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The impact of email recruitment on our understanding of college smoking

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Abstract

Email recruitment is growing in popularity; however, this convenience sampling method may yield very different results from prior convenience sampling methods. Participants in the current study were 825 undergraduate students, 446 recruited through a campus wide email and 379 recruited through Introductory Psychology courses, who completed an online survey on smoking and health. Outcomes varied significantly by group. Introductory Psychology students reported higher smoker self-concept, more pros of smoking, and were more likely to view smoking as a method of negative affect reduction. The current study suggests that recruitment method can bias our understanding of smoking behaviors among college students.

Keywords

college students; smoking tobacco; survey methodology

Smoking is the single greatest cause of preventable mortality and morbidity in the United States, causing over 440,000 deaths and costing over \$75.5 billion in medical care each year (CDC, 2003). The prevalence of smoking in the college student population increased in the 1990's and is now higher than the prevalence in the general population of smokers (28.5% vs. 21%; CDC, 2007). This increase in prevalence is in stark contrast to the decline in the overall smoking rate seen in adults with a college degree (9.6%; CDC, 2007) and suggests that if current college students do not quit smoking, the prevalence rate among adults who smoke will increase in the future. Despite the high smoking rate, few empirically validated interventions exist for this population (Murphy-Hoefer, Alder, & Higbee, 2004; Patterson, Lerman, Kaufmann, Neuner, & Audrain-McGovern, 2004). In order to develop effective interventions we need to better understand the unique risk factors that drive smoking behavior among college students.

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With few exceptions (Emmons, Wechsler, Dowdall, & Abraham, 1998; Rigotti, Lee, & Wechsler, 2000; Rigotti, Moran, & Wechsler, 2005), the majority of studies examining psychosocial predictors of smoking behavior and the effectiveness of cessation interventions among college students have relied on small samples accrued using traditional convenience sampling techniques, such as advertising through campus newspapers, flyers, in-class announcements, and introductory psychology pools (Correia & Benson, 2006; Escoffery, McCormick, & Bateman, 2004; Freeman, Hennessy, & Marzullo, 2001; Hines, 1996; Hines, Fretz, & Nollen, 1998; Lipkus & Prokhorov, 2007; McChargue, Spring, Cook, & Neumann, 2004; Obermayer, Riley, Asif, & Jean-Mary, 2004; Waters, Harris, Hall, Nazir, & Waigandt, 2006; Wetter et al., 2004). With the widespread use of email and the internet, researchers are now using this technology across populations and areas of research (e.g., Clarke et al., 2005; Franklin, Rosenbaum, Carey, & Roizen, 2006; Parrott, Tennant, Olejnik, & Poudevigne, 2008; Robinson & Serfaty, 2008)). In particular, these techniques are growing in popularity for surveying and treating addictive behaviors among college students (e.g., Bendtsen, Johansson, & Akerlind, 2006; McAlaney & McMahon, 2007; Morrell, Cohen, Bacchi, & West, 2005; Saitz et al., 2007), perhaps due to the privacy it offers respondents who can complete the survey or intervention in their own home and the widespread computer access on college campuses. Yet, little is known regarding how samples recruited via email or on-line differ from samples recruited in more traditional ways. Addressing this research question can help guide future epidemiologic and intervention studies with college students, a sub-group of the population at particular risk for escalating rates of tobacco use. In the current study we examine how self-reports of smoking behavior, as well as the psychosocial variables proposed to mediate smoking behaviors, differ by recruitment method (introductory psychology pool vs. email).

Methods

Participants and Procedure

A sample of 825 undergraduate students age 18-24 was recruited at Clarkson University (a privately-funded university) from September 2006 to May 2007. Two groups of students were recruited. First, students enrolled in Introduction to Psychology courses were invited, through in-class announcements and postings, to participate in a survey of health and smoking behaviors for course credit. Second, the remaining undergraduate students campus-wide (age 18-24) were sent an email invitation to complete the survey for a \$10 gift voucher. All students had to complete at least 90% of the survey to receive their incentive. Participants in both groups gave informed consent electronically and completed the survey online at their leisure and the computer of their choice at home or school.

Obtaining consent electronically is becoming increasingly common and the approach used in this study is consistent with ethical guidelines that have been suggested for internet research (Anderson & Kanuka, 2003). All students, regardless of survey response, were provided with information on local and national resources for quitting smoking, including websites and toll-free quitlines. To examine whether participants in the campus-wide group were representative of all students, a random subsample of non-responders from the campus-wide group was contacted and asked to complete a 10-minute, abbreviated version of the survey over the phone. Recruitment language and survey descriptions were similar across the three groups sampled.

Measures

Smoking behaviors—Smoking status was assessed with the National Health Interview Survey (NHIS) criteria (i.e., “have you ever tried a cigarette,” “have you smoked 100 or more cigarettes in your lifetime,” and “do you now smoke cigarettes: every day, some days or not at all.” Current smokers also completed the Fagerstrom Test of Nicotine Dependence (FTND);

Heatherton, 1991), a 6-item, self-report measure of nicotine dependence that possesses satisfactory reliability ($\alpha = .64$).

Perceptions of smoking—Participants completed the following measures: Smoker self-concept ($\alpha = .97$) and abstainer self-concept ($\alpha = .87$) subscales of the 9-item Smoker Self-Concept Questionnaire (Shadel, Mermelstein, & Borrelli, 1996); the pro ($\alpha = .77$) and con ($\alpha = .71$) subscales of the 20-item Decisional Balance Scale (Velicer, DiClemente, Prochaska, & Brnadenburg, 1985); a 5-item knowledge scale ($\alpha = .65$) created for the present study to assess participants' awareness of the harmful health effects of tobacco use (e.g., Smoking can cause cancer); the 10 subscales of the 30-item Brief Smoking Consequences Questionnaire (SCQ; $\alpha = .75$ to $\alpha = .94$; Brandon & Baker, 1991).

Alcohol use—Participants reported the following for the previous 30 days: a) average number of days they drank alcoholic beverages, b) average number of drinks consumed on those days, and c) number of days on which they consumed five or more drinks.

Psychosocial Factors—Participants completed the Centers for Epidemiologic Studies – Depression scale ($\alpha = .91$; Radloff, 1977) as a measure of depressive symptomatology and negative emotionality, as opposed to a clinical diagnosis of depression.; the Trait scale of the Spielberger State/Trait Anxiety Inventory ($\alpha = .93$; Spielberger, 1970); and the 4-item Perceived Stress Scale ($\alpha = .78$; Cohen & Lichtenstein, 1990).

Analysis Plan

First, independent sample t-tests and chi-square analyses were used to compare the Introductory Psychology group and campus-wide group on demographics and smoking behaviors. Similar comparisons were made between the campus-wide responders and the subsample of non-responders. Second, multivariate analyses of covariance (MANCOVA) were used to examine differences between the Introductory Psychology group and the campus-wide group. Four sets of analyses were conducted, examining the following dependent variables: a) perceptions of smoking, b) consequences of smoking (10 subscales of the SCQ), c) alcohol use, and d) psychosocial factors. All MANCOVA analyses controlled for participants' age.

Results

Response Rate

The response rate in the Introductory Psychology group was 91% (382 of 419 students enrolled in the course). Among students campus-wide, 1948 students were eligible to participate. Fourteen of these students were unreachable by email (e.g., invalid email address) and 457 students responded to the survey, yielding a response rate of 24% (457 of 1934). Of the 839 students who responded to the survey across both mechanisms, two students were excluded because of age (i.e., older than 24) and twelve students were excluded because of random responding or incomplete data (i.e., <10% of the survey completed). Thus, the final sample of student responders across both mechanisms is 825.

Ninety-five percent of non-responders ($n = 1401$) had a listed phone number, of which we attempted to contact approximately 6% ($n = 84$). Fifty-seven non-responders (4% of those with available phone numbers) were successfully contacted and interviewed. Due to the high response rate among the Introductory Psychology students, a non-responder sample was not gathered from this group.

Demographic Data

Of the 825 participants in the current analyses, 68% were male and 32% were female. Participants were primarily Caucasian (91%), with an average age of 19.75 years ($SD = 1.33$, range = 18-24). Demographics of the sample reflect the overall school demographics. See Table 1 for additional demographic information, by recruiting group. Participants in the Introductory Psychology courses were generally younger ($t(823) = -10.64$, $p = .00$) and more likely to be freshmen or sophomores than the campus-wide students, $\chi^2(4, N = 825) = 119.49$, $p < .01$. Given the high correlation between participants' age and year in school (Spearman's $\rho = .88$, $p = .00$), only participants' age is controlled in subsequent comparisons between these two groups.

The subsample of non-responders was also compared to participants in the campus-wide group on available demographic data. Non-responders were generally older ($t(501) = -4.87$, $p = .00$), more likely to be male, $\chi^2(1, N = 502) = 8.55$, $p = .003$, and more likely to be upper classmen, $\chi^2(4, N = 503) = 19.16$, $p = .001$, than campus-wide responders.

Comparisons Between Introductory Psychology Class and Campus-Wide Samples

Participants in the two groups did not differ significantly in reports of whether they had ever tried a cigarette [$\chi^2(1, N = 824) = .23$, $p = .63$], were currently smoking [$\chi^2(1, N = 825) = .91$, $p = .34$], or had smoked at least 100 cigarettes in their lifetime [$\chi^2(2, N = 823) = .36$, $p = .84$]. Among students who were currently smoking, the groups did not differ significantly on nicotine dependence ($t(86) = .79$, $p = .43$). The two groups did, however, differ in their perceptions of cigarette smoking. The Introductory Psychology students reported higher smoker self-concept, more pros of smoking, and were more likely to view smoking as a method of negative affect reduction than the campus-wide students, even after controlling for participants' age (see Table 2). Thus, although smoking behaviors did not differ significantly between the two groups, Introductory Psychology students tended to have more positive perceptions of smoking. Introductory Psychology students also reported drinking more per day, on average, than campus-wide students, but this difference was not significant once participants' age was taken into account.

A number of psychosocial factors were also examined. Introductory Psychology students reported significantly higher levels of depressive symptoms, anxiety, and perceived stress than their campus-wide counterparts. While group differences in perceived stress were reduced to nonsignificance ($p > .05$) after controlling for participants' age, differences in depression and anxiety were reduced but remained statistically significant (see Table 2).

We also examined whether non-responders differed from the campus-wide responders in their smoking behaviors. Non-responders did not differ significantly in their reports of whether they had ever tried a cigarette [$\chi^2(1, N = 502) = .41$, $p = .52$], or had smoked at least 100 cigarettes in their lifetime [$\chi^2(2, N = 501) = 3.78$, $p = .15$], but non-responders were more likely to be current smokers than campus-wide survey responders [$\chi^2(1, N = 503) = 4.65$, $p = .03$].

Discussion

This study clearly demonstrates that email recruitment and more traditional recruitment methods yield different results. Specifically, two conclusions can be made from the current study. First, convenience samples differ from one another and may not be representative of all college smokers. We found that although students in an Introductory Psychology pool and students who responded to a campus-wide email recruitment smoked in similar amounts and patterns, perceptions regarding smoking, psychosocial variables (depression and anxiety), and co-morbid addictions (alcohol use) differed. Although effect sizes were relatively small based

on Cohen's classification criteria (i.e., .01 as small, .09 as medium, and .25 or greater as a large effect size; Cohen, 1977), these differences are still important to consider, as they may guide our ability to tailor interventions to subgroups of students and address these factors. More research is clearly needed to understand why students in the Introductory Psychology group had more positive perceptions regarding smoking, as this may cause them to be more reluctant to engage in smoking cessation efforts. Second, students who did not respond to the campus-wide email recruitment efforts, but did respond to a follow-up interview, were more likely to be smokers. This suggests that a subset of students who smoke may be unwilling to respond to email recruitment methods to participate in studies about smoking. This group may be especially hard to reach and are more likely to be overlooked in current interventions, making them worthy of more intensive outreach efforts. In sum, the current study shows that participant sampling can bias our understanding of smoking behaviors among college students. More research is needed to understand how and why smoking perceptions, psychosocial functioning, and co-morbid addictions impact smoking behavior among different groups of students.

The current study focused on the college population due to their universal use of email and internet technology. However, as the digital divide closes, email and internet research will continue to grow across all populations. The use of technology to assess addictive behaviors will also continue to expand, as it allows for increased privacy in reporting and frequent monitoring. Thus, further research is needed to understand the impact of email recruitment methods across all addictive behaviors and populations.

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Table 1

Demographic Data for Study Participants

Variable	Introductory Psychology Students				Campus-Wide Students				Non-Responders			
	Mean (SD)	Range	n	%	Mean (SD)	Range	n	%	Mean (SD)	Range	n	%
Age (years) ^{a,b}	19.25 (1.19)	18-24	379		20.18 (1.29)	18-24	446		21.07 (1.39)	18-24	57	
Sex ^b												
Male			262	69			298	67			49	86
Female			116	31			147	33			8	14
Ethnicity												
Caucasian			336	89			414	93			50	88
African American			10	3			5	1			2	3
Asian			13	3			8	2			1	2
Pacific Islander			1	<1			0	0			1	2
American Indian			5	1			6	1			1	2
Hispanic			9	2			9	2			2	3
Unspecified			5	1			5	1			0	0
Year in School ^{a,b}												
Freshmen			156	41			96	21			6	11
Sophomore			140	37			86	19			3	5
Junior			45	12			137	31			23	40
Senior			34	9			123	28			22	39
Senior+			4	1			4	1			3	5

Note. SD = Standard deviation

^a Indicates a significant difference between Introductory and campus-wide students;^b Indicates a significant difference between campus-wide students and non-responders.

Table 2
Multivariate Analyses of Variance Examining Differences Between Introductory Psychology and Campus-Wide Students (N = 825)

Dependent Variable	No Covariates					Participants' Age as Covariate				
	F (df)	p	η^2	n	Mean	F (df)	p	η^2	n	Mean ^b
Perceptions of Smoking:										
<i>Smoker self-concept^a</i>	5.85 (1, 737)	.02	.008			5.66 (1, 736)	.02	.008		
Introductory				355	6.57				355	6.59
Campus-Wide				384	5.67				384	5.65
<i>Abstainer self-concept</i>	.54 (1, 737)	.46	.001			.75 (1, 736)	.39	.001		
Introductory				355	36.43				355	36.37
Campus-Wide				384	36.85				384	36.90
<i>Pros (DBS)^a</i>	3.76 (1, 737)	.05	.005			5.04 (1, 736)	.03	.007		
Introductory				355	21.13				355	21.21
Campus-Wide				384	20.52				384	20.45
<i>Cons (DBS)</i>	.52 (1, 737)	.47	.001			.12 (1, 736)	.73	.000		
Introductory				355	32.31				355	32.36
Campus-Wide				384	32.51				384	32.46
<i>Knowledge^a</i>	1.16 (1, 737)	.28	.002			.90 (1, 736)	.34	.001		
Introductory				355	18.53				355	18.54
Campus-Wide				384	18.68				384	18.67
Consequences of Smoking:										
<i>Negative Physical Feelings (SCQ)</i>	.00 (1, 366)	.98	.00			.87 (1, 365)	.35	.002		
Introductory				167	4.07				167	4.24
Campus-Wide				201	4.07				201	3.93
<i>Negative Affect Reduction (SCQ)^a</i>	6.54 (1, 366)	.01	.018			6.47 (1, 365)	.01	.017		
Introductory				167	2.55				167	2.57
Campus-Wide				201	1.83				201	1.81
<i>Taste (SCQ)</i>	1.11 (1, 366)	.29	.003			.48 (1, 365)	.49	.001		
Introductory				167	2.17				167	2.13
Campus-Wide				201	1.90				201	1.94

Dependent Variable	No Covariates					Participants' Age as Covariate				
	F (df)	p	η^2	n	Mean	F (df)	p	η^2	n	Mean ^b
<i>Craving (SCQ)^a</i>	1.78 (1, 366)	.18	.005	167	2.20	4.32 (1, 365)	.04	.012	167	2.32
Introductory				167	2.20				167	2.32
Campus-Wide				201	1.87				201	1.77
<i>Boredom Reduction(SCQ)</i>	.47 (1, 366)	.49	.001	167	1.48	.66 (1, 365)	.42	.002	167	1.50
Introductory				167	1.48				167	1.50
Campus-Wide				201	1.32				201	1.30
<i>Stimulation (SCQ)^a</i>	3.78 (1, 366)	.05	.010	167	1.45	3.59 (1, 365)	.06	.010	167	1.46
Introductory				167	1.45				167	1.46
Campus-Wide				201	1.08				201	1.07
<i>Social Facilitation (SCQ)</i>	2.42 (1, 366)	.12	.007	167	1.46	2.52 (1, 365)	.11	.007	167	1.47
Introductory				167	1.46				167	1.47
Campus-Wide				201	1.15				201	1.14
<i>Negative Social Impression SCQ)</i>	.39 (1, 366)	.53	.001	167	5.23	.10 (1, 365)	.76	.000	167	5.28
Introductory				167	5.23				167	5.28
Campus-Wide				201	5.42				201	5.38
<i>Health Risk (SCQ)</i>	.50 (1, 366)	.48	.001	167	6.56	.02 (1, 365)	.88	.000	167	6.64
Introductory				167	6.56				167	6.64
Campus-Wide				201	6.75				201	6.68
<i>Weight Control (SCQ)</i>	.06 (1, 366)	.81	.000	167	1.21	1.02 (1, 365)	.31	.003	167	1.30
Introductory				167	1.21				167	1.30
Campus-Wide				201	1.16				201	1.08
Alcohol Use:										
<i>Average Days of Drinking</i>	1.91 (1, 655)	.17	.003	308	7.13	.37 (1, 654)	.54	.001	308	7.32
Introductory				308	7.13				308	7.32
Campus-Wide				349	7.81				349	7.64
<i>Average Drinks per day^a</i>	5.48 (1, 655)	.02	.008	308	5.84	1.29 (1, 654)	.26	.002	308	5.67
Introductory				308	5.84				308	5.67
Campus-Wide				349	5.20				349	5.34
<i>Days of 5+ drinks</i>	.76 (1, 655)	.38	.001	308		.46 (1, 654)	.50	.001	308	

Dependent Variable	No Covariates					Participants' Age as Covariate				
	F (df)	p	η^2	n	Mean	F (df)	p	η^2	n	Mean ^b
Introductory				308	4.47				308	4.45
Campus-Wide				349	4.16				349	4.18
Psychosocial Factors:										
<i>Depression (CES-D)</i> ^a	6.96 (1, 721)	.01	.010			3.82 (1, 720)	.05	.005		
Introductory				343	14.60				343	14.38
Campus-Wide				380	12.64				380	12.84
<i>Anxiety (STAI)</i> ^a	9.25 (1, 721)	.00	.013			4.71 (1, 720)	.03	.006		
Introductory				343	40.86				343	40.55
Campus-Wide				380	38.45				380	38.73
<i>Perceived Stress (PSS)</i> ^a	5.12 (1, 721)	.02	.007			1.25 (1, 720)	.26	.002		
Introductory				343	6.25				343	6.10
Campus-Wide				380	5.67				380	5.80

Note: The number of participants varies based on whether the measure was completed by all students or only those with smoking experience; DBS = Decisional Balance Scale; SCQ = Smoking Consequences Questionnaire; CES-D = Centers for Epidemiological Studies-Depression; STAI = Spielberger Trait Anxiety Inventory; PSS = Perceived Stress Scale.

^aIndicates a significant difference between Introductory and campus-wide students;

^bMeans were adjusted for participants' age.