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How accurate are self-reported height and weight in the seriously mentally ill?

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ABSTRACT

Aims: (1) Determine the accuracy of self-reported height, weight, and body mass index (BMI) calculated from those values in a population suffering from both serious mental illness (SMI) and overweight/obesity; (2) identify any associations that may predict error in self-reported measurements. Data were collected from screening appointments for two clinical trials for adult patients with SMI and overweight/obesity (BMI > 28) who gained weight while on antipsychotic medications. Both studies were conducted at the same urban community mental health center. Differences in self-reported and measured height, weight, and BMI were calculated. Analysis included age, sex, race, psychiatric diagnosis, and level of education. BMI calculated from self-reported height and weight were significantly lower (-0.47 kg/m^2) than measured values. Height was significantly overestimated (1.04 cm), while weight was underestimated (0.055 kg). Men underestimated BMI more than women (0.55 vs. 0.41 kg/m^2). Increasing age correlated with lower accuracy of self-reported height and BMI. No differences due to psychiatric diagnosis, race, or education were found. BMI calculated from self-reported height and weight from patients with SMI and overweight/obesity is as accurate as the self-reported measurements collected from the general population and, while measurement is best, self-reports can be used as a tool for screening for obesity.

1. Introduction

Obesity is an epidemic in developed countries, with an estimated 1.9 billion overweight adults and 600 million adults suffering from obesity (Ng et al., 2014). Obesity, a condition of excess adipose tissue, is associated with significant morbidity and mortality rates and increases the risk of many comorbid conditions, including insulin resistance, type II diabetes, hypertension, cardiovascular disease, and sleep apnea (Jensen et al., 2013). In the US, the incidence of obesity is even greater in populations suffering from mental illness, including schizophrenia, depression, anxiety disorders, and mood disorders (Berkowitz and Fabricatore, 2011; Chwastiak and Tek, 2009; Rosen-Reynoso et al., 2011; Saha et al., 2007; Tiihonen et al., 2009). With the growing prevalence of obesity in people with serious mental illness (SMI), it is important to easily and accurately identify obesity.

Currently we rely on body mass index (BMI) as an indirect measure of body fat and a standard in screening for obesity (Connor Gorber et al., 2007). Although it does not directly measure adiposity, BMI is a practical measure for studies of large populations and as an initial screening tool (Stevens et al., 2008). Self-reported height and weight measures can be used to calculate BMI, though they may lead to considerable errors in studies involving the general population (Rothman, 2008). Subjects may inaccurately recall their previous height and weight measurements, show response bias due to social desirability, or have other reasons for inaccurate reporting (Singleton et al., 1993). Sex, age, and racial/ethnic demographics have been shown to affect the accuracy of self-reported measurements (Kuczmarski et al., 2001; Spencer et al., 2002; Stommel and Schoenborn, 2009). Inaccuracies in self-reported height and weight have been described as a “flat slope syndrome”, where lower heights and weights are reported as higher, while higher values are reported as lower (Kuskowska-Wolk et al., 1989). Therefore, BMI calculated from self-reported data converge towards the mean, and low and high BMI values are underreported.

Overall, BMI from self-reported data is 0.59–1.23 kg/m^2 lower than measured BMI (Krul et al., 2011; Spencer et al., 2002; Stommel and Schoenborn, 2009). In one analysis (Stommel and Schoenborn, 2009) involving 15,161 participants, 16% of respondents classified as “overweight” based on measured BMI were classified as “normal weight” using self-reported height and weight. Additionally, 19% of participants classified as “obese” by measured BMI were classified as “overweight” using self-reported measurements. In another study (Krul et al., 2011),

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Table 1
Baseline demographics by diagnosis.

Parameter	Schizophrenia (*N* = 129)	Schizoaffective (*N* =104)	Bipolar (*N* = 42)	MDD (*N* = 23)	Other (*N* = 14)	Total (*N* = 312)	Test stat.	*P* Value
Age (SD)	45.5 (11.27)	45.94 (10.16)	40.33 (13.15)	42.83 (12.1)	45.21 (12.78)	44.74 (11.41)	2.200[a]	0.069
Male	70 (54.3%)	40 (38.5%)	16 (38.1%)	5 (21.7%)	8 (57.1%)	139 (44.6%)	12.939[b]	0.012
Education							26.382[c]	< 0.001
< High School	51 (39.5%)	22 (21.6%)	5 (11.9%)	3 (13%)	2 (14.3%)	83 (26.8%)		
High School	43 (33.3%)	31 (30.4%)	13 (31%)	7 (30.4%)	4 (28.6%)	98 (31.6%)		
Some College	21 (16.3%)	33 (32.4%)	18 (42.9%)	8 (34.8%)	4 (28.6%)	84 (27.1%)		
College	8 (6.2%)	14 (13.7%)	3 (7.1%)	2 (8.7%)	4 (28.6%)	31 (10%)		
> College	6 (4.7%)	2 (2%)	3 (7.1%)	3 (13%)	0	14 (4.5%)		
Race							24.122[b]	< 0.001
White	33 (25.6%)	42 (40.4%)	27 (64.3%)	11 (47.8%)	8 (57.1%)	121 (38.8%)		
A. American	73 (56.6%)	50 (48.1%)	11 (26.2%)	10 (43.5%)	4 (28.6%)	148 (47.4%)		
Latino	21 (16.3%)	8 (7.7%)	2 (4.8%)	2 (8.7%)	1 (7.1%)	34 (10.9%)		
Asian	0	1 (1%)	0	0	0	1 (0.3%)		
N. American	0	1 (1%)	0	0	0	1 (0.3%)		
Other	2 (1.6%)	2 (1.9%)	2 (4.8%)	1 (1%)	1 (7.1%)	7 (2.2%)		

[a] ANOVA *F* statistic.
[b] Pearson χ^2 test statistic, [c]Pearson χ^2 test statistic comparing schizophrenia vs. non-schizophrenia.

11.4% of North American women and 13.9% of North American men were misclassified by BMI category (underweight, normal weight, overweight, and obese) when comparing measured and self-reported height and weight data.

Accurate height, weight, and BMI are essential in ensuring that medical decisions are being made with the best information available. Apart from a screening tool for adiposity, height and weight are involved in many aspects of health, including basal metabolic rate estimations, fitness tracking, and medication dosing. Thus, it is important to understand the accuracy of self-reported height and weight. To the best of the authors' knowledge, there are no studies measuring the accuracy of self-reported height, weight, and BMI in patients with SMI, a population with high prevalence of obesity and other medical issues. The purpose of this analysis is to (1) determine the accuracy of self-reported height and weight and the BMI calculated from those values in a population suffering from both SMI and obesity, and (2) determine any associations that may predict potential error in self-reported BMI.

2. Methods

2.1. Data collection

Data were collected during baseline screening from two clinical trials for weight loss for highly overweight or obese (BMI ≥ 28) patients with SMI. Both studies were conducted at the Connecticut Mental Health Center located in New Haven, CT. Participants were outpatients on stable doses of psychiatric medications for at least one month prior to enrollment. Subjects were excluded from the study if they had a history of dementia or mental retardation, were not capable of giving informed consent, or were pregnant or looking to become pregnant. Patients were recruited via physician referral, posted flyers and pamphlets at local psychiatry outpatient centers, and internet. Patients were asked to estimate their height and weight. Then during the same visit, trained study personnel measured the patient's weight with a calibrated scale to the nearest 0.1 kg and the patient's height with a stadiometer to the nearest 0.1 cm, with participants wearing lightweight clothing and no shoes.

One study was a lifestyle management study (ClinicalTrials.gov Id: NCT00990925) conducted from October 2009 to January 2012 for patients with DSM-IV diagnoses of schizophrenia or schizoaffective disorder. Structured Clinical Interview for DSM-IV was performed to confirm diagnosis (First et al., 2007). Patients who lived in a structured environment where meals were provided were excluded. Patients were randomly assigned into either a SIMPLE lifestyle modification group or a treatment as usual group. SIMPLE focuses on rule simplicity, community-based grocery shopping education, cognitive behavioral techniques, and a food reimbursement program that serves as a contingency management tool to reward healthy food purchases and provide behavioral reinforcement.

The other study (ClinicalTrials.gov Id: NCT01866098) is an ongoing double blind medication trial for non-diabetic adult patients with antipsychotic-induced weight gain. Screenings took place between May 2013 and January 2017. Mini International Neuropsychiatric Interview (M.I.N.I) for DSM-IV was performed to confirm diagnosis (Sheehan et al., 1997). Patients were randomized to either opiate antagonist naltrexone or placebo groups. Study protocol is previously published (Tek et al., 2013).

2.2. Statistical analysis

Data were analyzed for all screened participants with self-reported height and weight and researcher-measured height and weight. All statistical analyses were performed in SPSS Statistics Version 22.0 (IBM, Armonk, NY, USA). Categorical variables were analyzed with Pearson χ^2 tests. Continuous variables were analyzed with paired and Student's T tests for comparing two groups and ANOVA for comparing three or more groups. ANCOVA was used for comparing the effect of psychiatric diagnosis on the accuracy of self-reported values, while controlling for sex. Sex was used as covariate because of the disproportionate number of male patients with schizophrenia. Comparisons were done with the Bonferroni correction. Three contrasts for Bonferroni correction were applied when comparing sex differences. Analysis involving psychiatric diagnosis used four groups, schizophrenia, schizoaffective, bipolar, and "other". The "other" group contained patients suffering from major depressive disorder, post-traumatic stress disorder, psychosis NOS, and anxiety disorder. Analysis involving race used three groups, Caucasian, African American, and "other".

3. Results

Of the 312 patients, 139 were male (44.6%) with a mean age of 44.74 ± 11.4 years (Table 1). Schizophrenia was the most common psychiatric diagnosis, with 129 (41.3%) patients across studies. Schizoaffective disorder was the second most common diagnosis (104 patients, 33.3%). The schizophrenia group had a significantly higher proportion of males and significantly lower education. Age, sex, and level of education did not differ significantly between the two studies ($t = 1.34$, $p = 0.18$; $\chi^2 = 0.059$, $p = 0.81$; $\chi^2 = 7.065$, $p = 0.13$; respectively) while race demographics were significantly different ($\chi^2 = 7.745$, $d.f. = 2$, $p = 0.021$), with one study having a greater