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Social desirability, not dietary restraint, is related to accuracy of reported dietary intake of a laboratory meal in females during a 24-hour recall

Ashlee H. Schoch [1], Hollie A. Raynor *

University of Tennessee, Department of Nutrition, 1215 W. Cumberland Avenue, Knoxville, TN 37919, United States

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ABSTRACT

Underreporting in self-reported dietary intake has been linked to dietary restraint (DR) and social desirability (SD), however few investigations have examined the influence of both DR and SD on reporting accuracy and used objective, rather than estimated, measures to determine dietary reporting accuracy. This study investigated accuracy of reporting consumption of a laboratory meal during a 24-hour dietary recall (24HR) in 38 healthy, college-aged, normal-weight women, categorized as high or low in DR and SD. Participants consumed a lunch of four foods (sandwich wrap, chips, fruit, and ice cream) in a laboratory and completed a telephone 24HR the following day. Accuracy of reported energy intake of the meal = ((reported energy intake − measured energy intake) / measured energy intake) × 100 [positive numbers = overreporting]. Overreporting of energy intake occurred in all groups (overall accuracy rate = 43.1 ± 49.9%). SD-high as compared to SD-low more accurately reported energy intake of chips (19.8 ± 56.2% vs. 117.1 ± 141.3%, $p<0.05$) and ice cream (17.2 ± 78.2% vs. 71.6 ± 82.7%, $p<0.05$). SD-high as compared to SD-low more accurately reported overall energy intake (29.8 ± 48.2% vs. 58.0 ± 48.8%, $p<0.05$). To improve accuracy of dietary assessment, future research should investigate factors contributing to inaccuracies in dietary reporting and the best methodology to use to determine dietary reporting accuracy.

1. Introduction

Most methods of dietary assessment rely on self-reported information, which is subject to potential inaccuracies and biases (Hill & Davies, 2001; Kretsch, Fong, & Green, 1999; Livingstone & Black, 2003; Tran, Johnson, Soultanakis, & Matthews, 2000). Many factors, such as dietary restraint (DR) and social desirability (SD), have been hypothesized to affect accuracy of self-reported dietary intake, with higher levels of both of these factors associated with underreporting (Asbeck et al., 2002; de Castro, 2006; Horner et al., 2002; Jansen, 1996; Lafay et al., 1997; Novotny et al., 2003; Rennie, Siervo, & Jebb, 2006; Scagliusi, Polacow, Artioli, Benatti, & Lancha, 2003; Taren et al., 1999; Tooze et al., 2004). To identify underreporting, the majority of these studies compared reported dietary intake to estimated energy expenditure (Asbeck et al., 2002; de Castro, 2006; Horner et al., 2002; Lafay et al., 1997; Novotny et al., 2003; Rennie et al., 2006; Scagliusi et al., 2003; Taren et al., 1999; Tooze et al., 2004).

Only one study has examined the influence of the interaction of DR and SD on accuracy of reported intake. In this study men high in SD were more likely to underreport dietary intake when DR was low, with no outcomes found with women (Tooze et al., 2004). Accuracy of reported energy intake was evaluated by comparing reported energy intake from 24-hour dietary recall (24HR) to energy expenditure estimated using doubly-labeled water (DLW).

Taken together, these studies show inaccurate reporting of dietary intake in individuals high in DR and SD when estimated measures are used to determine accuracy of reported energy intake. Thus, the purpose of the present study was to evaluate how DR and SD interact to influence the accuracy of reporting consumption of a laboratory meal during a 24HR in normal-weight, college-aged women using an objective measure of food intake. It was hypothesized that females high in both DR and SD would be the least accurate in reporting dietary intake.

2. Methods

This investigation used a 2 × 2 × 4 quasi-experimental design, with two between-subject factors, DR (high and low) and SD (high and low) and one within-subject factor, foods (sandwich wrap, chips, fruit, and ice cream). Measured, reported, and accuracy of reported energy intake for the laboratory meal were the dependent variables. This study was approved by the Institutional Review Board at the University of Tennessee, Knoxville, Tennessee (UTK). Study participants were compensated with a $20 gift card.

From September 2008 to August 2009, study participants were recruited using flyers. Eligibility screening was conducted over the

* Corresponding author. Tel.: +1 865 974 6259; fax: +1 865 974 3491.
E-mail address: hraynor@utk.edu (H.A. Raynor).
[1] Present address: East Tennessee Children's Hospital, 2018 Clinch Avenue, Knoxville, TN 37919, United States.

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phone, in which demographic information was obtained and assessments for DR and SD were conducted. The Three Factor Eating Questionnaire — Restraint subscale (TFEQ-R), (Stunkard & Messick, 1985) which has been shown to identify successful "dieters," those individuals who successfully and consistently reduce their intake, as shown by weight loss and weight loss maintenance, was used to assess DR (Heatherton, Herman, Polivy, King, & McGree, 1988). Participants scoring 0–10 points were categorized as DR-low (DR-L) and those scoring 13–21 points were categorized as DR-high (DR-H). The Marlowe–Crowne Social Desirability Scale (MC-SDS) Form B (M-C Form B) (Reynolds, 1982) was used to assess SD. The M-C Form B (Reynolds, 1982) is a validated, shortened questionnaire, developed from the MC-SDS (Crowne & Marlowe, 1960). Participants scoring 0–6 points were categorized as SD-low (SD-L) and those scoring 7–12 points were categorized as SD-high (SD-H).

Eligible participants were female, 18–25 years of age, and normal weight defined as body mass index (BMI) of 18.5–24.9 kg/m^2. Participants were excluded if they had participated in other weight loss or exercise research at UTK, were majoring in nutrition or exercise science, were unable or unwilling to consume the foods provided, smoked, were pregnant, had health conditions or took medications that influenced eating, were attempting to lose weight, or scored 11 or 12 for DR. During the recruitment, 163 individuals were phone screened, with 125 screened out (24 — no interest; 20 — BMI; 9 — DR score of 11 or 12; 3 — age; 3 — medications; 2 — dietary restrictions or food allergies; 2 — participation in other research; 1 — food dislikes; 1 — smoking; and 60 — enrollment limit for category). After the exclusions, 38 participants remained and completed all aspects of the study. Eligible participants were scheduled for an individual appointment (11:00 am–3:00 pm, Monday–Thursday) and were instructed to not eat anything for 2 h prior to the appointment.

Upon arrival for their appointment, participants were given an explanation of the study, including a cover story of their participation in a taste test, and were asked to sign an informed consent. Height and weight measurements were taken on an electronic scale with stadiometer (Healthometer Professional 597XL, Pelstar LLC, Bridgeview, IL) using standard procedures, from which BMI (kg/m^2) was calculated (Lohman, Roche, & Martorell, 1998). The meal was provided to the participant for 30 min and the participant was instructed to taste each of the foods, eat as much as desired, and not take any foods out of the laboratory. After the meal, a telephone 24HR was scheduled and written instructions and portion estimation aids were provided for the 24HR. Following the appointment, the remaining food was weighed. On the next day, a trained master-level nutrition student conducted a telephone, multiple-pass 24HR, using Nutrition Data System for Research (NDSR) software version 2007 (NCC, University of Minnesota, Minneapolis, Minnesota).

Each food for the laboratory meal was prepared and weighed on an electronic food scale (SI-8001, Denver Instruments, Denver, CO). Each participant was provided two sandwich wraps (turkey or vegetable/cheese — 370 g [426 kcal]), chips (potato or tortilla — 70 g [364 kcal]), cut fresh fruit (tropical, melon, or berries — 300 g [134 kcal]), and ice cream (chocolate or vanilla — 200 g [417 kcal]), based on their selections. Foods were provided in portions of ± 3 grams (g) of target amounts. The meal was presented "family-style" and participants could serve themselves any amount.

Measured intake for each food was calculated by subtracting the remaining weight from the beginning weight. Each food and the consumed amount were entered into NDSR, which calculated energy intake (kcal). Reported energy intake for each food was obtained from a 24HR using NDSR. Accuracy of reported energy intake of each food was calculated using the equation (((reported energy intake − measured energy intake)/measured energy intake)×100), where positive values indicated overreporting.

Participant characteristics were analyzed with two-way analysis of variance (ANOVA), using the between-subject factors of DR and SD, for numerical measures and chi-square for nominal measures. BMI was found to be statistically different between the groups and thus was included as a covariate in subsequent analyses. Measured, reported, and accuracy of reported energy intake of each food were analyzed using 2×2×4 mixed factor analysis of covariance (ANCOVA), with the between-subject factors of DR and SD, and the within-subject factor of food. Where appropriate, Greenhouse–Geiser probability levels were used to control for sphericity. For significant outcomes, post-hoc comparisons with Bonferroni corrections were conducted. All analyzes were performed using SPSS software (version 17.0, 2009, SPSS Inc. Chicago, IL). The alpha level was set at $p<0.05$.

3. Results

Participant characteristics are shown in Table 1. There were no significant ($p>0.05$) differences between the groups in race, ethnicity, or age. For BMI, DR-L had a lower BMI as compared to DR-H (21.7 ± 1.8 kg/m^2 vs. 23.1 ± 1.4 kg/m^2, $p<0.01$).

Results for measured and reported energy intake are shown in Table 2. For measured and reported energy intake, DR-H consumed significantly less energy than DR-L (measured: 437 ± 169 kcal vs. 559 ± 207 kcal, $p<0.05$; reported: 561 ± 200 kcal vs. 818 ± 362 kcal, $p<0.05$). In addition, DR-H consumed significantly less energy as compared to DR-L from the sandwich wrap (156 ± 63 kcal vs. 210 ± 76 kcal, $p<0.05$) and ice cream (126 ± 73 kcal vs. 190 ± 106 kcal, $p<0.05$), and DR-H reported significantly less energy consumed from ice cream as compared to DR-L (145 ± 91 kcal vs. 302 ± 235 kcal, $p<0.05$).

As shown in Table 2, energy intake was overreported by all groups with a mean accuracy rate of 43.1 ± 49.9%. SD-H more accurately reported energy intake as compared to SD-L (29.8 ± 48.2% vs. 58.0 ± 48.8%, $p<0.05$). In addition, SD-H, as compared to SD-L, more accurately reported energy intake from chips (19.8 ± 56.2% vs. 117.1 ± 141.3%, $p<0.05$) and ice cream (17.2 ± 78.2% vs. 71.6 ± 82.7%, $p<0.05$).

4. Discussion

Results of both measured and reported energy intake found that those high in DR consumed and reported less energy during the laboratory meal as compared to those low in DR, which agrees with previous research (Asbeck et al., 2002; de Castro, 2006; Moreira, de Almeida, & Sampaio, 2005; Rennie et al., 2006; Rideout, McLean, & Barr, 2004). For accuracy of self-reported energy intake, this study found that overreporting of intake occurred in all groups. However,

Table 1
Baseline characteristics of participants (M ± SD).

	DR-H/SD-L $n=8$	DR-L/SD-L $n=10$	DR-H/SD-H $n=10$	DR-L/SD-H $n=10$
Age (yrs)	20.9 ± 1.8	20.5 ± 1.7	19.6 ± 1.6	20.2 ± 1.8
BMI (kg/m^2)[1]	23.3 ± 1.5^a	22.1 ± 2.0^b	23.0 ± 1.4^a	21.3 ± 1.6^b
DR score[1]	15.3 ± 1.8^a	4.8 ± 3.5^b	14.8 ± 1.2^a	5.9 ± 2.7^b
SD score[2]	5.3 ± 1.0^a	3.9 ± 1.6^a	8.0 ± 0.9^b	9.3 ± 1.5^b
Race (%)				
–Asian	25	20	0	10
–Black/African American	0	40	0	10
–Native Hawaiian/ Pacific Islander	0	0	0	10
–White	75	40	100	70
Non-Hispanic/Latino	100	100	90	90

Note: DR-H = dietary restraint-high; SD-L = social desirability-low; DR-L = dietary restraint-low; SD-H = social desirability-high; BMI = body mass index; DR = dietary restraint; SD = social desirability. [1]Main effect of DR; [2]main effect of SD. Values with different superscripts are statistically different ($p<0.05$).