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Psychosocial determinants of smoking in Swiss adolescents with special reference to school stress and social capital in schools

Summary

Objectives: To identify the major psychosocial determinants of smoking in adolescents and the school influence on these determinants.

Methods: Cross-sectional questionnaire survey in 8th grade (age 14.8 years, n = 459) of 14 schools. Logistic regression with smoking as the dependent, and psychosocial indicators as independent variables. Total climate score for each school computed as the sum of scores of five school-related indicators. Linear regression analysis on aggregate data (school level), controlling for gender, ethnicity, and social class.

Results: Five out of 15 tested psychosocial indicators were identified as independent protective factors. The prevalence of smoking decreased steeply with an increasing number of protective factors. In the regression analysis on the aggregate level the mean number of protective factors per school and the prevalence of smoking were significantly related to the school climate score ($R^2 = 0.650$, $p < 0.001$, and $R^2 = 0.456$, $p < 0.001$).

Conclusions: Provided a causal interpretation of the cross-sectional statistical associations is correct, efforts to improve the general climate in schools appear as a promising strategy to enhance individual protective factors. Longitudinal evaluative studies are needed to prove the effectiveness of such a strategy.

Keywords: Smoking – Adolescents – School climate – Psychosocial determinants.

Health and health-related behaviour of adolescents has raised serious concern in recent years. In the USA and all European countries participating in the WHO cross-national study *Health Behaviour in School-aged Children (HBSC)* the proportion of smoking children and adolescents of age 11, 13, and 15 years has increased between 1986 and 1998 (Müller 2001). In Switzerland, this increase has been quite dramatic: in 1986, 13.2% of 15-year-old boys and 14.4% of the girls reported smoking cigarettes at least once a week. By 1998, these figures had risen to 26.9% and 24.6%, respectively. For 13-year-olds, the corresponding figures were 2.4% and 2.1% in 1986, and 6.7% and 7.6% in 1998 (Janin Jacquat & François 1999). The changes occurred in spite of substantially increased preventive efforts at the national, regional (cantons) and local levels, and there is reason to suspect that these preventive efforts were either still not strong and consistent enough to counterbalance the trends in society favouring an increased use of psychoactive substances, or that they did not address the relevant determinants of consumption habits. These determinants have been analysed in a large number of studies. In most of these, the emphasis was on individual psychological factors and on peer and family influences (Brynin 1999; Coogan et al. 1998; Currie et al. 2000; Escobedo et al. 1997; Hu et al. 1998; Koval & Pederson, 1999; Liftrak et al. 1997; Mayhew et al. 2000; Miller 1997; Patton et al. 1998; Pedersen et al. 1997; Tyas & Pederson, 1998; Urberg et al. 1997; Wang et al. 1999; Wills et al. 1998). Most preventive programmes use the school as the most suitable environment for trying to change attitudes and behaviours of children and adolescents, but only few studies have looked into the importance of the quality of this setting for psychological health (Rutter et al. 1979), health related behaviour (Ennett et al. 1997; Kumpfer & Turner 1990; Setter et al. 1998; Simons-Morton et al. 1999), or self-declared health (Freitag 1998). In spite of this knowledge, prevention programmes are still mainly substance-oriented, and there appears to be a need for reinforcing the rationale for the so called settings approach (Baric & Conrad 1999), based on the theory of social capital (Coleman 1988), by providing additional – and local – empirical evidence.

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In accordance with the guidelines of the European Network of Health Promoting Schools, the city of Berne started the project "School Health Teams", which offers know-how and material support for the schools to develop a health promoting strategy of their own (Barkholz 1995). In 1997, an evaluation project was started with baseline measurements of process and outcome variables. Measurements four years later will show whether changes in outcome variables are related to the health promotion process. "School climate" is a central concept of this project. In a multivariate cross-sectional analysis using baseline data and controlling for gender, social class, and ethnicity, school climate was shown to be related significantly to all behaviour variables, health status, and some – but not all – of the psychological outcome measures (Vuille & Schenkel 2001). The present paper was prepared in order to look into details of the relationships between smoking, individual psychological variables, and school climate. Smoking was chosen as outcome variable because of the urgent need to develop new preventive strategies against this increasing health hazard.

In the Swiss lay press school stress is frequently incriminated as an important cause of deteriorating health and health related behaviour in children and adolescents. The implications of such general beliefs are not trivial. If stress caused by school work is to be considered as a major cause of ill-health and unhealthy behaviour, there would be a need for resolute action to reduce the demands which the educational system exerts on children. However, such a demand reduction could also be counterproductive by entailing a risk for weaker academic performance and hence less positive life perspectives. Stress in terms of life events has been identified as a significant determinant of smoking in adolescents (Koval & Pederson 1999), but the empirical evidence for stress caused by school work as a determinant of substance abuse is weak. Therefore, the paper pays special attention to this variable. The following hypotheses are to be tested:

a) Smoking behaviour in Swiss adolescents is highly determined by individual psychosocial characteristics, among which the experience of being stressed by school work is one of the most important;
b) The relevant psychosocial characteristics vary by school, and this variation can be explained by differences in the school climate.

The analysis is performed in two steps. First, the association of smoking with several psychosocial determinants is measured. In a second step the dependence of the significant determinants on the school climate is studied using aggregate data on the school level.

Design and study population

The City Health Department of Bern launched the project "School Health Teams" in 1992. At the beginning of the school year 1999/2000, a full 33 of 34 schools in the city were involved in the project. Baseline measurements for the evaluation procedure included questionnaires for students in the 6th grade (last year in primary school, mean age 12.8 ± 0.75 years) and 8th grade (secondary school, mean age 14.8 ± 0.74 years) and a teacher questionnaire. One primary and one secondary school declined to participate in the evaluation process, leaving a total of 18 primary and 14 secondary schools in the study.

The present analysis utilises baseline data obtained from the questionnaire administered in one or two 8th grade classes per school. Data on 6th graders are not used because of the low rate of smoking at this age. Prior to data collection, written permission was obtained from the local school authorities and headmasters. Parents were informed by letter of the intent of the study, and given assurances of the confidentiality and anonymity of the data. The questionnaires were presented in the classroom by a research assistant during an ordinary lesson in the absence of the class teacher. Although participation was voluntary, no student refused to fill out the questionnaire. Three questionnaires were later discarded because the answers were obviously faked. The official number of students per selected class represents enrolment at the beginning of the school year 1997/98, whereas questionnaire data were collected six months later. In the lapse time, some additional pupils were admitted to the sampled classes, which helps account for the striking agreement between the official enrolment figures and the numbers of questionnaires returned (Tab. 1).

Table 1 Study population

	Secondary schools 8th grade: 25 classes		
	Swiss	Immigrants	Total
Pupils in selected classes according to official figures			460
Completed questionnaires			462
Completed obviously faked			3
Questionnaires in analysis	250	209	459
Boys (%)	46.0	47.0	46.4
Girls (%)	54.0	53.0	53.6
Social class:			
lower (%)	2.8	25.4	13.1
middle (%)	49.2	39.7	44.9
upper (%)	48.0	34.9	42.0

Table 2 Indicators of school climate

Indicator	Number of items	Example item	Answer Options	Crohnbach's alpha
General well-being at school	3	In general, I like to go to school	1–4 (strongly disagree – strongly agree)	0.68
Pupil participation	3	In our school the pupils participate in decisions about regulations		0.42
Relationship with teachers	8	There is a good relationship between our class-teacher and the pupils		0.73
Peer support	6	I can work well together with my classmates		0.70
Bullying	3	Sometimes I am bullied by children or adolescents from other classes		0.53

Questions selected from Janin-Jacquat & François (1999) and Grob (1997) and constructed by present authors.

Methods

The questionnaire was a compilation of items selected from several instruments which had been successfully used in previous epidemiological studies in Switzerland, together with some additional questions on health education (Brunschwiler 1993; Grob 1997; Hansen 1993; Janin Jacquat & François 1999; Narring et al. 1994; Süss et al. 1996) The final instrument contained 202 items. Some questions were reformulated after a pretest. Answers were coded as shown in Table 2 and 3.

Definition of variables

Smoking: Defined as having smoked > 1 cigarette last week.

Psychosocial determinants of smoking: Fifteen indicators of psychosocial well-being and life skills were defined using single questions or unweighted sums of scores of the corresponding questions. For the further analyses, all but one indicators being composed of more than one item were dichotomized into 0 and 1, with the median value as cut-off point. For norm-breaking behaviour, the cut-off point for what can be considered as acceptable was chosen arbitrarily (< 4 violations of rules in the last six months). The value 1 was consistently assigned to the healthier end of the distribution.

School climate: For each school, mean values of standardised scores of the indicators *general well-being at school, pupil participation, relationship with teachers, peer support,* and *bullying* were calculated (Tab. 2). In a factor analysis these five values collapsed into a single factor, and therefore, the sum of the five scores *(total climate score "pupils")* was used as the independent variable in the analysis on the aggregate level. In the teacher questionnaire an existing instrument measuring the climate of the organisation from the point of view of teachers and headmasters was included (Bessoth et al. 1997). For validation purposes schools were ranked on the basis of the pupil climate score on the one hand and the teacher climate score on the other hand. For the majority of schools the rankings corresponded rather closely. After exclusion of an obvious outlier (a school which very recently had been created through the fusion of two previously independent and well functioning units, with ensuing severe tensions between the two fractions of the staff), the Spearman rank correlation coefficient *rho* was 0.573 ($p = 0.026$). This result is interpreted as support for the validity of the pupils' climate score which will be used in the present study.

Confounding variables: The analyses of associations between psychosocial determinants and school climate were adjusted for gender, ethnic background, and social class. Social class was coded according to a three-class model using information provided by the pupils on the father's – or the mother's if no information on the father was available – professional status (Tab. 1).

International data

In order to situate the school-related answers of the Swiss adolescents of this study in a European context, the ranking of the Swiss data among all countries participating in the HBSC study 1997/1998 was extracted from the publication and presented graphically (Currie et al. 2000).

Statistical analyses

Differences between proportions were tested for significance with the chi-squared test. The degree of association of the dependent variable *non-smoking* with the psychosocial determinants was further assessed by stepwise logistic regression, introducing one additional determinant in every step, thus taking into account possible redundancy and interrelationships between determinants. Since the school climate is a characteristic of schools, not of individual pupils,

Table 3 Independent variables: number of items, example items, answer options, and Cronbach's alpha

Indicator	Number of items	Example item	Answer options	Cronbach's alpha	Ref.
School-related variables					
School stress	1	How severely do you feel pressured by your school work?	not at all a little rather severely severely	–	Currie et al. (2000)
Academic performance	1	The level of my school marks is on an average	good pass fail	–	–
Attitudes and beliefs					
Incompatibility of substances use and personal aims	4	If you would drink alcohol regularly: would this disturb friendships and activities that are important for you?	would certainly not disturb would probably not disturb would probably disturb would certainly disturb	0.54	Hansen (1993)
Normative beliefs	3	True or false: Most of may classmates think that it is cool to drink beer or wine	true don't know false	0.37	Hansen (1993)
General attitude to life	4	My future looks fine	strongly disagree rather disagree rather agree strongly agree	0.76	Grob (1997)
Emotional well-being					
Habitual mood	1	How do you feel in general?	happy most of the time content most of the time often unhappy almost always unhappy	–	Janin-Jaquat & François (1999)
Depression	10	I could cry all the time	strongly disagree rather disagree rather agree strongly agree	0.81	Grob (1997)
Satisfaction with own body	2	I like my appearance (face, hair, body)	strongly disagree rather disagree rather agree strongly agree	–	Grob (1997)
Self-esteem	4	Has it happened in the last few weeks that you were glad because others said you are great?	strongly disagree rather disagree rather agree strongly agree	0.75	Hansen (1993)
Like skills/behaviour					
Coping strategy	11	What do you usually do when you get into troubles? I concentrate on the problem in order to find a solution	strongly disagree rather disagree rather agree strongly agree	0.54	Grob (1997)
Stress management	4	I know how I can relax if I am under pressure	strongly disagree rather disagree rather agree strongly agree	0.38	–
Self-efficacy	5	Imagine that you and your parents do not agree. You want them to share your opinion. Can you do something so that your parents change their mind? I can do something so that they change their mind	strongly disagree rather disagree rather agree strongly agree	0.59	Grob (1997)
Norm-breaking behaviour	15	Here are some things which one should not do, but which nevertheless happen sometimes. Specify, what you have done in the last six month: Taken something in a shop without paying?	yes no	0.93	Süss et al. (1996)
Making friends	1 1	How difficult is it for you to find new friends a) in the school b) outside the school	very difficult quite difficult indifferent hardly difficult not difficult at all	–	Janin-Jaquat & François (1999)

the association between this variable and the relevant psychosocial determinants of smoking behaviour was assessed in a separate analysis on the aggregate level with n = 14 schools, using linear regression and controlling for gender, social class, and ethnic background. The *total climate score "pupils"* was used as the independent variable, smoking prevalence and the mean number of protective factors as dependent variables. Computations were performed using the STATA 6.0 statistical package (StataCorp 1999).

Results

Prevalence of smoking in subgroups defined by gender and psychosocial determinants

In a series of bivariate analyses the following psychosocial variables did not exhibit any significant association with smoking: *school stress, satisfaction with own body, self-esteem, stress management,* and *self-efficacy* (Tab. 4). With four variables the associations were similar for girls and boys, but the variables *normative beliefs, a positive attitude to life,* and *absence of depression* seemed to be protective with respect to smoking only for boys, whereas *a happy mood* and *the ability to make friends* had a stronger effect in girls. With growing school stress the proportion of smoking adolescents increased as expected, but because of relatively small numbers especially in the two extreme categories, this association was not statistically significant. The strongest association was found for academic performance with 57.7 % smoking among those who failed, compared to 8.6 % among those reporting high performance. Big differences between the categories were also found in the variables *incompatibility of substance use with personal aims, norm-breaking behaviour, coping,* and *habitual mood.* The *ability to make friends* is generally appreciated as a positive asset, but it seems to increase the risk of adopting smoking habits, especially in girls. It is important to note, however, that only the ability to make friends outside the school showed this association, whereas smoking was equally prevalent in those who had no and those who had moderate difficulties to make friends in school. The small group experiencing more serious difficulties finding friends also in school smoke less. It is possible that they constitute a group with very special lifestyles not tolerated by their peers, but because of a small n, the association was not significant.

Multivariate analysis on the individual level

In order to account for correlations between the determinants, a series of logistic regressions were run with non-smoking as the dependent variable and the indicators with significant associations with smoking in the bivariate analysis as independent variables. For the variables with more than one category, dummy variables were formed. Because of the specific hypothesis concerning school stress, this variable was introduced first. Without suggesting any conceptual hierarchy, the sequence with which the other determinants were introduced into the equation followed the order in Table 4. Various models with different sequences came up with very similar results, and therefore, only one model is shown. Because the number of independent variables is high with respect to the sample size, the odds ratios are listed for each step. The pattern remained remarkably stable, which signifies that the number of variables is not decisive for the overall result. Odds ratios > 1.0 consistently indicate a possible preventive effect of positive values in the independent variables. Confidence intervals are omitted from the table in order to enhance readability (Tab. 5).

Whereas total absence of *school stress* at first seemed to provide a significant protection with respect to smoking, this effect disappeared when the variable school performance was introduced. *School performance*, on the other hand, remained as a powerful preventive asset throughout the analysis, with a consistent dose-effect relationship: the chances for non-smoking were three times better in adolescents managing the pass level, if compared to those who failed, and at least four times better in those with high performance. Thus, perceived stress in school and the pressure to perform does not in itself stand out as a risk factor for smoking, but school failure clearly does. Furthermore, the data in Table 5 confirm independent protective effects of *the belief that substance use would interfere with the achievement of personal goals, a happy mood, an active coping strategy, and norm-breaking behaviour within acceptable limits.* The variables *healthy normative beliefs, a positive attitude to life,* and *absence of depression,* which were related significantly to smoking in the bivariate analysis, did not contribute independently to the chances of non-smoking when analysed simultaneously with the other determinants. Finally, the unhealthy influence of a well developed *ability to make friends outside the school* was confirmed also in this multivariate analysis.

Protective power of accumulated positive determinants

Since five of the determinants tested in this study seem to exert an independent positive influence on non-smoking, their accumulation can be expected to display a considerable protective influence. The data confirmed this assumption. If no or only one positive value was present in any of the determinants *sufficient academic performance, belief in the incompatibility of substance use with the achievement of*

Table 4 Smoking prevalence (% having smoked > 1 cigarette last week) by psychosocial determinants and gender

Indicator	Categories in analysis		n	All	Girls	Boys
School related variables						
School stress	none		55	10.9	10.7	11.1
	little		265	16.2	16.2	15.3
	moderate		105	9.1	9.1	27.7
	severe		26	30.8	33.3	20.0
		p (chi²)		0.148	0.211	0.212
Academic performance	high		189	9.0	8.4	9.8
	pass		241	18.7	17.5	18.6
	fail		26	57.7	36.4	66.7
		p (chi²)		< 0.001	0.015	< 0.001
Attitudes and beliefs						
Incompatibility of substances use and personal aims	imcompatible		225	4.2	2.4	6.5
	compatible		216	29.8	28.7	27.7
		p (chi²)		< 0.001	< 0.001	< 0.001
Normative beliefs	healthy		233	12.9	12.7	12.2
	unhealthy		201	21.9	17.2	23.8
		p (chi²)		0.013	0.342	0.033
General attitude to life	positive		200	11.0	9.3	12.8
	negative		218	22.0	16.0	27.6
		p (chi²)		0.003	0.140	0.010
Emotional well-being						
Habitual mood	mostly happy		182	17.6	15.4	17.4
	mostly content		243	12.8	8.5	16.4
	often of alwas unhappy		34	43.5	47.4	33.3
		p (chi²)		< 0.001	< 0.001	0.343
Depression	low symptom load		206	12.1	10.3	12.0
	high symptom load		211	21.3	16.7	27.6
		p (chi²)		0.012	0.189	0.006
Satisfaction with own body	satisfied		296	13.5	12.3	15.6
	dissatisfied		152	20.4	20.8	20.2
		p (chi²)		0.059	0.119	0.386
Self-esteem	high		223	13.5	11.9	15.2
	low		225	18.2	16.4	20.4
		p (chi²)		0.167	0.314	0.331
Like skills/behaviour						
Coping strategy	active		195	8.7	8.0	9.6
	passive		220	23.2	19.5	25.8
		p (chi²)		< 0.001	0.015	0.003
Stress management	good		261	15.3	13.1	17.7
	poor		187	16.6	15.5	17.9
		p (chi²)		0.720	0.598	0.983
Self-efficacy	high		184	13.6	11.6	15.7
	low		264	17.4	15.9	19.3
		p (chi²)		0.274	0.352	0.502
Norm-breaking behaviour	acceptable		332	8.1	7.0	9.7
	unacceptable		127	39.4	38.9	36.5
		p (chi²)		< 0.001	< 0.001	< 0.001
Making friends outside school	not difficult at all		141	27.0	26.0	26.6
	hardly difficult		166	13.9	10.7	15.0
	indifferent		99	9.1	5.2	12.5
	quite or very difficult		47	12.8	13.0	9.5
		p (chi²)		< 0.001	0.005	0.133
Making friends in school	not difficult at all		138	16.7	16.1	17.5
	hardly difficult		162	16.1	13.8	18.3
	indifferent		110	17.3	14.8	20.4
	quite or very difficult		33	9.1	6.7	11.1
		p (chi²)		0.670	0.861	0.850

Table 5 Stepwise logistic regression of non-smoking (< 2 cigarettes last week) on psychosocial determinants: odds ratios

	School stress			Academic performance		Incompat. drugs/ aims compa-tible	Normative beliefs healthy	Attitude to life positive	Mood content	Mood unhappy	Depres-sion score 8–16	Coping active	Norm-breaking accept-able	Make friends moderat. difficult	hardly difficult	not diff. at all difficult
	moderate	some	none	pass	high fail		unhealthy	negative	unhappy	unhappy	score < 8	passive	unaccept.	difficult	difficult	difficult
Reference	severe	severe	severe	fail	fail											
Step 1	1.89	2.29	3.63*													
Step 2	1.33	1.47	1.63	5.43***	12.46***											
Step 3	1.96	1.59	2.75	4.80**	9.29***	9.62***										
Step 4	1.78	1.35	2.35	4.84**	9.37***	8.41***	1.54									
Step 5	1.95	1.43	2.22	3.64*	6.54***	7.64***	1.62	1.37								
Step 6	1.77	1.12	2.00	3.40*	6.53***	8.30***	1.48	1.35	7.23***	3.92**						
Step 7	2.22	1.40	2.75	2.68	5.14**	8.05***	1.49	1.16	5.96***	3.21*	1.37					
Step 8	2.01	1.20	2.75	3.52*	6.07**	6.66***	1.47	1.16	6.70***	3.25*	1.48	2.07*				
Step 9	1.91	1.03	2.40	2.36	3.65	6.27***	1.31	1.29	7.04***	3.86*	1.30	2.13*	4.71***			
Step 10	1.05	0.52	1.27	3.41	4.87*	8.22***	1.37	1.40	8.61***	6.02**	1.37	2.57**	3.94***	0.39	0.52	0.12**

* p < 0.05, ** p < 0.01, *** p = < 0.001.

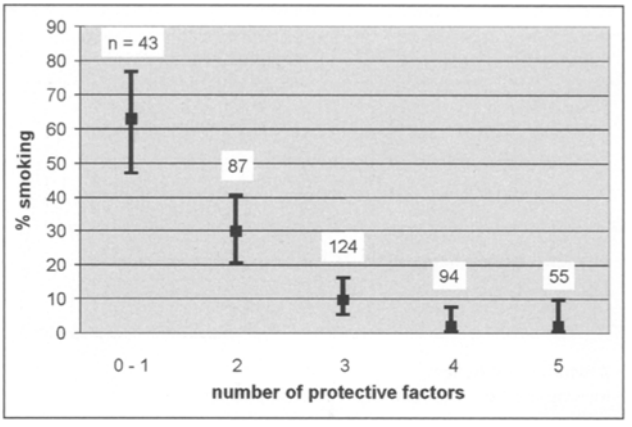

Figure 1 Proportion of smokers in groups with 0–1, 2, 3, 4, and 5 protective factors, with 95 % confidence interval

personal goals, happy or content mood, active coping, and *norm-breaking behaviour within acceptable limits,* 63 % of the adolescents were smoking, in contrast to 1.8 % if all five determinants had positive values (Fig. 1).

Effect of the school climate (aggregate level)

School climate is not a characteristic of individuals, but of organisations. Therefore, its association with the individual determinants was studied on the aggregate level, using the secondary schools of this study as units of analysis (n = 14) in a linear regression analysis, with weighting for population size, and adjusting for gender, the mean social class of the pupils and the proportion of immigrants in each school. The results confirmed a statistically highly significant association of the school climate with the mean number of individual protective factors which had been identified as a powerful predictor of non-smoking in the analysis on the individual level (Tab. 6). There was also a significant association of the school climate score with smoking prevalence. Sixty-five percent of the variance between schools in the total number of protective factors, and 45 % of the variance in smoking prevalence were explained by differences in school climate. Adjustment for social class and proportion of immigrants had only a small effect on the results. The strength of the relationship between protective factors and school climate is also illustrated graphically (Fig. 2).

International comparison

It is conceivable that some of the results presented in this paper reflect a situation typical for Swiss schools, rather than general laws governing health relevant behaviour of adolescents. The HBSC study of the WHO provides quite interesting data which could shed some light on this question (Currie et al. 2000). The relative ranking concerning nine

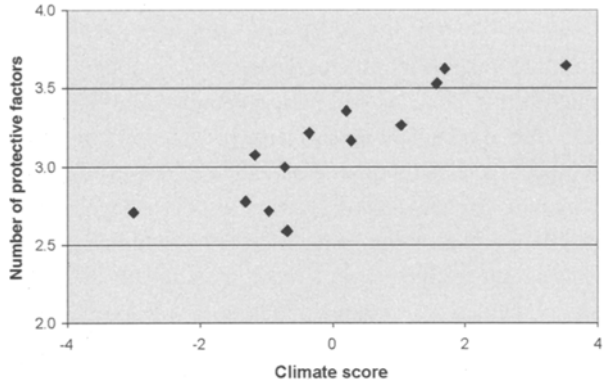

Figure 2 Mean number of protective factors per school, by school climate score

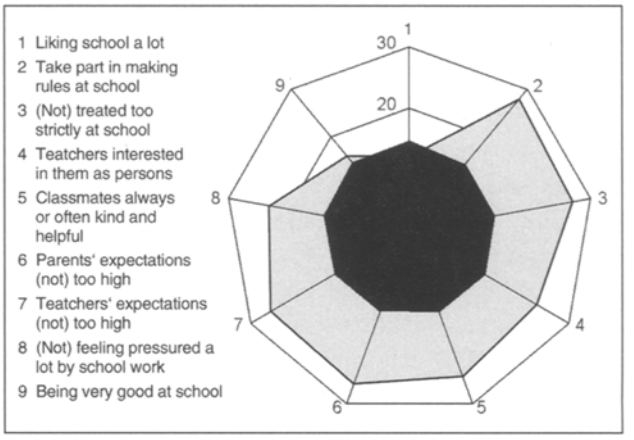

Figure 3 Relative ranking of Swiss pupils (mean of 11-, 13-, and 15-year-olds) among 28 countries, concerning nine questions of the WHO cross-national study of health behaviour in school-aged children (Currie et al. 2000). Rank 28 symbolises the highest, rank 1 the lowest proportion of most desirable answers. Grey area: ranks of Swiss pupils. Black area: mean ranks of the other 27 countries

Table 6 Linear regression coefficients of the mean number of protective factors and of smoking prevalence on school climate, unadjusted and adjusted for gender, social class, an proportion of immigrants. Weighted for size of subsamples. Aggregate level (schools, n = 14)

	Coefficient unadjusted	p	R2	Coefficient adjustes	p
Number of protecitve factors	0.231	< 0.001	0.650	0.268	< 0.001
Smoking prevalence	4.171	< 0.001	0.456	3.066	< 0.001

school-related questions of Swiss children and adolescents (mean values of 11-, 13-, and 15-year-olds) in comparison with those of the other 27 countries participating in the HBSC survey in 1997/1998 is presented graphically (Fig. 3). The rank 28 consistently signifies the most desirable situation (highest percentage stating that classmates are always or often kind and helpful, lowest percentage stating to feel pressured a lot by school work, etc.), the rank 1 the least desirable situation. The black area marks the mean ranks of all other countries, the light-grey area the Swiss values. With respect to the majority of other questions not shown here, Swiss adolescents occupied an average position in Europe. This applies also for the reported prevalence of smoking. With respect to the experiences at school, however, the results are quite striking. According to their own reports, Swiss pupils seem to be definitely privileged with respect to *taking part in making rules at school, (not) being treated too strictly at school, teacher's interest in them as persons, classmates always or often being kind and helpful, parents (not) expecting too much of them at school, teachers (not) expecting too much, (not) feeling pressured a lot by their school work.* The mean rank of these seven school-related indicators was 25.8. No other country reached a corresponding score greater than 20. Thus, Swiss children and adolescents report a definitely privileged school situation in the European context. This, however, does not guarantee that they like school a lot or that they think they are very good at school. Their ranking for these questions was only 12 and 16, respectively.

Discussion

The reliability (as measured by Cronbach's alpha) of the scales used to define the independent variables was rather low in some instances. Nevertheless, the analysis resulted in a clear distinction between variables that were associated with smoking and those that were not. At least in part this may be explained by the use of dichotomised values only instead of the full scales.

The two hypotheses to be tested were

a) Smoking behaviour in Swiss adolescents is highly determined by individual psychosocial characteristics, among which the experience of being stressed by school work is one of the most important;
b) The relevant psychosocial characteristics vary by school, and this variation can be explained by differences in the school climate.

Except for the latter part of hypothesis a), the data presented here are fully compatible with this hypothesis. Especially the combination of the significant determinants came out as a very powerful predictor of non-smoking. In contrast to academic achievement, however, school stress did not appear as a significant variable. In another questionnaire survey, the majority of 3500 10- to 16-year-old Swiss and

Norwegian children and adolescents reported a rather positive attitude to school work in general, more so in the German-speaking part of Switzerland than in the other study regions. Signs of stress were not a prominent feature, and the authors conclude that children and adolescents in Switzerland and Norway are burdened – at least as much by their active "leisure" time as by school work –, but hardly overstrained (Grob 1997). This, together with the international data presented here, may be part of an explanation why school stress did not come out as a significant predictor of smoking in this study, which is in contrast to findings by others (Koval & Pederson 1999; Kumpfer & Turner 1990; Tyas & Pederson 1998). The individual determinants of non-smoking identified here *(high academic performance, a strong belief that substance use is incompatible with the achievement of personal goals, a happy or satisfied general mood, active coping,* and *norm-breaking behaviour within acceptable limits)* essentially replicate the findings of earlier research (Coogan et al. 1998; Escobedo et al. 1997; Hu et al. 1998; Koval & Pederson 1999; Setter et al. 1998; Tyas & Pederson 1998). Also the risk connected to a peer-oriented lifestyle has been described before (Miller 1997; Pedersen et al. 1997; Simons-Morton et al. 1999; Wills et al. 1998), especially in girls with low scholastic competence (Liftrak et al. 1997), even if others found this influence to be rather weak (Urberg et al. 1997). A remarkable difference with the results of many other studies is the absence of a significant effect of self-esteem and self-efficacy. The most probable explanation is the use of different measures. The measure for self-esteem was taken from the Hansen manual (1993), the measure for self-efficacy from Flammer et al. (1989). It is conceivable that the effect which in other studies is mediated through self-esteem and self-efficacy is covered in the present study by active coping and (absence of) depression, but differences in the social position of the populations studied can not be ruled out as part of the explanation. Swiss pupils experience more chances for participation and more personal interest by their teachers than their peers in other countries, so that lack of self-esteem and self-efficacy may be less prominent in this population than in those of other countries.

Also hypothesis b) is strongly supported by the results of the analysis on the aggregate level. Sixty-five percent of the variation between schools with respect to the mean number of protective factors present among their pupils, and 45% of the variation with respect to the prevalence of smoking could be explained by differences in school climate.

The associations are strong and unequivocal, but since the study is cross-sectional, a causal inference of these statistical relationships has to be made with caution. Arguments for a causal interpretation are the "dose-effect" relationships and considerations of plausibility. With the exception of the variable *incompatibility of substance use with personal aims* it is difficult to imagine that the decision to start smoking should influence the psychosocial determinants identified here. Moreover, longitudinal studies have provided evidence that the psychosocial determinants actually precede the initiation of smoking (Brynin 1999; Epstein et al. 2000; Mayhew et al. 2000; Patton et al. 1998; Wang et al. 1999), and that prevention programmes focussing on these psychosocial factors can decrease adolescent smoking initiation (Langlois et al. 1999; Williams et al. 2000). It appears also quite plausible that a good school climate should promote positive attitudes and life skills in the pupils. On the other hand, a population of happy, active and well adapted pupils almost certainly contributes to a good climate in school. The only problem with this interpretation would be to find reasons why the pupil population should be happier in one school than another. Differences in social class and neighbourhood have been excluded as sufficient explanations by this study, as well as by other authors (Ennett et al. 1997; Freitag 1998; Rutter et al. 1979). The most probable interpretation at the present time appears to be that of a mutual transactional process.

With respect to preventive strategies, longitudinal experimental studies are needed, with interventions focussing on improving the climate in schools, as well as certain life skills of the pupils. In such an approach, the autonomy and active involvement of the single schools is highly valued, and hence, randomised controlled studies are not possible. Other methods of linking outcome to the process have to be developed. Such a methodological exploration is part of the ongoing evaluation study, out of which the data presented here have been extracted.

A good school climate alone, however, would not solve all the problems. It may have a positive effect on academic performance, but there will always be pupils who need special assistance in order not to drop out. This assistance should start very early and be governed by a realistic but optimistic attitude. Among other things, this implies high emphasis on efforts to reach individual predefined goals. Results of this study underline that perceived school stress is not a risk factor and that it is better to ask pupils to make strong efforts than to accept insufficient academic performance. The international comparison suggested that this conclusion might perhaps only be valid for Switzerland, where school stress seems to be much less of a problem than in other countries. It would therefore be desirable that similar studies be conducted in other countries. On the other hand, emphasis on academic achievement has been identified previously as an important component of an effective school process in England, a country with a completely different school system

(Rutter et al. 1979). Adolescents who reported that they usually felt happy or content smoked much less than those who usually felt unhappy. This determinant which delineates a small group with a very high risk of health damaging behaviour was unaffected by the school climate (data not shown). Mood is probably something very personal, composed of personality traits and of experiences in the private sphere. Case-finding and individual treatment appear as the most promising strategy for these individuals.

Taking all determinants together, the school climate explains a substantial fraction of the total variation. This fraction is important enough to support the claim that a considerable part of the preventive resources be allocated to this field. However, an equally important fraction of the variation in health damaging behaviour is not explained by school factors, and therefore, community-wide prevention strategies should not be restricted to the school alone, but also try to improve the general social climate and the life conditions of families with children and adolescents and to take action to reduce the availability and the attractiveness of cigarettes (Berg-Kelly et al. 1997; Lantz et al. 2000; Sowden & Arblaster, 2000; Wakefield et al. 2000).

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Zusammenfassung

Psychosoziale Determinanten der Rauchgewohnheiten bei Jugendlichen, unter besonderer Berücksichtigung von Schulstress und sozialem Kapital in Schulen

Fragestellung: Identifikation der psychosozialen Determinanten des Rauchens bei Jugendlichen und die Bestimmung der schulischen Einflüsse auf diese Determinanten.

Methoden: Fragebogenerhebung in 8. Klassen (Alter 14.8 Jahre, n = 459) von 14 Schulen. Logistische Regression mit der abhängigen Variable Rauchen und psychosozialen Indikatoren als unabhängige Variablen. Summe der Werte von fünf Schulindikatoren als Gesamt-Klima-Score für jede Schule. Lineare Regression auf dem Niveau Schule (n = 14), mit dem Geschlecht, der Sozialschicht und dem Ausländeranteil als Kontrollvariablen.

Resultate: Fünf von 15 getesteten psychosozialen Indikatoren wurden als unabhängige Schutzfaktoren identifiziert. Die Raucherprävalenz sank markant mit zunehmender Anzahl Schutzfaktoren. In der Regressionsanalyse auf der aggregierten Ebene waren die durchschnittliche Anzahl Schutzfaktoren und die Raucherprävalenz mit dem Schulklima assoziiert ($R^2 = 0{,}650$; $p < 0{,}001$, bzw. $R^2 = 0{,}456$; $p < 0{,}001$).

Schlussfolgerungen: Unter der Voraussetzung, dass eine kausale Interpretation der statistischen Zusammenhänge korrekt ist, erscheinen Anstrengungen zur Verbesserung des Schulklimas als vielversprechende Strategie zur Förderung individueller Schutzfaktoren. Zum Nachweis der Wirksamkeit einer solchen Strategie sind longitudinelle Evaluationsstudien notwendig.

Résumé

Déterminants psychosociaux du tabagisme des adolescents avec considération particulière du stress et du capital social scolaire

Objectifs: Identification des principaux déterminants psychosociaux du tabagisme des adolescents et de l'influence scolaire sur ces déterminants.

Méthodes: Enquête par questionnaire auprès d'écoliers de huitième classes (âge 14.8 ans, n = 476) dans 14 écoles. Régression logistique avec l'habitude de fumer comme variable dépendante et les indicateurs psychosociaux comme variables indépendantes. Mesure du climat scolaire basée sur les valeurs de cinq indicateurs scolaires. Régression linéaire sur le niveau écologique (écoles), avec le sexe, la proportion d'immigrants et la classe sociale comme variables de contrôle.

Résultats: Parmi 15 indicateurs psychosociaux cinq étaient identifiés comme facteurs protecteurs indépendants. La prévalence de fumeurs descendait rapidement avec le nombre de facteurs protecteurs. Par régression linéaire sur le niveau des écoles, l'influence du climat scolaire sur le nombre de facteurs protecteurs et la prévalence de fumeurs étaient démontrée ($R^2 = 0{,}650$; $p < 0{,}001$; et $R^2 = 0{,}456$; $p < 0{,}001$).

Conclusions: Pourvu qu'une interprétation causale des associations statistiques soit correcte, les efforts pour améliorer le climat dans les écoles se prêtent comme stratégie prometteuse pour promouvoir les facteurs protecteurs. Pour prouver l'efficacité de telles stratégies, des études d'évaluation longitudinales sont nécessaires.

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