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Self-weighing among adolescents: Associations with body mass index, body satisfaction, weight control behaviors, and binge eating

Sarah Friend, MPH, RD [Evaluation Coordinator],
Division of Epidemiology & Community Health, School of Public Health, University of Minnesota, 1300 South Second Street, Suite 300, Minneapolis, MN 55454, Phone: 612-626-8372, Fax: 612-626-7103

Katherine W. Bauer, PhD [Postdoctoral Fellow],
Division of Epidemiology & Community Health, School of Public Health, University of Minnesota, 1300 South Second Street, Suite 300, Minneapolis, MN 55454, Phone: 612-642-8223, Fax: 612-626-7103

Tracy C. Madden, MPH, RD [Health Coach], and
Health Fitness, 1600 West 82nd Street, Suite 100, Minneapolis, MN 55431, Phone: 952-897-5380 X5396

Dianne Neumark-Sztainer, PhD, MPH, RD [Professor]
Division of Epidemiology & Community Health, School of Public Health, University of Minnesota, 1300 South Second Street, Suite 300, Minneapolis, MN 55454, Phone: 612-624-0880, Fax: 612-626-7103

Sarah Friend: adki0032@umn.edu; Katherine W. Bauer: bauer223@umn.edu; Tracy C. Madden: Tracy.c.madden@gmail.com; Dianne Neumark-Sztainer: neumark@epi.umn.edu

Abstract

Among adolescent girls, the health effects of frequent self-weighing are unclear. This study examines cross-sectional and longitudinal associations between frequency of self-weighing and body mass index (BMI), body satisfaction, weight control behaviors, and binge eating among a diverse population of adolescent girls. The study was conducted in the Minneapolis/St. Paul metropolitan area from 2007–2009. The study population included 356 adolescent girls (mean age =15.7 years); 46.2% of the girls were overweight or obese and over 75% were from a racial/ethnic minority group. Anthropometric and survey data were collected at baseline and at follow-up, nine months later. Hierarchical linear regression models were developed to test associations. Cross-sectionally, frequent self-weighing was associated with lower body satisfaction ($p = 0.034$) and higher rates of healthy ($p = 0.002$), unhealthy ($p = 0.016$), and extreme ($p = 0.038$) weight control behaviors. A quadratic association was found between frequency of self-weighing and binge eating, with girls who weighed themselves least and most frequently reporting the highest prevalences of binge eating ($p = 0.014$). No association was observed between frequency of self-weighing and girls' BMI ($p = 0.111$). Short-term longitudinal associations between baseline frequency of self-weighing and changes in body satisfaction, weight control behaviors, binge

Correspondence to: Sarah Friend, adki0032@umn.edu.

eating, or BMI were not observed. Findings suggest that among adolescent girls, frequent self-weighing is cross-sectionally associated with both healthy and potentially harmful unhealthy weight control behaviors, and does not contribute to weight loss over time. Adolescents should not be encouraged to engage in frequent self-weighing.

Keywords

Self-weighing; Adolescence; Body satisfaction; Weight-control behaviors

Adolescent girls are regularly exposed to messages from the media about the desirability of being thin. At the same time, nearly a third of adolescent girls are overweight or obese (1). Disparities between cultural ideals of thinness and the current weight of many young people may contribute to high rates of dieting and body dissatisfaction among adolescent girls (2–4). Self-weighing may be a useful tool for weight management if it motivates girls to engage in healthy behaviors like increasing physical activity and eating fewer high-fat foods. However, increased attention to weight could make girls feel badly about themselves or lead to greater use of unhealthy weight control behaviors such as using diet pills and skipping meals.

Among adults, several studies have found frequent self-weighing to be helpful for weight loss (5, 6) and weight maintenance (7–11). However, researchers have raised concerns that the increased focus on weight caused by frequent self-weighing may have negative consequences including body dissatisfaction, decreased self-esteem, and depression (12, 13). In one study, young adult women who were assigned to weigh themselves daily became more anxious and depressed and reported lower self-esteem over a two-week study period (14). However, other studies have found no relationship between frequent self-weighing and depression (15, 16), binge eating (7, 15), or body satisfaction (17).

While several studies have examined self-weighing and its associations with weight status and psychological and behavioral outcomes in adults, the scientific literature on adolescents is more limited (18–20). Given that adolescent girls may be particularly vulnerable to the negative effects of increased attention to weight, it is important to explore whether self-weighing has benefits for weight management without being associated with harmful psychological and behavioral outcomes. One study that examined self-weighing in adolescent girls compared 62 overweight adolescent girls who had lost weight in the past two years with 68 overweight girls who had not lost weight (19, 20). Girls who had lost weight were more likely to report weighing themselves along with engaging in more healthful behaviors such as exercising and drinking less soda (19). In addition, girls who weighed themselves weekly or more reported using more healthy weight control behaviors, such as eating less junk food, as compared to girls who weighed themselves less frequently. Meanwhile, there were no differences in the use of unhealthy weight control behaviors between the two groups (20). These results are in contrast to findings from Project EAT-II, a population-based longitudinal study of 2,516 adolescents, which observed that among girls, frequent self-weighing was not associated with changes in body mass index (BMI) and predicted unhealthy weight control behaviors and binge eating five years later, even after adjustment for baseline behaviors and weight status (18).

The current study aims to expand upon the limited body of research addressing self-weighing among adolescents by examining 1) cross-sectional associations between frequency of self-weighing and BMI, body satisfaction, use of healthy and unhealthy weight control behaviors, and binge eating and 2) longitudinal associations between self-weighing at baseline and change in these behaviors over nine months, among a sociodemographically

diverse population of adolescent girls. The cross-sectional analyses provide information about what behaviors co-occur with self-weighing frequency, while the longitudinal analyses provide information on whether frequent self-weighing predicts changes in BMI and the use of weight control and disordered eating behaviors over time. It was hypothesized that girls engaging in frequent self-weighing would have lower body satisfaction and would be more likely to engage in both healthy and unhealthy weight control behaviors.

METHODS

Study Design

Cross-sectional and longitudinal data were drawn from a group-randomized trial evaluating New Moves, a school-based intervention designed to prevent obesity and other weight related problems in adolescent girls. New Moves was conducted in six intervention and six control high schools in the Minneapolis/St. Paul area (Minnesota, USA) during the 2007–2009 school years. New Moves targeted sedentary adolescent girls who were at risk for obesity or other weight-related problems. The program addressed behaviors related to obesity (e.g., breakfast intake, physical activity) but did not focus on weight per se in that weight goals were not discussed and girls were not encouraged to weigh themselves. Girls in both intervention and control schools received physical education credits by enrolling in an all-girls physical education class. Recruitment materials were targeted toward girls who were inactive, felt uncomfortable in regular physical education classes, and were interested in learning new ways to be active and manage their weight (21). The study was approved by the University of Minnesota's Institutional Review Board and by participating school districts. Participants provided written assent and parental consent.

The study included a socio-demographically diverse sample of 356 adolescent girls. Baseline data were collected prior to the intervention. Follow-up data were collected approximately nine months later, at the end of the school year. The overall response rate at follow-up was 94%. Data collection was conducted at the University of Minnesota's General Clinical Research Center by trained research staff.

Survey Development and Measures

The New Moves survey (22) was pilot-tested for overall comprehension and item/scale psychometrics. To determine test-retest reliability of the variables over a two-week period, 48 girls completed the survey twice. Additionally, internal consistency of scales was examined using Cronbach's alpha values utilizing data from 356 girls.

Self-weighing—Self-weighing was assessed with the question: "How often do you weigh yourself?" (5) (test/retest r = 0.92). The seven response options were collapsed into four categories for analysis: 1) never, 2) infrequent (about once a year or less, every couple of months, and every month), 3) weekly, and 4) at least daily (more than once a day and every day).

Body Mass Index (BMI)—Weight and height were measured by trained research staff using standardized procedures and BMI was calculated (23).

Body Satisfaction—Body satisfaction was measured with a modified version of the Body Shape Satisfaction Scale. Ten questions assessed satisfaction with weight, height and different areas of the body (24, 25). Six response categories ranged from "very dissatisfied" to "very satisfied" (test/retest r = 0.84, Cronbach's $\alpha = 0.92$).

Weight Control Behaviors—Weight control behaviors were assessed with the question: "Have you done any of the following things in order to lose weight or keep from gaining weight during the past month?"(yes/no) (26, 27). Extreme unhealthy weight control behaviors included: 1) took diet pills, 2) made myself vomit, 3) used laxatives, and 4) used diuretics (test/retest r = 0.70). Unhealthy weight control behaviors included all of the above and also: 1) fasted, 2) ate very little, 3) used food substitutes, 4) skipped meals, 5) smoked more cigarettes, and 6) gone on a diet (test/retest r = 0.80). Healthy weight control behaviors included: 1) exercised, 2) ate more fruits and vegetables, 3) ate fewer high fat foods, 4) drank less regular soda pop or sweetened beverages, 5) paid attention to portion sizes, and 6) ate fewer sweets (test/retest r = 0.83). Nearly all (91.5%) of the girls reported utilizing at least one of the healthy weight control behaviors in the past month; therefore, the total number of healthy weight control behaviors reported was used for analysis. For unhealthy and extreme weight control behaviors, the percentage of girls using one or more of the behaviors in the past month was used in analyses.

Binge Eating—Binge eating with loss of control was assessed with the questions: "In the past month, have you ever eaten so much food in a short period of time that youwould be embarrassed if others saw you (binge eating)?" and "During the time when you ate this way, did you feel you couldn't stop eating or control what or how much you were eating?" (28, 29). Girls were classified as engaging in binge eating with loss of control if they answered "yes" to both questions (27, 28) (test/retest r = 1.00).

Demographics—Age and racial/ethnic background were included as covariates in analyses and were based on self-report.

Statistical Analysis

Descriptive statistics were calculated. Hierarchical linear regression models examined associations between self-weighing frequency among the girls at baseline (independent variable) and BMI, body satisfaction, number of healthy weight control behaviors used, use of any unhealthy or extreme weight control behaviors, and binge eating (dependent variables). In addition, longitudinal analyses examined whether baseline frequency of self-weighing predicted changes in the dependent variables from baseline to nine-month follow-up. In cross-sectional and longitudinal analyses, models were adjusted for race/ethnicity and girlsl age and school was included as a random effect. Longitudinal analyses were additionally adjusted for study condition (intervention vs. control) and baseline values of the dependent variables being examined to allow for examination of change in the dependent variables from baseline to follow-up. Adjusted means were calculated for continuous variables and adjusted prevalences were calculated for dichotomous variables for each of the categories of self-weighing. Based on the distribution of the means, tests of linear and quadratic trends were performed. Analyses were performed using Statistical Analysis Software (version 9.2, 2008, SAS Institutes Inc, Cary, NC).

RESULTS AND DISCUSSION

Of the 356 adolescent girls in the study, over 75% of the girls were from racial/ethnic minority backgrounds; white (24.4%), Black or African American (28.4%), Asian (23.0%), Hispanic or Latina (14.3%), or mixed/other race (9.8%). The age range was 14–20 years (mean age=15.8). Almost half of the girls were overweight (18.0%) or obese (28.2%) based on CDC growth charts for age and gender (30, 31).

At baseline, 14.1% of girls reported never weighing themselves, 69.5% reported infrequent self-weighing, 10.7% reported weekly self-weighing, and 5.7% weighed themselves at least

once a day. Self-weighing frequency did not differ significantly by race ($p = 0.134$) or age ($p = 0.858$).

Cross-sectional results using baseline data found self-weighing frequency was not associated with girls' BMI (Table 1). However, frequency of self-weighing was inversely associated with body satisfaction ($p = 0.034$) and positively associated with use of healthy ($p = 0.002$), unhealthy ($p = 0.016$), and extreme weight control behaviors ($p = 0.038$). For example, girls who weighed themselves at least daily reported nearly twice as many healthy weight control behaviors as girls who never weighed themselves (4.2 vs. 2.8; $p = 0.002$) and 89.6% of girls who weighed themselves at least daily used unhealthy weight control behaviors as compared to 64.0% of those who never weighed themselves ($p = 0.016$). A quadratic relationship was observed between self-weighing and binge eating ($p = 0.014$) with both very infrequent and very frequent self-weighing associated with a higher likelihood of engaging in this disordered eating behavior.

Longitudinal associations were examined to determine if baseline frequencies of self-weighing predicted changes in BMI, body satisfaction, weight control behaviors, and binge eating over the nine-month study period. No associations were seen between self-weighing and any of the other variables after adjusting for baseline levels of BMI, socio-demographic characteristics and the baseline levels of the dependent variables.

Individuals trying to lose weight are often encouraged to monitor their physical activity or dietary intake for goal setting and to increase self-awareness (32) Among adults, research suggests that monitoring weight may also contribute to weight loss and maintenance (5, 6, 10, 11). While self-weighing may be beneficial for adults (33), in the current study of adolescent girls self-weighing was not related to weight loss. Our findings suggest that caution should be taken in recommending self-weighing to adolescents. Developmental differences may explain why self-weighing may be an effective tool in adults but not in youth. Furthermore, in many of the adult studies, self-weighing was part of a weight loss program that included instruction on how to combine self-weighing with other behavior changes (5, 7, 17). In contrast, the girls in the current study were part of a program that promoted a healthy lifestyle and did not specifically address self-weighing.

Engaging In efforts to lose weight is common among adolescent girls. In the Youth Risk Behavior Survey, 59% of adolescent girls reported trying to lose weight (4). Cross-sectional results from the current study suggest that many girls were using both healthy and unhealthy behaviors to try to control their weight, and that frequent self-weighing commonly co-occurred with use of these healthy and unhealthy weight control behaviors. These findings align with those of other studies that found that self-weighing was positively associated with the use of healthy weight control behaviors (19, 20) as well as unhealthy weight control behaviors (18) that are potentially harmful.

While a large population-based study of adolescents observed that frequent self-weighing longitudinally predicted use of unhealthy weight control behaviors five years later, after adjusting for baseline values of BMI and unhealthy weight control behaviors (18), in the current study, self-weighing frequency at baseline was not associated with any of the dependent variables over nine months. The short time period of the current study and the small changes in some of the variables examined may have contributed to the lack of significant findings in the longitudinal analyses. Thus, from the current analysis we cannot conclude that frequent self-weighing leads to changes in behaviors or weight outcomes.

In contrast, the cross-sectional findings from the current study indicate that frequent self-weighing behaviors tend to co-occur with a variety of measures including body dissatisfaction and the use of both healthy and unhealthy weight control behaviors indicating

potential preoccupation with weight among girls who weigh themselves frequently. Additionally, binge eating was most commonly reported by both girls who weighed themselves the least and those who weighed themselves the most. Together, these findings suggest that adolescents not paying any attention to their weight and those paying excessive attention to their weight should be monitored for other potentially harmful weight-related attitudes and behaviors.

It is important to learn more about self-weighing among populations at risk for obesity and other weight related problems The racially/ethnically diverse sample and the high percent of girls who were overweight are strengths of the study. Additionally, BMI was calculated based on measurements obtained from trained staff as opposed to self-report, therefore reducing the potential for bias. However, the small sample size and the low number of girls reporting very frequent self-weighing (i.e., at least daily) may have led to inadequate power to detect associations. Furthermore, although the current study examined self-weighing and BMI, body satisfaction and weight control behaviors longitudinally, a longer time between baseline and follow-up may have resulted in larger changes in the dependent variables and allowed for a more informative analysis.

CONCLUSION

Adolescent girls who weighed themselves frequently engaged in more healthy and unhealthy weight control behaviors at baseline. Additionally, both girls reporting never weighing themselves and those reporting frequent self-weighing were at greatest risk for binge eating. However, self-weighing did not predict a change in these behaviors or in weight status over time. Studies examining self-weighing among adolescent are limited, have shown inconsistent results, and suggest potential differences between adult and adolescent populations. Further research among adolescents should examine reasons for self-weighing, long-term longitudinal relationships between self-weighing and various outcomes, and utilize intervention designs which compare arms with and without self-weighing. Until strong and consistent evidence exists that self-weighing behaviors are helpful, and not harmful, adolescents should not be encouraged to engage in frequent self-weighing.

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Table 1

Frequency of self-weighing at baseline by body mass index, body satisfaction, healthy and unhealthy weight control behaviors, and binge eating among adolescent girls (n = 356).[a]

	N	Body Mass Index		Body Satisfaction		# of healthy weight control behaviors used		Use of any unhealthy weight control behaviors		Use of any extreme weight control behaviors		Prevalence of binge eating with loss of control	
Frequency of Self Weighing		**Mean**	**SE**	**Mean**	**SE**	**Mean**	**SE**	**%**	**N**	**%**	**N**	**%**	**N**
Never	50	27.0	1.0	35.3	1.8	2.8	0.3	64.0	32	11.8	6	20.4	10
Infrequently	246	25.3	0.6	37.3	0.9	3.5	0.1	66.1	163	9.6	24	11.5	28
Weekly	38	27.6	1.2	33.4	2.1	4.1	0.3	79.5	30	7.3	3	8.6	3
At least daily	20	23.4	1.5	29.1	3.0	4.2	0.4	89.6	18	29.7	6	26.1	5
		linear trend p = 0.111		linear trend **p = 0.034**		linear trend **p = 0.002**		linear trend **p = 0.016**		linear trend **p = 0.038**		linear trend p = 0.604	
		quadratic trend p = 0.237		quadratic trend p = 0.120		quadratic trend p = 0.420		quadratic trend p = 0.582		quadratic trend **p = 0.010**		quadratic trend **p = 0.014**	

[a] adjusted for age and race/ethnicity