

R-Rated Movies, Bedroom Televisions, and Initiation of Smoking by White and Black Adolescents

Christine Jackson, PhD; Jane D. Brown, PhD; Kelly L. L'Engle, PhD

Objective: To test movie exposure and television use as predictors of smoking initiation among white and black adolescents who had never smoked cigarettes.

Design: Survey research using audio computer-assisted self-interviews at baseline and at 2-year follow-up (2002-2004).

Setting: Participants' homes located in central North Carolina.

Participants: A sample of 735 12- to 14-year-old adolescents drawn from 14 public middle schools.

Main Exposure: Frequency of exposure to movies rated R, PG-13, PG, or G; frequency, location, and parental oversight of television viewing.

Main Outcome Measure: Initiation of smoking, indicated by the first occasion of puffing on a cigarette.

Results: Among white adolescents, high relative expo-

sure to R-rated movies predicted a significantly greater likelihood of smoking initiation at follow-up, and private access to television during early adolescence, indicated by having a bedroom television, was also a significant independent predictor of smoking initiation at follow-up. No significant associations were observed between any movie-exposure or television-use variables and likelihood of smoking among black adolescents.

Conclusions: Indicators of risky media use were associated with a significantly greater likelihood of smoking for white but not for black adolescents. These results diverge strongly from past results, which have indicated that all adolescents, regardless of race or place of residence, have a higher risk of smoking initiation as their exposure to movie smoking increases. Research is needed to identify the antecedents of risky media use and to understand how audience attributes, including race and other factors, moderate the effects of risky media use on health-related behaviors.

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ACTORS IN MOVIES NOW smoke almost as often as actors did in the 1950s.¹ In 2002, smoking was portrayed in 90% of all movies rated PG (parental guidance suggested) or PG-13 (parents strongly cautioned) and in 100% of movies rated R (viewers under 17 years of age must view with an adult).² In nearly all movie portrayals, smoking conveys physical attractiveness and social status.³⁻⁶

Exposure to movies that portray smoking begins early in life. Dalton et al⁷ found that 55% of children aged 2 to 6 years had watched movies for which parental guidance was recommended. The majority of children aged 8 to 10 years view movies rated PG or PG-13, and more than three fourths of 10- to 14-year-olds (84%) report watching R-rated movies at home with parental permission.⁸

Televised portrayals of smoking have also risen in recent years. About 20% of epi-

sodes of popular, noneducational prime-time television programs depict tobacco use,⁵ and prosmoking portrayals outnumber antismoking portrayals by a ratio of 10:1.⁹ Current patterns of television use provide ample opportunity for exposure to televised portrayals of smoking: youth aged 11 to 14 years watch an average of 4.3 hours of television daily,^{10,11} more than two thirds have televisions in their bedrooms (68%), and parental oversight of children's television use is limited.¹⁰

Can exposure to portrayals of smoking in the movies and on television increase the likelihood that adolescents will try smoking? There is consensus that media play a role in children's socialization^{5,12-15} and that social learning principles explain how the socializing effect of media can occur.¹⁶⁻²⁶ The general premise of social learning theory is that virtually all cognitive, affective, and behavioral learning from direct experience can also be achieved through vicarious observa-

Author Affiliations: Pacific Institute for Research and Evaluation, Chapel Hill Center (Dr Jackson), and School of Journalism and Mass Communication (Drs Brown and L'Engle), University of North Carolina at Chapel Hill, Chapel Hill.

tion of modeled attitudes and behaviors.²⁷⁻²⁹ Bandura²⁹ argued that by demonstration or description, media can instruct people about new ways of thinking and behaving and that media models can exemplify, legitimate, and motivate adoption of new behaviors.

To date, only a few studies have measured the association between media exposure and smoking initiation prospectively, and no studies to our knowledge have tested whether movie exposure and television use are independent predictors of smoking. Research on movie exposure and smoking includes a panel study completed by Dalton and Sargent et al,³⁰ which found that 10- to 14-year-olds in the highest quartile of exposure to smoking in movies were 2.7 times more likely to initiate smoking than peers in the lowest quartile. Because the sample for this study was predominantly white (94%) and resided in one area (northern New England), Sargent and Dalton et al²⁶ conducted a second study using a nationally representative sample of adolescents and replicated their earlier finding. Compared with adolescents in the lowest quartile of exposure to smoking in movies, adolescents in the second, third, and fourth quartiles were 1.7, 1.8, and 2.6 times more likely to initiate smoking, respectively.^{26,30}

Relatively little research has examined television use and smoking. A prospective study of 10- to 15-year-olds found that initiation of smoking was at least 4 times more likely among those who watched 4 or more hours of television daily.³¹ Two cross-sectional analyses from a sample of Belgian adolescents found a significant inverse association between time spent viewing television and age at onset of smoking²⁵ and a significant positive association between amount of time spent watching television and number of cigarettes smoked per week.³²

The present study expands on previous research by testing both movie exposure and television use as predictors of smoking initiation. Our indicators of television use are based on television practices identified by the American Academy of Pediatrics as detrimental to youth health and development^{33,34}: unrestricted television viewing time, private (bedroom) access to television, and lack of parental oversight of television program choices.

In this study, nearly equal numbers of black and white adolescents were recruited, allowing us to answer questions about media use and smoking by race separately. This is important because past research with adolescents has shown consistent differences by race in the amount and content of media used.^{10,35}

METHODS

STUDY SITE, SAMPLE, AND TIMELINE

The study protocols were approved by the institutional review board at the University of North Carolina at Chapel Hill. Our sample was drawn from 14 of 16 middle schools belonging to 3 school districts located in the southeastern United States. Participating schools were urban, suburban, and rural; they enrolled approximately equal proportions of black and white male and female students. In the fall of 2001, all seventh- and eighth-grade students from these schools (N=6234; mean age, 13.6

years) were eligible to attend brief informational sessions that invited students to seek parental permission to participate in a study of teens' media use and health. Of 6234 enrolled students, 5029 attended an informational session (81%) and 3261 returned a signed parental consent form and a completed questionnaire (65% of those who attended a session and 52% of all enrolled students). Respondents had the same mean age at baseline as the eligible sample (13.6 years); however, white female students were slightly overrepresented among respondents (26% of the study sample vs 22% of all students) and black male students were slightly underrepresented (18% vs 22%, respectively).

In the spring of 2002, 1200 of the 3261 adolescents who had complete media-use data were selected randomly for the second phase, during which a more detailed baseline health assessment and a 2-year follow-up assessment occurred. These assessments used at-home audio computer-assisted self-interview (audio-CASI) methods. At baseline and again at follow-up, a parent or guardian provided written consent for the adolescent's participation, and the adolescent provided signed assent. The audio-CASI method allowed adolescents to answer questions on a laptop computer while hearing the questions through earphones and touching the computer screen to select a response. Adolescents received \$20 for participating in each interview. Of the 1200 randomly selected adolescents, 1074 completed baseline audio-CASIs (90%).

In the spring of 2004, 1017 adolescents completed a follow-up interview (85% of the random sample and 95% of those who completed a baseline interview). Of the 57 respondents lost to follow-up, 6 were adolescent refusals, 7 were parent refusals, and the remaining 44 had moved out of the study area. There were no age, race, or sex differences between the 1017 adolescents who completed the follow-up survey and the 57 adolescents who did not. Of the 1017 respondents with longitudinal data, 282 reported initiation of smoking at baseline (28%), leaving 735 adolescents who had never tried smoking for the present analyses.

MEDIA VARIABLES

Movie-Exposure Variables

We measured which of 93 films being shown in theaters and popular with young teens from 2001 to 2002 were seen by participating adolescents. Popular films were those that appeared in published lists of media used by adolescents (eg, Nielsen reports) and that, in a preliminary classroom survey of teens who lived in the study area, had been seen in a theater by 10% or more of any demographic subgroup (ie, black and white males and females).³⁶ These films included 7, 14, 49, and 23 movies rated G, PG, PG-13, and R, respectively. A tertile split in each movie-rating category was used to indicate relatively low, moderate, or high exposure to movies in that category.

Television-Use Variables

Although the American Academy of Pediatrics recommends that viewing time be limited to no more than 2 hours daily, we could not use this cut-off value because only 10 individuals met this criterion. We therefore standardized scores on a continuous measure of hours spent viewing television (range, 1.6-6.0 hours daily) and split the distribution to indicate viewing time below (≤ 4.6 hours) or above (≥ 4.7 hours) the median. A 4-level categorical indicator of how often adolescents watched television during the week outside of time at school was also used, with responses ranging from 2 or 3 days a week to all the time. Privacy of television use was indicated by whether respondents had tele-

visions in their bedrooms. Parental oversight of television use was measured by asking adolescents to use a 4-point agree/disagree scale to indicate whether their parents had rules about the kinds of television shows they can watch.

COVARIATES

The following variables were used as covariates in the regression analyses:

- Demographic variables: participants reported sex, school grade (seventh or eighth), race (black or white), and parental education (highest level completed by each parent; combined and coded to indicate whether 0, 1, or both parents completed college).

- Exposure to smokers: adolescents indicated if at least 1 of 3 best friends was a current smoker and if at least 1 household member was a current smoker.

- Parental engagement: adolescents reported how aware their parents were of how they were doing at school; whether there were periods of an hour or longer after school or on weekends during which parents did not know where they were; and, during a typical week, how many times they and their parent(s) ate dinner together. Responses were summed and used to indicate high, moderate, or low levels of parental engagement.

- Academic ability: grades on the most recent report card were assessed; responses ranged from mostly As to mostly Ds. The final breakdown indicated high achievers (mostly As), average students (As and Bs, to mostly Bs), and all others (mostly Cs or lower). Adolescents also reported whether they were unlikely, likely, or definitely going to college.

- Sensation seeking: a 5-point agree/disagree scale was used to measure preference for doing things that are scary, doing things that are exciting even if it involves breaking rules, and having friends who are unpredictable. Responses were summed and used to sort participants into groups with low to high sensation seeking.

- Smoking behavior: using audio-CASI and a standard, reliable^{37,38} indicator of initiation, adolescents reported whether they had ever tried smoking a cigarette, even one puff.

ANALYSES

Logistic regression analyses were used first to compute the unadjusted odds of smoking initiation at follow-up by each covariate (**Table 1**) and by each media variable (**Table 2**). Multivariate logistic regression analyses were then used to compute 3 regression models for each race group. In model 1, smoking was regressed in a stepwise manner on the covariates; in model 2, the significant covariates from model 1 plus all movie-exposure variables were entered; and in model 3, the significant covariates from model 1 plus all television-use variables were entered (**Table 3** and **Table 4**). All independent variables were coded so that the referent was the purported low-risk category (eg, highly engaged parents, below median television use). The odds ratios (ORs) therefore indicated the odds of initiating smoking among adolescents in the higher-risk categories of each independent variable relative to adolescents in the low-risk category.

RESULTS

Initiation of smoking was reported by 30% of the sample at follow-up, when study participants were aged 14 to 16 years (mean age, 15.6 years). Taking into account the number of adolescents who reported initiation of smoking at baseline, this estimate of lifetime cigarette use is quite consistent with national prevalence estimates of

smoking in this age group.³⁹ Smoking incidence was higher among black than white adolescents (33.7% vs 26.7%, respectively). Breakdowns of smoking by covariates are presented in Table 1.

BIVARIATE RESULTS

The bivariate associations between smoking initiation and the movie-exposure variables are presented in Table 2. White adolescents with high exposure to R-rated movies were nearly 7 times more likely to start smoking as peers with low exposure (OR, 6.82; 95% confidence interval [CI], 3.61-12.88). High exposure to PG-13-rated movies was also a strong marker of increased risk of smoking among white youth, relative to low-exposed peers (OR, 5.12; 95% CI, 2.72-9.65). Even moderate exposure to R- and PG-13-rated movies was associated with a 3-fold increase in the likelihood of smoking among white adolescents (Table 2). In contrast, black adolescents with high exposure to R- or PG-13-rated movies at baseline had significantly greater odds of smoking at follow-up, but the magnitude of these bivariate associations was substantially lower than those observed for white adolescents (OR, 2.42; 95% CI, 1.28-4.57; and OR, 1.99; 95% CI, 1.12-3.54, respectively).

Table 2 also presents the bivariate associations between smoking initiation and television-use variables. White adolescents who reported watching television all of the time when not in school, who had television privacy, and who disagreed strongly that their parents had rules about program choices were about 3.5 times more likely on average to smoke than referent peers. None of these television-use variables was a significant predictor of smoking initiation among black adolescents.

MULTIVARIATE MODELS OF SMOKING REGRESSED ON COVARIATES AND MOVIE EXPOSURE

In the initial stepwise modeling of covariates, white and black adolescents alike were significantly more likely to initiate smoking if they had at least 1 friend who smoked and if they reported low parental engagement at baseline (Tables 3 and 4). These analyses also indicated that age (school grade) and sensation seeking were strong predictors of smoking onset among white youth but were unrelated to onset among black youth.

Tables 3 and 4 present the adjusted odds of smoking initiation by amount of exposure to movies. Among white adolescents, the association between R-movie exposure and smoking remained significant after adjustment, although the magnitude of effect was about half that observed in the bivariate model; specifically, the odds of smoking decreased from 6.82 in the unadjusted model (Table 2) to 2.67 in the adjusted model (Table 3). The ORs for having a friend who smokes and sensation seeking were also reduced substantially in the adjusted models. The association between PG-13 movies and smoking was nonsignificant after adjustment ($P = .46$).

Among black adolescents, smoking was predicted only by having a friend who smokes and parental engagement. The associations observed between R-rated and PG-

Table 1. Unadjusted Odds of Smoking by Covariates

Covariate	White Adolescents (n = 382)		Black Adolescents (n = 353)	
	No. (%) of Participants Who Smoke	Odds Ratio (95% Confidence Interval)	No. (%) of Participants Who Smoke	Odds Ratio (95% Confidence Interval)
Sex				
F	188 (26.6)	1 [Reference]	185 (35.1)	1 [Reference]
M	194 (26.8)	1.01 (0.64-1.59)	168 (32.1)	0.87 (0.56-1.36)
Grade				
Seventh	202 (20.8)	1 [Reference]	205 (27.7)	1 [Reference]
Eighth	180 (33.3)	1.90 (1.20-3.01)*	148 (38.0)	1.60 (1.01-2.53)†
Parental education				
2 College graduates	223 (21.1)	1 [Reference]	73 (24.7)	1 [Reference]
1 College graduate	109 (30.3)	1.62 (0.95-2.73)	184 (34.2)	1.59 (0.86-2.93)
0 College graduates	50 (44.0)	2.94 (1.54-5.60)*	96 (39.6)	2.00 (1.02-3.91)†
≥1 Friends who smoke				
No	290 (17.2)	1 [Reference]	242 (24.0)	1 [Reference]
Yes	92 (56.5)	6.24 (3.73-10.4)‡	111 (55.0)	3.87 (2.40-6.23)‡
≥1 Individuals in household who smoke				
No	312 (22.4)	1 [Reference]	216 (31.0)	1 [Reference]
Yes	57 (43.9)	2.70 (1.50-4.85)*	105 (39.0)	1.42 (0.87-2.31)
Parental engagement				
High	212 (19.3)	1 [Reference]	183 (27.9)	1 [Reference]
Moderate	120 (35.0)	2.24 (1.35-3.72)*	114 (35.1)	1.39 (0.84-2.31)
Low	43 (41.9)	3.00 (1.49-6.02)*	53 (50.9)	2.68 (1.43-5.04)*
Relationship with parents				
Excellent	159 (22.0)	1 [Reference]	138 (29.0)	1 [Reference]
Very good	124 (28.2)	1.39 (0.81-2.39)	115 (37.4)	1.39 (0.81-2.39)
Good	70 (31.4)	1.62 (0.86-3.04)	51 (35.3)	1.62 (0.86-3.04)
Fair	28 (32.1)	1.67 (0.69-4.03)	48 (37.5)	1.68 (0.69-4.03)
School grades				
Mostly As and higher	157 (15.3)	1 [Reference]	33 (27.3)	1 [Reference]
As and Bs, to mostly Bs	139 (31.7)	2.56 (1.46-4.50)*	106 (31.1)	1.20 (0.50-2.87)
Mostly Cs and lower	81 (37.0)	3.26 (1.74-6.09)‡	206 (35.9)	1.49 (0.66-3.38)
College aspiration				
Definite	282 (22.0)	1 [Reference]	219 (31.1)	1 [Reference]
Likely	80 (42.5)	1.63 (0.59-4.48)	81 (33.3)	1.10 (0.64-1.91)
Unlikely	19 (31.6)	2.62 (1.55-4.43)‡	53 (45.3)	1.83 (0.99-3.38)
Sensation seeking				
Low	140 (12.1)	1 [Reference]	108 (27.8)	1 [Reference]
Moderate	127 (27.6)	2.75 (1.45-5.21)*	39 (32.5)	1.25 (0.71-2.21)
High	112 (44.6)	5.83 (3.11-10.9)‡	119 (40.3)	1.75 (1.01-3.07)†

**P* < .01.
 †*P* < .05.
 ‡*P* < .001.

13-rated movies and smoking (Table 2) were nonsignificant after adjustment for covariates (*P* = .22 and *P* = .96, respectively) (Table 4), indicating that the amount of movie exposure was not a primary indicator of likelihood of smoking among black adolescents.

MULTIVARIATE MODELS OF SMOKING REGRESSED ON COVARIATES AND TELEVISION USE

For white adolescents, television privacy was associated with significantly greater odds of smoking initiation (OR, 2.15; 95% CI, 1.16-3.98) after adjusting for having a friend who smokes, sensation seeking, and other covariates (Table 3). For black adolescents, the multivariate model simply confirmed the overall lack of association between indicators of television use at baseline and subsequent odds of smoking initiation (Table 4).

RELATIVE STRENGTH OF R-RATED-MOVIE EXPOSURE AND TELEVISION PRIVACY AS PREDICTORS OF SMOKING

Is exposure to R-rated movies and television privacy independently related to initiation of smoking among white adolescents? After controlling for significant covariates (ie, having a friend who smokes, parental engagement, sensation seeking, and school grade), we entered R-rated-movie exposure and television privacy and found that white adolescents were significantly more likely to smoke if they had high exposure to R-rated movies (OR, 2.69; 95% CI, 1.25-5.77) and if they had televisions in their bedrooms (OR, 2.16; 95% CI, 1.19-3.88). This analysis was not repeated for black adolescents because of the lack of association between either of the media-use variables and smoking.

Table 2. Unadjusted Odds of Smoking by Indicators of Movie and Television Use

Variable	White Adolescents (n = 382)		Black Adolescents (n = 353)	
	No. (%) of Participants Who Smoke	Odds Ratio (95% Confidence Interval)	No. (%) of Participants Who Smoke	Odds Ratio (95% Confidence Interval)
Movie Variable				
R-rated movies				
Low	161 (11.8)	1 [Reference]	73 (23.3)	1 [Reference]
Moderate	133 (30.8)	3.33 (1.82-6.09)*	136 (30.1)	1.42 (0.73-2.73)
High	47.7 (88)	6.82 (3.61-12.8)*	144.4 (42)	2.42 (1.28-4.57)†
PG-13-rated movies				
Low	131 (11.5)	1 [Reference]	110 (23.6)	1 [Reference]
Moderate	27.8 (108)	2.97 (1.50-5.88)†	38.4 (125)	2.01 (1.14-3.55)‡
High	39.9 (143)	5.12 (2.72-9.65)*	38.1 (118)	1.99 (1.12-3.54)‡
PG-rated movies				
Low	53 (26.4)	1 [Reference]	117 (26.5)	1 [Reference]
Moderate	115 (27.0)	1.02 (0.49-2.14)	80 (31.3)	1.26 (0.67-2.35)
High	214 (26.6)	1.01 (0.51-2.00)	156 (40.4)	1.87 (1.11-3.16)‡
G-rated movies				
Low	92 (25.0)	1 [Reference]	72 (30.6)	1 [Reference]
Moderate	146 (25.3)	1.01 (0.55-1.85)	141 (33.3)	1.13 (0.61-2.09)
High	144 (29.2)	1.23 (0.68-2.23)	140 (35.7)	1.26 (0.68-2.32)
Television Variable				
Hours of use per day				
Below median	249 (22.9)	1 [Reference]	143 (32.9)	1 [Reference]
Above median	33.8 (133)	1.64 (1.02-2.63)‡	209 (34.0)	1.04 (0.65-1.64)
Frequency of use				
2-3 Times per week	98 (16.3)	1 [Reference]	47 (27.7)	1 [Reference]
Most days	96 (26.0)	1.81 (0.89-3.67)	101 (38.6)	1.64 (0.76-3.50)
Daily	137 (29.9)	2.07 (1.08-3.99)‡	79 (25.3)	0.84 (0.37-1.91)
All the time	49 (40.8)	3.35 (1.51-7.40)†	125 (36.8)	1.51 (0.72-3.17)
Television in bedroom				
No	228 (16.2)	1 [Reference]	98 (36.7)	1 [Reference]
Yes	154 (42.2)	3.58 (2.21-5.78)*	255 (32.5)	0.85 (0.51-1.39)
Parent has program rule				
Strongly agree	175 (22.3)	1 [Reference]	160 (28.1)	1 [Reference]
Agree	86 (23.3)	1.04 (0.56-1.92)	60 (33.3)	1.30 (0.68-2.44)
Disagree	71 (29.6)	1.44 (0.77-2.68)	53 (39.6)	1.71 (0.89-3.28)
Strongly disagree	40 (50.0)	3.43 (1.68-7.02)†	69 (40.6)	1.78 (0.98-3.23)

*P<.001.

†P<.01.

‡P<.05.

COMMENT

This study is 1 of only 3 longitudinal studies completed to date that have examined whether exposure during early adolescence to movies known to portray smoking predicts likelihood of smoking 2 years later.^{26,30} This study also tested indicators of television use during early adolescence as predictors of smoking onset, and it examined the associations between media use and smoking separately for black and white adolescents.

Three main findings were observed. First, among white adolescents, high relative exposure to R-rated movies predicted significantly greater likelihood of smoking initiation at follow-up. Second, smoking initiation was significantly more likely among black adolescents who reported low parental engagement and who had at least 1 best friend who smoked. However, after controlling for covariates of smoking, no significant associations were observed between movie exposure and likelihood of smoking among black adolescents. Third, among white ado-

lescents but not black adolescents, private access to television during early adolescence, indicated by having a bedroom television, was also a significant independent predictor of smoking initiation at follow-up. Having a friend who smokes and low parental engagement predicted smoking in both white and black adolescents, whereas family smoking and age (school grade) were associated with smoking by white adolescents only.

MOVIE EXPOSURE AND SMOKING

The observed association between exposure to R-rated movies and initiation of smoking among white adolescents is consistent with results from the only other longitudinal studies on this topic.^{26,30} When adolescents in the highest quartile of exposure to smoking in movies were compared with peers with lowest exposure, Dalton et al³⁰ and Sargent et al²⁶ reported adjusted odds of smoking of 2.7 and 2.6, respectively. Sargent et al²⁶ found that adolescents who were allowed by parents to watch

Table 3. Initiation of Smoking by White Adolescents Regressed on Covariates and Media Variables

Covariate/Variable	Odds Ratio (95% Confidence Interval)		
	Model 1*	Model 2†	Model 3‡
Covariate			
≥1 Friend smokes			
No	1 [Reference]	1 [Reference]	1 [Reference]
Yes	4.41 (2.45-7.95)§	3.49 (1.87-6.51)§	4.15 (2.18-7.92)§
Sensation seeking			
Low	1 [Reference]	1 [Reference]	1 [Reference]
Moderate	2.27 (1.11-4.66)	1.97 (0.93-4.15)	2.47 (1.16-5.28)
High	4.51 (2.21-9.18)§	3.95 (1.90-8.21)§	4.65 (2.19-9.88)§
Parental engagement			
High	1 [Reference]	1 [Reference]	1 [Reference]
Moderate	1.70 (0.94-3.10)	1.66 (0.88-3.12)	1.85 (0.98-3.51)
Low	2.55 (1.14-5.69)	2.29 (0.99-5.30)	2.81 (1.19-6.64)
Grade			
Seventh	1 [Reference]	1 [Reference]	1 [Reference]
Eighth	2.02 (1.17-3.49)	1.95 (1.10-3.47)	1.85 (1.03-3.31)
Movie Variable			
R-rated movies			
Low	NA	1 [Reference]	NA
Moderate	NA	1.57 (0.73-3.35)	NA
High	NA	2.67 (1.07-6.55)	NA
PG-13-rated movies			
Low	NA	1 [Reference]	NA
Moderate	NA	1.55 (0.65-3.69)	NA
High	NA	1.83 (0.69-4.84)	NA
PG-rated movies			
Low	NA	1 [Reference]	NA
Moderate	NA	1.36 (0.58-3.17)	NA
High	NA	1.46 (0.65-3.27)	NA
G-rated movies			
Low	NA	1 [Reference]	NA
Moderate	NA	0.55 (0.20-1.46)	NA
High	NA	0.48 (0.18-1.28)	NA
Television Variable			
Hours of use per day			
Below median	NA	NA	1 [Reference]
Above median	NA	NA	1.32 (0.69-2.53)
Frequency of use			
2-3 Times per week	NA	NA	1 [Reference]
Most days	NA	NA	1.21 (0.51-2.89)
Daily	NA	NA	1.34 (0.54-3.29)
All the time	NA	NA	1.71 (0.51-5.75)
Bedroom television			
No	NA	NA	1 [Reference]
Yes	NA	NA	2.15 (1.16-3.98)
Parent has television rule			
Strongly agree	NA	NA	1 [Reference]
Agree	NA	NA	0.90 (0.42-1.96)
Disagree	NA	NA	1.11 (0.52-2.03)
Strongly disagree	NA	NA	1.72 (0.68-4.35)

Abbreviation: NA, not applicable.

*Stepwise entry of all covariates listed in Table 1.

†Forced entry of model 1 covariates and all movie-exposure variables.

‡Forced entry of model 1 covariates and all television-use variables.

§ $P < .001$.

|| $P < .05$.

R-rated movies sometimes or all the time were 2.8 times more likely to initiate smoking than peers who were never allowed to watch R-rated movies. Our own result (adjusted OR, 2.67; 95% CI, 1.07-6.55) replicates these results, suggesting that the association between movie exposure and likelihood of smoking is robust.

Further evidence of the robustness of this association comes from the observation that 3 different methods of quantifying movie exposure produced essentially the same result. As noted previously, Dalton et al³⁰ and Sargent et al²⁶ quantified exposure as the number of occurrences of viewing smoking in movies. Sargent et al⁴⁰ used a single-

Table 4. Initiation of Smoking by Black Adolescents Regressed on Covariates and Media Variables

Covariate/Variable	Odds Ratio (95% Confidence Interval)		
	Model 1*	Model 2†	Model 3‡
Covariate			
≥1 Friend smokes			
No	1 [Reference]	1 [Reference]	1 [Reference]
Yes	3.89 (2.28-6.62)§	3.81 (2.19-6.56)§	4.15 (2.33-7.39)§
Parental engagement			
High	1 [Reference]	1 [Reference]	1 [Reference]
Moderate	1.12 (0.63-2.01)	1.18 (0.65-2.13)	1.06 (0.58-1.94)
Low	3.15 (1.56-6.34)	2.89 (1.39-6.00)	2.52 (1.19-5.33)¶
Movie Variables			
R-rated movies			
Low	NA	1 [Reference]	NA
Moderate	NA	0.97 (0.42-2.12)	NA
High	NA	1.75 (0.66-4.62)	NA
PG-13-rated movies			
Low	NA	1 [Reference]	NA
Moderate	NA	1.11 (0.59-1.87)	NA
High	NA	1.19 (0.61-2.34)	NA
PG-rated movies			
Low	NA	1 [Reference]	NA
Moderate	NA	0.94 (0.41-2.15)	NA
High	NA	1.46 (0.77-2.78)	NA
G-rated movies			
Low	NA	1 [Reference]	NA
Moderate	NA	1.01 (0.46-2.21)	NA
High	NA	1.30 (0.56-3.00)	NA
Television Variables			
Hours of use per day			
Below median	NA	NA	1 [Reference]
Above median	NA	NA	0.96 (0.45-2.01)
Frequency of use			
2-3 Times per week	NA	NA	1 [Reference]
Most days	NA	NA	1.81 (0.70-4.69)
Daily	NA	NA	1.15 (0.39-3.43)
All the time	NA	NA	1.73 (0.57-5.27)
Bedroom television			
No	NA	NA	1 [Reference]
Yes	NA	NA	0.65 (0.35-1.19)
Parent has television rule			
Strongly agree	NA	NA	1 [Reference]
Agree	NA	NA	1.16 (0.55-2.41)
Disagree	NA	NA	1.41 (0.65-3.06)
Strongly disagree	NA	NA	1.98 (0.93-4.20)

Abbreviation: NA, not applicable.

*Stepwise entry of all covariates listed in Table 1.

†Forced entry of model 1 covariates and all movie-exposure variables.

‡Forced entry of model 1 covariates and all television-use variables.

§*P* < .001.

||*P* < .01.

¶*P* < .05.

item categorical frequency measure of whether adolescents were allowed by parents to watch R-rated movies never, once in a while, or sometimes/all the time. We measured movie exposure by title and computed exposure in each movie-rating category. All 3 approaches produced essentially the same result: adolescents in the highest level of exposure were about 2.7 times more likely to initiate smoking. This convergence across methods offers strong support that high exposure to R-rated movies that are known to portray smoking predicts likelihood of initiating smoking during early adolescence.

TELEVISION PRIVACY AND SMOKING

Our study used the American Academy of Pediatrics' guidelines to define indicators of at-risk television use during childhood and adolescence. In the bivariate analyses, adherence to each guideline was associated with a significantly lower likelihood of smoking, but only among white adolescents. Multivariate models revealed that television privacy had the strongest association with smoking onset (adjusted OR, 2.15; 95% CI, 1.16-3.98) and that television privacy remained a significant predictor of smoking

even after controlling for exposure to R-rated movies and other covariates (OR, 2.16; 95% CI, 1.20-3.89), suggesting that television viewing without parental oversight may be as important a risk factor for smoking initiation as R-rated-movie exposure, at least for white youth.

RACE DIFFERENCES IN MEDIA USE AND SMOKING

In our analyses, only the results for white adolescents were consistent with past research on movie exposure and smoking. Although we, like Sargent et al,²⁶ found that more black than white adolescents were in the highest level of R-rated-movie exposure (42% vs 23%, respectively), this exposure had no significant association with their likelihood of smoking. These results diverge strongly from those of Sargent et al,²⁶ who, based on their national study, concluded that “all US adolescents, regardless of race or place of residence, have a higher risk of smoking initiation as their exposure to movie smoking increases.” Moreover, because minority youth were exposed to significantly more movie smoking than white adolescents, Sargent et al²⁶ also concluded that “the population impact of the exposure may be even higher for these minority groups.” Our results clearly support an opposite conclusion.

These discrepant findings may be due to the different racial composition of the samples. In the study by Dalton et al,³⁰ 94% of the sample was white. In Sargent et al,²⁶ after weighting the data, 62% and 16% of the sample were white and black, respectively, which met the purpose of obtaining a nationally representative sample. The stratified sample used in the present study was 50% white and 50% black, which provides a stronger approach when race differences in media use and risk behaviors are of interest. A second point to consider is that in our study, smoking initiation was predicted by both movie exposure and television use for white adolescents, but neither movies nor television use predicted smoking behavior for black youth. The consistency of results across these 2 media support the conclusion that race differences occurred. Finally, in previous longitudinal research, we have found significant associations between amount of exposure to sexual content in media and likelihood of transition to sexual intercourse, but only among white adolescents.³⁶ Given these points, we conclude that the observed race difference in the association between media exposure and initiation of smoking is not an anomaly but a true race difference that merits interpretation and further investigation.

Transportation theory offers a plausible explanation of why the level of exposure to R-rated movies would predict smoking among white but not black adolescents.⁴¹⁻⁴³ This theory posits that the persuasive impact of a movie, book, or other narrative depends on the audience members' involvement in the narrative, that is, on the degree to which individuals focus on and respond emotionally to characters and events in the narrative. Involvement is highest if audience members identify with characters, either because they perceive the characters to be like themselves or because they wish to be like the characters. Media effect theorists have argued that such identification with characters is the key mechanism by which movies and other narratives can influence beliefs, attitudes, intentions, and behaviors.⁴¹⁻⁴³

Brown and Pardun³⁵ note that viewers' preference for characters who are similar to themselves in sex, age, or race begins in childhood and that identification with characters increases with viewers' age. Research has found that black adolescents have greater levels of identification with black rather than white characters,⁴⁴ and that black adolescent girls have strong preferences for black television programming and prefer characters who look like them.⁴⁵ Because the majority of contemporary screen actors are white, it follows that experiencing identification and subsequent involvement in the narratives of popular movies and television programs is less likely among black adolescents than among white. This lower likelihood of identification and involvement may protect black adolescents from responding cognitively or behaviorally to the content of movies and other media. Further research is needed to measure variation in identification and involvement in media by race, sex, and other audience attributes (eg, sensation seeking). This research will help us understand the capacity of audience attributes to modify media effects on health-related behaviors among youth.

STUDY LIMITATIONS

Although the results show clearly that white adolescents who watch R-rated movies and have televisions in their bedrooms are significantly more likely to smoke, we cannot explain why these associations occur. Indeed, the fact that our television-use variables—which did not specifically indicate variation in exposure to smoking portrayals—predicted smoking behavior in essentially the same manner as R-rated-movie exposure raises questions about whether it is media content per se that accounts for the observed association with smoking. It is possible that as yet unidentified antecedents account for both adolescent media use and adolescent smoking behavior. For example, early problem behaviors, unsafe neighborhood environments, or other risk factors for substance use could affect patterns of media use and likelihood of smoking during adolescence.⁴⁶

The study sample included only adolescents living in the southeastern United States and may not generalize to adolescents living elsewhere. It is also possible that some bias was introduced because the sample was drawn from public middle schools rather than all adolescents in the region.

CONCLUSIONS

The American Academy of Pediatrics recommends that parents prevent children from viewing movies intended for mature audiences and keep televisions out of children's bedrooms.^{33,34} At baseline, 68% of the 12- to 14-year-old participants in this study reported moderate or high exposure to R-rated movies, and 56% had televisions in their bedrooms. These indicators of risky media use were associated with significantly greater likelihood of smoking for white adolescents but not black adolescents. Pediatricians should make parents aware of the health risk consequences of unrestricted media use and provide tools that enable parents to manage the content and duration of their children's media exposure. Re-

search is needed to identify the antecedents of risky media use and to understand how audience attributes, including race and other factors, moderate the effects of risky media use on health-related behaviors.

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Correspondence: Christine Jackson, PhD, Pacific Institute for Research and Evaluation, Chapel Hill Center, 1516 E Franklin St, Suite 200, Chapel Hill, NC 27514-2812 (cjackson@pire.org).

Author Contributions: *Study concept and design:* Jackson. *Acquisition of data:* Brown and L'Engle. *Analysis and interpretation of data:* Jackson and L'Engle. *Drafting of the manuscript:* Jackson. *Critical revision of the manuscript for important intellectual content:* Brown and L'Engle. *Statistical analysis:* L'Engle. *Obtained funding:* Brown and L'Engle. *Administrative, technical, and material support:* Jackson and Brown.

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