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Loss of Control Eating in African-American and Caucasian Youth

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Abstract

Loss of control (LOC) eating, a disinhibited eating behavior shown to predict excessive weight gain in youth, has been reported by African-American children and adolescents. Yet, little is known about how LOC-eating manifests in this population. To investigate potential racial differences in LOC-eating, the Eating Disorder Examination was administered to 185 non-Hispanic African-American and Caucasian youth ages 8–17y. Objective eating was assessed at two test meals during which youth ate *ad libitum* from a multi-item lunchtime food array. African-American and Caucasian youth reported a similar prevalence of LOC episodes (24.2% vs. 28.9%, $p = .75$). Yet, accounting for sex, age, fat-free mass, percent fat mass, height, and socioeconomic status, African-Americans consumed more total energy at both laboratory meals (1608 ± 57 kcal vs. 1362 ± 44 kcal; $p < .001$). Furthermore, African-American youth reporting LOC consumed the most total energy across both meals (1855 ± 104 kcal) compared to African-Americans without LOC (152 ± 60 kcal), Caucasians with LOC (1278 ± 68 kcal), and Caucasians without LOC (1399 ± 46 kcal; $p < .001$). Future research is required to examine whether LOC-eating contributes to the high rates of obesity in African-American youth.

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Contributors: Drs. Tanofsky-Kraff and Yanovski designed the study and wrote the protocol. Ms. Cassidy and Dr. Tanofsky-Kraff developed the hypotheses for the current study. Ms. Matheson, Dr. Osborn and Ms. Vannucci conducted literature searches and provided summaries of previous research studies. Dr. Shomaker conducted the statistical analysis. Ms. Cassidy wrote the first draft of the manuscript and all authors contributed to and have approved the final manuscript.

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Keywords

African-American; Loss of control eating; Child; Adolescent; Energy intake; Obesity

1. Introduction

Childhood obesity rates have increased dramatically among African-American youth (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010; Ogden, Carroll, & Flegal, 2008). Thirty-six percent of African-Americans (2-19y) are currently overweight or obese compared to 32% of Caucasian youth (CDC, 2000; Ogden, et al., 2010). Although these percentages do not statistically differ, they are clinically relevant as African Americans remain at a higher risk for serious obesity-related health comorbidities (Brancati, Kao, Folsom, Watson, & Szklo, 2000; Sriwattanakomen, et al., 2010). Given the weight and health disparities among African-Americans, it is critical to elucidate modifiable, behavioral risk-factors that may contribute to excess weight gain in this vulnerable population.

One such risk-factor may be loss of control (LOC) eating, which refers to the perceived experience of being unable to control what or how much is eaten, regardless of the reported amount of food consumed (Tanofsky-Kraff, 2008). By definition, LOC encompasses both classic episodes of binge-eating (i.e., large amounts of food consumed with LOC) and subjective binge-eating episodes (i.e., perceived, but not objective, overeating with LOC) (Tanofsky-Kraff, 2008). Rates of pediatric LOC range from 6-40% (Tanofsky-Kraff, 2008). Racial differences in prevalence are mixed with some studies reporting, relative to Caucasian youth, more (Swanson, Crow, Le Grange, Swendsen, & Merikangas, 2011), less (Story, French, Resnick, & Blum, 1995), or similar (Austin, et al., 2008; Glasofer, et al., 2007; Pernick, et al., 2006; Shaw, Ramirez, Trost, Randall, & Stice, 2004) rates of LOC/ binge-eating in African-American youth. LOC-eating is associated with excess weight (Tanofsky-Kraff, 2008). Even infrequent reports of LOC-eating among youth prospectively predict excessive weight gain (Tanofsky-Kraff, Yanovski, et al., 2009) and the development of exacerbated disordered eating and psychological distress (Tanofsky-Kraff, et al., 2011). While there are several proposed theoretical models of binge-eating (Heatherton & Baumeister, 1991; Polivy & Herman, 1985; Stice, 2001) data (Brown, Shear, Schulberg, & Madonia, 1999; Chui, Safer, Bryson, Agras, & Wilson, 2007; Wilson, Wilfley, Agras, & Bryson, 2010) suggest that the interpersonal model of LOC (Tanofsky-Kraff, et al., 2007) may be most suitable when describing such behaviors in minority groups. The model posits that interpersonal problems lead to negative affect, which precipitates LOC-eating and ultimately exacerbated disordered eating and excess weight gain. Given that interpersonal familial connectivity is highly valued in racial and ethnic minorities (Hill, 1999), it is likely that difficult interpersonal relationships may cause particular distress that leads to LOC-eating.

Youth with LOC-eating self-report and exhibit specific eating patterns that may illuminate the impact of LOC on weight. Compared to those without LOC, youth endorsing LOC consume more total energy (Hilbert, Tuschen-Caffier, & Czaja, 2010; Mirch, et al., 2006), fat (Hilbert, et al., 2010), carbohydrates, and palatable foods, while consuming less protein (Tanofsky-Kraff, McDuffie, et al., 2009; Theim, et al., 2007). There has been no investigation into how LOC differentially relates to food consumption in African-Americans and Caucasians.

We examined whether measured energy intake and food selection in the laboratory would differ among African-American and Caucasian youth with and without reported LOC. Based upon the higher rates of obesity in African-Americans, we hypothesized that LOC-eating

would be more strongly tied to greater food intake in African-Americans than Caucasians. We expected to observe these differences after adjusting for body composition, sex, age, and socioeconomic status (SES).

2. Materials & Methods

2.1. Participants

The present investigation is a secondary analysis of a published study and therefore recruitment and inclusion/exclusion criteria are previously reported (Tanofsky-Kraff, McDuffie, et al., 2009). In brief, healthy 8-17-year-olds participated in a study investigating eating behaviors in youth of all weight strata. Written child assent and parent consent were obtained. The study was approved by the *Eunice Kennedy Shriver* NICHD Institutional Review Board.

2.2. Procedures

The study involved three outpatient visits to the NIH Clinical Center. The first visit was a screening. The second and third appointments each involved a laboratory test meal to measure observed energy intake and food selection. Participants adhered to an overnight fast beginning at 10:00 pm the night before each appointment.

2.3. Measures

2.3.1. Body measurements

At the screening, weight and height were measured using calibrated electronic instruments, as previously described (Tanofsky-Kraff, McDuffie, et al., 2009). Body mass index (BMI, kg/m²) and BMI standard deviation (BMI-z) scores were calculated according to the CDC 2000 growth charts (Kuczmarski, et al., 2002). Body composition (fat-free mass and percent fat mass) was measured using air displacement plethysmography (Life Measurement Inc., Concord, CA). Pubertal status was assigned by staging breast and pubertal hair development (Marshall & Tanner, 1969, 1970) and measuring testicular volume (Tanner, 1981).

2.3.2. LOC-eating

The presence or absence of LOC-eating was assessed with the Eating Disorder Examination (EDE), version 120D/C.2.9 (Fairburn & Cooper, 1993), or the EDE for children <14y of age (Bryant-Waugh, Cooper, Taylor, & Lask, 1996). Youth were categorized as endorsing LOC if they reported any experience of lack of control over eating in the past month, regardless of the amount of food consumed. Youth who reported overeating without LOC or no episodes of overeating in the past month were categorized as not having LOC. The EDE has demonstrated excellent psychometric properties in children (Bryant-Waugh, et al., 1996; Tanofsky-Kraff, et al., 2004) and adolescents (Glasofer, et al., 2007).

2.3.3. Observed intake during laboratory test meals

Participants ate *ad libitum* from a multiple-item buffet test meal on two separate days. In random order, youth participated in a “normal meal” (at which they were told to “eat as much as you would at a normal meal”) and a “binge meal” (during which they were instructed to “let yourself go and eat as much as you want”). Other than the instruction, all other aspects of the test meal conditions were identical. On both days, participants were served a standard 280 kcal breakfast (74% carbohydrate, 7% protein, 19% fat). Youth remained at the laboratory for the next six hours, during which they were observed to ensure that they consumed no calorie-containing foods or beverages and participated only in sedentary activities. The test meal consisted of 9,835 kcal (12% protein, 51% carbohydrate,

37% fat across all foods) and contained a wide assortment of foods (Mirch, et al., 2006). All food items were weighed to the nearest 0.1g before and after the test session. Energy content and macronutrient composition were calculated as previously described (Tanofsky-Kraff, McDuffie, et al., 2009).

2.4. SES

The Hollingshead scale was used to assess SES based on parental occupation and education (Hollingshead, 1975). Scores range from 1 to 5, where lower scores correspond to higher SES.

2.5 Statistical analysis

Analyses were performed with SPSS 16.0 (SPSS, 2007). Data screening and the handling of outliers has been previously described (Tanofsky-Kraff, McDuffie, et al., 2009). A linear mixed model with repeated measures was conducted with the dependent variable being total energy intake (kcal). The fixed factors were the main and interactional effects of race (non-Hispanic African-American or non-Hispanic Caucasian) and LOC (presence or absence). The repeated measure was meal instruction (normal versus binge). Covariates included sex, age (y), fat-free mass (kg), percent fat mass, height (cm), and SES (scores 1 to 3 were recoded as “1” to identify “higher” SES and scores from 4 to 5 were recoded as “0” to identify “lower” SES). Puberty was considered in the analyses, but it was correlated highly with age and did not significantly contribute to any model and removed. Parallel, secondary analyses were conducted to examine the effects of race and LOC status on percentage of energy intake from protein, carbohydrate, and fat (arcsine transformed), food groups (kcal of dairy, sweets, snacks, meats, vegetables, fruits, condiments, or drinks). Total energy consumed (kcal) was included as a covariate in the models examining percent macronutrient content intake. In all models, we considered interactional effects among meal instruction, race, sex, and LOC with energy intake. Differences were considered significant when p values were ≤ 0.05 . All tests were two-tailed.

3. Results

Data from 185 youth ($M \pm SD$, $12.98 \pm 2.82y$; Table 1) were analyzed. The sample was 34.1% African-American and 65.9% Caucasian. Among youth who reported SES (4 were missing), 12% of African-American and 5% of Caucasian youth were categorized as lower SES (Hollingshead 4-5). As previously reported, all youth consumed more energy at the binge meal compared to the normal meal, with no main effect of LOC status (Tanofsky-Kraff, McDuffie, et al., 2009). A similar percentage of African-American (24.2%) and Caucasian (28.9%) youth reported the presence of LOC-eating ($X^2(1, N = 179) = 10, p = .75$).

There was a significant main effect of race on energy intake ($F(1, 172) = 11.12, p < .001$; Figure 1) such that African-American youth consumed more total energy at both laboratory test meals (1608.39 ± 57.33 kcal) compared to Caucasian youth (1362.16 ± 44.00 kcal), after adjusting for sex, age, fat-free mass, percent fat mass, height, SES, and LOC. Furthermore, there was a significant interaction of race and LOC status on energy intake ($F(1, 172) = 11.00, p < .001$). African-American youth with LOC consumed the most total energy across both meals (1854.75 ± 104.02 kcal) compared to African-American youth without LOC (1524.146 ± 59.83 kcal), Caucasian youth with LOC (1277.93 ± 68.31 kcal), and Caucasian youth without LOC (1399.46 ± 46.09 kcal) after adjusting for covariates (Figure 1). As shown in Table 2, the addition of the race by LOC interaction to the covariates only model resulted in a significant improvement in model fit ($p < .001$). There was also a significant effect of SES on energy intake such that individuals in the lower SES category consumed

more energy (262.69 ± 77.94 kcal) than those in the higher SES category after adjusting for covariates ($p = .001$; Table 2).

We examined whether observed effects differed by meal type or sex. There was no interaction of meal type with LOC ($p = .22$). In addition, there was no three-way interaction among meal type, LOC and race ($p = .47$), indicating that the LOC by race interaction did not differ in the two meal conditions. Sex did not significantly interact with race and/or LOC in predicting youths' energy intake ($ps > .10$).

There was no main effect of LOC ($p = .26$) or race, or interactional effect of race by LOC on any macronutrient group ($ps > .28$) or any food group ($ps > .05$; data not shown).

4. Discussion

In this examination of racial differences in LOC-eating, we found that similar rates of LOC were reported by African-American and Caucasian youth. In contrast, African-American youth consumed more energy than Caucasians in the laboratory, regardless of type of meal. Moreover, even after relevant adjustments for age, sex, and body composition, African-Americans with LOC consumed the most total energy compared to other youth, including those without LOC and Caucasian youth with LOC.

The finding that African-American youth have similar rates of LOC compared to Caucasian youth is consistent with some (Austin, et al., 2008; Glasofer, et al., 2007; Pernick, et al., 2006), but not all (Neumark-Sztainer, et al., 2002; Story, et al., 1995; Swanson, et al., 2011), prior research. Mixed findings may be a consequence of different assessment methods. Consistent with the current data, previous studies in pediatric samples utilizing the EDE (Glasofer, et al., 2007; Shaw, et al., 2004) or EDE-Questionnaire (Pernick, et al., 2006; Shaw, et al., 2004) have not found significant differences in LOC/binge-eating among various races. Yet, studies assessing eating patterns via the Questionnaire on Eating and Weight Patterns-Adolescent Version (Johnson, Rohan, & Kirk, 2002) or the World Health Organization Composite International Diagnostic Interview (Swanson, et al., 2011) have found higher rates of LOC/binge-eating among African-American youth. Although some adult studies have used measures validated in minority groups (Atlas, Smith, Hohlstein, McCarthy, & Kroll, 2002; Bardone-Cone & Boyd, 2007; Wilfley, et al., 1996), the majority of pediatric studies have used assessments developed in primarily Caucasian populations. Future research is necessary to determine the most valid method to assess LOC-eating among African-American samples.

African-Americans consumed more energy than Caucasians. Furthermore, African-Americans with LOC consumed the most energy in both meals compared to all other youth, with and without LOC. Culture likely plays a role in disordered eating patterns, as it does in perceptions of body weight. There is an acceptance of a larger body size among African-Americans (Gordon, Castro, Sitnikov, & Holm-Denoma, 2010; Kelly, Bulik, & Mazzeo, In press; Kronenfeld, Reba-Harrelson, Von Holle, Reyes, & Bulik, 2010) and average-weight African-Americans often report wanting to gain weight (Neumark-Sztainer, et al., 2002) or feeling pressure to eat to gain weight (Vander Wal, 2004). It is possible that African-American youth in this sample consumed more energy in order to achieve a larger body size.

Strengths of this study include the use of well-controlled laboratory test meals. Furthermore, we considered important variables including sex, age, body fat, fat-free mass, SES and puberty. Study limitations include the use of a paradigm that may not reflect eating in the natural setting. Since the EDE has not been carefully validated in African-American samples, it is unclear how well the measure captures disordered eating in African-American youth. Additionally, we did not include a measure of food insecurity, which may in part

explain the greater food intake of African-American participants. While there are some data to suggest that African-American adults who experience food insecurity may overeat (Dinour, Bergen, & Yeh, 2007), the research in children is largely inconclusive (Dinour, et al., 2007; Gundersen, Garasky, & Lohman, 2009). Furthermore, we did account for socioeconomic status which has been strongly correlated with food insecurity (Alaimo, Olson, Frongillo, & Briefel, 2001) and might serve as a proxy for this construct. Causal inferences are limited due to the cross-sectional design. Lastly, African-American youth participating in a study at the NIH may not be representative of the general African-American population, potentially limiting the generalizability of the findings.

In conclusion, African-American youth consumed more energy than Caucasian youth in laboratory test meals, and those with reported LOC may be at especially high-risk for overeating. These data shed light on one possible contributing factor for the disproportionate rates of obesity among this population. Prospective studies are needed in order to examine whether LOC-eating contributes to the high rates of obesity among African-American youth. If LOC-eating is a contributing factor to inappropriate weight gain in African-American youth, targeting this behavior may serve as one approach to reducing the rates of obesity (Tanofsky-Kraff, et al., 2007) in this population. Indeed, preliminary data suggest that reducing binge (Jones, et al., 2008) and LOC-eating (Tanofsky-Kraff, et al., 2010) may impact body weight in youth.

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Highlights

- Investigated prevalence of loss of control in African-American and Caucasian youth
- Examined energy intake in the laboratory in African-American and Caucasian youth
- African-Americans and Caucasians reported similar rates of loss of control eating
- African-American youth consumed more total energy than Caucasian youth
- African-American youth with loss of control consumed the most total energy

Figure 1.

African American youth consumed more energy (1608.39 ± 57.33 kcal) in comparison to Caucasian youth (1362.16 ± 44.00 kcal; $p < .001$). African American youth with reported loss of control consumed the most energy across both meals (1854.75 ± 104.02 kcal) in comparison to African American youth without loss of control (1524.146 ± 59.83 kcal), Caucasian youth with loss of control (1277.93 ± 68.31 kcal), and Caucasian youth without loss of control (1399.46 ± 46.09 kcal; $p < .001$). Estimates were adjusted for age, sex, percent body fat, fat-free mass, height, socioeconomic status, and meal instruction. Values that do not share a common letter were significantly different at $p < .001$.

Table 1
Participant Characteristics Based upon Race

	African American (n = 63)	Caucasian (n = 122)
	M ± SD	M ± SD
Age (y)	12.59 ± 2.86	13.18 ± 2.79
SES, median	3	2
BMI(kg/m ²) ^{**}	26.59 ± 7.88	22.44 ± 6.31
BMIz-score ^{**}	1.49 ± 1.05	.66 ± 1.10
Body fat (%) [*]	31.02 ± 14.62	25.43 ± 12.18
Fat-free mass (kg)	45.67 ± 15.65	41.94 ± 15.06
Total intake (kcal), normal meal ^{**}	1618.78 ± 617.28	1263.14 ± 500.83
Total intake (kcal), binge meal ^{**}	1677.92 ± 637.01	1425.26 ± 566.04
Loss of control (≥ 1 episodes) in the month prior to assessment	24.2 %	28.9 %

^{*}
 $p < .01$;

^{**}
 $p < .001$

Table 2
Association of Race, LOC, and Energy Intake

	Energy Intake		
	Estimate	Standard Error	95% Confidence Interval
Fixed Main Effects			
Age (y)	-42.12 [*]	19.24	-80.11,-4.14
Sex (male)	363.56 [‡]	63.63	237.97,489.15
SES (lower)	240.16 [‡]	81.07	80.14, 400.18
Body fat (%)	6.58 [‡]	2.43	1.79, 11.37
Fat-free mass (kg)	12.40 [‡]	3.39	5.70, 19.09
Height (cm)	12.14 [‡]	4.31	3.63,20.65
Meal type (normal)	-123.54 [‡]	32.54	-187.78,-59.30
Race (Caucasian)	-212.581 [‡]	67.51	-345.83, -79.32
LOC (absent)	-19.32	67.93	-153.42, 114.77
Model χ^2 ($-2 \times \log$ likelihood)	5076.91		
Fixed Interaction Effects			
Race $\times$ LOC	468.45 [‡]	132.68	206.56, 730.33
Model χ^2 ($-2 \times \log$ likelihood)	5064.88		
Change in χ^2 ($df=1$)	12.03 [‡]		

^{*} $p \leq .05$;

[‡] $p \leq .01$;

[‡] $p \leq .001$