Influence of smoking cues in movies on craving among smokers

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ABSTRACT

Aims  Research has shown that smoking-related cues are important triggers for craving. The objective of the present study was to test whether smoking cues in movies also function as triggers to evoke craving. To accomplish this, we conducted a pilot study in which we examined smokers’ reactivity to smoking cues from a particular movie in a common cue–reactivity paradigm using pictures. In the main study, we tested whether smokers who are confronted with smoking characters in a movie segment have a greater desire to smoke than smokers confronted with non-smoking characters. Design  Using an experimental design, participants were assigned randomly to one of two movie conditions (smoking versus non-smoking characters). Setting  In a laboratory, that reflected a naturalistic setting, participants watched a 41-minute movie segment. Participants  A total of 65 young adults who smoked on a daily basis participated in the experiment. Measurements  Craving was assessed before and after watching the movie. Findings  The pilot study revealed that pictures of smoking characters had strong effects on craving. However, when smokers actually watched a movie segment, no differences in craving were found between those who watched smoking characters and those who watched non-smoking characters. This finding was not affected by baseline craving, the time of the last cigarette smoked and daily smoking habits. Conclusions  No effect of smoking cues in movies on craving was found, in contrast with research supporting the cue-craving link. Thus, if replicated, this might indicate that smoking cues in such contexts do not affect smokers’ desire to smoke as expected.

Keywords  Craving, cue–reactivity, media, movie, smoking.

INTRODUCTION

Tobacco images are prevalent in popular movies [1]. Despite the downward trend of smoking images in movies between 1996 and 2005, more than 60% of the top 100 box-office hits in 2005 depicted tobacco images [1,2]. The average number of tobacco incidents per film for the top 50 films released in the period between 1994 and 2005 was 19.9 [3]. Given that young adults spend a great deal of their spare time watching television and videos or DVDs [4–6], young adults are often exposed automatically to tobacco images in films on a daily basis.

Research has demonstrated an association between smoking exposure in movies and smoking initiation among adolescents. The portrayal of smoking in movies has been linked to smoking experimentation in cross-sectional [6–9] and longitudinal studies [10–14]. Underlying mechanisms of these effects could be explained partly by the Theory of Planned Behavior (TpB) [15]. The TpB posits that a person’s behaviour is determined by their behavioural intention and that this, in turn, depends on the person’s attitude towards the behaviour, their subjective norm and their perceived behavioural control. Studies investigating mediating factors showed that the association between exposure to smoking in movies and intentions to smoke is mediated by positive expectancies [16,17] and one’s identification as a smoker [16]. These concepts are related in turn to smoking onset.

Most attention in previous research has been paid to the effect of exposure to smoking in movies on smoking initiation. Very few studies have dealt with the effect that the depiction of smoking in movies could have on smoking in people who already smoke. Like other environmental cues, smoking cues in movies could also elicit
physiological and subjective reactions in smokers. Research among smokers has shown that environmental cues are important triggers for craving. Cue–reactivity studies typically employ a paradigm in which smokers are exposed to both smoking and neutral cues to examine differences in subjective craving. It has been documented that smokers who are exposed to smoking cues experience increased craving compared with exposure to neutral cues. These effects were robust (effect sizes $d \sim 1.07–1.41\,[18,19]$) across a variety of modalities, including in vivo [20–24], pictorial [19], imaginary based [20,25–29], video clip [24,30] and virtual reality manipulations [31–33]. While differences in subjective craving have been found across different presentation modalities, smoking cues in movies have rarely been the subject of such research. It has not yet been determined whether smoking cues in movies evoke craving in the same way, and whether the theory on the cue–craving link can be transferred effectively to cues embedded within the context of a film. The examination of different kinds of cues is important for the development of the theory of cue–reactivity.

Hines, Saris & Throckmorton-Belzer [34] examined the effect of viewing smoking in films on craving by showing short video clips of six different movies. They showed that male smokers, but not female smokers, had a higher current desire to smoke if the film characters they had viewed smoked. However, in using only short video clips of 3 minutes each, this study did not show a (representative) segment of a movie. The exposure to a longer segment of an existing contemporary movie, which enables participants to involve themselves psychologically in the narrative and identify with the characters, represents a more naturalistic setting. Moreover, the use of an existing contemporary movie does not require the creation of cues, but provides more realistic cues and reflects cue exposure in real life more accurately. Dal Cin et al. [35] assessed the influence of young adults’ identification with a smoking movie character on their intention to smoke and their implicit self-smoking association, using data from a sample of male smokers and non-smokers. Participants were exposed to a 36-minute clip of the movie Die Hard in which the main character either smoked or did not smoke. They reported that greater identification with a character who smoked in a video segment predicted stronger implicit associations with smoking and an increased intention to smoke. The authors did not, however, test the effect of this exposure on craving. With regard to the continuation of smoking, craving may be a better predictor than smoking cognitions. It is therefore essential to test whether smoking cues in movies actually affect craving levels.

Understanding the effects of smoking cues in movies on smokers’ urge to smoke has important implications for smoking cessation and relapse avoidance. It has been documented that smoking cues play an important role in the process of smoking continuation and consequently in the process of smoking cessation. Using ecological momentary assessments, Shiffman et al. [36] found craving to be the strongest predictor for smoking. Craving is a predictor for smoking lapses and is therefore related to a decreased likelihood of successful cessation [37,38]. If smoking cues in movies evoke smoking urges and this, in turn, stimulates smokers to light a cigarette, smokers may find it more difficult to quit smoking and, moreover, watching movies with smoking scenes would increase the possibility of relapse. The aim of the present study is therefore to examine whether smoking cues portrayed in movies evoke urges to smoke among smokers. To accomplish this we first conducted a cue–reactivity study, using pictorial smoking and non-smoking cues derived from a movie, to explore whether the smoking cues function as stimuli to evoke urges to smoke. This set-up of the pilot study is in line with commonly used approaches in cue–reactivity research (e.g. similar to [19]). In the main study, we used an experimental design, in which we exposed smokers to a (representative) segment of an existing contemporary movie containing the same smoking cues as in the pilot study to investigate smokers’ subjective reactivity to smoking cues in movies. Both the pilot and the main study were intended to be used as a foundation upon which to compare the effects of pictorial and dynamic cues. For both studies, we hypothesized that smoking cues evoke stronger craving levels than non-smoking cues.

**METHOD**

**Pilot study: cue–reactivity study**

**Sample and procedure**

We conducted a within-subject cue–reactivity study to examine whether the smoking cues in the movie segment in the main study function as stimuli and evoke smoking urges. In this study, we used six smoking and six non-smoking pictures from the movie Atonement. Three smoking and three non-smoking pictures depicted the male character and three smoking and three non-smoking pictures depicted the female main character. Most of the smoking and non-smoking pictures portrayed shots from the same scene, the single difference being the presence of a cigarette. The six smoking and six non-smoking cues were combined in a 12-trial cue–reactivity paradigm. To control for order effects, four counterbalanced orders were developed for cue presentation (similar to [19]).

Thirty-one (12 male and 19 female) smokers between the ages 18 and 38 years [mean = 23.97, standard deviation (SD) = 4.50] participated in the cue–reactivity study.

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The participants were recruited through flyers around the campus. They were invited to a laboratory at the Radboud University Nijmegen and asked to refrain from tobacco use for 6 hours prior to the experiment. Before assessing the cue–reactivity, the participants were requested to complete a questionnaire assessing their smoking history and their current urge to smoke. Participants were given a carbon monoxide (CO) breath test using a smokerlyzer (Bedfont Scientific Ltd, Bedford, UK). If participants did not meet the <13 parts per million (p.p.m.) cut-off, they were excluded from the study (similar to [19]). After undergoing a practice trial, participants completed 12 automated cue-exposure trials, which followed a standard format: 20 seconds relaxation, 40 seconds picture viewing and post-trial craving ratings. Each response form instructed the participant to answer the ratings based on how he or she felt while viewing the picture in that trial. After completing the rating forms, participants clicked a button to start the next trial.

Measures

Participants completed a questionnaire assessing their smoking history and current smoking patterns (e.g. age of initiation, number of cigarettes per day). Furthermore, we used a visual analogue scale (VAS) (similar to [31,39,40]) and the four-item Questionnaire of Smoking Urges (QSU-4) [41] to measure craving. Using the VAS, participants were asked to indicate their desire to smoke at the moment of filling in the questionnaire, ranging from 0 to 100. The QSU-4 measured craving using the following four items: (i) nothing would be better than smoking a cigarette right now; (ii) I have an urge for a cigarette; (iii) all I want right now is a cigarette; and (iv) I crave a cigarette [41].

Main study: reactivity to smoking cues in movies

Sample and procedure

After having conducted the pictorial cue–reactivity study, we examined the subjective reactivity to smoking cues in a movie. The participants were assigned randomly to one of two different movie conditions, varying in respect of whether the main characters smoked or did not smoke. In the experimental condition, the participants were confronted with a 41-minute segment of the movie Atonement in which both main characters (acted by Keira Knightly and James McAvoy) smoked. In the control condition, the participants watched a 41-minute segment of the same movie without smoking scenes.

The sample consisted of 65 university students (43 female and 22 male), ranging in age from 18 to 42 years (mean = 22.69, SD = 3.89). The participants were recruited from the Psychology and Educational Science subject pool. They were invited to a laboratory at the Radboud University Nijmegen and were told that they were participating in research on the life-style of students and celebrities and were thus not informed about the aim of the experiment. To create a cozy and relaxing atmosphere, we equipped one of our laboratories with a comfortable leather chair and a big-screen television. Before watching the movie clip, the participants were requested to complete a questionnaire assessing their craving and the last time they had smoked. In addition, we measured the last time the participants had smoked objectively by taking a CO-sample. After completing the questionnaire and giving a breath sample the participants were exposed to a segment of the movie Atonement. In the questionnaire given after the movie segment, the participants were asked about their craving and their smoking habits. One hour after the experiment the participants were called on their mobiles and asked whether they had smoked in the past hour.

In both conditions we used a segment of the movie Atonement to control for similarity with regard to the genre of the film. From this movie, two 41-minute clips were made, one showing exclusively non-smoking scenes and the other showing both male and female characters smoking in addition to non-smoking scenes. The movie segments were manipulated in such a way that the two segments were of the same length and did not differ with regard to the movie scenes and storyline. To control for differences between the two edited movie segments, independent t-tests were conducted. No differences were found between conditions in transportation, identification with the main characters and appreciation of the movie. In the movie segment used in the experimental condition, the female character as well as the male character smoked three times. In addition, other characters smoked three times. In total, smoking was portrayed for 203 seconds: 40 seconds of smoking by the female character, 40 seconds by the male character and 123 seconds by other characters. Afterwards, participants were asked about the aim of the study (none of them guessed the actual aim) and were debriefed.

Measures

Participants completed a questionnaire assessing their smoking history and current smoking patterns. Craving was assessed by using a VAS (similar to [31,39,40]; see pilot study).

RESULTS

Pilot study

The participants smoked on average 67.4 cigarettes per week, had on average initiated smoking at the age of 14.7 years, and had an average CO measurement of 4.6 p.p.m.
A paired-samples t-test was conducted to evaluate whether smoking cues elicited urges to smoke (Fig. 1 and Fig. 2). The results showed an overall significant effect of the cue manipulation on craving [smoking versus non-smoking cues, $t_{(30)} = 3.61, P < 0.001$ (QSU-4); $t_{(30)} = 3.24, P < 0.005$ (VAS)], such that smoking-related cues evoked a greater urge to smoke (QSU-4: mean = 43.16, SD = 24.15; VAS: mean = 63.68, SD = 21.47) than non-smoking cues (QSU-4: mean = 33.35, SD = 20.22; VAS: mean = 56.53, SD = 22.93). The eta-squared statistic (QSU-4: $\eta^2_p = 0.30$; VAS: $\eta^2_p = 0.26$) indicated a large effect size [42]. There was a strong, positive relation between the two variables used to measure craving after smoking cue exposure (QSU-4 and VAS; $r_{(31)} = 0.64, P < 0.0001$), and a strong positive relation between the two variables used to measure craving after non-smoking cue exposure ($r_{(31)} = 0.74, P < 0.0001$).

A repeated-measures analysis of variance (ANOVA) conducted on the smoking pictures revealed an increase of craving ratings over time [QSU-4: Wilks’ lambda = 0.70, $F_{(5, 26)} = 2.27, P > 0.05$ (0.08), $\eta^2_p = 0.30$; VAS: Wilks’ lambda = 0.44, $F_{(5, 26)} = 6.69, P = 0.000, \eta^2_p = 0.56$], as shown in other studies [21,25]. In general, the results of the pilot study show that pictorial smoking cues from the movie *Atonement* function as stimuli to evoke craving.

**Main study**

The participants smoked on average 67.3 cigarettes per week and had on average initiated smoking at the age of
13.8 years. Participants’ average CO measurement was 8.8. Randomization over the two conditions was successful. The two groups did not differ in terms of gender \((P = 0.61)\), baseline craving level \((P = 0.25)\), the last time participants had smoked \((P = 0.22)\), the CO level \((P = 0.18)\) and the average number of cigarettes smoked per day \((P = 0.10)\).

An analysis of covariance (ANCOVA) was conducted to evaluate the influence of smoking cues in movies on smokers’ desire to smoke (Fig. 3). The independent variable was the experimental condition (movie segment containing smoking cues versus movie segment without any smoking cues), and the dependent variable consisted of scores on craving assessed after the participants had watched the movie. Participants’ scores on baseline craving (assessed before the movie) were used as covariate. After adjusting for scores on baseline craving, there was no significant difference between the experimental \([\text{mean} = 60.15, \text{standard error (SE)} = 3.31]\) and control condition \([\text{mean} = 62.51, \text{SE} = 3.31]\) on scores of craving after watching the movie \((F_{1, 61} = 0.25, P = 0.62, \eta^2 = 0.004)\). There was a relationship between the pre-craving and post-craving scores, as indicated by a partial eta-squared value of 0.49. Adjustment for scores on baseline craving, the time of the last cigarette smoked and daily smoking habits did not affect this finding \((F_{1, 59} = 0.62, \eta^2 = 0.005)\). There was no significant relationship between the baseline craving scores and the number of cigarettes smoked within an hour after the movie, but there was a positive relation between craving after smoking movie exposure and smoking behaviour \((r_{58} = 0.41, P < 0.001)\).

In contrast to Hines et al. [34], no significant differences between conditions were found between men and women. Additional analyses also showed no differences between conditions between participants who were heavy or light smokers, or between those who were low or high on baseline craving.

**DISCUSSION**

The present study was designed to examine the effect of the portrayal of smoking in movies on craving among smokers and to compare whether dynamic cues have the same effects on smokers as pictorial cues. Using a cue-reactivity paradigm with pictorial smoking cues derived from the same film used in the main study, the results of the pilot study clearly revealed that smokers had higher subjective smoking urges after being exposed to smoking cues than after being exposed to neutral cues. These results corroborate previous studies (e.g. [20,22,24,27,30–33]) and suggest that pictorial smoking cues, when isolated from the movie, evoke craving. In the main study, in which we exposed smokers to a movie segment either with or without smoking scenes, no evidence for the influence of smoking cues in movies on craving was found.

There are several possible explanations for the lack of findings in the present study. Studies using Stroop, visual probe and eye-tracking paradigms have shown that smokers have an attentional bias for pictorial smoking-
related cues [43–50]; up to this point, however, no research has been conducted on whether or not smokers consciously detect smoking cues in movies and if so how they interpret those cues. It may be that participants simply do not see the cues, for example because of their involvement in the narrative.

Even if participants do see the smoking cues in the movie, the strength of the cue, in terms of number and duration, may be insufficient to affect craving in daily smokers. In our study, participants were exposed to nine smoking scenes with a total length of 203 seconds. Moreover, as opposed to research supporting the cue–craving link, which is often characterized by an explicit and strong focus on smoking cues, in our main study participants were exposed to more realistic, subtle cues and were unaware of the aim of the study. It might be the case that more frequent, longer or more explicit cues in movies still lead to an increase in craving.

The results may also be explained by the dynamics of craving. Shiffman [38] distinguishes between background and episodic craving. Background craving appears steadily throughout the day and is not evoked by environmental cues, unlike episodic craving. We found an effect on background craving, as smokers in both conditions reported higher craving levels after watching the movie compared to their levels at baseline measurement. No effects were found on episodic craving. However, this may be deceptive because, unlike other cue–reactivity studies, in the main study it was not possible to obtain self-report measures immediately after cue-exposure and therefore to detect direct effects of smoking cues in movies on craving. Craving levels could increase at the moment of cue exposure and decrease immediately after cue appearance. The decrease in craving-level could be explained by the unavailability of cigarettes. Cue availability studies, in which smokers are exposed to smoking-related and neutral cues and in which the participants are informed about the availability of the drug, showed that craving increased with cigarette availability [41]. The participants’ involvement in the storyline of the film could also strengthen this effect. Besides having no opportunity to smoke during the experiment, the smoker might be distracted from further thoughts about smoking by the continuation of the movie.

Also, we did not find any effect of smoking cues in movies on smoking behaviour within 1 hour after the experiment. This could be explained simply by the lack of difference in craving between conditions, as craving is one of the strongest predictors of smoking behaviour [36]. However, smoking cues in movies could affect other constructs, such as smoking behaviour itself on an implicit, more unconscious level [35]. In the same vein, cues might affect smoking behaviour directly through automatic processes such as mimicry [51–53]. As we did not allow people to smoke while watching, we could not test this assumption.

A number of limitations to this study should be acknowledged. First, in the main study, participants were not asked to be abstinent prior to the study (as we did not want to bring attention to the aim of the study). Nevertheless, we did not find different effects for participants who had not smoked a couple of hours before the experiment compared to those who had. Secondly, more than 60% of the participants indicated that they smoke one to 10 cigarettes per day. Different effects may be found if we were to focus only on heavy smokers. Thirdly, we did not measure craving at the moment of cue exposure or shortly after cue exposure. Further studies including more measurements during the movie are therefore suggested. In future investigations it might also be interesting to examine smokers’ attention to and perception of smoking cues in movies to investigate whether smokers also have an attentional bias for smoking-related cues in movies. Future studies are also needed to reveal whether people do indeed light a cigarette directly after being exposed to smoking cues in movies. This is relevant in occasions where people are permitted to smoke while watching a movie (e.g. at home). In circumstances where people are not permitted to smoke while watching (e.g. in the cinema) and cannot immediately fulfill their needs, we do not expect smoking portrayals in movies to have a strong effect on smoking behaviour after watching a movie.

In contrast to pictorial smoking cues, we did not find any direct effects of the portrayal of smoking in movies on craving and smoking behaviour among smokers. Thus, if replicated, this might indicate that smoking cues in such contexts do not affect smokers as expected and the cue-kraving literature may need to account for the effects of smoking cues in movies. However, as this is one of the first experimental studies testing the effects of smoking cues in movies on craving in smokers, further research needs to be undertaken.

**Declarations of interest**

None.

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