



Predictors of Increased Smoking per Day in Light Smokers

Thom Taylor, B.A.S., Theodore V. Cooper, Ph.D., Ashley A. Murray, B.A., Nora Y. Hernandez, B.S., Ernie Gonzalez, and Francisco Salgado, B.S.



The University of Texas at El Paso

Abstract

Limited information exists about the proximal predictors of light smoking fewer than 10 cigarettes per day (cpd). This study was part of a broader brief intervention targeting light smokers which also included an examination of the predictors of light smoking in 118 light smoking predominantly Hispanic/Latin American college students. Participants completed a 7 day Tobacco Consumption Diary (TCD) by recording each cigarette as well as the time, day, location, number of people present, number of smokers present, mood, and whether alcohol was consumed at the time of the recorded cigarette. Results suggest light smoking in a given day is most strongly associated with the alcohol, latter time of day, and a variety of locations. However, light smoking throughout the day was unassociated with a particular day of the week and the number of smokers present. Light smokers appear to be environmentally cue oriented in their smoking, though these cues are likely to be highly ideographic given the impact of time of day and the wide variability of each aspect of smoking assessed in the TCD. Flexible or tailored interventions are likely needed to aid light smokers.

Introduction

Light Smoking Influences
•Some of the most salient factors that affect college student smoking are the lack of signs of addiction, social smoking and drinking situations, and stress (Lenz, 2004).
Craving and Addiction.
•The urge to smoke may be considerably less in lighter smokers compared with heavier smokers (Sargent, Mott, & Stevens, 1998; Shiffman & Paty, 2006; Shiffman, Paty, Gnys, Kassel, & Elash, 1995; Sayette et al., 2001).
•Light smokers also exhibit less tolerance (Soresi, Catalano, Spatafora, Bonsignore, & Bellia, 2005) and fewer symptoms of withdrawal compared to heavier smokers (Shiffman, Paty, Kassel, Gnys, & Zettler-Segal, 1994).
•**Affect and Mood.**
•Light smokers' affective states appear to be less influenced by cigarette smoking relative to heavier smokers (Sayette, Martin, Wertz, Shiffman, & Perrott, 2001).
•Negative affect (Hoz et al., 2004), depressive symptoms (Patton et al., 1996; Zhu, Sun, Billings, Choi, & Malarcher, 1999) as well as anxiety (Patton et al., 1996) do appear to influence adolescents' and young adults' smoking patterns.
•Relative to heavier smokers, light smokers may smoke more as an indulgent activity (Shiffman & Paty, 2006) or when their moods are higher (Shiffman et al., 1994).
At-Risk Times and Places for Light Smoking.
•Light smokers appear to be particularly susceptible to smoking during the weekend (Colder et al., 2006; Murphy-Hoefer, Alder, & Higbee, 2004), when going out to bars and restaurants (Shiffman & Paty, 2006), and when relaxing (Shiffman & Paty, 2006; Shiffman et al., 1994).
•Light smokers tend to report that the last cigarette of the day is often the most difficult to give up (Shiffman et al., 1994).
•Light smokers also appear to react strongly to conditioned environmental cues to smoke (Lazev, Herzog, & Brandon, 1999).
Light Smoking and Alcohol Consumption.
•Specific to light smokers, consumption of alcohol influences smoking behavior (Krukowski et al., 2005; Shiffman & Paty, 2006).
•Even the mere presence of alcohol appears to trigger cravings in nicotine deprived smokers, and actual alcohol intoxication amplifies these cravings to smoke (Lazev et al., 1999; Sayette et al., 2005; Sayette, 2002).
Assessment of Light Smoking Behavior in Diary Format
•One useful method of assessment of health behaviors is a paper recording diary (Bolger, Davis, & Rafaeli, 2003).
•Diary methods work well for rare events (Bolger et al., 2003; Moghaddam & Ferguson, 2007), such as in the case of light smoking.

Aims & Hypotheses

- This study assessed self-monitoring over an extended period of time (7 consecutive days) in a light smoking college population in order to achieve a better understanding of the most strongly associated factors to light smoking.
- It was hypothesized that light smoking college students would smoke significantly more on the weekend days compared to weekdays.
- Smokers were hypothesized to smoke more in the evening.
- The presence of other smokers, the consumption of alcohol, and higher mood were all predicted to increase cpd on a given day.

Methods

Participants

- Participants (N = 118) were enrolled in psychology courses at the University of Texas at El Paso in which experimental or extra credit was offered.
- Students received experimental participation credit toward the final grade in their class in exchange for participation.
- Participants must have reported smoking at least 1 cigarette a week and no more than 10 cigarettes per day in order to participate.
- Participants must have reported that they were able to carry a pen or pencil to record smoking patterns during the week of participation.

Measures

•**Tobacco Consumption Diary (TCD).** The TCD is a 7 page paper diary designed to wrap around a cigarette carton wherein participants were asked to record time and place of cigarette smoking, number of people present, number of smokers present while smoking, and a Likert-scale mood rating. The TCD also provided a section in which to indicate if participant was consuming alcohol during time of cigarette.
•**The Fagerström Test of Nicotine Dependence (FTND).** The FTND assesses participants' degree of psychological dependence on nicotine. The FTND contains 6 items that are summed to produce a score ranging from 0 to 10 with an increase in scores indicating a higher level of dependence. Heatherton et al. (1991) reported that the FTND has an internal consistency of .61. In college aged smokers, the FTND has been shown to have a coefficient alpha of .67 (Haddock, Lando, Klesges, Talcott, & Renaud, 1999); among relatively lighter smokers (average of 12 cpd), Etter, Duc, and Perneger (1999) reported a coefficient alpha as being greater than .70 for the FTND. For this study, the baseline ($\alpha = .42$) and follow-up ($\alpha = .45$) reliabilities were low.

Procedure

- IRB approval was obtained for the study which entailed two sessions with each participant; an orientation/baseline session and a return session.
- After consent and measure completion, participants were instructed to begin record keeping for a 7 day period starting the day following their orientation session
- Participants returned acceptably completed TCD's at a follow-up time that was convenient for both the participant and the investigators, but not less than 7 days later.
- Recorded values in the TCD were compared to both expired CO readings and participants' estimates of how much they smoke each week reported prior to exposure to the TCD, if these values reasonably matched what was recorded, the TCD was considered acceptably completed.

Approach to Analyses

- All TCD variables were collapsed within day and within participant with the dependent variable representing the sum of cpd smoked within a given day.
- Independent predictors were categories representing time of day, location, the day of the week, alcohol consumption, number of people present, number of smokers present, and an overall mood rating for that day when smoking.
- CPD was zero-truncated and best fit by a negative binomial regression.
- Cluster adjusted standard errors were computed to account for nesting of day of cpd within persons.

Results

- Demographic characteristics of participants (N = 118) and TCDs (N = 575 days) can be seen in Tables 1 and 2.
- Table 3 presents the full model estimated, $Wald \chi^2(22) = 461.36, p < .001$, predicting cpd based on TCD variables and controlling for gender and baseline FTND score. This model adequately addressed over-dispersion, $\chi^2(1) = .17, p > .34$, in the count distribution of the daily cpd smoked.
- Predictors of increased cpd in light smokers:
 - The presence of alcohol, $IRR = 1.45, p < .01$.
 - All times of day categories were significant including: 6am to 12pm, $IRR = 1.58, p < .01$; 12:01pm to 5pm, $IRR = 1.52, p < .01$; 5:01pm to 10pm, $IRR = 1.83, p < .01$; and 10:01pm to 4:59pm, $IRR = 1.83, p < .01$.
 - Six locations assessed in the TCD were significant predictors of cpd including: the house or apartment, $IRR = 1.30, p < .01$; at school, $IRR = 1.15, p < .05$; in the car, $IRR = 1.20, p < .05$; at a bar or club, $IRR = 1.19, p < .05$; at a restaurant, $IRR = 1.23, p < .01$; and at a party, $IRR = 1.27, p < .05$.

Table 1: Participant Characteristics (N = 118)

Categorical Demographics	% of Sample		
Gender			
Male	46		
Female	54		
Ethnicity			
Hispanic/Mexican American	65		
Mexican National	15		
Non-Hispanic White	17		
Other	3		
Self-Report Smoking Status			
Non-Smoker	4		
Social	46		
Light	24		
Regular	24		
Heavy Smoker	2		
Continuous Variables	M	SD	Med.
Age	19.57	2.52	19
FTND	0.92	1.02	1
TCD total cigs. recorded	18.30	16.85	12
CPD	2.93	2.52	3

Table 2: TCD Recording Behavior (N = 575 Days)

Categorical Variables	N	%
Day of the Week		
Monday	75	13
Tuesday	78	13
Wednesday	85	15
Thursday	91	16
Friday	93	16
Saturday	95	17
Sunday	58	10
Count Variables ^a	Median	Range
Time Period		
5am to 11:59pm	0	0 - 10
12:00pm to 4:59pm	0	0 - 7
5pm to 9:59pm	1	0 - 6
10pm to 4:59am	0	0 - 13
Location		
House or Apartment	0	0 - 16
School	0	0 - 8
Car	0	0 - 9
Bar or Club	0	0 - 10
Restaurant	0	0 - 4
Work	0	0 - 3
Party	0	0 - 8
Other	0	0 - 17
Drinking Alcohol	0	0 - 17
No. of People Present ^b	2	0 - 25
No. of Smokers Present ^b	1	0 - 10
Mood ^b	5	1 - 7
^a Count of Cigarettes Recorded		
^b Median for cpd recorded each day		

Table 3: Predicting light smokers' cigarettes smoked per day

Predictor	IRR	S.E.	p
Demographics			
Gender (Female)	.89	.06	.10
Baseline FTND	1.04	.03	.23
Potential Triggers			
Alcohol Present	1.45	.11	.01
Persons Present	.85	.09	.14
Smokers Present	1.15	.10	.10
Median Mood	1.01	.03	.66
Day of the Week			
Tuesday	1.06	.06	.28
Wednesday	.92	.05	.09
Thursday	1.03	.06	.66
Friday	1.01	.05	.88
Saturday	1.01	.07	.88
Sunday	1.06	.07	.38
Time of Day			
6am to 12pm	1.58	.11	.01
12:01pm to 5pm	1.52	.12	.01
5:01pm to 10pm	1.83	.19	.01
10:01pm to 4:59am	1.83	.14	.01
Location			
House or Apartment	1.30	.10	.01
School	1.15	.08	.04
Car	1.20	.09	.02
Bar or Club	1.19	.08	.02
Restaurant	1.23	.09	.01
Work	.94	.07	.40
Party	1.27	.13	.02

Discussion

Findings Consistent with Past Research

- Light smokers tended to smoke more often after 5:00pm, and particularly after 10:00pm.
 - Given the low levels of nicotine dependence and limited early morning smoking, light smokers seem to escalate their smoking throughout the day, perhaps due to largely environmental cues.
 - Light smokers may benefit from treatment examining the triggers to smoke that are present at night versus the rest of the day, or conversely, which prohibitive factors (e.g., a non-smoking workplace) may not be present at later times of the day.
- Consistencies between previous literature and the present study were also encountered with regard to smoking locations including the home (Shiffman & Paty, 2006; Shiffman et al., 2002), and a bar or restaurant (Shiffman & Paty, 2006; Shiffman et al., 2004; Shiffman et al., 2002).
 - The locations assessed and influential to increased light smoking suggest a largely ideographic set of location triggers.
 - Tailored and flexible interventions are likely needed to accommodate this potentially large set of triggers.
- Alcohol consumption was strongly associated with increased smoking per day.
 - Consistent with past studies on light smoking (Flay, Hu, & Richardson, 1998; Krukowski et al., 2005; Sayette et al., 2005; Shiffman & Paty, 2006).
 - The effect of alcohol would suggest that intervention considerations that address alcohol as a trigger to smoke are necessary for efficacious intervention.

Findings Contrary to Past Research

- The present study suggests light smokers do not smoke more frequently on the weekends than any other day of the week.
 - Day of the week may be less influential to smoking than the situations that occur more frequently during the weekend for light smokers.
 - Interventions could be tailored to these aspects of smoking behavior rather than to day of the week.
- Mood was unrelated to smoking which is discrepant with previous ecological studies (e.g., Aronson et al., 2008; Shiffman et al., 2007)
 - Mood in this study was collapsed across day of the week perhaps thereby reflecting overall affect or disposition rather than moment to moment mood changes.
 - Assessments of light smokers and interventions may do well to consider more momentary states of mood and craving than to mood over the course of longer periods of time.
 - Alternatively, mood may be associated with unique settings and activities as well as other internal emotions which may serve as cues to light smokers both for mood change and desire to smoke.
 - Internal and external cues may possibly mediate both:
 - an immediate desire/craving to smoke for light smokers.
 - an immediate change in mood.
- The number of people and the number of smokers present were not influential in predicting amount smoked per day which is inconsistent with past studies (e.g., Flay et al., 1998; Krukowski et al., 2005; Shiffman et al., 2004; Shiffman & Paty, 2006).
 - The presence of others may be more qualitative, with the relationship of those around the light smoker having more impact on the likelihood of smoking than the number of other smokers around.
 - Possible interactions between qualitative status of other smokers around (e.g., friend versus other) and the amount of other smokers present may also warrant consideration in stimulating a desire to smoke in light smokers.
 - The social smoker label that many lighter smokers may give themselves may not be entirely accurate.

Limitations and Future Directions

- Ecological validity of paper diaries must always be considered.
 - Electronic time/date stamps are not possible with paper diaries.
 - Concurrent validity was assessed with timeline follow-back reports and self report of smoking status in the present study, prior to introduction to the TCD recording task.
 - Under-reporting may have occurred, though a large number of participants recorded more than 10 cigarettes per day on some days, suggesting they were attentive to recording.
- Future work with longitudinal assessment of light smokers might use a more open-ended response format to capture the unique environments in which light smokers may feel tempted to smoke.

Conclusions

- Light smokers appear to be environmental cue dependent smokers.
- Triggers to smoke may be largely unique to the individual smoker, necessitating flexibility in intervention strategies or tailoring to the individual light smoker.
- The "social smoker" label may possibly be questioned given the association of many environmental cues to smoke and increased light smoking, but no association between other smokers or people present and increased light smoking each day.

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