



The impact of active and passive peer influence on young adult smoking: An experimental study

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ABSTRACT

Background: Peers influence adolescent and young adult smoking, but little is known about the underlying mechanisms. It is necessary to understand whether the current assumption of peer pressure is valid, or whether an alternative explanation as imitation is more appropriate. We examined whether passive (imitation) and/or active (pressure) peer influence affects young adult smoking.

Methods: An experiment was conducted among 68 daily-smoking students aged 16–24. The actual study aim was masked. Participants had to do a 30-min music task with a confederate. The experiment consisted of a 2 (smoking condition: confederate smokes or not) by 2 (pressure condition: confederate offers the participant a cigarette or not) factorial design, resulting in four conditions: (1) no smoking and no pressure ($N = 15$); (2) smoking but no pressure ($N = 16$); (3) pressure but no smoking ($N = 20$); and (4) smoking and pressure ($N = 17$). The primary outcome tested was the total number of cigarettes smoked during this music assignment.

Results: Peer smoking significantly predicted the total number of cigarettes smoked by young adults while peer pressure did not. The interaction effect of peer pressure and peer smoking was not significant.

Conclusions: Peer pressure did not have a significant additional contribution, over and above smoking of the peer. Passive (imitation) peer influence affected young adult smoking rather than active (pressure) peer influence. Thus, smoking cessation efforts should aim at preventing interaction with smoking peers and raising awareness about its impact.

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1. Introduction

A widely held assumption is that young people engage in smoking and other risk behaviors (e.g., alcohol or cannabis use) because their peers pressure them to do so. This assumption taps into one of the frequently applied theoretical models of peer influence, implying an active, explicit form of peer influence. As a result, most mass-media campaigns and school smoking-prevention programs focus on countering peer pressure by teaching young people refusal and resistance skills. Nevertheless, susceptibility to peer pressure in young people is not limited to adolescents but also includes young adults (see also review of Borsari and Carey, 2001). So far, the findings of survey studies, focusing on this active peer influence, show inconsistent findings (Perrine and Aloise-Young, 2004; Slater, 2003; Urberg et al., 1990) and experimental studies are lacking. Moreover, scholars question whether the outcomes of survey studies are valid and reliable (Arnett, 2007; Michell and West, 1996). Thus, we still know little about the effects of peer pressure on adolescent and young adult smoking. An important question that needs

to be addressed is whether this assumption and theory of active peer influence is valid.

An alternative explanation for the influence of peers is found in the imitation hypothesis which taps into a different theoretical model of peer influence, implying a more passive, implicit form of peer influence. Adolescents and young adults observe and imitate the smoking of others, without being urged to do so. There are two explanations of imitation that have found support in the literature. One of the explanations is provided by the social cognitive/learning theory of Bandura (1977, 1986), which suggests that individuals observe and imitate (also called ‘modeling’) other’s behavior that may intentionally lead to (immediate) positive rewards such as belonging to the group or being liked. Another explanation is provided by the perception-behavior link paradigm (Chartrand and Bargh, 1999); stressing the fact that individuals often imitate (also called ‘mimicry’) the behavior of others spontaneously and unintentionally. Moreover, empirical evidence has consistently shown that during interaction with another person, individuals unintentionally mimic his/her postures, mannerisms, facial expressions, eating behavior, and other behaviors (Chartrand and Bargh, 1999; Tanner et al., 2008). A small number of experimental studies, focusing on passive peer influence, have shown consistently that students are more likely to smoke in the company of a

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heavy-smoking than a non-smoking peer (Antonuccio and Lichtenstein, 1980; Harakeh et al., 2007; Kniskern et al., 1983; Miller et al., 1979). In the alcohol literature, experimental studies showed similar findings. Students modify their 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). The hypothesis of passive and active peer influence has not yet been put to the test in an experimental design, however. In this paper we report on an experimental study in which we focused on both passive (imitation) and active (pressure) peer influence to assess their relative impact on student smoking. Our hypothesis is that passive peer influence has a much stronger impact than active peer influence.

2. Method

2.1. Study design

The aim of this experiment is to examine whether passive (imitation) and/or active (pressure) peer influence affects young adults' smoking. An experimental, observational study with a 2 (smoking condition) by 2 (peer pressure condition) factorial design was used. The smoking condition consisted of a confederate smoking zero cigarettes (non-smoking condition) versus three cigarettes (heavy smoking condition). The peer pressure condition consisted of a confederate not offering the participant cigarettes (no peer pressure condition) versus offering the participant verbally and non-verbally a cigarette three times by asking if s/he would like to smoke, along with opening the pack in front of him/her (peer pressure condition).

2.2. Procedure

The Ethics Committee of the Faculty of Social Sciences at Utrecht University gave their approval for this experiment. The principals of seven Dutch schools for intermediate technical and vocational training (in Nijmegen, Arnhem, Utrecht, Den Bosch) were informed about the actual aim of the experiment whereas this aim was masked for the students at these schools. The students were approached in the school to participate in a study on music taste and preference. We asked students to complete an initial screening questionnaire (Harakeh et al., 2010). Only daily smokers aged 16–25 years were invited to participate. Next, students participated once in a 60-min session during schooldays from 10:00 am to 17:30 pm in the period from May 2009 to January 2010. The participants were randomly assigned to the four conditions. Random assignment was blocked by gender and time of day in order to equally distribute males and females to each condition, and to equally distribute the time of the day when the participant participated over each condition. One-way ANOVA showed that there were no significant differences between the four conditions with regard to participants' characteristics (age, gender, number of cigarettes smoked daily, and carbon monoxide level in their breath).

We created a mobile lab in a camper vehicle which we parked near the schools. One of the rooms was equipped as a relaxing room with a comfortable couch and a table, and the other room functioned as the observation room. In each session, a confederate and a participant participated in same-sex dyads sitting opposite each other. Participants were asked to blow into a device (Smokerlyzer) to measure the CO (carbon monoxide) level in their breath. To disguise the real aim of the device, students were told that the device enables us to assess alcohol consumption. Further, they were told they could eat food and take drinks that were made available, and that they were allowed to smoke in both rooms. Cigarettes were freely available in order to make the condition where the confederate offered cigarettes but smoked zero cigarettes credible. Confederates sat at a fixed place in the camper and, in each condition, the confederate noticed a pack of cigarettes next to him/her on the couch. The experimenter then asked them if they smoked (the confederate always answers positively) and explained that these cigarettes must have been forgotten by a previous participant and that they are allowed to use them. If the participant was in the smoking and/or pressure condition, the confederate directly smoked a cigarette from the pack, offered a cigarette, or both. The 30-min music task consisted of six music clips of pop songs. After each song, they filled in three questions individually in the questionnaire (grading the song) and discussed ten questions. The confederates were trained and instructed beforehand to always have a similar opinion on the songs as the participant, to act in a warm and friendly manner and to smoke cigarettes at a prearranged rate during the music task of 30 min. The confederates again smoked, offered a cigarette or both during the third and fifth song. At the end of the session, both filled in a brief questionnaire taking approximately 15 min. Each participant received eight Euros for their participation. After completion of this experiment, all participants were debriefed.

2.3. Participants

Of the 71 participants in the study sample, three participants were excluded: they were no longer daily smokers when they were participating in the session.

Table 1

The effects of active (peer pressure) and passive (peer smoking) peer influence on participants' total number of cigarettes.

	Total number of cigarettes smoked	
	IRR	95% CI
Peer pressure	1.19	0.85–1.64
Peer smoking	1.65**	1.18–2.31
Gender	1.03	0.73–1.45
CO-level	0.99	0.97–1.02

Note: Poisson loglinear analyses, 95% CI = 95% confidence intervals.

** $p < 0.01$.

Nine participants were only twice exposed to peer pressure, as they lit and smoked a cigarette just when the confederate was supposed to offer a cigarette (five participants in the pressure, no smoking condition; four participants in the pressure, smoking condition). Of these, five participants did not get offered a cigarette the first time, three participants the second time, and one participant the third time. These nine participants were included in the analyses on the basis of intention-to-treat. The 68 participants were assigned to one of the four conditions: (1) no pressure, no smoking condition ($N = 15$), (2) smoking, no pressure condition ($N = 16$), (3) pressure, no smoking condition ($N = 20$), and (4) pressure, smoking condition ($N = 17$). Participants were 16–24 years-old (mean age = 18.21, $SD = 1.71$), 38.2% were male. At the end of the session all participants answered the question in the questionnaire on what they thought the study was about. The responses showed that none of these participants suspected the actual aim of the experiment.

2.4. Measures

Participant's smoking behavior during the session. The experimenter coded the number of cigarettes smoked. We examined as primary outcome the total number of cigarettes.

CO level. The Micro+ Smokerlyzer is a breath monitor which assesses the CO (Harakeh et al., 2010; www.bedfontusa.com). The participants were asked to blow into the monitor after holding their breath, and a digital readout of CO ppm (one part CO in one million parts of breath) is displayed on the monitor.

2.5. Statistical analyses

All analyses were conducted with Stata. We used Poisson loglinear analyses to investigate the main effects of the pressure and smoking condition on the total number of cigarettes smoked during the session, controlling for covariates (participant's CO level and gender). Subsequently, we tested the interaction effect of peer pressure $\times$ peer smoking.

3. Results

The majority (77.9%) of the participants lived at home. All participants were daily smokers: 22.4% smoked 1–5 cigarettes/day, 28.4% 6–10 cigarettes/day, 47.8% 11–20 cigarettes/day, and 1.5% 21–30 cigarettes/day. The participant's smoked at various locations: school (98.5%), at parties/pleasantly engaging evenings (98.5%), on the street (89.7%), at the homes of their friends (88.2%), at bars/discotheques (80.9%), at home – kitchen/living room (45.6%), at home – in their bedroom (36.8%), and in the sports canteen (13.2%). The participants all smoked during the music task: 22.1% smoked one cigarette, 36.8% smoked two cigarettes, and 41.2% smoked three cigarettes. The participants' CO level ranged from 0 to 34 ppm ($M = 9.14$, $SD = 5.65$).

The findings depicted in Table 1 show that peer smoking affected significantly the total number of cigarettes smoked by the student. Students confronted with a smoking peer had a higher likelihood to smoke more cigarettes ($p = 0.003$). However, peer pressure did not significantly predict the total number of cigarettes smoked by the student ($p = 0.309$). The covariates (i.e., gender and CO-level) did not predict significantly the total number of cigarettes smoked by the participant. Furthermore, we tested in a next step the interaction effect of peer pressure $\times$ peer smoking. This interaction effect showed to be not significant ($IRR = 0.70$, $95\% CI = 0.35–1.38$, $p = 0.301$).

4. Discussion

This study is the first to show the importance of passive (imitation) peer influence over and above the impact of active (pressure) peer influence on young adult smoking in an experimental design. In our study, peer smoking increased significantly young adults' likelihood to smoke more cigarettes while peer pressure did not. In the literature, peer smoking is suggested to tap into the passive peer influence, and the underlying mechanism in experimental studies and survey studies on smoking is often contributed to imitation. Students confronted with smoking peers are more likely to smoke regardless of being offered a cigarette or not: seeing is doing. Several theoretical models may explain the underlying mechanisms leading to imitation of behavior of others. One of these theories that have frequently been examined in previous studies is social conformity (see also a meta-analysis of [Bond and Smith, 1996](#)). Solomon Asch's work showed that in a group setting participants conform to the norm of the group, i.e., they tended to conform to the behavior of the other group members ([Asch, 1951](#)). Thus, social conformity may explain our findings and imply that young adults imitating peer smoking have been intentional. However, in our study we tested peer dyads and not peer groups. There is evidence that conformity of people is more likely to occur in groups than in dyads, and thus this explanation may have played a minor role in our present study. Another possible explanation is that imitating the other in human interaction may reflect a basic instinct in human beings that might even be biological in origin, as has been shown by studies on the importance of imitation for social interaction and social development of animals ([Hurley and Chater, 2005](#)).

An alternative theory to explain our findings is the cue-reactivity paradigm. According to this paradigm, smokers react to smoking-related cues/stimuli (e.g., handling a lit cigarette, ashtrays, lighters, or smelling another person's cigarette) in their environment by an increase in craving to smoke (see also meta-analyses of [Carter and Tiffany, 1999](#); [Conklin et al., 2008](#)). The smoking-related cues of ashtrays, lighters and package of cigarettes were present in all four conditions, although handling a lit cigarette and smelling another person's cigarette were only present in the condition where the confederate smoked. Thus, these latter two smoking-related cues may have elicited craving in the daily smoking young adults and triggered them to smoke. However, in our previous experimental study ([Harakeh and Vollebergh, in press](#)) we excluded in our research design the alternative hypothesis concerning smelling another person's cigarette smoke. These findings showed that when the participant interacted with a smoking peer through the internet and webcam (i.e., confederate and participant sat in two different rooms and participant could not smell the cigarette of the peer) they were also more likely to smoke more cigarettes. Thus, finding support for the imitation hypothesis.

Our findings seem to suggest that young adults behave in a particular way because their social environment passively evokes certain behaviors and less because they are actively or explicitly encouraged to behave in a specific way. Thus, our results may imply that passive peer influence may be of more importance to understand young adult smoking than active peer influence. Our findings must be carefully interpreted but seem to suggest that smoking cessation programs and policy should probably target and put more emphasis on passive peer influence (rather than active peer influence) in order to decrease smoking among daily smoking young adults. There may be three possible ways they could address this. First of all, most of the smoking cessation campaigns portray smoking models in their ads which in themselves may induce people to smoke and may therefore be counterproductive. Therefore, smoking models should perhaps no longer be depicted in these campaigns. Second, interaction with smoking models should be prevented. Government policy has been contributing to this goal by

restricting smoking in public settings (e.g., trains, airplanes, bars, restaurants). However, smoking is, surprisingly, not yet officially banned in schoolyards worldwide; one of these countries that does not have such legislation in place is The Netherlands. We would recommend stricter school policies in this respect for these countries ([Griesbach et al., 2002](#); [Schnohr et al., 2008](#); [Wold et al., 2004](#)). Third, awareness should be increased of the urge to imitate others. Especially young adults trying to quit or reduce smoking need to be alerted to the effects of smoking by others in their presence, and to successfully quit or reduce smoking they should learn to avoid these situations. Smoking cessation campaigns could emphasize and support this message. Nevertheless, future studies are needed to replicate our study to find support for our findings and to gain more knowledge on these two kinds of peer influences.

4.1. Future research

There are several aspects that need to be taken into account in future research. First, we operationalized peer pressure as the verbal and nonverbal encouragement to take and smoke a cigarette but we did not take into account the possibility that in real life situations, this could be accompanied by teasing, taunting and rejection when the offered cigarette is declined. Although there is less evidence for the occurrence of this so-called coercive pressure ([Arnett, 2007](#)), future studies nevertheless need to examine its impact on student smoking. Second, more insights are needed on who are more likely to being imitated (e.g., popular peers), who are more likely to imitate (e.g., young adults with little self-esteem), and whether young adults imitate peer smoking intentional and/or unintentional. Thus, future studies also need to examine the characteristics of the confederate and the participant and test participant's awareness of imitation.

4.2. Limitations

The strengths of these two studies are: (1) the experimental design and (2) testing peer imitation and pressure in one design. There are also some shortcomings which should be taken into consideration. First, in our study unfamiliar peers were the confederates, but peer relations usually centre on familiar companions of a similar age, including (best) friends, siblings, etc. It would be interesting to test whether smoking by familiar peers (e.g., best friend, sibling) affects student smoking differently compared to smoking by strangers. This is difficult to examine in experimental studies; observational studies would be more appropriate. Second, our sample is restricted to smoking continuation among daily smokers. Thus, our findings may be helpful for smoking cessation programs but we need to replicate in future studies whether this also applies to preventing and discouraging smoking initiation and experimentation. Third, this experimental study is conducted in a camper van focusing on peer dyads. However, the impact of active and passive peer influence may vary in different environment and setting (e.g., work setting, school setting, or other public places) and may depend on the number of peers and smoking norms in that specific setting. Fourth, in this study design cigarettes were freely available in order to make the condition where the confederate offered cigarettes but smoked zero cigarettes credible. However, this may not have biased our findings because the cigarettes were freely available in all conditions but may explain why in this study all participants smoked at least one cigarette. Finally, we did not measure smoking topography in detail, but only looked at cigarette frequency. 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 ([Antonuccio and Lichtenstein, 1980](#); [Miller et al., 1979](#)). We did not include

the latter smoking outcome in this present study because the number of participants would decrease in this analysis, and therefore also the power to detect significant findings.

5. Conclusion

Young adults seem to continue to smoke due to passive peer influence rather than active peer influence. Young adults strongly imitate smoking in mere interaction with complete strangers regardless of being offered a cigarette or not. Anti-smoking policy could probably target this passive peer influence by removing smoking models from smoking cessation campaigns, by banning smoking in schoolyards, and by increasing awareness of imitating the smoking of others.

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Contributors

Z.H. contributed to the study design, coordinated the study, conducted the analyses, and was lead author. W.V. contributed to the study design, and all sections of this paper. All authors have read and approved the final manuscript.

Conflict of interest

All authors declare that they have no conflicts of interest.

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