

ORIGINAL ARTICLES

Chronic dieting and the belief that smoking controls body weight in a biracial, population-based adolescent sample

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Abstract

Objective—To evaluate the prevalence of weight concerns and smoking for body weight reasons as a function of race and gender.

Design—A questionnaire measuring a number of factors thought to be predictive of smoking was administered.

Setting—The Memphis (Tennessee) school system.

Participants—Participants were 6961 seventh-grade students (mean age 13 years). This population consisted of 80.8% black children, 16.5% white children, and 2.7% of other ethnic origins.

Main outcome measures—Weight concerns were assessed using items from a restraint scale. Students were questioned regarding their smoking status, beliefs that smoking controls body weight, and their own weight-control smoking behaviour.

Results—Dietary restraint interacted with race in that, whereas white girls scored the highest on dietary restraint, black boys scored higher on dietary restraint than white boys. Almost 40% of subjects at this school level believed that smoking controls their body weight. Of the regular smokers, 12% indicated they have smoked to control their weight, with white girls endorsing this belief significantly more than other respondents.

Conclusions—The propensity to smoke for weight control reasons, previously described by other researchers among white females of college and high-school age, was also found among this sample of students of junior high school age.

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Keywords: dieting; body weight and smoking; adolescence

Introduction

Cigarette smoking is the primary preventable cause of premature disease and death in the United States. Smoking has been causally linked to lung cancer and other fatal malignancies, atherosclerosis and coronary heart disease, chronic obstructive pulmonary disease, and other conditions that constitute a wide array of serious health consequences.¹

Although smoking is responsible for more than one of every six deaths in the United States,¹ more than 50 million adult Americans continue to smoke.¹

Tobacco use primarily begins in early adolescence, typically by age 16 with almost all first use occurring before the time of high school graduation (age 18).² It has been estimated that over two thirds of all children and adolescents have tried at least one cigarette^{2 3}—this is important for three reasons. First, the earlier in life one begins to smoke, the more likely it is for that individual to continue smoking as an adult. Second, earlier onset of cigarette smoking provides more life-years in which to use tobacco and thereby increases the potential duration of use and the risk of a range of more serious health consequences. Third, earlier onset is also associated with heavier use; those who begin to use tobacco as younger adolescents are among the heaviest users in adolescence and adulthood.²

It has been estimated that 3.1 million adolescents and 25% of 17- and 18-year-olds currently smoke cigarettes.² Smoking prevalence among American adolescents declined sharply in the 1970s, but this decline slowed significantly in the 1980s, particularly among white males who have shown no decline in recent years.⁴ Female and male adolescents are now equally likely to smoke,² while white adolescents are more likely to smoke than are black adolescents.^{2 4} These trends may reflect differing rates of smoking initiation among the subgroups.

Several social, psychological, and physiological factors have been associated with smoking initiation and maintenance in teenagers.⁵⁻¹² One factor that has emerged is the use of smoking for weight control.¹³ Weight control does appear to be an issue for many adolescents, particularly for females. Rosen and Gross¹⁴ found that more than two thirds of the girls and half of the boys in a sample of primarily white high-school adolescents were trying to modify their weight. A large percentage of girls was either losing or trying to lose weight, even though they were already in the normal weight range. Whereas girls tended to show a bias towards thinness, boys generally revealed a bias toward larger figures.¹⁵ They typically have the reverse pattern of weight modification: trying to gain weight even when

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they were already in the normal weight range.¹⁴ Contrary to these and other similar findings, Emmons¹⁶ reported that, in a sample of high-school students, more than 40% of the males were dieting to lose weight.

The research also demonstrates racial differences in the perception of weight and body-figure preferences. Although a large number of white girls were found to be dieting unnecessarily for weight control,¹⁷ black girls tended to be more satisfied with their weight and engaged in dieting behaviour less frequently.^{14 18-20} These findings are generally consistent despite the fact that blacks tend to weigh more than whites on average.²¹

In terms of the relationships between dieting concerns and smoking status, numerous cross-sectional studies have linked dieting, weight concerns, and the belief that smoking controls body weight with increased risk for adolescent smoking. For example, in a survey of 16 000 adolescent students, the heaviest regular smokers were the most likely to agree that smoking controls weight (42.2%) compared with students who never smoked (16.6%).²² In a study of high-school students ($n = 1705$), females concerned about their body weight were twice as likely as other young women to be current smokers.²³ These variables, however, were generally unrelated to smoking status in males.²³ A study of 33 393 young people in the seventh to 12th grades found that dieting frequency was associated with greater likelihood of regular tobacco use in females, but not in males.²⁴ The findings that smoking adolescents were more likely to report the use of diet pills and, for female smokers, the use of amphetamines for weight loss, are further evidence of a relationship between weight concerns and smoking, at least in young women.¹⁸

The purpose of this study was to evaluate the prevalence of weight concerns and smoking for body weight reasons as a function of race and gender. Our study addressed these issues using a large sample heavily representing black subjects, a group previously underrepresented in the growing body of literature on adolescent smoking and weight concerns. Specifically, this study was designed to address some of the inconsistencies in the literature on the weight concerns of black adolescents, consequently allowing for important ethnic comparisons of the degree to which adolescents are concerned about controlling their weight. Finally, we were interested in whether children in the seventh grade (junior high school) have begun to endorse the belief that smoking can help control weight, and whether they have actually engaged in this behaviour for weight-controlling purposes.

Methods

SUBJECTS

Participants were 6961 students in the seventh grade of the Memphis city schools (mean age 13 years). Subjects were participants in the first phase of the Memphis Health Project, a longitudinal investigation of the correlates of smoking onset in black *vs* white adolescents. This population consisted of 80.8% black children,

16.5% white children, and 2.7% of other ethnic origins. Boys and girls were approximately equally represented (49.5% and 50.5%, respectively).

OVERVIEW OF THE MEMPHIS HEALTH PROJECT

The Memphis Health Project is a longitudinal, prospective evaluation of the predictors of smoking onset among black *vs* white girls. With additional support from the University of Memphis, the researchers were able to collect data on boys as well. The study was designed to be the first comprehensive assessment of gender and race models of smoking onset. All children in the seventh grade of this major, mid-south metropolitan school system were invited to participate. This particular school system is among the largest in the nation and has a principally (81%) black student body. For the larger study, a questionnaire measuring a number of factors thought to be predictive of smoking was administered to all students who agreed to participate (see Results for participation rate data). These students will be surveyed prospectively for several years, allowing us to identify which factors accurately predict smoking onset for the students. Among other items, weight concerns and the belief that smoking controls body weight were included.

QUESTIONNAIRE/MEASURES

Six items from a restraint scale²⁵ were embedded in the Memphis Health Project Survey to assess weight-control concerns. This scale is widely used and is a reliable and valid measure of dietary restraint.²⁵ The entire scale was not used because it is now known to measure more than one dimension of restraint.²⁶ Two distinct factors, representing separate dimensions, constitute the restraint scale: concern with dieting (CD), which reflects heightened attention to and emotional association with eating, and weight fluctuation (WF), which reflects extent of previously experienced weight gain and loss.²⁷ The CD items were considered more appropriate for this investigation for several reasons. First, the CD items are an assessment of food intake inhibition, rather than varying body weights. Second, the WF items require specific information about weight variation that might not be answerable by most subjects in this study population. Furthermore, adolescence is a period when weight and body size are expected to fluctuate naturally. Thus, only the CD items were used. With the CD subscale, higher scores on this scale reflect greater dietary concern.

Body mass indices ($BMI = kg/m^2$) were calculated for each subject, based on his or her self-reported height and weight. Evidence seems to suggest that self-reported weights are quite accurate for both normal and overweight persons.²⁸ Although there may be a tendency to underestimate weight and overestimate height, group means reported for weight and height are considered valid enough measures of actual weight and height for adolescents in large-scale epidemiological studies.²⁹ So that implausible values and outliers would not contaminate the data, the top and bottom 1% of these values

Table 1 Means and standard deviations (SDs) of study variables, according to race and sex

Variable	Blacks		Whites	
	Boys	Girls	Boys	Girls
Age*†				
Mean	13.27	13.00	13.05	12.78
(SD)	(0.87)	(0.78)	(0.77)	(0.64)
n	2676	2840	597	533
BMI*‡				
Mean	20.94	21.47	20.53	19.87
(SD)	(4.67)	(4.89)	(4.51)	(4.94)
n	2427	2496	587	511
Restraint score†‡				
Mean	6.28	6.64	5.28	7.47
(SD)	(3.20)	(3.35)	(3.09)	(3.90)
n	2492	2709	575	528

* Denotes a significant main effect for race.

† Denotes a significant main effect for sex.

‡ Denotes a significant race by sex interaction.

BMI (body mass index) = kg/m².

were dropped from the analyses. Only values between 11.00 and 36.00 were used.

One item on the questionnaire asked subjects whether they endorsed the belief that smoking cigarettes helps people control their weight. A follow-up question asked respondents if they have ever smoked to control or lose weight. These questions were included because, although there may be a relationship between smoking and weight concerns, it would still not be clear if adolescents were actually using smoking as a dieting strategy.

This investigation relied on self-reports of smoking. The use of biochemical measures of smoking status is not feasible for survey research due to cost and its inability to detect low levels of cigarette consumption.³⁰ "Bogus pipelines", in which subjects are led to believe that a "breath test" or "saliva samples" will be used to corroborate their reports of smoking, have produced mixed results³¹⁻³³ and have increased refusal rates.³⁴ The best predictor of accurate reporting appears to be assured confidentiality,³⁵ which was used carefully in this study.

PROCEDURE

The principal of each school assigned a coordinator who was responsible for overseeing survey administration. School coordinators attended a training session where they learned about the project, their roles, and procedures for the administration of the survey. Two weeks before survey administration, letters informing the parents about the nature and planned administration of the survey were sent home with the students. Parents did not have to sign or return the letters if they agreed to allow their child to participate. If the parent objected, he/she was instructed to notify the researchers. Students also signed consent forms on the survey day.

On the survey day, each student received: a student consent form which the student signed agreeing or declining to participate, a student identification/information sheet, the survey, and a large envelope in which the student was to place materials upon completion. The teachers read from a prepared script a description of the materials and instructions to the students. After the students had completed the

materials and sealed their envelopes, the teacher collected the envelopes in a large box, which was then sealed.

APPROACH TO ANALYSIS

In this investigation, we were interested in evaluating varieties in adolescent weight concerns by race and sex. These data were analysed using ANOVA unique sums of squares to account for the non-orthogonal nature of the design. This same approach was applied in analysing respondents' endorsement of the belief that smoking could help control one's weight. To follow up on significant interactions, the Newman-Keuls test was employed.³⁶

In some cases, we were interested in the relationship between variables. Pearson product moment correlations were employed to assess the direction and strength of the relationship between BMI and restraint. In other cases, we were interested in the relationship between dichotomous dependent and predictor variables. In these cases, χ^2 analyses were performed.

Because increasing age is sometimes associated with increases in concerns related to dieting,²⁴ age was considered as an independent variable in the analysis. However, because all participants were in the same grade (seventh), age was severely truncated. Age correlated with BMI 0.06, while age and restraint correlated 0.02. As such, age was not included.

In all analyses, the following definitions of smoking status were always employed: (1) never-smoker, never smoked a cigarette; (2) experimental smoker, currently smoking fewer than one cigarette per week; and (3) regular smoker, smoking weekly or daily.

Results

DESCRIPTIVE RESULTS

Participation rates among available students were excellent. Only 3% of the students refused to complete the survey. Another 2% of the children had to be withdrawn from the study due to parental refusal or our inability to notify the parents of the research project. Although gender and ethnicity comparisons of non-responders could not be assessed, our resultant sample's ethnic and gender breakdown was virtually identical to the city-wide statistics in the Memphis city schools.

Table 1 contains means and standard deviations of demographic variables by sex and race. As can be seen, black boys and girls were older than their white counterparts. Within both races, boys were older than girls. Smoking status varied greatly by ethnicity. A full 10% of white boys (total n = 550) and 6.4% of white girls (total n = 517) in the seventh grade reported daily smoking. In contrast, only 1.3% of black boys (total n = 2066) and 0.9% of black girls (total n = 2531) reported daily smoking. Thus, compared with white students, black children were significantly less likely to be regular smokers than never-smokers, $\chi^2(1) = 221.9, P < 0.001$.

Table 2 Endorsement of the belief that smoking can help people control their weight, by race and sex

	Mean	SD
Blacks		
Boys (n = 2578)	0.60	0.78
Girls (n = 2768)	0.54	0.75
Whites		
Boys (n = 585)	0.42	0.65
Girls (n = 528)	0.64	0.71

BODY WEIGHT CONCERNS

A 2 (race) \times 2 (sex) factorial analysis of variance was performed on restrained eating scores (RES); table 1 shows the results. Because smoking status did not interact with race and gender ($F = 0.01$, $P = 0.92$), data are not split by smoking status. The main effect for race was not significant, $F(1, 6300) = 0.57$, $P = 0.45$. The main effect for sex was significant, $F(1, 6300) = 134.93$, $P < 0.0001$. However, this was moderated by a significant sex-by-race interaction, $F(1, 6300) = 68.71$, $P < 0.0001$.

To follow up on the significant interaction, the analysis of simple effects employed the Newman-Keuls test ($P = 0.01$). Girls in the sample produced scores (mean = 6.78 (SD 3.46)) on the RES that were higher than boys (mean = 6.09 (SD 3.20)). White girls indicated more restraint than black girls. However, among boys, the reverse pattern emerged, with black boys scoring higher than white boys.

Pearson product moment correlations were employed to assess the direction and strength of the relationship between RES scores and BMI. For the entire sample, RES scores were not strongly, but nevertheless significantly, correlated with BMI, $r(5728) = 0.21$, $P < 0.0001$. Among the four subgroups, the correlation between these two variables was highest among white girls and boys ($r = 0.31$ and 0.30 , respectively), followed by black girls ($r = 0.25$), and was not significant among black boys ($r = 0.14$).

PREVALENCE OF WEIGHT-RELATED BELIEFS ABOUT SMOKING

Of the 6462 respondents, 39.4% ($n = 2547$) endorsed the belief that smoking could help control one's weight. Table 2 contains a breakdown of the degree of endorsement by sex and race. A 2 \times 2 factorial analysis of variance was performed. The main effect for race was not significant, $F(1, 6455) = 2.65$, $P = 0.10$. The main effect for sex was significant, $F(1, 6455) = 10.66$, $P < 0.01$. However, this was moderated by a significant sex by race interaction, $F(1, 6455) = 29.52$, $P < 0.0001$. Follow-up analyses employed the Newman-Keuls test ($P = 0.01$). White girls endorsed this belief significantly more than any other subgroup. White boys were the least likely to endorse this belief. There was a significant difference between black girls and boys at a 0.01 significance level with black boys reporting more weight concerns than black girls.

The pattern of endorsement was also analysed by smoking status (table 3). One-way analysis of variance revealed that never-smokers, experimental smokers, and regular

Table 3 Endorsement of the belief that smoking can help people control their weight, by smoking status

	Mean	SD
Never	0.51	0.74
Experimental	0.66	0.75
Regular	0.70	0.81
Daily	0.79	0.75

Note: item is coded to reflect the extent of belief in the weight-control effects of smoking, with 0 = no weight-control benefits, 1 = a fair amount, and 2 = quite a bit of weight-control benefit.

Table 4 Percentage of regular smokers, by sex and race, who reported having smoked to control their weight

	Blacks (%)	Whites (%)
Boys	7	8
Girls	11	27

Note: total $n = 233$; black boys = 58; black girls = 45; white boys = 86; white girls = 44. A regular smoker is defined as one who smokes weekly or daily.

smokers differed significantly from each other in their endorsement of the belief, $F(3, 1007) = 10.95$, $P < 0.0001$. In general, endorsement of smoking for weight control increased as smoking exposure increased. Never-smokers (mean = 0.51) were the least likely to endorse this belief followed by experimental (mean = 0.66), regular (mean = 0.70), and daily (mean = 0.79) smokers.

USE OF SMOKING FOR WEIGHT CONTROL

A follow-up question of the regular smokers asked whether they had actually used smoking to control their weight. Of the 240 respondents with an active smoking history, approximately 12% ($n = 29$) indicated that they did smoke to control their body weight. Among female smokers, 18% ($n = 17$) endorsed this behaviour, whereas only 8% ($n = 12$) of male smokers reported using smoking as a weight control strategy, and this difference was significant, $\chi^2(1) = 6.52$, $P < 0.05$. Although black children were less likely than white children to endorse smoking for weight control (9%, $n = 9$; 15%, $n = 19$, respectively), this difference did not achieve conventional levels of statistical significance. Table 4 presents the percentages of regular smokers, by sex and race, who endorsed this behaviour. Consistent with the data on dietary restraint, white girls were the most likely to endorse smoking for weight control, nearly three times as likely as the other groups.

Discussion

Results of this study indicate that girls expressed more concern for dieting than boys. White girls reported more concerns than any other group. Additionally, a sizable percentage endorsed the belief that smoking could help control one's weight. As the level of previous smoking exposure increased, endorsement of this belief also went up. Analyses further revealed that, of the regular smokers, 12% indicated that they have smoked to control their weight, with white girls endorsing this behaviour significantly more than other respondents.

The finding that the white students in the sample reported more concern for dieting and

body weight than all other groups is consistent with previous research in this area.^{14 15} The finding that white girls expressed a much greater concern than black girls is also consistent.^{16 20} That the reverse pattern emerged among boys is a new finding, in that previous studies have suggested that white males were more likely to have more dietary/weight concerns than black males,^{14 20} or that there was no difference in these concerns between the two groups.¹⁶ Perhaps having a large representative sample of black adolescents ($n = 5346$) allowed this difference to emerge. Still, it is quite curious that black boys were more restrained and more likely to believe that smoking reduces body weight than white boys. Perhaps these youths and their weight concerns are related to an increased emphasis on athleticism in this sample. Future research should further study this relative higher level of weight concern in black boys and relate these concerns to other interests.

Approximately 39% of our sample endorsed the belief that smoking can help control one's weight. This percentage is consistent with the observance of Camp *et al.*¹³ that approximately 40% of a sample of high school students endorsed this belief. What should be highlighted is the fact that respondents in the our sample are much younger (seventh grade) than the respondents in the investigation by Camp *et al.*¹³ Furthermore, it has previously been reported that smoking youths under the age of 13 were not likely to endorse the belief that smoking would control a person's weight.²² Our study, with very young subjects, suggests that a surprising number of young adolescents endorse this belief, with current and regular smokers the most likely. Like Camp *et al.*¹³ we found that white girls were markedly more likely than any other ethnic/gender group to endorse this belief.

The finding that a notable percentage (12%) of adolescent regular smokers, primarily white girls, reported smoking for weight-control reasons is consistent with a growing literature^{13 22 24 36} that suggests that white females are more susceptible to smoking for weight control. It appears that white females are at high risk of smoking for weight control across a wide age range. The active use of cigarettes as a weight-control strategy was not exclusively race dependent as found in the investigation by Camp *et al.*¹³ Although comprising only a small proportion of the sample, there were some black students (of both sexes) who endorsed this behaviour. Future studies should evaluate whether the incidence of smoking for weight control is increasing among black males and females.

Our investigation of the relationship between body weight concerns and smoking in adolescence was conducted using one of the largest sample sizes known to date. This study was unique in that these concerns were assessed using a sample with a majority representation of black children, thus adding to the literature investigating these concerns and behaviours among this population. However, certain limitations should be noted.

First, the data for this study were obtained from students dwelling in one mid-South urban city who attended public schools. Results might have differed if the study had been based on a suburban or more rural population or in other urban locations with different ethnic populations.

Second, white students in this sample may not be representative of the whole community, because many attend private schools. For these reasons, one should be particularly cautious in making generalisations to other samples of white subjects.

Third, although there are arguments both for and against biochemical and "bogus pipeline" procedures,³¹⁻³³ the lack of these procedures in the current study may have led to an underestimate of smoking behaviour, potentially biasing the results. Nonetheless, the rates of smoking obtained in this age group was very close to national estimates.²

Fourth, because substance users may have a pattern of behaviour that includes delinquent behaviour,² there may have been an underrepresentation of these students because of their absence from school and their failure to fill out items on the questionnaire. A different pattern of results might have been obtained if these students could have been included in the survey. Finally, one must be cautious regarding cross-sectional data, even with large sample sizes. Only prospective studies can determine whether the rate of new smoking (incidence) is related to dieting concerns, as cross-sectional studies must typically rely on those subjects who have recently converted to smoking, as well as those who have been smoking for longer periods of time (prevalence).

In summary, a significant proportion of children in the seventh grade have concerns about dieting and believe that smoking controls body weight. White girls are more concerned with dieting and more likely to believe that smoking controls body weight. Among boys, the opposite is true: black boys are more likely to express concern about diet and to endorse the belief that smoking has weight-suppressing effects. Future research should address the relationship between these concerns and the initiation of health risk factors, such as smoking or restrictive eating.

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Alongside this photo, the Washington Post (20 November 1996) noted that "China's state monopoly produces 1.7 trillion cigarettes a year for 350 million smokers."