

# **The Imitation of Smoking Behavior during Real Life versus Digital Interaction**

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## **Abstract**

The current study investigated to what extent adolescents tend to imitate the smoking behavior of peers during both real life and digital interaction. Two different experiments were performed. The first experiment focused on mechanisms of the imitation of smoking behavior during real life, where participants were being exposed to a same-gender confederate who smoked zero cigarettes (non-smoking condition) or three cigarettes (heavy smoking condition) during a session. The second experiment was conducted to investigate mechanisms of imitation of smoking behavior during digital interaction, so the influence of craving on participants' smoking behavior could be reduced by excluding the others' tobacco smell. The same procedure was used as in the first experiment. The confederates' smoking behavior affected the participants' cigarette use significantly: participants smoked a higher number of cigarettes when being exposed to a heavy smoking confederate, during both real life and digital interaction. Imitation in terms of smoking typography could also be located in both experiments, when looking at time of lighting up a cigarette and the duration of smoked cigarettes by participant and confederate. Mechanisms of imitation can serve as an explanation of why adolescents light up cigarettes and maintain cigarette smoking.

## **Introduction**

Since July 2008, the Dutch government has decided that smoking is no longer allowed in the entire Dutch catering industry. It is one of the restrictions the government has applied with the intention to prevent or reduce smoking prevalence in the Netherlands. Despite this, and many other applied policies to prevent or reduce smoking, people still continue cigarette smoking. The World Health Organization shows that use of tobacco is the second major cause of death worldwide (WHO, 2009). Addiction to cigarette smoking can lead to many negative circumstances, ranging from unhealthy skin, to lung diseases and, in the worst scenario, death. The prevalence number on cigarette smoking indicates that the majority of people in the Netherlands start smoking during adolescence: an average increase of smokers between the

age of 10 to 19 can be identified (Stivoro, 2009). More than one-third of high school students worldwide use tobacco at least once a month, and almost 20 percent of them are smoking cigarettes every day (USDHHS 1998, as shown in Kobus, 2003).

Many researchers identified several explanations for the increased risk of starting and continuing cigarette smoking during adolescence. Adolescents are not completely aware of the risks and consequences of their behavior; dangerous situations are underestimated and they often act impulsive. During adolescence, the role and importance of peers seem to increase compared with childhood (Essau, 2008). The greatest part of daily smoking adolescents seemed to have smoked their first cigarette in the presence of peers (Aloise-Young, Graham & Hansen, 1994). Previous studies provide strong evidence for the high influence of peers on adolescent cigarette smoking. Adolescents can be influenced by peers in several ways. Being surrounded by smoking peers increases the availability of cigarettes, besides, adolescents can identify cigarette smoking as normal behavior, which might will provide them social acceptance of their peers (Graham, Marks & Hansen, 1991). To avoid exclusion and become a misfit, own behavior will be adjusted to fit the dominant behavior, norms and values of peers (Essau, 2008).

Several studies emphasize the importance of smoking peers in explaining adolescent cigarette smoking (e.g. Glad & Adesso, 1976; Harakeh, Engels, van Baaren & Scholte, 2007; Mercken, Snijders, Steglich & de Vries, 2009). One often applied mechanism in explaining adolescent cigarette smoking is modeling or imitation. Mechanisms of modeling are extensively investigated by Bandura (1977). With his social learning theory, he indicates that behavior is learned by observing and modeling behavior of other people. This learning process occurs conscious, with the intention to reach a particular goal. Specific behavior will be modeled depending on the negative or positive associations linked to that behavior, and on expected rewards or punishments (Kobus, 2003). However, it is also possible that modeling, or imitation, will occur unconsciously and without any intention (Chartrand & Bargh, 1999).

A few studies has been performed to investigate mechanisms of imitation in the context of cigarette use. An experimental study, performed by Antonuccio and Lichtenstein (1980), used heavy and light smoking confederates to see how modeling affected the smoking behavior of the heavy and light smoking participants. The results showed that the number of cigarettes smoked by light smoking participants increased during interaction with heavy smoking confederates. This assumption is in line with outcomes of a study of Kniskern, Biglan, Lichtenstein, Ary & Bavry (1983), which also found that participants were significantly affected by observing a heavy smoking model. Other studies focused on imitation in terms of smoking typography. A study of Glad & Adesso (1976) showed that the

number of minutes that the subject was smoking cigarettes during the experiment was increased by the presence of a smoking confederate. Miller, Frederiksen & Hosford (1979) investigated processes of social cues on smoking typography. The results indicated that the type of social condition affected the smoking style of the light-smoking participants. During the social-condition, where confederates were told to act friendly and hold conversations with the participants, these participants smoked less cigarettes than during the non-social condition, where little or no conversation between participants and confederates took place. A more recent experimental study of Harakeh and colleagues (2007) investigated the effect of smoking confederates on adolescents' cigarette use in a naturalistic setting, showing that lighting up a cigarette and maintain cigarette smoking can be explained by mechanisms of imitation.

In short, all previous studies show a significant influence of imitation by explaining the influence of peers on adolescents' smoking behavior. The proximity of (heavy) smoking confederates resulted in a increased number of smoked cigarettes by participants. However, there is still one aspect which remains unclear in all previous studies in the imitation of smoking behavior. When participants were being confronted with the smoking behavior of confederates, they were being exposed to the other's tobacco smell at the same time, The smell of cigarettes may have caused feelings of craving among participants (Bailey, Goedeker & Tiffany, 2009). Because of the fact that it is not clear to what extent these possible feelings of craving have affected the smoking behavior of participants in all previous studies, it cannot be assumed that the affected smoking behavior can completely be attributed to mechanisms of imitation. The current study will provide new insights in mechanisms of imitation by excluding the smell of tobacco. When participants' smoking behavior will be affected even without the presence of tobacco smell, more clarity will be created about the role of imitation in this process.

A context in which mechanisms of imitation can be investigated in the absence of tobacco smell, is during digital interaction. Today's adolescents are growing up in a digital culture. A study in the USA indicates that 93% of the American youth is using the Internet, mostly with the intention to interact with other people. Online social networks are dealing with an explosive growth of members (Montgomery & Chester, 2009). Several online chat platforms and other ways of online communicating offer users the opportunity to watch the other person by webcam during an online conversation. Thus, people can observe each other's behavior on a computer screen, which makes it possible that the own behavior might be affected by the observed behavior. As far as known, no previous studies investigated the imitation of smoking behavior during digital interaction. A review of Kobus (2003) indicates

that some gaps can be pointed out in the social learning theory of Bandura. One of these gaps, is that it is not clear if mechanisms of imitation also will occur during “indirect” contact, such as conversations over the phone or via Internet. However, a number of studies has been performed in the effect of smoking movie characters on participants smoking behavior. Results showed that participants’ intentions to smoke increased after observing smoking movie characters (e.g. Nes, Saris & Hrockmorton-Belze, 2007; Dal Cin, Gibson, Zanna, Shumate & Fong, 2007). Although it is not possible to predict that seeing somebody smoke on a computer screen will cause the same effect as seeing somebody smoke on television, it could be that similar mechanisms will be identified.

### *Current Study*

The current study will investigate mechanisms of imitation of smoking behavior during both real life and digital dyadic interaction. The central aim is to investigate whether mechanisms of imitation will occur during online conversations, without the presence of tobacco smell. In order to find out, it first must become clear if people actually will be affected by the smoking behavior of peers during real life interaction. Then, the focus will shift from real life conversations to digital interaction to examine the role of craving and to make clear if affected smoking behavior of participants can actually be attributed to mechanisms of imitation.

To investigate if imitation of smoking behavior actually occurs during real life and digital interaction, two different experiments will be performed. The first experiment will focus on the imitation of smoking behavior in real life interaction, where two adolescents (confederate and subject), who do not know each other, will be interacting with each other in the same room. The aim of this experiment is to investigate if adolescents will imitate the smoking behavior of peers during a 30-minutes dyadic interaction. The main expectation is that the confederate’s smoking behavior will affect the participant’s smoking behavior: observing a heavy smoking confederate will lead to an increase of participant’s cigarette use. This assumption can find evidence in theories as the perception-behavior link (Chartrand & Bargh, 1999) and the social learning theory (Bandura, 1977). Besides, feelings of craving caused by the smell of tobacco can also affect the smoking behavior during this experiment.

Because of the presence of tobacco smell during experiment 1, the outcomes of this experiment cannot make clear to what extent smoking behavior is the result of mechanisms of imitation or craving. During the second experiment, both participants (confederate and subject) will also be in dyadic interaction; however, they will no longer be in the same room. They will interact with each other via Internet, visually supported by webcam connections.

This second experiment has to make clear if, and to what extent, imitation of smoking behavior will occur during digital interaction, and thus without the presence of tobacco smell. Because this study is, as far as known, the first in investigating mechanisms of imitation during digital interaction, no clear expectations about the outcomes of the second experiment can be made. However, in line with the first experiment, it might be expected that also during digital (visual) interaction, people will still observe and model smoking behavior of other people.

Since, as far as known, no previous study investigated mechanisms of imitation in the absence of tobacco smell, the current study can complement missing knowledge and provide new insights. If the second experiment shows that imitation during digital interaction occurs, it becomes clear that mechanisms of imitation actually do play an important role in the continuation of adolescent cigarette smoking. Outcomes of the current study can provide evidence for the fact the affected smoking behavior of participants in previous studies are correctly attributed to mechanisms of imitation. This new insights can also lead to new recommendations and governmental actions. Anti-tobacco organizations such as the Trimbos Institute and Stivoro can use outcomes of the current study for customizing existing campaigns and creating new campaigns. By providing information, all adolescents should become aware of the fact that they might imitate smoking behavior of other people. Smoking bans in public places should be established or maintained and make people realize that in particular contexts, it is necessary to adjust their own smoking behavior to avoid that they will serve as a source of imitation.

## **EXPERIMENT 1**

### **Method**

#### *Experimental design*

An experimental design with a two (smoking condition: non-smoking versus heavy smoking) by two (pressure condition: no social pressure versus heavy social pressure) factor design was used. All four conditions will be performed by confederates. However, effects of social pressure on smoking behavior will not be included in the current study, so participants who were being exposed to social pressure during the experiment are excluded. Thus, only the smoking condition, containing a non-smoking versus heavy smoking condition, will be of use. This smoking condition will be the manipulated factor, to examine to what extent the smoking behavior of the confederate affects the smoking behavior of the participant. During the non-smoking condition, the confederate smokes no cigarettes, next to three cigarettes in the heavy

smoking condition. In the heavy smoking condition, it is necessary that the confederate will light up the first cigarette before the subject does, to speak of causality between the smoking behavior of the confederate (cause) and the smoking behavior of the subject (effect). During the heavy smoking condition, the confederate has to light up a cigarette each ten minutes. The confederate must extinguish each cigarette after five a seven minutes, to make sure that enough time is left to smoke three whole cigarettes during a 30-minute dyadic interaction.

### *Participants*

Each single session provided room for two people to participate in the experiment: one student (subject) and one confederate. During each session, participant and confederate must be of the same gender, to avoid the fact that ‘attractiveness’ would appear as a confounding factor.

### *Subject*

All of the participants of the first experiment were students of four schools for intermediate and technical vocational training in the Netherlands (Utrecht and Nijmegen). The research team asked the students in school if they were willing to participate in a study. Because none of the participants should be aware of the real aim of the study, a cover story was made up. Awareness of the real purpose of the research could possibly cause bias in the (smoking) behavior of the participants during the experiment. Instead of presenting the actual aim, the participants were asked if they were interested in participating in a music-study, in which they had to listen to and discuss about six different music fragments. Students who were interested in participating, had to fill in a screening list, containing questions about contact information, smoking behavior and, to emphasize the cover story, questions about their taste of music. Someone was selected as a suitable participant when he or she was a student between the age of 16 and 25 and based on the screening list could be qualified as a daily smoker (smoked at least one cigarette a day).

A total of 63 participants were involved in experiment 1. Of these 63 participants, 31 participants are suitable to be included in the analysis. 29 participants will be excluded because of the fact that they were exposed to social pressure. Besides, two participants will be excluded because they can no longer be qualified as daily smokers during their participation in the experiment. One participant cannot be included in the analysis because of the fact that he lighted up his first cigarette before the confederate did. All of the suited participants fit in the age group of 16 to 23 years ( $M = 18.09$ ;  $SD = 1.64$ ). Within this group, 21 participants were female (67.7%). Participants were divided at random over the four conditions, however,

each condition must have been performed both in the morning as in the noon and the afternoon, to avoid the probability that the time of the day would appear as a disturbing factor. Analysis of variance were performed to check differences in participant characteristics (gender, CO-level, age and average number of smoked cigarettes on daily basis) between the two conditions, but no significant differences were found.

### *Confederate*

Each session, a confederate participated in the experiment, next to the actual participant (subject). The actual participant was not aware of the fact that the other participant was a confederate, because the confederate had to act like he or she was a college-student and a participant of the experiment as well. Awareness of the fact that the other participant was actually a confederate did not match with the provided cover story. The use of confederates was necessary to control and manipulate the smoking condition. Confederates were recruited at the University of Utrecht and the College of Utrecht, through flyers and a message on the website of the Faculty of Social Science (<http://student.fss.uu.nl>). Someone was suitable to become a confederate, when he or she was between the age of 18 and 25 and at least smoked one cigarette a day (daily smoker). When someone fitted this profile, this person had to follow a short training before participating in the experiment. This training provided guidelines on how to act during each session, how to perform the music-experiment and the time of lighting up each cigarette. The relevance of this training was that these particular conditions could be kept nearly equal during each individual session with the use of different confederates. Each confederate had to act nice and social, both verbally and non-verbally, create a social and safe atmosphere and keep the conversation going during the whole session. In this way, the behavior of each confederate could be kept equal during each session, so this could not serve as a disturbing factor which might could affect the smoking behavior of participants.

### *Procedure*

Experiment 1 was realized from April 2009 till January 2010. The ethics committee of the University of Utrecht provided permission to conduct the first experiment. Recruited subjects, who were suited to participate in the experiment, were contacted by telephone to make an appointment. When the participant was not familiar with the location of the experiment, an e-mail was sent with a description of the route. A day before the appointment, the participant was called again as a reminder of the agreed date and time.

All sessions took place on weekdays between 10:00 and 17:30 and lasted approximately 50 minutes to one hour. The experiment took place in a camper from the



University of Utrecht. The camper consisted of two separated rooms. In the first room, the participants performed the experiment. Three inconspicuous placed video cameras recorded each single session. Before a session started, a package of cigarettes (Malboro Light) containing 8 cigarettes and a lighter, was hidden beneath a pillow on the seat of the confederate. The second room served as an observation room, where the experimenter observed the participants on a television screen recorded by the video cameras. The experimenter coded the time of lighting up and extinguish each smoked cigarette by confederate and participant in SPSS (version 16.0).

At the start of a session, the two participants (subject and confederate) met each other in the camper. The experimenter let them sign an informed consent document. Then, CO-levels (level of carbon monoxide in exhaled air) of both participants were assessed using a Smokelyzer<sup>®</sup> (Bedfont Scientific Ltd, Bedford, UK) and written down by the experimenter. However, the participants were told that his or her alcohol percentage would be measured, to avoid that the real purpose of the study would be discovered. The participants were asked to attach a small device on their fingers, to measure the skin conductance and mark out so-called stress-levels during discussing the music fragments. In fact, the devices did not work and were used to distract participants from the actual aim of the study. The participants were instructed about performing the music-experiment. At the end of this instruction, the experimenter offered the participants a non-alcoholic drink (soda, water or juice). Then, the confederate did “accidentally” noticed the package of cigarettes beneath his or her pillow. The experimenter explained that a previous participant probably forgot his or her cigarettes, and that the current participants were allowed to smoke these cigarettes if they wanted to. It was important that the confederate explicitly, yet subtle did make clear to the participant that he/she was a daily smoker, to avoid the possibility that participants would feel burdened because of smoking cigarettes in the presence of the other participant. The experimenter emphasized the fact that every participant was allowed to drink, eat and smoke during the whole experiment. An ashtray was prominent located on the table.

The actual music-study contained six music fragments, of which each fragment did last one minute. During the next four minutes after each music fragment, the participant and confederate were asked to fill in two opinion-questions about the particular piece of music and to discuss the fragment which each other on the basis of ten questions. The whole music-experiment did last around 30 minutes. During this 30 minutes, the confederate lighted up zero or three cigarettes, depending on the smoking condition. After discussing all music fragments, the participants were asked to fill in a questionnaire on smoking behavior, mood and a evaluation of the other participant, which took about ten minutes. Finally, the session

was concluded by paying the participant eight euros in cash as a reward for his/her participation, which had to be confirmed with signing a form. The confederate received a reward of ten euros per session, of which two euros were paid later in time, to make it look like the confederate received the same amount as the participant. Each recorded session was burned on a DVD. After finishing the data-collection of both experiments, all participants were debriefed about the real purpose of the study.

### *Instruments*

*Smoking behavior of participant* – The smoking behavior of each participant was measured by observing smoking behavior during a session. The total number of smoked cigarettes during a session, the time of lighting up each cigarette and the time of extinguishing each cigarette were coded by the experimenter, using SPSS (version 16.0). After each session, the total number of smoked cigarettes was checked again by counting the cigarettes in the ashtray. The number of cigarettes in the ashtray did always correspond with the observed number of smoked cigarettes.

*Time of lighting up cigarettes* – The time of lighting up and extinguish each cigarette by confederate was coded in the database. A new variable was created to point out the elapsed time (in minutes) between the confederate lighting up a cigarette and the participant lighting up a cigarette. Because there is no general guideline which can tell how much time must have been elapsed to speak of imitation, the current study did look at two possible ways of imitation: in terms of lighting up a cigarette in the exact same minute or one minute after the confederate did, and in terms of smoking a cigarette during the same interval in which the confederate was smoking a cigarette.

*Duration of smoked cigarettes* - A new variable is created to point out the duration (in minutes) of each smoked cigarette by confederates and participants. The duration of smoking a cigarette expresses the elapsed time between lighting up and extinguishing this cigarette.

*CO-level (carbon monoxide)* – To measure the extent of which the participants experienced feelings of craving during the experiment, a Smokelyzer<sup>®</sup> (Bedfont Scientific Ltd, Bedford, UK) was used to measure the level of carbon monoxide in exhaled air. The CO-level can be considered as a proxy for craving (Domier et. al, 2007).

### *Data-analyses*

To investigate the conducted data, first, the descriptive statistics were analyzed using SPSS (version 17.0). Next to the descriptive statistics, a linear regression-analysis was performed. The aim of the analysis is to investigate the possible main effect of confederates'

smoking behavior on participants' smoking behavior, by checking the total number of smoked cigarettes of both confederate and participant. CO-levels and gender were used as control-variables, to investigate to what extent these variables might have affected the participants' smoking behavior, and thus the outcomes of the study. Imitation in terms of smoking typography was examined by looking at time of lighting up and the duration of smoked cigarettes. The time of lighting up each cigarette by confederate was compared with the time of lighting up each cigarette by participant, to analyze how much time was elapsed and to check if the participants smoked their cigarettes in the same interval as the confederates did. The duration of smoking each cigarette by confederate and participants was analyzed with Pearson's correlation test to see if significant correlations between both could be found. An interaction-test has been performed to investigate whether the gender of the participant strengthened or weakened the effect of confederates' smoking behavior on participants' cigarette use. The gender of the participants is multiplied by the smoking behavior of the confederate (gender \* smoking behavior confederate).

## **Results**

### *Descriptive statistics*

Central aim of the study is to investigate possible mechanisms of the imitation of smoking behavior during dyadic interaction between two strangers. A total of 15 participants were included in the non-smoking condition, next to 16 participants in the smoking condition. When looking at participant's self-reported smoking behavior on daily basis, 16.1% indicated to smoke an average of one to five cigarettes a day, while 32.3% reported a daily average of six to ten cigarettes. Almost half of the participants (48.4%) smoked 11-20 cigarettes a day. Not one participant indicated to smoke more than 20 cigarettes a day. The total of smoked cigarettes by the participants during the first experiment ranged from one to three cigarettes ( $M = 2.07$ ,  $SD = .85$ ). The number of smoked cigarettes during the experiment did not significantly correspond with the self-reported number of smoked cigarettes on daily basis ( $r(31) = .036$ ,  $p = .852$ ).

### *The Impact of Smoking Behavior Confederate on Smoking Behavior Participant*

In the non-smoking condition ( $N = 15$ ), 66.7% ( $N = 10$ ) smoked one cigarette and 33.3% ( $N = 5$ ) smoked two cigarettes. None of the participants in the non-smoking condition smoked three or more cigarettes. In the smoking condition ( $N = 16$ ), 25% ( $N = 4$ ) smoked two cigarettes and a total of 75% ( $N = 12$ ) smoked three cigarettes during the experiment.

Results of a linear regression analysis (Table 1) showed that the smoking behavior of the confederates significantly and positively affected the smoking behavior of participants. The cigarette use of confederates and the gender of the participants together explained 65.8% of the variance in participants' cigarette use. The confederates' smoking behavior predicted the participants' smoking behavior with a beta of .800, which implies a strong effect. CO-level and gender were added as control variable. No significant effect of CO-level on participants' cigarette use could be found. However, gender seemed to have a significant influence on participants' smoking behavior: female participants smoked more cigarettes during a session than male participants did. No interaction effect of gender on participants' smoking behavior could be located ( $\beta = .258$  ( $B = .151$ ,  $SE = .122$ )).

**Table 1**

*Linear Regression Analysis of Smoking Behavior Confederate, Gender and CO-level on Smoking Behavior Participant (N = 31)*

Model	B	Std. Error	Beta
Smoking behavior confederate	.448	.065	.800***
Gender participant	.442	.204	.246*
CO-level	-.020	.025	-.094

Note: \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$

#### *Imitation in Terms of Smoking Typography of Confederate and Participant*

Imitation of smoking behavior can also occur in terms of smoking typography. The time of lighting up a cigarette and the duration of smoked cigarettes by confederate and participants during the heavy smoking condition can provide information about the strength of imitation. In 93.8% of the cases did the participant light up his/her first cigarette in the exact same minute or one minute after the confederate did. In 100% of the cases did the participant light up his/her first cigarette during the interval in which the confederate was smoking a cigarette. The duration of smoking the first cigarette by confederate and participant significantly correlated ( $r(16) = .625$ ,  $p = .013$ ). The second cigarette was lighted up in the exact same minute or one minute after the confederate did in 50% of the cases. 87.5% of the participants lighted up his/her second cigarette during the interval in which the confederate was smoking a cigarette. The duration of smoking the second cigarette by confederate and participants did not significantly correlated ( $r(16) = .269$ ,  $p = .313$ ). In the cases of participants lighting up a third cigarette during the heavy smoking condition ( $N = 12$ ), 41.7% of the participants lighted up the third cigarette in the exact same minute or one minute after

the confederate did. In 91.7% of the cases did the participant light up his/her third cigarette during the interval in which the confederate was smoking a cigarette. The duration of smoking the third cigarette by confederate and participants did not significantly correlated ( $r(12) = -.073, p = .823$ ).

## **EXPERIMENT 2**

### *Experimental design*

Experiment 2 was set up to investigate mechanisms of imitation of smoking behavior during digital interaction. A two factor between subjects design was used, containing the same (smoking) conditions as applied in the first experiment: the non-smoking condition, where the confederates smoked no cigarettes, and the heavy smoking condition, where the confederates smoked three cigarettes.

### *Participants*

#### *Subject*

To cover the real intention of the second experiment, a new cover story was made up: experiment 2 would be conducted to investigate how participants would discuss music video clips over the Internet. Participants who were involved in experiment 1 and gave permission on the screening list to participate in future studies, were called again to ask whether they want to participate in another comparable follow-up study. To avoid recognition it was of high importance that the subject did not performed the second experiment together with the same confederate as in experiment 1, which probably could lead to a discovery of the real aim of the study. Because of the possibility that people who participated in experiment 1 would detect the real aim by participating again in experiment 2, new participants were recruited at two schools for intermediate and technical vocational training in the Netherlands (Utrecht). Subjects must met the same inclusion criteria as described in experiment 1 to be qualified as a suited participant.

A total of 35 participants were involved in experiment 2. Of these 35 participants, 31 participants are suitable to be included in the analysis. Three participants will be excluded because of the fact that they can no longer be qualified as daily smokers during their participation, one participant because of the absence of a package of cigarettes during participating in the experiment. All of the suited participants fit in the age group of 16 to 24 years ( $M = 18.48; SD = 1.90$ ). Within this group, 18 participants (61.1%) were male. Participants were divided at random over both conditions by taking a paper at the start of each

session, which told which specific condition should be applied. Analysis of variance were performed to check differences in participant characteristics (gender, CO-level, age and average number of smoked cigarettes on daily basis) between the two conditions, but no significant differences were found.

### *Confederate*

A number of confederates who participated in experiment 1 were willing to participate in experiment 2. New confederates were recruited through flyers at the University of Utrecht and the College of Utrecht.

### *Procedure*

Experiment 2 is realized in February 2010 till April 2010. The ethics committee of the University of Utrecht also provided permission to conduct the second experiment. Experiment 2 is conducted at the same way as experiment 1, except for a number of aspects. Each session took place in the following places: the smoking room of the Trimbos Institute (Utrecht) and the same camper as used in experiment 1, placed on the parking area of the Trimbos Institute. The use of a smoking room was necessary because the confederate had to have the availability to smoke during the experiment. Since a public smoking ban in the Netherlands has been established, people are no longer allowed to smoke in public places, except for smoking rooms. During the experiment, both participant and confederate had the availability of a computer, headset and webcam, in order to perform the video clip-study. The computers had free access to the Internet (fixed connection). Before a session started, the experimenter handed the confederate a package of cigarettes (Marlboro), containing at least ten cigarettes and a lighter. Another package of cigarettes, with the same content, was present in the smoking room of the Trimbos Institute and served as a reserve-package. When a session began, the confederate, subject and experimenter met each other in front of the Trimbos Institute. The experimenter brought both participants to the camper. After conducting the same tasks as in experiment 1, the participants were asked to fill in a brief questionnaire about their current state of mind (not included in analysis of the current study). To make sure the actual participant was aware of the fact that the confederate was a daily smoker, the confederate smoked a cigarette in presence of the subject during the meeting in front of the Trimbos Institute at the start of the experiment, or put his or her package of cigarettes prominent on the table during the first instructions in the camper. If participants did mention that they forgot their cigarettes, the experimenter offered a package of cigarettes and explained that a previous participant has forgotten his or her package. Next, the experimenter

asked the confederate to move into the Trimbos Institute, while the participant stayed in the session-room of the camper. The subject could not be informed about the fact that the confederate did actually took place in the smoking room, to avoid that he or she would detect the real aim of the study. During the second experiment, participants did no longer have to attach the skin-conductance devices. Through Skype, a software program which makes it possible to make free calls over the Internet, the confederate and participant interacted with each other during the whole session. They talked to each other by headsets, to make sure that they had their hands available in case they would like to smoke cigarettes. During the whole experiment, participant and confederate did see each other through webcams.

The actual video clip-study contained of six music-video clips of different genres. After each music-video fragment, the participant and confederate had to discuss each video clip on the basis of ten established questions. After discussing all six video clips and fill in a questionnaire, they had to perform a mood and stress-task (both are not included in analysis of the current study). After that, the experimenter asked the confederate to leave the Trimbos and return to the camper. Finally, CO-levels were measured again (not included in analysis of the current study) and the participants had to fill in a questionnaire on smoking behavior, mood and a evaluation of the other participant. After completing, participant and confederate both received 15 euro for their participation, which meant the end of the experiment. Each session was recorded on DVD. After finishing the data-collection of both experiments, all participants were debriefed about the real purpose of the study.

### *Instruments*

Smoking behavior of participant, time of lighting up cigarettes, the duration of smoked cigarettes and CO-levels were measured the same way as in experiment 1.

### *Data-analyses*

Results of experiment 2 will be analyzed in the same way as described in experiment 1.

## **Results**

### *Descriptive statistics*

A total of 17 participants were included in the non-smoking condition, next to 14 participants in the smoking condition. When looking at participant's self-reported smoking behavior on daily basis, 12.9% ( $N = 4$ ) of the participants smoked an average of one to five cigarettes a day, while 41.9% ( $N = 13$ ) reported a daily average of six to ten cigarettes. An average of 11-20 cigarettes was reported by 35.5% ( $N = 11$ ) of the participants, next to 9.7%

( $N = 3$ ) who indicated to smoke 21-30 cigarettes a day. The number of cigarettes smoked by the participants during the second experiment ranged from zero to four cigarettes ( $M = 1.55$ ,  $SD = .99$ ) The number of smoked cigarettes during the experiment did not significantly correspond with the self-reported number of smoked cigarettes on daily basis ( $r(31) = .074$ ,  $p = .692$ ).

### *The Impact of Confederate's Smoking Behavior on Participant's Smoking Behavior*

In the non-smoking condition ( $N = 17$ ), 29.4% ( $N = 5$ ) did not smoke, 41.2% ( $N = 7$ ) smoked one cigarette, 23.5% ( $N = 4$ ) smoked two cigarettes and 5.88% ( $N = 1$ ) smoked three cigarettes. In the heavy smoking condition ( $N = 14$ ), 14.29% ( $N = 2$ ) smoked one cigarette, 64.29% ( $N = 9$ ) smoked two cigarettes, 14.29% ( $N = 2$ ) smoked three cigarettes and 7.14% ( $N = 1$ ) smoked four cigarettes.

Results of the linear regression analysis (Table 2) showed that the smoking behavior of the confederates significantly and positively affected the smoking behavior of participants. In the second experiment, the confederates' smoking behavior explained 35.4% of the variance in participants' smoking behavior. A beta of .576 could be found, which is lower than in experiment one, but still implies a strong effect of confederates' smoking behavior on participants' cigarette use. Gender and CO-level were added as control variables, but both did not significantly affected the participants' smoking behavior. No interaction effect of gender on participants' smoking behavior could be found ( $\beta = -.459$  ( $B = -.358$ ,  $SE = .208$ )).

**Table 2**

*Linear Regression Analysis of Smoking Behavior Confederate, Gender and CO-level on Smoking Behavior Participant ( $N = 31$ )*

Model	B	Std. Error	Beta
Smoking behavior confederate	.377	.105	.576**
Gender participant	-.236	.310	-.160
CO-level	.038	.031	.148

Note: \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$

### *Imitation in Terms of Smoking Typography of Confederate and Participant*

In 92.9% of the cases did the participant light up his/her first cigarette in the exact same minute or one minute after the confederate did. In 100% of the cases did the participant light up his/her first cigarette during the interval in which the confederate was smoking a cigarette. The duration of smoking the first cigarette by confederate and participant significantly correlated ( $r(14) = .803$ ,  $p = .001$ ). In 41.7% of the cases did the participant light



up his/her second cigarette in the exact same minute or one minute after the confederate did. In 100% of the cases did the participant light up his/her second cigarette during the interval in which the confederate was smoking a cigarette. The duration of smoking the second cigarette by confederate and participant did not show a significant correlation ( $r(12) = -.263, p = .409$ ). In the case of participants lighting up a third cigarette in the heavy smoking condition ( $N = 3$ ), 33.3% lighted up this third cigarette in the exact same minute or one minute after the confederate did. In 66.7% of the cases did the participant light up his/her third cigarette during the interval in which the confederate was smoking a cigarette. No significant correlation could be found referring the duration of smoking the third cigarette by confederate and participant ( $r(3) = .500, p = .667$ ).

## **Discussion**

The current experimental study investigated to what extent adolescents tend to imitate the smoking behavior of complete strangers during real life conversations and digital communication. The two conducted experiments showed that adolescents tend to imitate the smoking behavior of complete strangers during a 30-minute dyadic interaction, both real life and digital. When the participants were being exposed to a heavy smoking confederate, a significant higher amount of cigarettes was smoked by participants compared with the non-smoking condition. Imitation of cigarette smoking could also be located in the smoking typography of participants during the heavy smoking condition of both experiments: especially in the case of smoking the first cigarette, participants lighted up their cigarettes in very short time after confederates did. The majority of the participants lighted up their cigarettes during the interval in which the confederate was smoking a cigarette. Besides, the duration of smoking the first cigarette by confederate and participant significantly correlated in both experiments. The outcomes of both experiments are in line with the few existing studies on the imitation of smoking behavior. An experimental study of Antonuccio and Lichtenstein (1980) showed that participants smoked a higher amount of cigarettes when they were being exposed to a heavy smoking confederate. Several other previous studies examined the effect of smoking confederates on participants' cigarette use, showing all an increase in the number of smoked cigarettes by participants in the presence of a heavy smoking confederate (e.g. Ary & Bavry, 1983; Glad & Adesso, 1976, Harakeh et. al, 2007, Kniskern et. al, 1983).

An explanation of why adolescents tend to model smoking behavior of complete strangers can be found in the social learning theory of Bandura (1977), which indicates that people tend to observe and model behavior of other people. Behavior will be modeled because

it may lead to positive rewards or negative consequences can be avoided. Whether people choose to imitate behavior depends on people's associations and expectations regarding to that particular behavior (Bandura, 1977). The imitation of behavior thus occurs conscious and with specific intentions.

Another explanation can be located in the perception-behavior link (Chartrand & Bargh, 1999). The perception-behavior link stated that people will model observed behavior, but unlike the social learning theory, without specific intentions. This process of adapting behavior to the environment mostly occurs unconsciously. Research of Bernieri (1988) and Dabbs (1969) show that during positive interaction, people will imitate behavior even of people they have never seen before. Chartrand & Bargh (1999) went even further by investigating if automatic imitation would occur when the nature of interaction between to strangers was negative and unsocial. Results were interestingly: participants even changed their behavior to observed behavior of strangers they did not bond with. Referring to the current study, this finding emphasizes that it is not plausible to assume that participants of both experiments did imitate the other's smoking behavior just to be liked by that particular person.

Specifically focused on adolescents' imitation of smoking behavior during digital interaction, an explanation is harder to find. Since, as far as known, no previous study investigated the same process, no comparisons with previous outcomes can be made. However, a cautious comparison of imitation of smoking behavior during digital interaction may be made with the effect of watching smoking characters in movies: in both situations, people are observing smoking persons on a screen. Previous studies in the effect of smoking in movies showed that participants' intentions to smoke increased after watching movie characters who smoked (Nes, Saris & Hrockmorton-Belze, 2007; Dal Cin, Gibson, Zanna, Shumate & Fong, 2007). Because the current study showed that participants also tend to get affected by smoking behavior observed on a computer-screen, it could be that similar mechanisms can be identified in explaining the imitation of observed behavior both on a computer screen and on a television. However, a number of differences can be located which makes it hard to lump the effects of both types of studies together. Firstly, the existing studies were all survey-studies. Survey studies do not say anything about possible cause-effect relationships, so no hard assumptions can be made about the question if the participants' increased intention to smoke was actually the result of the exposure to smoking movie characters. Secondly, these previous studies investigated the effect of smoking movie characters on participants' intentions to smoke and changes in cognitions regarding to cigarette smoking, but did not look at direct, spontaneous smoking among daily smokers. An

increased intention to smoke does not say anything about the fact if people will actually smoke a higher number of cigarettes when observing smoking movie characters. Thirdly, an important difference between both types of studies is that the current study investigated the effect of observing smoking peers, towards smoking movie characters in previous studies. It might be the case that peers do affect adolescents' behavior in a different way or to a stronger extent than movie characters do. Fourthly, a difference exists in the way that participants were being confronted with smoking persons. Previous studies let their participants watch smoking characters in movies to see to what extent this affected the participants' smoking behavior. Participants of the current study did not only observe, but also interacted with a smoking person and were actually in contact with the other person. Dal Cin and colleagues (2007) and Nes and colleagues (2001) agreed about the assumption that the effect of watching smoking characters in movies on peoples' own smoking behavior is the highest when participants were able to identify themselves with the observed characters. The fact that participants of the current study were actually in contact with the other person might have made it easier to identify themselves with the other person. If this turns out to be true, the effect of seeing a person smoke on a computer screen might be even stronger than seeing a smoking person on television. However, because of the large differences between both types of studies, no clear assumptions can be made. Future research has to be conducted in the imitation of smoking behavior during digital interaction, in order to obtain more knowledge about the underlying mechanisms.

### *Real Life versus Digital Interaction*

The current study shows that participants' tend to imitate the smoking behavior of complete strangers, during both real life and digital interaction. To investigate the difference in the strength of imitation during both types of interaction, and thus investigate the role of tobacco smell, results should be compared. The effect of imitation seems to be stronger during the first experiment. The beta of confederates' smoking behavior on participants' cigarette use turned out to be higher compared with the second experiment. Besides, the average number of smoked cigarettes per session, independently of smoking condition, turned out to be higher during the first experiment. During experiment 1, all of the participants smoked, even during the non-smoking condition. During the non-smoking condition of the second experiment, there were participants who did not light up any cigarettes.

However, a number of differences between both experiments can be pointed out, which makes it impossible to compare the outcomes of both studies. During the first

experiment, participants had the availability to smoke free cigarettes. Each session, a package of cigarettes was provided to the participants in order to perform the social pressure condition (not included in the analysis of the current study). This could have probably affected the participants' smoking behavior: it is plausible to assume that people tend to smoke more cigarettes when these cigarettes were provided for free.

Another factor which can explain the higher amount of smoking in the first experiment is the presence of tobacco smell. The smell of tobacco can be seen as a smoking cue and may have caused feelings of craving, which in turn may have led to an increased need to smoke. At the same time, this can serve as a limitation of the first experiment: because of the presence of tobacco smell, it is not possible to say that the effect of confederates' smoking behavior on participants' cigarette use can actually be attributed to mechanisms of imitation. However, the second experiment tried to exclude this limitation by investigating mechanisms of imitation in the absence of the other peoples' tobacco smell. Significant outcomes show that even without the free availability of cigarettes and the absence of others' tobacco smell, the effect of smoking confederates on participants' smoking behavior still remains strong. So even when feelings of craving are reduced, participants still imitate smoking behavior of confederates. This assumption can serve as evidence for the outcomes of experiment 1, which implies that the affected smoking behavior of participants is not only the result of craving caused by tobacco smell, but in all probability mainly the result of mechanisms of imitation. At the same time, the outcomes of experiment 2 can also confirm that previous studies who claimed that their participants' smoking behavior could be attributed to mechanisms of imitation, were right.

### *Gender and Participants' Smoking Behavior*

In the first experiment, gender seems to have a significant influence on smoking behavior during sessions. Results show that being a female participant affected the own smoking behavior during the experiment. A study of Flay et al. (1994) indicates that people of female gender are more sensitive for social influences than people of male gender, which can serve as an explanation for the significant gender effect in the first experiment. Based on the theory of Flay et al. (1994), it may be assumed that the female participants of the first experiment reacted stronger on the observed smoking behavior than male participants did. However, the significant effect of gender on participants' smoking behavior cannot be found in the second experiment. It is possible that the higher sensitivity of girls regarding to social influences may not appear during indirect communication, like online conversations. However, since as far as known, no previous study ever investigated the effect of social

influences during digital interaction regarding to gender, future research have to be conducted to fill this missing knowledge.

### *Limitations*

In current study, the following limitations can be pointed out. First, no distinction was made between heavy and light smoking participants. Mechanisms of both imitation and craving may differ between heavy and light smokers. However, the self-reported average number of smoked cigarettes on daily basis, did not significantly correlated with the number of smoked cigarettes during the experiment. There seems to be no significant difference in the extent to which heavy and light smokers were affected by confederates' smoking behavior. Second, both experiments did not took place in a complete naturalistic setting. All participants were aware of the fact they were participating in an experiment and most of them knew they were being observed by video cameras. This could have probably affected their (smoking) behavior. However, by letting the confederates create a warm and social atmosphere, we tried to construct a more naturalistic setting. Third, the possibility exists that participants who already participated in the first experiment also participated in experiment 2. Participants who were involved in both experiment 1 and experiment 2 were at higher risk to discover the actual aim. However, only one subject who participated in both experiments turned out to be suited for analysis. Besides, after finishing the (video) music task, all participants were asked to fill in a questionnaire about their thoughts of the purpose of the study. Except for one person, who indicated that the real purpose could be related to music taste but also to cigarette smoking, none of the participants of both experiments mentioned things which in some way could be related to cigarette smoking. Even the person who participated in both experiments, did not mentioned the real purpose. Therefore, it can be assumed that almost all participants were unaware about the real intention of the study, so no significant distortion in the outcomes may be expected.

### *Future Research*

Future research is necessary to investigate whether the imitation of smoking behavior occurs unaware or with particular intentions. With the current study it was not possible to make a distinction in participants who were consciously imitating the confederates' smoking behavior and participants who did this completely unconscious. Future studies can ask participants afterwards if they were in some way aware of the fact that they were modeling behavior of complete strangers. People who were modeling the behavior with specific goals,

should be asked about their intentions, so more clarity can be created in the explanation of why people are modeling behavior of persons they have never seen before.

Current study only investigated mechanisms of imitation with regard to the continuation of cigarettes smoking among daily smokers. It is important that more knowledge will be obtained about possible mechanisms of imitation in starting cigarette smoking among adolescents, in both real life and digital interaction. A study of Sargent and colleagues (2001) showed a significant effect between observing tobacco use in movies and the initiation of cigarette smoking. It is therefore possible that people will initiate cigarette smoking as a result imitation during real life or dyadic interaction with a smoking person.

To create more clarity about the possible presence and intensity of craving during comparable experiments, future research should apply official craving-scales to investigate to what extent feelings of craving can affect the smoking behavior of participants. The current study did not applied official scales in measuring the presence and intensity of experienced feelings of craving. It is therefore not possible to actually distinguish the possible effect of craving from the effect of imitation, so no hard conclusions can be drawn in the extent to which both mechanisms played a part in the explanation of participants' smoking behavior. By using official craving-scales, statements can be made about the levels of experienced craving, which might provide more clarity about the strength of the imitation of smoking behavior.

### *Implications*

Mechanisms of imitation can serve as an explanation of why adolescents maintain their cigarette smoking. The outcomes of the study demonstrates the strength of imitation, which occurs during both real life and digital interaction. This emphasizes the importance of a smoking ban in all public places worldwide. Adolescents should be exposed to smoking people as little as possible, which in the long term should lead to a reduction of smoking people.

Although worldwide several smoking bans have been implemented in the fight against cigarette smoking, ranging from anti-tobacco campaigns to a complete smoking ban in all public places, the desired effect has not been achieved yet. People in all countries still initiate and maintain their smoking behavior, despite their knowledge about the negative consequences. The current study can provide new information in the field of adolescent cigarette smoking. It has become clear that people tend to imitate smoking behavior of complete strangers, which emphasizes the importance of a public smoking ban. The frequency of which people will be exposed to others' smoking behavior should be minimized, to avoid

the fact that observed smoking behavior will be modeled. Especially people who are trying to reduce or quit their cigarette smoking, will experience positive benefits of smoking bans in public spaces. Adolescents should become aware of the fact that they are easily imitating smoking peers and at the same time can serve as a source of imitation. They should be taken this into account and adapt their own smoking behavior in specific contexts.

Besides, the current study showed that people will imitate smoking behavior of strangers, even during digital interaction. No previous studies has been conducted in this field, which makes the outcomes of the current study a complement to existing knowledge. All people should become aware of the fact that they might be imitating smoking behavior during digital interaction, or that they are being imitated. Although a reduction of smoking movie characters will be possible to arrange, however, it is not possible to establish a smoking ban during online conversations. Policies can be created in the form of warnings at online chat platforms and other ways of online communication. Anti-smoking campaigns should be established to warn people about the possible effect of imitation.

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