The Figure Rating Scale as an Index of Weight Status of Women on Videotape

Tiffany M. Cardinal, Niko Kaciroti,* and Julie C. Lumeng*†*

Abstract

CARDINAL, TIFFANY M., NIKO KACIROTI, AND JULIE C. LUMENG. The Figure Rating Scale as an index of weight status of women on videotape. *Obesity.* 2006;14: 2132–2135.

Objective: To determine whether Stunkard's Figure Rating Scale (FRS) is a valid and reliable index of weight status when an unbiased observer assigns the figure ratings of adult women viewed on videotape.

Research Methods and Procedures: Seventy-two women drawn from a community sample participated in a videotaped study in which height and weight were measured. The FRS is a rating scale displaying 9 silhouettes ranging from very thin to very obese. Women were assigned a figure rating "in-person" by a research assistant (FRS used as a 17-point scale) and by additional research assistants viewing women only on videotape (FRS used as both a 17- and 9-point scale). Pearson's correlation coefficients were calculated for in-person figure ratings, mean videotape figure ratings, and BMI.

Results: BMI and in-person figure ratings were highly correlated ($r = 0.91$), as were BMI and both mean 17-point videotape figure ratings and mean 9-point videotape figure ratings ($r = 0.89$ and 0.87, respectively). Inter-rater agreement for in-person figure ratings and mean 17-point videotape figure ratings was 0.86, and agreement between in-person figure ratings and mean 9-point videotape figure ratings was 0.82.

Discussion: The FRS can be used as an index of women's weight status by an unbiased observer, with subjects viewed in-person or on videotape.

Key words: BMI, body image, scale reliability and validity, psychometrics, videotape recording

Introduction

The prevalence of obesity has increased significantly over the past 2 decades (1). The use of videotaped data in research studies has become increasingly accessible and affordable over the same time period. There are many large data sets with videotaped images which lack measured or reported height and weight data of subjects. These data sets could prove useful in work focused on obesity or eating behavior if a validated method of indexing weight status from videotaped images was available.

The Figure Rating Scale (FRS),[1] developed by Stunkard et al. (2) in 1983, consists of nine schematic silhouettes ranging from very thin to very obese (Figure 1). The scale has been used frequently as a measure of body dissatisfaction (2–4), requiring participants to self-select a figure rating. Self-selected figure ratings have been correlated with self-reported BMI in a large sample of white subjects (5). The FRS was originally developed and validated, however, to index the weight status of research subjects' relatives when measured or self-reported values were unavailable (2). Measured BMI was documented to correlate with adult children's ratings of their parents' figures on the FRS (2,6). A similar scale, developed by Pulvers et al. (7) for use in African-American populations, has been demonstrated to show a strong correlation ($r = 0.88$ to 0.93) between measured BMI and in-person figure ratings assigned by unrelated observers.

To our knowledge, no study has evaluated the correlation between BMI and figure ratings assigned by observers who viewed participants only on videotape (using any figural scale). If BMI and FRS figure ratings are highly correlated, the FRS could prove useful as a measure of study subjects' weight status when measured height and weight are not available. This study sought to test the hypothesis that Stunkard's FRS is a valid index of subjects' weight status

Received for review April 25, 2006.
Accepted in final form July 31, 2006.
The costs of publication of this article were defrayed, in part, by the payment of page charges. This article must, therefore, be hereby marked "advertisement" in accordance with 18 U.S.C. Section 1734 solely to indicate this fact.

*Center for Human Growth and Development, and †Department of Pediatrics and Communicable Diseases, University of Michigan, Ann Arbor, Michigan.
Address correspondence to Tiffany M. Cardinal, Center for Human Growth and Development, 300 North Ingalls Building, 10th Floor, University of Michigan, Ann Arbor, MI 48109-0406.
E-mail: tcardina@umich.edu

[1] Nonstandard abbreviation: FRS, Figure Rating Scale.

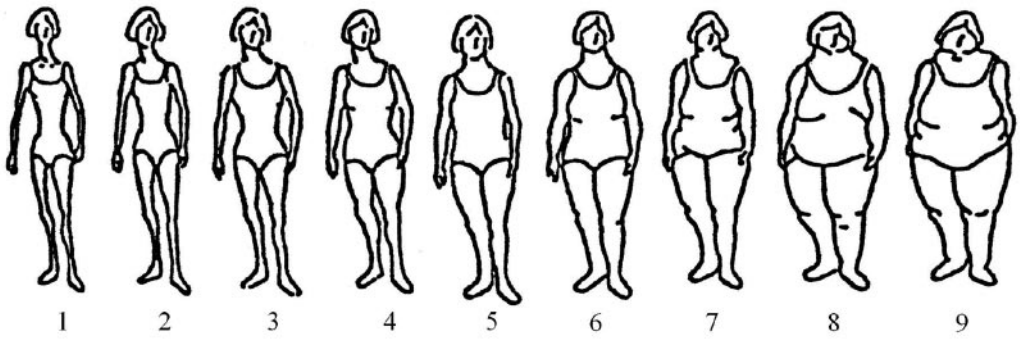

Figure 1: Female images of the FRS. Reprinted with permission by Stunkard et al. (2)

when a researcher identifies the figure rating of adult women, both in-person and on videotape.

Research Methods and Procedures

Seventy-two mothers of 3- to 6-year-old children were recruited from the community to participate in a study of mother-child interactions during a videotaped feeding. After obtaining informed consent (~4 minutes), a research assistant (one of three) assigned each woman an FRS figure rating from 1 to 9, with 1 representing the thinnest figure and 9 the most obese. When a woman's figure fell between two of the silhouettes, a figure rating halfway between the two numbers could be assigned (e.g., 7.5). The FRS therefore functioned as a 17-point scale when women were rated in person (hereafter, "in-person rating"). On completion of the videotaped feeding, each woman's height and weight were measured by the same research assistant and BMI was calculated.

Four additional research assistants, blinded to the study hypotheses and the recorded heights and weights of the women, assigned a figure rating to each woman from videotape. Because women were seated at a table during most of the food presentation, only 37% of the women could be viewed standing on videotape. Two research assistants were instructed to use the FRS as a 17-point scale, and two were instructed to use the FRS as a 9-point scale (applying whole number ratings only). Given that inter-rater agreement was high (intra-class correlation coefficients both 0.91), we calculated the mean 17- and 9-point ratings from both research assistants. Mean figure ratings were then used in our analyses. We calculated Pearson's correlation coefficients for in-person figure ratings, mean videotape figure ratings, and BMI. Proportion of variance in BMI accounted for by FRS figure ratings was calculated from regression analyses.

Results

The sample was 69.0% white, with a mean age of 35.7 ± 6.1 years (range, 24.6 to 53.1 years); the subjects had a mean BMI of 27.9 ± 7.7 (range, 18.1 to 53.2). About a third (36.6%) of the women were obese (BMI ≥30). The mean in-person figure rating ($n = 70$) was 4.7 ± 1.5 (range, 2.5 to 9). The mean 17-point videotape figure rating ($n = 72$) was 4.9 ± 1.7 (range, 2.25 to 8.75). The mean 9-point videotape figure rating ($n = 72$) was 5.0 ± 1.8 (range, 2 to 9). The correlation between the in-person figure ratings and the videotape figure ratings was high ($r = 0.86$ for 17-point figure ratings, $r = 0.82$ for 9-point figure ratings).

The correlation between BMI and in-person figure ratings was stronger (0.92) than that between BMI and either videotape figure rating (0.89 and 0.87 for 17-point and 9-point, respectively) (Table 1). Figure 2 presents the relationship between in-person figure ratings and BMI, whereas Figure 3 presents the relationship between 17-point videotape figure ratings and BMI. Whether women were standing during the video was not a statistically significant contributor to the relationship between BMI and either 17- or 9-point figure ratings. Sensitivity and specificity for the FRS as a test for obesity is presented in Table 2.

Table 1. Pearson correlation coefficients of FRS ratings with measured BMI

Condition of FRS rating	No. of subjects	*r*
17-point in-person figure rating	70	0.92
17-point videotape figure rating	72	0.89
Subject standing	26	0.91
Subject sitting	46	0.89
9-point videotape figure rating	72	0.87
Subject standing	26	0.91
Subject sitting	46	0.85

FRS, Figure Rating Scale.

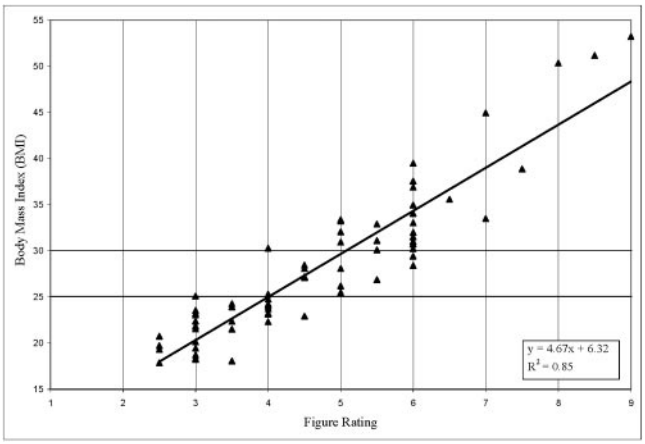

Figure 2: Graph showing relationship of in-person figure ratings to BMI.

Table 2. Sensitivity and specificity of FRS by observer for detection of obesity

	Sensitivity	Specificity
Figure rating ≥5, obese		
In-person	0.96	0.86
17-point videotape	0.92	0.83
9-point videotape	0.96	0.67
Figure rating ≥6, obese		
In-person	0.73	0.95
17-point videotape	0.65	0.96
9-point videotape	0.88	0.91

FRS, Figure Rating Scale.

Discussion

Stunkard's FRS is a valid and reliable measure of women's weight status, when rated as viewed either in-person or on videotape by an unrelated observer. The relationship between BMI and figure ratings was only slightly stronger when rated in-person vs. on videotape. There was little difference in the strength of correlation when figures were rated with 17 or 9 points, nor when the women were viewed on videotape seated or standing.

Our findings compare closely with past work. Sorensen et al. (6) found that the adult children of research subjects selected figure ratings that correlated closely with their parents' BMI scores ($r = 0.74$). The mean BMI of the women in our study (measured in the 1990s) was higher than that of the sample of Sorensen et al. (measured in the 1960s) (6), reflecting the rise in obesity prevalence. The correlations between measured BMI and in-person figure ratings by an unrelated observer using a similar scale in an African-American population (7) were similar to our correlations for both in-person and videotape-derived figure ratings. These findings further support the use of the FRS to index weight status and highlight the strength of our videotape figure ratings.

The FRS can be used by researchers as a measure of women's weight status when images of female participants are available either in-person or on videotape. In past research, the fifth figure of the FRS has been associated with a BMI of slightly more than 25 (overweight) in adult women (8), while the sixth figure has been indicated as the cut-off point for obesity in adults (5,8) as well as overweight for girls at menarche (9). Our sensitivity and specificity results also point to figure ratings of ≥5 or 6 if researchers do choose to categorize participants as obese, although we recommend that researchers use the scale in a continuous manner rather than as a categorical scale.

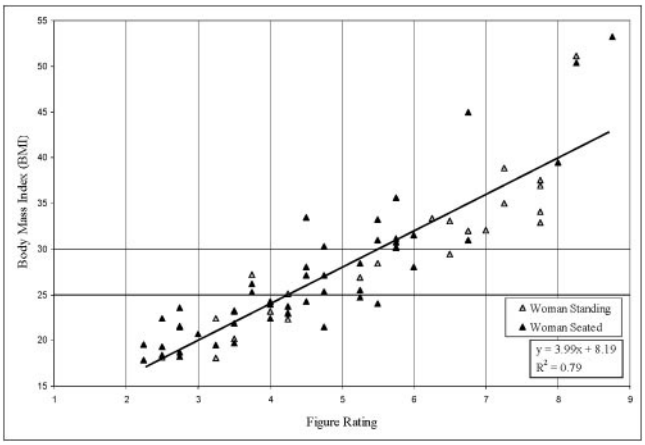

Figure 3: Scattergram showing relationship of 17-point videotape figure ratings to BMI.

Acknowledgments

We thank Lori Burke and Jacinta Sitto for their assistance with data collection and thoughtful review. This study was supported by the American Heart Association Fellow-to-Faculty Transition Award 0275040N (to J.C.L.).

References

1. **Flegal KM, Carroll MD, Ogden CL, Johnson CL.** Prevalence and trends in obesity among US adults, 1999–2000. *JAMA.* 2002;288:1723–7.
2. **Stunkard AJ, Sorensen TI, Schulsinger F, eds.** *Use of the Danish Adoption Register for the Study of Obesity and Thinness.* New York: Raven Press; 1983.
3. **Striegel-Moore RH, Silberstein LR, Rodin J.** Toward an understanding of risk factors for bulimia. *Am Psychol.* 1986; 41:246–63.

4. **Fallon AE, Rozin P.** Sex differences in perceptions of desirable body shape. *J Abnorm Psychol.* 1985;94:102–5.
5. **Bulik CM, Wade TD, Heath AC, Martin NG, Stunkard AJ, Eaves LJ.** Relating body mass index to figural stimuli: population-based normative data for Caucasians. *Int J Obes.* 2001;25:1517–24.
6. **Sorensen TI, Stunkard AJ, Teasdale TW, Higgins MW.** The accuracy of reports of weight: children's recall of their parents' weights 15 years earlier. *Int J Obes.* 1983;7:115–22.
7. **Pulvers KM, Lee RE, Kaur H, et al.** Development of a culturally relevant body image instrument among urban African Americans. *Obes Res.* 2004;12:1641–51.
8. **Hediger ML, Hartnett HJ, Louis GM.** Association of endometriosis with body size and figure. *Fertil Steril.* 2005;84: 1366–74.
9. **Must A, Phillips SM, Stunkard AJ, Naumova EN.** Expert opinion on body mass index percentiles for figure drawings at menarche. *Int J Obes.* 2002;26:876–9.