Factors Associated With Smoking Onset: 3-Year Cohort Study of Schoolchildren

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OBJECTIVE: To analyze the predictors of smoking onset among schoolchildren.

METHODS: A cohort study of 1056 children starting in first year secondary school at 44 schools in Barcelona was carried out. Participating children were invited to answer a lifestyle questionnaire every year for 4 years. Each questionnaire carried a personal code to allow the 4 questionnaires to be matched. Matching questionnaires were found for 729 children, 70% of the initial sample.

RESULTS: Over the study period, the prevalence of regular smokers increased from 1.7% to 22% among boys and from 1.6% to 38.2% among girls. The predictors of smoking onset among boys were scoring high on the pro-smoking attitudes index (odds ratio [OR]=1.2; 95% confidence interval [CI], 1.1-1.3), intention to smoke in the future (OR=2.2; 95% CI, 1.0-4.9), low self-efficacy in resisting pressures to smoke (OR=0.98; 95% CI, 0.96-0.99), having siblings that smoke (OR=2.5; 95% CI, 1.2-5.4), and spending some free time in bars (OR=2.4; CI, 1.1-4.9). Among girls, the predictors were having low self-esteem (OR=0.94; 95% CI, 0.88-0.99), scoring low on the anti-tobacco attitudes index (OR=0.92; 95% CI, 0.88-0.97), having siblings who smoke (OR=2.5; 95% CI, 1.2-5.5), spending some free time in discotheques (OR=4.5; 95% CI, 1.9-11.8), and living in high socioeconomic-status neighborhoods (OR=3.1; 95% CI, 1.4-10.9).

CONCLUSIONS: The results show the importance of cognitive variables as well as a variety of environmental variables, particularly the pattern of free time use and the influence of sibling models. Prevention programs must take into account smoking onset risk factors as a whole.

Key words: *Smoking onset. Longitudinal study. Schoolchildren.*

Factores asociados con el inicio del tabaquismo: seguimiento a los 3 años de una cohorte de escolares

OBJETIVO: El objetivo del estudio es analizar los factores predictivos del inicio del consumo de tabaco entre los escolares.

MÉTODOS: Se ha realizado un estudio longitudinal de seguimiento de 1.056 escolares de primer curso de Educación Secundaria Obligatoria de 44 escuelas de Barcelona. Durante los 4 años del estudio, se invitó a todos los escolares de la cohorte a responder cada año a un cuestionario sobre estilo de vida. A través de un código personal, al final del estudio se pudieron aparear los 4 cuestionarios de 729 escolares, un 70% de la muestra inicial.

RESULTADOS: En el período estudiado la prevalencia de fumadores regulares pasó del 1,7 al 22% entre los chicos, y del 1,6 al 38,2% entre las chicas. Los factores predictivos del inicio del consumo fueron en los chicos tener una puntuación elevada en la escala de actitudes pro tabaco (*odds ratio* [OR] = 1,2; intervalo de confianza [IC] del 95%, 1,1-1,3), la intención de fumar en el futuro (OR = 2,2; IC del 95%, 1,0-4,9), una baja autoeficacia para resistir presiones hacia el consumo (OR = 0,98; IC del 95%, 0,96-0,99), el consumo de tabaco de los hermanos (OR = 2,5; IC del 95%, 1,2-5,4) y pasar parte del tiempo libre en bares (OR = 2,4; 1,1-4,9). Para las chicas las variables predictoras fueron tener una baja autoestima (OR = 0,94; IC del 95%, 0,88-0,99), tener una baja puntuación en la escala de actitudes contra el tabaco (OR = 0,92; IC del 95%, 0,88-0,97), el tabaquismo de los hermanos (OR = 2,5; IC del 95%, 1,2-5,5), pasar parte del tiempo libre en discotecas (OR = 4,5; IC del 95%, 1,9-11,8) y vivir en barrios de nivel socioeconómico elevado (OR = 3,1; IC del 95%, 1,4-10,9).

CONCLUSIONES: Los resultados señalan la importancia de las variables cognitivas, así como una diversidad de variables del entorno, entre las que destaca el patrón de tiempo libre y la influencia de modelos de los hermanos. Los programas preventivos deberían tener en cuenta el conjunto de factores de riesgo para el inicio del tabaquismo desde una perspectiva global.

Palabras clave: *Inicio del tabaquismo. Estudio longitudinal. Escolares.*

Introduction

Despite efforts made in recent years, experimentation and onset of smoking among the young have remained stable in Spain[1] as in most industrialized countries.[2-5] In the United States of America the rate actually increased during the 1990s, despite over 30 years of considerable

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effort towards prevention and control[6]; an increase that has been attributed to subtle and effective marketing strategies by the tobacco industry.[7] In Spain, the latest studies have found a prevalence of smoking of about 40% among 16- to 24-year-olds.[8] Studies carried out in Barcelona in 1993 and 1999 indicated a decrease in age of onset from 13.9 to 13.4[3] but this tendency has not been observed in nation-wide studies on tobacco, alcohol, and drug use in the young carried out over the same period.[9]

Socioeconomic, family, cognitive, and emotional factors have been identified in cohort studies as predictors of smoking onset.[10] In particular, several authors have indicated the importance of having smokers in the family environment[11] and among friends,[12,13] while other authors have emphasized cognitive aspects such as perceived influences, pro- or anti-smoking attitudes, or self efficacy in resisting social pressure to smoke.[14]

Cohort studies allow predictive factors to be identified and associations caused by selection processes and subjective perceptions of the young to be rejected.[15] However, there have been few cohort studies carried out in Spain[5,16] and follow up has rarely lasted more than a year. The objective of the present study was to analyze factors related to smoking onset in a cohort of secondary-school students over a period of 3 years.

Methods

The study examined the development of smoking onset after 3 years of follow up in a sample of schoolchildren who participated, between 1998 and 2002, in the European Smoking Prevention Framework Approach (ESFA), a European program for prevention of smoking among adolescents. The characteristics of the study and the evaluation questionnaire have been described before.[17] The questionnaire consisted of closed questions on smoking and associated attitudes and beliefs. In 1998, a representative sample of 44 schools from all secondary schools in Barcelona, including public, semi-private (private schools with government funding), and private, were selected. Letters were sent to the selected schools explaining the study and inviting all first-year students (12- to 13-year-olds) to participate. Once participation was confirmed, trained data collectors, mostly doctors and nurses from the city council school health staff, administered the questionnaire in the classroom. In the first year, questionnaires were answered by 1056 students. In the 3 following years, the same questionnaire was administered in the same schools, 921 students providing valid responses in the second year, 832 in the third, and 729 in the fourth. The response rate with respect to the initial cohort was 70%. The questionnaire was designed at the University of Maastricht and included sociodemographic variables, smoking predictors, and questions on health-related behavior.

The Family Economic Capacity Index (FECI) of the students' neighborhoods was used to measure socioeconomic status. The FECI is a socioeconomic index which grades geographic census sections, neighborhoods, and districts according to indicators such as occupation, consumption of electricity, land rental rates, and car tax rates.[18] Three levels —high, medium, and low—were used in the analysis. Family environment was analyzed according to type of family, single or 2-parent, and parents' level of education.

In order to analyze cognitive predictors such as attitudes, social influences (norms, models, and perceived social pressure), and self efficacy using the Attitudes-Social influences-Efficacy (ASE) model proposed by de Vries et al,[19] a factorial analysis was performed first to identify the factors underlying the items studied. The questionnaire included 8 items related to perceived social pressure towards smoking, measured in 2 variables: pressure from friends to smoke (best friend, friends in general, class companions) and pressure from other people to smoke (brothers, sisters, parents, and teachers). There were 5 possible answers to the items, ranging from very often to never. The dichotomization of the resulting variables was obtained by separating the never response from the other responses. With respect to the perception of smoking among people in the social environment, the friends model ("Does your best friend smoke?," "How many of your friends smoke?," "How many of your class companions smoke?," "How many people you know smoke?"), the siblings model ("Do your brothers and/or sisters smoke?"), and the parents model ("Does your father and/or mother smoke?") were classified. Dichotomization of the variables was different for parents and siblings ("none smoke" separated from "at least 1 of them smokes") compared with friends where the responses were distributed along a slope from "Almost all of them smoke" to "Hardly anyone smokes" and for which the percentile 50 was used as a cut off. Regarding self efficacy, or perceived capacity to resist pressure to smoke, the 12 associated items were added to create a single, continuous variable given that in the factorial analysis the first factor alone accounted for 83.7% of the variance. The 11 items that measured attitudes to smoking were grouped in 2 variables: pro-smoking attitudes ("It calms you down," "It helps you keep thin," "It relaxes you," "It helps you act naturally with people," "Friends think more of you") and anti-smoking attitudes ("It is bad for your health," "It would be stupid of me to smoke," "It would be a bad thing to do," "I would feel bad if I got ill," "It tastes bad," "It creates an unfriendly atmosphere"). This variable, like self efficacy, was studied as continuous, the scores of each item being added together.

Other variables analyzed included preferring the company of nonsmokers, academic performance, and conflictive behavior defined by one or more affirmative answers to the following items: voluntary absenteeism from school, fighting, participating in vandalism, and stealing. A global index of these variables was made for the 3 years. Regarding use of free time, items included spending free time in bars, discotheques, and commercial centers, distinguishing students who went frequently from those who rarely went over the 3 years.

Intention to smoke in the future was also studied, distinguishing between those who believed or stated that they would not smoke in the future from those who thought that they would. These groups were classified as "precontemplators" and "contemplators" respectively, using the stages of change model adapted for smoking onset in adolescence.[20] Finally, perceived hazard of smoking and alcohol use was examined, distinguishing between students who perceived them to be hazardous or very hazardous from students who perceived them as hardly or not at all hazardous, both variables measured in the first year; perceived self esteem was measured on a scale of 12 items, in the second year, and perception of drug and alcohol use in friends was measured in the third year.

Smoking regularly (at least once a week) at the time the questionnaire was administered in the third year was considered the dependent variable. Separate analyses were made for boys and girls. After performing a bivariate analysis, the significant variables ($P<.05$) were selected to perform a binary logistic regression analysis using the forward-conditional model and thus obtain the adjusted odds ratios (OR) and 95% confidence intervals (CI). Independent variables were obtained in the first year in the case of stable variables such as parents' level of studies and FECI, means were used in the case of variables that were subject to changes over time such as academic performance among others.

Results

The results for the 729 students (70% of the initial sample) who answered all 4 questionnaires are presented. Table 1 contains the sociodemographic characteristics of the cohort of schoolchildren corresponding to the first year of the study, compared with the sample lost to follow up. In the matched sample the mean age was 12.53 years, more than 70% studied at semi-private schools, and over 80% had medium or low FECI scores. Over 50% had parents with primary school studies, 23.7% lived in a single-parent family, and 6.0% admitted to having low academic performance compared with the rest of the class. Regarding smoking and alcohol use, 1.8% declared they smoked regularly, 34.4% had tried alcohol at least once, and 4.3% had got drunk at least once. Regarding drug use, 1.0% had tried cannabis. In comparison with the sample lost to follow up significant differences were found for nearly all variables except type of school, mother's level of studies, alcohol use, and getting drunk. Students lost to follow up were more likely to be boys, were older, had poor school performance, or smoked tobacco or cannabis. With

TABLE 1
Sample Characteristics According to Follow-up Status After 3 Years*

	Lost to Follow-up†		Followed and Matched		Total‡	*P*
	Number	Percentage	Number	Percentage		
Sex						
Boy	189	57.8	362	49.7	551	
Girl	138	42.2	367	50.3	505	.014
Mean age, years						
Mean age	12.64		12.53		1.040	.001
Type of school						
Public	87	26.6	164	22.5	251	
Semi-private	219	67.0	534	73.3	753	
Private	21	6.4	31	4.3	52	.082
FECI						
Low	219	35.5	534	31.1	298	
Medium	21	44.6	31	55.5	480	
High	327	19.9	729	13.4	141	.004
Father's level of studies						
Secondary or tertiary	127	38.8	342	46.9	469	
Primary, special, no answer	200	61.2	387	53.1	587	.015
Mother's level of studies						
Secondary or tertiary	127	38.8	310	42.5	437	
Primary, special, no answer	200	61.2	419	57.5	619	.261
Smokes regularly						
No	302	94.4	704	98.2	1.006	
Yes	18	5.6	13	1.8	31	.001
Has drunk alcohol						
No	200	61.2	478	65.6	678	
Yes	127	38.8	251	34.4	378	.167
Has got drunk						
No	286	92.9	668	95.7	954	
Yes	22	7.1	30	4.3	52	.060
Has smoked cannabis						
No	300	97.1	693	99.0	993	
Yes	9	2.9	7	1.0	16	.025
Family situation						
Two parent	218	66.7	556	76.3	774	
Single parent	109	33.3	173	23.7	282	.001
School performance						
Medium-High	276	85.7	675	94.0	951	
Low	46	14.3	43	6.0	89	<.001
Total	327	31.0	729	69.0	1.056	

*FECI indicates family economic capacity index.[18]
†All impediments to matching questionnaires in the follow-up years, including loss to follow up and errors in coding.
‡Items may not add up to 1056 for some variables.

TABLE 2
Regular Smoking According to Sociodemographic, School Environment, Free Time, and Cognitive Variables for Boys. ESFA Study, Barcelona, 1998-2001*

	Regular Smokers		
	Number (%)	OR (95% CI)	aOR (95% CI)
Perception of academic performance			
Good or tending to good	55 (18.8)		
Poor, tending to poor, or inconsistent	15 (36.6)	2.5 (1.2-5.0)	
Conflictive behavior			
None in the 3 years	7 (8.2)		
Some in 1 year	17 (22.1)	3.2 (1.2-8.1)	
Some in 2 years	26 (25.2)	3.8 (1.5-9.2)	
Some in 3 years	24 (28.2)	4.4 (1.8-10.9)	
Free time in bars/cafes			
Rarely in the 3 years	23 (13.9)		
Often in the 3 years	37 (28.0)	2.4 (1.3-4.3)	
Free time in bars/pubs			
Rarely in the 3 years	32 (14.5)		
Often in the 3 years	30 (34.9)	3.2 (1.8-5.7)	2.4 (1.1-4.9)
Free time in discotheques			
Rarely in the 3 years	46 (17.4)		
Often in the 3 years	13 (34.2)	2.5 (1.2-5.2)	
Perceived pressure by adults (3rd year)			
No	61 (18.8)		
Yes	13 (52.0)	4.7 (2.0-10.8)	
Perceived sibling behavior (3rd year)			
No	44 (16.5)		
Yes	30 (35.7)	2.8 (1.6-4.9)	2.5 (1.2-5.4)
Perceived alcohol and/or drug use in friends (3rd year)			
No	11 (8.3)		
Yes	63 (29.0)	4.5 (2.3-9.0)	
Attitudes against smoking†	7.12 (4.86)	0.9 (0.8-0.9)	
Attitudes in favor of smoking†	3.28 (3.9)	1.3 (1.2-1.4)	1.2 (1.1-1.3)
Self efficacy (3rd year)†	16.36 (18.80)	0.98 (0.97-0.99)	0.98 (0.96- 0.99)
Prefer company of nonsmokers			
Yes in the 3rd year or tending to prefer them	19 (11.7)		
Tending not to prefer them	42 (30.0)	3.3 (1.8-5.9)	
Never	12 (26.7)	2.8 (1.2-6.2)	
Intention to smoke in the future (1st year)			
Precontemplator	47 (16.9)		
Contemplator	24 (37.5)	2.9 (1.6-5.3)	2.2 (1.0-4.9)
Total	74 (21.4)		

*OR indicates odds ratio; CI, confidence interval; aOr, adjusted odds ratio.
†Mean (SD).

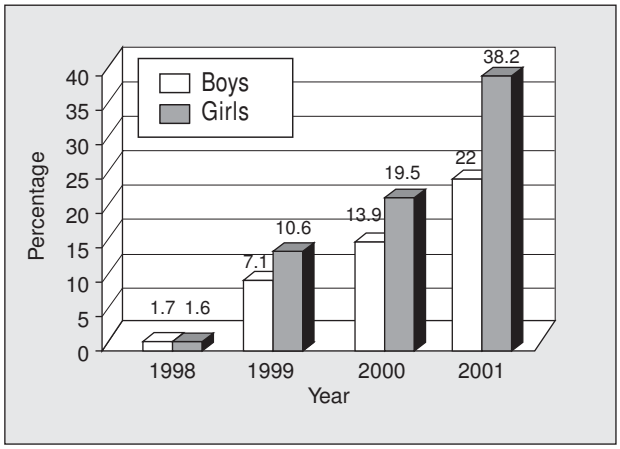

Figure. Onset of regular smoking (daily or weekly) in a sample of schoolchildren over the study period. Barcelona, 1998-2001.

respect to family characteristics, students lost to follow up were more likely to live in high income neighborhoods, in single-parent families, or have fathers' with low levels of studies.

Figure shows the progression of smoking over the 4 years of the study. The proportion of regular smokers increased from 1.7% to 22% in boys and 1.6% to 38.2% in girls over the study period.

Table 2 shows the bivariate and multivariate analysis results for boys of the variables significantly associated with smoking. Table 3 shows the same for girls. In boys (Table 2), the predictors corresponded to poor school performance, conflictive behavior, free time spent in places meant for adults, environmental influences such as pressure from other people to smoke or having siblings who smoked, cognitive variables such as pro-smoking attitudes, poor self efficacy in resisting

TABLE 3
Regular Smoking According to Sociodemographic, School Environment, Free Time, and Cognitive Variables for Girls. ESFA Study (Barcelona), 1998-2001*

	Regular Smokers		
	Number (%)	OR (95% CI)	aOR (95% CI)
FECI			
Low	21 (23.9)		
Medium	68 (37.4)	1.9 (1.0-3.4)	1.8 (0.8-4.1)
High	15 (53.6)	3.7 (1.5-8.9)	3.1 (1.4-10.9)
Family status			
Two parent family (1st, 2nd, and 3rd year)	74 (32.7)		
Single parent family any year	54 (43.9)	1.6 (1.0-2.5)	
Perception of academic performance			
Good or tending to good	107 (35.5)		
Poor, tending to poor, or inconsistent	17 (42.5)	1.3 (0.7- 2.6)	
Absenteeism, fighting, vandalism, stealing			
Never in 3 years	28 (29.8)		
Some in 1 year	40 (35.4)	1.3 (0.7-2.3)	
Some in 2 years	33 (38.8)	1.5 (0.8-2.8)	
Some in 3 years	27 (47.4)	2.1 (1.1-4.2)	
Free time in pubs			
Rarely in the 3 years	75 (31.5)		
Often in the 3 years	36 (48.0)	1.8 (1.1-3.1)	
Free time in discotheques			
Rarely in the 3 years	82 (30.5)		
Often in the 3 years	26 (66.7)	4.0 (1.9-8.3)	4.5 (1.9-11.8)
Free time in commercial centers			
Rarely in the 3 years	15 (19.0)		
Often in the 3 years	90 (40.4)	3.1 (1.6- 5.8)	
Perceived pressure from adults (3rd year)			
No	116 (35.0)		
Yes	12 (66.7)	3.7 (1.4-10.11)	
Perceived behavior of siblings (3rd year)			
No	83 (31.4)		
Yes	45 (52.9)	2.5 (1.5-4.0)	2.5 (1.2- 5.5)
Perceived alcohol and/or drug use in friends (3rd year)			
No	24 (26.1)		
Yes	104 (40.5)	1.9 (1.1-3.3)	
Anti-smoking attitudes (3rd year)†	7.10 (3.86)	0.8 (0.8-0.9)	0.92 (0.88-0.97)
Pro-smoking attitudes (3rd year)†	2.59 (2.73)	1.2 (1.1-1.3)	
Self efficacy (3rd year)†	13.32 (16.26)	0.97 (0.95-0.97)	
Prefer company of nonsmokers			
Yes or tending to prefer them	23 (20.5)		
Tending not to prefer them	51 (35.2)	2.1 (1.2-3.7)	
Never	52 (59.1)	5.6 (3.0-10.4)	
Self esteem (2nd year)†	6.24 (6.11)	0.95 (0.92-0.99)	0.94 (0.88-0.99)
Hazards of smoking and alcohol (1st year)			
Very hazardous	28 (24.6)		
Little or no hazard	88 (40.7)	2.1 (1.3-3.5)	
Intention to smoke in the future (1st year)			
Precontemplator	70 (28.8)		
Contemplator	51 (54.8)	3.0 (1.8-4.9)	
Total	126 (36.6)		

*FECI indicates family economic capacity index; OR, odds ratio; CI, confidence interval; aOr, adjusted odds ratio.
†Mean (SD).

invitations or pressures to smoke, or the intention to smoke in the future declared in the first year. In the multivariate analysis, variables that continued to be associated were spending free time in music bars (OR=2.4; 95% CI, 1.1-4.9), having siblings who smoked (OR=2.5; 95% CI, 1.2-5.4), pro-smoking attitudes (OR=1.2; 95% CI, 1.1-1.3), poor self efficacy (OR=0.98; 95% CI, 0.96-0.99), and intention to smoke (OR=2.2; 95% CI, 1.0-4.9). In girls (Table 3) the bivariate analysis revealed that most of the predictors were the same as for boys although there were some additional sociodemographic variables such as medium to high income status, or living in a single-parent family, as well as poor self esteem and reduced perception of the hazards of smoking or drinking alcohol. In the multivariate analysis variables that continued to be

associated were high income status (OR=3.1; 95% CI, 1.4-10.9), free time spent in discotheques, (OR=4.5; 95% CI, 1.9-11.8), having siblings who smoked (OR=2.5; 95% CI, 1.2-5.5), having few anti-smoking attitudes (OR=0.92; 95% CI, 0.88-0.97), and having low self esteem (OR=0.94; 95% CI, 0.88-0.99).

Discussion

This is the first cohort study of a representative sample of schoolchildren over 3 years that has been carried out in Spain. The wide range of variables associated with social factors of risk included in the study as well as the cognitive variables proposed in the ASE model[14] made it possible to evaluate their relative importance at different levels of influence. It is interesting to see that the final models contain several cognitive variables (attitudes towards smoking, intention to smoke, and low self esteem in the case of girls), followed by several social variables which include having siblings who smoked, free time use, and socioeconomic status of the girls. Other variables that have been identified in other studies were not relevant in ours or lost significance over the study period.

In order to assess the results as a whole it is important to consider the limitations of the study which are largely related to the validity of the self-declared behaviors and to selection bias. The questionnaire was designed and validated at the University of Maastricht in the Netherlands and, despite the fact that it has not been formally validated in all the participating countries, the translation and adaptation to each language underwent qualitative validation. Additionally, it is possible for a selection bias in follow up to affect results as it is generally accepted not only that risk factors will occur in higher proportions among students lost to follow up but that predictors might also be different for them. In any event it is difficult to avoid this kind of bias in follow-up studies but a response rate of 70% of the initial sample over 3 years is a satisfactory result that reduces the risk of bias.

Results indicating differences between the sexes are consistent with those reported by Swan et al[21] in their review of several studies. Those authors concluded that although some factors influenced boys and girls in different ways, the overall differences were minimal. Our results show that attitudes, intention to smoke in the future, having siblings who smoke, and spending free time in bars and discotheques had the same influence on both sexes but low self esteem and high socioeconomic status were only predictors in girls. Likewise, Stanton and Silva[22] found that, while there was no clear specific pattern of behavior for each sex, some influences were nevertheless more important for girls than for boys.

The effect of socioeconomic status in girls is interesting as higher socioeconomic status was associated with greater probability of smoking onset, a result which corresponds to smoking patterns in the adult population.[23,24] Poor self esteem was seen to be another risk factor for smoking among girls. At this age girls are thought to have feelings of inferiority associated with behaviors, like smoking, that give a certain feeling of security.[25] This finding which needs further and more specific investigation has been described in earlier studies[26] and could be examined within the framework of adolescent problems. In a sample of adolescent North Americans, Carvajal et al[27] found that self esteem and an overall positive attitude were protective factors against smoking for both sexes.

With respect to the association of smoking onset with patterns of free time use, particularly activities regarded as adult such as spending free time in bars or discotheques, the association could be attributable to both greater access to cigarettes and reduced parental control and at the same time reflect a desire to imitate adult behavior. Independently of the causes, this risk situation can be reduced by greater supervision of free time use.

Finally, this study demonstrates that there are risk factors of smoking onset that are subject to modification. If we want to effectively reduce the impact of what is—and will conceivably continue to be for some time—the main preventable cause of mortality in developed countries, we must act on the results of the study: making families aware of the potential risks of certain ways of spending free time and modifying attitudes by having adolescents study the pros and cons of smoking are examples.

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