Concordance of Self-Report and Measured Height and Weight of College Students

Virginia Quick, PhD, RD[1,†]; Carol Byrd-Bredbenner, PhD, RD[2]; Suzanne Shoff, PhD, RD[3]; Adrienne A. White, PhD, RD[4]; Barbara Lohse, PhD, RD[5]; Tanya Horacek, PhD, RD[6]; Kendra Kattelmann, PhD, RD[7]; Beatrice Phillips, MS, RD[8]; Sharon L. Hoerr, PhD, RD[9]; Geoffrey Greene, PhD, RD[10]

ABSTRACT

Objective: This study examined associations between college students' self-report and measured height and weight.

Methods: Participants (N = 1,686) were 77% white, 62% female, aged 18–24 years (mean ± SD, 19.1 ± 1.1 years), and enrolled at 8 US universities. Body mass index (BMI) was calculated for self-report (via online survey); trained researchers measured height and weight and categorized them as normal (18.5 to < 25), overweight (25 to < 30), obese (30 to < 35), and morbidly obese (≥ 35).

Results: Concordance of self-report vs objectively measured BMI groups using chi-square revealed that 93% were accurate, 4% were underestimated, and 2.7% were overestimated. Pearson correlations and adjusted linear regression revealed significant associations between self-report and measured BMI ($r = .97$; $P < .001$) and BMI adjusted for age, gender, and race/ethnicity ($R^2 = .94$). Concordance was also high between BMI categories (kappa = 0.77; $P < .001$).

Conclusions and Implications: Findings provide support for the utility of self-report height and weight for survey research in college students.

Key Words: self-report, height, weight, body mass index, college students (*J Nutr Educ Behav*. 2015;47:94-98.)

INTRODUCTION

Many research studies include weight and height as primary outcomes. Although having trained personnel conduct direct measurements of body weight and height using research-quality equipment and standardized techniques is considered the reference standard in research,[1] financial and/or logistical considerations (eg, geographic distance between researchers and participants) frequently preclude the application of this standard. This can be a problem for the many research studies that use weight and height or body mass index (BMI) as primary outcomes. Self-reported body weight and height data are easy and cost-effective to obtain,[2] but they are often viewed as a study limitation and are considered insufficiently accurate for research studies. Previous investigations have found good concordance between measured and self-reported height and weight among youth (aged 15–25 years) and adults (aged 30–75 years).[3-5] However, little is known about the accuracy of self-reported weight and height among young adults enrolled in college. Some studies suggest that college students who are female and/or overweight tend to overestimate height and underestimate weight, which makes it difficult to have confidence in self-reported measurements in this population.[6,7]

[1]Department of Health Sciences, James Madison University, Harrisonburg, VA
[2]Department of Nutritional Sciences, Rutgers University, New Brunswick, NJ
[3]Department of Nutritional Sciences, University of Wisconsin–Madison, Madison, WI
[4]School of Food and Agriculture, University of Maine, Orono, ME
[5]Department of Nutritional Sciences, Pennsylvania State University, University Park, PA
[6]Department of Public Health, Food Studies and Nutrition, Syracuse University, Syracuse, NY
[7]Department of Health and Nutritional Sciences, South Dakota State University, Brookings, SD
[8]Department of Food and Nutritional Sciences, Tuskegee University, Tuskegee, AL
[9]Department of Food Science and Human Nutrition, Michigan State University, East Lansing, MI
[10]Department of Nutrition and Food Sciences, University of Rhode Island, Kingston, RI
[†]At the time this research was conducted, Dr Quick was at *Eunice Kennedy Shriver* National Institute of Child Health and Human Development, National Institutes of Health.
Address for correspondence: Virginia Quick, PhD, RD, Department of Health Sciences, James Madison University, 801 Carrier Drive, MSC 4301, Harrisonburg, VA 22801; Phone: (540) 568-6362; Fax: (540) 568-3336; E-mail: gingermquick@gmail.com

It is important to calculate BMI data in studies of young adults because people of this age experience increases in weight gain at an average of 15 kg over 15 years, which places them at risk for cardiovascular disease and other obesity-related diseases.[8-10] For the majority of young adults who transition to college, weight gain may be related to changes in their food environment and physical activity levels.[11,12] Studies of college students often use self-reported height and weight data to track the prevalence of overweight and obesity,[13] which helps to inform obesity prevention and intervention efforts. Thus, information on the accuracy of students' self-reports of height and weight to estimate rates of overweight and obesity is important.

Body mass index is a continuous variable calculated from height and weight that is often classified into categories (ie, underweight, < 18.5 kg/m^2; normal, 18.5 to < 25 kg/m^2; overweight, 25 to < 30 kg/m^2; obese, 30 to < 35 kg/m^2; and morbidly obese, ≥ 35 kg/m^2).[14] The current authors could locate no studies that compared the concordance of BMI categories in a large, ethnically diverse population of young adults enrolled in college. Thus, the purpose of this study was to determine the accuracy of BMI categories when using self-report vs measured height and weight among college students from 8 universities. If self-reports of body weight and height are determined to be reasonably accurate, self-reported data in calculating BMI could be viewed with greater confidence.

METHODS

The university partners in the US Department of Agriculture Multistate Healthy Campus Research Consortium that focuses on the health of young adults conducted this survey. This study was approved by the institutional review boards of these participating universities: Michigan State University, South Dakota State University, Syracuse University, Pennsylvania State University, Tuskegee University, University of Rhode Island, University of Maine, University of Wisconsin, and Rutgers University.

Participants aged 18–24 years enrolled at the first 8 universities named above were recruited to participate in the Project WebHealth behavioral intervention using verbal announcements at student gatherings, flyers, and postings to university listservs. Eligibility criteria included having a BMI > 18.5 kg/m^2, not being pregnant or lactating, and not majoring in nutrition or exercise science.[15] Only baseline data were used in the study reported here. Response rates to the overall Project WebHealth study are reported elsewhere.[16] However, there were no statistical significant demographic (ie, age, gender, race/ethnicity) differences between participants (n = 1,686) and nonparticipants with online survey data (n = 557), except that nonparticipants were significantly more likely to self-report slightly higher BMIs compared with participants ($t =$ 2.28; $P = .02$).

Data Collection

Eligible participants gave informed consent and completed online questionnaires that included demographic measures (ie, age, sex, college major, and race/ethnicity), and self-reported height and weight, which took about 30 minutes to complete. Participants also scheduled an appointment to complete physical assessments.

To prepare for the physical assessments, participants were instructed to refrain from eating or drinking caloric beverages for 4 hours, to avoid high-intensity exercise for 24 hours before the assessment, and to wear light clothing. Trained research personnel used standardized procedures[1] and measured participants' weight (in kilograms) and height (in centimeters) in duplicate. Weight was measured to the nearest 0.25 lb with a calibrated digital or balance beam scale and height was measured to the neared 0.25 inch using a wall-mounted stadiometer.

Researchers used the height and weight of each study participant to derive 2 BMI estimates (ie, self-reported BMI and measured BMI).[14] Both self-reported and measured BMI were used as both linear and categorical variables (ie, underweight, < 18.5 kg/m^2; normal 18.5 to

< 25 kg/m^2; overweight, 25 to < 30 kg/m^2; obese, 30 to < 35 kg/m^2; and morbidly obese, ≥ 35 kg/m^2).[14] Self-reported and measured body weight and height also were categorized and coded into normal (ie, BMI 18.5 to $< 25 =$ coded 0) and overweight/obese (ie, BMI $\geq 25 =$ coded 1) weight status groups. Body mass index misclassification groups (ie, accurate and under- and over-reporting) were created by taking the difference between values of self-report and measured weight status groups. Scores deviating from 0 indicated BMI group misclassification (ie, −1 indicated underreporting and 1 indicated over-reporting).

Data Analysis

Descriptive statistics defined demographic variables and self-reported and measured BMI. The researchers used paired t tests to determine statistical significant difference between measured and self-reported height and weight by gender. Chi-square tests were used to determine whether significant differences in BMI classification groups occurred between genders. In addition, correlations between self-report and measured BMI using BMI classification groups (ie, underweight, < 18.5 kg/m^2; normal, 18.5 to < 25 kg/m^2; overweight, 25 to < 30 kg/m^2; obese, 30 to < 35 kg/m^2; and morbidly obese ≥ 35 kg/m^2) were conducted using Pearson correlation, and agreement level (ie, concordance) was calculated using kappa tests. Linear regression (unadjusted and adjusted for gender, age, and race/ethnicity) of measured BMI (dependent variable) with self-report BMI (independent variable) was also conducted. The researchers performed analyses using SPSS 21 (Chicago, IL).

RESULTS

Most participants (N = 1,686) were female (62%) and white (77%), and had a mean $\pm$ SD age of 19.1 $\pm$ 1.1 years (Table 1). Most participants also were within a normal weight range, with a measured BMI of 23.9 $\pm$ 4.1 kg/m^2.

Paired t tests indicated that men were significantly more likely to over-report weight and height (weight: $t =$ 5.29, degrees of freedom [df] = 633,