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Emotional Eating in Adolescent Females

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Abstract

Emotional Eating in Adolescent Females

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Background: Sixteen percent of adolescents in the United States are overweight, a condition which causes major medical and psychological problems. Emotional eating is a risk factor for obesity in adults. The purpose of this study is to investigate the emotional eating behavior of white and black adolescent females across puberty and adolescence. The aims are: 1) to examine whether adolescent females eat in response to emotions and if this changes with puberty, 2) to examine whether emotional eating in adolescent females is influenced by race, pubertal timing, and socioeconomic status (SES), and 3) to determine if emotional eating in early adolescence influences the development of obesity in late adolescence.

Methods: This is a secondary data analysis of the National Heart, Lung and Blood Institute Growth and Health Study (NGHS) which collected data from 1987 through 1997 on black and white females, beginning at 9 to 10 years of age. Longitudinal data included: height, weight, pubertal stage (by exam), demographic data, and the Emotion-Induced Eating Scale (EIES) developed for the NGHS.

Results: Emotional eating levels were low throughout (average 8-10 out of 21) and age did not influence scores. Significant racial differences emerged with black subjects beginning the study with lower EIES scores than white subjects (10.4 vs. 9.8, $p=0.002$). Over time, black subjects decreased EIES scores, while white subjects increased scores so that by study termination the black females were reporting lower EIES scores than the white females (9.5 vs. 10.2, $p<0.001$). Neither puberty nor pubertal timing influenced EIES score. SES was significantly related to EIES score for both races (white, $p=0.007$; black, $p=0.028$) with an initial inverse relationship between SES and EIES. Trends then differed by race and SES. EIES score did not influence BMI at any time point in the study.

Conclusions: Emotional eating levels are low in the adolescent females and do not affect the development of obesity during the teen years. However, there are interesting racial and SES differences that are worthy of further study, as emotional eating does influence adult obesity.

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Introduction

National surveys have found that an alarming 16% of adolescents in the United States are now overweight, that is, have a body mass index (BMI) at or above the sex- and age-specific 95th percentile for age. There are notable racial disparities in overweight prevalence among adolescent females with 23.6% of black females meeting overweight criteria while 12.7% of white females fall into this category (1). Obesity among teens causes major medical and psychological problems that can have a life-long impact (2, 3).

The cause of obesity in our society is multifactorial; however, one relatively unexplored mechanism may be emotional eating. Eating in response to emotions, as opposed to hunger, has been shown to be a risk factor for weight gain, obesity, and bulimic attitudes in young and middle-aged adults (4, 5). Negative emotions more commonly precede uncontrolled eating than positive ones. While negative emotions increase eating in normal weight and overweight populations, the influence has been shown to be stronger in obese adults (6, 7).

Adolescents also demonstrate emotional eating behavior, but little research has been done in this area. In a two-year prospective study of 231 adolescent females from private California high schools looking at risk factors for binge eating, itself a verified risk factor for obesity, it was found that emotional eating predicted binge eating onset (8). This study by Stice and Presnell provides indirect evidence that emotional eating may influence the development of obesity; however, its generalizability was limited by including primarily subjects from high socioeconomic status (SES) homes. A second study, by Striegel-Moore et al., examined the correlates of emotional eating in young girls focusing on race, adiposity, and food intake (9). This cross-sectional study used baseline data from the National Growth and Health Study (NGHS, see below) which included almost 2400 white and black 9-10 year-old females. They found that emotional

eating levels were low in this age group, with black subjects scoring significantly higher than white subjects on the Emotion-Induced Eating Scale (EIES), a self-report measure developed for the NGHS. Higher emotional eating scores were also associated with lower parental education and family income. Interestingly, and most unexpected, emotional eating was inversely related to BMI in this young cohort (9).

Achieving pubertal maturation is one of the major developmental processes that occur in adolescence. During puberty, females have a natural increase in adipose tissue which, in the face of the societal ideal of thinness, may create body dissatisfaction. Research points to pubertal changes as contributing to body dissatisfaction, dieting behavior, and eating disorders in female adolescents (10). The timing of pubertal development has also been shown to be influential on eating behavior. Females with earlier timing of puberty are more likely to be overweight and to have greater body dissatisfaction and dieting attempts than their peers with on-time or late puberty (11). Therefore, puberty is a time when females experience natural changes in their bodies which may lead to mental stress and behavior change.

Adolescent obesity is a serious problem, and risk factors must be identified so that effective obesity prevention and intervention programs may be developed. Emotional eating may be a behavior which promotes adolescent obesity. Further, puberty is a time in adolescence when many emotions and behaviors emerge which may influence the development of obesity. Therefore, this study was designed to examine the changes in emotional eating in black and white adolescent females longitudinally across 10 years, looking at trends with age, SES, stage of pubertal development, and timing of pubertal development. We hypothesized that emotional eating would increase with age and stage of pubertal development and would be higher in those of a lower SES and in those with earlier pubertal maturation. We also sought to determine if the degree of emotional eating behavior early in adolescence would influence later BMI, hypothesizing that a

higher level of emotional eating in early adolescence would lead to a higher BMI in the late teen years.

Methods

Participants

This is a secondary data analysis of the National Heart, Lung and Blood Institute's Growth and Health Study (NGHS) which has been described previously (12). Briefly, the NGHS was a collaborative cohort study designed to assess factors associated with the development of obesity in black and white females throughout their adolescence, and its effects on major cardiovascular disease risk factors. The group collected data on 2379 female subjects annually from 1987 through 1997 at three clinical centers: the University of California at Berkeley, Cincinnati Children's Hospital, and WESTAT, Inc., in Rockville, Maryland. Eligibility criteria required that the subjects were within 2 weeks of age 9 or 10 years at the first study visit, declared themselves as either non-Hispanic white or black, and that they had ethnically concordant parents who completed a household demographic information form and gave consent for participation (12). A subset of 871 subjects, 432 white and 439 black, from the Cincinnati site was used in this analysis. This subset reported lower household incomes and maximum parental education levels than the participants from the other institutions. Proportions of black and white participants were the same between all study sites. Institutional review board (IRB) approval for the study was originally obtained from all participating institutions. IRB approval for the secondary analysis was obtained from Cincinnati Children's Hospital Medical Center and The University of Cincinnati Medical Center.

Demographic Information

At study entry, parents or guardians provided information about their highest level of educational attainment which is used as a proxy for SES. These data were collapsed into three SES categories for statistical analyses: 1) high school or less, 2) less than 4 years of college, 3) 4 or more years of college (12).

Physical Development and Timing of Sexual Maturation

As previously reported (12), at each annual visit, trained and certified female health examiners conducted an assessment of physical development. Height and weight were measured twice and if the two measurements differed by more than 0.5 cm or 0.3 kg, respectively, a third measurement was taken. The average of the two or the closest two of three measurements was used for BMI calculation. Body mass index (BMI) was calculated by dividing weight (in kilograms) by height (in meters squared). Information was obtained annually (until Year 7) about menstrual status and date of first menses. For this study, pubertal stage by physical exam using modified Tanner staging (NHLBI NGHS Research Group, 1992) was categorized into a 4 stage maturation index: 1) prepubertal, 2) pubertal, but premenarcheal, 3) within 2 years of menarche, 4) more than 2 years after menarche (F. Biro and F. Falkner, unpublished data). Self-reported age of menarche was used as the index of timing of sexual maturation in order to be consistent with how timing was defined in other NGHS papers (11). Additionally, 80 percent of the 10-year-old black subjects were already pubertal at study entry and self-reported measurement of onset of menses is more reliable than self-reported measurement of onset of breast or pubic hair development (13, 14). Timing of puberty was defined by ethnicity-specific quintiles: early-maturing and late-maturing girls fell below or exceeded the 10th and 90th percentile, respectively, of menarcheal timing for their ethnic group in the NGHS.

Emotion-Induced Eating Scale

The development of the Emotion-Induced Eating Scale (EIES) has been described elsewhere (9). To summarize, no instruments to measure the eating habits of preadolescent females were available at the initiation of the NGHS. Therefore, a Nutrition Patterns Form was developed specifically for the study. Eighteen questions on this form reflected mood eating, eating outside of regular meals, and parental control over eating. From these 18 questions, the 7-item EIES was developed. This scale (Table 1) consists of 7 items concerning eating behavior in response to emotions, such as worry, sadness, and happiness. Answers were recorded on a three-point scale (1 = never or almost never, 2 = sometimes, 3 = usually or always), with total scores ranging from a low of 7 to a high of 21 points. Inter-item reliability as measured by Cronbach's coefficient alpha is reported as 0.78 for the entire sample and 0.77 when calculated separately for each of the two racial groups.

Data Analysis

All statistical analyses were performed with SAS for Windows, version 8.2. An alpha of 0.05 was used to determine statistical significance. The association between age, race, and EIES score was analyzed using the generalized estimating equations (GEE) technique (15). This method was also used to explore the relationship between puberty, pubertal timing, and SES with EIES score. The relationship between EIES score and later BMI was analyzed using general linear models.

Results

Emotional Eating Trends by Age and Race

The EIES levels were low and, overall, age did not influence the EIES score ($p = 0.183$). Confirming previous research (9), at 9-10 years, black females had significantly

higher levels of EIES than white females (10.4 vs. 9.8, $p=0.002$). There was a significant age-by-race interaction with white females increasing their emotional eating score by 0.16 units for each one year increase in age ($p<0.0001$), while black females decreased their EIES score by 0.06 units ($p=0.006$) with each year. By study termination at 18-19 years of age, the black subjects were reporting lower EIES scores than the white subjects (9.5 vs. 10.2, $p<.001$) (Figure 1).

Emotional Eating and Pubertal Stage and Timing

When pubertal stage was added to the model for each race, it was found not to be an independent predictor of EIES score (white $p=0.29$, black $p=0.40$). Mean EIES score by pubertal stage and race are shown in Table 2.

Using a 10%-80%-10% division for determining pubertal timing, we found that for whites menarche before 11.7 years fell into the early category and after 13.6 years fell into the late category. For blacks, menarche before 11.1 years was early and after 13.0 was considered late pubertal timing. Timing of menarche was not found to significantly effect the degree of emotional eating for either race ($p=0.61$).

Emotional Eating and SES

Parental education level was found to be significantly related to EIES for both races (white $p=0.007$, black $p=0.028$). For whites and blacks, those females in the highest SES group had the lowest levels of emotional eating at study initiation, and the lower SES groups had higher emotional eating scores (Figures 2 and 3). However, the pattern of emotional eating over time by SES was different between the races. In whites, those subjects in the highest SES group had an increase in emotional eating score throughout the 10-year study period so that at study termination there was no significant difference between the EIES level for all groups. Among the black subjects, those in the high SES

groups had stable emotional eating scores over time, but those in the lower two groups decreased their EIES scores over time so that there was no statistical difference between the three SES groups in emotional eating score at study termination.

Emotional Eating and BMI

Finally, we looked at the relationship between emotional eating scores and later BMI. At no time point in the study were EIES scores significantly related to later BMI (e.g. EIES score at study initiation did not have an impact on BMI at the end of the study).

Discussion

This is the first longitudinal study to examine the patterns of emotional eating in a large cohort of black and white adolescent females. The study suggests that emotional eating levels are low during the adolescent years and that emotional eating does not influence the development of obesity in black and white females. However, some interesting racial patterns were detected. For white females, emotional eating levels were lowest at study initiation when the subjects were 9 or 10 years old and increased throughout the study period. The black subjects, however, began the study with higher levels than the white subjects, but decreased their reported emotional eating over time. It would be informative to follow these trends into adulthood to see if the divergence continues or if emotional eating levels stabilize after adolescence. Studies with adults have shown emotional eating to be a risk factor for obesity; perhaps there is a threshold level of emotional eating exists that is not crossed until adulthood which contributes to obesity.

SES, as measured by parental education level, is also significantly related to EIES score with high SES being negatively correlated with emotional eating levels in the early

adolescent years. While white females with high SES increased their EIES scores over time, black females with low SES decreased their emotional eating levels with time. Given this is the same pattern that the races follow with age, this may be a reflection that there are more whites in the high SES group and more black females in the low SES group.

Additionally, and contrary to our hypothesis, puberty and pubertal timing did not influence emotional eating levels. This study finding is strengthened by having pubertal stage determined via physical exam by a trained health examiner.

We found that emotional eating score early in adolescence did not influence BMI at the end of the study when the subjects were 19 years old. With the overall level of emotional eating being so low throughout the study (average 9-10 on a scale from 7-21), it is not surprising that it held little influence.

This study examined emotional eating in a diverse population of black and white females. It is possible that emotional eating only contributes to obesity in a subset of the adolescent population. As mentioned previously, Stice and Presnell found that emotional eating predicted binge eating in adolescent females (8). Perhaps, if we had used a subset of females who reported binge eating or other disordered eating behavior, we then may have found that emotional eating contributes to being overweight in this subset of the population. Alternatively, emotional eating behavior may not emerge to a significant degree until adulthood due to a change in emotional expression, availability of food, or other unknown factors.

Limitations

This study has several limitations that should be considered. First, the Emotion-Induced Eating Scale has not been used in other research, so results may not be comparable to those in other studies using other emotional eating scales (e.g. the Dutch

Emotional Eating Scale as used by Stice, Presnell and Spangler, 2002 (8)). Second, the Emotion-Induced Eating Scale includes two questions relating to positive emotions (“When I do something well I give myself a treat” and “When I am happy I eat more.”). Given that, in adult studies, negative emotions are more influential on eating behavior than positive ones, the inclusion of such questions may have diluted the effect of emotion on eating in this study. Third, it is difficult to separate measures of age and puberty, so their individual influences on emotional eating may not have been fully elucidated with our analyses. Finally, although a strength of this study was its length, more than 10 years may be required to see the effects of emotional eating on BMI.

Conclusions

Racial and socioeconomic characteristics partially determine the emotional eating status of adolescent females. Emotional eating does not appear to be a major contributor to obesity in the adolescent age group. At this point we cannot recommend developing interventions for obesity prevention and treatment targeted at emotional eating. However, further research warrants an examination of emotional eating on subsets of the adolescent population, such as those with disordered eating. In light of its role in adult obesity, clinicians and researchers who focus on adolescents should be mindful of emotional eating behavior, especially in older, white adolescent females.

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How well do these statements describe you? Put a mark in the box that best describes how often this happens.

	Never or Almost Never	Sometimes	Usually or Always
1. When I am worried I eat more	()	()	()
2. I eat when I am mad	()	()	()
3. When I do something well I give myself a treat	()	()	()
4. When I am sad I eat more	()	()	()
5. When I am happy I eat more	()	()	()
6. When I am bored I eat more	()	()	()
7. I eat between meals even when I am not hungry	()	()	()

Table 1. Emotion-Induced Eating Scale.

Source: Striegel-Moore RH, Morrison, JA, Schreiber G, Schumann BC, Crawford PB, Obarzanek E. Emotion-induced eating and sucrose intake in children: the NHLBI growth and health study. *International Journal of Eating Disorders* 1999;24:389-98. Copyright ©1999 Wiley-Liss, Inc., a subsidiary of John Wiley & Sons, Inc. Reprinted with permission of John Wiley & Sons, Inc.

Figure 1. Emotion-Induced Eating Scale scores by age for black and white females.

Pubertal Stage	Race	N*	Variable	Mean	Std Dev	Minimum	Maximum
1	White	529	EIES	9.80	2.70	7.00	21.00
			AGE (years)	10.74	1.27	9.00	15.20
	Black	318	EIES	10.20	2.85	7.00	21.00
			AGE	10.86	1.21	9.07	14.78
2	White	1221	EIES	9.32	2.41	7.00	21.00
			AGE	12.60	2.01	9.05	19.78
	Black	1239	EIES	9.67	2.71	7.00	21.00
			AGE	12.05	1.82	9.08	19.79
3	White	427	EIES	9.43	2.48	7.00	20.00
			AGE	13.60	1.58	9.38	19.47
	Black	434	EIES	9.63	2.84	7.00	20.00
			AGE	12.84	1.47	9.63	19.97
4	White	1358	EIES	10.18	2.60	7.00	20.00
			AGE	17.16	1.60	12.02	21.09
	Black	1776	EIES	9.75	2.75	7.00	21.00
			AGE	16.79	1.83	11.64	21.38

Table 2. Mean Emotion-Induced Eating Scale score by pubertal stage and race. Pubertal stages are 1) prepubertal, 2) pubertal, but premenarcheal, 3) within 2 years of menarche, 4) 2 or more years after menarche. *The N values represent every time a subject was found to be in the specific pubertal stage over the entire 10 year study period. Therefore, each N may include single participants multiple times.

Figure 2. Emotion-Induced Eating Scale (EIES) score by SES for white females.

Figure 3. Emotion-Induced Eating Scale score by SES for black females.