Nicotine & Tobacco Research Volume 10, Number 6 (June 2008) 975–983

informa
healthcare

Associations between parental smoking restrictions and adolescent smoking

Joseph W. Ditre, James T. Coraggio, Thaddeus A. Herzog

Received 21 December 2006; accepted 4 June 2007

The purpose of this study was to examine the cross-sectional relation between reported levels of parental smoking restriction and several behavioral and cognitive variables in a sample of 757 (363 males, 394 females) adolescent smokers. Experimenters administered surveys to students in the homerooms of three Florida high schools. After controlling for student age, gender, and parental smoking status, results revealed that more restrictive parental smoking policies were significantly associated with less smoking on weekdays and weekend days, greater latency to smoking the first cigarette of the day, greater motivation to quit smoking, greater confidence in ability to quit smoking, and higher estimated risk perception regarding the health consequences of smoking. Results also revealed that 44% of adolescent smokers reported that their parents or legal guardians did not know that they smoked tobacco. These findings suggest that parental smoking restrictions may have the potential to impede adolescent progression to adult smoking behavior by reducing smoking rates and nicotine dependence, and increasing motivation to quit, self-confidence to quit, and health risk perception. Parental restrictions on smoking may present obstacles and inconveniences to adolescent smoking behavior that make smoking cessation a more attractive option.

Introduction

Adolescent cigarette smoking is a major public health problem that has become a priority among policy makers, researchers, and health professionals. Although adolescent smoking rates have dropped since the late 1990s, the decline has abated in recent years and future reductions in youth smoking are far from certain (Johnston, O'Malley, Bachman, & Schulenberg, 2005b). Currently, one-quarter of America's youth are classified as current (past 30-day) smokers by the time they complete high school (Johnston, O'Malley, Bachman, & Schulenberg, 2005a).

Most adolescent smoking intervention research has focused on the prevention of smoking, and many of these efforts have employed school-based or classroom-based approaches. Whereas early methods of smoking prevention focused on increasing students' knowledge about the harmful effects of smoking, they were not particularly effective in delaying the onset of smoking behavior (Thompson, 1978). Attention has since shifted to programs based on social-cognitive theory, which emphasize the role of social influences and the importance of teaching children to recognize and to counteract peer and media pressures (Flay, 1985; Sussman, 2001).

Although peer smoking is a consistent predictor of adolescent smoking (Conrad, Flay, & Hill, 1992; Derzon & Lipsey, 1999), researchers also acknowledge the unique social-cognitive influence of parental attitudes and behaviors (Baker, Brandon, & Chassin, 2004; Chassin, Presson, Pitts, & Sherman, 2000; Derzon & Lipsey, 1999; Sullivan & Kendler, 1999).

Among the various influences on child smoking, parental smoking itself appears to be the most obvious and direct. Indeed, parental smoking has been shown in numerous studies to be a significant correlate of child smoking (Bricker et al., 2003; Bricker, Leroux, Robyn Andersen, Rajan, &

Joseph W. Ditre, M.A., University of South Florida, Tampa, FL and Tobacco Research & Intervention Program, Moffitt Cancer Center, Tampa, FL; James T. Coraggio, M.Ed., University of South Florida, Tampa, FL; Thaddeus A. Herzog, Ph.D., Department of Community Medicine, West Virginia University, Morgantown, WV.

Correspondence: Joseph W. Ditre, M.A., University of South Florida, Tobacco Research & Intervention Program, Moffitt Cancer Center, 4115 E. Fowler Ave, Tampa, FL 33617, USA. Tel: +1 (813) 745-1751; Fax: +1 (813) 745-1755; E-mail: joseph.ditre@moffitt.org

ISSN 1462-2203 print/ISSN 1469-994X online

DOI: 10.1080/14622200802087549

Peterson, 2005; Chassin, Presson, Rose, Sherman, & Prost, 2002; Farkas, Distefan, Choi, Gilpin, & Pierce, 1999; Flay, Hu, & Richardson, 1998; Griffin, Botvin, Doyle, Diaz, & Epstein, 1999; Jackson & Henriksen, 1997; Murray, Kiryluk, & Swan, 1985; Patton et al., 1998). Far less attention, however, has been given to other mechanisms by which parents may influence their children's tobacco smoking. Parental influences can be usefully divided into two categories: general parenting style, and specific parenting practices (Darling & Steinberg, 1993). In terms of tobacco use, there is evidence that both parenting style (e.g., authoritative, authoritarian, autocratic, democratic, permissive, unengaged) and smoking-specific parenting practices (e.g., parental smoking restrictions) have unique effects on adolescent smoking (Chassin et al., 2005; Chassin, Presson, Todd, Rose, & Sherman, 1998). For example, authoritative parenting has been associated with reduced odds of current adolescent cigarette smoking (Castrucci & Gerlach, 2006) and lower rates of child smoking intention and behaviors (Jackson, Bee-Gates, & Henriksen, 1994). Conversely, permissive parenting has been associated with increased rates of child tobacco use (Cohen & Rice, 1997). Although interventions that focus on altering general parenting styles (e.g., education regarding the benefits of authoritative parenting) could prove fruitful, smoking-specific parenting practices (i.e., concrete behaviors defined by specific content and socialization goals) may be more amenable to intervention.

Recent research suggests that parents can engage in a variety of behaviors that influence their children's smoking (Chassin et al., 2002; Farkas, Distefan, et al., 1999). Smoking-specific parenting practices that are related to reduced smoking prevalence among adolescents include: expressed attitudes toward smoking (Andersen et al., 2002; Murray et al., 1985), discussion of smoking (Chassin et al., 2005; Chassin et al., 1998; Jackson & Henriksen, 1997), disapproval of smoking (Sargent & Dalton, 2001), punishment for smoking (Chassin et al., 1998; Jackson & Henriksen, 1997), and engaging in antismoking behaviors, such as asking to sit in nonsmoking sections in public establishments and asking smokers not to smoke in their presence (Andersen, Leroux, Bricker, Rajan, & Peterson, 2004; Bricker et al., 2005). The current study focuses on one smoking-specific parenting practice: the degree to which parents or legal guardians restrict adolescent cigarette smoking.

Although there is evidence of an association between smoking restrictions and adult smoking behavior (Farkas, Gilpin, Distefan, & Pierce, 1999; Gilpin, White, Farkas, & Pierce, 1999; Pierce, Gilpin, & Farkas, 1998), the effects of parental smoking restrictions on adolescent smoking is less clear. Of the few studies that have investigated the relationship between home or parental smoking restrictions and teenage tobacco use, only three, to our knowledge, have examined multiple levels of restriction (e.g., full ban, partial ban, no ban). These multi-level restriction investigations found that more restrictive home smoking policies were associated with a lower likelihood of trying smoking (Proescholdbell, Chassin, & MacKinnon, 2000), and reduced prevalence of current smoking among high school students (Farkas, Gilpin, White, & Pierce, 2000; Wakefield et al., 2000). Similarly, the results of other studies indicate that parental smoking restrictions were associated with reduced prevalence of daily smoking among 12th graders (Andersen et al., 2004; Bricker et al., 2005), and less smoking experimentation among elementary and middle school students (Henriksen & Jackson, 1998; Jackson & Henriksen, 1997). These findings were generally limited to nonsmoking families, with the exception of two studies that reported significant effects for parental smoking restrictions in both smoking and nonsmoking families (Bricker et al., 2005; Wakefield et al., 2000). One study, in contrast, found that restrictions on smoking in the home were not associated with a reduced prevalence of teen smoking, though it was suggested that this may have been due to inadequate sample size (Biener, Cullen, Di, & Hammond, 1997).

Given that more than 80% of adult smokers initiate smoking prior to age 18 (Henningfield & Jude, 1999), it is not surprising that research on parental smoking policy has focused almost exclusively on smoking prevention. There is, however, reason to believe that parental smoking restrictions may have significant effects on adolescents who are already smoking. For example, there is evidence that parental restrictions on smoking in the home can delay the progression of smoking behaviors among teens who are in the early phases of smoking acquisition (Wakefield et al., 2000). In fact, it has previously been suggested that temporary interruptions in youth smoking behavior may reduce adult tobacco use because intermittent smokers are less likely to progress to daily smoking in the future (Chassin, Presson, Sherman, & Edwards, 1990). Thus, by instituting bans or restrictions on smoking, parents, in effect, impose temporary interruptions in a child's smoking behavior. These interruptions, may, in some cases, be enough to obstruct the progression to full adult smoking.

Many authors have suggested stage schemes for the acquisition of smoking among children and adolescents (Mayhew, Flay, & Mott, 2000). Whereas the details of these schemes differ, all recognize that children and adolescents change their smoking behavior over time and that youths can be

usefully placed into different categories (e.g., experimenter, regular smoker). Implicit in these categories is the reality that many adolescent smokers do not resemble the typical adult smoker. Specifically, many are not daily, regular users, as are most adults. In fact, many teenage experimenters do not end up as long-term smokers (Robinson, Klesges, Zbikowski, & Glaser, 1997), and the interval between experimentation and addiction has been described as variable and protracted (Baugh, Hunter, Webber, & Berenson, 1982).

The progression from adolescent smoking experimentation to everyday adult tobacco use can be hastened by a number of factors, including an increased smoking rate, lowered motivation to quit, and lowered confidence in quitting. For example, children who smoke regularly, as opposed to not regularly, increase their likelihood of adult smoking by a factor of 16 (Chassin et al., 1990). Also, early quitting age and reduced rates of pre-quitting smoking have predicted cessation success (Ershler, Leventhal, Fleming, & Glynn, 1989). Therefore, any adolescent smoking intervention that can reduce the number of cigarettes smoked per day and increase motivation to quit, would be important to prevent the development of full, adult smoker status.

The purpose of this study was to examine the association between multiple levels of parental smoking restriction and several behavioral (smoking rate, time to first cigarette) and cognitive (motivation to quit, self-efficacy to quit, and health risk perception) variables in a large sample of adolescent smokers while controlling for several known covariates (parent smoking status, child gender, and child age). To our knowledge, all previous investigations have assessed smoking restrictions in relation to the binary outcome of adolescent smoking or nonsmoking, with the exception of Wakefield et al. (2000) who employed both a binary outcome and a 5-point scale of smoking uptake. An additional topic of interest is the extent to which parents are aware that their children are smokers. To our knowledge, only one published study has reported such data, indicating that only 39% of parents were aware that their child smoked cigarettes (Williams, McDermitt, Bertrand, & Davis, 2003). The issue of parental awareness of adolescent smoking is relevant to how parental restrictions are defined and classified. It is possible that many parents have no stated policy restricting or banning smoking, and yet there may be an implicit understanding between parent and child that smoking is prohibited. Further, children of parents who strongly disapprove of smoking may be more motivated to hide their smoking from their parents. Thus, it is possible that children who hide their smoking from their parents do so in response to a tacit understanding that smoking would be unacceptable. Children who hide their smoking from their parents are also likely to be more obstructed in their efforts to smoke. This is because hiding smoking from parents, in most cases, will involve significant restriction in time and location for smoking opportunities.

We hypothesized that more restrictive parental smoking policies would be associated with lower rates of daily smoking, extended time to first cigarette of the day, increased motivation to quit, enhanced confidence in quitting ability, and greater perception that smoking is harmful. Further, we hypothesized that parental unawareness of child smoking would be associated with the lowest smoking rates, and the highest levels of motivation to quit, self-confidence to quit, and health risk perception. This is because adolescents who actively hide their smoking from their parents are expected to be the most obstructed in their smoking behaviors, leading to fewer opportunities to smoke and less nicotine dependence.

Method

Participants and setting

Student surveys were conducted in three Florida high schools during the fall semester of 1999. Smokers and nonsmokers were eligible to take part in the survey, though only smokers were included in the current analyses. Smoker status was determined by whether or not a student had smoked at least one cigarette in the previous 30 days. This criterion for smoker status has been used in previous research with adolescents (Sussman, Dent, Severson, Burton, & Flay, 1998). There were 775 smokers according to this criterion, which comprised 19.6% of the total sample. Smokers were 52.8% female and had a mean age of 16.0 years (SD=1.2). The ethnic composition was 73.8% Caucasian, 20.7% Hispanic, 3.4% Black, and 2.1% other or unspecified. The distribution of grade-levels was 23.7%, 24.9%, 22.3% and 29.1% for grades 9, 10, 11, and 12, respectively. Finally, 52.5% of participants reported that one or both of their parents were smokers. Current analyses were limited to the 757 (97.6%) adolescent smokers for whom parental restrictions data was obtained (see Table 1 for demographic characteristics by level of parental smoking restriction).

Procedure

A total of 4,025 out of 6,021 eligible students (66.8%) completed surveys. Passive parental consent was employed, and the parents of 311 (5.2%) students elected to exclude their children from participation. The surveys of 67 students were excluded because of

Table 1. Demographic characteristics by level of parental smoking restriction.

	Level of parental smoking restriction											
	(a) Never (lowest level)		(b) Usually no		(c) Sometimes		(d) Yes, a lot		(e) Parents don't know I smoke		Total	
Demographic characteristic	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)
Gender*												
Male	52	(14.3)	36	(9.9)	33	(9.1)	107	(29.5)	135	(37.2)	363	(100.0)
Female	37	(9.4)	46	(11.7)	29	(7.4)	90	(22.8)	192	(48.7)	394	(100.0)
Grade*												
9	13	(7.3)	11	(6.1)	14	(7.8)	55	(30.7)	86	(48.0)	179	(100.0)
10	20	(10.8)	17	(9.1)	18	(9.7)	50	(26.9)	81	(43.5)	186	(100.0)
11	18	(10.6)	21	(12.3)	12	(7.1)	39	(22.9)	80	(47.1)	170	(100.0)
12	37	(16.9)	33	(15.1)	18	(8.2)	51	(23.3)	80	(36.5)	219	(100.0)
Ethnicity												
White/Caucasian	61	(11.1)	58	(10.5)	45	(8.2)	148	(26.9)	238	(43.3)	550	(100.0)
Other	14	(9.2)	18	(11.8)	11	(7.2)	34	(22.4)	75	(49.3)	152	(100.0)
Black	4	(16.0)	2	(8.0)	3	(12.0)	6	(24.0)	10	(40.0)	25	(100.0)
Asian American	3	(25.0)	2	(16.7)	2	(16.7)	4	(33.3)	1	(8.3)	12	(100.0)
Native American	2	(33.3)	1	(16.7)	0	(0.0)	2	(33.3)	1	(16.7)	6	(100.0)
Hispanic												
Yes	17	(10.9)	13	(8.3)	14	(9.0)	38	(24.4)	74	(47.4)	156	(100.0)
No	72	(12.0)	69	(11.5)	48	(8.0)	158	(26.4)	252	(42.1)	599	(100.0)
Parents Smoke?*												
Yes (one or both)	60	(15.3)	55	(14.0)	40	(10.2)	93	(23.7)	145	(36.9)	393	(100.0)
No (neither)	28	(7.9)	25	(7.0)	22	(6.2)	102	(28.7)	178	(50.1)	355	(100.0)

Note. *$p<.01$.

concerns about the integrity of survey responses (e.g., illogical or systematically-biased responses). Homeroom teachers administered surveys while the principal investigator provided instructions to students and homeroom teachers via intercom in some schools, and closed-circuit television in other schools. Students and homeroom teachers were informed that participation in the survey was entirely voluntary. Nonparticipation occurred for various reasons, including absenteeism, scheduling conflicts, and decisions by students or parents not to participate.

Measures

Parental smoking restrictions. Parental restrictions on cigarette smoking were measured by a single survey item: "Do your parents or legal guardians restrict your cigarette smoking (for example, do they not allow you to smoke cigarettes at certain times and/or in certain places)?" Response options included: (a) "My parents or legal guardians don't know that I smoke cigarettes," (b) "Yes, my parents or legal guardians restrict my smoking a lot," (c) "Sometimes my parents or legal guardians restrict my smoking," (d) "My parents or legal guardians usually do not restrict me," (e) "My parents or legal guardians never restrict my smoking."

Smoking rates. Cigarettes per day were measured by the following two multiple-choice items: "How many cigarettes do you smoke on a typical weekday (Monday–Friday)?" and "How many cigarettes do you smoke on a typical weekend day (Saturday–Sunday)?" Participants were given six response options for each question: 0, 1–5, 6–10, 11–15, 16–20, 21–25, or 26 or more. Mean cigarettes per day were calculated by using the midpoint of each response option (e.g., the "1–5" option was coded as three cigarettes per day). Participants indicating "26 or more" were coded as 26.

Time to first cigarette. The amount of time after waking up until smoking the first cigarette of the day was measured by a single survey item: "How soon after you wake up do you usually smoke your first cigarette?" Response options ranged from "Right away" to "Longer than 2 hours," with six intermediate response options.

The contemplation ladder. The contemplation ladder is an 11-point scale used to measure motivation to quit smoking. Verbal labels are attached to the two extremes and three intermediate rungs of the ladder, ranging from "No thought of quitting (Rung 0)" to "Taking action to quit (Rung 10)" at the extremes, and with "Think I should quit but not quite ready" as the midpoint (Rung 5). Participants circle the number on the ladder that best indicates where they are in terms of thinking about quitting. The contemplation ladder has good psychometric properties and discriminant validity (Biener & Abrams, 1991).

Confidence to quit smoking. Confidence to quit smoking was measured by a single item: "How confident are you that you will be able to quit smoking cigarettes in the next six months?" Response options ranged from "Not confident" to "Extremely confident," with three intermediate response options.

Perception of health risk. Beliefs regarding the health consequences of smoking were measured by a single survey item: "In your opinion, what effect does cigarette smoking have on a person's health?" Response options ranged from "Cigarette smoking is one of the most unhealthy things a person can do" to "Cigarette smoking is not unhealthy at all," with two intermediate response options.

Results

The following results are divided into three sections. First, we briefly discuss the frequency distribution of student responses to the survey item regarding parental restrictions on cigarette smoking. Next, we review significant demographic group differences across the five levels of parental smoking restriction. Finally, we present our primary analyses, which were designed to test the relationship between levels of parental smoking restriction and adolescent smoking-related behaviors and cognitions.

Frequency distribution of student-reported levels of parental smoking restriction

The first result of interest is the frequency distribution of student responses to the survey item assessing level of parental smoking restriction. As can be seen in Figure 1, the number of responses for each option ranged from 62 (parents sometimes restrict) to 327 (parents don't know I smoke). One conspicuous finding is the large percentage of students (43%) who reported "My parents or legal guardians don't know that I smoke cigarettes." Interestingly, the second most endorsed option (26%) was "Yes, my parents or legal guardians restrict my smoking a lot," which is the highest level of expressed, rather than tacit, parental restriction. Finally, only 12% of adolescents reported "My parents or legal guardians never restrict my smoking."

Demographic group differences across levels of parental smoking restriction

Nonparametric analyses were conducted to determine whether demographic group characteristics differed across levels of parental smoking restriction (see Table 1). Mann-Whitney *U* tests were conducted when comparing two independent samples (e.g., gender), and Kruskal-Wallis tests were conducted when comparing more than two independent samples

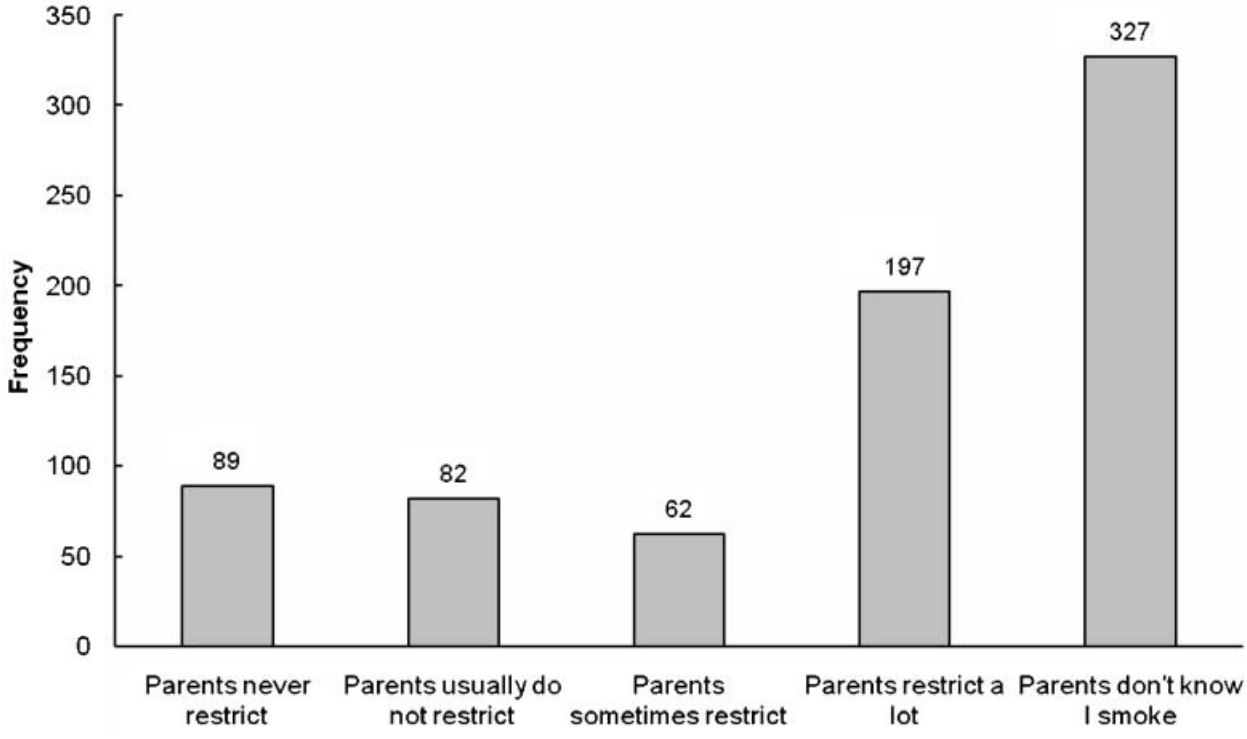

Figure 1. Frequency distribution of student responses to the survey item: "Do your parents or legal guardians restrict your cigarette smoking (for example, do they not allow you to smoke cigarettes at certain times and/or in certain places)?"

(e.g., grade level). A significant effect for gender emerged ($z=-2.86$, $p<.01$), such that female students reported greater levels of parental smoking restriction than did male students. We also found an overall effect for grade level, $\chi^2(3)=14.35$, $p<.01$. The pattern of results revealed that students in 9th grade reported the most stringent parental smoking policies, whereas students in 12th grade reported that their parents were the least restrictive. The degree of parental smoking restriction reported by students in grades 10 and 11 were approximately the same and fell between those reported by the 9th and 12th graders. No significant group differences were found for ethnicity or Hispanic status (both $p>.23$) across levels of parental smoking restriction. Finally, analysis revealed a significant effect for parental smoking status ($z=-4.95$, $p<.01$), indicating that children who live with nonsmoking parents reported greater levels of restricted smoking than did children who live in homes where one or both parents smoke.

Adolescent smoking-related variables across levels of parental smoking restriction

The independent variable for the purpose of the current analyses was student responses to the survey item regarding parental restrictions on cigarette smoking. Student responses to six survey items served as the dependent measures. The number of response options for each item ranged from four to eleven. Analyses of covariance (ANCOVAs) were selected to control for covariates (i.e., student age, student gender, and parental smoking status) across the five levels of parental smoking restriction. There were no substantial violations of the homogeneity or normality assumptions, and independence was addressed throughout the survey administration. Table 2 presents the means and standard deviations for each dependent measure by level of parental smoking restriction.

Self-reported smoking behaviour. Analysis of number of cigarettes smoked per day on weekdays ($M=8.1$; $SD=8.6$) revealed significant differences between two or more levels of the parental smoking restriction variable, $F(4, 734)=23.71$, $p<.01$. Table 2 illustrates that more stringent parental restrictions were associated with fewer cigarettes smoked per day on weekdays. A follow-up Tukey test procedure, conducted to examine pair-wise differences while simultaneously minimizing the likelihood of Type I errors, indicated significant differences for six of the ten possible pair-wise comparisons (see superscript notations in Table 2). Similarly, analysis of weekend day smoking rates ($M=9.5$; $SD=8.6$) revealed a main effect for level of parental restriction, $F(4, 735)=25.92$, $p<.01$, indicating that more restrictive parental smoking policies were associated with fewer cigarettes smoked per day on weekend days. Significant differences were found for six of the ten pair-wise comparisons. Finally, analysis of the amount of time (in minutes) until smoking the first cigarette of the day ($M=73.3$; $SD=47.5$) revealed significant differences between two or more levels of the parental smoking restriction variable, $F(4, 692)=26.86$, $p<.01$, with eight of the ten pair-wise comparisons revealing statistically significant differences. This finding indicates that the amount of time elapsed until smoking the first cigarette of the day increased in association with more restrictive parental smoking policies.

Self-reported smoking-related cognitive variables. Analysis of responses to an 11-point contemplation ladder ($M=6.1$; $SD=3.4$) revealed a main effect for parental restriction level, $F(4, 679)=10.40$, $p<.01$, indicating that more restrictive parental smoking policies were associated with higher levels of motivation to quit smoking. Follow-up tests revealed significant differences for eight of the ten possible pair-wise comparisons (see superscript notations in

Table 2. Means (standard deviations) for dependent measures by level of parental smoking restriction.

	Level of parental smoking restriction				
Measure	(a) Never (lowest level)	(b) Usually no	(c) Sometimes	(d) Yes, a lot	(e) Parents don't know I smoke
Cigarettes/day weekdays**	15.05 (8.79)^{cde}	12.19 (8.84)^{de}	9.90 (8.33)^{ae}	7.27 (8.42)^{ab}	5.39 (7.14)^{abc}
Cigarettes/day weekend days**	16.46 (8.16)^{cde}	14.51 (8.60)^{de}	11.25 (8.34)^{ae}	8.43 (8.15)^{ab}	6.64 (7.37)^{abc}
Time after waking (minutes)**	36.32 (40.5)^{cde}	49.42 (44.6)^{de}	55.76 (47.1)^{ade}	74.11 (45.6)^{abce}	92.72 (40.9)^{abcd}
Contemplation ladder**	4.05 (3.23)^{bcde}	5.08 (3.11)^{ade}	5.53 (3.01)^{ade}	6.54 (3.35)^{abc}	6.75 (3.31)^{abc}
Confidence in quitting (6 months)**	2.42 (1.52)^{bcde}	3.04 (1.44)^{ade}	3.16 (1.31)^{ade}	3.73 (1.40)^{abc}	3.94 (1.33)^{abc}
Perception of health risk*	3.03 (.92)^{e}	3.23 (.73)	3.28 (.64)	3.28 (.91)	3.40 (.77)^{a}

Note. Analysis of covariance was selected to control for student age, student gender, and parental smoking status. For contemplation ladder: 0=No thought of quitting, 10=Taking action to quit. For confidence in quitting (6 months): 1=Not confident, 3=Somewhat confident, 5=Extremely confident. For perception of health risk: 1=Smoking not unhealthy, 4=Smoking most unhealthy. Asterisks indicate significant differences between two or more levels of parental smoking restriction (*$p=.01$, **$p<.01$). Superscript letters indicate significant differences for pair-wise comparisons of parental smoking restriction level for each dependent measure ($p<.05$).

Table 2). A main effect of parental restriction level was also revealed for reports of confidence to quit smoking in the next 6 months ($M=3.5$; $SD=1.5$), $F(4, 726)=20.05$, $p<.01$, indicating that more stringent parental restrictions were associated with enhanced confidence in self-reported quitting ability. Significant differences were found for eight of the ten pair-wise comparisons. Finally, analysis of the perception of smoking as a health risk ($M=3.3$; $SD=0.8$) revealed significant differences between two or more levels of the parental smoking restriction variable, $F(4, 724)=3.33$, $p=.01$, indicating that more restrictive parental smoking policies were associated with greater adolescent perception that smoking is harmful. Significant differences were found for only one of the possible ten pair-wise comparisons.

Discussion

The identification of potentially modifiable risk factors for adolescent smoking acquisition is a prominent goal of contemporary smoking prevention research. Smoking-specific parenting practices may represent an important target for interventions that are designed to disrupt adolescent progression to adult tobacco use (Chassin et al., 2005; Wakefield et al., 2000). Clearly, there is a need to identify specific adolescent behaviors and cognitions that may be influenced by parental antismoking behaviors.

The current study is the first to examine the relation between multiple levels of parental smoking restrictions and several behavioral and cognitive variables among adolescents who are already smoking. Results indicated that, as hypothesized, more restrictive parental smoking policies were significantly associated with less smoking on weekdays and weekend days, longer time intervals prior to the first cigarette of the day, greater motivation to quit smoking, greater confidence in ability to quit smoking within the next 6 months, and higher estimated risk perception for smoking. Further, these results were obtained while controlling for parental smoking status, child gender, and child age. The significant pair-wise comparisons presented in Table 2 suggest that even subtle differences between levels of parental smoking restriction may have important effects on child smoking-related behaviors and cognitions. Indeed, only the variable related to child perception of health risk was not usefully differentiated across restriction levels (possibly because most adolescents will acknowledge that smoking is at least somewhat unhealthy).

These findings provide some preliminary evidence that parental restrictions on smoking may present obstacles and inconveniences that could have real effects on smoking behavior, and possibly make smoking cessation a more attractive option. These findings may also inform the development of future prospective studies or randomized trials that are necessary to determine more definitively the effects of parental smoking restrictions on child smoking. Future investigations may also benefit from examining the longitudinal and cross-sectional association between parenting style and smoking-specific parenting practices as they relate to adolescent smoking behaviors and cognitions. For example, considering the current results along with the previously reviewed associations between parenting style and child smoking, one might hypothesize more permissive parenting to be correlated with (or perhaps predict) lower levels of parental smoking restriction, with the potentially additive or synergistic effect of each contributing to greater adolescent smoking behavior and reduced motivation/confidence to quit.

We also hypothesized that parental unawareness of child smoking would be associated with the lowest smoking rates, and the highest levels of motivation to quit, self-confidence to quit, and health risk perception. This hypothesis was supported, suggesting that future investigations of parental smoking policies should not assume that parental bans on smoking exclusively represent the highest level of smoking restriction. Rather, our results suggest that some parents who are unaware that their children smoke may be, de facto, the most restrictive from the child's perspective. In other words, many parents may not explicitly state their smoking policy because the idea of smoking in their presence was never considered an option. Although post-hoc findings suggest that the parental smoking restriction variable allowed for ample differentiation among the five levels, future research would benefit from assessing parental awareness of child smoking and parental restrictions on smoking using separate scales. Indeed, there may be instances in which parents do not know the teen's smoking status, but still have explicit restrictions in place.

Another contribution of the current study was the assessment of the extent to which parents were unaware that their children are smokers. Results revealed that 43% of adolescent smokers reported that their parents or legal guardians did not know that they smoked cigarettes. This finding, while lower than the 61% reported by Williams et al. (2003), demonstrates that a substantial percentage of parents are unaware that their children smoke. However, it is important to consider that these results are from the adolescent's perspective, and are not necessarily accurate in all cases.

The present study has several important limitations. First, the use of cross-sectional data precludes us from making causal inferences as to the relationship between more restrictive parental smoking policies, reduced smoking behavior, and increased

quitting motivation and confidence. It is possible, for example, that increased rates of adolescent smoking may cause parents to ease their smoking restrictions. It is also important to note that factors beyond general and specific parenting practices (e.g., genetic influences, socioeconomic status and neighborhood effects) may influence these associations. Second, this investigation relied solely on adolescent reports of parental smoking restrictions. A recent analysis of problems in the classification of smoking restrictions in the home concluded that individuals in the household may hold different perceptions of parental smoking policy (Mumford, Levy, & Romano, 2004). Clearly, it would be ideal to obtain both parent and child reports of smoking policy. However, it is also important to consider that the child's understanding or interpretation of the parental smoking policy may have the greatest influence on his or her smoking-related behaviors and cognitions (Cohen & Rice, 1997). Third, given that children may under- or over-report their tobacco use, biochemical validation of smoking levels would be ideal. Fourth, students lost to absenteeism, scheduling conflicts, and integrity of survey responses may have influenced the representativeness of the current sample. Finally, this study does not address issues related to adolescents who live in more than one home (e.g., shared custody), in which parental policies may differ.

Acknowledgments

The authors thank Russell Callaghan and Amanda Heisserer for their assistance.

Declaration of interest: This study was supported by an American Cancer Society Institutional Grant ACS-IRG 032 to the University of South Florida and H. Lee Moffitt Cancer Center & Research Institute.

References

Andersen, M. R., Leroux, B. G., Bricker, J. B., Rajan, K. B., & Peterson, A. V., Jr. (2004). Antismoking parenting practices are associated with reduced rates of adolescent smoking. *Archives of Pediatrics and Adolescent Medicine*, *158*, 348–352.

Andersen, M. R., Leroux, B. G., Marek, P. M., Peterson, A. V., Jr., Kealey, K. A., & Bricker, J., et al. (2002). Mothers' attitudes and concerns about their children smoking: Do they influence kids? *Preventive Medicine*, *34*, 198–206.

Baker, T. B., Brandon, T. H., & Chassin, L. (2004). Motivational influences on cigarette smoking. *Annual Review of Psychology*, *55*, 463–491.

Baugh, J. G., Hunter, S. M., Webber, L. S., & Berenson, G. S. (1982). Development trends of first cigarette smoking experience of children: The Bogalusa heart study. *American Journal of Public Health*, *72*, 1161–1164.

Biener, L., & Abrams, D. B. (1991). The Contemplation Ladder: Validation of a measure of readiness to consider smoking cessation. *Health Psychology*, *10*, 360–365.

Biener, L., Cullen, D., Di, Z. X., & Hammond, S. K. (1997). Household smoking restrictions and adolescents' exposure to environmental tobacco smoke. *Preventive Medicine*, *26*, 358–363.

Bricker, J. B., Leroux, B. G., Peterson, A. V., Jr., Kealey, K. A., Sarason, I. G., & Andersen, M. R., et al. (2003). Nine-year prospective relationship between parental smoking cessation and children's daily smoking. *Addiction*, *98*, 585–593.

Bricker, J. B., Leroux, B. G., Robyn Andersen, M., Rajan, K. B., & Peterson, A. V., Jr. (2005). Parental smoking cessation and children's smoking: Mediation by antismoking actions. *Nicotine & Tobacco Research*, *7*, 501–509.

Castrucci, B. C., & Gerlach, K. K. (2006). Understanding the association between authoritative parenting and adolescent smoking. *Maternal and Child Health Journal*, *10*, 217–224.

Chassin, L., Presson, C., Rose, J., Sherman, S. J., & Prost, J. (2002). Parental smoking cessation and adolescent smoking. *Journal of Pediatric Psychology*, *27*, 485–496.

Chassin, L., Presson, C. C., Pitts, S. C., & Sherman, S. J. (2000). The natural history of cigarette smoking from adolescence to adulthood in a midwestern community sample: Multiple trajectories and their psychosocial correlates. *Health Psychology*, *19*, 223–231.

Chassin, L., Presson, C. C., Rose, J., Sherman, S. J., Davis, M. J., & Gonzalez, J. L. (2005). Parenting style and smoking-specific parenting practices as predictors of adolescent smoking onset. *Journal of Pediatric Psychology*, *30*, 333–344.

Chassin, L., Presson, C. C., Sherman, S. J., & Edwards, D. A. (1990). The natural history of cigarette smoking: Predicting young-adult smoking outcomes from adolescent smoking patterns. *Health Psychology*, *9*, 701–716.

Chassin, L., Presson, C. C., Todd, M., Rose, J. S., & Sherman, S. J. (1998). Maternal socialization of adolescent smoking: The intergenerational transmission of parenting and smoking. *Developmental Psychology*, *34*, 1189–1201.

Cohen, D. A., & Rice, J. (1997). Parenting styles, adolescent substance use, and academic achievement. *Journal of Drug Education*, *27*, 199–211.

Conrad, K. M., Flay, B. R., & Hill, D. (1992). Why children start smoking cigarettes: Predictors of onset. *British Journal of Addiction*, *87*, 1711–1724.

Darling, N., & Steinberg, L. (1993). Parenting style as a context: An integrative model. *Psychological Bulletin*, *113*, 487–496.

Derzon, J. H., & Lipsey, M. W. (1999). Predicting tobacco use to age 18: A synthesis of longitudinal research. *Addiction*, *94*, 995–1006.

Ershler, J., Leventhal, H., Fleming, R., & Glynn, K. (1989). The quitting experience for smokers in sixth through twelfth grades. *Addictive Behaviors*, *14*, 365–378.

Farkas, A. J., Distefan, J. M., Choi, W. S., Gilpin, E. A., & Pierce, J. P. (1999). Does parental smoking cessation discourage adolescent smoking? *Preventive Medicine*, *28*, 213–218.

Farkas, A. J., Gilpin, E. A., Distefan, J. M., & Pierce, J. P. (1999). The effects of household and workplace smoking restrictions on quitting behaviours. *Tobacco Control*, *8*, 261–265.

Farkas, A. J., Gilpin, E. A., White, M. M., & Pierce, J. P. (2000). Association between household and workplace smoking restrictions and adolescent smoking. *Journal of the American Medical Association*, *284*, 717–722.

Flay, B. R. (1985). Psychosocial approaches to smoking prevention: A review of findings. *Health Psychology*, *4*, 449–488.

Flay, B. R., Hu, F. B., & Richardson, J. (1998). Psychosocial predictors of different stages of cigarette smoking among high school students. *Preventive Medicine*, *27*, A9–18.

Gilpin, E. A., White, M. M., Farkas, A. J., & Pierce, J. P. (1999). Home smoking restrictions: Which smokers have them and how they are associated with smoking behavior. *Nicotine & Tobacco Research*, *1*, 153–162.

Griffin, K. W., Botvin, G. J., Doyle, M. M., Diaz, T., & Epstein, J. A. (1999). A six-year follow-up study of determinants of heavy cigarette smoking among high-school seniors. *Journal of Behavioral Medicine*, *22*, 271–284.

Henningfield, J. E., & Jude, N. R. (1999). Prevention of nicotine addiction: Neuropsychopharmacological issues. *Nicotine & Tobacco Research*, S41–48.

Henriksen, L., & Jackson, C. (1998). Anti-smoking socialization: Relationship to parents and child smoking status. *Health Communication*, *10*, 87–101.

Jackson, C., Bee-Gates, D. J., & Henriksen, L. (1994). Authoritative parenting, child competencies, and initiation of cigarette smoking. *Health Education Quarterly*, *21*, 103–116.

Jackson, C., & Henriksen, L. (1997). Do as I say: Parent smoking, antismoking socialization, and smoking onset among children. *Addictive Behaviors*, *22*, 107–114.

Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2005a). *Monitoring the Future national survey results on drug use,*

1975-2004. Volume I: Secondary school students (NIH Publication No. 05-5727). Bethesda, MD: National Institute on Drug Abuse.

Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2005b). *Monitoring the Future national results on adolescent drug use: Overview of key findings, 2004* (NIH Publication No. 05-5726). Bethesda, MD: National Institute on Drug Abuse.

Mayhew, K. P., Flay, B. R., & Mott, J. A. (2000). Stages in the development of adolescent smoking. *Drug and Alcohol Dependence*, *59*(Suppl. 1), S61–81.

Mumford, E. A., Levy, D. T., & Romano, E. O. (2004). Home smoking restrictions. Problems in classification. *American Journal of Preventive Medicine*, *27*, 126–131.

Murray, M., Kiryluk, S., & Swan, A. V. (1985). Relation between parents' and children's smoking behaviour and attitudes. *Journal of Epidemiology and Community Health*, *39*, 169–174.

Patton, G. C., Carlin, J. B., Coffey, C., Wolfe, R., Hibbert, M., & Bowes, G. (1998). The course of early smoking: A population-based cohort study over three years. *Addiction*, *93*, 1251–1260.

Pierce, J. P., Gilpin, E. A., & Farkas, A. J. (1998). Can strategies used by statewide tobacco control programs help smokers make progress in quitting? *Cancer Epidemiology, Biomarkers and Prevention*, *7*, 459–464.

Proescholdbell, R. J., Chassin, L., & MacKinnon, D. P. (2000). Home smoking restrictions and adolescent smoking. *Nicotine & Tobacco Research*, *2*, 159–167.

Robinson, L. A., Klesges, R. C., Zbikowski, S. M., & Glaser, R. (1997). Predictors of risk for different stages of adolescent smoking in a biracial sample. *Journal of Consulting and Clinical Psychology*, *65*, 653–662.

Sargent, J. D., & Dalton, M. (2001). Does parental disapproval of smoking prevent adolescents from becoming established smokers? *Pediatrics*, *108*, 1256–1262.

Sullivan, P. F., & Kendler, K. S. (1999). The genetic epidemiology of smoking. *Nicotine & Tobacco Research*, *1*(Suppl. 2), S51–57; discussion S69–70.

Sussman, S. (2001). School-based tobacco use prevention and cessation: Where are we going? *American Journal of Health Behavior*, *25*, 191–199.

Sussman, S., Dent, C. W., Severson, H., Burton, D., & Flay, B. R. (1998). Self-initiated quitting among adolescent smokers. *Preventive Medicine*, *27*, A19–28.

Thompson, E. L. (1978). Smoking education programs 1960–1976. *American Journal of Public Health*, *68*, 250–257.

Wakefield, M. A., Chaloupka, F. J., Kaufman, N. J., Orleans, C. T., Barker, D. C., & Ruel, E. E. (2000). Effect of restrictions on smoking at home, at school, and in public places on teenage smoking: Cross sectional study. *British Medical Journal*, *321*, 333–337.

Williams, R. J., McDermitt, D. R., Bertrand, L. D., & Davis, R. M. (2003). Parental awareness of adolescent substance use. *Addictive Behaviors*, *28*, 803–809.