

**Adolescents' susceptibility to  
imitate the smoking behaviour  
of peers:  
the moderating effect of self-esteem  
and self-efficacy**

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**Abstract:** The central focus of the present study was whether individual characteristics (self-esteem and self-efficacy) were moderating factors for the susceptibility of adolescents to imitating the smoking behaviour of peers. This was examined in an observational, experimental 2 factor smoking design (confederate smoking three cigarettes and not smoking) among 36 students of intermediate technical and vocational-training in an age-range of 16-24 years. By means of an Internet connection and a webcam, the youngsters could communicate with each other. Instruments used in the present study were the Rosenberg self-esteem scale, a self-efficacy scale and measuring CO-level by using a smokerlyzer. Data-analysis consisted of descriptive analyses and linear regression analysis. The results showed that only the variable total amount of cigarettes smoked by confederate was significant on the smoking behaviour of the subject. No interaction effect between both individual characteristics and the smoking behaviour of the confederate was found. Nevertheless, the present study do gave several new insights in underlying mechanisms of the smoking behaviour of adolescents, which can be very useful for the development of (new) intervention programs.

## **Introduction**

Worldwide, tobacco smoking is considered as the second major death cause (WHO, 2007). The effects of tobacco smoking cause serious health damage but people continue smoking. It has been estimated that around 20 percent of the world population still smokes (Welch & Poulton, 2009). In the Netherlands, tobacco smoking is a major problem too and that is why the Dutch government tends to discourage this. The Dutch government has already implemented several policies to reduce people's smoking behaviour but people still continue smoking, especially adolescents. In adolescence, youngsters usually start experimenting with tobacco smoking around the age of 10 until 14 (Stivoro, 2008). At the age of 15, 21 percent of them become daily smokers, who are physically and psychologically addicted to tobacco smoking (Stivoro, 2008). These are critical numbers because tobacco smoking causes dramatic consequences for adolescent's health. Adolescents are more vulnerable than adults for the harmful substances carbon monoxide, nicotine and tar in tobacco smoke (Stivoro, 2009). These harmful substances cause serious health damage to the youngsters' health as critical parts of their bodies, namely their brain, lungs and heart, are still in development. As a result, these harmful substances decrease the physical resistance of adolescents and that is why smoking youngsters are more vulnerable to get ill more often (Stivoro, 2009).

Thus, it is important to discover why adolescents continue smoking and to understand the underlying mechanisms of their smoking behaviour. To do so, it is necessary to focus on the predictors of the smoking behaviour of adolescents. Various studies revealed that an important predictor for adolescents' tobacco smoking are friendship groups (Engels et al., 2004; Urberg, 1997) and in particular the

smoking behaviour of peers (Avenevoli & Merikangas, 2003; Graham, Marks & Hansen, 1991; Vitoria et al., 2009). Many studies examined adolescents who are experimenting with tobacco smoking but only few have studied youngsters who are daily smokers. The present study focuses on the implicit influence (imitation) peers may have on youngsters. This means that youngsters may observe and imitate smoking behaviour of (important) peers in their social environment. However, various studies have shown that peer influence is not the only factor contributing to the smoking behaviour of adolescents. Individual characteristics such as self-esteem and self-efficacy seem to be important factors as well (Glendinning & Inglis, 1999; Guo et al., 2010; Young-Ho Kim, 2004).

To our knowledge, little is known about the interaction between the implicit peer influence and the smoking behaviour of adolescents and individual characteristics. The present study will examine this and does an attempt to discover new insights about the smoking behaviour of adolescents by observing conversations between confederate and subject through a webcam. The present study may give new insights necessary to understand why adolescents continue smoking and may also be very useful for the development of intervention and prevention programs for tobacco smoking as most intervention programs were mainly focused on peer pressure (Urberg et al., 1990). Besides this, it may be useful as most previous studies examined the face to face contact between the confederate and subject and the present study examines the influence of peers on the adolescents' smoking behaviour through the webcam. This means that there is no smell involved, which may be an important factor in the influence peers have on youngsters' smoking behaviour as exposure to smoking cues, such as cigarette smell, may create feelings of yearning for a cigarette (Baily et al., 2009). Thus, the results of the present study may be a merit and may enlarge the effectiveness of these programs through new insights in the smoking behaviour of youngsters.

### *Peers*

Peers are considered to be very important for and may play a crucial role in the development of youngsters (Engels et al., 2004; Maxwell, 2002) by shaping their beliefs and interpretations regarding risk behaviour (Maxwell, 2002). Bandura's *social learning theory* (1977) supports above-mentioned as it suggests that individuals observe, model, and imitate behaviour of important individuals in their environment.

Previous studies confirmed that the smoking behaviour of adolescents is related to the smoking behaviour of peers (Harakeh, 2006; Hill, et al., 1997; Maher & Rickwood, 1997). This means that when peers set an example or serve as a role model, adolescents may imitate their smoking behaviour (Mercken et al., 2009). This copying or imitating peers' behaviour is called *implicit influence*. Various studies have already examined the (implicit) influence peers have on adolescents (Caudill et al., 1975; Miller et al., 1979; Urberg, et al., 1997). Miller and colleagues (1979) conducted an experimental study about the influence of peers on adolescents' smoking behaviour in heavy and light smoking dyads. Their study found a tremendous effect of the influence of peers on the youngsters smoking behaviour. A significant effect between the absence or presence of social interaction between all smokers occurred. Antonuccio and Lichtenstein (1980) performed an experimental study about peer modelling influences on smoking behaviour of heavy and light smokers. Their findings were consistent with above mentioned results as they found an imitation effect on taking and lighting a cigarette. Similar results were found in experimental studies about the influence of the drinking behaviour of peers on adolescents drinking behaviour, for example in the study of Caudill and Marlatt (1975) and the study of Larsen and colleagues (2009).

Overall, these studies showed that peers do influence the smoking and drinking behaviour of adolescents through implicit influence (imitation).

### *Individual characteristics*

Individual characteristics may influence the smoking behaviour of adolescents. Various studies revealed that there is a relation between self-esteem and the smoking behaviour of adolescents (Abernathy et al., 1995; Glendinning, 2002; Glendinning & Inglis, 1999; Kawabata et al., 1999). The longitudinal study of Abernathy and colleagues (1995) examines the relationship between youngsters self-esteem and smoking among a large cohort (N= 3567) through surveys and self-reports. This study revealed a significant relationship between low self-esteem and high smoking behaviour of youngsters. The study of Kawabata and colleagues (1999) showed consistence results. The longitudinal study of Penny and Robinson (1986) among 1225 adolescents also found these results. Their study showed that adolescents who smoked had lower self-esteem than adolescents who did not smoke. However, the longitudinal study of Glendinning (2002) found contradictory results. Glendinning

(2002) found that never smokers, instead of ever smokers, had a low self-esteem. Although the results of above-mentioned longitudinal studies differ, more studies found a relation between adolescents smoking and a low self-esteem. In sum, above-mentioned studies all revealed that self-esteem is significantly correlated with the smoking behaviour of youngsters. That is why the present study expects results that confirm that self-esteem and self-efficacy do affect the smoking behaviour of youngsters. Young- Ho Kim (2004) also concludes that not only self-esteem but also self-efficacy may have an influence on the smoking behavior of adolescents. Previous studies have examined individual characteristics such as self-efficacy and smoking behaviour (Hill et al., 1997; Joseph et al., 2003; Maher & Rickwood, 1997; Papakyriazi & Joseph, 1998). The results of the study of Joseph and colleagues (2003) and the study of Papkyriazi and Joseph (1998) showed that individual characteristics such as self-efficacy were associated with smoking behaviour and they stated that automatic and habitual smokers have low self-efficacy. Maher and Rickwood's (1997) study applied the *theory of planned behaviour* (Ajzen, 1991) to adolescents smoking behaviour. Their study revealed that self-efficacy was a significant and the strongest predictor of the three factors, attitude, social norm and self-efficacy, which influence the intention and smoking behaviour of adolescents. In short, all above-mentioned studies showed that there is an association between low self-efficacy and (strong) smoking behaviour.

Only few previous studies have conducted the interaction of the environment and individual characteristics on the smoking behaviour of youngsters. To our knowledge, only Epstein and colleagues (2006) conducted a longitudinal study about which psychosocial factors moderate or directly affect substance use among inner-city adolescent. This study confirms the suggestion that drug use develops from the interplay between social en personal factors as their results showed a significantly moderating effect of low self-efficacy with peers' smoking behaviour. In other words, the smoking behaviour of peers has more influence on the smoking behaviour of adolescent who have a low self-efficacy than youngsters with high self-efficacy. The research of Epstein thus confirmed that there is a moderating effect between the ability to refuse tobacco smoking and the influence of peers.

#### *Present study*

The present study is an attempt to understand how individual characteristics influence the daily smoking behaviour of adolescents. The design of the present study is an observational experiment. One of the characteristics of experiments is that they are the most reliable instrument for measuring causal relations ('t Hart et al., 2006) and to understand underlying mechanisms. Thus, this study will be an observational, experimental research as it is the only design which may observe and measure spontaneous imitation. Spontaneous imitation is the observing and modeling of the smoking behaviour of peers without knowing that examining the smoking behaviour is the purpose of the present study. Another characteristic of an experimental design is the possibility to manipulate and control for different factors.

The main question of the present study is: *does the susceptibility of adolescents to imitate the smoking behaviour of peers depend on adolescents' individual characteristics self-esteem and self- efficacy?*

Three questions will be examined: (1) does the smoking behaviour of peers influence the smoking behaviour of adolescents' through imitation? (2) Do individual characteristics such as self-esteem and self-efficacy affect the smoking behaviour of adolescents? (3) Do individual characteristics (self-esteem and self-efficacy) moderate the effect of smoking behaviour of peers on the smoking behaviour of adolescents? There are three hypotheses for these questions. (1) Peers do influence the smoking behaviour of adolescents through implicit influence (imitation), (2) self-esteem and self-efficacy do affect the smoking behaviour of youngsters negatively and (3) when adolescents experience a high self-esteem and self- efficacy, the vulnerability of the adolescent to imitate smoking behaviour will be low.

## **Methods**

### *Design*

The present study is a 2-factor smoking condition, in which the smoking behaviour of a stranger (without knowing) will be manipulated in two conditions, (1) not smoking during the session and (2) smoking three cigarettes during the session. To be able to perform these two conditions, this study manipulates the experiment by using a trained confederate. In this way, this study controls for undesired factors. The role of the confederate will be further explained in the next paragraph. By means of a session of 60 minutes, in which 30 minutes for observing and registering the behaviour of the

subject and 20 to 25 minutes and an introduction, for answering the questionnaire and short additional research about stress.

### *Procedure*

The present study approached subjects who participated in a previous experiment about the smoking behaviour of adolescents and who agreed to participate in other further research. Furthermore, as previous studies revealed that lower educated students were more likely to smoke than higher educated students (Richter & Lampert, 2008; Richter & Leppin, 2007), the present study also approached students of intermediate technical and vocational-training from Utrecht during classes, lunch-breaks and after school hours with a similar cover story about a music research. The subjects of this experiment were all daily smoking adolescents between 16 and 24 years old. The youngsters were told that they could participate in a research about discussing music video clips with another participant. Thereby, they were told that the session would take about one hour and that they would gain fifteen euro's after completing the session. Those who were interested in participating the research needed to fill in a screenings questionnaire, in which topics about personal information, such as name, education, address, telephone number, music tastes, alcoholic and smoking behaviour had to be answered. After collecting these screenings questionnaires, the investigator only selected the daily smokers in the age-range 16 to 25 who filled in the questionnaire as these are the inclusion criteria. Continuously, the investigator called the selected youngsters for an appointment to participate in the research. However, the subject was unaware of the fact that the confederate was not a regular participant too. The confederates are College or University students from Utrecht, who are 20 until 25 years old. They were mainly approached through posters and flyers. Before participating in the sessions each confederate followed training. In this training they were told how to behave in front of the subject.

The study is performed in the period of February until March 2010. The ethical procedure which this study will follow was accepted and approved by the advice committee of the University of Utrecht. All sessions took place at property of the Trimbos institute, at two places. The first place was the smoking room in the Trimbos institute. The second place was in a camper of the Utrecht University, parked at the parking place of the Trimbos institute in Utrecht. The subject and confederate

met each other at the entrance of the institute before the start of the session as the confederate was a stranger to the subject but acted like a participant. The investigator introduced the subject and confederate to each other prior to the experiment and explained that due to the purpose of the research they had to sit in two different rooms. The youngsters were told that the purpose of the study was that music often is listened to and downloaded from the Internet and the present study would like to understand how youngsters communicate through the Internet. The investigator then took the two persons to the camper where they filled in an 'informed consent'. Further, the investigator performed the Smokerlysertest to measure carbon monoxide (CO-level) by both the subject and confederate. This is done under the cover story that it was an alcohol test and that the study liked to control for alcohol consumption in the analysis as alcohol might influence someone's perception about music clips. Then, the investigator asked if the subject and confederate fill in a couple of 'mood questions'. Subsequently, the investigator gave an instruction of the rest of the session and clearly explained that eating, drinking and smoking were allowed in both rooms. The subject knew that the confederate was a daily smoker as he/she saw the confederate smoking at the entrance of the institute before the session. If not, then the confederate showed his/her cigarette pack through laying it on the table in the camper during the introduction. Subsequently, the investigator asked the confederate to go to the reception and ask the way to the other room. The subject stayed in the camper, which was equipped with cameras, audio and a computer with webcam. The participants were sitting in different rooms as this research tried to copy communication via the Internet. In this way, the investigator observed how youngsters talk about music on the Internet. During the whole session, the subject and confederate were able to see and chat with each other through the webcam and headset. The actual session existed of discussing about music questions such as what they like about a music video clip using the program Skype (a program were one can video call for free). Important is that they had to come to a univocal answer and that the confederate would act warm and social during the whole session and especially during the discussion. Thereby, more importantly, the confederate had to lead an equal discussion, which means that he/she had to have the same opinion as the subject during and at the end of the discussion. The music task took about 30 minutes. Only the smoking behaviour (i.e. lightning and finishing a cigarette) of the subject and confederate was registered by the investigator in SPSS in a separate room in the front

of the camper. On each table lay a form with the assignments, a pen and something to drink (non-alcoholic: soda, water and juice) and eat (nuts). After the 30 minutes the investigator asked the confederate to come to the camper to fill in another questionnaire, which took about fifteen minutes. The questionnaire contained questions about individual characteristics of the subject, such as self-esteem, self-efficacy and stress and their home situation, background, feelings, individual characteristics, the smoking behaviour of their social environment, such as parents and peers, and feelings of stress and their opinion about their co-participant. The participants of this study consisted of a subject and a confederate as only same-sex dyads will be examined. Finally, the subject and confederate received their fifteen euro's after they had confirmed that they received the money. Notable is that even afterwards the session, none of the subjects knew the real purpose of the experiment.

At the end, of the 42 sessions, 36 sessions were successful. This reduction was due to mistakes made during the session or excluding sessions as the subject did not fit the inclusion criteria.

### *Instruments*

In this study, a smokerlyzer, cameras and a questionnaire will be applied.

Carbon monoxide (CO-Level): The smokerlyzer (Sinefuma, 2010) is used to measure the amount of CO-level in the blood of an individual. Carbon monoxide is a harmful substance in cigarettes. The more cigarettes a person has smoked, the higher the amount of CO is in their blood. The CO-level was measured in parts per million (ppm). In short, the smoking behaviour of the subject before the session might influence the smoking behaviour during the session. Thus, erratic results in the analyses may be due to the amount of cigarettes the youngster has smoked before the session and therefore, his or her behaviour may be deviant during the session.

Smoking behaviour participant: To be able to measure the amount of cigarettes smoked by the subject, the smoking behaviour of the subject was observed by cameras and the investigator controlled the amount of cigarettes in the ashtray after every session. In the end, for every session, the total amount of smoked cigarettes by the subject was consistent with the total amount of cigarettes in the ashtray.

Self-esteem: refers to 'a global positive or negative attitude toward the self' (Rosenberg & Pearlin, 1978). Self-esteem, measured by the Rosenberg self-esteem scale (Rosenberg, 1965) was frequently used in many previous studies and it turns out

to be a valid and reliable instrument for measuring self-esteem (Glendinning & Inglis, 1999; Kawabata et al., 1999). This scale contains ten items. For example, one of these items is: *'I feel that I am a person of worth, at least on an equal plane with others'* (Rosenberg, 1965). These items all have to be answered with one of the answer categories: 'strongly agree', 'agree', 'disagree', 'strongly disagree'. Cronbach's Alpha of self-esteem: 0.83.

Self-efficacy: refers to 'the extent to which an individual is able to offer resistance to not perform particular behaviour' (Ajzen, 1991). The self-efficacy scale emerged to be a reliable and valid instrument for measuring the confidence of an individual in being able to resist smoking in a variety of tempting situations (Ham, 2007). This scale contains six items. For example, one of these items is: *'Not smoking, when my friends do smoke, is for me...'* These items all have to be answered on a six-point Likert scale, ranging from 'very difficult' to 'very easy'. Cronbach's Alpha of self-efficacy: 0.75.

#### *Data-analysis*

In total, descriptives were performed to filter the most important information for this study from all the collected data. The number of participants, gender, CO-level, frequencies of self-esteem and self-efficacy and the amount of cigarettes that were smoked during the session were important information. Continuously, linear regression analysis was performed. The following terms were included in the univariate analysis: the independent variables were the smoking behaviour of the confederate, frequencies of self-efficacy and self-esteem, the dependent variable was the amount of cigarettes the subject smoked during the session and the covariates were CO-level and gender. In the multivariate analysis, the above mentioned variables and the interaction terms 'self-efficacy x smoking behaviour confederate' and 'self-esteem x smoking behaviour confederate' were included.

Continuously, by performing a multivariate regression analysis, there might be a high correlation between independent variables (multicollinearity). If this was the case, the correlation between the variables self-efficacy and self-esteem would be very high which means that these variables can not be measured in one analysis. Therefore, the independent variables were controlled for multicollinearity by Pearson R. The variables 'self-esteem' and 'self-efficacy' have a correlation of .59. As the

correlation must not be higher than 0.60 (Nijdam, 2004), both the variables could be measured in one analysis.

## Results

### *Descriptives*

Of the total of 36 participants (14 males and 22 females,  $\mu = 18.61$ ,  $sd = 1.82$ ), 19 participants participated in a smoking condition and 17 participants participated in a non smoking condition. Of the 19 participants in the smoking condition, 5.6% smoked only one cigarette, 30.6% smoked two cigarettes, 11.1% smoked three cigarettes and 5.6% smoked four cigarettes. In the non smoking condition ( $N = 17$ ), 16.7% of the youngsters smoked zero cigarettes, 19.4% smoked one cigarette, 8.3% smoked two cigarettes and 2.8% smoked three cigarettes. Overall, zero to four cigarettes per session were smoked by the participants ( $\mu = 1.64$ ,  $SD = 1.10$ ).

### *Univariate and multivariate regression analyses*

All three of the sub questions have been analysed at the same time. First, an univariate regression analysis including all the independent variables, the smoking behaviour of the confederate, self-efficacy and self-esteem, has been performed, testing also the covariates, gender and CO-level ( $\mu = 8.64$ ,  $sd = 4.84$ ,  $min. = 1.00$ ,  $max. = 21.00$ ). In this way, the independent effects on the subjects' smoking behaviour were examined, see Table 1.

**Table 1. Univariate Regression Analysis on Subjects' Smoking Behavior (N=36)**

	B	Std. Error	Beta
Gender	-.20	.38	-.09
CO-level	.01	.04	.05
Self-esteem	-.74	.38	-.32
Self-efficacy	.18	.23	.13
Cigarettes smoked by confederate	1.40	.29	.64***

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

In Table 1, both gender and CO-level turned out to be not significant. The variables self-esteem and self-efficacy also turned out to be not significant. Only the amount of cigarettes smoked by the confederate seems to be significant on the subjects' smoking behaviour. The more the confederate smokes, the more the subject will smoke.

Subsequently, since the first hypothesis assumes that peers do influence youngsters, multivariate regression analysis has been conducted, including all of above stated variables and including the interaction variables. In this model, 46.3% of the variance of the smoking behaviour of the subject was explained by ‘total amount of cigarettes smoked by confederate’, which was the only variable significant with the dependent variable.

**Table 2. Multivariate Regression Analysis of Independent Variables on the Subjects’ Smoking Behaviour (N=36).**

	B	Std. Error	Bèta
Gender	-.11	.31	-.05
Co-level	.03	.03	.11
Self-esteem	-.38	.34	-.17
Self-efficacy	.07	.20	.05
Cigarettes smoked by confederate	1.34	.31	.62***

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

By performing the multivariate analysis, the impact of more than one variable could be measured. The variance explained by the multivariate analysis turned out to be 46.3 % (R square). In the multivariate analysis, both control variables (gender and CO-level) were still not significant with the smoking behaviour of the subject. Secondly, the effects of the independent variable total amount of cigarettes smoked by confederate on adolescents’ smoking behaviour, remains strong and significant. Thirdly, the second hypothesis about the effects of individual characteristics, self-esteem and self-efficacy, on adolescents’ smoking turned out to be not significant. Finally, the third hypothesis about the interaction effect was also not significant for both ‘self-esteem \* smoking behaviour confederate’ (B=-.49, Std. Error=.36, Beta=-1.07) and ‘self-efficacy \* smoking behaviour confederate’ (B=-.88, Std. Error=.68, Beta= -1.41).

## Discussion

The present study was an observational experimental study. This study examined whether adolescents’ susceptibility to imitate the smoking behaviour of peers depends on adolescents’ individual characteristics self-esteem and self- efficacy. In accordance with the first hypothesis, the present study found a significant effect of imitation of the smoking behaviour of peers on adolescents smoking behaviour. The more cigarettes peers will smoke, the more cigarettes youngsters will smoke. This result is

confirmed by previous experimental studies, such as the study of Antonuccio and Lichtenstein (1980), Caudill and Marlatt (1975), Larsen and colleagues (2009) and Miller and colleagues (1979). These studies all found strong effects of the influence of peers on youngsters smoking behaviour. Bandura's *social learning theory* (1977) supports above-mentioned as it suggests that individuals imitate behaviour of important individuals in their environment. However, a difference to prior studies and theory is the influence of peers on daily smoking youngsters during digital interaction. Above mentioned studies all found strong effects in a direct interactive setting, but the present study examined the influence of peers across distance, through digital interaction instead of real live interaction. Thus, even when youngsters are not in the same room and communicate over the Internet, youngsters model, observe and imitate the smoking behaviour of peers. Furthermore, as stated in the introduction, exposure to cigarette smell may create feelings of yearning for a cigarette (Baily et al., 2009). Although there is no cigarette smell involved as youngsters only see peers' smoking behaviour on the computer screen, the present study still found a strong significant effect of the smoking behaviour of peers on the adolescents' smoking behaviour. Therefore, the present study showed innovative results with regard to the extent to which adolescents imitate the smoking behaviour of peers. Nevertheless, further research of imitating behaviour through digital interaction is necessary to confirm and come to stronger evidence for the present findings.

The second hypothesis was not confirmed by the present study as measured individual characteristics did not correlate with the smoking behaviour of the subject. Both low self-esteem and self-efficacy thus did not seem to influence the smoking behaviour of youngsters. To the best of our knowledge, few experimental studies have found significant effects of individual characteristics on youngsters' smoking behaviour. Nevertheless, prior longitudinal studies did find some effects. The results of the present study were inconsistent with previous longitudinal studies as those studies found a significant effect of individual characteristics on adolescents' smoking behaviour (Abernathy et al., 1995; Glendinning, 2002; Glendinning & Inglis, 1999; Hill et al., 1997; Joseph et al., 2003; Kawabata et al., 1999; Maher & Rickwood, 1997; Papakyriazi & Joseph, 1998). For example, Abernathy and colleagues (1995) found a strong association between low self-esteem and smoking behaviour among females ( $p < .001$ ) in their longitudinal study ( $N=3567$ ). In a less strong extent, this association of low self-esteem and smoking behaviour was found among males

( $p < .05$ ). Glendinning and Inglis (1999) also showed an effect of self-esteem on the adolescents' smoking behaviour in their longitudinal study. Of the regular smokers, 23% had a low self-esteem. However, this effect was not a very strong effect ( $p < .05$ ). The present study did not find similar effects, although the present study was an experimental research. This may be due to the power of the experiment. In the univariate analysis, there was nearly a significant effect of self-esteem on the subjects' smoking behaviour ( $p = 0.056$ ). Though, in the multivariate analysis, there was no effect at all. Therefore, future studies may include a larger population as that may lead up to a significant effect of self-esteem on the youngsters' smoking behaviour. Besides this, there may also be another explanation. Youngsters who have low self-esteem may be more vulnerable for influences from their (social) environment and may be afraid of what peers think of them. Namely, when adolescents fail and don't meet the norm of the peer group, they fall out of the group, become an outsider and lose their identity (Engels et al., 2004; Urberg, 1997). Therefore, they are (more) likely to show socially acceptable behaviour and give socially acceptable answers in the questionnaire this study used to measure individual characteristics. In short, youngsters may have low self-esteem as they give socially acceptable answers on questions, which may lead to a non significant effect of individual characteristics on the adolescents' smoking behaviour. In future studies, it may therefore be interesting to look the interaction in online chatrooms as youngsters then are participating in a group. On the other hand, the youngsters in this experiment interacted during the sessions with strangers instead of (close) friends. As strangers can not be seen as social environment, youngsters might have not felt the need to show socially acceptable behaviour.

The third hypothesis did not correlate with the smoking behaviour of adolescents. To our knowledge, only few previous experimental studies examined the moderating effect of individual characteristics on the smoking behaviour of adolescents. What is more, only the longitudinal study of Epstein and colleagues (2006) found a small significant effect of self-efficacy on the smoking behaviour of youngsters (N=1459). Their results showed that the lower one's resistance to not perform smoking behaviour, the more one will be influenced by the smoking behaviour of peers. The huge difference in power between the study of Epstein and colleagues and the present study might be part of an explanation. Though, the proportion between male (38.9 %) and female in the present study did not differ much

from the population (46.6% male) of the study of Epstein and colleagues (2006). Unfortunately, as the study of Epstein and colleagues (2006) is the only study which is comparable with the present study, it is hard to fully explain the difference in results. More similar future studies, with regard to main focus of the present study, are necessary to come to a stronger evidence based answer. Another part of an explanation may focus on the fact that most adolescents are not only smoking in dyads as they mainly function in friendship groups (Engels et al., 2004; Urberg, 1997). The present study only studied smoking behaviour of daily smoking youngsters in dyads, through digital interaction. Previous studies examined smoking initiation and not daily smokers. The mechanisms of smoking initiation and daily smoking may differ. In order to control for this, more experimental research about daily smoking adolescents is necessary. Besides this, previous studies on youngsters' behaviour showed that friendship groups were important factors for the smoking behaviour of youngsters (Avenevoli and Merikangas, 2003, Urberg et al., 1997). It may be recommended to examine friendship group instead of dyads. However, as digital interaction mainly occurs in one-to-one situations, exploring dyads in the present study was appropriate. Although the population was randomly selected based on screening results, the test population was selected from a non-random population of youngsters. This may have led to a sampling bias. Prior studies revealed that groups with low socio-economic status (SES) faced a higher risk to tobacco smoking than groups with high SES; lower educated students were more likely to smoke than higher educated students (Richter & Lampert, 2008; Richter & Leppin, 2007). However, previous studies among higher educated students revealed that there was a significant effect of peers' smoking behaviour on the smoking behaviour of youngsters (Antonuccio and Lichtenstein, 1980; Miller and colleagues, 1979). From a more global point of view this is a limited test population as it represents only a part of a western society, in which the onset is raised with the thought that one has to be independent and should have the ability to cope for oneself. For this reason it may be likely that other results can be found if the present study was performed among a more diverse population, which include multiple cultures and education levels. In this way, future studies may show that individual characteristic in previous and present studies may be based on culture differences.

### *Limitations*

The most important limitation of this study is probably the power of the experiment. In the univariate analysis, a significant effect of self-efficacy on youngsters' smoking behaviour was nearly found. Using a larger population to gain more power in future research, this effect may turn into a significant effect. Besides this, in the multivariate analysis, no effects occurred. It is possible that small effects might be overruled by the significant effect of the smoking behaviour of the confederate on the smoking behaviour of the adolescent and therefore, small effects were invisible.

#### *Implications of the present study*

As stated in the introduction, tobacco smoking, especially among adolescents, is very harmful for a person's health. Smoking is even the second death cause in the World. Prevention and intervention programs are important means for reducing the smoking behaviour of the world population. Intervention programs used to focus on the mechanism of peer pressure, while the present study significantly showed that implicit influence (imitation) is more important than previously expected. Moreover, the results of the present study provide new insights for intervention programs as was proven that digital peer influence was significant on the adolescents' smoking behaviour, next to face-to-face peer influence. Therefore, future policies and intervention programs should focus more on digital aspects as the present study found a strong significant effect of the digital smoking behaviour of peers on the adolescents' smoking behaviour.

In conclusion, although not all the hypotheses of the present study were confirmed, the results of the present study did give new insights in the underlying mechanisms of the smoking behaviour of youngsters. Furthermore, this study also gave new insights for future intervention programs as not only peer pressure, but also imitation is an important factor for the adolescents' smoking behaviour.

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