whom the difference between measured and reported weight, height, and BMI, when rounded to the nearest integer, was no greater than specified values. On average, less than 70% of the adolescents reported their weight to within 3 kg of the measured value compared with over 80% of the parents. In addition more adolescent girls than boys reported their weight at all specified levels of precision, while for the parents the proportion at all levels was very similar for both mothers and fathers. In the case of height only approximately 50% of adolescents and fathers reported their height to within 3 cm compared with nearly 80% of the mothers. A difference in the proportion of fathers and mothers was evident at all levels of precision specified in the table but was most obvious at the higher levels of precision (within 3 cm or less).

Correlation coefficients between measured and reported weight and height in the adolescents were 0.87 and 0.77, respectively, but only 0.67 for BMI. The correlation coefficients for all three measures were higher in the parents than in the adolescents and ranged from 0.92 for BMI in the fathers to 0.98 for weight in the mothers.

Influence of Body Size on Reported Weight and Height

Table 3 shows the regression equations for reported on measured weight and height for the adolescents and their parents. For all three groups the slopes of the regression lines were highly statistically significant ($p < 0.001$) and close to 1.0 both for weight and height. Only in the parents did the 95% confidence interval for the slope of reported on measured weight not include 1.0 (fathers, 0.8667–0.9579; mothers, 0.9338–0.9872) indicating a consistent tendency to underestimate weight. The regression equations indicate that over the range of weight and height observed in the present study, body size had little effect on the extent of the tendency to underestimate weight and overestimate height. For example, from the regression equations the mean estimated weights of adolescents, mothers and fathers with a measured weight of 50 kg were 49.5, 49.4, and 52.2 kg, respectively, and for those with a measured weight of 90 kg were 88.3, 87.8, and 88.7 kg, respectively. While in the case of height the mean estimated heights of adolescents, mothers and fathers with a measured height of 150 cm were 150.3, 151.1, and 154.1 cm, respectively, and for those with a measured height of 180 cm were 180.9, 182.0, and 182.4 cm, respectively.

Relationships With Occupation and Education

When adolescents and parents were grouped into tertiles according to the father's Daniel score (DS) the only significant differences observed were in the parents (Table 4). The mean difference between reported and measured height differed significantly with DS for height ($p < 0.01$) and for BMI ($p < 0.05$). In both cases the reporting bias was smallest in the

Table 3. Regression Equations for Reported (y) on Measured (x) Weight and Height for Adolescents and Their Parents

Group	Regression Equation ($y = a + bx$)	n	SE (b)
Reported weight			
Adolescents	0.85 + 0.972x	204	0.03808
Mothers	1.42 + 0.960x	190	0.01355
Fathers	6.64 + 0.912x	135	0.02307
Reported height			
Adolescents	−2.70 + 1.023x	190	0.06123
Mothers	−3.37 + 1.032x	180	0.02715
Fathers	12.35 + 0.945x	121	0.02982

Table 4. Mean Bias and Standard Deviation of the Mean Difference (Sd) Between Reported and Measured Values for Weight, Height, and Body Mass Index (BMI) According to Father's Daniel Score for Adolescents and Parents

Daniel Score	Weight			Height			BMI		
	n	Bias	Sd	*n*	Bias	Sd	*n*	Bias	Sd
Adolescents									
<4.0	73	−1.35	5.62	73	1.25	5.79	71	−0.69	2.61
4.0–4.8	57	−0.19	3.69	53	0.86	6.84	52	−0.20	2.16
>4.8	58	−0.98	5.69	47	1.61	6.42	47	−0.56	2.20
Parents									
<4.0	126	−0.79	2.58	120	2.08[b]	2.20	119	−0.98[a]	1.10
4.0–4.8	98	−1.23	2.47	92	2.90[b]	2.19	91	−1.28[a]	1.11
>4.8	90	−0.63	3.22	80	1.69[a]	2.48	80	−0.76[a]	1.39

Bias, mean difference (reported − measured); Sd, standard deviation of the difference between reported and measured values

[a] $p < 0.05$, bias significantly different between Daniel score groups by analysis of variance.

[b] $p < 0.01$, bias significantly different between Daniel score groups by analysis of variance.

group with the lowest occupational status (DS > 4.8).

A similar analysis by the parents' level of education revealed no significant differences in reporting bias.

Discussion

The results of the present study are in agreement with other reports in the literature (1,2,5,8–10) that self-reported weight and height in adults are valid and generally reliable measures with the majority of individuals able to report their weight and height to within 3% of measured weight and height and Pearson correlations of the order of 0.9 or higher between measured and reported values. The findings of the present study are also consistent with other reports that adults tend to underestimate their weight and to overestimate their height, and that women have a greater tendency to underestimate their weight and men a greater tendency to overstate their height. A tendency for heavier individuals to underestimate their weight to a greater extent than lighter individuals and for taller individuals to overestimate their height to a lesser extent than shorter individuals was also evident in the present study (2,3).

In contrast to the situation in adults there are few data with which to compare the findings in adolescents. Brooks-Gunn et al. (11) have reported correlations between self-reported and measured weight and height in English girls, aged between 11 and 13 years, of 0.98 for weight and 0.75 for height, while Stewart (10), in American adolescents aged between 14 and 17 years, has reported correlations similar to those reported for adults (0.97 for weight and 0.95 for height). In the present study, although the correlations between measured and reported weight and height were lower (0.87 for weight and 0.77 for height), the average amount by which weight was underestimated and height overestimated (0.8 kg and 1.1 cm) was similar to that in the studies of Brooks-Gunn et al. (11) (0.95 kg and 0.5 cm) and Stewart (1.1 kg and 0.3 cm). What was different in the present study was the magnitude of the standard deviation of the differences, or the precision of reporting, which was 4–6 kg and 6–8 cm as compared with 2–3 kg and 1 cm in Stewart's study. This clearly indicates that in this group of Australian adolescents the reliability of individual self-reports of weight and height was considerably lower than that observed in Stewart's study of American adolescents and that observed in the parents of the Australian adolescents. One possible reason for the lower reliability of self-reported height in the Australian adolescents is that they were on average younger than the American adolescents, and had a similar correlation for height to that reported by Brooks-Gunn et al. (11) for younger adolescents. It is not possible to argue on the same basis for weight because the correlations observed by both Brooks-Gunn and Stewart were higher than those in the present study and similar to those for adults. Another possible reason for the apparent difference in reliability between the Australian and the American data is that Stewart excluded from her analysis all differences between measured and reported data which exceeded four standard deviations of the mean difference (1% of cases), on the basis that these represented coding errors, whereas in the present study all reported values were included provided that they could be verified from the original data. It is possible that the changeover from imperial to metric units in Australia about 10 years ago also contributed to the lower reliability of reporting as some adolescents may have incorrectly calculated the metric equivalents reported by them in the questionnaire.

The present study found no evidence for significant differences in the degree of under- or overestimation of weight or height with parents' educational level as reported by others (3,8,10), however, the proportion of parents with a university education was only 15%, and the sample size may have been insufficient for such a comparison. Parents from the lowest tertile of occupational status,

based on father's occupation, were, however, found to overestimate height to a lesser degree than those in the other tertiles while no significant differences were observed with weight.

In summary, individual self-reports of both weight and height by the Australian adolescents in this study were less reliable than those of their parents and for other groups of adolescents reported in the literature. On average, however, the extent to which weight was underestimated and height overestimated was no greater than that observed in adults and suggests that at the group level mean reported weight and height are likely to be as valid a measure of actual weight and height as in adults.

[See related articles in J. Adolesc. Health 1992; 13:114–118 and 118–121. Ed.]

References

1. Stunkard AJ, Albaum JM. The accuracy of self-reported weights. Am J Clin Nutr 1981;34:1593–9.
2. Wing RR, Epstein LH, Ossip DJ, La Porte RE. Reliability and validity of self-report and observers' estimates of relative weight. Addictive Behaviours 1979;4:133–40.
3. Pirie P, Jacobs D, Jeffery R, Hannan P. Distortion in self-reported height and weight data. J Am Diet Assoc 1981;78:601–6.
4. Hearns JF, Bruida JP, Gayton WF. Accuracy of estimations of body-frame size as a function of sex and actual frame size. Percept Mot Skills 1988;66:144–6.
5. Kuskowska-Wolk A, Karlsson P, Stolt M, Rossner S. The predictive validity of body mass index based on self-reported weight and height. Int J Obesity 1989;13:441–53.
6. Daniel A. Australian studies. Power, privilege and prestige. Occupations in Australia. Melbourne: Longman Cheshire, 1983.
7. Gore SM, Altman DG. Statistics in practice. London: British Medical Association, 1982;13.
8. Jalkanen L, Tuomilehto J, Tanskanen A, Puska P. Accuracy of self-reported weight compared to measured body weight. Scand J Soc Med 1987;15:191–8.
9. Palta M, Prineas RJ, Berman R, Hannan P. Comparison of self-reported and measured height and weight. Am J Epidemiol 1982;115:223–30.
10. Stewart AL. The reliability and validity of self-reported weight and height. J Chronic Dis 1982;35:295–309.
11. Brooks-Gunn J, Warren MP, Rosso J, Gargiulo J. Validity of self-report measures of girls' pubertal status. Child Dev 1987;58:829–41.
12. Charney E, Goodman HC, McBridge M, et al. Childhood antecedents of adult obesity. Do chubby infants become obese adults? N Engl J Med 1976;295:6–9.