The role of family factors and school achievement in the progression of adolescents to regular smoking

M. Pennanen¹,²*, E. Vartiainen² and A. Haukkala³

¹Department of Public Health, University of Helsinki, PO Box 41, FI-00014 Helsinki, Finland, ²Division of Welfare and Health Promotion, National Institute for Health and Welfare, PO Box 30, FI-00271 Helsinki, Finland and ³Department of Social Research, University of Helsinki, PO Box 54, 00014 Helsinki, Finland

*Correspondence to: M. Pennanen, National Institute for Health and Welfare, PO Box 30, FI-00271 Helsinki. E-mail: marjaana.pennanen@helsinki.fi

Received on January 10, 2011; accepted on October 1, 2011

Abstract

This study examines whether parental smoking and single parenting were related to adolescents’ school achievement and anti-smoking parental practices as well as how these factors predicted later smoking. The sample comprised 1163 Finnish students in Grades 7 through 9. Results show that at the beginning of the seventh grade, parental smoking and single parenting were related to adolescents’ lower levels of school achievement. Moreover, parental smoking had moderate association with lack of house smoking rules. At the beginning of the ninth grade, these associations were strengthened and lack of house smoking rules as well as loosened perceived parental punishment for smoking was related to both parental smoking and single parenting. The likelihood of ninth grade regular smoking was greater among adolescents whose parents smoked, who had no smoking rules in their homes and had substandard school achievement. These results suggest that smoking parents and single parents had similar anti-smoking regulations for their children at the baseline but once children became older smoking parents were not able to maintain these rules as successfully as non-smoking parents and families with two parents. Motivating parents to uphold these anti-smoking regulations offers a prospective intervention opportunity.

Introduction

Tobacco use is one of the main preventable causes of death in the world [1]. Adolescence is an important period of risk for the development of lifelong smoking behaviours [2]. About 20% of 16-year-old Finns smoke on a daily basis [3]. Numerous studies indicate that student’s school achievement is related to smoking behaviour [4]. The better students do scholastically, the less likely they are to smoke [5]. School achievement can be viewed as an indicator of education level and socio-economic level later in life [6].

Evidence shows that individuals of lower socio-economic status (SES) are at greater risk of mortality and morbidity [7]. One factor that mediates linkages between low SES and health is the higher prevalence of smoking [8]. Parental smoking is more prevalent among low socio-economic families [9], which is a major influence on their children’s smoking behaviour [10]. A number of studies have suggested that adolescents are less likely to smoke if they perceive parental disapproval of smoking [11], if parents expect their children not to smoke [12], if parents make clear the consequences of attempting to smoke [13] and if there are non-smoking rules in their homes [14]. Furthermore, permissive parental practices with
regard to smoking are associated with lower levels of SES of parents [15, 16].

Reduction of the currently high-smoking prevalence among adolescents and disadvantaged socio-economic groups is an essential public health goal [17]. Achieving this goal will require more knowledge about factors that influence adolescents who are particularly vulnerable to becoming a smoker. In our earlier study, we found a strong association between lower levels of school achievement and smoking [18]. To understand better this association, we need to study factors that can be assumed to influence the associations between adolescent smoking behaviour and school achievement. Evidence shows that adolescent smoking is more prevalent in single-parent households [19], in families where parents smoke [9] and have lax anti-smoking practices [14]. Moreover, there is some evidence that children whose parents smoke or who live with a single parent may be in danger to make less academic progress [20–22]. In families where parents smoke exposure to passive smoking may cause health problems in children and these health problems increase risk of school absence and underperformance [20, 21]. Furthermore, children from single-parent homes are more likely to receive poor grades than children from two-parent homes [22]. This could be attributed to the lack of economic researches and shortage of quality time with their families [22, 23].

Yet, studies that examine the associations between parental smoking and school achievement as well as single parenting and school achievement are lacking. Likewise, studies that explore influence of parental smoking and single parenting to anti-smoking parental practices. Therefore, in this study, we will investigate how parental smoking and single parenting are related to school achievement and changes in school achievement. Furthermore, we will examine how parental smoking and single parenting are linked to anti-smoking parental practices and, finally, how these factors can predict uptake of regular smoking.

Materials and methods

Data for the study were collected as part of a school and community-based smoking prevention programme carried out in Finland (European Smoking Prevention Framework Approach, ESFA) [24, 25]. The aim of this smoking prevention programme was to reach adolescents at four levels: the individual, parental, school and community levels. The programme was based on the Integrated Change Model [26], addressing attitude, social influence and self-efficacy (ASE) [24, 25]. The programme was based on Social Learning Theory [26] and The Theory of Planned Behaviour [27] including social modelling and social pressure measurements [24, 25].

Schools were randomized into treatment and control groups. Analyses presented here include only the control group; they received only the standard health education curriculum. In total, 14 control schools participated in the study ($n = 1523$). During the first measurement 1485 (response rate 97.5%) and at the follow-up measurement 1331 (response rate 87.4%) questionnaires were available for analyses. Students who reported smoking at least once a week during the first measurement were excluded from the analyses ($n = 168$). We had 1317 control group students at the baseline (the baseline weekly smokers excluded) and of those, 1163 students completed the 24-month follow-up. The present study used two measurements conducted between the years 1998 and 2000. The first measurement was conducted when the students started their seventh grade and were about 13 years of age and the follow-up measurement took place when the students started their ninth grade approximately 24 months later. The study was reviewed and approved by the Ethics Committee of the National Institute for Health and Welfare, Finland and City of Helsinki Education Department.

Measurements

The adolescents filled out the questionnaires in teacher-guided lessons [18]. Students received questionnaires in open bar-coded envelopes, filled in the questionnaires, put them in envelopes and collected them into a mail bag. The bag was closed in the presence of the students and instantly mailed to researchers [18]. The ESFA questionnaire measured demographic variables, school achievement,
smoking behaviour, parental smoking, single parenting and anti-smoking parenting practices [28].

In Finland, school achievement is based on grade point averages (GPAs) from 4 to 10, 10 being the highest grade and 4 indicating failure. Students were asked to mark their last term’s school GPA: (i) 10–9.00, (ii) 8.99–8.00, (iii) 7.99–7.00, (iv) 6.99–6.00, (v) 5.99–5.00 and (vi) below 5. In Categories 5 and 6, number of cases was too few and students with GPA below 7 are normally unable to enter high school [29]. Therefore, GPA groups were recoded as follows: (i) excellent (10–9); (ii) good (8.9–8); (iii) satisfactory (7.9–7) and (iv) poor (below 7).

Smoking behaviour was measured using five questions that best described adolescents’ smoking behaviour. Responses were cross-validated using an algorithm, consisting of concepts measuring current smoking and lifetime smoking as suggested by US Department of Health and Human Services [30, 31]. Adolescents were classified as (1) regular smokers (smoking at least once a week) and (0) non-smokers (never having smoked, having experimented with smoking but had quit experimenting, experimenting with smoking but not smoking weekly and those who had quit). In the case of incongruent answers, the adolescents were allocated the most unfavourable response. For example, if the adolescents reported being experimental smokers but indicated having smoked more than 100 cigarettes in their lives, the respondents were classified as regular smokers [28, 32].

Mothers’ and fathers’ smoking status were examined using four category questions: (i) yes, my mother/father smokes, (ii) no, my mother/father does not smoke, (iii) I do not know and (iv) I do not have one/do not live at home and recoded as: (i) both parents are non-smokers and (ii) both or one of the parents smoke. We had 14 students who reported that they did not have a mother and 8 students who did not know whether their mother smoked. Furthermore, we had 25 students who reported not having a father and 38 students who did not know whether he smoked. These students were excluded from the analyses. Single parenting was assessed with four category questions: Who lives together with you in your house: (i) my mother, (ii) my father, (iii) other female carer, (iv) other male carer and recoded as: (i) I live with two biological parents or one biological parent and one step parent and (ii) only a single parent lives with me. All students were living with at least one parent.

Measures of perceived anti-smoking parenting practices included three different constructs. Firstly, we asked about perceived parental punishment for smoking, for two different questions: (i) would your parents get angry if they found out that you have smoked and (ii) would your parents punish you if they found out that you have smoked. Answers ranged from (1) they would not get angry with me/not punish me to (5) they would get very angry with me/punish me a lot. These two questions were totalled and variable for parental punishment was created. Secondly, we asked about smoking rules in the adolescents’ homes. Students were asked to indicate whether they were allowed to smoke in the: (i) own room, (ii) living room, (iii) kitchen, (iv) bathrooms and toilets, (v) hall, corridor or staircases and (vi) outside in the garden, yard, garage or shed. Answers were dichotomized into two groups, those who reported that they may smoke in at least one of the six places were coded as yes and they scored 0 and those who indicated that they may not smoke in any of the six places were coded as no and they scored 1. Thirdly, in questions related to parent–child communication, students were asked to indicate the frequency of discussions about smoking with their parents during the preceding year. Scores ranged from (1) never to (6) often.

**Analyses**

Statistical analyses were performed using PASW 18. Bivariate associations were examined with Paired Samples T-test for normally distributed variables, McNeamar Chi-Square Test for dichotomous variables and Spearman’s rank correlation coefficients. Previous evidence shows that the measurements for students within the same school are not independent observation and variability in tested variables may be due to within-school variability. This could lead to overestimation of the statistical significance [33, 34]. We used linear
repeated mixed model with school as the unit of analyses to examine how changes during the follow-up in school achievement were related to seventh grade parental smoking and single parenting. Using random-effects models for repeated data [35, 36], we analysed changes in school achievement by parental smoking and single parenting.

Finally, we conducted the bivariate and multivariate binary logistic regression analyses for independent variables (parental smoking, single parenting, anti-smoking parental practices and school achievement) measured at the beginning of the seventh grade to predict regular smoking in ninth grade. Effects of anti-smoking parental practices on adolescents smoking may vary across parental smoking status [37] and house smoking may be more prevalent in single-parent households [38, 39]. Therefore, we included interaction terms between parental smoking and anti-smoking parental practices as well as between single parenting and anti-smoking parental practices to examine whether the practices differ according to parental smoking or single parenting when predicting adolescents’ later smoking. Gender differences were analysed using logistic regression model with interaction terms and the results indicated that gender was not associated with parental smoking, single parenting, anti-smoking parental practices or school achievement when predicting ninth grade regular smoking (all \( P > 0.05 \)). Gender was adjusted in analyses. Dropouts from the study were assessed using logistic regression model and the results indicated that dropout was not associated with gender, school achievement, parental smoking, single parenting or anti-smoking parental practices (all \( P > 0.05 \)). A school variable was included in all logistic regression models in order to obtain valid confidence intervals (CIs) [40]. \( P \)-values less than 0.05 were considered significant and 95% CIs are presented.

**Results**

**Descriptive statistics**

The prevalence and mean levels of variables are presented in Table I. Among ninth graders, 29.5% reported smoking regularly. The school achievement of students deteriorated during the study time (\( P < 0.001 \)). Among seventh graders, 6.1% received poor school grades and by the ninth grade the number was up to 14.8%. There were 38.2% of the students who reported that at least one of their parents smoked and 22.3% lived with a single parent. During the follow-up, students had perceived that the parents had relaxed their anti-smoking practices (parental punishment and house smoking rules) (\( P < 0.001 \)). Only the level of conversations at home about smoking remained constant (Table I).

**Associations of family factors and school achievement**

We examined how parental smoking and single parenting were associated with adolescents’ school achievement and anti-smoking parental practices. Cross-sectional correlations revealed that at the beginning of the seventh grade parental smoking (\( r = 0.16, P < 0.001 \)) and single parenting (\( r = 0.14, P < 0.001 \)) were related to adolescents’ lower levels of school achievement. Moreover, parental smoking had moderate association with lack of house smoking rules (\( r = -0.07, P < 0.05 \)). At the beginning of the ninth grade, these cross-sectional correlations were strengthened; lack of house smoking rules and loosened perceived parental punishment for smoking were related to both parental smoking (lack of house smoking rules: \( r = 0.16, P < 0.001 \); punishment: \( r = -0.14, P < 0.001 \)) and single parenting (lack of house smoking rules: \( r = -0.13, P < 0.001 \); punishment: \( r = -0.09, P < 0.01 \)) (Table II).

Longitudinal correlations show that parental smoking reported at the beginning of the seventh grade was positively related to adolescent lower levels of school achievement (\( r = 0.16, P < 0.001 \)) and negatively to parental punishment for smoking (\( r = -0.08, P < 0.05 \)) as well as house smoking rules (\( r = -0.10, P < 0.01 \)) reported 24 months later. Single parenting reported when entering the seventh grade was also positively associated with lower levels of school achievement (\( r = 0.18, P < 0.001 \)) and negatively with parental punishment for smoking.
Changes in school achievement affected by parental smoking and single parenting

To detect how parental smoking and single parenting were related to changes in school achievement, we used a linear mixed model with repeated measurements. The analyses revealed that the deterioration of school achievement was more severe among adolescents who had at least one parent who smoked (estimate = 0.008, 95% CI 0.004–0.016, \( P < 0.01 \)) or who lived with a single parent (estimate = 0.010, 95% CI 0.005–0.018, \( P < 0.01 \)) compared with those with non-smoking parents or living with two parents (Table III).

Associations of progression to regular smoking with family factors and school achievement

We tested how family factors and school achievement measured at the beginning of the seventh grade were associated with ninth grade regular smoking. Using correlation coefficients, analyses showed that seventh grade parental smoking (\( r = 0.14, P < 0.001 \)), single parenting (\( r = 0.11, P < 0.01 \)), lack of house smoking rules (\( r = -0.09, P < 0.01 \)) and lower levels of school achievement (\( r = 0.22, \)
were associated with regular smoking 24 months later (Table II).

Next, we used logistic regression models to determine the effects of seventh grade family factors and school achievement in predicting ninth grade regular smoking. The bivariate analyses showed that parental smoking [odd ratio (OR) = 1.86, 95% CI 1.41–2.44, \( P < 0.001 \)], single parenting

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seventh grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parental smoking</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single parenting</td>
<td>0.14*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parental punishment for smoking</td>
<td>−0.02</td>
<td>−0.01</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>House smoking rules</td>
<td>−0.07*</td>
<td>−0.05</td>
<td>0.12*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conversations about smoking</td>
<td>0.02</td>
<td>−0.05</td>
<td>−0.03</td>
<td>0.00</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low school achievement</td>
<td>0.16*</td>
<td>0.14*</td>
<td>−0.01</td>
<td>0.01</td>
<td>−0.04</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ninth grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular smoking</td>
<td>0.14*</td>
<td>0.11*</td>
<td>0.04</td>
<td>−0.09*</td>
<td>0.01</td>
<td>0.22*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parental smoking</td>
<td>0.81*</td>
<td>0.15*</td>
<td>−0.02</td>
<td>−0.09*</td>
<td>−0.01</td>
<td>0.17*</td>
<td>0.17*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single parenting</td>
<td>0.14*</td>
<td>1.00*</td>
<td>−0.01</td>
<td>−0.05</td>
<td>−0.05</td>
<td>0.14*</td>
<td>0.11*</td>
<td>0.15*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parental punishment for smoking</td>
<td>−0.08*</td>
<td>−0.09*</td>
<td>0.31*</td>
<td>0.10*</td>
<td>−0.02</td>
<td>−0.18*</td>
<td>−0.23*</td>
<td>−0.14*</td>
<td>−0.09*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>House smoking rules</td>
<td>−0.10*</td>
<td>−0.13*</td>
<td>0.08*</td>
<td>0.20*</td>
<td>−0.02</td>
<td>−0.18*</td>
<td>−0.34*</td>
<td>−0.16*</td>
<td>−0.13*</td>
<td>0.33*</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conversations about smoking</td>
<td>−0.02</td>
<td>0.03</td>
<td>0.02</td>
<td>−0.02</td>
<td>0.12*</td>
<td>−0.02</td>
<td>0.00</td>
<td>−0.03</td>
<td>0.03</td>
<td>0.06*</td>
<td>0.00</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Low school achievement</td>
<td>0.16*</td>
<td>0.18*</td>
<td>0.04</td>
<td>0.00</td>
<td>−0.04</td>
<td>0.77*</td>
<td>0.29*</td>
<td>0.17*</td>
<td>0.17*</td>
<td>−0.19*</td>
<td>−0.23*</td>
<td>−0.01</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Covariance estimate (CI)b</th>
<th>P-value</th>
<th>SEa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time × parental smokingc</td>
<td>0.008 (0.004–0.016)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Time × single parentingd</td>
<td>0.010 (0.005–0.018)</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

aParental smoking behaviour scores: (i) both parents are non-smokers, (ii) both or one of the parents smoke. Students who did not know whether their parents smoked or did not have one were excluded from the analyses.
bSingle parenting recoded as: (i) I live with two parents and (ii) only a single parent lives with me.
cPerceived parental punishment was created with two variables and answers ranged from (1) I would not be punished to (5) they would punish me a lot. These scores were totalled.
dTo create a variable for house smoking rules, students were asked to indicate whether they were allowed to smoke in their homes: (0) yes; and (1) no.
eConversation about smoking with parents scores range from (1) never to (6) often. *\( P < 0.05 \).
fIn analysis, seventh grade regular smokers excluded.
Family factors, school achievement and smoking

Table IV. Logistic regression analysis for ninth grade regular smoking\(^a\) predicted by seventh grade parental factors and school achievement from Step 1 to Step 3

<table>
<thead>
<tr>
<th></th>
<th>Bivariate analysis</th>
<th>Multivariate analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (95% CI)</td>
<td>Step 1</td>
</tr>
<tr>
<td>Parental smoking(^b)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>1.86*** (1.41–2.44)</td>
<td>1.73*** (1.28–2.33)</td>
</tr>
<tr>
<td>Single parenting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>1.71** (1.26–2.30)</td>
<td>1.51* (1.07–2.13)</td>
</tr>
<tr>
<td>Parental punishment for smoking(^c)</td>
<td>1.06 (1.00–1.13)</td>
<td>1.09* (1.09–1.17)</td>
</tr>
<tr>
<td>House smoking rules(^d)</td>
<td>0.65** (0.48–0.89)</td>
<td>0.62** (0.43–0.88)</td>
</tr>
<tr>
<td>Conversations about smoking(^e)</td>
<td>0.99 (0.90–1.10)</td>
<td>1.00 (0.89–1.11)</td>
</tr>
<tr>
<td>School achievement(^f)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excellent</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>2.31** (1.35–3.94)</td>
<td></td>
</tr>
<tr>
<td>Satisfactory</td>
<td>4.18*** (2.41–7.23)</td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>10.46*** (5.24–20.87)</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\)Regular smoking scores: (0) no and (1) yes. Seventh grade regular smokers excluded from the analysis.
\(^b\)Students who did not know whether their parents smoked or did not have one were excluded from the analyses.
\(^c\)Perceived parental punishment was created with two variables and answers ranged from (1) I would not be punished to (5) they would punish me a lot. These scores were totalled.
\(^d\)To create a variable for house smoking rules, students were asked to indicate whether they were allowed to smoke in their homes: (0) yes and (1) no.
\(^e\)Conversation about smoking with parents scores range from (1) never to (6) often.
\(^f\)Students’ school achievement is based on grades from 4 to 10. Students’ school grades were categorised as follows: (i) excellent (10–9), (ii) good (8.9–8), (iii) satisfactory (7.9–7) and (iv) poor (below 7). OR* \(P < 0.05\), OR** \(P < 0.01\), OR*** \(P < 0.001\).

(OR = 1.71, 95% CI 1.26–2.30, \(P < 0.01\)) and poor grades (OR = 10.46, 95% CI 5.24–20.87, \(P < 0.001\)) increased likelihood of the ninth grade regular smoking. Only preventive parental practice related to later smoking was maintaining house smoking rules (OR = 0.65, 95% CI 0.48–0.89, \(P < 0.01\)) (Table IV).

The multivariate analyses revealed that students who had poor school grades were nine times more likely to smoke regularly 24 months later than students who had achieved excellent school grades (OR = 9.19, 95% CI 4.36–19.39, \(P < 0.001\)). Moreover, the likelihood of later regular smoking was 1.5 times greater for students who had at least one parent who smoked than for students whose parents did not smoke (OR = 1.52, 95% CI 1.12–2.07, \(P < 0.001\)). Students’ whose families had house smoking rules were less likely to smoke regularly (OR = 0.60, 95% CI 0.42–0.87, \(P < 0.01\)). However, perceived parental punishment for adolescents’ smoking was positively associated with adolescents’ regular smoking 24 months later (OR = 1.09, 95% CI 1.02–1.18, \(P < 0.05\)) (Table IV).

No statistically significant interactions were found between parental smoking and anti-smoking parental practices (house smoking rules: OR = 0.98, 95% CI 0.47–2.04, \(P > 0.05\); parental punishment: OR = 1.12, 95% CI 0.97–1.30, \(P > 0.05\); conversations about smoking: OR = 1.12, 95% CI 0.89–1.41, \(P > 0.05\)) nor between single parenting and anti-smoking parental practices (house smoking rules: OR = 0.93, 95% CI 0.43–2.00, \(P > 0.05\); parental punishment: OR = 1.17, 95% CI 0.99–1.38, \(P > 0.05\); conversations about smoking: OR = 1.03, 95% CI 0.80–1.33, \(P > 0.05\)) when predicting adolescents’ later smoking.
Discussion

We found that parental smoking and single parenting were not related to perceived anti-smoking parental practices at the baseline. However, in the follow-up, adolescents of parents who smoked or who lived with a single parent reported fewer negative anti-smoking practices than others. Furthermore, children who had a parent who smoked or were from a single parent family more likely realized lower levels of school achievement than those whose parents did not smoke or who lived with two parents. When predicting adolescents’ later smoking, our results show that school achievement and parental smoking had independent effects on adolescents regular smoking 2 years later.

Results from the analyses of our baseline data suggest that parents who smoked had similar perceived anti-smoking regulations for their children’s smoking as other parents. Yet, by the time adolescents were ninth graders, children of smoking parents reported lower levels of punishment for smoking and less likely to have smoking rules at home than children of the non-smoking parents. These results indicate that the parents who smoked tried to enforce anti-smoking parental practices in order to decrease their children’s susceptibility to smoking, as suggested elsewhere [41]. However, when the adolescents’ became older, parents who smoked may have had more difficulty in maintaining these anti-smoking practices [42, 43]. One promising finding, however, is that, initially, smoking parents tried to uphold anti-smoking practices. Encouraging parents who smoke to act on these beliefs presents possible intervention opportunities [11, 41].

Similar results were obtained when we investigated how single parenting was related to anti-smoking parental practice. Our results suggest that single parents also tried to maintain practices similar to other parents but once children were older, single parents were unable to enforce the rules. In previous literature, studies that examine associations between single parenting and anti-smoking parental practices are lacking. However, some evidence can be found indicating that children living in households with single parents are more likely to be exposed to passive smoking in their homes than children living with two parents [38, 39]. A noteworthy finding in our data is that nearly two-thirds of the single parents smoked and this is likely to have an impact on the similarity of the results based on associations between parental smoking and anti-smoking parental practices. Nevertheless, we have to pay attention to relatively low-correlation coefficients for the relation between parental smoking and anti-smoking parental practices as well as single parenting and anti-smoking parental practices. These results, therefore, should be interpreted cautiously.

We also investigated whether the anti-smoking parental practices measured at the beginning of the seventh grade predicted adolescents’ ninth grade regular smoking. Previous literature related to anti-smoking parenting practices have supported the assumption that these practices may prevent adolescent from smoking [43]. However, our findings revealed that the only preventive practice related to later smoking was maintaining house smoking rules. In the literature, there are several studies that are in agreement with our finding [15, 42]. Quite surprisingly, our multivariate analyses showed that perceived parental punishment for smoking was positively associated with adolescents’ later smoking. This result is similar to results reported elsewhere [16, 37]. Previous studies suggest that not only do adolescents react to parenting practices but parents are also influenced by adolescents’ behaviour [43]. The present study included some students who reported experimental smoking. Plausibly, parents who are aware of or suspect their child’s smoking may have explicitly expressed their willingness to punish [43]. It should also be taken into consideration that adolescents may respond to their parents’ admonishments by increasing their abuse as an act of rebelliousness [16].

Significant predictors of later regular smoking were parental smoking and lower levels of school achievement. According to Social Learning Theory, many behaviours, such as smoking, are learnt by observation [44]. A debate in the literature
ranges over whether the influence of parental smoking is consistent throughout adolescence. Some authors have suggested that the influence of parental smoking on adolescent smoking declines over time, whereas peer influence increases [45]. Other studies have reached results similar to ours and have suggested that parental smoking may not only influence the initial and further experimentation but also the later escalation of adolescents’ smoking behaviour [19]. Moreover, our results revealed that single parenting increased the ORs of adolescents’ later smoking, in agreement with results reported elsewhere [19]. However, in multivariate models, it significantly increased the likelihood of later smoking only until the school achievement variable was added into the model. This may be explained by previous evidence suggesting that single parents may have fewer resources such as money, social support and time to invest in their child’s education and development [23, 46]. Therefore, single parenting is a marker of multiple risks that may diminish parents’ likelihood of being involved in school and may influence on underachievement of their children in schools [46], which in turn increases the probability of smoking uptake of these children [4].

With respect to adolescent school achievement, our results also revealed that the strongest independent determinant of later regular smoking was, indeed, poor school achievement even when other determinants were included in the model. Many studies have found a similar association [47]. Even low-school grades during elementary school years, before the onset of smoking, have been found to be significantly associated with smoking in high school [47]. Students with poor school achievement may have lower educational aspirations [48] and they may not commit themselves to school [4], which might influence their education level and socio-economic level later in life [6]. The result of our study raises a grave concern since the ORs of becoming a regular smoker among adolescents who had poor grades was nine times greater than adolescents with excellent school grades.

A limited body of research has examined the impact of parental smoking on adolescents’ school achievement. A finding of the present study, the link between parental smoking and lower levels of school achievement, is in line with a previous study by Ferguson et al. [9]. Furthermore, our other finding, suggesting that adolescents with single parents had more frequently attained lower levels of school achievement is supported by previous studies [49]. Recent evidence suggests that parents who smoke [50] or are single parents [51] more often may possess lower levels of education themselves and that may affect on their children’s level of school achievement. Furthermore, some evidence shows that children of smoking parents [20–22] and single parents [38] are more likely to have health problems caused by passive smoking and may fall behind in school.

These explanations may also impact on our other results, which implied that for adolescents of smoking parents and single parents, school achievement moved in a worse direction during the follow-up compared with those with non-smoking parents and to those living with two-parent families. Our results may be part of the multidimensional socio-economic disadvantage, which is not only the reality during childhood, but potentially the future of the children as well [9]. Seeing that, parental smoking [9], single parenting [52], low-scholastic achievement [6] and smoking [53] of adolescents are more prevalent among families with low SES. All these factors in turn are associated with later socio-economic level of adolescents [6, 9, 54].

This study is subject to several limitations. One limitation of this study was that self-reports on smoking behaviour could not be biologically validated. Nonetheless, previous studies have shown that self-reported smoking behaviour is a reliable tool in measuring adolescents’ smoking [55]. Moreover, the prevalence of regular smoking between the two study years is reflected in regular smoking prevalence in Finland [3]. It would have been interesting to include family SES in the analyses. Unfortunately, we could not do that. However, since there is some evidence that school achievement in adolescence has prominent consequences for adulthood educational level [6], we consider that school achievement is an indicator of students’ future SES level. Another limitation was that we were
restricted to the use of adolescents’ reports and could not include parents’ reports according to anti-smoking parenting practices. However, we consider adolescents’ reports to be reliable since anti-smoking parenting practices are effective only to the extent that they have been perceived by the adolescents [37]. Furthermore, it would have been interesting to run analyses for baseline never smokers; however, small number of cases in the lowest school achievement group prevented us to do so. In spite of the limitations, these longitudinal data offer reliable opportunities to study the predictors and associations of adolescent smoking since the data were collected in a time period when adolescents often change their smoking behaviour and start experiencing smoking.

What is needed is more robust evidence of the links between parental factors, adolescent smoking and school achievement. Future research should extend our procedure and consider the use of more sophisticated statistical methods such as structural equation modelling. Moreover, future intervention research should consider focussing on how to offer parents effective methods for preventing their children from smoking or becoming a regular smoker. It would be also important to discover those methods that may not be effective in reducing smoking, conversely, may contribute increasing it. For instance, evidence shows that adolescents may respond to their parents’ admonishments by increasing their abuse as an act of rebelliousness [16]. Adolescents may react to the inconsistency between their parents’ demands and their behaviour [56], making it difficult for parents to try to uphold anti-smoking practices. As noted previously, parents who smoke may need assistance in finding ways to uphold their rules, which might include smoking cessation.

Acknowledgements

The study was part of the ESFA study, in which six European countries participated and was conducted by the Maastricht University. In Finland, the study was performed by the National Institute for Health and Welfare, Finland and University of Helsinki. We thank all the cooperating parties and others who were involved in the study.

Conflict of interest statement

None declared.

References


Funding

European Commission The Tobacco Research and Information Fund (96/IT/13-B96 SOC96201157); Finnish Ministry of Social Affairs and the Health; National Institute for Health and Welfare, Finland and Juho Vainio Foundation.


