

## Original Investigation

# Movie smoking and urge to smoke among adult smokers

James D. Sargent, Matthias Morgenstern, Barbara Isensee, & Reiner Hanewinkel

## Abstract

**Introduction:** Few studies have assessed the association between exposure to movie smoking and urge to smoke under real-world conditions.

**Methods:** We conducted exit interviews with 4,073 movie patrons, of whom 2,817 were aged 18 years or older. Some 536 were smokers and had complete data. Subjects had exited 26 movies, of which 12 contained smoking. We used least squares regression to assess the association between exposure to movie smoking and urge to smoke (scale range 0–10), controlling for movie rating, age, sex, heaviness of smoking index (HSI, range 0–6), and time since last cigarette smoked.

**Results:** Median age was 27 years and 52% were female. Median urge to smoke level at movie exit was 7. The dose–response between higher categories of movie smoking and median urge to smoke was one point for two lower categories (1–11 and 11–54 s) and two for the highest category ( $\geq 55$  s), but these differences were not statistically significant. In the multivariate analysis, attendance of a movie with smoking was associated with a 0.81-point increase (95% CI = 0.46–1.16) in urge to smoke. For comparison, an HSI score of 3 (vs. 0) was associated with a 2-point increase in urge to smoke.

**Discussion:** In this sample of adult smokers, exposure to movie smoking was associated with higher urge to smoke after the movie, independent of movie rating. The effect size was consistent with responses seen in cue reactivity experiments. Exposure to movie smoking may affect urge to smoke among adult smokers.

## Introduction

Movie watching is an international leisure time activity, and movies offer salient visual images which, combined with audio tracks, provide a potentially powerful stimulus for behaviors. There has been much research examining the association be-

tween seeing smoking in movies and smoking onset, such that the National Cancer Institute (2008) now recognizes movie smoking as a cause of adolescent smoking initiation. However, little is known about whether exposure to movie smoking affects urge to smoke or smoking intensity among adult smokers.

Cue reactivity research has identified a number of visual and other sensory stimuli that reliably elicit strong subjective urges to smoke (Carter & Tiffany, 1999), including smoking scripts (Shadel et al., 1998), other imagery (Tiffany & Drobles, 1990), virtual reality simulations (Baumann & Sayette, 2006), and videos of smoking depictions (Tong, Bovbjerg, & Erblich, 2007). Compared with a static visual image of a cigarette, a movie with smoking could offer a highly salient cue to induce craving. Interestingly, proximate effects of movies on smoking behavior have previously not been studied in the setting where movies are actually watched (i.e., in the theater) but were analyzed only in laboratory settings. The one exception we are aware of did not focus on urge to smoke but on attitudes toward smoking in the movies (Edwards, Harris, Cook, Bedford, & Zuo, 2004; Edwards, Oakes, & Bull, 2007).

The present observational study surveyed adult smokers as they were leaving the movie theater over a 4-week period, capturing exit surveys from smokers leaving 26 movies, in order to test the hypothesis that the presence of smoking in the movie is associated with higher urge to smoke.

## Methods

### Study design and procedure

In a cross-sectional observational study that took place at a large movie theater, exit questionnaires were completed for 4,073 movie patrons during a 4-week study period in November 2008. In this period, all movies except movies starting at about 11 p.m. were considered. During the period, 47,916 subjects attended the theater, so surveys were completed by 8.5% of the entire audience. A booth advertised the study in the hall outside the theaters. Research assistants actively recruited participants as they exited movies by distributing illuminated clipboards with the questionnaire

James D. Sargent, M.D., Dartmouth Medical School, Cancer Control Research Program, Norris Cotton Cancer Center, Lebanon, NH

Matthias Morgenstern, Ph.D., Institute for Therapy and Health Research, IFT-Nord, Kiel, Germany

Barbara Isensee, Ph.D., Institute for Therapy and Health Research, IFT-Nord, Kiel, Germany

Reiner Hanewinkel, Ph.D., Institute for Therapy and Health Research, IFT-Nord, Kiel, Germany

### Corresponding Author:

Reiner Hanewinkel, Ph.D., Institute for Therapy and Health Research, IFT-Nord, Harmsstrasse 2, 24114 Kiel, Germany. Telephone: +49-431-5702920; Fax: +49-431-5702929; E-mail: hanewinkel@ift-nord.de

doi: 10.1093/ntr/ntp097

Advance Access publication on June 19, 2009

Received February 4, 2009; accepted April 9, 2009

© The Author 2009. Published by Oxford University Press on behalf of the Society for Research on Nicotine and Tobacco.

All rights reserved. For permissions, please e-mail: journals.permissions@oxfordjournals.org

on them to as many patrons as possible without any given indicator of selection (at least two assistants during the afternoon to up to six assistants in the evening). Participants were asked to complete a short questionnaire after which they were allowed to participate in a lottery for a theater voucher. The questionnaires were anonymous, so the study was considered exempt from a human subject standpoint. The study was described as a “study on movies” without any mention of smoking or health. Information on rate of persons not agreeing to participate was not collected. Ethical approval was obtained from the Ethical Committee of the Medical Faculty of the University of Kiel (Reference: D 416/08).

### Outcome measure and control variables

Smoking subjects were selected on the answer to the item, “You are a smoker/nonsmoker/ex-smoker?” We assessed urge to smoke or craving with a single item, “How much do you want to smoke a cigarette now?”, giving them an 11-point response scale that ranged from 0 to 10. Level of addiction was determined using the heaviness of smoking index (HSI; range 0–6; Heatherton, Kozlowski, Frecker, Rickert, & Robinson, 1989). In addition, we assessed how long before entering the theater the subject had smoked his or her last cigarette with the question “When did you smoke your last cigarette before entering the theater?” (5, 6–30, 31–60, more than 60 min). Further questions referred to the movie the subject attended, having noticed smoking in the movie, opinion on smoking in that movie, and on smoking in general.

Subjects had exited 26 movies; research assistants attended each movie with a timer and clocked the duration of any appearance of smoking on screen. Twelve of the movies contained smoking. Movie rating was added as a covariate in order to exclude the possibility that subjects were responding to violence or another aspect of more adult-oriented films besides smoking. The German film rating system, called the Freiwillige Selbstkontrolle der Filmwirtschaft (Voluntary Self-Control of the Film Business: FSK) system, rates films mainly on violent content; the film categories have some overlap with Motion Picture Association of America categories (Hanewinkel, Morgenstern, Tanski, & Sargent, 2008). The categories indicate the age below which children will not be admitted to the movie; the categories are: FSK 0, FSK 6, FSK 12, FSK 16, and FSK 18.

### Statistical analysis

Urge to smoke was modeled using a least squares regression in Stata 9.0. Age was entered as a continuous variable, and categories for the rest were entered as dummy variables. We controlled for other factors that we thought could predict urge to smoke and movie choice. First, we included movie as a random effect in the model to control for individual characteristics that might be associated with movie choice (intraclass correlation for movie was small, 0.014). We entered the following covariates as fixed effects: age (in years), sex, HSI, time since last cigarette, and German movie rating. Results are reported for unadjusted (crude) and adjusted beta estimates, with two-tailed 95% CIs determined using the “cluster” option to adjust SEs for intragroup correlation at the movie level.

## Results

### Characteristics of the participants

Some 2,817 of the participants were aged 18 years or older, 585 were smokers, and 536 had complete data for all study variables.

Median age was 26 years (interquartile range, 21–39) and 52% were female. Thirty-eight percent of the participants smoked less than half a pack per day and 13% smoked a pack or more per day; HSI score was 2 or below in 60%.

### Description of movie smoking and evaluation of dose–response

Length of smoking scenes for the 12 movies with smoking ranged from 1 to 3,259 s; two movies with large viewership (one was “Bond”) each contained 50 s of smoking. Considering this, dose of smoking was parsed into 3 categories, 1–11 (37 subjects), 11–54 (184 subjects), and  $\geq 55$  s (73 subjects). We examined the relation between the three categories of on-screen smoking and urge to smoke (Figure 1) and found that the median increased from 6 for smokers seeing no smoking to 7 for movies with 1–11 or 11–54 s of smoking and 8 for movies with  $\geq 55$  s of smoking. But when we assessed for a dose–response in a bivariate regression model, the estimates for each higher category of dose were not significantly different from each other. Thus, we modeled exposure to movie smoking as presence versus absence of movie smoking.

### Association between movie smoking and urge to smoke

Figure 2 illustrates the crude association between presence of movie smoking and craving, with the box plots showing median and interquartile range for urge to smoke by movie smoking and FSK rating. There is no figure for FSK 6 movies because none of them contained smoking. Within each rating category, the presence of movie smoking was associated with a 1- to 2-point increase in median levels for urge to smoke. The figure suggests that there is a main effect of the presence of movie smoking on urge to smoke, regardless of FSK movie rating.

### Multivariate analysis

The results for the main effects multivariate analysis are shown in Table 1. With the exception of FSK rating category, which was not significantly associated with urge to smoke, there was a statistically significant crude association with smoking for all the variables including sex, for which females had significantly

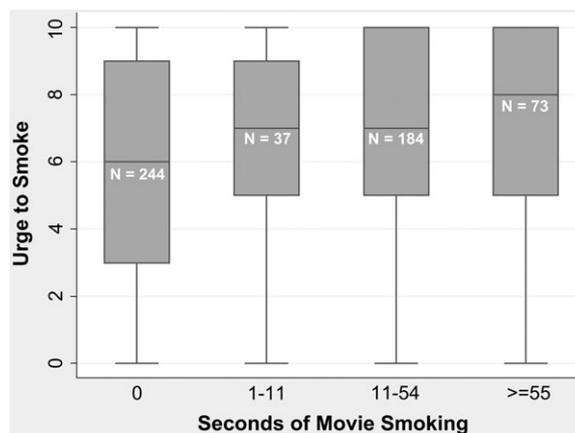
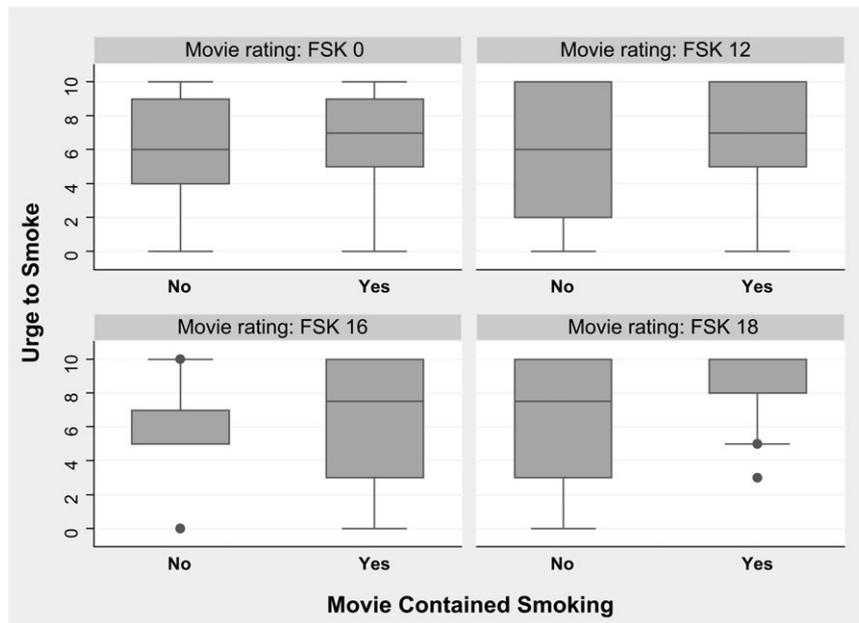


Figure 1. Box plots showing median and interquartile range for urge to smoke for smokers exposed to no movie smoking versus three “doses” of movie smoking.

## Movie smoking and urge to smoke among adult smokers



**Figure 2.** Box plots showing median and interquartile range for urge to smoke by whether or not the movie contained smoking and FSK rating (FSK rating notes the age below which children will not be admitted to the movie).

lower urge to smoke. In the multivariate analysis, sex was no longer statistically significant. All else being equal, the presence of movie smoking was associated with a statistically significant 0.81-point increase in urge to smoke score. Higher age was associated with less urge to smoke, and both HSI score and time since last cigarette were associated with urge to smoke. To benchmark the size of the movie smoking association, an HSI score of 3 (vs. 0) was associated with a 2-point increase in urge to smoke.

## Discussion

This study shows that smokers attending movies that depict smoking have higher urge to smoke when leaving the movie. The magnitude of the effect, about 10% on an urge to smoke scale, is similar to the effects demonstrated by experimental studies in which craving response to smoking images was compared with response to neutral images (Tiffany, Carter, & Singleton, 2000). For example, in a recent study of the effect of video images on craving, Tong et al. (2007) found that average craving scores for smokers viewing smoking images were 49.5 (on a 100-point craving scale), compared with 39.2 for those viewing neutral images. Although there are other aspects of movies that might be responsible for the finding, because we controlled for movie rating, we suggest that the most likely explanation is that smokers responded to visual cues to smoke.

The major strength of this study lies in the fact that it measured the reactions of smokers to the exposure of movie smoking delivered by a set of very different movies under naturalistic conditions in real theaters. Because this was not an experimental study, we cannot be certain that craving response attributed herein to movie smoking is actually caused by something con-

tained in the movie. There is the alternative possibility that movie patrons self-select, such that smokers more sensitive to cues choose the same movie. The intraclass correlation for movies in this study (.014) would suggest that this type of self-selection bias is not a big problem; nevertheless, we adjusted the SEs for this type of self-selection and found that, if anything, the SEs for the estimates decreased. Alternatively, moviegoers could be responding to some other movie element correlated with movie smoking—for example, sexual and alcohol content—that could prompt urge to smoke. To address this, we controlled for movie rating, which in Germany would be considered an adequate control for movie violence but is not a good marker for other types of depictions (Hanewinkel et al., 2008). Given the strength and consistency of cue reactivity experiments that show visual smoking cues prompt higher urge to smoke, we feel the most likely movie element prompting increased craving is the presence of smoking.

We found no statistical evidence to support a dose-response between higher levels of timed movie smoking and craving. It is possible that a single smoking depiction increases exit levels of craving as much as several depictions, such that presence of the depiction is more important than dose. However, the distribution of attendance for movies in this sample somewhat limited our ability to assess for a dose-response because many of the participants attended 2 movies with 50 s of movie smoking. Thus, the conclusion that there is no dose-response bears replication in a larger and more diverse sample of movies with smoking.

In summary, this study suggests that viewing smoking images in movies prompts higher urge to smoke among smokers in a naturalistic setting, a finding consistent with a large body of cue reactivity research. One avenue for future research might be to add a movie diary to a study of smoking cessation to

**Table 1. Association between movie smoking and urge to smoke**

Variable	N	Beta coefficient		95% CI <sup>a</sup>
		Crude	Adjusted	
<i>Categorical variables</i>				
Movie smoking				
No	242	Reference	Reference	
Yes	294	0.75	0.81	0.46–1.16
Sex				
Male	257	Reference	Reference	
Female	279	–0.04	0.01	–0.3 to 0.319
Heaviness of smoking index				
Zero	155	Reference	Reference	
One	82	2.26	1.32	0.50–2.15
Two	82	3.18	1.92	1.31–2.54
Three	100	3.39	1.99	1.09–2.88
Four	67	3.69	2.21	1.65–2.77
Five	36	4.73	3.28	2.23–4.34
Six	14	5.01	3.33	2.43–4.23
Last cigarette before entering theater				
5 min or less	137	Reference		
6–30 min	82	2.88	1.91	1.18–2.64
31–60 min	200	3.44	2.10	1.44–2.76
More than 60 min	117	4.61	2.87	1.97–3.77
German movie rating				
FSK 0	111	Reference	Reference	
FSK 6	78	0.21	–0.19	–0.75 to 0.38
FSK 12	280	0.35	–0.35	–0.80 to 0.09
FSK 16	23	0.86	–0.85	–1.56 to –0.14
FSK 18	44	0.57	0.61	–0.37 to 1.58
<i>Continuous variables</i>				
Age (in years)	M (SD)			
	30 (11)	–0.05	–0.04	–0.06 to –0.02

Note. The least squares regression has movie entered as a random effect,  $F(14, 25) = 107, R^2 = .37$ .

<sup>a</sup>For the adjusted beta coefficient.

determine if movie smoking cues have a large enough effect on urge to smoke that they are implicated in relapse.

## Funding

The study was funded by the Ministry of Health of the Federal Republic of Germany. The contributions of Dr. Sargent were supported by CA77026, National Institutes of Health, and IFT-Nord.

## Declaration of Interests

None declared.

## Acknowledgments

We would like to acknowledge the work of Lars Grabbe, Andreas Böhm, Meike Dalhoff, Sven Heid, Antje Hesse, Katrin Jeguschke, Detlef Kraut, Wiebke Pustal, Gesa Sander, and Janine Tefsmann, who were key in the implementation of the study. We thank CinemaxX, Kiel Germany, especially Jan-Per Sellmer for allowing us to conduct the study there and logistical support.

## References

- Baumann, S. B., & Sayette, M. A. (2006). Smoking cues in a virtual world provoke craving in cigarette smokers. *Psychology of Addictive Behaviors, 20*, 484–489.
- Carter, B. L., & Tiffany, S. T. (1999). Meta-analysis of cue-reactivity in addiction research. *Addiction, 94*, 327–340.
- Edwards, C., Oakes, W., & Bull, D. (2007). Out of the smoke-screen II: Will an advertisement targeting the tobacco industry affect young people's perception of smoking in movies and their intention to smoke? *Tobacco Control, 16*, 177–181.
- Edwards, C. A., Harris, W. C., Cook, D. R., Bedford, K. F., & Zuo, Y. (2004). Out of the smokescreen: Does an anti-smoking advertisement affect young women's perception of smoking in movies and their intention to smoke? *Tobacco Control, 13*, 277–282.
- Hanewinkel, R., Morgenstern, M., Tanski, S. E., & Sargent, J. D. (2008). Longitudinal study of parental movie restriction on teen smoking and drinking in Germany. *Addiction, 103*, 1722–1730.

## Movie smoking and urge to smoke among adult smokers

Heatherton, T. F., Kozlowski, L. T., Frecker, R. C., Rickert, W., & Robinson, J. (1989). Measuring the heaviness of smoking: Using self-reported time to the first cigarette of the day and number of cigarettes smoked per day. *British Journal of Addiction, 84*, 791–799.

National Cancer Institute. (2008). *The role of the media in prompting and reducing tobacco use*. Tobacco Control Monograph No. 19 (NIH Publication No. 07-6242). Bethesda, MD: U.S. Department of Health and Human Services, National Institutes of Health, National Cancer Institute.

Shadel, W. G., Niaura, R., Abrams, D. B., Goldstein, M. G., Rohsenow, D. J., Sirota, A. D., et al. (1998). Scripted imagery manipulations and smoking cue reactivity in a clinical sample of

self-quitters. *Experimental and Clinical Psychopharmacology, 6*, 179–186.

Tiffany, S. T., Carter, B. L., & Singleton, E. G. (2000). Challenges in the manipulation, assessment and interpretation of craving relevant variables. *Addiction, 95*(Suppl. 2), S177–S187.

Tiffany, S. T., & Drobles, D. J. (1990). Imagery and smoking urges: The manipulation of affective content. *Addictive Behaviors, 15*, 531–539.

Tong, C., Bovbjerg, D. H., & Erblich, J. (2007). Smoking-related videos for use in cue-induced craving paradigms. *Addictive Behaviors, 32*, 3034–3044.