Published in final edited form as:
Tob Control. 2010 June ; 19(3): . doi:10.1136/tc.2009.030684.

Exposure to movie smoking, antismoking ads and smoking intensity: an experimental study with a factorial design

Zeena Harakeh[1], **Rutger C M E Engels**[2], **Kathleen Vohs**[3], **Rick B van Baaren**[2], and **James Sargent**[4]

[1]Interdisciplinary Social Science, Utrecht University, Utrecht, The Netherlands [2]Behavioural Science Institute, Radboud University Nijmegen, Nijmegen, The Netherlands [3]Carlson School of Management, University of Minnesota, Minneapolis, USA [4]Norris Cotton Cancer Center, Dartmouth-Hitchcock Medical Center, One Medical Center Drive, Lebanon, New Hamsphire, USA

Abstract

Background—This study examines whether smoking portrayal in movies or antismoking advertisements affect smoking intensity among young adults.

Methods—We conducted an experimental study in which 84 smokers were randomly assigned using a two (no-smoking versus smoking portrayal in the movie) by three (two prosocial ads, two antismoking ads or one of each) factorial design. Participants viewed a 60-minute movie with two commercial breaks and afterwards completed a questionnaire. Smoking during the session was allowed and observed.

Results—Exposure to the movie with smoking had no effect on smoking intensity. Those who viewed two antismoking ads had significantly lower smoking intensity compared with those who viewed two prosocial ads. There was no interaction between movie smoking and antismoking ads. Baseline CO (carbon monoxide) level had the largest effect on smoking intensity.

Conclusion—These findings provide further evidence to support antismoking ads placed with movies because of their possible effect on young adult smoking behaviour. However, caution is warranted, because nicotine dependence appears to be the primary predictor of smoking intensity among young adult smokers in this study.

INTRODUCTION

People are exposed on a daily basis to entertainment media, often for hours at a time.[1] While tobacco advertisements in the visual media are banned or reduced in many countries, entertainment media (ie, music video clips, television series and movies) still contains many prompts to smoke, because they frequently depict characters that smoke. Because movies and television series with smokers are distributed worldwide, these smoking depictions contribute to people's exposure to smoking models worldwide.[2] Our previous experimental study showed that daily smokers smoke more when exposed to 'real-life' smoking models.[3] However, we do not yet know how daily smokers are affected by smoking models in the visual media.

Correspondence to: Dr Zeena Harakeh, Interdisciplinary Social Science, Utrecht University, PO Box, 80.140, 3508 TC Utrecht, The Netherlands; z.harakeh@uu.nl.

Competing interests None.

Ethics approval This study was conducted with the approval of the ethics committee at the Radboud University Nijmegen.

Provenance and peer review Not commissioned; externally peer reviewed.

Characters that smoke tobacco in contemporary movies are predominantly white, male, middle-aged and of high socioeconomic status.[4] According to the social learning theory,[56] the high social status of the movie star increases influence; making it more likely that his/her smoking behaviour will be adopted by the viewers. This is problematic, especially because the movie character is usually portrayed with appealing traits (eg, good looking, mature, healthy, successful) and the negative consequences of smoking are absent in these movies.[17] Therefore, it is crucial to gain knowledge on the impact of smoking portrayal in movies on people's smoking-related cognitions and smoking behaviour. In 2008, the National Cancer Institute issued a publication reviewing the effect of entertainment media smoking,[1] and concluded that there is a significant association between exposure to smoking depictions and youth smoking initiation. The conclusion was based on cross-sectional[8–10] and longitudinal survey studies,[1112] which show that smoking portrayal in movies is associated with more favourable attitudes towards smoking and a higher likelihood to initiate smoking. Besides survey studies, a few experimental studies have been conducted. The advantage of using such an experimental design to examine the impact of smoking portrayal in movies is: (1) the manipulation of smoking versus no-smoking portrayal in movies, and (2) enhancing causal interpretations.[1] The experimental research that has been conducted in this area showed that adolescents and young adults who are exposed to smoking in movies have a higher likelihood for pro-smoking beliefs and intentions to smoke.[13–15]

Importantly, Pechmann and Shih reasoned that, by displaying an antismoking advertisement before the movie, adolescent viewers will be less likely to approve of the smoking in movies.[7] Their experimental study, conducted in a classroom setting among 800 non-smoking adolescents (14–15 years of age), demonstrated that showing an antismoking advertisement—emphasising the negative consequences of smoking—before the movie reduces the effect of smoking models in movies. The findings are partly in line with the quasi-experimental study of Edwards and colleagues among 2038 female visitors to real movie theatres (12–17 years of age).[16] They showed that among smokers (but not among non-smokers) antismoking advertisements before a movie with smoking portrayal decreased intentions to smoke in the future.

In conclusion, previous empirical research has shed light on the impact of smoking portrayal in movies on smoking initiation; however, research beyond the initiation phase is lacking. We know of no data to suggest that smoking portrayal in movies also affects the smoking behaviour of daily smokers either during or after a movie. To begin to fill this gap, we conducted an experimental study on whether exposure to smoking in one movie could influence smoking intensity among young adult daily smokers able to smoke ad lib during the presentation. Based on previous results for alcohol, which showed that young adults drank more alcohol during a movie showing alcohol depictions,[17] our first hypothesis was that subjects would have higher smoking intensity—smoking a greater number of cigarettes and having a higher likelihood to continue smoking (ie, smoke more than one cigarette)—when exposed to smoking in movies. Further, we were interested whether antismoking ads (a) could reduce smoking intensity, and (b) whether they would moderate the effect of smoking in movies. Specifically, our second hypothesis was that subjects would smoke fewer cigarettes and have a lower likelihood to continue smoking when exposed to antismoking ads. Based on the results of Pechmann and Shih,[7] our third hypothesis was that antismoking advertisements will reduce the effect of smoking in movies on the number of cigarettes smoked and the likelihood to continue smoking.

METHOD

Design

An experimental study with a two (*'Movie'*) by three (*' Advertisement'*) factorial design was used. Participants watched the first 60 minutes of the movie with two commercial breaks: 16-minute film, 4-minute commercial break, continuation 16-minute film, 4-minute commercial break and continuation of 16-minute film. The condition *'Movie'* consisted of two groups: (a) no-smoking James Bond movie *The Living Daylights*, and (b) a smoking James Bond movie *Dr No* (26 scenes with smoking cues in the edited movie, see table 1 for more detailed information of these scenes) (insert footnote[i]). Displaying a James Bond film in both groups enabled us to have comparable footage as the main character (James Bond), and the genre (action, adventure and thriller). Moreover, the characteristics of James Bond are representative and in agreement with the traits of the character (ie, white, male, middle-aged) that is often depicted as a smoker in movies.[4] The user ratings of the two movies at www.IMDB.com (Internet Movie Database that is visited by over 57 million visitors each month) were 6.7 for *The Living Daylights* (n=19 175) and 7.3 for *Dr No* (n=29 225).

The condition *' Advertisement'* refers to three groups: (1) the same prosocial advertisement 'Kort Lontje' was shown twice (in two different commercial breaks), and (2) the antismoking advertisement 'Joanne' was shown in the first commercial break and the prosocial advertisement 'Kort Lontje' in the second break, and (3) the antismoking advertisement 'Joanne' was shown twice (in two different commercial breaks). The three-group design allowed us to test for a dose-response to antismoking advertisements. The prosocial ad promoted prosocial behaviour, and the antismoking ad promoted non-smoking behaviour. Both ads used the same approach, showing a negative depiction of the behaviour to be suppressed. The prosocial advertisement 'Kort Lontje' (from Sire: Stichting Ideële Reclame) displayed antisocial people being rude to each other in an unattractive light. The antismoking advertisement 'Joanne' (from the Dutch expert centre on tobacco control, STIVORO) displayed the negative consequences of smoking: a young woman in front of a mirror who takes a puff of a cigarette and then directly becomes older (ie, wrinkled skin, grey hair) and coughs. Both advertisements were embedded in the commercial break with neutral advertisements. The first commercial break consisted of seven neutral ads (eg, Mercedes-Benz, JVC camcorder) followed by the prosocial or antismoking advertisement, and the second commercial break consisted of six neutral ads (eg, Calgonit tablets for dishwasher, BOSE DVD entertainment set) followed by the prosocial or antismoking advertisement (insert footnote[ii]).

Procedure

The ethics committee of the Faculty of Social Sciences at the Radboud University Nijmegen gave their approval. Dutch college and university students in Nijmegen were recruited and invited to watch and evaluate a movie clip. The actual aim of the study was masked. Participants had to fulfil the following criteria to be included in this study: Dutch college or university student, smokes at least one cigarette a day and is 18 years or older. In order to select the daily smokers and invite them to participate without revealing the intent of the study, we asked a larger group of students to participate. Thus, students who were interested to participate were asked to complete an initial screening questionnaire with questions on lifestyle (ie, alcohol consumption, eating behaviour, exercise, smoking and watching movies) and were told that this enables us to select participants who are representative for

[i] *The Living Daylights* needed some editing; there were originally four brief smoking scenes, which we cut out of the movie without any difference in the story line or movie.

[ii] The two commercial breaks during the movie did not differ in length and diversity of the displayed advertisement products.

the general Dutch population. The actual reason of this screening was to identify and select only the daily smokers for participation; students who did not smoke or were irregular smokers were excluded. All 84 students who passed selection criteria were asked to participate in this study and all gave their informed consent and were included. Individual students participated in the 90-minute session in the period March to July 2007 between 10 am and 3 pm during weekdays. Before the participant entered the room, the experimenter had randomly assigned him/her to one of the six different conditions of the study. Random assignment was blocked by gender to equally distribute males and females in each condition, and to equally distribute the number of participants and the time of the day when the participant participated over each condition. The evaluator was not blind to treatment assignment or the hypotheses underlying the study. Afterwards, one-way ANOVA showed that there were no significant differences between the six conditions with regard to participants' characteristics (ie, age, number of cigarettes smoked daily, CO level and appreciation of the movie). When the data collection of this study was completed, all participants were debriefed on the actual aim of this study.

The study was conducted in a semi-naturalistic setting; the bar lab at the campus of the Radboud University Nijmegen functioned as a specially equipped entertainment room where smoking was allowed.[318] The setting of this study consisted of a comfortable couch, a large screen and a projector, like a home cinema.[17] When the participant entered the bar lab s/he was asked to sit in the couch in front of this large screen. The experimenter first explained the procedure to the participant. Participants were instructed not to leave the room during the movie. Further, they were told they could eat food and drinks that were made available, and that they were allowed to smoke in this room. After these instructions, participants were asked to blow into a device (Smokerlyzer) to measure the CO (carbon monoxide) level in their breath. To disguise the real aim of the device, students were told that the device enables us to assess and control for their past alcohol consumption. Additionally, to give the participants the impression that we were interested in how they perceive/judge the movie, we attached a bogus device assessing 'arousal'. Subsequently, the experimenter turned on the movie and left the room. Thus, each participant watched the movie alone with no-one else in the room. In the observation room the experimenter observed and coded the number of cigarettes smoked by the participant. After the movie, the experimenter entered the room and participants were asked to fill in a questionnaire containing various questions (ie, about the movie, the commercials, smoking habits, personality, the real aim of the study, availability of cigarettes and/or lighter), taking approximately 30 minutes. Each participant received 12 euros for their participation. During each session, video and audio recordings were made using a hidden camera. All participants gave their informed consent and also their permission for making video recordings and audio recordings during the session.

Participants

After watching the movie, all participants answered the question in the questionnaire on what they thought the study was about. The responses showed that none of the 84 participants suspected the actual aim of the study. Only eight thought the study had anything to do with smoking, but none of them identified the exact aim of the study. We explored whether this suspicion affected their smoking behaviour when watching the movie. Independent sample t-test showed that these eight students did not smoke significantly more during the movie compared to the other 76 participants. The 84 participants were between 18 and 41 years old (mean=22.06; SD=3.35), and 44% (n=37) were male.

Measures

Participant's smoking behaviour during the movie—In the observation room the experimenter observed and coded (in SPSS 12.0) the time when the participant lit the first

cigarette, the time when he/she extinguished the cigarette in the ashtray and the total number of cigarettes smoked. At the end of each session, we immediately checked the number of cigarettes smoked by counting the cigarette butts in the ashtray as an exact confirmation, which always corresponded with our observations. In this study, we examined two measures of smoking intensity: the total number of cigarettes smoked and smoking continuation, coded as no = 0 or 1 cigarette versus yes ≥1 cigarette. These two measures were both primary outcomes and we did not include a secondary outcome in this study.

CO level—The Micro Smokerlyzer is a breath monitor which assesses the CO in participant's breath. It was used to verify smoking status and to assess whether the subject was a light or heavy smoker.[19] Before the movie began, the participant was asked to blow into the monitor after breath holding for 15 seconds. The variable CO level was divided into three categories: 0–6 ppm CO = very light smoker (as they were all smokers), 7–10 = light smoker and >10 = heavy smoker (www.bedfontusa.com).

Gender—Gender was coded as a categorical variable.

Participants' evaluation of the movie character—To ensure that the manipulation resulted in movies that were similar with respect to other characteristics besides smoking, participants rated James Bond in their movie on the following eight characteristics: (1) boring versus pleasantly engaging, (2) unkind versus kind, (3) unattractive versus attractive, (4) annoying versus not annoying, (5) unfriendly versus friendly, (6) arrogant versus not arrogant, (7) tough versus sissy, and (8) smart versus stupid. Responses ranged from 1 to 7.[3] Also, participants indicated the level of similarity with the movie character. Responses ranged from 1=self and other are completely different to 7=self and other are mainly similar.[20] Further, participants indicated their appreciation of the movie on a 5-point scale: 1=very awful to 5=very good.

Data analyses

All analyses were by 'intention-to-treat' and conducted in SPSS. First, descriptive statistics were performed. Frequencies were performed to present information of participants' characteristics. Furthermore, an independent-samples t-test was conducted to test whether smoking during the movie differed for participants who had seen the movie before or not. Second, we did a manipulation check to test (with independent-samples t-tests) whether the two movies of the *Movie* condition (*The Living Daylights* and *Dr No*) differed significantly for perceived traits of the main movie character (ie, James Bond), participant's similarity with James Bond and appreciation of the movie. Third, we investigated with a Poisson loglinear analyses whether the movie condition or advertisement condition had a main effect on the number of cigarettes smoked during the session, controlling for gender, CO level in participant's breath. Finally, we tested an interaction effect between movie condition × advertisement condition in predicting the total numbers of cigarettes smoked. We repeated this approach to test which of the above affected smoking continuation (smoking 0 or 1 cigarette versus > 1 cigarette) using logistic regression analyses because of the binary nature of smoking continuation. We also tested the interaction effect of movie condition × advertisement condition on smoking continuation. However, three participants with missing values for CO level were excluded from the analyses.

RESULTS

Descriptive statistics

Participants reported watching an average of two movies per week (mean=2.08; SD=1.09), and most viewed these movies on DVDs at home (table 2). Most reported watching movies

with someone else rather than alone. The majority of the participants (59.5%) indicated to never have seen the James Bond movie displayed during their session. A number of the participants had seen the movie before: 39.6% had seen *The Living Daylights* movie and 41.1% had seen *Dr No*. The CO level in participants' breath ranged from 0 to 36 ppm (mean=10.33; SD=2.07). Table 2 shows that, during the 60-minute movie, the majority of the participants smoked two cigarettes. Furthermore, the time the participants lit up their first cigarette ranged from 0.00 to 41.30 minutes (mean=13.65; SD=11.17), the second cigarette 17.55 to 59.53 minutes (mean=35.31; SD=9.94), and the third cigarette 38.02 to 58.57 minutes (mean=51.49; SD=7.23). Smoking during the movie did not differ for participants who had seen the movie before or not (t (82)=1.03, p=0.30). The baseline percentages of participants' CO level and gender are depicted for each condition in table 3.

Manipulation check

Table 4 shows that the two movie conditions did not differ significantly on eight characteristics of the James Bond movie character, participant's identification with the movie character (ie, similarity) or participant's appreciation of the movie.

Impact of movie condition and advertisement on cigarette use—multivariate analyses

Movie condition did not affect the total number of cigarettes smoked while advertisement condition significantly affected the total number of cigarettes smoked, with those assigned to antismoking ads smoking significantly fewer cigarettes (see table 5). With regard to the covariates, there was no gender effect, and CO level positively affected the total number of cigarettes smoked. Heavy and light smokers (determined by CO level) were more likely to smoke more cigarettes compared to very light smokers. Next we tested for interaction between movie condition and advertising condition and it was not statistically significant (Wald χ^2=0.40, df=2, p=0.819). Moreover, for prediction purposes the more parsimonious model carrying only the main effects seems adequate, which is backed by a LR test (−2delta LL=0.40, df=2, p=0.819).

Second, we assessed the smoking continuation (>1 cigarette) outcome using multivariate logistic regression, and controlling for the same covariates (table 6). The findings were parallel to the findings on the total number of cigarettes smoked. Again, there was no effect of movie condition while the advertisement condition effect was significant. Participants who viewed the antismoking advertisement twice were less likely to light up two or more cigarettes during the movie compared to those who viewed the prosocial advertisement twice. There was no gender effect on smoking continuation. Heavy and light smokers were more likely to continue smoking compared to very light smokers. There was no interaction effect between movie condition and advertisement condition on smoking continuation: (interaction with both advertisements, OR=0.47, 95% CI 0.04 to 6.00, and p=0.560) and (interaction with twice antismoking advertisement, OR=1.20, 95% CI 0.69 to 21.12, and p=0.899). Moreover, for prediction purposes the more parsimonious model carrying only the main effects seems adequate, which is backed by a LR test (−2delta LL=0.56, df=2, p=0.754).

DISCUSSION

The aim of this experimental study was to investigate whether pro-smoking portrayal in movies affects smoking behaviour in young adult daily smokers and whether antismoking advertisements could neutralise these effects. The first hypothesis was that pro-smoking portrayal in movies positively affects smoking behaviour in daily smokers. This study did not detect a significant relation between smoking portrayal in the James Bond movie and smoking intensity. The findings suggest that movie smoking portrayals do not have a large

main effect on the smoking behaviour of daily smokers, compared with a similar movie without smoking. Because of the small sample size, we cannot rule out a small effect. Previous studies examining the association between movies and smoking have focused mainly on smoking-related cognitions and/or the early phases of smoking (ie, smoking initiation) among adolescents. The few existing experimental studies have demonstrated that adolescents and young adults exposed to smoking portrayal in movies are more likely to have pro-smoking beliefs and intentions to smoke.[13–1521] One observational study of adult smokers leaving the movie theatre showed that seeing a movie with smoking was associated with a greater urge to smoke.[22] Although these findings might be interpreted as conflicting, both the observational study and ours showed that the primary driver of urge to smoke and smoking behaviour during a movie was level of addiction. Further research could examine whether movie-related cues to smoke contribute to relapse among abstaining smokers or whether there are factors that make smokers more or less sensitive to movie smoking cues.

Regarding the second hypothesis, our findings demonstrated that seeing an antismoking ad during the course of the movie reduced the number of cigarettes smoked and lowered rates of continued smoking. Compared to the reference group, smoking intensity significantly reduced in the group viewing the antismoking advertisement twice. Results for viewing it once were in the predicted direction but were not statistically significant. At present, some youth-rated movies containing smoking are released on DVDs in the USA with a single anti-smoking ad embedded in the beginning of the movie. This approach was adopted by some movie distributors at the request of the state attorneys general. Although the intent of the request was to blunt the impact of movie smoking on the adoption of smoking by teenagers,[716] the present research suggests that these ads may also affect young adult smokers. Furthermore, the dose-response suggests that more than one ad (perhaps one at the beginning and one at the end of the movie) could have a larger effect. More research should be done to determine if antismoking ads, when paired with movies, could be a factor in reducing smoking intensity after the movie or, when viewed over the long term, could prompt young adult smokers to quit.

With respect to the third hypothesis, antismoking advertisements did not moderate the effects of smoking portrayal movies on smoking behaviour in this study. Pechmann and Shih found that smoking portrayal in movies positively affected pro-smoking beliefs and antismoking advertisement neutralised these effects in a sample of adolescents.[7] The results from the present study contrast with that study, in that there was no movie smoking effect on behaviour. However, the present findings, combined with the findings of Pechmann and Shih, make a good case for placing antismoking ad in theatres before movie viewing.

Limitations

Narrowly viewed, the present findings are only generalisable to the 'James Bond' movies used in our study. *Dr No* was produced in 1962 (nearly 50 years ago); it is possible that the findings would differ for smoking scenes from contemporary movies or movies with another genre classification, and these possibilities should be explored in further research before concluding that movie portrayals of smoking have no impact on the behaviour of smokers. For example, movies that are highly appreciated by the participant or that elicit more arousal may affect a participant's smoking behaviour more strongly. Another limitation is in the comparison condition: we did not display the same movie in the two movie conditions (smoking versus no-smoking portrayal). Instead we tried to find two similar movies with respect to genre and movie character, one with smoking and one without. However, there were important differences; for example, Timothy Dalton played James Bond in *The Living Daylights* and Sean Connery in *Dr No*. It would be better to use identical footage in both conditions; however, this presents the difficult task of editing the movie and concerns about loss of information related to the deleted smoking scenes. Furthermore, because of the small

sample size this study may have had limited power to detect significant interaction effects. Finally, this study only examined the smoking portrayal in movies on the macro-level of smoking (ie, number of cigarettes) but not smoking topography (eg, number of puffs). However, previous studies suggest that mimicry of 'real-life' smoking models has little impact on puff frequency, puff duration and average inter-puff interval.[2324]

Implications

Our findings suggest that there is little pro-smoking effect of movie smoking on frequency and quantity of cigarettes consumed during a movie in young adult smokers; instead, the main contributor to smoking during a movie is level of addiction. Surprisingly, there appears to be a statistically significant antismoking effect of showing antismoking ads. These findings deserve further exploration, but strengthen the basis for efforts to pair antismoking ads with movies that contain smoking by suggesting that the effects of these ads may extend beyond the adolescent target group.

Acknowledgments

This study was funded by a grant from "STIVORO" ('The Dutch expert centre on tobacco control'). JS receives support from the National Institutes of Health (CA 077026). All the authors of this manuscript declare that there are no competing interests. The authors thank the research assistants Jolien Klein Haarhuis, Lotte van de Weem, Naomie Kroon and Marleen Bogers for helping with the collection of the data, and also the participants for participating in this study. Furthermore, we would like to thank Carel Peeters, Dr Quinten AW Raaijmakers, Professor Peter van der Heijden and Dr Regina JJM van den Eijnden for their helpful advice and discussions.

Funding STIVORO ('The Dutch expert centre on tobacco control'), Parkstraat 83, 2514 JG, The Hague, The Netherlands.

References

1. National Cancer Institute. Tobacco Control Monograph No 19. Bethesda, MD: US Department of Health and Human Services, National Institutes of Health, National Cancer Institute; 2008. The role of the media in promoting and reducing tobacco use. NIH Pub No 07-6242
2. Glantz SA. Smoking in movies: a major problem and a real solution. Lancet. 2003; 362:258–9. [PubMed: 12892950]
3. Harakeh Z, Engels RCME, Van Baaren RB, et al. Imitation of cigarette smoking: an experimental study on smoking in a naturalistic setting. Drug Alcohol Depend. 2007; 86:199–206. [PubMed: 16870357]
4. Dalton MA, Tickle JJ, Sargent JD, et al. The incidence and context of tobacco use in popular movies from 1998 to 1997. Prev Med. 2002; 43:516–23. [PubMed: 11969352]
5. Bandura, A. Social learning theory. Oxford, England: Prentice-Hall; 1977.
6. Bandura, A. Social foundations of thought and action: a social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall; 1986.
7. Pechmann C, Shih C. Smoking in films and antismoking advertisements before films: effects on youth. J Mark. 1999; 63:1–13.
8. Distefan J, Gilpin E, Sargent J, et al. Do movie stars encourage adolescents to start smoking? Evidence from California. Prev Med. 1999; 28:1–11. [PubMed: 9973581]
9. Sargent JD, Dalton MA, Beach ML, et al. Viewing tobacco use in movies: does it shape attitudes that mediate adolescent smoking? Am J Prev Med. 2002; 22:137–45. [PubMed: 11897456]
10. Tickle JJ, Sargent JD, Dalton MA, et al. Favourite movie stars, their tobacco use in contemporary movies, and its association with adolescent smoking. Tob Control. 2001; 10:16–22. [PubMed: 11226355]
11. Dalton MA, Sargent JD, Beach ML, et al. Effect of viewing smoking in movies on adolescent smoking initiation: a cohort study. Lancet. 2003; 362:281–5. [PubMed: 12892958]

12. Hanewinkel R, Morgenstern M, Tanski SE, et al. Longitudinal study of parental movie restriction on teen smoking and drinking in Germany. Addiction. 2008; 103:1722–30. [PubMed: 18821879]
13. Gibson B, Maurer J. Cigarette smoking in the movies: the influence of product placement on attitudes towards smoking and smokers. J Appl Soc Psychol. 2000; 30:1457–73.
14. Hines D, Saris RN, Throckmorton-Belzer L. Cigarette smoking in popular films: does it increase viewers' likelihood to smoke? J Appl Soc Psychol. 2000; 30:2246–69.
15. Jones B, Carroll M. The effect of a video character's smoking status on young females' perceptions of social characteristics. Adolescence. 1998; 33:657–67. [PubMed: 9831883]
16. Edwards CA, Harris WC, Cook DR, et al. Out of the Smokescreen: does an anti-smoking advertisement affect young women's perception of smoking in movies and their intention to smoke? Tob Control. 2004; 13:277–82. [PubMed: 15333884]
17. Engels RCME, Hermans R, Van Baaren RB, et al. Alcohol portrayal on television affects actual drinking behavior. Alcohol Alcohol. 2009; 44:244–9. [PubMed: 19237443]
18. Bot SM, Engels RCME, Knibbe RA. The effects of alcohol expectancies on drinking behaviour in peer groups: observations in a naturalistic setting. Addiction. 2005; 100:1270–9. [PubMed: 16128716]
19. Jarvis MJ, Belcher M, Vesey C, et al. Low cost carbon monoxide monitors in smoking assessment. Thorax. 1986; 41:886–8. [PubMed: 3824275]
20. Aron A, Aron EN, Smollan D. Inclusion of other in the self scale and the structure of interpersonal closeness. J Pers Soc Psychol. 1992; 63:596–612.
21. Dal Cin S, Gibson B, Zanna MP, et al. Smoking in movies, implicit associations of smoking with the self, and intentions to smoke. Psychol Sci. 2007; 18:559–63. [PubMed: 17614861]
22. Sargent JD, Morgenstern M, Isensee B, et al. Movie smoking and urge to smoke among adult smokers. Nicotine Tob Res. 2009; 11:1042–6. [PubMed: 19542516]
23. Antonuccio DO, Lichtenstein E. Peer modeling influences on smoking behavior of heavy and light smokers. Addict Behav. 1980; 5:299–306. [PubMed: 7211527]
24. Miller PM, Frederiksen LW, Hosford RL. Social interaction and smoking topography in heavy and light smokers. Addict Behav. 1979; 4:147–53. http://www.bedfontusa.com retrieved on 20 February 2009; http://www.IMDB.com retrieved on 20 January 2009. [PubMed: 474265]

Table 1

Information on the smoking cues in the smoking James Bond movie *Dr No*

Time	Smoking cues
3:19–3:48	4 people are playing cards; in front of them an ashtray lies on the table and 2 men smoke (one man a cigarette and one man a cigar)
6:46–6:54	In a casino setting with many people, where a man smoking a cigar and two women each holding a cigarette are walking in this room
7:00–8:30	In this casino setting, ashtrays are lying on the tables. A big group is playing around the casino table and 7 people are smoking (6 male and 1 female)
7:43	Black cigarette package (no brand) with the cigarettes inside are shown James Bond (JB) introduces himself and lights up a cigarette from this black cigarette package
7:50–8:22	
11:37–14:00	A man lights up a pipe at his office, JB offers his lighter
16:03–16:10	Smoking man displayed in the airport
First break	
21:58–21:59	Outside the airport, a man passes by with a cigarette in his hand
22:01–22:07	Outside the airport, a man lights a cigarette with the cigarette of the cabdriver and he goes inside the cab
27:18–27:32	Ashtray lies on the table in the hotel room of JB
28:20–28:29	Ashtray on the desk table in the hotel room of JB
28:38–29:13	In a lounge, 3 men and JB are playing backgammon with one man smoking a cigar and one a cigarette
29:37–31:08	At the dock, Mr Quarell is painting a boat; he has a cigarette in his mouth. He walks to the bar and extinguishes his cigarette in the ashtray
31:48–31:54	Ashtrays are displayed on the bar
34:18–34:27	At a party outside, JB and two men are sitting around a table with an ashtray
34:50–34:56	
35:52–36:03	
36:46–36:50	
Second break	
42:20–42:42	In the (lab) room of Prof Dent an ashtray is lying on the table
43:06–43:12	
43:30–43:32	A man is repairing the dock with a cigarette in his mouth
46:50–46:52	Hotel lounge with an ashtray on the table and a 2-second smoking cloud visible from a cigar of a man
47:04–47:05	An ashtray lies on the table at the hotel desk
48:13–48:14	Ashtray lies on the table in the hotel room of JB
50:12–50:46	The man in the office sitting behind his desk lights up and smokes his pipe. JB, sitting opposite him, lights up and smokes a cigarette and extinguishes his cigarette in the ashtray on the office desk
51:04	The man with his pipe is depicted for 2 seconds in this office
51:14	Again, the man with his pipe is depicted for 2 seconds
53:22–53:31	On a boat at the dock, JB offers from his black cigarette package (no brand), a cigarette to his fellow-player/partner. His partner takes the cigarette and puts it in his mouth. JB also takes a cigarette
53:35–53:46	JB is in the hotel lounge and passes two tables with an ashtray
53:49–53:55	In this lounge, JB walks towards a table with a phone and ashtray
57:36	At the house of a woman, an ashtray with a cigarette is visible for 1 second on a little table near her bed
58:51–59:10	JB lies in bed with a cigarette, the woman is sitting near him

Note. This is the time schedule of '*Dr No*' with in the first break 'Joanne' and in the second break 'Kort Lontje'.

Table 2

Information on participants' characteristics

	Percentage
Movie	
Where do you usually watch the movies (one answer possible)?	
on DVDs at home	51.8%
on TV at home	24.1%
on DVD in the home of others	20.5%
on TV in the home of others	2.4%
at the cinema	1.2%
With whom do you usually watch the movies?	
With partner	32.5%
With one friend	27.7%
With friends	18.1%
Alone	16.9%
With their parent(s)	2.4%
With their sibling	2.4%
Smoking behaviour	
Baseline CO:	
Very light smoker	35.8%
Light smoker	21.0%
Heavy smoker	43.2%
How many cigarettes do you smoke on average a day?	
< 1 cigarettes/day	3.7%
1–5 cigarettes/day	39.0%
6–10 cigarettes/day	20.7%
11–20 cigarettes/day	30.5%
21–30 cigarettes/day	6.1%
Smoking during the movie:	
0 cigarettes	29.8%
One cigarette	29.8%
Two cigarettes	32.1%
Three cigarettes	8.3%
Did you have cigarettes and lighter with you?	
Yes	76.2%

Table 3

Baseline percentages of the two covariates (gender and CO level) for each of the six conditions of the study

	Covariates				
	Gender		CO level		
	Male	Female	Very light smoker	Light smoker	Heavy smoker
No-smoking portrayal + 2× prosocial ads	7.1%	9.5%	4.9%	4.9%	7.4%
No-smoking portrayal + mixed ads	8.3%	8.3%	6.2%	4.9%	6.2%
No-smoking portrayal + 2× antismoking ads	6.0%	11.9%	7.4%	4.9%	6.2%
Smoking portrayal + 2× prosocial ads	7.1%	8.3%	7.4%	2.5%	6.2%
Smoking portrayal + mixed ads	8.3%	10.7%	4.9%	3.7%	8.6%
Smoking portrayal + 2× antismoking ads	7.1%	7.1%	4.9%	0%	8.6%

Table 4

Comparison of indicators of participants' perception of the movie character and movie between the two movie conditions

	Perception participant				
	The Living Daylights		*Dr No*		
	Non-smoking model		Smoking model		
	Mean	SD	Mean	SD	95% CI for the difference
Boring versus pleasantly engaging	4.81	1.20	4.55	1.18	−0.26 to 0.78
Unkind versus kind	5.19	1.10	5.23	1.10	−0.52 to 0.44
Unattractive versus attractive	4.84	1.48	4.50	1.59	−0.33 to 1.01
Annoying versus not annoying	5.47	1.40	5.05	1.66	−0.26 to 1.09
Unfriendly versus friendly	5.14	1.15	4.85	1.25	−0.23 to 0.81
Arrogant versus not arrogant	3.02	1.42	3.35	1.70	−1.01 to 0.36
Tough versus sissy	3.14	1.64	2.80	1.34	−0.32 to 1.00
Smart versus stupid	2.81	1.65	2.55	1.47	−0.42 to 0.95
Similarity with movie character	2.16	1.19	2.49	1.21	−0.85 to 0.20
Appreciation of the movie	3.28	0.83	3.35	0.83	−0.43 to 0.29

Note. The two movies did not differ significantly ($p<0.05$) for each of the 10 indicators.

Table 5

The effects of movie condition, advertisement condition and covariates on participants' total number of cigarettes

	Total number of cigarettes smoked		
	exp{B}	**95% CI**	**Wald χ^2(df)**
Movie condition	0.81	0.53 to 1.22	1.06 (1)
Advertisement condition:			
2× Prosocial ad (reference group)	1.00		
Prosocial + antismoking ad	0.86	0.54 to 1.35	0.45 (1)
2× antismoking ad	0.56*	0.33 to 0.96	4.45 (1)
Gender	1.16	0.76 to 1.75	0.47 (1)
CO level:			
Very light smoker (reference group)	1.00		
Light smoker	2.26**	1.20 to 4.27	6.32 (1)
Heavy smoker	2.90***	1.66 to 5.05	14.08 (1)

Note. Poisson log-linear analyses,

* $p<0.05$,

** $p<0.01$,

*** $p<0.001$.

Table 6

The effects of movie condition, advertisement condition and covariates on participants' smoking continuation

	Smoking ≥2 cigarettes	
	exp{B}	**95% CI**
Movie condition	0.45	0.15 to 1.36
Advertisement condition:		
2× Prosocial ad (reference group)	1.00	
Prosocial + antismoking ad	0.52	0.15 to 1.79
2× antismoking ad	0.12**	0.03 to 0.52
Gender	1.65	0.54 to 5.01
CO level:		
Very light smoker (reference group)	1.00	
Light smoker	8.32**	1.80 to 38.46
Heavy smoker	15.96***	3.65 to 69.86

Note. Logistic regression analyses,

* $p<0.05$,

** $p<0.01$,

*** $p<0.001$.

$R^2 = 0.382$.