

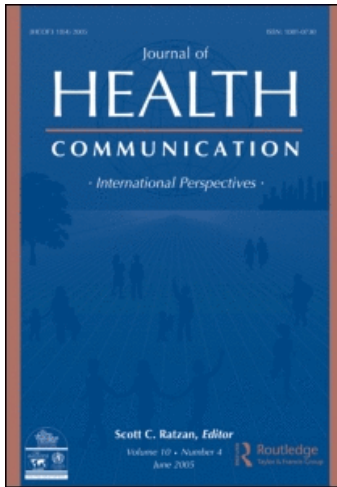
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### Associations Between Smoking and Media Literacy in College Students

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## Associations Between Smoking and Media Literacy in College Students

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*Organizations recommend media literacy to reduce tobacco use, and higher media literacy has been associated with lower smoking among high school students. The relationship between smoking media literacy and tobacco use, however, has not been systematically studied among college students. The purpose of this study was to determine the association between smoking and smoking media literacy among college students. We conducted the National College Health Assessment (NCHA) at a large, urban university, adding six items measuring smoking media literacy. A total of 657 students responded to this random sample e-mail survey. We used multiple logistic regression to determine independent associations between smoking media literacy items and current smoking. The media literacy scale was internally consistent ( $\alpha=0.79$ ). Of the respondents, 21.5% reported smoking cigarettes over the past 30 days. In a fully adjusted multivariate model, participants with medium media literacy had an odds ratio (OR) for current smoking of 0.45 (95% CI=0.29, 0.70), and those with high media literacy had an OR for current smoking of 0.38 (95% CI=0.20, 0.70). High smoking media literacy is independently associated with lower odds of smoking. Smoking media literacy may be a valuable construct to address in college populations.*

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## Introduction

Smoking remains the leading cause of preventable death and disease in the United States, causing more than 440,000 deaths per year (Mokdad, Marks, Stroup, & Gerberding, 2004) and costing over \$150 billion in direct and indirect costs annually (Centers for Disease Control and Prevention, 2002). It is known that certain media exposures—such as films (Dalton et al., 2003; Sargent et al., 2005) and promotions (Altman, Levine, Coeytaux, Slade, & Jaffe, 1996; DiFranza et al., 2006; Pierce, Choi, Gilpin, Farkas, & Berry, 1998; Wakefield, Flay, Nichter, & Giovino, 2003)—contribute significantly to adolescent smoking. Although one strategy would be to reduce exposure to media images of smoking (Glantz, 2002; Sargent et al., 2004; Sargent, Dalton, Heatherton, & Beach, 2003), this is not always feasible.

Another tactic available to public health advocates is to promote “media literacy,” often defined as the ability to understand, analyze, evaluate, and create media messages in a wide variety of forms (Aufderheide & Firestone, 1993; Bergsma et al., 2007; Buckingham, 2003; Thoman, 2003). Media literacy often is described as having three major theoretical domains expanded upon in Table 1: “Authors and Audiences,” “Messages and Meanings,” and “Representation and Reality.” Proponents of this smoking prevention strategy suggest that this educational technique may give adolescents the tools they need to “decode” prosmoking messages, making them less likely to accept these messages at face value. Therefore, organizations such as the American Academy of Pediatrics and the Office of National Drug Control Policy recommend the use of media literacy to reduce tobacco use (Committee on Public Education, 1999; Office of National Drug Control Policy, 2001).

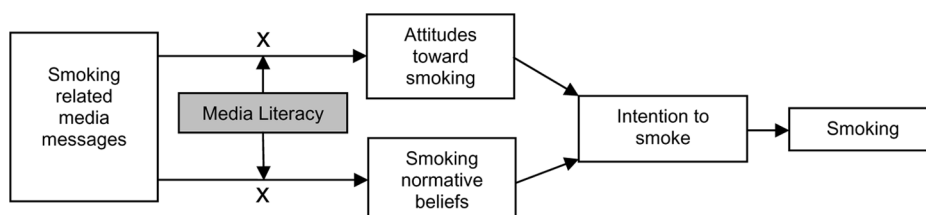
Health behavior theory also supports the use of media literacy to prevent harmful health behaviors such as smoking. The Theory of Reasoned Action (TRA) is a well-accepted, broadly applied theory of health behavior that has been used to predict a variety of health behaviors. It has, in particular, accurately predicted adolescent smoking (Ajzen & Fishbein, 1980; Faucher & Carter, 2001; Grube, Morgan, & McGree, 1986; McGahee, Kemp, & Tingen, 2000; O’Callaghan, Callan, & Baglioni, 1999; Unger, Rohrbach, Howard-Pitney, Ritt-Olson, & Mouttapa, 2001). According to the TRA, an individual’s behavior (such as smoking) is determined by his or her *intention* to perform the behavior, which is in turn predicted by his or her *attitude* toward the behavior and sense of *normative beliefs* regarding it (Ajzen & Fishbein, 1980). This model may be useful particularly with regard to media literacy programs because of the potential for media literacy to buffer the impact of mass media messages on attitudes and normative beliefs (Figure 1). With regard to attitudes, media literacy teaches analysis skills that help participants separate how products such as cigarettes are represented in media from their true effects. This may buffer the influence of those media messages on proproduct attitudes. Similarly, mass media producers often use techniques such as “bandwagoning,” testimonials, and targeted concentration to make certain habits and lifestyles seem more normal. Media literacy corrects these miscommunications by exposing the techniques used to make behaviors seem more normative and emphasizing the reality of the situation.

Studies support these theoretical relationships. The American Legacy Foundation’s “truth” campaign and the Florida “TRUTH” campaign are well-known programs that successfully reduced smoking among youth (Farrelly, Davis, Haviland,

**Table 1.** Media literacy core domains, essential core concepts, and tobacco-related measurement items

Core domains	Essential core concepts	Measurement items
Authors and Audiences	Authors of media messages often have financial and/or political motives.	To make money, tobacco companies would do anything they could get away with.
	Authors of media messages target specific audiences.	When designing an advertising campaign, tobacco companies think very carefully about their target markets.
Messages and Meanings	Media messages convey particular values and/or points-of-view.	Cigarette ads link smoking to natural things that humans want like love, good looks, and power.
	Producers carefully construct media messages.	When people make movies and TV shows with smoking in them, every camera shot is very carefully planned.
Representation and Reality	Media messages use multiple techniques to reframe and/or filter reality.	Most movies and TV shows that show people smoking make smoking look more attractive than it really is.
	Media messages omit important information.	When you see an advertisement for a tobacco product (such as cigarettes or cigars), it is important to think of what was <u>left out</u> of the advertisement.

Messeri, & Heaton, 2005; Sly, Heald, & Ray, 2001; Sly, Hopkins, Trapido, & Ray, 2001). Although they were not designed specifically as media literacy programs, they did incorporate principles of media literacy. For example, they aimed to expose the

**Figure 1.** Media literacy's potential ability to buffer the influences of smoking related media messages on smoking.

true motives of the tobacco industry and to deconstruct the manipulative promotion messages of the industry (Hicks, 2001).

Similarly, the Washington State Department of Health conducted a pilot study showing that media literacy improved variables related to smoking outcomes in both types of participants: those naïve to smoking as well as experienced smokers (Austin, Pinkleton, Hust, & Cohen, 2005; Pinkleton, Austin, Cohen, Miller, & Fitzgerald, 2007). Prior research also has demonstrated that smoking media literacy, as measured by a reliable, valid scale, was strongly and independently associated with both reduced adolescent smoking and reduced susceptibility to future smoking among high school students (Primack, Gold, Land, & Fine, 2006; Primack, Gold, Switzer, et al., 2006). This further suggests that smoking media literacy may indeed be a valuable construct to utilize to reduce tobacco use by younger adolescents.

The relationship between smoking media literacy and tobacco use, however, has not been systematically studied among U.S. college students. Although many young people become addicted to nicotine during the early adolescent years, the college years also are important regarding the development and maintenance of nicotine dependence (Moran, Wechsler, & Rigotti, 2004; Rigotti, Lee, & Wechsler, 2000; Wechsler, Rigotti, Gledhill-Hoyt, & Lee, 1998). This period of “emerging adulthood” is distinct developmentally from earlier adolescence in terms of identity formation and role exploration (Arnett, 2000), each of which is central to the uptake and maintenance of tobacco smoking (Amos, Gray, Currie, & Elton, 1997; Chang, 2007; MacFadyen, Amos, Hastings, & Parkes, 2003).

Recent nationally representative surveys show that one-fourth of all U.S. college students are current smokers (Moran et al., 2004), defined as having smoked at least once in the past 30 days (Marshall et al., 2006; Rigotti et al., 2000; Wechsler, Lee, & Rigotti, 2001; Wechsler et al., 1998). Media literacy with regard to smoking may be a valuable construct to address in college populations, since newfound independence from family can be associated with both new media exposures (Alloy Media and Marketing, 2006) and increased availability of tobacco (Johnston, O'Malley, Bachman, & Schulenberg, 2006; Ling & Glantz, 2002).

It will be important to determine if the relationships observed in high school students between smoking media literacy and tobacco use persist among college students. If they do, media literacy may represent an important opportunity for tobacco-related health promotion, since in prior studies it has been shown to be teachable, acceptable to adolescents, and effective in college students regarding other topics (Austin & Johnson, 1997; Coughlin & Kalodner, 2006; Hobbs, 2004; Pinkleton et al., 2007).

Additionally, it would be useful to determine the relationships between tobacco use and each of the various components of media literacy. This is because media literacy is a multifaceted construct (Bazalgette, 1992; Primack et al., 2006b; Thoman, 2003), some facets of which may be more important than others in terms of their potential relationship with smoking-related behavior among college students. For example, some believe that the “Authors and Audiences” components may be most valuable, and they therefore recommend that the emphasis of media literacy be placed on exposing the true nature and motives of the tobacco industry. Others, however, suggest that it is less important to vilify the industry and more important to teach deconstruction skills related to the “Messages and Meanings” underlying a given media message.

The purpose of this study was to determine whether smoking media literacy is independently associated with current smoking in college students, controlling for a comprehensive set of sociodemographic variables known to influence tobacco use (Aim 1). A secondary aim was to determine which of the particular core principles of media literacy are most strongly associated with current smoking among college students (Aim 2). A tertiary aim was to determine internal consistency of a brief media literacy scale among college students (Aim 3). Our a priori primary hypothesis was that our measure of smoking media literacy would be associated independently with current smoking among college students (Hypothesis 1). We also hypothesized that current smoking would be associated with at least one item representing each of the core domains of media (Hypothesis 2) and that the brief media literacy scale would be internally consistent (Hypothesis 3).

## Methods

### *Study Design and Context*

We conducted a cross-sectional survey of a random sample of students at a large urban university with approximately 16,000 undergraduate and 8,000 graduate students. The data for this study were collected via the web-based version of the American College Health Association's National College Health Assessment (ACHA-NCHA), ([ACHA], 2004), which is conducted each semester at selected institutions.

The ACHA-NCHA was developed in 2000 by the ACHA to provide their members with a tool to assist with needs assessment, program evaluation, and resource allocation. The ACHA-NCHA is a comprehensive student health survey collecting information across a wide variety of content areas including alcohol, tobacco, and other drug use; sexual health; weight, nutrition, and exercise; mental health, physical health, personal safety and violence; and impediments to academic performance. The base survey takes 20–30 minutes to complete. For a fee, participating institutions can include additional items of their own design. In addition to the standard items, we added six items addressing smoking media literacy.

With permission from the University Vice Provost, University Computing Services generated a list of the e-mail addresses and key demographic data for 3,600 randomly selected students. This number was selected based on both our power calculations and on guidance from the ACHA that, in their experience, response rates for e-mail surveys among university students are generally low (10%–30%). Deidentified demographic data on all students were available so that we could determine any differences between respondents and nonrespondents.

### *Procedures*

This study was approved as exempt by the university Institutional Review Board. The survey was administered during a 3-week period beginning April 9, 2007. We strategically selected this time period for two reasons. First, we wanted first-year students to have had completed at least one semester at college. Second, in order to reduce bias we wanted to avoid the 30-day period following spring break, which was March 5–9, since some survey items ask about risk-taking behavior (such as smoking) over the past 30 days.

Students were sent an invitation e-mail detailing the purpose and content of the survey and a link to the instrument. The invitation stated that the survey was anonymous and that participation was voluntary. To motivate student participation, respondents completing the survey were automatically enrolled in a lottery to win cash prizes ranging from \$25 to \$100. Three reminder e-mails were sent to all potential respondents during the 3-week period.

## *Measures*

### *Sociodemographics*

We collected demographic data including age in years, gender, self-reported race, and undergraduate vs. graduate status. We also asked about housing arrangement (on-campus vs. off-campus) and membership in a fraternity or sorority. Finally, students provided self-reported academic achievement with As, Bs, or Cs and below. We included each of these variables in our analyses since similar sociodemographic factors have been shown in other studies to be related to cigarette smoking (Marshall et al., 2006; Rigotti et al., 2000; Rigotti, Moran, & Wechsler, 2005; Wechsler et al., 2001).

### *Smoking Behavior and Beliefs*

The NCHA asks the following smoking behavior item: "Within the last 30 days, on how many days did you use cigarettes?" Possible response categories are "Never smoked," "Smoked but not in the past 30 days," "1–2 days," "3–5 days," "6–9 days," "10–19 days," "20–29 days," and "all 30 days." Our primary outcome was current smoking, a dichotomous variable that was coded as "1" if the students had smoked at least once in the past 30 days and "0" if they did not. We selected this definition of current smoking since it is preferred by the Centers for Disease Control for this population (National Center for Health Statistics, 2007).

Since normative beliefs have been shown to be related to smoking in adolescents (Primack, Switzer, & Dalton, 2007), it is appropriate that the NCHA asks, "Within the past 30 days, what percentage of students at your school used cigarettes?" Students respond with any number between 0 and 100. For purposes of analysis, we divided this continuous variable to a categorical variable by quartiles: those in quartile 1 felt smoking was uncommon and those in quartile 4 felt smoking was extremely common.

### *Media Literacy*

Media literacy is a multifaceted construct involving several core concepts related to the analysis and evaluation of media messages (Bazalgette, 1992; Bergsma et al., 2007; Thoman, 2003). Previous work relating media literacy specifically to smoking behavior has adapted various theoretical models into a comprehensive framework with three major domains: "Authors and Audiences," "Messages and Meanings," and "Representation and Reality" (Table 1); (Primack, Gold, Land, et al., 2006; Primack, Gold, Switzer, et al., 2006).

We previously have used theoretical grounding, item brainstorming and refinement, and factor analysis to develop a scale with reliability and validity for measurement of media literacy among high school students (Primack, Gold, Land, et al., 2006; Primack, Gold, Switzer, et al., 2006). Based on input from college students

and experts in education, public health, adolescent health, and psychometrics, we identified six items based on this previous scale representing each of the core concepts and domains of media literacy to use with college students in the current study (Table 1). We asked students to respond to each of these measurement items on a 4-point Likert scale from “strongly disagree” to “strongly agree.” We divided participants on each individual item into “high media literacy” and “low media literacy” groups. To be defined as having “high media literacy” with regard to a particular item, participants had to strongly agree with that statement.

We also computed a composite media literacy measure. For the composite media literacy scale ( $N = 6$  items), we computed the *average response* on a scale from 0 (strongly disagree) to 3 (strongly agree). Based on the items and the distribution of participant data, we developed a categorical composite media literacy variable with three levels (high, medium, and low). We defined “high media literacy” as a score of 3 (strong agreement with each item), “medium media literacy” as  $> 2$  and  $< 3$ , and “low media literacy” as  $\leq 2$ . According to this categorization, 30.6% ( $N = 201$ ) of the sample had low media literacy, 51.1% ( $N = 335$ ) had medium media literacy, and 18.3% ( $N = 120$ ) had high media literacy. The smoking media literacy scale was internally consistent ( $N = 6$  items, Cronbach’s  $\alpha = 0.79$ ).

### Analysis

We performed a descriptive analysis of the survey by computing the number of responses to each survey item and calculating the mean and standard deviation for age, the only continuous variable. We computed these figures in the total sample and among students who were and were not current smokers. We used chi-square tests for categorical variables and  $t$  tests for age to determine which covariates were significantly different between the two groups. We defined statistical significance as a two-sided  $\alpha$  of 0.05.

We used bivariate and multivariate logistic regression modeling to assess the association between current smoking and the media literacy items, both individually and as a complete scale. In order to obtain the most parsimonious models, our primary method of analysis was stepwise backward logistic regression, using criteria for removal from the model of  $p < 0.15$ . In order to determine the robustness of our results, however, we also conducted all analyses using all measured covariates (age, gender, race, student type, level of debt, living arrangement, fraternity/sorority membership, academic achievement, and impression of smoking popularity). Participants with missing data were not included in the analyses.

We used the complete media literacy scale as the outcome variable in two different ways. First, we used it as a categorical variable as described above (high, medium, and low media literacy). In order to test the robustness of our results, we also conducted this analysis with the total media literacy score (0–3) as a continuous variable.

### Results

Of the 3,539 potential respondents, 660 (18.6%) students completed the questionnaire. Since three of the 660 respondents did not respond to the outcome variable

(smoking in the past 30 days), 657 (99.5%) had evaluable data for this study. Age range was 18–26. Compared with nonrespondents, respondents were younger (20.9 vs. 21.4 years,  $p < .001$ ), more likely to be female (65.7% vs. 50.5%,  $p < .001$ ), and more likely to be Caucasian (85.6% vs. 80.7%,  $p = .004$ ).

Of the 657 college students who completed the questionnaire, 139 (21.2%) had smoked in the past 30 days (Table 2). Compared with nonsmokers, smokers were more likely to be undergraduate students (87.7% vs. 74.4%,  $p = .001$ ) and Caucasian (92.0% vs. 83.8%,  $p = .015$ ). There were no statistically significant relationships between smoking and residence, self-reported academic achievement, membership in a fraternity/sorority, or impression of what percentage of their peers use cigarettes (Table 2).

### Hypothesis 1

In our primary regression models (stepwise backward regression using criteria for removal of  $p < .15$ ), compared with the reference group (low media literacy), those with medium media literacy (defined as  $>2$  but  $<3$ ), had 55% lower odds of being current smokers (OR = 0.45, 95% CI = 0.29, 0.70), and those with high media literacy (strong agreement with all statements) had 62% lower odds of being current smokers (OR = 0.38, 95% CI = 0.20, 0.70). Thus, Hypothesis 1 was supported.

**Table 2.** Baseline characteristics of respondents by smoking status\*

Characteristic	Current smoker** N = 139	Nonsmoker** N = 518	Total sample N = 657	P value
Age, mean (SD)	20.9	20.9	20.9	0.87
Gender (female, %)	64.2	66.1	65.7	0.69
Race (Caucasian, %)	92.0	83.8	85.6	0.015
Undergraduate (%)	87.7	74.4	77.2	0.001
Lives on campus (%)	35.1	41.4	40.2	0.21
Member of fraternity/ sorority (%)	12.4	7.3	8.4	0.053
Grades (%)				
As	37.7	41.6	40.8	0.62
Bs	50.7	48.8	49.2	
Cs or below	11.6	9.5	10.0	
Impression of what percentage of peers use cigarettes				
Quartile 1 (lowest estimate)	26.8	33.9	32.4	0.27
Quartile 2	20.3	19.8	19.9	
Quartile 3	22.5	23.0	22.9	
Quartile 4 (highest estimate)	30.4	23.4	24.9	

\*Percentages do not always add to 100 due to rounding.

\*\*Smoked at least once in the past 30 days.

**Hypothesis 2**

Individual responses to five of the six media literacy items were significantly associated with reduced odds of smoking (Table 3). Items most strongly associated with lower smoking were “When you see an advertisement for a tobacco product, it is important to think of what was left out of the advertisement” (OR = 0.47, 95% CI = 0.31, 0.72) and “Cigarette ads link smoking to natural things that humans want

**Table 3.** Bivariate and multivariate associations between media literacy items and current smoking

	Item	OR (95% CI)* for current smoker, bivariate	OR (95% CI)* for current smoker, multivariate <sup>†</sup>
1	To make money, tobacco companies would do anything they could get away with.	0.75 (0.51, 1.09)	0.65 (0.44, 0.97) <sup>‡</sup>
2	When designing an advertising campaign, tobacco companies think very carefully about their target markets.	0.64 (0.43, 0.95) <sup>‡</sup>	0.60 (0.39, 0.91) <sup>‡</sup>
3	Cigarette ads link smoking to natural things that humans want like love, good looks, and power.	0.59 (0.40, 0.87) <sup>‡</sup>	0.51 (0.34, 0.78) <sup>‡</sup>
4	When people make movies and TV shows with smoking in them, every camera shot is very carefully planned.	0.71 (0.47, 1.07)	0.74 (0.48, 1.13)
5	Most movies and TV shows that show people smoking make smoking look more attractive than it really is.	0.55 (0.36, 0.84) <sup>‡</sup>	0.56 (0.36, 0.87) <sup>‡</sup>
6	When you see an advertisement for a tobacco product (such as cigarettes or cigars), it is important to think of what was <u>left out</u> of the advertisement.	0.51 (0.34, 0.76) <sup>‡</sup>	0.47 (0.31, 0.72) <sup>‡</sup>
	Total media literacy score, categorical <sup>§</sup>		
	Low ( <i>N</i> = 201, 30.6%)	1	1
	Medium ( <i>N</i> = 335, 51.1%)	0.50 (0.33, 0.75) <sup>‡</sup>	0.45 (0.29, 0.70) <sup>‡</sup>
	High ( <i>N</i> = 120, 18.3%)	0.39 (0.21, 0.70) <sup>‡</sup>	0.38 (0.20, 0.70) <sup>‡</sup>
	Total media literacy score, continuous	0.51 (0.35, 0.76) <sup>‡</sup>	0.49 (0.33, 0.75) <sup>‡</sup>

Abbreviations: OR = odds ratio; CI = confidence interval; SML = smoking media literacy.

\*Odds ratios are the odds of being a smoker for those who responded to survey items in a way that denotes high media literacy.

<sup>†</sup>Multivariate model was adjusted for age, gender, race, undergraduate status, living arrangement, fraternity/sorority membership, grades, and sense of social norms involving smoking.

<sup>‡</sup>*p* < 0.05.

<sup>§</sup>Low: SML ≤ 2; Medium: 2 < SML < 3; High: SML = 3.

like love, good looks, and power” (OR = 0.51, 95% CI = 0.34, 0.78). Only one item was not independently associated with smoking in this analysis (“When people make movies and TV shows with smoking in them, every camera shot is very carefully planned”; OR = 0.74, 95% CI = 0.48, 1.13). Although this one item was not associated with smoking, Hypothesis 2 nonetheless was supported; current smoking was associated with at least one item from each media literacy construct. In order to determine the robustness of our results, we also conducted all analyses using all covariates, and all results and levels of significance were similar.

### **Hypothesis 3**

The smoking media literacy scale was internally consistent ( $N = 6$  items, Cronbach’s  $\alpha = 0.79$ ). Thus, Hypothesis 3 was supported.

### **Discussion**

This study shows that, in a population drawn from a random sample of college students at a large urban university, higher smoking media literacy was, as expected, significantly associated with lower current smoking; this was true whether media literacy was treated as a categorical or a continuous variable (Hypothesis 1). Additionally, with only one exception, high scores on each of the items representing various facets of media literacy were individually associated with lower odds of current smoking (Hypothesis 2). Finally, this study shows that smoking media literacy among college students can be measured, using a scale with strong face validity and internal consistency reliability (Hypothesis 3).

These findings are consistent with prior data showing smoking media literacy to be strongly and independently associated with reduced smoking outcomes among high school students (Primack, Gold, Land, et al., 2006; Primack, Gold, Switzer, et al., 2006). This suggests that smoking media literacy may be a valuable construct to utilize with college-aged adolescents as well as with high school students. This is a valuable finding, since college is ripe with opportunities for intervention. Those conducting media-based campaigns may wish to integrate the information contained in these media literacy items. For instance, media-based campaigns may do well in continuing to expose the fact that the tobacco industry targets certain sociodemographic groups (item 2) and to highlight the ironic difference between reality and prosmoking media messages (item 6). Similarly, those conducting curricular or extracurricular programming relating to smoking may wish to address similar topics.

Although positive responses to all of the Author/Audience items were associated with lower smoking, their associations were not as strongly associated with smoking as were certain of the Messages/Meanings and Representation/Reality items (in particular, items 3 and 6). This is an important finding, since antismoking programs that include some media literacy tend to focus on the Authors/Audiences domain by emphasizing the power and motives of the tobacco industry (Farrelly et al., 2002; Hicks, 2001; Wakefield et al., 2005). This suggests that media literacy programming designed for this population, in order to be most effective, should go beyond discussion of the motives of the tobacco industry and delve more substantially into the various manipulative marketing techniques they use as well as the stark difference between representation of cigarettes in media and reality. The Legacy

truth campaign is an example of a media-based campaign that did incorporate these various elements.

Related to this, these findings suggest that merely inculcating negative attitudes toward the tobacco industry may not be enough to reduce youth smoking. The most strongly attitudinal statement of the six media literacy items was item 1 (“To make money, tobacco companies would do anything they could get away with”), but this was not the most strongly associated with smoking.

The only item not significantly related to the outcome was item 4 (“When people make movies and TV shows with smoking in them, every camera shot is very carefully planned”). It is unlikely that this is because the Messages/Meanings concepts are not important, especially since item 3, also representing this domain, was so strongly associated with the outcome (“Cigarette ads link smoking to natural things that humans want like love, good looks, and power”; OR = 0.51, 95% CI = 0.34, 0.78). It is more likely that item 4 was simply not specific enough regarding the *nature* of smoking-related messages.

The items in this scale may be valuable to future studies investigating the relationship between media literacy and smoking among older adolescents. They could be used, for example, to determine associations between this construct and other key variables relevant to college-aged youth. Additionally, this scale could be used to evaluate interventions related to smoking-related media literacy. This is particularly true since the scale is brief, has good face validity and internal consistency, and divides college-aged students into relatively even groups (low, medium, and high).

### *Limitations*

Although we sent students three follow-up reminder e-mails, our response rate was only 18.6%, increasing the potential for response bias. Response rates with college students, however, are generally in the 10%–30% for this type of survey (Gillman, Kim, Alder, & Durrant, 2006; Hayslett & Wildemuth, 2004; Morrell, Cohen, Bacchi, & West, 2005; Sax, Gilmartin, & Bryant, 2003; White, Jamieson-Drake, & Swartzwelder, 2002). Fortunately, we accurately predicted a relatively low response rate and had (1) powered our study appropriately and (2) ensured that demographic data on respondents and nonrespondents would be available. Those data showed that our respondents were more likely to be younger, Caucasian, and female. This bias is a known limitation of this type of research, since previous surveys of college students demonstrate that these students are more likely to respond (Pealer, Weiler, Pigg, Miller, & Dorman, 2001; Porter & Umbach, 2006; Porter & Whitcomb, 2005; Wechsler et al., 2002).

Another important limitation is that this study used cross-sectional data, so causality or temporal relationships cannot be inferred from the results, and future longitudinal research will be necessary to investigate these issues. These data, however, provide a crucial starting point for such studies. Finally, more studies will be necessary to more completely investigate psychometric properties of the scale. Although the scale’s strong theoretical basis lends it face validity, for instance, future studies should more carefully assess its construct and criterion validity. Similarly, testing with Cronbach’s alpha shows strong internal consistency reliability, but this study did not assess other types of reliability, including test–retest reliability.

## Conclusion

This study describes psychometric properties of a smoking media literacy scale for use in college-aged young adults and finds an independent association between smoking media literacy and smoking in this population. Although further study of the construct and criterion validity of the scale would be useful, this brief media literacy scale seems to have good face validity and internal consistency. Despite this study's limitations related to response rate and cross-sectional design, these results suggest important findings that will help guide future research and educational efforts related to reducing the massive levels of smoking on college campuses.

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