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The effects of a three-year smoking prevention programme in secondary schools in Helsinki

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Background: This study evaluates the effects of a 3-year smoking prevention programme in secondary schools in Helsinki. The study is part of the European Smoking prevention Framework Approach (ESFA), in which Denmark, Finland, the Netherlands, Portugal, Spain and the UK participated. **Methods:** A total of 27 secondary schools in Finland participated in the programme ($n = 1821$). Schools were randomised into experimental (13) and control groups (14). The programme included 14 information lessons about smoking and refusal skills training. The 3-year smoking prevention programme was also integrated into the standard curriculum. The community-element of the programme included parents, parish confirmation camps and dentists. The schools in the experimental group received the prevention programme and the schools in the control group received the standard health education curriculum. **Results:** Among baseline never smokers (60.8%), the programme had a significant effect on the onset of weekly smoking in the experimental group [OR = 0.63 (0.45–0.90) $P = 0.009$] when compared with the control group. Being female, doing poorly at school, having parents and best friends who smoke and more pocket money to spend compared with others were associated with an increased likelihood of daily and weekly smoking onset. These predictors did not have an interaction effect with the experimental condition. **Conclusion:** This study shows that a school- and community-based smoking prevention programme can prevent smoking onset among adolescents.

Keywords: Adolescents, prevention, smoking

Tobacco use and its health-related consequences are one of the most serious public health problems. Smoking prevalence among Finnish adolescents is one of the highest in Western Europe.[1] Almost three-quarters of persons aged 16–18 years have tried smoking, and one-third smoke daily.[2] We can observe, however, some positive trends in Finland in smoking prevalence. Daily tobacco use among boys aged 14 and 16 years is decreasing, and smoking initiation age is rising.[2] The Finnish public health programme aims to halve adolescent smoking prevalence and to improve health equalities between population groups by 2015.[3]

Several studies worldwide deal with predictors and associations of adolescent smoking. Among other factors, adolescent smoking predicts adulthood smoking.[4] Most adult smokers have started to smoke before the age of 20.[5] Adolescent smoking also predicts poor school achievement and worse career and job opportunities.[6] What is more, poor school achievement early on in life predicts strongly increased tobacco use at a later date[7] and difficulties in quitting smoking.[8] Adolescent smoking is associated with parental smoking.[9] An American study proves that maternal smoking plays a greater role in adolescent smoking than paternal smoking does.[10] It is also indicated that peer and best friend's smoking predicts adolescent smoking,[11] and that adolescents tend to choose friends who have similar smoking habits to their own.[12] In spite of everything, influence of parental and friends' smoking to adolescent smoking has been found to be more complex than commonly thought,[12,13] and therefore multilevel smoking prevention programmes are needed.

Over the past decades, many smoking prevention activities for adolescents have been implemented. Prevention programmes are very commonly school-based, because health education is already on the curriculum.[14] Since exclusively information-based prevention programmes appear to be ineffective,[14] other prevention programmes have been developed. Positive short-term results have been achieved by no-smoking competitions. However, no long-term positive results have been achieved.[15] These competitions motivate adolescents to abstain from smoking for a certain period after which they have a chance to win prizes.[16,17] Social influence approaches use normative educational methods and resistance skills training.[18] This approach has achieved some positive long-term results.[19,20] Furthermore, some studies indicate that smoking rates can be reduced within an integrated school-community programme setting.[19,20] However, many smoking prevention programmes have failed to deliver positive results.[21,22] Therefore, it has been very difficult to determine which prevention models are most effective.[14] What is more, due to a small number of effective smoking cessation programmes[23] a better understanding of smoking cessation methods are needed.

The aim of the smoking prevention programme known as the European Smoking prevention Framework Approach (ESFA) was to reach adolescents at four levels: the individual, parental, school, and community level. The ESFA programme uses the Attitude, Social influence, self-Efficacy Model (ASE)[24,25] as a theoretical framework. The ASE model, which is developed from the social learning theory[26] and the theory of planned behaviour[27] includes social modelling and social pressure measurements[25,28] and was recently upgraded to the latest version known as the Integrated Change Model.[29] The programme was

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carried out in Denmark, Finland, the Netherlands, Portugal, Spain, and the UK. After the first year, a significantly less onset of weekly smoking in experimental groups was found in Finland ($P < 0.001$) and in Spain ($P < 0.05$).[30] In Finland, the third-year analysis also showed a significantly less onset of weekly smoking in the experimental groups ($P < 0.05$) and a borderline effect at the end of the programme ($P < 0.06$). A significant overall effect of the programme was found in the onset of weekly smoking ($P < 0.03$). Other countries where the onset of weekly smoking was lower in the experimental groups compared with control groups were the Netherlands ($P < 0.04$) and Portugal ($P < 0.01$).[31] This study focuses on outlining the effects of the Finnish ESFA programme. First, since poor school achievement, parental and best friends' smoking are well-known risk factors for smoking onset, this study examined whether the programme had an effect on daily and weekly smoking including that of high-risk students. We studied the programme's effects on smoking among all students, furthermore among subgroups: students who smoked less than weekly or were never smokers at the baseline. Second, the study aimed to examine the programme's possible effects on smoking cessation.

Methods

Participants

In Finland, 2745 students in Helsinki participated in the ESFA programme. 27 secondary schools were randomised into experimental (13) and control groups (14). The experimental schools received the prevention programme and the control schools received the standard health education curriculum. Power analysis calculations were based on the smoking incidence rates of adolescents at the age of 15 years. Based on earlier experiences a dropout rate of 20% was hypothesized. For a significance level of 0.01, and power of 0.95, and hypothesizing differences between probabilities of success in both conditions of 10%, the power calculations resulted in recommended sample size of at least 2×1200 students, including expected dropout.[32]

A total of 25 students changed school during the programme and were excluded from the study. At the fourth measurement, two control schools did not return the questionnaires to researchers and therefore 297 pupils could not be included in the last measurement. The number of participants at the baseline survey (T1) was 2816. Due to dropouts caused by absenteeism, change of schools, uncompleted and non-returned questionnaires at T1: 2745 (97.5%); T2: 2430 (86.3%); T3: 2188 (77.7%); and T4: 1821 (64.7%) questionnaires were available for analysis.

Procedure

The programme was carried out over a period of 3 years. It was implemented in 1998 when the adolescents began their seventh grade and continued until 2001 when they finished the ninth grade. Data was collected four times: at the beginning of school years (autumn) 1998 (T1), 1999 (T2), and 2000 (T3), and at the end of the third programme year (spring) in 2001 (T4). The time span between T3 and T4 was ~6 months. Students were invited to participate and to read the introductory letter. Before the questionnaires were distributed, the teachers explained the procedure. Students were informed that the questionnaires would be treated confidentially and that they could refuse to participate.[30]

The questionnaire was based on a review of the literature and on earlier smoking prevention work.[30,33] Students received questionnaires in open bar-coded envelopes, filled in the questionnaires during teacher-led classroom sessions, put them in envelopes and collected them into a mail bag. The bag was closed in the presence of the students and immediately mailed to researchers. The barcode allowed for student identification.

Based on questionnaires, students were divided into the following groups: (i) daily smoking, (ii) weekly smoking, (iii) less than weekly smoking, (iv) quit, and (v) never smoking. Daily smoking included all who smoked at least once a day (I smoke at least once a day). Weekly smoking included all who smoked at least once a week (I do not smoke daily, but at least once a week). However, daily smoking was included in weekly smoking. Students who were categorized as smoking less than once a week picked one of the following statements: (i) I do not smoke weekly, but at least once a month, (ii) I smoke less than once a month, (iii) I try smoking once in a while. Students who were categorised as quitters picked up one of the following statements: (i) I have quit smoking after having smoked at least once a week, (ii) I have quit smoking, I have always smoked less than once a week, (iii) I have tried smoking once for a while, but I do not smoke anymore. The criterion for quitting included all who had picked one of the above-mentioned quitting statements in T4 and indicated themselves as smokers in earlier measurement. Never smoking included students who have never smoked a cigarette, not even a puff. Self-reports were cross-validated by current smoking and lifetime smoking.[30]

The demographics assessed were age, gender (1 = boy; 2 = girl); pocket money (0 = nothing; 7 = >200 marks), and ethnic background (1 = native; 2 = non-native). In Finland, students' school achievement is based on grades from 4 to 10, 10 being the highest grade and 4 indicating a failure. Based on their grade average, students were categorised as follows: (i) 9–10, (ii) 8–8.99, (iii) 7–7.99, (iv) 6–6.99, and (v) <6. Mothers' and fathers' smoking status was examined using four category-questions: (i) yes, (ii) no, (iii) I don't know (iv), I don't have one/don't live at home, and recoded as (1) both parents are non-smokers, (2) only father smokes, (3) only mother smokes, and (4) both parents smoke. If a student's both parents were smokers they were categorized as: both parents smoke. If only one parent smoked, he/she was categorised as: only father smokes or only mother smokes. Four category-questions—(i) yes, (ii) no, (iii) I don't know, and (iv) I don't have one- were asked to determine best friends' smoking status and recoded as (1) no, my best friend does not smoke, and (2) yes, my best friend smokes. Options I don't know and I don't have one/don't live at home were recoded as missing.

Intervention

Teachers, who were trained for the programme, participated in 2–3 training days during each year. Training days included information about the programme, smoking prevention and practical training for lessons. Teachers received manuals about the programme, information during visits and phone calls from a researcher.

The programme included 14 information lessons about smoking, and refusal skills training led by an outside drama group. Adolescents attended five lessons a year during the first and second year and four lessons during the third year. Smoking prevention was also integrated into regular subjects such as maths, Finnish and geography. In the third year, the school nurses taught one smoking cessation lesson. During the first and second year, students hung up self-made anti-smoking posters in public places and received newsletters where other young people described their ways of refusing smoking. Behavioural journalism technique was used to elicit these descriptions.[34] Students were also given an opportunity to participate in no-smoking competitions.

Parents and school personnel were offered information about the programme. Smokers were given information about cessation and they were encouraged to participate in a Quit and

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Win contest. Approximately 90% of adolescents aged 15 years take part in parish confirmation classes and camps in Finland. Therefore, parish confirmation camps were included into the programme during the third year. Camp leaders were informed about the programme and trained to motivate students to do anti-smoking activities. In the third year, school dentists were involved in the programme as well. During the regular 2-min dental appointments, trained dentists informed students about the hazards of smoking and how smoking affects their gums and teeth.

Analysis

Firstly, we analysed the programme's effects in individual and school level on daily and weekly smoking in respect of all students. Secondly, we conducted an analysis to determine the effects of school achievement, parental and best friend's smoking at T1 on the adolescent smoking onset at T2, T3 and T4. Furthermore, we studied the effects of the programme on the onset of daily smoking including students who were never smokers or smoked less than weekly at the baseline. The analysis for the onset of weekly smoking among students who smoked less than weekly at the baseline has been published elsewhere.[31] Therefore, only the onset of weekly smoking among never smokers at the baseline was analysed in this study.

The analysis for smoking cessation excluded students who were never smokers. Covariates used in the analysis included demographic variables, school achievement, parental smoking, and best friend's smoking. However, best friend's smoking was excluded from the analysis for never smokers at the baseline, because only a small number of never smokers had best friends who smoked.

Adolescents' smoking behaviour was predicted with T1 covariates. Smoking behaviour at T1 was also included in the analysis as a covariate to standardise smoking differences at the baseline between the experimental and control groups. At T4, two control schools did not deliver questionnaires to students and were excluded from the T4 analysis. Students who had not marked their smoking behaviour and gender in the questionnaires were excluded from the analysis. Predicting smoking interactions between age, ethnic background, gender, pocket money, school achievement, parental smoking, best friend's smoking, and experimental condition were included in the model to analyze whether the programme had similar kind of effect on all students. The final models were analysed using the logistic regression model. We aggregated information at the school level, and compared the mean of smoking prevalence between 13 experimental and 14 control schools with independent samples *t*-test (two-tailed). All analyses were conducted with SPSS.

Results

Attrition

Two control schools that did not return questionnaires to researchers at T4 were excluded from dropout analysis ($n = 258$). Between stages T1–T3, no statistically significant differences between dropouts and non-dropouts were found.

Demographic findings

Table 1 shows that at the baseline the experimental schools included 45% of the students. The participants' average age was 13.8 years and that 53.0% of them were boys. Nearly all students were native, only 6.6% were non-natives. At the baseline, ~20% of both parents of the students were smokers, and ~86% of best friends did not smoke. There were virtually no differences in demographic variables between the experimental and control groups.

Smoking status

Daily and weekly smoking increased annually. At T1, in the experimental group 6.2% of the students smoked daily and in the control group 9.2%, by T4 daily smoking was up to ~30% in both groups. Changes in weekly smoking reflected a similar kind of pattern. By T4 weekly smoking had increased from ~10 up to >30%. Never smoking halved during the programme. At T1, >60% were never smokers, but at T4 only 28%. Smoking was more common in the control group and among girls than boys through the whole follow-up study (table 1).

Predictors of adolescent smoking behaviour

In table 2, the analysis showed that school achievement at T1 predicted adolescents' daily and weekly smoking initiation. The risk of being a weekly smoker at T4 among those who did poorly at school was greater compared with others [odds ratio (OR) = 2.24; 95% confidence interval (CI) = (1.91–2.64)] $P < 0.001$. Furthermore, parental smoking at T1 predicted adolescents' daily and weekly smoking initiation. Students whose parents both smoked were at greater risk of smoking at least once a week compared with those students who had non-smoking parents at T4 [OR = 1.76 (1.26–2.50)] $P < 0.001$. Maternal smoking behaviour showed greater impact on students' daily and weekly smoking than father's smoking did.

Table 2 shows that best friend's smoking at T1 predicted daily and weekly smoking among students. The risk of being a weekly smoker among those who had a smoking best friend was greater compared with students who had a non-smoking best friend at T4 [OR = 2.25 (1.45–3.49)] $P < 0.001$. Daily and weekly smoking was more frequent among girls than boys and among students who had more pocket money to spend.

Daily and weekly smoking

When using students as observational units we can see in table 2 that statistically significantly fewer number of students smoked daily in the experimental group compared with the control group at T3 [OR = 0.77 (0.61–0.97)] $P = 0.029$, but no longer at T4 [OR = 0.88 (0.68–1.13)] $P = 0.300$. This similar kind of phenomenon can also be observed in weekly smoking in table 2. The experimental group smoked statistically significantly less weekly than the control group at T3 [OR = 0.78 (0.63–0.97)] $P = 0.025$, but no longer at T4 [OR = 0.86 (0.67–1.10)] $P = 0.222$.

Nearly coincident results were obtained when analyses were done on school level, and schools were used as observational units. Comparing experimental schools to control schools difference in weekly smoking was found at T2 ($P = 0.027$), and at T3 ($P = 0.014$), but no longer at T4 ($P = 0.125$). Difference in daily smoking was found at T3 ($P = 0.020$), but not at T2 ($P = 0.083$) or T4 ($P = 0.128$).

When predicting daily and weekly smoking no statistically significant interactions between age, ethnic background, gender, pocket money, school achievement, parental smoking, best friend's smoking, and experimental condition were found ($P > 0.125$).

Onset of daily smoking among students who smoked less than weekly at the baseline

A difference in daily smoking initiation between the experimental and the control groups was found among students who smoked less than once a week at the baseline. At T2,

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Table 1 Smoking prevalence rates, cessation and demographic variables

	T1[a]		T2[b]		T3[c]		T4[d,e]	
	Experimental group	Control group	Experimental group	Control group	Experimental group	Control group	Experimental group	Control group
Valid cases (*N*)	1244	1501	1132	1298	1011	1177	950	871
Daily smoking								
Total (%)	6.2	9.2	13.2	18.1	24.0	31.4	27.9	33.0
Boys (%)	6.0	7.3	11.0	16.1	21.3	29.7	25.6	30.7
Girls (%)	6.4	11.4	15.5	20.3	26.7	33.4	30.0	35.5
Weekly smoking[f]								
Total (%)	7.5	11.0	17.0	22.8	27.8	35.3	31.5	37.2
Boys (%)	7.1	8.8	15.2	19.1	25.8	32.0	29.0	34.0
Girls (%)	7.9	13.7	19.0	27.2	29.8	39.3	33.8	40.7
Cessation[g]								
Total (%)	—	—	6.2	5.5	5.0	3.9	4.3	4.6
Boys (%)	—	—	6.7	5.7	5.2	4.6	3.9	5.6
Girls (%)	—	—	5.7	5.2	4.9	3.0	4.6	3.5
Never smoking								
Total (%)	60.8	60.8	45.9	44.3	32.7	31.1	28.3	27.9
Boys (%)	59.4	60.4	47.2	46.9	35.5	33.0	32.0	31.3
Girls (%)	62.3	61.4	44.5	41.2	29.7	28.7	24.7	24.2
School achievement[h]								
9–10 (%)	14.5	13.3	14.0	12.6	15.4	11.9	16.3	14.3
8–8.99 (%)	47.5	44.0	41.3	41.1	35.3	36.2	33.9	31.1
7–7.99 (%)	31.4	34.7	31.8	34.1	28.9	31.5	29.7	32.6
6–6.99 (%)	6.2	7.5	10.0	10.1	15.5	15.9	15.5	16.8
<6 (%)	0.4	0.5	2.9	2.1	4.8	4.4	4.5	5.2
Only father smokes (%)[i]	19.6	18.8	—	—	—	—	—	—
Only mother smokes (%)[i]	13.7	12.0	—	—	—	—	—	—
Both parents smoke (%)[i]	19.6	19.6	—	—	—	—	—	—
Best friend a non-smoker (%)[i]	87.2	85.4	—	—	—	—	—	—
Gender (% male)[i]	52.3	54.3	—	—	—	—	—	—
Age (years)[i]	13.8	13.8	—	—	—	—	—	—
Ethnic background (% native)[i]	92.9	94.1	—	—	—	—	—	—

a: Baseline year
b: Second year of study
c: Third year of study: autumn
d: Third year of study: spring (final measurement)
e: Two control schools excluded, questionnaires not returned
f: Daily smoking included
g: Never smoking excluded, criterion for quitting reached all who had smoked at least once a week or tried smoking once in a while and had stopped smoking
h: Previous year's school achievement
i: Only baseline measurements used in analysis

8.9% of the pupils in the experimental group started to smoke daily and in the control group 12.4%, at T3 the figures were 21.1 and 26.2%, respectively, and at T4 24.8 and 27.8%, respectively. The difference between the experimental and the control group was statistically significant at T3 [OR = 0.76 (0.60–0.97)] $P = 0.026$, but no longer at T4 [OR = 0.82 (0.63–1.06)] $P = 0.129$.

Onset of daily and weekly smoking among never smokers at the baseline

At T2, 3.5% of the students in the experimental group started to smoke daily and in the control group 5.7%, at T3 the figures were 11.7 and 16.7%, respectively, and at T4 14.1 and 18.0%, respectively. Table 3 shows that among never smokers at the

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Table 2 Daily and weekly smoking from T2 to T4

	T2[b] (n = 2228)		T3[c] (n = 1876)		T4[d] (n = 1533)	
	OR[a]	95% CI	OR[a]	95% CI	OR[a]	95% CI
Daily smoking						
Baseline daily smoking	11.98***	7.29–19.69	4.78***	2.78–8.23	6.13***	3.04–12.34
Control group (1)	0.71*	0.54–0.93	0.77*	0.61–0.97	0.88	0.68–1.13
School achievement	2.24***	1.90–2.64	2.05***	1.77–2.37	2.22***	1.89–2.61
Best friend smokes	2.38***	1.65–3.44	2.11***	1.47–3.03	2.17***	1.43–3.31
Both parents non-smokers	1		1		1	
Only father smokes	1.22	0.83–1.79	1.65***	1.21–2.24	1.66**	1.20–2.31
Only mother smokes	1.27	0.83–1.94	2.15***	1.51–3.06	1.88***	1.29–2.76
Both parents smoke	1.97***	1.40–2.79	2.12***	1.57–2.86	1.83***	1.31–2.55
Gender	1.85***	1.39–2.47	1.46**	1.15–1.85	1.65***	1.27–2.14
Pocket money	1.22***	1.08–1.37	1.64**	1.06–1.28	1.18**	1.07–1.31
	T2[2] (n = 2222)		T3[3] (n = 1992)		T4[4] (n = 1461)	
Weekly smoking						
Baseline weekly smoking	13.98***	8.48–23.06	6.60***	3.89–11.22	5.96***	3.04–11.68
Control group (1)	0.68**	0.53–0.88	0.78*	0.63–0.97	0.86	0.67–1.10
School achievement	2.10***	1.80–2.45	1.87***	1.63–2.14	2.24***	1.91–2.64
Best friend smokes	2.45***	1.71–3.50	2.20***	1.54–3.15	2.25***	1.45–3.49
Both parents non-smokers	1		1		1	
Only father smokes	1.30	0.93–1.82	1.47**	1.10–1.95	1.74***	1.26–2.40
Only mother smokes	1.48*	1.01–2.18	1.85***	1.33–2.58	1.69**	1.15–2.47
Both parents smoke	1.61**	1.16–2.23	1.71***	1.29–2.28	1.76***	1.26–2.50
Gender	1.91***	1.47–2.48	1.50***	1.20–1.87	1.70***	1.31–2.20
Pocket money	1.21***	1.09–1.35	1.15**	1.05–1.26	1.19***	1.07–1.32

a: OR: *$P < 0.05$; OR: **$P < 0.01$; OR: *** $P < 0.001$
b: Second year of study
c: Third year of study: autumn
d: Third year of study: spring (final measurement)

baseline there was statistically significantly less daily smoking in the experimental group at T3 [OR = 0.70 (0.50–0.99)] $P = 0.045$, but no longer at T4 [OR = 0.71 (0.50–1.02)] $P = 0.061$.

Weekly smoking initiation was more frequent in the control group than in the experimental group. At T2, 4.3% of the students in the experimental group started to smoke weekly and in the control group 8.9%, at T3 the figures were 14.2 and 19.7% respectively, and at T4 16.2 and 22.5%, respectively. Table 3 shows that there was statistically significantly less onset of weekly smoking in the experimental group at T4 [OR = 0.63 (0.45–0.90)] $P = 0.009$.

Smoking cessation

The last goal was to explore if the programme had any effects on smoking cessation. The programme did not have any effect on smoking cessation compared with control group (OR). Altogether 72 students who smoked at T1 had quit smoking by T4 [OR = 1.05 (0.62–1.78)] $P = 0.890$, furthermore 84 students who smoked at T2 had quit smoking by T4 [OR = 0.98 (0.60–1.60)] $P = 0.946$, and 113 students who were smokers at T3 had quit by T4 [OR = 0.77 (0.50–1.18)] $P = 0.224$.

The model included the following covariates: gender, age, ethnic background, school achievement, parental smoking, and pocket money, all which did not have statistically significant association with smoking cessation. However, smoking cessation was more frequent among adolescents who had a non-smoking best friend at T2 [OR = 0.41 (0.25–0.67)] $P < 0.001$, but no longer at T3 and T4.

Discussion

The purpose of this study was to explore the effects of the Finnish ESFA programme on adolescent smoking. This programme prevented adolescents' onset of weekly smoking. Analysis included well- known high-risk factors such as poor school achievement[7] and parental[9] and best friends smoking.[11] No statistically significant interactions between these high-risk factors and the experimental condition were found, which indicates that intervention influenced all students' the same way, including high-risk students. We could conclude that statistically the programme significantly prevented the onset of weekly smoking among those who were never smoking at the baseline. These positive results suggest that this type of school- and community-based smoking prevention programme can prevent smoking initiation among all adolescents including high-risk students. Nevertheless, no statistically significant results indicating that

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Table 3 Daily and weekly smoking from T2 to T4 among never smokers at the baseline

	T2[b] ($n = 1402$)		T3[c] ($n = 1224$)		T4[d] ($n = 1003$)	
	OR[a]	95% CI	OR[a]	95% CI	OR[a]	95% CI
Daily smoking						
Control group (1)	0.52*	0.30–0.91	0.70*	0.50–0.99	0.71	0.50–1.02
School achievement	2.64***	1.93–3.61	1.72***	1.38–2.14	1.89***	1.50–2.39
Both parents non-smokers	1		1		1	
Only father smokes	0.93	0.43–1.99	1.75*	1.12–2.74	1.68*	1.05–2.70
Only mother smokes	2.14*	1.04–4.41	2.30**	1.36–3.80	1.90*	1.10–3.29
Both parents smoke	1.22	0.60–2.50	1.83*	1.15–2.91	2.04**	1.26–3.32
Gender	1.98*	1.15–3.41	1.66**	1.16–2.36	1.71**	1.18–2.49
Pocket money	1.33**	1.08–1.63	1.13	0.99–1.30	1.11	0.96–1.29
	T2[b] ($n = 1402$)		T3[c] ($n = 1286$)		T4[d] ($n = 968$)	
Weekly smoking						
Control group (1)	0.41***	0.25–0.66	0.70*	0.51–0.95	0.63**	0.45–0.90
School achievement	2.28***	1.74–2.98	1.75***	1.44–2.13	1.87***	1.49–2.35
Both parents non-smokers	1		1		1	
Only father smokes	1.20	0.65–2.20	1.48	0.99–2.23	1.85**	1.20–2.87
Only mother smokes	2.23*	1.18–4.20	1.94**	1.20–3.11	1.63	0.95–2.78
Both parents smoke	1.54	0.85–2.77	1.61*	1.06–2.45	1.95**	1.23–3.10
Gender	2.63***	1.65–4.18	1.66**	1.21–2.30	1.69**	1.18–2.40
Pocket money	1.23*	1.03–1.47	1.14*	1.00–1.29	1.10	0.95–1.26

a: OR: *$P < 0.05$; OR: **$P < 0.01$; OR: ***$P < 0.001$
b: Second year of study
c: Third year of study: autumn
d: Third year of study: spring (final measurement)

the programme influenced students' smoking who had at least tried smoking by the baseline were found at T4. However, the exclusion of two control schools ($n = 258$) from the last measurement might have affected these results.

As previous studies have come to show, poor school achievement increased the likelihood of daily and weekly smoking onset.[7,35] However, a possibility has to be considered that not only did poor school achievement affect smoking, but also that smoking might have affected school achievement or that there might have been a third factor involved causing both poor school achievement and smoking. In addition, best friend's smoking increased the likelihood of smoking at least once a week. Unfortunately, due to the small number of cases, an analysis between the association of baseline never smokers' smoking initiation and best friend's smoking could not be carried out. One possible reason might have been the choice of friends, since adolescents tend to choose friends who have similar smoking habits to their own.[13] Therefore, among students at the baseline who had never tried smoking, only ~3% had a smoking best friend.

Parental smoking was associated with adolescent smoking. As in a previous study,[10] maternal smoking had a stronger impact on adolescent smoking than paternal smoking did. Nevertheless, the number of single mother families (at T4: $n = 718$) and how that might have affected these results needs to be considered. Unfortunately, parental socioeconomic status (SES) could not be used in the analysis. However, smoking among adults is strongly associated with SES in Finland. Higher SES groups include fewer smokers than lower SES groups.[36] A higher level of education as well as higher social class among women predict smoking cessation.[37] Therefore, the possibility that not only parental smoking affected their children's smoking, but also parental SES, which has been proved in previous studies,[38,39] needs to be considered.

This study supported the findings of previous studies[40,41] indicating that being a female increased the likelihood of daily and weekly smoking onset. The risk of smoking increased also among students who had more pocket money to spend compared with others. Earlier studies[42,43] have reached similar conclusions regarding the use of money and it has been suggested that decreasing the amount of pocket money could be a very rewarding smoking prevention action.[42]

The last goal was to test whether this programme had any influence on smoking cessation. The programme was mainly aimed to prevent adolescent smoking, and therefore had no influence on smoking cessation. A weakness of the programme was that it included only one smoking cessation lesson during the last year, which was insufficient to have a positive impact on smoking cessation. Adolescents' smoking cessation is considered to be inconsistent.[44] It is common that adolescents' smoking behaviour changes frequently and therefore smoking cessation is difficult to study. A better understanding of adolescent cessation is needed to provide effective smoking cessation programmes for adolescent.[45]

The weakness of this programme was also that self-reports on smoking status could not be biologically validated due to logistical and financial limitations.[30] However, previous studies have shown that self-reported smoking behaviour is a reliable

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tool in measuring smoking when asked in various questions[46,47] as done in this study.[30] One purpose of this study was to examine whether the programme had an influence on smoking including high-risk students. This programme was not developed for high-risk students, which can lead to a lack of statistical power. Interactions are not statistically significant for power calculations for main effects. In order to increase statistical power, school achievement was used as a continuous variable instead of categorical variable in the analysis.

One aim of the ESFA project was to create a large community programme as well. For practical reasons, only the capital area of Finland was chosen to participate in the programme. And for this reason, some randomly chosen schools were located close to one another. Therefore, some of the elements of the community programme, such as strong media involvement could not be exploited fully. It is also possible that some students in the control group participated in parish confirmation camps that were planed only for students in the experimental group. However, we believe that students mostly participated in confirmation camps provided by their own local church. The camps were generally different between the experimental and the control groups.

The strength of this programme was the collaboration of various bodies. The Helsinki educational administration and the principals in different schools supported the programme and made it possible to successfully complete the study.

Teachers participated in 2–3 training days per year. Training days, which included information about the programme, smoking prevention and practical training for lessons were a big investment. However, trained teachers will surely benefit from the information and educational material for the rest of their careers. Estimates of annual costs per school for staff expenses including teachers' training were ~1000 euros, in addition, material and operational costs were ~1500 euros per school. Therefore, estimated costs per school each year were ~2500 euros.

It is difficult to determine whether it is better to hire outsiders to organise smoking prevention activities than to leave the organisation to school personnel. Refusal skills' training that was carried out by a drama group increased the costs. However, students provided such positive feedback that it is recommended for schools to include such activities in their budget planning. Since one aim of the Finnish National Health Programme is to halve adolescent smoking prevalence by 2015,[3] this kind of smoking prevention programme should be included in the curriculum.

Adolescent smoking prevention programmes tailored to youths with special needs, such as students with poor school achievement and whose parents and best friends are smokers, are needed in the future. In order to be more effective, prevention programmes should target students who have never smoked. However, it is equivocal to say whether this programme will have long-term effects on adolescent smoking. Therefore, long-term smoking prevention programmes, lasting up to adulthood are needed to better ensure that adolescents abstain from smoking for longer.

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Key points

- School- and community- based smoking prevention programme can prevent smoking initiation among all adolescents including high-risk students
- Adolescent smoking prevention programmes tailored to youths with special needs, such as students with poor school achievement and whose parents and best friends are smokers, are needed in the future
- A better understanding of adolescent cessation is needed to provide effective smoking cessation programmes for adolescent

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