Are anti-smoking parenting practices related to adolescent smoking cognitions and behavior?

Rose M. E. Huver, Rutger C. M. E. Engels and Hein de Vries

Abstract

The aim of this study was to explain the effects of anti-smoking parenting practices on adolescent smoking cognitions and behavior by showing the mediating effects of cognitions. Data were gathered among Dutch high school students in the control condition of the European Smoking prevention Framework Approach (ESFA). Anti-smoking parenting practices were measured by parental reactions to smoking, house rules, and frequency and content of communication about smoking. Attitudes, perceived social influences and self-efficacy made up for smoking cognitions. Additionally, intention to smoke was measured. Relations between practices and cognitions were mostly significant. While some practices were associated with less smoking (communication about health risks of smoking, health risks of breathing in smoke, addictive qualities of smoking and attention for smoking in school), others were related to increased chances of smoking (rewards for not smoking, frequency of communication about smoking, communication about being allowed to smoke, price of cigarettes and friends smoking). The effects of parenting hardly varied by parental smoking status or adolescent gender. Several practices operated through cognitions, which was more pronounced in older adolescents. Counter-productive effects of practices and the few effects in the longitudinal analyses indicate that the order in which parents and adolescents influence each other should be examined more closely.

Introduction

Early adolescence is a particularly important period in which efforts to prevent smoking uptake and to delay smoking initiation can be effective (Bush and Iannotti, 1993; Glynn, 1993; Kelder et al., 1994). Early adolescence and the transition from primary to secondary school are characterized by a sharp increase in the percentage of youths that have ever tried a cigarette (STIVORO, 2004; US Department of Health and Human Services, 1994). Of adult daily smokers, 89% had their first cigarette before their 19th birthday and 71% had started daily smoking by age 19 (US Department of Health and Human Services, 1994). By the age of 18, 71% of Dutch adolescents had smoked at least once (DEFACTO-rookvrij, 2001). In addition, 28% of adolescents aged 10–19, of which 11% were 10–14 years old, had smoked in the past 4 weeks (STIVORO, 2003).

The Integrated Model for Change (I-Change Model) proposed by De Vries et al. (De Vries et al., 2003) and earlier versions of this model, then called the ASE model (Attitude–Social influence–Self-Efficacy), have been successful in predicting smoking and other health behaviors (Brug et al., 1995; Lechner and De Vries, 1995, 2002; Lechner...
et al., 1997; De Vries and Mudde, 1998). As can be seen from Figure 1, this model of motivational and behavioral change combines aspects of several theories, such as Bandura’s Social Learning Theory (Bandura et al., 1977), the Theory of Planned Behavior (Ajzen, 1991), the Health Belief Model (Janz and Becker, 1984) and the Transtheoretical Model (Prochaska et al., 1992). According to the I-Change Model, smoking intention and behavior can be predicted from a set of motivation factors or cognitions, i.e. attitude, perceived social influences and self-efficacy expectations. Attitudes consist of the advantages and disadvantages a person perceives concerning a certain health behavior. Social influence is a constellation of three types of perceived influence of others, consisting of perceived social norms, behavior and pressure. Finally, self-efficacy is defined as the estimated ability to engage in a certain behavior. These cognitive factors are influenced by several predisposing factors, among which are social factors. Behavior is then predicted by intention as well as by ability factors and barriers.

One of the predisposing social factors relates to anti-smoking parenting practices that can be described as content-specific acts of parenting (Darling and Steinberg, 1993). Associations between parenting practices and smoking have been found for parental reactions to adolescent smoking (Ma et al., 2003), such as punishments (Jackson, 1997; Jackson and Henriksen, 1997; Fearnow et al., 1998; Henriksen and Jackson, 1998), house rules about smoking (Henriksen and Jackson, 1998; Jackson and Henriksen, 1997) and communication about smoking (Jackson, 1997; Jackson and Henriksen, 1997; Fearnow et al., 1998; Engels and Willemsen, 2004). However, of the papers published on this subject, only a very few have made use of longitudinal data [e.g. (Ennett et al., 2001a; Engels et al., 2005)].

While effects of cognitions and anti-smoking parenting practices on adolescent smoking have
been established, this study aims to explain effects of anti-smoking practices by taking mediating effects of cognitions into account. In this line of reasoning, parenting practices are considered distal predisposing social factors in the I-Change Model. It is hypothesized that anti-smoking parenting practices are associated with adolescent smoking cognitions, i.e. attitude, social influence and self-efficacy. In addition, a model is tested to analyze the effects of anti-smoking parenting practices on lifetime smoking and the mediating role of smoking-specific cognitions. In addition to proposing this mediating model, the current study goes beyond previous work in terms of three features. This study is set in a representative sample of youngsters. Moreover, this study measures several forms of anti-smoking parenting practices. Finally, effects of anti-smoking practices on smoking behavior were investigated for students in the first year of high school and 2 years later, as well as longitudinally.

Method

Participants and procedures
Data were gathered in two waves among Dutch students at 30 high schools in the control condition of the European Smoking prevention Framework Approach (ESFA) project (Kremers et al., 2000; De Vries et al., 2003). In 1998, all Grade 7 students were asked to fill in self-administered questionnaires at the beginning of the school year (T1), with Grade 7 being the first year of high school in The Netherlands. This procedure was repeated 2 years later (T2). The questionnaires had been qualitatively pre-tested (Vroom, 1994) in a representative sample of youngsters. Filled-in questionnaires were put in envelopes and individually sealed, after which the teacher put all the envelopes in a larger one that was sealed in front of the class. Analyses were carried out with 2312 students in Grade 7 (mean age = 13.22; SD = 0.61) and 2421 students in Grade 9, the marginal difference in sample sizes being caused by a change in student population, due to absenteeism at one measurement point. Respondents that participated in both waves and were never smokers at T1 were included in the longitudinal analyses (n = 1072; mean age = 12.71; SD = 0.54 at T1). The sample was 51.0% male and mostly native (82.0%), 4.5% were from Turkey, 1.9% from Morocco, 1.1% from Surinam, 1.0% from Indonesia, 3.5% from elsewhere and 6.0% had a mixed background. Of the 47.3% of religious respondents, 31.2% were Roman Catholic, 6.9% Islamic, 4.5% Protestant, 0.3% Buddhist and 4.4% had another religion. At T1, 40.1% of respondents had ever smoked. Two years later, this percentage was 62.2%. In the longitudinal analyses, 36.7% of the never smokers at T1 had smoked at T2.

Measures
Adolescent smoking behavior was assessed by classifying participants in one of two categories. Never smokers were defined as never having smoked a cigarette, not even one puff. Respondents that did not fit into the category of never smokers were classified as ever smokers (Kremers et al., 2001a). Answers were cross-validated using a four-item algorithm assessing current and lifetime smoking status (De Vries et al., 1994; De Vries et al., 2003).

Demographical variables taken into account were respondents’ age and gender (0 = male, 1 = female).

Parental reactions were measured by three questions on five-point scales. First, Respondents were asked whether their parents would get angry if they found out they smoked. Second, they were asked if they would be punished for smoking. Third, participants were asked if they would receive a reward for not smoking.

House rules were measured by seven questions. The adolescents could indicate whether they were allowed to smoke in their own room; the living room; the kitchen; bathrooms and toilets; the hall, corridor and staircases; outside, specifically in the garden, yard, garage or shed. A score of 1 indicated presence of a house rule of not being allowed to smoke and 0 indicated the absence of such a rule.

Communication about smoking was measured by 11 questions. First, participants were asked to
indicate the frequency with which they had discussed the subject of smoking with their parents. Answers ranged from 0 = ‘No/talked about it, but not in the last year’ to 4 = ‘Yes, often’. Subsequently, respondents were asked to indicate whether their parents had discussed the following topics with them: health risks of smoking, health risks of breathing in smoke, non-smoking agreements, being allowed to smoke, places where the adolescent could or could not smoke, price of cigarettes, addiction, attention paid to smoking in school, friends who smoke and others offering cigarettes.

**Attitudes** were measured by 12 smoking-related beliefs on seven-point scales. Factor analysis revealed that variables loaded on one of two unique factors, i.e. the pros or cons of smoking, which were summed to form two scales of six questions each (α = 0.62 and 0.72) (Kremers et al., 2001b).

**Parental social influences** were measured with three constructs. Parental social norms were assessed by asking the participants what their mother or father would expect them to do (-3 = ‘I definitely should not smoke’ to +3 = ‘I definitely should smoke’) (r = 0.67, P < 0.001). Perceived parental smoking behavior was addressed by two dichotomous questions asking respondents about their parents’ smoking behavior (r = 0.31, P < 0.001). Respondents could indicate the amount of perceived parental pressure by answering whether they had ever felt pressure not to smoke from their mother or father. Answers ranged from 0 = ‘Never’ to 4 = ‘Very often’ (r = 0.60, P < 0.001). Maternal and paternal answers were summed.

**Self-efficacy** was assessed with an instrument based on earlier work by Lawrance (Lawrance, 1988). Twelve questions were presented such as ‘When you are with others who smoke, are you able not to smoke?’ and answers ranged from -3 = ‘I am sure I won’t smoke’ to +3 = ‘I am sure I will smoke’. Answers were summed to form a self-efficacy score, ranging from -36 to +36 (α = 0.95).

**Intention to smoke** was measured by the question ‘Do you intend to smoke in the future?’ with answers from -3 = ‘Definitely not’ to +3 = ‘Definitely’.

**Statistical analyses**

Regression analyses were carried out to determine the associations between anti-smoking parenting practices, adolescent smoking cognitions and behavior. Attitude, social influence and self-efficacy were regressed on parenting practices to test the relationship between smoking cognitions and smoking-related parenting practices. In addition, a model was tested using logistic regression to predict lifetime smoking status by parenting practices, adolescent smoking-related cognitions and intention to smoke. In the first step of the model, age and gender were included as covariates. In the second step, the model tested the direct relations between parenting practices and smoking behavior. In the third step, attitudes, perceived social influences and self-efficacy were entered into the model. Intention to smoke in the next year was included in the final step. The first two steps were carried out according to the Backward Likelihood Ratio method. In contrast, the cognitions and intention were entered into the model by means of ‘forced entry’ (Tabachnick and Fidell, 2001). These multiple and logistic regressions were carried out cross-sectionally at two points in time to compare the models with children when at different ages, as well as longitudinally, where T1 variables were used to predict T2 outcomes. Effect sizes (f²) were calculated. Sizes over 0.02 were considered small, over 0.15 medium and over 0.35 large (Cohen, 1988, 1992).

**Results**

**Effects of anti-smoking parenting practices on smoking-related cognitions**

Results of the backward multiple regressions predicting smoking-related cognitions by anti-smoking parenting practices at T1, T2 and longitudinally are shown in Tables I, II and III, respectively.

As can be seen from the effect sizes in Table I, at T1, anti-smoking practices were associated mostly with the cons of smoking, perceived social norm and perceived behavior, although effect sizes were small. House rules about smoking in the adolescent’s own room and communication about the
price of cigarettes or friends smoking were not significantly related to cognitions.

At T2 (Table II), parenting practices were more often related to cognitions, and standardized $\beta$s and effect sizes increased in comparison to T1. Most associations were found of practices with cons and self-efficacy. Medium effect sizes were found for cons of smoking, perceived social norms, perceived behavior and self-efficacy. Where communication about being allowed to smoke was most frequently associated with cognitions at T1, no significant relations were found at T2.

Longitudinally (Table III), practices were still significantly associated with all smoking-related cognitions, although fewer associations were found and effect sizes were non-existent or small. Perception of parental behavior was influenced most. House rules about smoking in one’s own room and bathroom or toilets, frequency of communication about smoking, communication about the health risks of breathing in smoke, being allowed to smoke, places where smoking is allowed, the price of cigarettes, addictive qualities of smoking, and friends smoking were not associated with cognitions.

**Effects of anti-smoking parenting practices on smoking behavior, and mediating effects of smoking-related cognitions and intention**

Tables IV, V and VI show the results of the logistic regression analyses at T1, T2 and longitudinally predicting ever smoking by demographics (Step 1), anti-smoking parenting practices (Step 2), attitudes, social influences and self-efficacy (Step 3), and intention (Step 4), in order to shed light on the process by which parenting practices operate on smoking behavior and the role of smoking-specific cognitions and intention herein.

**Step 1**

The first columns of Tables IV, V and VI show the results of the regression analyses with age and

<table>
<thead>
<tr>
<th>Variable</th>
<th>Attitudes</th>
<th>Social influences</th>
<th>Self-efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pros</td>
<td>Cons</td>
<td>Social norms</td>
</tr>
<tr>
<td>Reaction get angry</td>
<td>$-0.05^*</td>
<td>0.13^{***}</td>
<td>$-0.21^{***}</td>
</tr>
<tr>
<td>Reaction punishment</td>
<td>$0.05^*</td>
<td>$-0.05^*</td>
<td>0.07^{***}</td>
</tr>
<tr>
<td>Reaction reward</td>
<td>$-0.09^{***}</td>
<td>$-0.21^{***}</td>
<td>$-0.09^*</td>
</tr>
<tr>
<td>House rule living room</td>
<td>$0.09^{**}</td>
<td>$0.21^{***}</td>
<td>$-0.06^*</td>
</tr>
<tr>
<td>House rule kitchen</td>
<td>$0.09^{**}</td>
<td>0.09^{**}</td>
<td>0.09^*</td>
</tr>
<tr>
<td>House rule bathroom, toilets</td>
<td>$0.08^{***}</td>
<td>$0.14^{***}</td>
<td>0.08^{***}</td>
</tr>
<tr>
<td>House rule hall, corridor, staircases</td>
<td>$-0.09^{***}</td>
<td>$0.10^{***}</td>
<td>$-0.05^*</td>
</tr>
<tr>
<td>Frequency of communication about smoking</td>
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<td>$0.07^{**}</td>
<td>$-0.05^*</td>
</tr>
<tr>
<td>Topic health risks of smoking</td>
<td>$-0.10^{***}</td>
<td>0.13^{***}</td>
<td>0.08^{**}</td>
</tr>
<tr>
<td>Topic health risks of breathing in smoke</td>
<td>0.06^{**}</td>
<td>0.06^{**}</td>
<td>0.04^*</td>
</tr>
<tr>
<td>Topic non-smoking agreement</td>
<td>$-0.06^*</td>
<td>0.07^{**}</td>
<td>0.04^*</td>
</tr>
<tr>
<td>Topic allowed to smoke</td>
<td>$0.09^{***}</td>
<td>$-0.14^{***}</td>
<td>$-0.05^*</td>
</tr>
<tr>
<td>Topic places where smoking is allowed</td>
<td>$-0.05^*</td>
<td>$0.09^{***}</td>
<td>0.05^*</td>
</tr>
<tr>
<td>Topic smoking is addictive</td>
<td>$-0.09^{***}</td>
<td>$-0.09^{***}</td>
<td></td>
</tr>
<tr>
<td>Topic attention for smoking in school</td>
<td>$-0.07^{**}</td>
<td>$-0.07^{**}</td>
<td>$-0.04^*</td>
</tr>
<tr>
<td>Topic others offering cigarettes</td>
<td>0.04</td>
<td>0.09</td>
<td>0.08</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.04^{a}</td>
<td>0.09^{a}</td>
<td>0.09^{a}</td>
</tr>
<tr>
<td>$f^2$</td>
<td>0.04^{a}</td>
<td>0.09^{a}</td>
<td>0.09^{a}</td>
</tr>
</tbody>
</table>

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$; *small effect size.
Table II. Significant results ($\beta$) of backward multiple regressions of smoking cognitions on parenting practices among Grade 9 students ($n=2421$)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Attitudes</th>
<th>Social influences</th>
<th>Self-efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pros</td>
<td>Cons</td>
<td>Social norms</td>
</tr>
<tr>
<td>Reaction get angry</td>
<td>0.19***</td>
<td>−0.22***</td>
<td>0.06*</td>
</tr>
<tr>
<td>Reaction punishment</td>
<td>0.06**</td>
<td>−0.08***</td>
<td>0.05**</td>
</tr>
<tr>
<td>Reaction reward</td>
<td>−0.11***</td>
<td>0.07**</td>
<td>−0.10***</td>
</tr>
<tr>
<td>House rule own room</td>
<td>0.06*</td>
<td>−0.10***</td>
<td>0.08**</td>
</tr>
<tr>
<td>House rule living room</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>House rule kitchen</td>
<td></td>
<td>−0.14***</td>
<td></td>
</tr>
<tr>
<td>House rule bathroom, toilets</td>
<td>−0.06**</td>
<td>−0.15***</td>
<td></td>
</tr>
<tr>
<td>House rule hall, corridor, staircases</td>
<td>0.05*</td>
<td>−0.17***</td>
<td>0.10***</td>
</tr>
<tr>
<td>House rule outside</td>
<td>−0.13***</td>
<td>0.10***</td>
<td>0.07**</td>
</tr>
<tr>
<td>Frequency of communication about smoking</td>
<td>0.12***</td>
<td>−0.11***</td>
<td>−0.19***</td>
</tr>
<tr>
<td>Topic health risks of smoking</td>
<td>0.10***</td>
<td>−0.09***</td>
<td>−0.05**</td>
</tr>
<tr>
<td>Topic health risks of breathing in smoke</td>
<td>−0.09***</td>
<td>0.10***</td>
<td>−0.04*</td>
</tr>
<tr>
<td>Topic non-smoking agreement</td>
<td>0.06**</td>
<td>0.06*</td>
<td>0.11***</td>
</tr>
<tr>
<td>Topic places where smoking is allowed</td>
<td>0.07**</td>
<td>−0.09***</td>
<td>0.05*</td>
</tr>
<tr>
<td>Topic price of cigarettes</td>
<td>0.05*</td>
<td>−0.06*</td>
<td>0.07**</td>
</tr>
<tr>
<td>Topic smoking is addictive</td>
<td></td>
<td></td>
<td>−0.05*</td>
</tr>
<tr>
<td>Topic attention for smoking in school</td>
<td>0.11***</td>
<td>0.07*</td>
<td>−0.05**</td>
</tr>
<tr>
<td>Topic friends smoking</td>
<td>−0.06**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic others offering cigarettes</td>
<td>0.06**</td>
<td>0.06*</td>
<td></td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.11</td>
<td>0.15</td>
<td>0.17</td>
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<tr>
<td>$f^2$</td>
<td>0.12a</td>
<td>0.18b</td>
<td>0.20b</td>
</tr>
</tbody>
</table>

*P < 0.05, **P < 0.01, ***P < 0.001; a small effect size, b medium effect size.

Table III. Significant longitudinal results ($\beta$) of backward multiple regressions of smoking cognitions on parenting practices (n = 1072)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Attitudes</th>
<th>Social influences</th>
<th>Self-efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pros</td>
<td>Cons</td>
<td>Social norms</td>
</tr>
<tr>
<td>Reaction get angry</td>
<td>0.15***</td>
<td>−0.13***</td>
<td>0.06*</td>
</tr>
<tr>
<td>Reaction punishment</td>
<td>−0.09**</td>
<td>0.12***</td>
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<tr>
<td>Reaction reward</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>House rule living room</td>
<td>−0.06*</td>
<td>−0.07*</td>
<td>−0.25***</td>
</tr>
<tr>
<td>House rule kitchen</td>
<td></td>
<td>0.08*</td>
<td>−0.09*</td>
</tr>
<tr>
<td>House rule hall, corridor, staircases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>House rule outside</td>
<td>0.08*</td>
<td>−0.06*</td>
<td>0.10*</td>
</tr>
<tr>
<td>Topic health risks of smoking</td>
<td>−0.08**</td>
<td>0.07*</td>
<td></td>
</tr>
<tr>
<td>Topic non-smoking agreement</td>
<td>−0.11***</td>
<td>−0.06*</td>
<td>0.07*</td>
</tr>
<tr>
<td>Topic attention for smoking in school</td>
<td>−0.11***</td>
<td>−0.06*</td>
<td>0.07*</td>
</tr>
<tr>
<td>Topic others offering cigarettes</td>
<td>0.09**</td>
<td>0.03</td>
<td>0.06</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.03</td>
<td>0.04</td>
<td>0.06</td>
</tr>
<tr>
<td>$f^2$</td>
<td>0.03a</td>
<td>0.04a</td>
<td>0.06a</td>
</tr>
</tbody>
</table>

*P < 0.05, **P < 0.01, ***P < 0.001; a small effect size.
gender. It is apparent that older adolescent’s are more likely to have smoked in at both T1 and T2. At T1, girls were less likely to have smoked than boys.

**Step 2**

As can be seen from the third column of Table IV, at T1, some practices (communication about health risks of breathing in smoke and about addictive qualities of smoking) were inversely related to ever having smoked, whereas others (reward for not smoking, the frequency of communication about smoking, communication about being allowed to smoke and price of cigarettes) were significantly associated with higher chances of lifetime smoking. At T2 (Table V), more parenting practices were related to smoking behavior directly. As at T1, while some practices were associated with less smoking (house rules for smoking in the living room and outside, communication about health risks of smoking, health risks of breathing in smoke and attention paid to smoking in school), others were related to an increase in smoking behavior (frequency of communication about smoking, communication about being allowed to smoke, price of cigarettes and friends smoking). Table VI shows that, whereas discussing attention paid to smoking in school at T1 led to decreased chances of smoking initiation at T2, the opposite was true for the prospect of a reward for not smoking. Effect sizes were small in all analyses.

**Step 3**

Results of the T1 and T2 analyses indicate that relationships between some practices and smoking were mediated by smoking-related cognitions (fifth columns of Tables IV and V, respectively). The increased P levels and consequently fewer significant effects of parenting practices on smoking behavior after including smoking-related cognitions were most pronounced at T2, where six of the nine effects became insignificant and were not seen in the longitudinal analysis. Effect sizes were medium at T1, large at T2 and small in the longitudinal analysis.

**Step 4**

As predicted by the I-Change Model, P values of attitude, social influence and self-efficacy increased.

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**Table IV. Results of logistic regression among Grade 7 students of ever smoking on demographics (Step 1), parenting practices (Step 2), attitude, social influence and self-efficacy (Step 3), and intention (Step 4) (n = 2312)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Step 1</th>
<th></th>
<th>Step 2</th>
<th></th>
<th>Step 3</th>
<th></th>
<th>Step 4</th>
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<tbody>
<tr>
<td>Age</td>
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<td>0.000</td>
<td>1.49</td>
<td>0.000</td>
<td>1.41</td>
<td>0.000</td>
<td>1.35</td>
<td>0.000</td>
</tr>
<tr>
<td>Gender</td>
<td>0.75</td>
<td>0.001</td>
<td>0.73</td>
<td>0.000</td>
<td>0.71</td>
<td>0.000</td>
<td>0.64</td>
<td>0.000</td>
</tr>
<tr>
<td>Reaction reward</td>
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<td>0.035</td>
<td>1.10</td>
<td>0.009</td>
<td>1.12</td>
<td>0.006</td>
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</tr>
<tr>
<td>Frequency of communication</td>
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<td>0.000</td>
<td>1.19</td>
<td>0.000</td>
<td>1.20</td>
<td>0.000</td>
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<tr>
<td>Topic health risks breathing in smoke</td>
<td>0.55</td>
<td>0.000</td>
<td>0.63</td>
<td>0.001</td>
<td>0.64</td>
<td>0.002</td>
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<tr>
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<td>0.000</td>
<td>1.53</td>
<td>0.000</td>
<td>1.39</td>
<td>0.004</td>
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<tr>
<td>Topic price of cigarettes</td>
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<td>0.009</td>
<td>0.83</td>
<td>0.092</td>
<td>0.88</td>
<td>0.273</td>
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<td>Topic smoking is addictive</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Pros of smoking</td>
<td>1.05</td>
<td>0.000</td>
<td>1.05</td>
<td>0.000</td>
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<tr>
<td>Cons of smoking</td>
<td>0.92</td>
<td>0.000</td>
<td>0.99</td>
<td>0.562</td>
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<tr>
<td>Perceived social norm parents</td>
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<td>0.002</td>
<td>1.05</td>
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<tr>
<td>Perceived behavior parents</td>
<td>1.35</td>
<td>0.000</td>
<td>1.26</td>
<td>0.000</td>
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<tr>
<td>Perceived pressure not to smoke</td>
<td>1.16</td>
<td>0.022</td>
<td>1.05</td>
<td>0.519</td>
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<tr>
<td>Self-efficacy</td>
<td>0.97</td>
<td>0.000</td>
<td>0.98</td>
<td>0.001</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intention to smoke</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nagelkerke’s R²</td>
<td>0.03</td>
<td>0.09</td>
<td>0.25</td>
<td>0.36</td>
<td></td>
<td></td>
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<tr>
<td>f²</td>
<td>0.03</td>
<td>0.10</td>
<td>0.33</td>
<td>0.56</td>
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</tbody>
</table>

aSmall effect size, bmedium effect size, clarge effect size.
after taking intention into account. This was not the case longitudinally, as self-efficacy continued to make a unique significant contribution. Results at T2 showed that after intention had been included, effects of two of the three remaining parenting practices became insignificant. At T1, 75.2% of respondents were correctly classified. These percentages were 75.1 and 64.8% at T2 and in the longitudinal analyses, respectively. The effect size of the full model was medium at T1, large at T2 and small in the longitudinal analysis.

Additional analyses
Interaction analyses were carried out to test whether effects of anti-smoking parenting practices varied by perceived parental smoking behavior or adolescent gender. Due to the polytomous nature of the variable for parental smoking status, dummy variables were used, relating to maternal or paternal smoking behavior. After correcting for gender and age, at T1, the enforcement of house rules about smoking outside by non-smoking mothers was related to increased chances of adolescent smoking [odds ratio (OR) = 0.56, 95% confidence interval (CI) = 0.36–0.88, P < 0.05]. Considering the cross-sectional nature of these findings, a possible explanation holds that smoking adolescents were being banned outside by their non-smoking mothers. Communication about friends offering cigarettes was only associated with less smoking if fathers did not smoke (OR = 1.77, 95% CI = 1.12–2.80, P < 0.05). At T2, talking about a non-smoking agreement was related to decreased chances of smoking for children of smoking mothers (OR = 0.55, 95% CI = 0.34–0.90, P < 0.05). If mothers did not smoke, discussing the price of cigarettes was associated with increased chances of adolescent smoking (OR = 0.57, 95% CI = 0.35–0.95, P < 0.05). Possibly, non-smoking mothers thought this a useful argument to prevent smoking progression, once initiation had occurred. Communication about attention for smoking in school was only related to decreased chances of lifetime smoking for children of non-smoking mothers (OR = 3.25, 95% CI = 1.56–6.81, P < 0.01).
CI = 1.24–8.51, \( P < 0.05 \). Furthermore, along the lines of the results of the cross-sectional regression analyses where more frequent communication about smoking was related to higher chances of lifetime smoking, the more frequent non-smoking mothers talked about smoking at T1, the higher the chances of adolescent smoking were at T2 (OR = 0.75, 95% CI = 0.59–0.95, \( P < 0.05 \)). Similar to the significant interaction effect of communication about a non-smoking agreement with parental smoking status at T2, longitudinally, communication on this topic by smoking fathers predicted reduced chances of smoking uptake (OR = 0.50, 95% CI = 0.26–1.00, \( P < 0.05 \)). We then tested whether effects of parenting practices differed for boys and girls and found no significant interactions at T1 or T2. Longitudinally, frequency of communication about smoking was again positively associated with smoking initiation, but only for girls (OR = 1.30, 95% CI = 1.03–1.64, \( P < 0.05 \)). As in both cross-sectional regression analyses of smoking on parenting practices, communication about the health risks of breathing in smoke at T1 was related to lower levels on smoking initiation at T2, but only for girls (OR = 0.37, 95% CI = 0.19–0.73, \( P < 0.01 \)). Given that out of the many possible interactions relatively few proved to be significant, these were not further taken into account. The finding that parental smoking behavior does not interact with anti-smoking practices has also been reported elsewhere [e.g. (Jackson and Henriksen, 1997)].

### Table VI. Results of logistic regression of smoking initiation on demographics (Step 1), parenting practices (Step 2), attitude, social influence, self-efficacy (Step 3), and intention (Step 4) (n = 1072)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Step 1</th>
<th></th>
<th>Step 2</th>
<th></th>
<th>Step 3</th>
<th></th>
<th>Step 4</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>( P )</td>
<td>OR</td>
<td>( P )</td>
<td>OR</td>
<td>( P )</td>
<td>OR</td>
<td>( P )</td>
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<tr>
<td>Reaction reward</td>
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<td>0.001</td>
<td>1.20</td>
<td>0.000</td>
<td>1.20</td>
<td>0.001</td>
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<tr>
<td>Topic attention for smoking in school</td>
<td>0.59</td>
<td>0.035</td>
<td>0.59</td>
<td>0.040</td>
<td>0.58</td>
<td>0.037</td>
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<tr>
<td>Pros of smoking</td>
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<td>0.202</td>
<td>0.97</td>
<td>0.110</td>
<td>0.97</td>
<td>0.162</td>
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<tr>
<td>Cons of smoking</td>
<td>0.97</td>
<td>0.110</td>
<td>0.97</td>
<td>0.99</td>
<td>0.99</td>
<td>0.629</td>
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<tr>
<td>Perceived social norm parents</td>
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<td>0.273</td>
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<td>1.03</td>
<td>0.501</td>
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<td>Perceived behavior parents</td>
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<td>0.074</td>
<td>1.16</td>
<td>0.161</td>
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<td>Perceived pressure not to smoke</td>
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<td>0.310</td>
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<td>0.88</td>
<td>0.88</td>
<td>0.286</td>
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<tr>
<td>Self-efficacy</td>
<td>0.98</td>
<td>0.001</td>
<td>0.99</td>
<td>0.001</td>
<td>0.99</td>
<td>0.025</td>
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<tr>
<td>Intention to smoke</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nagelkerke’s ( R^2 )</td>
<td>0.00</td>
<td>0.02</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( f^2 )</td>
<td>0.00( ^a )</td>
<td>0.02( ^a )</td>
<td>0.05( ^a )</td>
<td>0.05( ^a )</td>
<td>0.08( ^a )</td>
<td></td>
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</tr>
</tbody>
</table>

\( ^a \) Small effect size.

### Discussion

This study investigated effects of anti-smoking parenting practices on adolescent smoking initiation by explaining the role of smoking-specific cognitions in this process. As hypothesized, anti-smoking practices were associated with adolescent cognitions that predict smoking behavior, i.e. attitude, perceived social influences and self-efficacy expectations. Furthermore, effects of practices on lifetime smoking were at least partially mediated by smoking-specific cognitions and intention to smoke. These findings support the idea that anti-smoking parenting practices can be viewed as predisposing processes operating on adolescent smoking behavior through cognitions.

Anti-smoking practices favorably related to adolescent smoking included house rules for smoking in the living room and outside, communication about the health risks of smoking, addictive qualities of smoking, and attention for smoking in school. However, increased chances of lifetime smoking were found for rewards for not smoking, frequency of communication about smoking, communication about being
allowed to smoke, price of cigarettes and friends smoking. These reversed ORs could not be ascribed to multicollinearity (Tabachnick and Fidell, 2001). Several interpretations are possible. Anti-smoking practices might lead to increased chances of lifetime smoking, out of adolescent rebelliousness. To examine situations in which these counter-productive effects take place, not only the content of practices should be taken into account, but also the way in which they are conveyed (Olsen Fulero and Conforti, 1983; Jaccard and Dittus, 1993), which was not possible in our study. Additionally, earlier research suggests that adolescents not only react to parenting practices, but that parents are also influenced by adolescent behavior (Jaccard and Dittus, 1993; Ennett et al., 2001a; Engels et al., 2005). While in cross-sectional research it appears as though some practices result in smoking initiation, it is plausible that parents only explicitly engage in expressing anti-smoking practices after teens have started smoking. Similarly, parents might engage in more acts of socialization if they feel their son or daughter is likely to smoke. The increase in smoking behavior associated with rewards, for example, may be explained by the fact that parents promise rewards if they feel their offspring has started or is likely to start smoking. Similar explanations can be given for the effects of the frequency of communication about smoking, communication about being allowed to smoke and about the price of cigarettes. Thus, the counter-intuitive associations between some practices and smoking, and the few significant effects of anti-smoking practices on smoking uptake in the longitudinal analysis, might be explained by a reciprocal relationship between parents’ and their offspring’s behaviors.

As predicted by the I-Change Model, the effects of anti-smoking parenting practices were partially mediated by attitudes, social influences and self-efficacy. The decrease in significant unique contributions of practices after including smoking-related cognitions in the model was more pronounced at T2 than T1, and was not seen longitudinally. Several explanations are possible. Some practices might serve as predisposing processes, while others influence behavior directly. For instance, the effects of the prospect of a reward for not smoking, the frequency of communication about smoking and communication about being allowed to smoke remained in the model after cognitions and intention had been accounted for. Effects of other practices, such as communication about health risks of breathing in smoke and the price of cigarettes, were direct in Grade 7 and mediated by cognitions 2 years later. It seems that at a young age, practices may lead to behavior change without change in cognitions, indicating barrier effects on smoking without internalization. These acts may lead to cognitive changes in older teenagers. Possibly, smoking-related cognitions may not have fully developed in early adolescence, causing practices to influence behavior directly (Kremers et al., 2004). The increased number of significant associations between anti-smoking practices and cognitions, as well as the larger effect size at Step 3 in the Grade 9 analyses could indicate this.

The current study is subject to limitations. First, effect sizes were small. However, since smoking behavior is determined by multiple factors, a selection of factors will never explain all of the variance. Moreover, a concept can show small levels of explained variance and still have theoretical relevance (Rosenthal, 1990). Second, not all aspects of parenting were taken into account, due to limited response time. In addition to parental reactions, house rules and communication about smoking, other anti-smoking parenting practices may be of importance. Examples include parental monitoring of substance use (Jackson, 1997; Farnow et al., 1998; Beal et al., 2001; Ma et al., 2003) and availability of tobacco (Jackson, 1997; Ennett et al., 2001b; Ma et al., 2003; Engels and Willemsen, 2004; Engels et al., 2005). Moreover, parenting style, defined as a global climate in which a family functions, was not investigated in the present study and can influence the way in which anti-smoking practices affect adolescent behavior (Darling and Steinberg, 1993). Future research should consider these additional aspects of parenting. Additionally, the notion that parents do not only influence their offspring’s smoking behavior, but that this behavior might also affect acts of parenting, as is discussed.
above, needs to be considered in more detail. More attention should be paid to longitudinal effects of parenting in order to examine the sequence in which parents and adolescents influence each other (Jaccard and Dittus, 1993; Ennett et al., 2001a; Engels et al., 2005). Finally, it could be argued that parental social influences can be regarded as more distal factors. However, measures were based on adolescent perceptions and reports, and that is why in most social cognitive models these perceptions are regarded within the concept of social influences, such as in the Theory of Planned Behavior (Ajzen, 1991) and Social Cognitive Theories (Bandura et al., 1977). As the model currently used is based on these traditions, we believe that testing the place of these constructs is beyond the scope of this article. The authors intend to test alternative models making use of Structural Equation Modeling techniques in the future.

In conclusion, our study suggests that parents have a role in adolescent smoking behaviors and that adolescent smoking-specific cognitions operate as mediating factors at least to an extent. Practical implications of this research include incorporating the mediating role of smoking-related cognitions in future research and interventions. Additional aspects of parenting and the order in which parents and adolescents influence each other should be subject of additional research. Interventions aimed at prevention of smoking uptake should encourage those anti-smoking parenting practices that influence adolescent smoking-related cognitions in a favorable manner.

Acknowledgements

The ESFA project is funded by a grant from the European Commission (The Tobacco Research and Information Fund; 96/IT/13-B96 Soc96201157).

References


*Received on November 11, 2004; accepted on May 25, 2005*