Imitation of cigarette smoking: An experimental study on smoking in a naturalistic setting

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Abstract

\textbf{Aims:} Examine whether smokers imitate smoking behaviour of strangers and to what extent this is moderated by the nature of social interactions.

\textbf{Design and participants:} An experiment with a three (heavy smoking, light smoking, or no smoking condition) by two (warm versus cold social interaction condition) factorial design. Daily smoking young adults were exposed to same-gender confederates and were observed in a bar laboratory.

\textbf{Measurements:} Smoking and social behaviour were observed and coded during a 30-min break between two tasks, consisting of rating television advertisements.

\textbf{Findings:} Participants imitated the smoking behaviour of confederates. After controlling for young people’s craving, confederate’s smoking explains 35% of the variance in the number of cigarettes smoked. Participants are more likely to smoke and to continue smoking in the warm social interaction condition. Lighting up the first cigarette was affected by confederate’s smoking and participant’s urges to smoke. Lighting up a second was affected by the heavy smoking condition and warm social interaction condition. Lighting up a third cigarette was affected only by the heavy smoking condition.

\textbf{Conclusion:} Imitation largely explains why individuals light up a cigarette and continue to smoke.

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\textbf{Keywords:} Young adults; Experimental study; Smoking behaviour; Imitation; Social interaction

1. Introduction

Tobacco consumption and exposure to tobacco smoke cause death, disease and disability all over the world which, in addition, lead to devastating economic costs and consequences. People smoke and are exposed to smoke especially in public places such as public transport, bars, restaurants, work and educational environment (\textbf{WHO, 2002}). To control tobacco, governmental actions are needed to ban smoking in social settings and public places. In the current study, we examine to what extent exposure to smoking models in a social setting (a bar) affects individual smoking levels. Insights into these mechanisms help in the development and implementation of policy measures that focus on banning smoking in social situations.

Many people start experimenting with smoking during adolescence and a substantial part end up as daily smokers in late adolescence and young adulthood. It is therefore important to identify which environmental factors cause late adolescents and young adults to maintain smoking. Imitation plays a major role in the development and maintenance of addictive behaviours such as smoking (\textbf{Bandura, 1977, 1986}). People often imitate the behaviour of others spontaneously and without being aware that they are imitating behaviour, or that they are functioning as a role model in social interactions (\textbf{Van Baaren, 2003}). However, in some cases individuals intentionally imitate other individuals, e.g., when it may lead to immediate positive rewards, or may offer some advantage in initiating and continuing social relationships. In everyday life, we are exposed to different models, for example, in the visual media (e.g., movie, television and sport personalities), at home (e.g., parents, siblings), at work or school (e.g., peers), or in peer groups (e.g., friends, romantic partners), which may affect our smoking behaviour. It is known
that we imitate the behaviour of others we like (e.g., parents and friends) or individuals we adore and who function as a role model (e.g., celebrities, famous people), but we may even imitate the behaviour of strangers (Chartrand and Burgh, 1999).

The present experimental study investigates whether young adults imitate the smoking behaviour of complete strangers. Two experimental studies conducted in the late 1970s indicated that imitation plays an important role in maintaining individuals’ smoking (Antonuccio and Lichtenstein, 1980; Miller et al., 1979), but neither of these studies measured ad lib (spontaneous) smoking. In these two studies, it was stressed that during the experiment the participants were allowed to smoke, participants were instructed to smoke at least a few cigarettes, and cigarettes were provided freely on the table. In contrast to these two studies, in the present study, we were specifically interested in ad lib smoking and the generalization of our findings to the ‘real life’ situation. To our knowledge no experimental studies have investigated whether people spontaneously imitate the smoking behaviour of complete strangers, apart from one experimental study by Kniskern et al. (1983): using data from 56 students they reported that adolescent smokers are influenced by smoking models.

In the alcohol literature some experimental studies have explored the imitation of alcohol consumption, taking into account ad lib drinking and spontaneous imitation. It was found that imitation plays an important role in an individual’s alcohol consumption, modifying his/her drinking rate in the direction of the drinking rate of the model (e.g., Collins and Marlatt, 1981; see also review of Quigley and Collins, 1999; Rosenbluth et al., 1978). Based on the outcomes of these experimental alcohol studies one might assume that in relation to smoking that participants will also imitate the smoking behaviour of the model. Whether or not a person starts imitating another person’s smoking may depend on the quality of the social interaction. We assume that imitation will occur more in situations in which individuals feel connected with each other. An individual will be more likely to imitate someone else’s behaviour in a situation in which the other shows interest, acts in a friendly way and shows empathy (i.e., ‘interpersonal closeness’), in contrast to a situation where the other individual is indifferent, and does not interact (Van Baaren, 2003). Thus, a warm and interactive individual will be a more attractive model than an unsociable model (Parks, 1980; Reid, 1978). Although the findings concerning the imitation of alcohol consumption and the nature of social interaction were ambiguous, these studies generally support the assumption that the magnitude and duration of imitation depends on the quality of the social interaction (Collins et al., 1985; Parks, 1980; Reid, 1978).

The present observational experimental study investigated the effect of peer smoking and the nature of social interaction on young adults’ smoking behaviour (i.e., cigarette frequency, cigarette duration, and inter-cigarette interval) in a bar lab setting. We investigated whether the smoking condition (i.e., non-smoking, light smoking, and heavy smoking), the nature of the social interaction (warm versus cold model), sex of the participant, and participant’s general urge to smoke in different situations (i.e., craving) would predict the number of cigarettes smoked during the break. We also tested what the predictors were for a participant to light up the first cigarette, the second cigarette, and the third cigarette in a time-out situation. Finally, we examined whether there was an interaction between the nature of the social interaction and the smoking condition.

2. Method

2.1. Design and participants

An experimental design with a three (smoking condition) by two (nature of social interaction) factorial design was used. The confederate’s smoking was divided into a non-smoking (confederate smoked zero cigarette), light smoking (confederate smoked one cigarette), and heavy smoking (confederate smoked four cigarettes) condition, and the nature of social interaction was divided into a sociable (i.e., warm) and unsociable (i.e., cold) condition. A total of 125 young adults (primarily college and University students), 63 females and 62 males participated; their age range 18–33 years (M = 22.08; S.D. = 2.61). Participant’s age of smoking onset was 13.82 (S.D. = 2.82) years. All participants smoked daily; 20.8% smoked 1–5 cigarettes/day, 28.8% 6–10 cigarettes/day, 41.6% 11–20 cigarettes/day, and 8.8% 21–30 cigarettes/day. Analysis of variance (i.e., one-way ANOVA) were used to test for differences in participant characteristics (i.e., age, number of cigarettes smoked daily, tried to smoke less and/or quit smoking, intention to quit smoking, nicotine dependence) between the six conditions; no significant differences were found between the conditions.

2.2. Procedure

Participants who were smoking outside (on campus) were asked if they were daily smokers and were willing to participate in a study where they had to judge (on television) general advertisements and a smoking-prevention campaign aimed at daily smokers. No information was provided about the real aim of the study, i.e., whether participants imitate the smoking behaviour of another unfamiliar individual. This type of procedure has been used in several experiments on imitation and alcohol consumption (see Quigley and Collins, 1999). In the present study, to observe the participant in a naturalistic setting, we simulated a bar in one of the university buildings (for more information on the bar lab, see Bot et al., 2005). The participants were invited to our bar lab in the period January–April 2005, for a session lasting 1 h. Of the 137 participants who participated, 125 were included in the analyses; 12 participants dropped-out from the analyses (nine males and three females) because they had recently stopped smoking, were not a daily smoker (smoked less than one cigarette per day), or they suspected that the other person was an accomplice in the study. Eight undergraduate students (five females and three males) who were regular smokers acted as a confederate. In each session two persons participated, one was the actual observed participant, the other was the confederate who acted as though they were an ‘ordinary’ participant. Confederates and participants were always of the same gender to avoid confounding effects of ‘attractiveness’. Before each session, the confederate was told whether during the break he/she had to smoke zero, one or four cigarettes (cigarettes were provided to the confederate) and whether he/she should act as the warm or cold model. In the sociable condition, the confederate was warm and friendly, talking cheerfully, initiating and maintaining a conversation with the participant on topics the participant showed interest in (e.g., sports, education, leisure activities, etc.) while avoiding matters related to the experiment, and generally reflecting and agreeing with the participant’s point of view. The confederate also used warm and friendly non-verbal gestures, e.g., smiling, maintaining eye contact, leaning forward, etc. (see also Caudill and Kong, 2001). In the unsociable condition, the confederate showed no interest in the participant, read magazines on the table, did not initiate or maintain a conversation with the participant, and responded to statements or questions of the participant with a single word or short phrase. The confederate also acted unresponsively non-verbally by, e.g., not smiling, being restrained in gestures and body movements, avoiding eye contact, leaning away from the participant, etc. However, although the confederates were mainly unresponsive, they were instructed not to be aggressive or hostile.
After the participants had entered the bar lab the experimenter explained the procedure of the study to both the participant and confederate, they were told to sit separately from each other at two different tables in order to guarantee anonymity and privacy. Then, the participants were asked to fill in a questionnaire containing various questions about smoking habits, nicotine dependence, craving, personality traits, conformity tendencies, and stress. This took approximately 10 min.

Next, the participant was told to sit at the table in front of a TV screen where the other participant (i.e., confederate) was sitting. Before beginning the first task, the participants were told that they would be observed. The first task (taking 5 min) involved evaluating six general advertisements shown on the TV screen (e.g., adds on products such as detergent, food, and drinks); they had 30 s to fill in questions on whether the advertisement was clear, which aspects of the advertisements were appealing, and whether they would use or buy the product being advertised.

After completing this task, there was a break. The participants were told that they had a break but had to stay in the room; they could play billiards or table football and/or read magazines. During the break the experimenter tuned into a radio station playing popular music and put some magazines on the table. Volume and radio station (i.e., type of music) were kept stable in all the conditions. Participants were told that it was allowed to smoke in this room and they were offered (gratuit a drink (e.g., soda, juice and water). The experimenter did not specify how long the break would last, unless they were specifically asked. After serving the drinks the experimenter left the room (to avoid the participant starting a conversation with the experimenter). The confederate was instructed to directly light up a cigarette at the beginning of the break if she/he had been instructed to smoke one or four cigarettes during the session. This was essential, because we were assessing modeled behaviour and therefore, the confederate always lit up the first cigarette before the participant did. We told the confederate in advance that if the participant ran out of cigarettes, the participant was allowed to take cigarettes from the confederate. If the participant asked the experimenter where to buy cigarettes, the experimenter told them that a participant from a previous session had left his/her cigarettes and that the participant could smoke the cigarettes which were left behind.

After the 30-min break, the second task began. Five advertisements of a smoking-prevention campaign to discourage smoking were shown on the TV. Again, similar to the first task, the participants had to fill in a questionnaire to evaluate the advertisements shown.

At the end of the session, both participants were asked to fill in an evaluation form and we requested them to sit apart from each other in order to maintain the anonymity and privacy of each individual. The evaluation form consisted of a few questions, which functioned as a manipulation check. The evaluation form included a question in which participants were asked to explain in their own words the purpose of this study, to check whether the participant knew the primary aim of the study (i.e., imitating the smoking behaviour of the confederate during the break). Not one participant described the real purpose of the study. The evaluation form also included items to check to what extent the participant perceived the other (i.e., confederate) as friendly/nice, kind, enjoyable/pleasant, not annoying, and not arrogant.

Each participant received € 6 for their participation. After each session, the air was purified by special equipment. Pilot studies were conducted to verify the credibility of the setting and procedure. Participants strongly endorsed the credibility of the setting. Complete debriefing of participants was done after we had completed all data collection.

During each 1-h session, video and audio recordings were made. One flexible camera with zoom was used; this camera and another one (which we did not use) were hidden in two corners of the bar lab. One research assistant observed the camera in an observation room next to the bar lab and observed the behaviour of the participant during the break and conducted the coding. Four undergraduate research assistants were trained and served as observers in the study.

1 The evaluation form also included four questions used as a manipulation check on the participant’s feelings of stress or tension during the session: (1) when you entered the room, (2) when you were doing the first task, (3) during the break, and (4) when you were doing the second task.

2 The mean score on this item was 1.49 (S.D. = 0.50), with limited variance because most participants had no or hardly any stress or negative tension during the break (51.2% did not experience stress/negative tension, and 48.8% had hardly no stress/negative tension). We tested whether stress/negative tension affected the number of cigarettes smoked during the break, and the results showed that this was not the case (χ² = 3.21, N = 125, p = 0.52).
participants and confederates, in the warm condition participants as well as confederates were not seen as more attractive than in the cold condition. Table 2 shows that, in the session in which the confederate acted as a warm model, participant and confederate perceived the break to be more pleasant and less boring than the session with a cold model. Thus, we can safely state that both our manipulations were successful.

3.2. Impact of smoking condition and nature of social interaction on cigarette use

In the non-smoking condition (N = 41), 36.6% (N = 15) of the participants did not smoke, 46.3% (N = 19) of the participants smoked one cigarette, and 17.1% (N = 7) of the participants smoked two cigarettes. In the light-smoking condition (N = 41), 24.4% (N = 10) of the participants did not smoke, 43.9% (N = 18) of the participants smoked one cigarette, and 31.7% (N = 13) of the participants smoked two cigarettes. In the heavy-smoking condition (N = 43), 2.3% (N = 1) did not smoke, 27.9% (N = 12) of the participants smoked one cigarette, 32.6% (N = 14) of the participants smoked two cigarettes, 34.9% (N = 15) of the participants smoked three cigarettes, and 2.3% (N = 1) smoked four cigarettes.

We tested whether the nature of social interaction and the smoking condition affected the total number of cigarettes smoked during the 30-min break (Table 3). First, the number of cigarettes smoked by the confederate (zero, one or four cigarettes) strongly affected the total number of cigarettes smoked by the participant (F = 32.16, N = 125, p < 0.0001, partial $\eta^2 = 0.351$). With regard to the nature of social interaction, when the participant is in a warm social interaction (interacting with a warm model) he/she will smoke more cigarettes than in the presence of a cold model (F = 13.99, N = 125, p < 0.0001, partial $\eta^2 = 0.105$). We found no smoking condition x nature of social interaction effect (F = 0.58, N = 125, p = 0.56).

Furthermore, because lighting up a cigarette by daily smokers may also be affected by craving, we included craving in the analyses as a covariate. It appeared that confederate’s smoking and the nature of the social interaction predicted the number of cigarettes smoked by the participant after controlling for craving. Craving predicted the number of cigarettes smoked by the participant (F = 7.21, N = 125, p < 0.01, partial $\eta^2 = 0.058$). The model explained 43.6% of the variance in participants’ smoking.

### Table 1
Comparison of indicators of participants’ and confederates’ perception of the other person during the session between the warm and cold model

<table>
<thead>
<tr>
<th>Perception participant</th>
<th>Confederate warm model</th>
<th>Confederate cold model</th>
<th>Perception confederate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>S.D.</td>
<td>M</td>
</tr>
<tr>
<td>Boring vs. pleasant</td>
<td>5.38 a</td>
<td>1.49</td>
<td>2.93 b</td>
</tr>
<tr>
<td>Unkind vs. kind</td>
<td>5.91 a</td>
<td>1.20</td>
<td>3.90 b</td>
</tr>
<tr>
<td>Unattractive vs. attractive</td>
<td>3.84 a</td>
<td>1.56</td>
<td>3.53</td>
</tr>
<tr>
<td>Annoying vs. not annoying</td>
<td>5.98 a</td>
<td>1.48</td>
<td>4.97 b</td>
</tr>
<tr>
<td>Unfriendly vs. friendly</td>
<td>6.11 a</td>
<td>1.35</td>
<td>3.73 b</td>
</tr>
<tr>
<td>Arrogant vs. not arrogant</td>
<td>6.02 a</td>
<td>1.50</td>
<td>4.28 b</td>
</tr>
</tbody>
</table>

Note: means with different letters are significantly different (p < 0.01). Responses ranged from 1 to 7.

### Table 2
Comparison of indicators of participants’ and confederates’ perception of the break during the session between the warm and cold model

<table>
<thead>
<tr>
<th>Perception participant</th>
<th>Confederate warm model</th>
<th>Confederate cold model</th>
<th>Perception confederate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>S.D.</td>
<td>M</td>
</tr>
<tr>
<td>Break is relaxing</td>
<td>0.58</td>
<td>0.50</td>
<td>0.52</td>
</tr>
<tr>
<td>Break is boring</td>
<td>0.08 b</td>
<td>0.27</td>
<td>0.47 a</td>
</tr>
<tr>
<td>Break is pleasant</td>
<td>0.55 a</td>
<td>0.50</td>
<td>0.08 b</td>
</tr>
<tr>
<td>Break is unpleasant</td>
<td>0.03</td>
<td>0.18</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Note: means with different letters are significantly different (p < 0.01). None of the confederates perceived the break as unpleasant, therefore, no means and standard deviations are shown in this table.

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$\eta^2$ is 0.402. N = 125.
Sex was included in the analyses as a covariate to test whether it affected the total number of cigarettes smoked; however, gender did not predict the number of cigarettes smoked by the participant ($F = 0.03, N = 125, p = 0.864$). In addition, we tested whether there was a moderating effect of gender with the variables included in the model (smoking condition, nature of social interaction, craving), and in addition a three-way interaction (gender $\times$ nature of social interaction $\times$ smoking condition); this proved not to be the case. We also tested other possible interactions between model variables, and found an interaction effect only between smoking condition and craving ($F = 3.87, N = 125, p < 0.05$, partial $\eta^2 = 0.065$). When the participant has a low urge to smoke he/she will be more susceptible to imitation compared to participants who have a high urge to smoke.

3.3. Participants lighting up the first cigarette

In sum, 79.2% ($N = 99$) of the participants smoked during the break. In the non-smoking condition 63.4% of the participants still lit up and smoked one or more cigarettes. In the two conditions in which confederates smoked (i.e., the combination of the light and heavy smoking condition) 86.9% lit up and smoked one or more cigarettes. The cross-tabulation between smoking condition (no smoking versus smoking by confederate) and smoking by participant (no smoking versus smoking one or more cigarettes) was significant ($\chi^2 = 9.23, p < 0.01$). More specifically, 75.6% of the participants smoked when the confederate smoked one cigarette, and 97.7% of the participants smoked when the confederate smoked four cigarettes.

In addition to cross-tabulations, logistic regression analyses were used to test which variables (e.g., smoking condition, the nature of social interaction, craving and gender) predicted the participant lighting up a first cigarette. Because most participants who smoked lit up their cigarette immediately after the break started, the differentiation between light and heavy smoking condition did not affect lighting up the first cigarette. Therefore, we used two groups in the subsequent analyses (non-smoking condition versus smoking condition; light and heavy smoking combined) (Table 4). Logistic regression analyses showed that participants imitated the confederate during the break with regard to lighting up a first cigarette. Participants in the smoking condition were three times more likely to light up a first cigarette compared to participants who were in a non-smoking condition. Further, participants who scored high on craving were 11 times more likely to light up their first cigarette compared to participants who scored low on craving. The variables in our model predicted 41.4% of the variance in smoking. Gender of the participant and the nature of the social interaction (warm versus cold) did not affect lighting up a first cigarette. We found no interaction between the nature of the social interaction and the smoking condition. However, an interaction was found between gender and the smoking condition (OR $= 0.07, p < 0.05$, 95% CI 0.01–0.75). In the non-smoking condition males were less likely to light up a first cigarette than females; however, in the smoking condition males were more likely to light up a first cigarette than females.

3.4. Participants lighting up the second cigarette

Findings showed that 17.1% ($N = 7$) of the participants in the non-smoking condition, 31.7% ($N = 13$) in the light smoking condition and 69.8% ($N = 30$) in the heavy smoking condition lit up a second cigarette ($\chi^2 = 26.03, p < 0.0001, N = 125$). Logistic regression analyses (see Table 4) implied that the smoking condition and the nature of the social interaction did affect lighting up the second cigarette. Craving and gender of the participant did not affect smoking a second cigarette. A cold social interaction was a protective factor to stop the participant from smoking a second cigarette. Participants in the heavy smoking condition (in which the confederate lighted up four cigarettes) had an 18 times higher risk compared to the participants in the non-smoking condition. The participants in the light smoking condition were not more likely to light up a second cigarette than the participants in the non-smoking condition. The model explained 45.4% of the variance of lighting up the second cigarette.

We found no interaction between the smoking condition and the nature of the social interaction on the likelihood of lighting up a second cigarette. Furthermore, there was no significant interaction effect with gender. We also tested whether craving of the participant was a significant moderator. There was a significant interaction term between craving and the smoking condition (OR $= 0.08, p = 0.054$, 95% CI 0.01–1.04). The participants who scored low on craving were the most susceptible to imitate the second cigarette. The variables entered in the

<p>| Table 4 |</p>
<table>
<thead>
<tr>
<th>Logistic regression analyses of the first and second cigarette smoked by the participant during the break</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First cigarette</strong> ($N = 125$)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Gender participant</td>
</tr>
<tr>
<td>Smoking condition</td>
</tr>
<tr>
<td>Non-smoking condition (reference group)</td>
</tr>
<tr>
<td>Light smoking condition</td>
</tr>
<tr>
<td>High smoking condition</td>
</tr>
<tr>
<td>Nature of social interaction</td>
</tr>
<tr>
<td>(warm vs. cold)</td>
</tr>
<tr>
<td>Craving participant</td>
</tr>
</tbody>
</table>

Note: OR = odds ratio. 95% CI = 95% confidence intervals. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. $R^2$ of the model explaining first cigarette is 0.414; $R^2$ of the model explaining second cigarette is 0.454.

3 We rerun the analyses of the first cigarette excluding the craving measure from the analyses. The results showed similar findings as depicted in Table 4: gender (OR $= 0.67$, 95% CI 0.27–1.67), smoking condition (OR $= 3.90$, 95% CI 1.57–9.67), and nature of social interaction (OR $= 0.61$, 95% CI 0.24–1.51).

4 We compared smoking condition (combining light and heavy smoking condition) with the non-smoking condition in this analysis.
analyses (including the significant interaction term) explained 48.5% of the variance of participant’s lighting up the second cigarette.

3.5. Participants smoking the third cigarette

In the non-smoking condition \((N=41)\), none of the participants in the warm or cold social interaction lighted up a third cigarette. When the confederate smoked one cigarette during the break \((N=41)\), in both the warm and cold model none of the participants lighted up a third cigarette. In the heavy smoking condition, 50% of the participants in the warm model condition \((N=11)\) did light up a third cigarette, whereas, in the cold model condition 23.8% of the participants \((N=5)\) did light up a third cigarette \((\chi^2 = 3.15, p = 0.076, N=43)\).

Because of zero participants in the non-smoking and light smoking condition who smoked a third cigarette, we tested which variables predicted participant’s lighting up their third cigarette using cross-tabulations instead of logistic regression analyses. The cross-tabulations showed that the smoking condition affected the participant’s lighting up the third cigarette \((\chi^2 = 34.99, N = 125, p < 0.0001)\). The nature of the social interaction, craving and the gender of the participant did not affect lighting up the third cigarette.

3.6. Imitation in terms of duration of the cigarette by participant

Besides looking at whether a participant imitates a confederate in terms of lighting up a cigarette at all, imitation may also occur in terms of the duration of smoking a cigarette. The time taken to smoke the first cigarette smoked by the confederate correlated with that of the participant \((r(125) = 0.24, p < 0.05)\). When the confederate and participant smoked more than one cigarette, the time taken to smoke the second cigarette of the confederate was not significantly correlated \((r(125) = -0.04, p = 0.83)\) with that of the second cigarette smoked by the participant. When the confederate and participant smoked more than two cigarettes, the time taken to smoke the third cigarette of the confederate was not significantly correlated \((r(125) = 0.19, p = 0.48)\) with that of the third cigarette smoked by the participant.

3.7. Imitation in terms of inter-cigarette interval by participant

Imitation may also occur in terms of the time elapsing between each cigarette (i.e., inter-cigarette interval). When the confederate and participant smoked one or more cigarettes, the interval between the first and second cigarette of the confederate was not correlated with that of the participant \((r(125) = 0.05, p = 0.80)\). Also, confederates and participants smoking more than two cigarettes, no significant correlation was found with regard to the interval between the second and third interval of the confederate and the participant \((r(125) = -0.18, p = 0.51)\). In sum, the findings indicated that imitation did not occur in terms of inter-cigarette interval.

4. Discussion

4.1. Imitation of smoking

The findings of this observational experimental study showed that even during 30 min young adults may imitate the smoking behaviour of complete strangers. Imitation explains a large proportion of the variance of the participant smoking. In a bar setting individuals imitate the first, second and third cigarette of complete strangers. Even after controlling for the urge to smoke and nature of social interaction, the imitation of smoking was strong. In everyday life, we are exposed to different models in public places, and the present findings indicate that imitation plays an important role in maintaining individuals’ smoking behaviour. As far as we know, there are no experimental studies investigating ad lib smoking with the exception of the study of Kniskern et al. (1983). That study indicated that adolescent smokers are influenced by smoking models (in particular same-gender smoking models compared to opposite-gender smoking models), although imitation could not explain why adolescents maintain smoking. In contrast to our study, their study among adolescents only included a smoking model who smoked two cigarettes during 30 min and did not include a non-smoking (control condition) or a heavy smoking model. Experimental studies on alcohol consumption indicating that imitation plays an important role in the amount of the individual’s alcohol consumption, modifying his/her drinking rate in the direction of the drinking rate of the model, are in line with our findings (see review of Quigley and Collins, 1999).

With regard to smoking, imitation did not differ between males and females, with the exception of the first cigarette where males were shown to be more likely to imitate the smoking of the confederate than females. Alcohol consumption studies showed that imitation differs between male and female participants (Cooper et al., 1979; Lied and Marlatt, 1979): in a same-gender dyad interaction males were more likely to imitate the alcohol consumption rate of the model than females. However, to obtain more insight into the imitation mechanism affecting individual’s smoking, we need to elucidate whether attractiveness of the opposite gender causes a higher level of imitation than in a same-gender dyad. In addition, we need to investigate whether imitation of smoking is stronger in groups than in dyads. Findings of an experimental study on alcohol of Rosenbluth et al. (1978) suggest that males drank more and faster than females, and that males and females drank more in groups than in dyads, but we do not know if this also applies to smoking.

4.2. The nature of social interaction

Individuals are more likely to light up a cigarette and continue smoking when this takes place in a warm and sociable interaction with others. The nature of the social interaction explained approximately 11% of the variance of the participant smoking. Even after controlling for the urge to smoke and smoking condition, the effect of the nature of the social interaction remained. The nature of the social interaction only predicted the participant lighting up the second cigarette, and not the first or the third
cigarette. A possible explanation could be that other factors are more important for lighting up the first cigarette, such as craving and the bar setting.

The findings of other studies on the effect of the nature of the social interaction on participant’s smoking are ambiguous. Miller et al. (1979) found that heavy smokers were not affected by the social condition, but light smokers were affected by the social condition and took more frequent and longer puffs when smoking in the non-social condition. Glad and Adesso (1976) showed that the participants in the high arousal evaluation situation in which an atmosphere was created with socially induced tension experienced more tension and were more anxious than participants in the low-arousal affiliations in which a friendly and social atmosphere was created. However, this socially induced tension condition had no effect on the participant’s smoking. In our study the participants reported little or no stress regardless of whether they are in an unsociable or a sociable interaction and stress did not affect the participant’s need to smoke, suggesting that the participants did not smoke in the sociable or unsociable interaction to reduce tension. Thus, during our experiment, participants did not smoke as a strategy for coping with adverse social interactions, therefore, it is unlikely that stress levels affect the findings of our study.

4.3. The nature of social interaction affecting imitation of smoking

Our findings show that the magnitude of imitation of smoking was not influenced by the nature of the social interaction. The findings concerning imitation of alcohol consumption and the nature of the social interaction were ambiguous. Caudill and Marlatt (1975) showed that social interaction did not influence imitation of alcohol consumption, whereas, the findings of Collins et al. (1985), Parks (1980) and Reid (1978) implied that social interaction did play a role in the imitation of the alcohol consumption rates but only in the sociable condition. A possible explanation why in our experimental study imitation of smoking was not influenced by the nature of the social may be because 30 min was too short a period to observe this. Our study showed that more participants lighted up a second cigarette in the condition where the model was warm and smoked one cigarette than in the light smoking condition where the model was cold. It seems that a warm social interaction results in accepting each other, and resulted in a ‘cosy’ and comfortable context in which participants were relaxed and continued to smoke. If we had included a longer observation period (e.g., by extending the break or including a second session with the same participant) perhaps imitation would have increased more in those participants in a warm social interaction than in a cold social interaction.

4.4. Limitations

Our study has the following limitations. First, we did not differentiate between light and heavy smokers among participants. We assumed that all young adults who smoked daily had a relatively stable and established smoking pattern, and the participants in each experimental condition did not differ concerning nicotine dependence. However, imitation and the nature of the social interaction may be different for heavy and light smokers. Future research should reveal whether imitation effects differ for different types of smokers. Besides, manipulation of age might also be interesting. Imitation might be stronger in young people and decline with an increase in age. In addition, this experimental study examined imitation of smoking in a bar setting. However, the degree of imitation may vary in different environment and setting (e.g., work setting, school setting, or other public places) depending on the smoking norms in that specific setting. Future research should reveal whether smoking in different settings would elicit the same degree of imitation. Second, we did not control for satiation, and a ceiling effect may have occurred. To avoid satiation, we could have instructed participants not to smoke for at least 1 h before each session, or perhaps artificially controlled participant abstinence in the laboratory prior to the experiment to ensure that smokers have similar blood nicotine levels at the start of the experiment. Another possibility is that we could have assessed the amount of prior smoking via CO. However, these approaches might have caused participants to suspect that the real aim was to study their smoking behaviour during the break (see also Antonuccio and Lichtenstein, 1980). Participants may have just smoked a cigarette before participating in the session, and thus when entering the bar lab had a high level of satiation. However, participants with a high and low satiation level were probably equally distributed among the six conditions. Third, we did not measure smoking topography in detail, but only looked at cigarette frequency, cigarette duration, and inter-cigarette interval. For example, we did not look at the number of puffs. However, previous studies showed that imitation did not affect puff frequency per cigarette, percentage of tobacco burned, puff duration, and average inter-puff interval, but only influenced the macro-measures of cigarette frequency and inter-cigarette interval which are related to the act of taking and lighting up a cigarette (Antonuccio and Lichtenstein, 1980; Miller et al., 1979). Finally, in this present study, we assessed craving as the general urge to smoke in various situations. However, future research could apply other measures of craving such as the immediate urge to smoke (e.g., Questionnaire of Smoking Urges; Tiffany and Drobes, 1991) to replicate the findings.

4.5. Implications

To decrease smoking prevalence, efforts are being made worldwide via a broad range of policies and activities such as tobacco tax and price increases, bans on direct and indirect tobacco advertising, large graphic health messages on tobacco packages, providing mass-media campaigns to promote cessation, and smoke free environments in all public and workplaces. Several countries have reported that these actions have decreased the smoking prevalence. However, such governmental and community actions have not yet been implemented in all countries worldwide.

The findings of this experimental study confirm that governmental action to ban smoking in public settings is likely to decrease the smoking prevalence. Smoking is banned in some public settings because non-smokers are exposed to pas-
sive smoking, but another reason to ban smoking in public places would be because individuals imitate cigarette smoking. Our study showed that people continue smoking because they imitate the smoking behaviour of complete strangers, and therefore exposure to smoking models should be as infrequent as possible. Presumably those individuals who are trying to cut down or quit smoking will be more at risk in these public settings. Further, our findings indicated that craving and modeling both predicted the first cigarette but that modeling and the type of confederate predicted the second cigarette but craving did not. This finding stresses the importance of the environment on smoking because it suggests that initiation of a smoking event may be strongly ruled by craving but that social aspects may then have the stronger effect on continuation of smoking.

In summary, the mechanism of imitation partly explains why individuals continue to smoke. The findings of this study underscore that governmental actions to create and more strictly enhance smoke-free areas in public places (such as bars, restaurants, work and educational environment) are effective in reducing the smoking prevalence.

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References


West, R., Unpublished research.