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TIME SPENT WITH SMOKING PARENTS AND SMOKING TOPOGRAPHY IN ADOLESCENTS

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Abstract

Although the relationship between parental and adolescent smoking has been linked to health consequences of smoking, limited study has explored the specific association between exposure to smoking and adolescent smoking topography (the way a cigarette is smoked). As a first step in this line of enquiry, smoking topography measures were collected from 67 adolescent dependent smokers. Participants smoked one cigarette of their own brand while being monitored by a computer-based smoking-topography unit and completed questionnaires about their time spent daily with parents who smoke. Pearson's correlation analysis revealed that time spent daily with parents who smoke was significantly associated with maximum puff velocity ($r = 0.285, p = .019$), a parameter predicting later pulmonary morbidity. ANOVAs, after a median split, were consistent with correlation analyses. There was a significant group effect on puff velocity ($F(2,66) = 5.197, p = .008$); no significant relationship was found with puff volume ($F(2,66) = .617$) or puff duration ($F(2,66) = .776$). A post hoc Tukey HSD test indicated puff velocity was higher in the "high time spent" ($M = 54.37, SD = 12.03$) than in the "low time spent" group ($M = 45.59, SD = 9.91$) and in the group with non-smoking parents ($M = 44.96, SD = 10.17$). Future research with a larger non-treatment seeking sample of adolescents aimed at preventing tobacco smoking related diseases should further examine parental influences on adolescent smoking, including potential modeling effects.

Keywords

Tobacco; Adolescent; Nicotine; Smoking Topography

1. Introduction

Adverse health effects associated with cigarette consumption are well documented. Although the duration of smoking history and the number of cigarettes smoked daily play major roles in determining the severity of smoking-related morbidity, they do not act in isolation. Smoking topography also mediates negative health outcomes a smoker may experience. Greater maximum puff velocity has been linked to higher alveolar carbon monoxide concentrations (Burling, et al, 1983), risk of lung damage (Clark, et al, 1998), and mortality from lung cancer in women (Garfinkel & Stellman, 1988). Puff volumes also predict smokers' cessation

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treatment success and health outcomes (Rieben, 1992), even among youths (Franken, et al, 2006). Since most smokers initiate tobacco use during childhood and adolescence (Moolchan, Ernst and Henningfield, 2000), the plurality of sociobiological factors that influence adolescent smoking topography and its resultant health impact merit further investigation.

Parental smoking behavior has been linked to adolescent smoking prevalence (Griesler, Kandel, & Davies, 2002), smoking frequency (Wohlford, 1970), and persistence (Brook, et al, 1997). Some of the effects may be mediated genetically; heritability estimates are high for both smoking itself (Han, McGue, & Iacono, 1999) and for enzymatic processes relevant to nicotine metabolism and activation of pro-carcinogens (Pianezza, Sellers, & Tyndale, 1998). As a first step in a line of enquiry that include potential social influences on smoking topography, the present investigation examines the relationship between time spent daily with smoking parents and adolescent smoking topography. We hypothesized that greater time spent daily with smoking parents are associated with higher indices of puff topography and that this relationship is stronger in adolescents whose parents or guardians smoke in their presence.

2. Method

2.1 Participants

Participants were adolescent smokers (N=67; age 13–17) enrolled in a smoking-cessation trial at the Teen Tobacco Addiction Treatment Research Clinic, Baltimore, Maryland (see Table 1 for participant demographics). Inclusion in the cessation study required a six-month history of daily smoking (minimum of ten cigarettes per day) and a score of 5 or more on the Fagerström Test of Nicotine Dependence (FTND). The study was approved by the National Institute on Drug Abuse Institutional Review Board

2.2 Procedure

All measures included here were obtained prior to treatment randomization. Participants smoked a single cigarette of their own brand, *ad libitum*, through a plastic mouthpiece connected to a computer-based smoking-topography unit (Clinical Research Support System, Plowshare Technologies, Baltimore, MD) that calculated and stored data on puff volume, puff duration, and maximum puff velocity for each puff (Eissenberg, et al, 1999).

Participants provided demographic data, detailed smoking histories, and underwent medical and psychological screening. As part of the intake evaluation, participants completed questionnaires detailing current parental smoking and the amount of time spent daily with smoking parents. A specific question addressed whether each parent or guardian smoked while in the presence of the participant.

2.3 Data Analysis

Participants' topography measures were derived from six representative artifact-free puffs, as in previous reports (Franken et al. 2006). Puff velocity was correlated with CO boost from the topography session as a marker of constituent exposure.

Both parents and guardians will be referred to as "parents" hereafter. The time spent daily with parents was capped at 960 minutes: eight hours per day for each of two caretakers. Participants reporting estimates greater than 960 minutes per day were not included in the current analysis. Of sixty-seven participants, forty-seven had at least one smoking parent. Participants with non-smoking parents were included and assigned a score of zero minutes per day.

We conducted correlation analyses between three topography measures (puff volume, maximum puff velocity, and puff duration) and two constructs of time spent with smoking

parents (“total time spent daily with smoking parents”, “time spent daily with those parents who smoke in front of adolescent participants”). Because longer duration of smoking history might decrease smoking-related airway nociception (Rau, et al, 1993) and increase depth of inhalation (Hee, et al, 1995), the analyses were repeated controlling for adolescents’ years of daily smoking.

Because participants’ estimates of “time spent daily” with smoking parents might reflect gross estimates rather than careful calculations, we also conceptualized this variable as categorical and conducted one-way analyses of variance (ANOVA). The “total time spent daily” ANOVAs were performed comparing three groups: participants with non-smoking parents (n=21); the remaining participants were divided into two groups – “low time spent” (n=25) and “high time spent” (n=21) – by a median split at 300 minutes (5 hours) per day. The “time spent with parents who smoke in front of participants” ANOVAs compared three groups: a “no exposure group” (participants without smoking parents and participants with smoking parents who do not smoke in front of participants; n=24), and two groups – “low” (n=20) and “high” (n=23) – determined by a median split at 277 minutes per day.

3. Results

In our sample, puff velocity was significantly correlated with CO boost ($r = .255$, $p = .05$) denoting increased toxicant exposure with greater maximum puff velocity. Controlling for total number of puffs and average puff volume did not alter results.

3.1 Total time spent daily with smoking parents

A two-tailed Pearson correlation revealed that maximum puff velocity was significantly and positively correlated with the time spent daily with parents who smoke, ($r = 0.285$, $p = .019$). Neither puff volume ($r = 0.116$) nor puff duration ($r = -0.047$) was significantly correlated with “time spent daily” with smoking parents.

Results from ANOVAs were consistent with the correlational analyses. There was a significant group effect of “time spent” on puff velocity ($F(2,66) = 5.197$, $p = .008$); no significant relationship emerged with puff volume ($F(2,66) = .617$) or puff duration ($F(2,66) = .776$). A post hoc Tukey HSD test indicated that puff velocity was higher in the “high time spent daily” group ($M = 54.37$, $SD = 12.03$) compared to the “low time spent daily” group ($M = 45.59$, $SD = 9.91$) or in the group without smoking parents ($M = 44.96$, $SD = 10.17$). The “low time spent daily” group and the group without smoking parents did not differ significantly from one another (see Figure 1).

3.2 Time spent daily with parents who smoke in front of participants

When we repeated the correlational analyses with “time spent daily” with parents who smoked in front of their children” as an additional parental-influence variable, no correlation reached statistical significance ($r = 0.185$, $p = 0.137$). Controlling for years of daily smoking did not alter these results.

4. Discussion

Our results of our analysis indicate a positive relationship between the total time adolescents spend daily with their smoking parents and their maximum puff velocity. The effect sizes seen above are consistent with past estimates of parental influence on smoking behavior (Biglan, et al, 1995). Because our observation of puff velocity is related to CO boost (independently of any ETS effect), greater time spent with smoking parents would imply greater smoke exposure and thus toxicity for those adolescent smokers. The group spending greater than five hours per

day with smoking parents was at highest risk. Of interest, the time spent with parents who smoke in front of their teens – as such, a context for potential social-behavioral modeling – was not related to maximum puff velocity.

While preliminary, and limited to one of the many different influences on teen smoking, our results, coupled with evidence that parental smoking cessation is associated with lower rates of teen smoking (Chassin, et al, 2002) suggest that addressing the impact of parental smoking, and potentially modeling of smoking behavior, might yield additional preventive effects. A more family-based paradigm and focus on eliminating household smoking (Richards, et al, 2003) might further enhance teenage smokers' ability to quit.

Further research on how parental smoking, genetic factors, peer influences, and the effects of smoking bans might serve to strengthen adolescent smoking cessation programs.

The present analysis has limitations essentially linked to the measure of "time spent" which was self-reported, retrospective, and may reflect a broad estimation of the variable. A more accurate measure of quantity and nature of time spent with smoking parents would enhance precision.

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Figure 1.
Maximum Puff Velocity by Total Time Spent with Smoking Parents

Table 1

Sample Demographics (N=67).

Age (SD)	% Female	Years of Daily Smoking (SD)	% With Smoking Parent	Puff Velocity (mL/sec)	Puff Volume (mL)	Puff Duration (sec)
15.3 (1.3)	63	3.42 (1.66)	69	48.14	38.69	1.14

Table 2

Maximum Puff Velocity by Total Time Daily with Smoking Parents and Time with Parents who Smoke in Teens' Presence (N=67).

Total time with smoking parents		Time with parents smoke in front	
$r = 0.2950$	$p = .016$	$r = 0.185$	$p = 0.137$

* All scores are controlled for years of daily smoking