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Smoking Expectancies, Weight Concerns, and Dietary Behaviors in Adolescence

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Abstract

Objective—To examine the association of cigarette smoking and weight concerns in adolescents, given that adolescents may begin smoking or have difficulty quitting due to their expectancies of the effects of smoking on body weight.

Method—The current study utilized data from a cross-sectional survey of 4,523 Connecticut high school adolescents to assess the influence of gender, smoking intensity and dietary restrictive behavior on smoking related weight concerns.

Results—Heavy smokers were significantly less likely to engage in healthy dietary restrictions than nonsmokers; however, light smokers did not differ from nonsmokers. Both light and heavy smokers were significantly more likely to engage in unhealthy dietary restriction, when compared to nonsmokers. In the model examining smokers only, heavy smokers were significantly less likely to engage in healthy dietary restriction than light smokers, but smoking level was not associated with unhealthy dietary restrictions. Dietary restrictions are significantly associated with smoking-related weight concerns; however, this appears to be related to type of dietary restrictive behavior, with greater weight concerns observed only in those smokers who engaged in unhealthy dietary restrictions and not in those who engaged in healthy dietary restrictions or no restrictions.

Conclusions—Although limited by its cross-sectional nature, the findings from this large geographically diverse sample have clinical implications for smoking prevention and cessation interventions in adolescents.

Keywords

Adolescence; Smoking; Dietary habits; Weight management

INTRODUCTION

Each day, more than 4,000 adolescents aged 12–17 try their first cigarette in the United States and nearly 75% of them eventually become dependent.¹ According to a national survey, rates of adolescent smoking within the past month are 14% for 10th graders and 22% for 12th graders.² Interestingly, many adolescent smokers report having a desire to quit although few adolescents seek help in smoking cessation programs.³ It is important to

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understand the factors that may contribute to the initiation and maintenance of smoking in adolescents, as well as to the ambivalence about quitting and failed attempts at cessation.

One factor playing a role in smoking behavior is the belief that adolescents have about smoking as a method of weight control. Various studies suggest that anywhere from 15–40% of adolescents endorse this belief with higher levels of concurrence among smokers than nonsmokers^{4–7}. The level of agreement with smoking as a means to control weight increases with prior smoking history with never smokers least likely to agree, regular smokers more likely to agree, experimental smokers even more likely to agree, and never smokers being the most likely to agree.^{4, 6} Furthermore, female adolescents are more likely to endorse this belief than their male counterparts.^{5, 6}

A number of studies have used structured questionnaires to examine weight related smoking expectancies among college-aged smokers. Daily college smokers scored significantly higher than occasional and never smokers on a factor of the Smoking Consequences Questionnaire⁸ (SCQ) assessing the perceived impact of smoking on appetite-weight control, with females reporting significantly greater weight-related smoking expectancies than males. Similar findings have been reported in other college-aged samples using different scales measuring beliefs about the consequences of smoking^{9, 10} Copeland and Carney¹¹ also reported that weight-related smoking expectancies were significantly associated with smoking rates, with heavier smokers reporting higher expectancies.

Few studies have examined weight-related smoking expectancies in high school-aged adolescents. Our group observed in a small sample of well-characterized high-school-aged, daily smokers that the belief that smoking helps to control weight was positively associated with smoking rate and negatively associated with number of years smoking.¹² Additionally, female adolescents who smoked more cigarettes reported more concern about gaining weight upon quitting, but this did not hold true for males. We also found that males with higher body mass indices (BMIs) were more likely to report smoking to control weight than were females. More recently, Bean and colleagues¹³ examined attitudes toward smoking and weight control in rural high school students and found that girls believed that people smoke to control weight, but boys had stronger beliefs that quitting smoking would lead to weight gain.

Although it is unknown what portion of adolescents begins smoking as a means of controlling weight, weight gain is a significant concern among this population. There is an increased prevalence of obesity and dieting behaviors among adolescents with approximately 16% of adolescents being mildly overweight and 9.9% being severely overweight.^{14, 15} Furthermore, dietary behaviors are not just popular with overweight adolescents, but are also common among the normal weight adolescents, indicating that these youth are typically trying to maintain a healthy body weight or prevent gaining weight.

Weight control strategies range from healthier forms, such as exercise and dietary restriction, to more serious weight loss measures, such as purging and fasting. While moderate changes in diet and exercise have been shown to be safe, significant psychological and physical consequences may occur with extreme or unhealthy dieting practices. Increased frequency of dieting and purging behavior have been shown to be independently associated with increased health-risk behavior in adolescent females and to a lesser extent in males and purgers, compared with nonpurging adolescents, are more likely to use alcohol, tobacco, and drugs.^{16, 15} In fact, many studies consider cigarette smoking as a method of unhealthy weight control, suggesting that anywhere from 9–34% of young smokers use smoking as a weight loss strategy, a behavior more commonly seen in females.^{16–19}

To the best of our knowledge, none of these studies have examined the relationship that smoking has to other forms of weight control strategies, both unhealthy and healthy. Various forms of weight control may have different implications for tobacco use in adolescents. Furthermore, weight control practices among adolescents may be associated with the beliefs adolescents have about the effectiveness of smoking to control weight.

The present study is the first examination of the relationship between cigarette smoking, weight-related smoking expectancies and dietary behaviors in a large geographically diverse sample of high-school-aged adolescents. Moreover, we also wanted to determine if any of these relationships were altered by intensity of smoking. We hypothesized that heavier smokers would engage in more dietary restrictive behaviors when compared to nonsmokers and light smokers. We explored whether light smokers, heavy smokers, and nonsmokers differed in the type of dietary restrictive behavior (healthy vs. unhealthy). Lastly, we hypothesized that adolescent smokers who also endorsed dietary restrictive behaviors would have higher weight-related smoking expectancies.

METHOD

Procedures

Letters were mailed to 122 public high schools in the state of Connecticut and were followed by phone calls to determine interest in survey participation. Schools were offered a statistical summary report of the prevalence of high-risk behaviors in their school to encourage participation. School administrators were left phone messages, but only a few calls were returned. Of those returned calls, the responses varied based on the school's various commitments for that year. For schools that expressed an interest in participating, permission was obtained from the administration and/or the board of education. In most cases, the superintendent and or school board provided permission after consulting with the principal at each school. The schools that agreed to participate had an interest in receiving the survey data for their school or were schools with which we had ongoing or previous relationships. The final sample included schools from each geographical region of the state of Connecticut, with schools from each of the state's district reference groups (DRGs), which are groupings of schools based on the socioeconomic status of the families in the school district. Although this was not a random sample of public high schools in the state of Connecticut, the demographics of this sample are similar to the sample of CT residents ages 14–18 described in the 2000 Census.

Following approval from school officials, information letters about the survey were sent home to parents and they were asked to call the school if they did not want their child to participate. If no message was received from a parent, the student was assumed to have permission to participate. This waiver of parental permission procedure was approved by all schools and the Investigational Review Board of the Yale University School of Medicine. There were approximately none to a few students in each school who were unable to complete the survey because their parents declined their participation.

The entire student body (i.e., grades 9–12) was targeted for administration of the survey. However, a few schools preferred to limit the involvement of their students to a random sample of each grade or selected grades. In some schools, surveys were administered in a school-wide assembly, and in other schools; surveys were administered in English or health classes. Each school was visited on a single day by research staff who explained the study, distributed the surveys, answered questions, and collected the completed surveys.

Students were told that their participation was voluntary, could choose to not complete the survey if they wished, and were reminded to keep surveys anonymous by not writing their

name or other identifying information anywhere on the survey. If a student chose not to participate or their parent denied permission for their participation, they were able to work quietly at their desk during the survey administration. Students were given a pen as a token of appreciation.

Data were scanned into an electronic database and cleaned and checked for accuracy before performing analyses. All of the surveys were included in the analyses except for the few that were returned completely blank at each school. The surveys that had incomplete items or sections were considered missing data and questions were excluded if more than one response was incorrectly circled.

Measures

The survey consisted of 153 questions inquiring about demographic characteristics, substance use, and other high-risk behaviors. To assess tobacco use, participants were asked if they ever smoked a cigarette. Those students who responded yes to this question were asked a series of other questions about the frequency and quantity of their smoking.. Smoking status was defined based on past month cigarette consumption and categorized into three groups of smokers: nonsmokers (no cigarettes in the past 30 days), light smokers (<1 cigarette per day and up to 7 cigarettes per day), and heavy smokers (> 7 cigarettes per day).

Weight-related smoking expectancies were ascertained using the likelihood ratings of the Appetite-Weight Control Factor of the SCQ.⁸ Likelihood ratings (outcomes that are important to the participant) appear to be more sensitive than desirability ratings (outcomes that are desirable to the participant) or subjective expected utility (SEU) scores (weighting probability ratings by desirability ratings) to differences in smoking status.^{8,20} Participants who endorsed smoking were given five possible consequences of smoking and were asked to rate the likelihood of each consequence on a 10-point scale from “completely unlikely” to “completely likely”. The statements included “Smoking controls my appetite”, “Smoking keeps my weight down”, “Cigarettes keep me from overeating”, “Cigarettes keep me from eating more than I should”, and “Smoking helps me control my weight”. Scores were an average across all items. The SCQ shows evidence of good internal consistency, high factor loadings, and coefficient alphas ranging from .72 to .97.⁸

Dietary behaviors were assessed using five questions from the Youth Risk Behavior Survey.²¹ This national survey shows moderate test-retest reliability^{22,23} and although validity has not been assessed, self-reports can be affected by both cognitive and situational factors that may or may not threaten the validity of self-reports of this behavior.²⁴ All participants were asked during the past 30 days, “Did you exercise to lose weight or keep from gaining weight?”, “Did you eat less food, fewer calories, or foods low in fat to lose weight or to keep from gaining weight?”, “Did you go without eating for 24 hours or more (also called fasting) to lose weight or keep from gaining weight?”, “Did you take any diet pills, powders, or liquids without a doctor’s advice to lose weight or keep from gaining weight?”, and “Did you make yourself vomit or take laxatives to lose weight or to keep from gaining weight?”. These five behaviors were stratified into “healthy” and “unhealthy” dieting practices. “Healthy” dieting was endorsement of either or both of the first two items (exercise or eat less). “Unhealthy” dieting was endorsement of any or all of the last three items (fasting or diet pills or vomiting). Other researchers in the field of dietary restriction use similar guidelines to distinguish healthy versus unhealthy dietary behaviors.

Participants were asked their height in feet and inches and also asked for their best guess of their weight in pounds. Body mass index (BMI) was calculated with weight in pounds multiplied by 703 and divided by the square of height in inches. A BMI less than 18.5 was

considered underweight, BMI between 18.5 and 25 was considered normal weight, and BMI greater than 25 was considered overweight/obese.

Data Analysis

All analyses were conducted using SAS© software (Cary, NC). A multinomial logistic regression model was used to investigate the relationship between smoking level (nonsmoker, light smoker, heavy smoker) and type of dietary restriction (no restriction, healthy restriction, unhealthy restriction). A second binary logistic regression model was used to look at the sub-sample of smokers to determine differences between heavy and light smokers on dietary restrictions. Ninety-five percent confidence intervals (CI) for odds ratios (OR) were calculated. An analysis of variance (ANOVA) compared weight-related smoking expectancies between light smokers and heavy smokers. Another ANOVA compared weight-related expectancies between light and heavy smokers and between smokers who reported dietary behaviors and those who did not. Analyses were conducted using both unadjusted and adjusted models for gender, grade, and BMI.

RESULTS

Of the 4,523 adolescents surveyed, 4,182 provided information about smoking behavior during the past month. Nonsmokers comprised 79% (n=3323) of the group, light smokers comprised 13% (n=530) and heavy smokers comprised 8% (n=329). Comparisons of subjects with complete data and those without complete data indicated that there was no significant difference by BMI ($p=0.16$), but respondents with missing data were more likely to be non-white and Hispanic ($p<0.0001$ for both), older ($p=0.0003$), and boys ($p<0.0001$). The demographic characteristics of the final sample are summarized in Table 1.

In terms of healthy dietary restriction, heavy smokers were significantly less likely to engage in these behaviors than were nonsmokers (OR = 0.58, CI = 0.44–0.77, Chi = 14.74, $p < 0.0001$) while light smokers did not differ from nonsmokers (OR = 0.93, CI = 0.75–1.15, Chi = .46, $p = 0.50$). In terms of unhealthy dietary restrictions, both light (OR = 2.67, CI = 2.08–3.43, Chi = 59.14, $p < 0.0001$) and heavy smokers (OR = 2.92, CI = 2.20–3.87, Chi = 55.63, $p < 0.0001$) were significantly more likely to engage in these behaviors when compared to nonsmokers. Analyses controlling for gender, grade, and BMI suggest that the association between smoking level and dietary restrictions is either mediated or confounded by a combination of these variables, but no single factor influencing the results was identified (see Table 2).

In the model examining smokers only, heavy smokers were significantly less likely to engage in healthy dietary restriction than were light smokers (OR = 0.62, CI = .45–0.87, Chi = 7.54, $p = 0.006$), but smoking level was not associated with unhealthy dietary restriction (OR = 1.094, CI = 0.78–1.54, $p = 0.60$). Controlling for grade, gender and BMI did not alter the results. Boys were significantly more likely than girls to be heavy smokers (see Table 3). We additionally tested an interaction between gender and dietary restrictions; however, it was non-significant, suggesting that the association between smoking and dietary restrictions does not differ in boys and girls.

In analyses examining weight-related smoking expectancies on the SCQ, ANOVA results indicated that heavy smokers were more likely to endorse weight-related smoking expectancies than were light smokers ($F(1, 819) = 32.7$, $p < 0.0001$). We also ran additional analyses to determine if the very low level smokers (i.e. those who smoke < 1 cigarette per day) were different from other smokers. Pairwise comparisons did indicate that the extra low group (< 1) had significantly lower scores on weight related smoking expectancies than the 3–7 group ($p < 0.05$). However, when we repeated the ANOVA analyses on smoking

expectancies after separating the groups into <1–2 cigarettes per day, 3–7 cigarettes per day and > 7 cigarettes per day, the results were not significantly different.

When examining weight-related smoking expectancies by dietary restrictive behaviors, ANOVA results also indicated that dietary restrictions are significantly associated with weight-related smoking expectancies in smokers ($F(2, 818) = 33.9, p < 0.0001$). Specifically, among all adolescent smokers, those engaging in unhealthy dietary restrictions had significantly greater weight-related smoking expectancies than those engaging in no dietary restrictions ($t = 7.55, p < 0.0001$). However, those engaging in healthy dietary restrictions did not differ from those engaging in no dietary restrictions ($t = 1.08, p = 0.2783$). Controlling for gender, grade and BMI did not alter results.

DISCUSSION

The results of this study suggest that adolescent smokers engage in more dietary restrictive behaviors and may also have strong expectations about the role of cigarette smoking in assisting with weight control. While a considerable number of adolescents report engaging in some type of dietary behavior, adolescent smokers appear to engage in more unhealthy dietary restrictive behaviors when compared with nonsmokers. Comparisons within smokers on dietary behaviors indicated that heavy smokers were less likely to engage in healthy dietary behaviors, but the two groups did not differ in their endorsement of unhealthy forms of dietary restrictions, indicating that these differences were not due to quantity/frequency of tobacco use and that smokers, in general, engaged in more unhealthy dietary restrictive behaviors. Results also indicated that the association between smoking and dietary restrictions did not differ in boys and girls, even though boys were more likely to be heavy smokers.

Regarding weight-related smoking expectancies, adolescents who were heavier smokers were more likely to have greater expectancies for weight control from smoking when compared with lighter smokers, similar to earlier findings with college aged smokers.¹¹ Furthermore, as hypothesized, adolescent smokers engaging in unhealthy weight control methods reported higher weight-related smoking expectancies than those who reported none of these behaviors or healthy forms of dietary restriction.

This study has important clinical implications for adolescents. First, heavier smokers have greater weight-related smoking expectancies than lighter smokers, with those smokers who are also engaging in unhealthy forms of weight control having greater smoking expectancies. Thus, smokers, independent of their smoking rate, tend to engage in more forms of unhealthy dieting than nonsmokers, including use of tobacco as an “unhealthy” means to control weight. Lighter smokers may struggle with weight issues and turn to smoking as a means to control weight, first using healthy forms of dietary restriction and then progressing to more unhealthy forms. Over time, these smokers may increase their smoking, rely more on cigarettes as a means to control weight, and turn to methods of unhealthy dieting. This may reflect a progression in an interaction between increased cigarette consumption or tobacco dependence and dietary behaviors. Since we cannot directly confirm this hypothesis from cross-sectional data, future studies should investigate the relationships between smoking and dieting over time.

Our results also suggest that there is a need to promote healthy methods of weight maintenance and dispel the notion of tobacco use as a weight control method for adolescent smokers. Adolescents should be made aware that there are other ways to lose weight that are more effective and healthier, and such messages should be included in educational curricula, especially when discussing quitting smoking. Additionally, cessation programs should build

into their behavioral treatments a focus on the concern about gaining weight as a result of quitting and alternative methods to maintain a healthy weight.

A few limitations of the present study should be noted. First, as noted earlier, the data analyzed were cross-sectional in nature, which precludes establishment of causal relationships between the variables. Future longitudinal studies should further investigate relationships between smoking initiation and initiation of dietary behaviors. Furthermore, self-reported information may have biases including inaccurate reporting of tobacco use, dietary behaviors, and other measures. Finally, objective data were not collected to calculate BMI, with collected information reflecting a perceived BMI (based on self-reported height and weight) rather than a measured one. However, data from the YRBS that asks for self-reported height and weight followed by measurements have observed that self-report data is reliable.²³ A notable strength of this study is that it included a large geographically diverse sample of adolescents to examine weight-related smoking behaviors, while other studies focused on college samples or relatively smaller adolescent samples.

In summary, this study suggests that smokers engage in less healthy dietary behaviors and more unhealthy weight control methods than do nonsmokers. Heavy smokers also endorse greater weight-related smoking expectancies than light smokers, with those smokers engaging in unhealthy dietary restrictions having greater expectancies than those engaging in no dietary restrictions. Future research needs to further examine these relationships in both promotion and maintenance of smoking behavior and evaluate behavioral and pharmacological methods to address these issues clinically with adolescent smokers.

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Table 1**Demographic Characteristics of Sample**

Characteristic	Whole Sample (n = 4182)	Light Smokers (n = 530)	Heavy Smokers (n = 329)	Nonsmokers (n= 3323)
Gender				
Male	47.5%	38.5%	52.7%	47.2%
Female	52.5%	61.5%	47.4%	52.8%
Grade				
9	31.5%	24.7%	23.4%	33.3%
10	27.3%	23.6%	26.5%	28.0%
11	25.6%	29.8%	31.4%	24.4%
12	15.6%	21.9%	18.8%	14.3%
Race				
Caucasian	75.8%	82.8%	78.7%	74.3%
African-American	10.1%	5.3%	7.9%	11.0%
Hispanic	14.2%	12.1%	20.6%	13.9%
Dietary Restriction				
No Restrictions	35.3%	30.9%	35.6%	36%
Healthy Restrictions	48.9%	41.5%	29.8%	52%
Unhealthy Restrictions	15.8%	27.6%	34.7%	12%
BMI				
Underweight (BMI < 18.5)	11.1%	8.3%	6.5%	12.2%
Overweight (BMI > 25)	21.7%	24.8%	28.1%	20.5%
Normal Weight (BMI 18.5–25)	67.2%	66.9%	65.5%	67%

Table 2

Logistic regression investigating the relationship between smoking level (smokers versus nonsmokers) and type of dietary restriction

	Light Smokers vs. Nonsmokers				Heavy Smokers vs. Nonsmokers			
	B	OR	95% CI	P	B	OR	95% CI	P
Unadjusted Model:								
Healthy Restrictions	-.07	.93	(.75, 1.15)	.50	-.55	.58	(.44, .77)	.0001
Unhealthy Restrictions	.98	2.67	(2.08, 3.43)	<.0001	1.07	2.92	(2.20, 3.87)	<.0001
Adjusted Model:								
Healthy restrictions	-.21	.81	(.64, 1.03)	.082	-.44	.64	(.47, .88)	.006
Unhealthy restrictions	.85	2.35	(1.77, 3.11)	<.001	1.00	2.72	(1.94, 3.84)	<.0001
Gender	.07	1.14	(.87, 1.49)	.335	-.16	.73	(.59, .90)	.004
Underweight	-.47	.62	(.38, 1.04)	.069	-.31	.73	(.51, 1.05)	.090
Overweight	.28	1.32	(.98, 1.78)	.068	.15	1.16	(.92, 1.48)	.214
Grade:								
9 th	-.29	.49	(.37, .66)	.0008	-.47	.45	(.30, .66)	<.0001
10 th	-.27	.50	(.37, .66)	.0021	-.10	.64	(.44, .93)	.3476
11 th	.15	.77	(.58, 1.02)	.0036	.23	.89	(.62, 1.28)	.0288

Table 3

Logistic Regression investigating the relationship between smoking level and type of dietary restriction in smokers only

Heavy Smokers vs. Light Smokers				
	B	OR	95% CI	P
Unadjusted Model:				
Healthy Restrictions	-.47	.62	(.45, .87)	.006
Unhealthy Restrictions	.09	1.09	(.78, 1.54)	.600
Adjusted Model:				
Healthy Restrictions	-.23	.79	(.54, 1.15)	.219
Unhealthy Restrictions	.13	1.14	(.77, 1.70)	.520
Male Gender	.23	1.57	(1.14, 2.16)	.006
Underweight	-.17	.85	(.47, 1.55)	.590
Overweight	.12	1.13	(.79, 1.61)	.502
Grade:				
9 th	-.19	.88	(.56, 1.39)	.1826
10 th	.17	1.26	(.81, 1.97)	.1963
11 th	.07	1.14	(.75, 1.73)	.5685