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Weight concern and smoking in children

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WEIGHT CONCERN AND SMOKING IN CHILDREN

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Abstract

Studies have shown that weight concern is prevalent in children and that many children believe smoking can be used to control appetite and weight. However, little is known about the impact of the combination of these factors on smoking initiation in children. Initial research has indicated that weight concern predicts smoking initiation in adolescents, but these studies have not addressed the role of weight control outcome expectancies. The purpose of this study was to prospectively investigate the relationship between weight concern and smoking initiation, and to evaluate weight control outcome expectancies as a moderator of this relationship in children. Cross-sectional analyses were conducted to determine whether children who had tried smoking possessed greater concern about weight than those who had not. The impact of sex and race on these relationships were also examined. Results indicated that smokers endorsed greater weight concern, $F(1, 708) = 6.71$, $p = .01$, and dieting than non-smokers, $F(1, 708) = 7.043$, $p = .008$, and that black children had greater weight concern than white children, $F(1, 708) = 3.999$, $p = .046$. Dieting predicted smoking at five months, $X^2(3, N = 708) = 24.297$, $p = .000$, and smokers had greater weight concern over time than non-smokers, $F(2, 691) = 3.569$, $p = .029$. Weight control outcome expectancies did not predict smoking at five months, and was not supported as a moderator of the relationship between weight concern and smoking.

Introduction

Studies have identified many predictors of smoking in children including parental smoking, parenting style, peer influence, knowledge and beliefs about smoking, intentions to smoke, availability of cigarettes, school bonding, social support, and personality variables such as independence, sensation seeking, rebelliousness, aggressiveness, and shyness (Conrad, Flay, & Hill, 1992; Greisler, Kandel, & Davies, 2002; Robinson & Klesges, 1997). However, the impact of weight-related variables on smoking initiation has not been thoroughly investigated. There is a large body of research indicating that weight concern, body dissatisfaction, and dieting are prevalent among children (Brodie, Bagley, & Slade, 1994; Cohn et al., 1987; Collins, 1991; Cullari, Rohrer, & Bahm, 1998; Flannnery-Schroeder & Chrisler, 1996; Gustafson-Larson & Terry, 1992; Hill & Robinson, 1991; Leichner, Arnett, Rallo, Srikameswaran, & Vulcano, 1986; Lowes & Tiggeman, 2003; Maloney, McGuire, Daniels, & Specker, 1989; Richards, Casper, & Larson, 1990; Schur, Sanders, & Steiner, 2000; Shapiro, Newcomb, & Loeb, 1997; Thelen & Cormier, 1995; Thompson, Rafiroiu, & Sargent, 2003; Wood, Becker, & Thompson, 1996), and that children are aware of the weight control properties of smoking at an early age (Camp, Klesges, & Reylea, 1993; Charlton, 1984; Klesges, Elliott, & Robinson, 1997). Plausibly, children with weight concerns may see smoking as a way to control weight. The presence of both weight concern and weight control outcome expectancies may increase the risk of smoking initiation in children.

A few prospective studies have provided initial evidence that weight-related variables are important to our understanding of smoking initiation in children (Austin & Gortmaker, 2001; Field et al., 2002; French, Perry, Leon, & Fulkerson, 1994), and

expectancy theory may help to explain this relationship. Expectancy theories suggest that behaviors, such as smoking, are more likely to occur if a person has either positive attitudes about the behavior (Azjen, 1985; Ajzen & Fishbein, 1970) or believes that the behavior is likely to be helpful or useful (Edwards, 1954). Children who possess both weight concern and positive expectations about the weight control properties of smoking may be more likely to initiate smoking for weight control reasons than those who possess only one or the other. Racial and sex differences are also important factors, as smoking is more prevalent among white children and boys in Louisiana (Louisiana Office of Public Health, 2002). In addition, white girls are more likely to be concerned with their weight and to possess weight control beliefs about smoking than boys and black girls (Adams et al., 2000; Collins, 1991; Parnell et al., 1996; Thompson et al., 2003). It is likely that white girls may be at particular risk of initiating smoking for weight control reasons.

Smoking Initiation and Prevalence

According to the National Youth Tobacco Survey, 36.3% of middle school students (grades 6-8) reported that they had tried a cigarette, and 11% reported smoking in the last 30 days (Centers for Disease Control and Prevention, 2001). Further, 8.4% of these students reported that they had first smoked a cigarette prior to age 11. In Louisiana, 17.1% of middle school students (11.9% of sixth graders and 23% of eighth graders) reported that they had smoked in the last 30 days, with 28.6% of students reporting that they had smoked a cigarette prior to age 11 (Louisiana Office of Public Health, 2002). Given the particularly high prevalence of smoking in Louisiana, it is important to identify and address risk factors for smoking at an early age in prevention programs.

Research has suggested that smoking prevalence and initiation may vary by race and sex. In Louisiana, recent reports indicate that smoking prevalence is higher among white middle school students than black middle school students (Louisiana Office of Public Health, 2002). Further, studies have indicated that white children start smoking earlier, are more likely to persist in smoking, and become more nicotine dependent than black children (Choi, Pierce, Gilpin, Farkas, & Berry, 1997; Flint, Yamada, & Novotny, 1998; Greisler et al., 2002; Harrell, Bangdiwala, Deng, Webb, & Bradley, 1998; Headen, Bauman, Deane, & Koch, 1991; Kandel, Chen, Warner, Kessler, & Grant, 1997; Louisiana Office of Public Health, 2002; Robinson & Klesges, 1997). Smoking has been reported to be more prevalent among boys than girls (Centers for Disease Control and Prevention, 2001; Louisiana Office of Public Health, 2002; Robinson & Klesges, 1997), and is typically initiated at an earlier age among boys (Centers for Disease Control and Prevention, 2001; Louisiana Office of Public Health, 2002; Santi, Best, Brown, & Cargo, 1990-1991).

Studies have explored possible reasons for racial and sex differences in smoking prevalence and initiation. One study reported that boys were more likely than girls to endorse the belief that smoking enhanced their image, and that white children rated cigarette use more positively than black children (Robinson & Klesges, 1997). White children also reported more rebellious and risky behavior than black children, and this relationship was particularly strong among boys. In another study, it was reported that non-white adolescents viewed smoking as inappropriate for females, and black girls reported greater concern about how smoking would adversely affect their reputations and appearance than white children (Mermelstein & The Tobacco Control Network Writing

Group, 1999). Attempts to understand racial and sex differences in smoking prevalence and initiation will facilitate the development of effective prevention programs that are sensitive to the needs of specific subgroups.

Weight Concern

Weight concern is common in children and adolescents as early as elementary school (Gustafson-Larson & Terry, 1992; Leichner et al., 1986; Richards, et al., 1990; Shapiro et al., 1997). Studies have shown that children frequently report fear of becoming fat and the desire to be thinner (Gustafson-Larson & Terry, 1992; Shapiro et al., 1997). A substantial number of children have indicated extreme concern about weight, scoring within the range associated with eating disorders on the Eating Attitudes Test (EAT) and the Children's version of the Eating Attitudes Test (ChEAT; Leichner et al., 1986; Maloney, McGuire, & Daniels, 1988; Maloney et al., 1989). Racial and sex differences in weight concern are common, with white children and girls more likely to report concern about weight than black children and boys (Adams et al., 2000; Gustafson-Larson & Terry, 1992; Leichner et al., 1986; Richards et al., 1990; Thompson et al., 2003).

Body dissatisfaction, another measure of weight concern, has been operationalized as the discrepancy between perceived current body size and ideal body size. It is typically measured by having participants choose figure drawings or silhouettes that represent their current and ideal body size. Ideal body size is then subtracted from current body size to arrive at a difference score. Studies utilizing figure drawings have shown differences between current and ideal body size among children as young as five years old (Brodie et al., 1994; Cohn et al., 1987; Collins, 1991; Cullari et al., 1998; Lowes & Tiggeman, 2003; Wood et al., 1996). Body dissatisfaction appears to be more

common among girls than boys (Adams et al., 2000; Collins, 1991; Cullari et al., 1998; Lowes & Tiggeman, 2003; Wood et al., 1996), with reports of up to 69% of girls and 35% of boys preferring thinner figure drawings than their perceived current size (Cullari et al., 1998; Lowes & Tiggeman, 2003; Wood et al., 1996). Race may also play a role in body dissatisfaction, with black children frequently choosing larger, and plausibly more realistic, ideal figure drawings than white children (Adams et al., 2000; Collins, 1991; Parnell et al., 1996).

Given the high prevalence of weight concern, it is not surprising that dieting behaviors are reported to be common among children and adolescents as early as first grade (Flannery-Schroeder & Chrisler, 1996; Gustafson-Larson & Terry, 1992; Hill & Robinson, 1991; Klesges, Elliott, & Robinson, 1997; Maloney et al., 1989; Schur et al., 2000; Shapiro et al., 1997; Thelen & Cormier, 1995; Thompson et al., 2003; White, Kohlmaier, Varnado-Sullivan, & Williamson, 2003; Williamson, DeLany, Bentz, Bray, Champagne, & Harsha, 1997). Many children report restricting their caloric intake or avoiding specific foods associated with becoming fat (Gustafson-Larson & Terry, 1992; Hill & Robinson, 1991; Maloney et al., 1989; Schur et al., 2000; Shapiro et al., 1997; Thompson et al., 2003), exercising to lose weight (Maloney et al., 1989; Schur et al., 2000; Shapiro et al., 1997; Thompson et al., 2003), and purposefully vomiting after a meal to control weight (Flannnery-Schroeder & Chrisler, 1996; Maloney et al., 1989; Shapiro et al., 1997; Thompson et al., 2003). In one study, children were reported to have made dieting and weight loss recommendations in response to a short story in which two fictional characters had put on weight, demonstrating that children are aware of dieting as a means of weight loss at a very young age (Lowes & Tiggeman, 2003). Race and sex

have been shown to be important factors, with white children and girls more likely to report dieting behaviors than black children or boys (Adams et al., 2000; Klesges et al., 1997; Maloney et al., 1989; Shapiro et al., 1997; Thompson et al., 2003; White et al., 2003; Williamson et al., 1997).

Expectancy Theory

Subjective expected utility is the degree to which the outcome of a behavior, or outcome expectancy, is considered desirable or undesirable (Edwards, 1954). Bauman, Fisher, Bryan, and Chenoweth (1984) showed that greater subjective expected utility was associated with increased smoking in adolescents, and that the subjective expected utility for non-smokers at baseline was significantly higher in those who became smokers over one year than those who remained non-smokers. Similarly, it has been shown that the subjective expected utility of consuming alcohol among adolescents was correlated with alcohol use, and that there was a bi-directional relationship such that subjective expected utility predicted behavior and behavior predicted subjective expected utility (Bauman, Fisher, Bryan, & Chenoweth, 1985).

Ajzen and Fishbein (1970) proposed the theory of reasoned action in which behavior is thought to be a result of behavioral intention, which is determined by attitudes towards the behavior, and beliefs about the expectations of others with regards to the behavior. This model has been shown to predict smoking status in middle school and high school students (Chassin et al., 1981). Predictors in the model accounted for between 18% and 52% of the variance in intentions to smoke, with the attitudinal component contributing more to smoking intentions than the normative beliefs component. In a prospective evaluation of the model, Norman and Tedeschi (1989)

showed that attitudes about smoking and normative beliefs about the expectations of others with regards to smoking predicted intention to smoke in children at baseline. Intention to smoke at baseline predicted smoking status six months later. Within this theoretical framework, it could be hypothesized that positive weight control attitudes (i. e., expectancies) towards smoking along with normative beliefs about the expectations of others would significantly contribute to behavioral intentions and subsequent behavior among weight concerned children.

Similarly, within the theory of planned behaviour (Ajzen, 1985) it is hypothesized that individuals may intend to smoke and actually initiate smoking if they believe that smoking will lead to valuable outcomes (i. e., attitudes), if other people whose views they value approve of smoking (i. e., normative beliefs), and if they possess the resources and opportunity to smoke (i. e., perceived behavioural control). In a cross-sectional study, Maher and Rickwood (1997) showed that attitudes, normative beliefs, and perceived behavioral control predicted intention to smoke in adolescents, and that intentions predicted smoking behavior. In a more recent study, the components of the theory of planned behaviour both cross-sectionally and prospectively predicted smoking intentions and smoking behavior in children (Higgins & Connor, 2003). Based on this theory, it could be hypothesized that positive attitudes about the weight control properties of smoking, normative beliefs about the expectations of others, and the resources and opportunity to smoke should significantly contribute to intentions to smoke and actual smoking behavior among weight concerned children.

More recently, outcome expectancy has been described as the anticipation of a relationship between events or objects in a particular situation, such that if a particular

event occurs then another event is expected to follow. Alcohol outcome expectancies have been shown to prospectively predict quantity and frequency of drinking, problem drinking, and transition to problem drinking after one year among middle school students (Christiansen, Roehling, Smith, & Goldman, 1989). Positive outcome expectancies, in particular, have been shown to predict smoking initiation in children (Bauman & Chenoweth, 1984; Chassin, Presson, Sherman, & Edwards, 1991), and to both mediate and moderate the relationship between dispositional variables and smoking or drinking behavior (Brandon, Wetter, & Baker, 1996; Cooper, Russell, Skinner, Frone, & Mudar, 1992; Copeland & Carney, 2003; McKirnan & Peterson, 1988). A recent study showed that weight control outcome expectancies mediated the relationship between weight concern and smoking status in young women, suggesting that women may continue to smoke because of their positive weight control outcome expectancies (Copeland & Carney, 2003). Research is needed to determine whether weight control outcome expectancies also moderate the relationship between weight concern and smoking initiation. It is possible that weight control outcome expectancies exist prior to initiation, and subsequently interact with weight concern to predict smoking initiation in children.

Brandon, Juliano, and Copeland (1999) developed a model for the role of smoking outcome expectancies in smoking initiation, maintenance, cessation, and relapse. Within this model, generalized positive outcome expectancies and dispositional variables (i.e., personality, psychopathology, self-efficacy, coping skills) are hypothesized to predict smoking initiation. Generalized outcome expectancies are thought to develop through either direct experience with smoking or through the observation of others. The authors emphasize the need to test whether outcome

expectancies mediate or moderate the relationship between other variables hypothesized to be important and smoking motivation. Similarly, it has been proposed that alcohol outcome expectancies may both mediate and moderate drinking behavior because they can be acquired both vicariously and directly (Goldman, Del Boca, & Darkes, 1999). Vicarious experience with substances may result in the development of outcome expectancies prior to actual use, which may interact with other variables to become a moderator. Alternatively, outcome expectancies may develop following direct experience with the substance and may mediate continued use. In support of these relationships, alcohol and tobacco expectancies have been shown to change with age and direct experience (Charlton, 1984; Christianson, Goldman, & Inn, 1982; Klesges et al., 1997).

Weight Control Outcome Expectancies

Little is known about the specific impact of weight control outcome expectancies on smoking initiation in weight-concerned children, despite evidence that young children possess these expectancies prior to smoking initiation. It is plausible that children may both initiate smoking and continue to smoke because of positive outcome expectancies. If a child is weight concerned and also believes that smoking is likely to be useful as a method of weight control, it is logical to hypothesize that the child may be at greater risk for smoking initiation. Alternatively, it is possible that a child may learn about the weight control effects of smoking only after having direct experience with smoking. This study will focus on the former hypothesis, that weight control outcome expectancies will moderate the relationship between weight concern and smoking initiation in children (see Figure 1).

Charlton (1984) found that approximately 13% of non-smoking boys and 13.7% of non-smoking girls under age 12 believed that "smoking keeps your weight down," indicating that weight control expectancies frequently precede, and may moderate smoking behavior. However, the heaviest smokers in this sample were the most likely to agree with this statement compared with those who had never smoked, and agreement with this statement increased with level of smoking. These findings provide evidence that outcome expectancies may also mediate smoking behavior. The percentage of children who believed that smoking controls weight increased with age. Further, a higher percentage of girls than boys endorsed this statement at each age. Another study found that smoking for weight control reasons increased with exposure to smoking such that children who had never smoked were least likely to endorse weight control beliefs, and regular smokers were the most likely to endorse these beliefs (Klesges et al., 1997). While these findings are consistent with previous research showing that expectancies may become more developed with direct experience (Christianson et al., 1982), they also provide evidence that expectancies exist prior to direct experience and may motivate smoking initiation.

As with other weight-related variables, the prevalence of weight control outcome expectancies has been shown to vary by sex and race. Klesges et al. (1997) reported that approximately 39% of seventh grade students in their sample believed that smoking could help control weight. White girls were the most likely to endorse this belief, while white boys were the least likely. Further, white girls were most likely to report smoking for weight control reasons. Another study reported that about 40% of high school students believed that smoking could help control appetite and weight (Camp et al., 1993). This

belief was most prevalent among white girls (45.7%), and least prevalent among black girls (10%). Among girls who smoked, approximately 39% indicated that they used smoking to control their weight, compared to only 12% of boys. No black smokers, male or female, reported smoking to control their weight. Given that weight control beliefs and weight concerns are most common among white girls, this group may be at greater risk of initiating smoking for weight control reasons than white boys or black children.

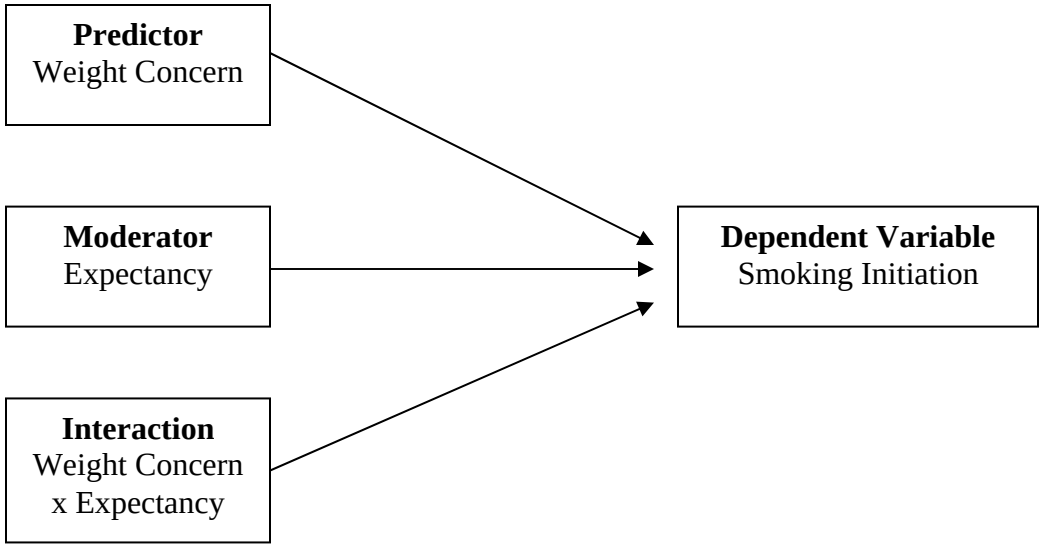

Figure 1. Proposed moderator model.

Weight Concern and Smoking Initiation

Several studies have indicated that being overweight, or believing that one is overweight, is associated with smoking or intentions to smoke. Tucker (1983) found that overweight high school boys scored higher on smoking intent than normal or underweight boys. In another study, overweight females were more likely to be regular smokers (Halek, Kerry, Humphrey, Crisp, & Hughes, 1993), and to report initiating smoking for weight-related reasons, than normal weight females (Klesges & Klesges,

1988). Further, smoking has been shown to be associated with the belief that one is overweight (Fisher, Schneider, Pegler, & Napolitano, 1991) and smokers report that they are less satisfied with their weight than non-smokers (Page, Allen, Moore, & Hewitt, 1993).

In addition to body weight, weight concern has been reported to be associated with smoking among adolescents (Fisher et al., 1991). Weight concern has been shown to be more prevalent among adolescent girls who report smoking frequently, than among those who have never smoked or have smoked only once (Feldman, Hodgson, & Corber, 1985). The prevalence of weight concern was reported to be higher among children and adolescents who were contemplating or experimenting with smoking, than among those who were not contemplating smoking (Tomeo, Field, Berkey, Colditz, & Frazier, 1999).

Dieting and disordered eating, in particular, have been reported to be associated with smoking among adolescent females (Newmark-Sztainer & Hannon, 2000). Females who smoke are more likely to report that they are on a diet, or that they are too fat, than female non-smokers (Coogan et al., 1998). In one study, a greater number of adolescent girls at high risk for the development of eating disorders reported current or previous use of tobacco, than girls at moderate, mild, or low risk (Leon, Fulkerson, Perry, & Cudeck, 1993). Another study reported that preoccupation with dieting was associated with an increased probability of experimental smoking among white adolescent females (Robinson, Klesges, Zbikowski, & Glaser, 1997). Studies have shown that the odds of tobacco use are higher among adolescents and young adults with greater weight concern, as well as among those who engage in dieting, purging, and the use of other unhealthy weight loss methods (French, Story, Downes, Resnick, & Blum, 1995;

Neumark-Sztainer, Story, & French, 1996; Page et al., 1993; Tomeo, Field, Berkey, Colditz, & Frazier, 1999). Many dimensions of weight concern have been cross-sectionally associated with intentions to smoke and smoking behavior, particularly in females. Prospective studies are needed to establish the order of this relationship in younger children, and to investigate the impact of the sex and race on this relationship.

A few prospective studies have indicated that weight concern in adolescent girls predicts smoking initiation. French et al. (1994) reported that adolescent girls, in seventh through tenth grade, who reported two or more eating disorders symptoms, had recently tried to lose weight, were afraid of gaining weight, or had a strong desire to be thin were twice as likely to be current smokers than girls who did not report these concerns or behaviors. Further, non-smoking females who reported two or more eating disorder symptoms, recent attempts at weight loss, or constantly thinking about their weight were twice as likely to initiate smoking than those who did not report these concerns or behaviors. None of the weight concern measures utilized in this study predicted smoking initiation among boys. However, boys who reported the desire to be as thin as possible were more likely to be current smokers than those who did not report this desire.

Austin and Gortmaker (2001) reported that among adolescent girls, aged 10-14 years, those who reported dieting as much as once per week were twice as likely to become smokers at follow-up compared with girls who had not dieted at all in the past month. Girls who reported dieting greater than once per week were four times as likely to initiate smoking than those who had not dieted. Dieting was not associated with smoking initiation among boys in this sample.

In a recent study, adolescents aged 10-15 years, who were considered to be highly concerned with weight, were reported to be at increased risk of initiating smoking over one year (Field et al., 2002). Girls who were high in weight concern were 2.2 times more likely to begin smoking, and highly weight concerned boys were 1.7 times more likely to begin smoking over the course of a year. In contrast with other studies, this study indicated that weight concern was a risk factor for boys as well as girls.

Weight concern, dieting, and eating disorder symptoms are associated with smoking in adolescent girls, and variably associated with smoking among adolescent boys. The inconsistent relationship among boys may be due to the lower prevalence of weight concern in boys. Further, smoking is more prevalent among white children, with white girls the most likely to report weight concern and to possess weight control outcome expectancies. More research is needed to examine racial and sex differences in the relationship between weight concern and smoking initiation in younger children. Children who are both weight concerned and possess weight control outcome expectancies may be at particular risk of initiating smoking for weight control reasons.

In summary, the purpose of this study was to test the hypothesis that weight concern and weight control outcome expectancies would prospectively predict smoking initiation in a sample of elementary school children, over the course of five months. Further, it was expected that weight concern and weight control outcome expectancies would interact to predict smoking initiation, such that children who believed that smoking was an effective weight control method and were also concerned about their weight would be more likely to initiate smoking. Additionally, it was hypothesized that children who had already tried smoking at baseline would have greater weight concern

and body dissatisfaction than those who had not tried smoking. White children and girls were expected to have higher weight concern and body dissatisfaction than black children and boys respectively.

Method

Participants

Participants were 727 students recruited from five schools within the Baton Rouge Catholic Diocese. All participants were enrolled in a larger study in which each of the five schools was randomly assigned to either an environmental obesity or an alcohol and tobacco prevention program. Children in grades two through six, aged 7-13 years old (M = 9.2 years, SD = 1.5), participated in the study. Due to the small number of children belonging to other racial groups, only Blacks and Whites were included in this study. Approximately 50.3% (n = 366) of the participants were female, and 12.7% (n = 92) were Black. The mean BMI percentile at baseline was 61.12% (SD = 30.58), and 3.7% (n = 27) of the children reported that they had ever smoked a cigarette. Participant characteristics are listed in Table 1 and Table 2. The percentages of children who endorsed smoking and possessed weight control expectancies are listed in Table 3.

Measures

Children's Version of the Eating Attitudes Test (ChEAT; Maloney et al., 1988) was administered to assess children's eating attitudes. The ChEAT is a 26-item self-report inventory modified from the adult Eating Attitudes Test (EAT; Garner & Garfinkel, 1979) to be appropriate for children ages 8-13 years old. Reliability estimates of the ChEAT are high, with a Chronbach's alpha of .76 and a test-retest reliability correlation coefficient of .81 (Maloney et al., 1988). Four subscales of the ChEAT have been derived: Dieting, Overconcern with Eating, Social Pressure to Increase Body Weight, and Extreme Weight Control Practices (Williamson et al., 1997). The Dieting subscale measures restrictive eating and eating-related negative emotions. The Overconcern with Eating subscale contains items that measure a focus on controlling

eating and fatness. The Social Pressure to Increase Body Weight subscale measures perceived pressure from others to eat and gain weight. Finally, the Extreme Weight Control Practices subscale measures purging and avoidance of foods perceived to be fattening.

Table 1. Participant characteristics (means and standard deviations).

	White	Black	*p*
Age	9.2 (1.5)	9.2 (1.6)	*ns*
Male	9.3 (1.5)	9.3 (1.7)	*ns*
Female	9.1 (1.5)	9.2 (1.5)	*ns*
BMI %	59.3 (30.4)	73.8 (28.9)	.000
Male	60.3 (30.6)	75.4 (28.4)	.002
Female	57.9 (30.2)	72.3 (29.5)	.002
ChEAT Total	62.1 (15.1)	65.7 (18.7)	.038
Male	62.9 (15.7)	68.7 (18.9)	.028
Female	61.3 (14.5)	63.1 (18.3)	*ns*
ChEAT Dieting	18.9 (7.3)	20.6 (8)	.034
Male	18.9 (7.5)	21.5 (8.1)	.035
Female	18.8 (7.1)	19.8 (7.9)	*ns*
ChEAT Overconcern with Eating	11.8 (5.3)	11.8 (5.2)	*ns*
Male	12.1 (5.6)	12.2 (5.1)	*ns*
Female	11.5 (5.1)	11.4 (5.3)	*ns*
ChEAT Social Pressure to Increase Body Weight	8.5 (3.8)	9 (4.4)	*ns*
Male	8.6 (3.9)	9.8 (4.6)	*ns*
Female	8.4 (3.8)	8.3 (4)	*ns*
ChEAT Extreme Weight Control Practices	10.2 (3.3)	11.3 (4.1)	.005
Male	10.6 (3.6)	11.8 (4.4)	*ns*
Female	9.8 (2.9)	10.8 (3.9)	*ns*

Body Image Assessment for Children (BIA-C; Veron-Guidry & Williamson, 1996) was administered to measure perceived current and ideal body size. The BIA-C is an individually administered interview designed for children aged 8-13 years old (Veron-Guidry & Williamson, 1996). During the interview, each child was shown a random presentation of nine sex specific silhouettes, on separate cards, depicting body sizes ranging from very thin to obese. Participants were instructed to select the “figure that is your current body size.” The silhouettes were reshuffled and the children were instructed

to “select the figure that is your ideal body size.” Current body size (CBS) scores were subtracted from ideal body size (IBS) scores to arrive at a difference score. The procedure has one-week test-retest reliability correlation coefficients of .79 for current body size, .67 for ideal body size, and .67 for the difference score (Gardner, 2001; Veron-Guidry & Williamson, 1996).

Table 2. Baseline BIA-C scores (means and standard deviations).

	White	Black	*p*
BIA-C CBS	4 (1.3)	4.5 (1.6)	-
Male	3.9 (1.3)	4.3 (1.6)	*ns*
Female	4.1 (1.4)	4.7 (1.5)	.003
BIA-C IBS	3.4 (1.2)	3.5 (1.7)	-
Male	3.4 (1.2)	3.3 (1.9)	*ns*
Female	3.4 (1.2)	3.8 (1.5)	.054
BIA-C Difference	.6 (1.5)	1 (2)	-
Male	.59 (1.5)	.98 (2.3)	*ns*
Female	.63 (1.4)	.96 (1.8)	*ns*

Smoking Consequences Questionnaire-Child (SCQ-C; Copeland, Kendzor, Rash, & Clendenin, 2004) is a 26-item self-report measure that was recently developed to measure current smoking, smoking initiation, and beliefs about smoking in children. The measure contains three subscales: Positive Consequences/Effects, Negative Consequences/Effects, and Weight Control. For the purposes of this study, only the Weight control subscale was used. The Weight Control subscale contains two items that assess belief in specific weight control outcome expectancies. Participants respond to the items by checking “yes” or “no,” for which they score one point for each item endorsed. Possible scores ranged from 0-2 points on the subscale. Current smoking was assessed with the question, “Have you ever tried a cigarette?” Children who endorsed this statement were considered smokers. Smoking initiation was inferred when smoking was endorsed at the five-month data collection, after previously denying smoking at baseline.

Table 3. Percent of sample that endorsed smoking and weight control outcome expectancies at baseline.

	White	Black	*p*
Tried Smoking	3%	8.7%	.015
Male	4.2%	14%	.018
Female	1.9%	4.1%	*ns*
Smokers are thinner than non-smokers.	36.6%	50%	.016
Male	37.7%	46.5%	*ns*
Female	35.6%	53.1%	.026
Smokers eat less than non-smokers.	52.4%	54.3%	*ns*
Male	52.3%	53.5%	*ns*
Female	52.6%	55.1%	*ns*

Procedure

Baseline measures were collected during regular school hours in November 2003. All measures were re-collected five months later, in April 2004. Prior to questionnaire administration, participants were informed that their responses would remain confidential. The ChEAT and the SCQ-C were administered to the participants in the classroom as a group. The BIA-C was individually administered to each child in a private location.

Results

Smoking Status, Sex, Race, and Weight Concern

A 2 x 2 x 2 analysis of covariance (ANCOVA) was conducted with sex (male vs. female), race (Black vs. White), and baseline smoking status (smoker vs. non-smoker) as between subjects factors. ChEAT total score from baseline was entered as the dependent variable. Age, BMI percentile, and school were initially included in the analysis as covariates because of the probable relationship between these variables and ChEAT total scores. School was later removed from the analysis because it was not significantly related to the dependent variable. After controlling for age and BMI percentile, significant main effects of smoking status, $F(1, 708) = 6.71$, $p = .01$, and race, $F(1, 708) = 4.00$, $p = .046$, were found. As hypothesized, smokers ($m = 72.65$) scored significantly higher than non-smokers ($m = 62.99$) on the ChEAT. Unexpectedly, black children ($m = 71.55$) scored significantly higher than white children ($m = 64.08$). Sex was not a significant factor in this analysis. Three-way interactions could not be interpreted due to small cell size.

A 2 x 2 x 2 multiple analysis of covariance (MANCOVA) was conducted with sex (male vs. female), race (Black vs. White), and baseline smoking status (smoker vs. non-smoker) as the between-subjects factors. The four subscales of the ChEAT from baseline (i. e., Dieting, Overconcern with Eating, Social Pressure to Gain Weight, and Extreme Weight Control Practices) were entered as the dependent variables. Age, BMI percentile, and school were initially included in the analysis as covariates because of the probable relationship between these variables and the ChEAT subscales. School was later removed from the analysis because it was not significantly related the dependent

variables. After controlling for age and BMI percentile, a significant effect of smoking status on the ChEAT subscales was found, *Wilks' lambda* = .986, F (4, 708) = 2.58, p = .036. Specifically, scores on the ChEAT Dieting subscale varied by smoking status, F(1, 708) = 7.04, p = .008, such that smokers (m = 23.36) scored significantly higher than non-smokers (m = 19.00). A marginal effect of smoking status on the Overconcern with Eating subscale was found, F(1, 708) = 3.23, p = .073, such that smokers (m = 14.01) scored higher than non-smokers (m = 11.73). In addition, a significant interaction was found between sex and race on the ChEAT subscales, *Wilks' lambda* = .984, F (4, 708) = 2.82, p = .024. This interaction was observed on the ChEAT Overconcern with Eating subscale (see Figure 2), F(1, 708) = 4.00, p = .046, such that black females scored the highest (m = 15.13), followed by white males (m = 13.15), black males (m = 11.70), and white females (m = 11.50). Three-way interactions could not be interpreted due to small cell size.

Two separate 2 x 2 analyses of covariance (ANCOVAs) were conducted with race (Black vs. White) and baseline smoking status (smoker vs. non-smoker) as the between-subjects factors, and baseline BIA-C difference scores (CBS – IBS) as the dependent variable. Males and females were analyzed separately because they were asked to respond to sex-specific sets of body silhouettes. Age, BMI percentile, and school were included in the analysis as covariates because of the probable relationship between these variables and BIA-C difference scores. Results indicated that BIA-C difference scores did not differ significantly by race or smoking status for males or females.

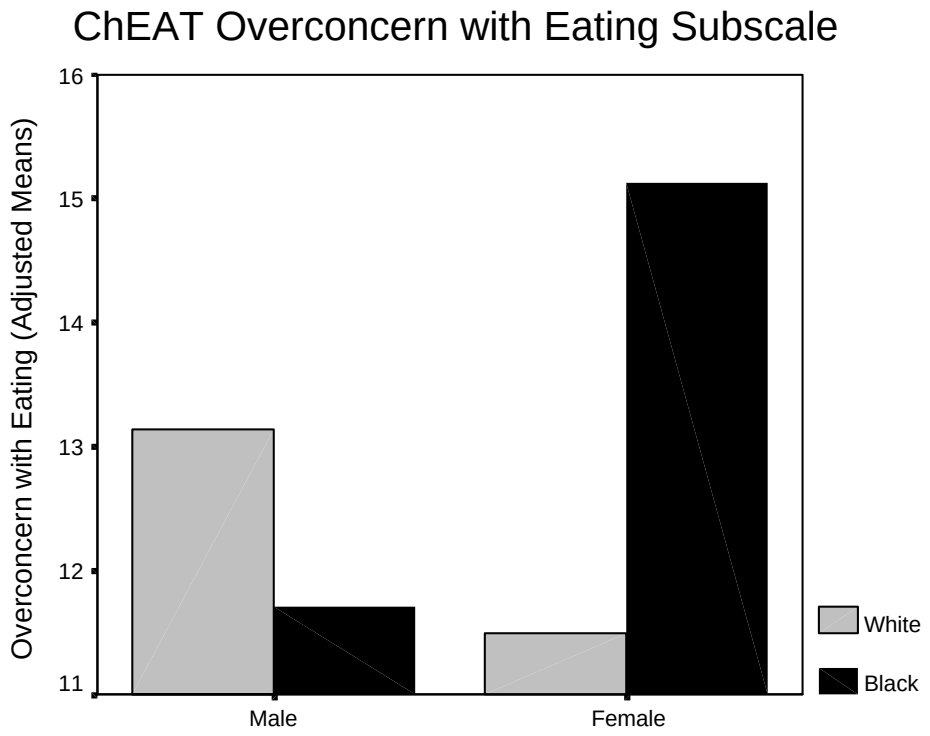

Figure 2. ChEAT Overconcern with Eating subscale means (adjusted for age and BMI percentile) by sex and race.

Smoking Status, Sex, Race and Weight Control Outcome Expectancies

A 2 x 2 x 2 analysis of covariance (ANCOVA) was conducted with sex (male vs. female), race (Black vs. White), and baseline smoking status (smoker vs. non-smoker) as between subjects factors. SCQ-C Weight Control scores from baseline were entered as the dependent variable. Age, BMI percentile, and school were included in the analysis as covariates because of the probable relationship between these variables and the SCQ-C Weight Control Subscale. No significant differences were found on the SCQ-C Weight Control subscale by sex, race, or smoking status.

Weight Concern, Weight Control Outcome Expectancies, and Smoking Initiation

Due to the limited number of children who initiated smoking between baseline and five months (n = 23), it was not possible to test a true predictor model in which

children who had already tried smoking at baseline were excluded. Separate hierarchical logistic regression analyses were conducted to test the individual hypotheses that total ChEAT score, ChEAT subscale scores, BIA-C difference scores, and SCQ-C Weight Control scores at baseline would predict smoking status at five months. Additional hierarchical regression analyses were conducted to test the hypothesis that weight control outcome expectancies would interact with weight concern (ChEAT or BIA-C) to predict smoking status after five months. Treatment type (obesity or smoking prevention), school, age, sex, race, and BMI percentile were entered onto the first step of each regression as covariates because of the probable relationship between these variables and smoking status. Sex was not included as a covariate in the BIA-C analysis, as males and females were analyzed separately. Covariates that were not significantly related to the dependent variables were removed from each analysis.

After controlling for sex and race, hierarchical logistic regression analysis revealed that scores on the Dieting subscale at baseline significantly predicted five-month smoking status, $X^2(3, N = 708) = 24.30$, $p = .000$. The odds of smoking after five months increased by a factor of 1.041 for each one-point increase in Dieting at baseline. ChEAT total scores, ChEAT subscale scores (other than Dieting), BIA-C difference scores, and SCQ-C Weight Control subscale scores did not significantly predict smoking status after five months. SCQ-C Weight Control subscale scores did not significantly interact with the ChEAT total scores, ChEAT subscale scores, or BIA-C difference scores to predict smoking status after five months.

Smoking Status and Weight Concern Over Time

Due to the difficulties encountered with the prospective logistic regression analyses (i.e., limited number of new smokers), repeated measures analyses were conducted to examine the relationship between weight concern and smoking status over time (baseline to five months). The children were categorized into three smoking status groups based on self-reports of smoking at baseline and five months. "Smokers" included those children who had already tried smoking prior to the beginning of the study. "Starters" included those children who were not smoking at the beginning of the study, but who reported that they had tried smoking over the course of the five-month study. "Never-smokers" included those who reported that they had never tried smoking.

A 2 x 2 x 3 repeated measures ANCOVA was conducted with sex (male vs. female), race (Black vs. White), and smoking status (never-smoker vs. starter vs. smoker) as between-subjects factors. ChEAT total scores at baseline and five months were entered as the within–subjects factor. Treatment type, school, age, and BMI percentile were entered into the analysis as covariates because of the probable relationship between these variables and ChEAT scores. Treatment type and school were removed as covariates because they were not significantly related to the dependent variable. After controlling for age and BMI percentile, results indicated a main effect of smoking status, $F(2, 691) = 3.57$, $p = .029$ (see Figure 3). Bonferroni post-hoc tests indicated that smokers ($m = 69.14$) scored significantly higher on the ChEAT than never-smokers ($m = 60.82$) over time. A marginal effect of race was found, $F(1, 691) = 3.15$, $p = .076$, such that black children ($m = 66.24$) scored higher than white children ($m = 61.21$) over time.

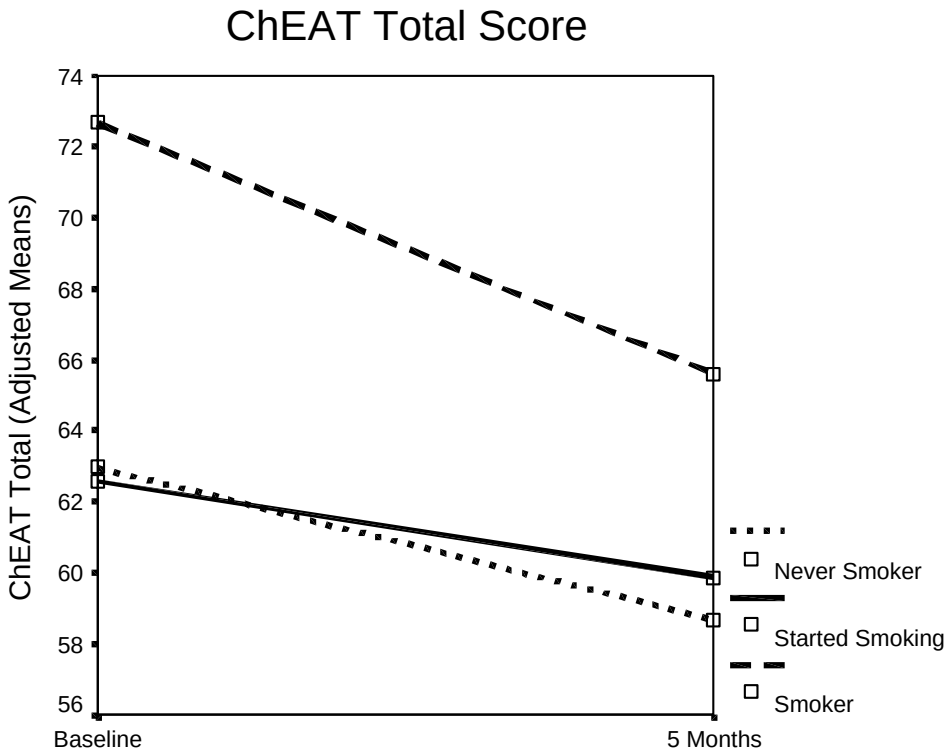

Figure 3. ChEAT total score means (adjusted for age and BMI percentile) by smoking status, over time.

A 2 x 2 x 3 repeated measures MANCOVA was conducted with sex (male vs. female), race (Black vs. White), and smoking status (never-smoker vs. starter vs. smoker) as between-subjects factors. The four subscales of the ChEAT at baseline and five months were included as within-subjects factors. Treatment type, school, age, and BMI percentile were entered into the analyses as covariates because of the probable relationship between these variables and the ChEAT subscale scores. No significant differences were found between groups.

Two separate 2 x 3 repeated measures ANCOVAs were conducted with race (Black vs. White), and smoking status (never-smoker vs. starter vs. smoker) as between-subjects factors. BIA-C difference scores (CBS – IBS) at baseline and five months were entered as the within-subjects factor. Males and females were analyzed

separately because they were asked to respond to sex-specific sets of body silhouettes. Treatment type, school, age, and BMI percentile were entered into the analyses as covariates because of the probable relationship between these variables and BIA-C difference scores. Neither race nor type of smoker was significantly related to BIA-C difference scores over time among males or females.

Smoking Status and Weight Control Outcome Expectancies Over Time

A 2 x 2 x 3 repeated measures ANCOVA was conducted with sex (male vs. female), race (Black vs. White), and smoking status (never-smoker vs. starter vs. smoker) as between-subjects factors. SCQ-C Weight Control subscale scores from baseline and five months were included as the within-subjects factor. Treatment type, school, age, and BMI percentile were entered into the analyses as covariates because of the probable relationship between these variables and SCQ-C Weight Control scores. School and age were removed from the analysis as covariates because they were not significantly related to the dependent variable. After controlling for treatment type and BMI percentile, a significant interaction between sex and time on the SCQ-C Weight Control subscale was revealed, $F(1, 681) = 5.58$, $p = .018$, such that males ($m = 1.3$) scored higher than females ($m = .87$) at the five month data collection. A marginal interaction between race and smoking status was found, $F(2, 681) = 2.98$, $p = .051$. Among white children, those who started smoking had the highest SCQ-C Weight Control scores over time ($m = 1.26$), followed by never-smokers ($m = .85$), and smokers ($m = .80$). The opposite pattern was observed among black children, with smokers scoring the highest ($m = 1.22$), followed by never-smokers ($m = 1.15$), and children who started smoking ($m = .83$).

Discussion

Smoking Status, Sex, Race, and Weight Concern

Similar to previous studies, general weight concern and dieting were higher in children who had tried smoking than those who had not. The present study demonstrated this relationship in a younger sample than in previous research, using a reliable and valid measure of weight concern (i.e., ChEAT). Body dissatisfaction, as measured by the BIA-C, and the remaining ChEAT subscales (i.e., Social Pressure to Gain Weight, Overconcern with Eating, and Extreme Weight Control Practices) were not significantly associated with smoking status, clarifying the specific types of weight concern that may be risk factors for smoking. These findings indicate that general weight concern and dieting, in particular, are associated with smoking in elementary school children.

In contrast with previous studies, black children had greater general weight concern than white children, and weight concern was not significantly different between males and females. Further, the interaction between sex and race on the Overconcern with Eating subscale suggests that black females experience greater concern with eating than white females. The opposite pattern was observed for males, with white males endorsing greater concern with eating than black males. Black females scored the highest on this subscale, while white females scored the lowest. These findings may reflect an increasing concern with weight among black children and males, which may become more apparent in future studies.

Smoking Status, Sex, Race, and Weight Control Outcome Expectancies

No significant differences in weight control outcome expectancies (i.e., SCQ-C Weight Control subscale) were found between smokers and non-smokers, males and

females, or Blacks and Whites. It is possible that weight control outcome expectancies are not present in children of this age, and do not develop until early adolescence. Another possibility is that the SCQ-C weight control subscale may not be a valid measure of weight control outcome expectancies in this age group. More research is needed to determine the reliability and validity of this newly developed questionnaire.

Weight Concern, Weight Control Outcome Expectancies, and Smoking Initiation

Consistent with other prospective studies, dieting significantly predicted smoking status at five months. Children who scored higher on the ChEAT Dieting subscale at baseline were more likely to have tried smoking by the five-month data collection. Other measures of weight concern were not significant predictors of smoking. However, children who reported smoking at baseline were included in the prospective analysis due to the limited number of children who began smoking over the course of the study.

The role of weight control outcome expectancies as a moderator of the relationship between weight concern and smoking was not supported despite the high prevalence of weight control outcome expectancies in this sample. Plausibly, the proposed moderator relationship could not be detected due to the limited number of smokers, the brief amount of time between data collections, and the questionable validity of the weight control outcome expectancy measure. It remains unclear whether children who are concerned about their weight or report dieting believe smoking to be a useful method for controlling weight.

Alternative mechanisms may better explain the relationship between weight concern and smoking. Weight control outcome expectancies may be more accurately described as a mediator rather than a moderator of the relationship between weight

concern and smoking initiation. Previous research has indicated that smoking for weight-control reasons tends to increase with exposure to smoking (Charlton, 1984; Christianson et al., 1982; Klesges, et al., 1997), suggesting that weight-concerned smokers may realize the weight control and appetite suppressing effects of smoking after initiating smoking. The weight control effects may motivate smokers to continue smoking, and deter them from quitting smoking.

There is also evidence that individuals who are weight-concerned or engage in dieting behaviors may be more likely to engage in a variety of unhealthy behaviors such as smoking, alcohol and drug use, and eating disordered behaviors (Field et al., 2002; French et al., 1995; Krahn, Kurth, Demitrack, & Drewnowski, 1992). In addition, animal studies have indicated that food deprivation may increase self-administration of nicotine and other drugs (Carroll, 1982; Carroll, France, & Meisch, 1979; Carroll & Meisch, 1980; Carroll & Meisch, 1981; Lang, Latiff, McQueen, & Singer, 1977; Takahashi, Singer, & Oei, 1978). Limited research has suggested that food deprivation in humans may produce this same effect (Bulik & Brinded, 1994; Zacny & De Wit, 1990). Clearly, more research is needed to identify the relevant mechanism(s) that may help to explain the relationship between weight concern and smoking.

Smoking Status and Weight Concern Over Time

Smokers endorsed more general weight concern than never-smokers over time. These findings suggest the possibility that weight concern may increase with smoking, as smokers possessed the greatest weight concern, followed by children who started smoking, and those who had never smoked. Similar to the cross-sectional findings, BIA-C difference scores did not differ by race or smoking status, for boys or girls over time.

Smoking Status and Weight Control Outcome Expectancies Over Time

In contrast with general outcome expectancy research, children who smoked or initiated smoking did not endorse more weight control outcome expectancies. The nature of the interaction between sex and time, and the near significant interaction between race and smoking status on the SCQ-C weight control subscale is unclear. Males scored higher on the Weight Control subscale than females at five months. In addition, among white children, those who started smoking over the course of the study had the highest SCQ-C Weight Control scores, followed by never-smokers, and smokers. Conversely, among black children, smokers scored the highest, followed by never-smokers, and children who started smoking. More investigation of the psychometric properties of the SCQ-C Weight Control subscale is needed to determine the nature of these findings.

Strengths and Limitations

Strengths of this study include the elementary school sample, and the use of reliable and valid measures of weight concern. Additionally, other factors known to be related to weight concern and smoking (i.e., sex, race, BMI percentile, age) were included in the analyses. Finally, the present study identified the specific types of weight concern associated with smoking, and tested weight control outcome expectancies as a moderator of this relationship.

The relatively few children who began smoking over the course of the study limited the prospective analyses, and a true prospective design could not be utilized. Children who reported smoking at baseline were included in the analyses, and therefore the findings did not necessarily reflect smoking initiation. The low prevalence of smoking may be due, in part, to the use of a sample recruited from Catholic rather than

public schools. There is evidence that religiosity may be a protective factor against smoking among adolescents (Nonnemaker, McNeely, & Blum, 2003; Wills, Yaeger, & Sandy, 2003). It is also possible that the brief period of time between assessments and the ongoing smoking prevention program in two of the schools may have hindered the normal progression of smoking initiation in the children. The fairly small number of black children, in addition to the low prevalence of smoking in this sample, limited the ability to evaluate three-way interactions between race, sex, and smoking status.

Additional prospective studies that focus on the association between weight concern and smoking initiation are needed to determine the temporal order of these factors, and to identify underlying mechanisms. Studies utilizing larger samples of black children and children of other racial minorities will be necessary in order to understand the nature of the racial differences in weight concern and smoking initiation. Further, the identification of mediators and moderators will help to clarify which individuals may be at risk, and under what circumstances. The use of reliable and valid measures of weight control expectancies in children will be required to adequately test the role of expectancies in the relationship between weight concern and smoking initiation. Further study of the SCQ-C Weight Control subscale, and possibly the development of new measures will be needed. Knowledge gained from prospective studies of weight concern and smoking initiation will facilitate the development of effective smoking prevention interventions.

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