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Validation of self-reported height and weight in fifth-grade Korean children

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Abstract

Height and weight are important indicators to calculate Body Mass Index (BMI); measuring height and weight directly is the most exact method to get this information. However, it is ineffective in terms of cost and time on large population samples. The aim of our study was to investigate the validity of self-reported height and weight data compared to our measured data in Korean children to predict obese status. Four hundred twenty-two fifth-grade (mean age 10.5 ± 0.5 years) children who had self-reported and measured height and weight data were final subjects for this study. Overweight/obese was defined as a BMI of or above the 85th percentile of the gender-specific BMI for age in the 2007 Korean National Growth Charts or a BMI of 25 or higher (underweight : < 5th, normal : ≥ 5th to < 85th, overweight : ≥ 85th to < 95th). The differences between self-reported and measured data were tested using paired *t*-test. Differences based on overweight/obese status were tested using analysis of variance (ANOVA) and linear trends. Pearson's correlation and Cohen's kappa were tested to examine agreements between the self-reported and measured data. Although measured and self-reported height, weight and BMI were significantly different and children tended to overreport their height and underreport their weight, the correlation between the two methods of height, weight and BMI were high (r = 0.956, 0.969, 0.932, respectively; all $P < 0.001$), and both genders reported their overweight/non-overweight status accurately (Cohen's kappa = 0.792, $P < 0.001$). Although there were differences between the self-reported and our measured methods, the self-reported weight and height was valid enough to classify overweight/obesity status correctly, especially in non-overweight/obese children. Due to bigger underestimation of weight and overestimation of height in obese children, however, we need to be aware that the self-reported anthropometric data were less accurate in overweight/obese children than in non-overweight/obese children.

Key Words: Self-report, measure, height, weight, children

Introduction

Height and weight are commonly used to calculate the body mass index (BMI) that is an important indicator to assess obesity status. To obtain information of height and weight, self-report methods are more preferable to direct measurements in many epidemiological studies due to the heavy cost and effort of direct measurement on large population samples [1]. However, several studies have found that the self-reported height and weight data do not correspond to those by direct measurement. Most people tend to overestimate their height and underestimate their weight [2-9]. Obese women have greater probability of misreporting their anthropometric information [2,10,11]. Also, relatively older adults tend to misreport the information [1,12]. They may be unaware of their physical information or often recall past information [13,14]. According to some studies, adolescents tend to report their height almost similar to their actual height and slightly underreport their weight [15,16]. Conversely, other studies demonstrate that self-reported data is not valid, especially among overweight children and adolescents [8,17-21].

Many studies compare two methods measuring height and weight, but the relation of the two methods has been changed by age, gender, BMI, and so on. Furthermore, few of this kind of study have been performed in South Korea; therefore, this study is aimed to test the validity of height and weight by self-report methods and the degree of misreported height and weight by overweight/obese status in fifth-grade Korean children.

Subjects and Methods

Subjects

Data for our study were obtained from the television food advertisement and obesity study conducted in Korea, which examined how food advertisements influence children's food intake and obesity status [22]. Participants of the study consisted of 2,517 fifth-grade children who were representative of 118 schools from all 16 cities in Korea. We used a stratified sampling method. Of those 2,517 children who completed the self-admi-

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nistered questionnaires-including height and weight information-422 children (212 boys, 210 girls, mean age 10.5 ± 0.5 years) from 22 schools who had measured height and weight data were selected as subjects for this study to test the validity of self-reported height and weight by matching the measured data.

Overweight/Obesity criteria

Overweight was defined as a BMI of equal to or higher than the 85th percentile and lower than the 95th percentile of the gender-specific BMI for age in the 2007 Korean National Growth Charts [23]. *Obese* was defined as a BMI of or above the 95th percentile of the gender-specific BMI for age in the 2007 Korean National Growth Charts or a BMI of 25 or higher (underweight: < 5th, normal : ≥ 5th to < 85th, overweight: ≥ 85th to < 95th).

Statistical analysis

The differences between self-reported and measured data were tested using paired *t*-test. Differences of height and weight between self-reported and measured data among groups according to overweight/obese status were tested using analysis of variance (ANOVA). Linear trends were also conducted to examine the trends of differences by overweight/obese status. Correlations between self-reported and measured data were analyzed by Pearson's correlation coefficient to examine the strength of linear dependence between the two methods. Agreement of overweight/obese status between the two methods was tested using Cohen's kappa. *Statistically significant* was defined as $P < 0.05$. SPSS (version 18.0 for Windows) was used for statistical analyses of data.

Results

The means and standard deviation of measured and self-reported height, weight and BMI by gender are shown in Table 1. There were significant differences in height, weight and BMI between the self-reported method and our measured data in both genders of fifth-grade children (all $P < 0.001$). Height was overreported by 0.84 cm in boys and 0.72 cm in girls; on average, weight tended to be underreported by about 0.48 kg in boys and 0.36 kg in girls. The differences of the two methods were not significantly different by gender (for height $P = 0.537$, for weight $P = 0.599$).

The differences between measured and self-reported height and weight were significantly different by body weight status, and the differences showed significant linear trends (Table 2). Obese children tended to report higher than their actual height by an average of 1.12 cm and lower than their actual weight by an average of 2.08 kg. Also, a significantly positive linear trend was shownin height difference between the two methods (*P* for

Table 1. Mean of self-reported and measured heights and weights, body mass index (BMI) by gender

	Total			Boys (n = 212)			Girls (n = 210)		
	Self-reported	Measured	*P*-value[1)]	Self-reported	Measured	*P*-value[1)]	Self-reported	Measured	*P*-value[1)]
Height (cm)	144.67 ± 7.15[2)]	143.89 ± 6.71	< 0.001	144.79 ± 7.17	143.94 ± 6.57	< 0.001	144.56 ± 7.14	143.84 ± 6.87	< 0.001
Weight (kg)	39.53 ± 8.61	39.95 ± 9.21	< 0.001	40.65 ± 8.60	41.14 ± 9.40	< 0.001	38.38 ± 8.49	38.75 ± 8.87	< 0.001
BMI (kg/m^2)	18.75 ± 3.10	19.14 ± 3.34	< 0.001	19.26 ± 3.09	19.69 ± 3.40	< 0.001	18.24 ± 3.04	18.58 ± 3.20	< 0.001
Mean Differences in height (cm)[3)]	0.78 ± 2.09		0.537[4)]	0.84 ± 2.07			0.72 ± 2.11		
Mean Differences in weight (Kg)[3)]	-0.42 ± 2.30		0.599[4)]	-0.48 ± 2.45			-0.36 ± 2.13		

[1)] *P*-value by paired t-test between self-reported and measured method.
[2)] Mean ± SD.
[3)] Self-reported value.
[4)] *P*-value by student's t-test between boys and girls.

Table 2. Mean differences between measured and self-reported heights and weights by BMI categories

	BMI categories by measure				F-value[1)]	*P*-value[2)]	*P*-value[2)]
	Underweight (n = 17)	Normal (n = 308)	Overweight (n = 49)	Obese (n = 48)			
Mean differences in height[3)]	-0.92 ± 1.89	0.80 ± 1.98	0.93 ± 2.42	1.12 ± 2.25	4.384	0.005	0.026
Mean differences in weight[3)]	1.11 ± 2.02	-0.16 ± 1.85	-0.95 ± 2.14	-2.08 ± 3.81	14.270	< 0.001	< 0.001

[1)] F-value and p for ANOVA among groups based on weight status.
[2)] P for linear trend among groups based on weight status.
[3)] Self-reported value.

Table 3. Pearson's correlation coefficients of self-reported and measured heights and weights, body mass index (BMI) by gender

	Total		Boys (n = 212)		Girls (n = 210)	
	Pearson's correlation	*P*-value	Pearson's correlation	*P*-value	Pearson's correlation	*P*-value
Height (cm)	0.956	< 0.001	0.958	< 0.001	0.955	< 0.001
Weight (kg)	0.969	< 0.001	0.967	< 0.001	0.971	< 0.001
BMI (kg/m^2)	0.932	< 0.001	0.927	< 0.001	0.935	< 0.001

Table 4. Agreement (Cohen's kappa) of BMI categories by measure and self-reported methods

	By measure									
	Total				Boys			Girls		
By self-report	Non Overweight/ Obese	Overweight/ Obese	Total	k	Non Overweight/ Obese	Overweight/ Obese	k	Non Overweight/ Obese	Overweight/ Obese	k
Non-overweight /Obese	320(75.8)[1)]	24(5.7)	344(81.5)		153(72.2)	15(7.1)		167(79.5)	9(4.3)	
Overweight /Obese	5(1.2)	73(17.3)	78(18.5)	0.792[2)]	2(0.9)	42(19.8)	0.780[2)]	3(1.4)	31(14.8)	0.803[2)]
total	325(77.0)	97(23.0)	422(100)		155(73.1)	57(26.9)		170(81.0)	40(19.0)	

[1)] The number of subjects (%)
[2)] Analyzed by Cohen's kappa at $P < 0.001$

linear trend = 0.026) and a negative linear trend was shown in weight difference between the two methods (P for linear trend < 0.001) as children become obese.

Pearson's correlation coefficients between measured and self-reported height, weight and BMI showed statistically significant positive linear relationship in both genders (Table 3, r = 0.956, 0.969, 0.932, respectively; all $P < 0.001$).

Using Cohen's kappa to examine agreement, the self-reported data agreed with measured data significantly (k = 0.792, $P <$ 0.001; Table 4). Of all children, 29 children (6.9%) were misclassified in their obese status. Five children (1.2%) included in the non-overweight/obese group in measured data were misclassified into an overweight/obese group; 24 children (5.7%) included in an overweight/obese group were misclassified into a non-overweight/obese group. The agreements of the two methods appear to be similar for both genders (in boys, k = 0.780, $P < 0.001$; in girls, k = 0.803, $P < 0.001$).

Discussion

Our study examined the validity of self-reported height and weight in fifth-grade children. We found that of 422 children, only 29 (6.9%) children were misclassified when comparing their actual BMI categories. But considering only the overweight/obese group, 24.7% of children included in an actual overweight/obese group were misclassified by self-report. These findings are similar to other results that 30% of overweight/obese adolescents in Australia and overweight adults in Sweden were classified incorrectly [17,24]. Nevertheless, taken as a whole, BMI categories classified by self-report agreed with the actual BMI categories in 93.1% of participants. Especially, 98.5% of non-overweight/obese children were classified into correct categories. These results support previous studies that the percentage of correct classification of obesity status by self-reported height and weight was 94% in adolescents 12 to 16 years of age and 91% in children 6 to 12 years of age [25,26].

Most people with a higher weight, regardless of age, tend to report weight inaccurately [16,17,19,21,25,27,28]. Our study also found that there were significant differences in height, weight and BMI between the self-reported and measured methods, and that participants overreported their height and underreported their weight slightly in both genders. Despite the differences of the two methods, the correlation between self-reported and measured height and weight was high. It is similar to what has been found in other studies of children and adolescent [8,17,20,27].

The agreement value of body weight categories using BMI by our measure and the self-report method was 0.792, which was higher than that in another study with high school students that demonstrated the value as '0.630' [27]. Kuczmarski *et al*. [1] suggested that young adults were better at classifying weight, height and obesity than older adults using self-reports because older adults might have greater elapsed time since their height and weight were last measured. Participants in our study were school children whose height and weight were measured every year at school. This might result in relatively accurate classification of overweight/obese status by self-reports in fifth-grade children, although the values of height and weight were a little different between the two methods. In our study, there were no differences in the accuracy of self-reported height and weight between boys and girls. A study with young adolescents also reported no gender differences in accuracy and 94% correct classification of weight status [25]. In conclusion, although there were a number of differences between self-reported and measured methods, the self-reported height and weight was valid enough to classify overweight/obesity status correctly, especially in non-overweight/obese children. Due to underestimation of weight and overestimation of height, however, we need to be aware that fifth-grade children may also consider obesity as a stigma and that self-reported anthropometric data were less accurate in overweight/obese children than in non-overweight/obese children.

Our study has limitations. First, the sample size is smaller than other studies. This smaller sample size may result in non-significant results by lowering statistical power. Second, the results of this study may be applicable to only specific populations such as pre-teenagers in elementary school because this study handled only fifth-grade children of matched gender.

Despite these limitations, the high agreement and correlation between measured and self-reported height, weight and BMI suggest that self-report methods can be used as a valid tool to

classify the overweight/obese status for large population studies of Korean children in school-based research when direct anthropometric measures are not available. But using the self-report method should be considered carefully in epidemiological and clinical studies because of underestimation of the overweight and obese children in the population.

References

1. Kuczmarski MF, Kuczmarski RJ, Najjar M. Effects of age on validity of self-reported height, weight, and body mass index: findings from the Third National Health and Nutrition Examination Survey, 1988-1994. J Am Diet Assoc 2001;101:28-34.
2. Brunner Huber LR. Validity of self-reported height and weight in women of reproductive age. Matern Child Health J 2007; 11:137-44.
3. Gorber SC, Tremblay M, Moher D, Gorber B. A comparison of direct vs. self-report measures for assessing height, weight and body mass index: a systematic review. Obesity 2007;8:307-26.
4. Katsnelson MJ, Peterlin BL, Rosso AL, Alexander GM, Erwin KL. Self-reported vs. measured body mass indices in migraineurs. Headache 2009;49:663-8.
5. Gillum RF, Sempos CT. Ethnic variation in validity of classification of overweight and obesity using self-reported weight and height in American women and men: the Third National Health and Nutrition Examination Survey. Nutrition J 2005;4:27-34.
6. Palta M, Prineas RJ, Berman R, Hannan P. Comparison of self-reported and measured height and weight. Am J Epidemiol 1982;115:223-30.
7. Smith GT, Hohlstein LA, Atlas JG. Accuracy of self-reported weight: Covariation with binger or restrainer status and eating disorder symptomatology. Addict Behav 1992;17:1-8.
8. Danubio ME, Miranda G, Vinciguerra MG, Vecchi E, Rufo F. Comparison of self-reported and measured height and weight: Implications for obesity research among young adults. Econ Hum Biol 2008;6:181-90.
9. Engstrom JL, Paterson SA, Doherty A, Trabulsi M, Speer KL. Accuracy of self-reported height and weight in women: an integrative review of the literature. J Midwifery Womens Health 2003;48:338-45.
10. de Araujo DS, de Araujo CG. Self-perception and dissatisfaction with weight does not depend on the frequency of physical activity. Arq Bras Cardiol 2003;80:235-49.
11. Nawaz H, Chan W, Abdulrahman M, Larson D, Katz DL. Self-reported weight and height: Implications for obesity research. Am J Prev Med 2001;20:294-8.
12. Rowland ML. Self-reported weight and height. Am J Clin Nutr 1990;52:1125-33.
13. Alvarez-Torices JC, Franch-Nadal J, Alvarez-Guisasola F, Hernandez-Mejia R, Cueto-Espinar A. Self-reported height and weight and prevalence of obesity. Study in a Spanish population. Int J Obes Relat Metab Disord 1993;11:663-7.
14. Haboubi NY, Hudson PR, Pathy MS. Measurement of height in the elderly. J Am Geriatr Soc 1990;38:1008-10.
15. Morrissey SL, Whetstone LM, Cummings DM, Owen LJ. Comparison of self-reported and measured height and weight in eighth-grade students. J Sch Health 2006;10:512-5.
16. Elgar FJ, Chris Roberts C, Tudor-Smith C, Moore L. Validity of self-reported height and weight and predictors of bias in adolescents. J Adolesc Health 2005;37:371-5.
17. Wang Z, Patterson CM, Hills AP. A comparison of self-reported and measured height, weight and BMI in Australian adolescents. Aust N Z J Public Health 2002;26:473-8.
18. Himes JH, Hannan P, Wall M, Neumark-Sztainer D. Factors associated with errors in self-reports of stature, weight, and body mass index in Minnesota adolescents. Ann Epidemiol 2005;4: 272-8.
19. Lee K, Valeria B, Kochman C, Lenders CM. Self-assessment of height, weight, and sexual maturation: validity in overweight children and adolescents. J Adolesc Health 2006;39:346-52.
20. Tsigilis N. Can secondary school students' self-reported measures of height and weight be trusted? An effect size approach. Eur J Public Health 2006;16:532-5.
21. Shannon B, Smiciklas-Wright H, Wang MQ. Inaccuracies in self-reported weights and heights of a sample of sixth-grade children. J Am Diet Assoc 1991;6:675-8.
22. Lee B, Lee HJ, Chung SJ, Lee SK, Yoon BJ, Chang KA. The effect of exposure to television food advertising on BMI and frequencies of food by fifth-grade children in South Korea. Seoul, Korea: The Korean Society of Community Nutrition 2011, Abstract
23. Korea Center for Disease Control and Prevention & The Korean Pediatric Society. 2007 Korean National Growth Charts. 2007
24. Kuskowska-Wolk A, Karlsson P, Stolt M, Rössner S. The predictive validity of body mass index based on self-reported weight and height. Int J Obes 1989;13:441-53.
25. Strauss RS. Comparison of measured and self-reported weight and height in a cross-sectional sample of young adolescents. Int J Obes Relat Metab Disord 1999;23:904-8.
26. Epstein LH, McCurley J, Murdock RC Jr. Estimation of percent overweight within families. Addict Behav 1991;16:369-75.
27. Brener ND, Mcmanus T, Galuska DA, Lowry R, Wechsler H. Reliability and validity of self-reported height and weight among high school students. J Adolesc Health 2003;32:281-7.
28. Sherry B, Jefferds ME, Grummer-Strawn LM. Accuracy of adolescent self-report of height and weight in assessing overweight status: a literature review. Arch Pediatr Adolesc Med 2007; 161:1154-61.