© International Journal of Clinical and Health Psychology

ISSN 1697-2600
2011, Vol. 11, Nº 1, pp. 23-33

Psychosocial risk factors for adolescent smoking: A school-based study[1]

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ABSTRACT. Smoking among adolescents is one of the main concerns for the public health systems in most developed countries. The knowledge of which individual and social risk factors are the most influential for the development of nicotine addiction would help to improve procedures aimed at reducing tobacco use and to develop not only efficacious but efficient prevention programs. The main purpose of this *ex post facto* study was to detect psychosocial variables related to adolescent smoking. Study participants were 2,840 adolescents aged 12 to 16. Age, gender, perceived availability, weekly income, perceived risk of harm, family- and peer-use, drive for thinness, and self-esteem were selected as predictive variables. The logistic model estimated revealed that smoking in the adolescent's social context (friends and/or partners who are smokers) was the most determinant variable for tobacco use. Future research directions and proposals are discussed in relation to the implications of these findings for adolescent smoking prevention programs.

KEYWORDS. Smoking. Adolescents. Risk factors. *Ex post facto* study.

RESUMEN. El consumo de tabaco entre adolescentes es uno de los principales problemas de los sistemas públicos de salud en los países desarrollados. Conocer cuáles

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son los factores de riesgo más determinantes, tanto individuales como sociales, en el desarrollo de la adicción a la nicotina es esencial para mejorar las estrategias orientadas a reducir el consumo de tabaco y ayudaría a desarrollar programas eficaces y también eficientes. El objetivo de este estudio *ex post facto* fue determinar qué variables psicosociales están relacionadas con el consumo de tabaco en la adolescencia. Participaron 2.840 adolescentes de entre 12 y 16 años. Las variables predictoras fueron la edad, el género, la disponibilidad percibida, los ingresos semanales, la percepción de riesgo, el consumo de tabaco en familiares y amigos, la obsesión por la delgadez y la autoestima. El modelo de regresión logística reveló que el consumo de tabaco en el contexto social de los adolescentes (amigos y pareja fumadora) es la variable más determinante para que éstos fumen. Se proponen futuras líneas de investigación y se discuten las implicaciones de estos hallazgos para mejorar los programas de prevención del tabaquismo.

PALABRAS CLAVE. Tabaco. Adolescentes. Factores de riesgo. Estudio *ex post facto*.

Smoking is now considered the greatest preventable public health problem in developed countries, and smoking among adolescents is one of the main concerns for public healthcare systems. Spain is one of the EU countries with the highest prevalence of cigarette consumption per person (Mackay and Eriksen, 2002). Despite a fall in the amount of smoking in recent years, it is estimated that 29.6% of Spain's population between the ages of 15 and 64 smoke every day (Plan Nacional sobre Drogas, 2008), which is still a very high figure, considering the impact of tobacco on health. In adolescents aged 14 to 18, the figure for daily use is around 15%, and moreover, first use of tobacco is situated at age 13.3 years, whilst the daily use pattern emerges at age 15.1 (Plan Nacional sobre Drogas, 2009). Therefore, prevention strategies must focus on early adolescence in order to reduce risk factors and increase protective factors before and during smoking onset.

Several studies have identified risk and protective factors for adolescent smoking (Tyas and Pederson, 1998) and emphasize the need for a multifaceted approach to understanding and preventing adolescent smoking (Collins and Ellickson, 2004). Multiple levels of influence, from cultural and social variables to individual factors, have been shown to be associated with it. One such variable is smoking in the adolescent's family context (Chassin, Presson, Sherman, McLaughlin, and Gioia, 1985; Flay *et al.,* 1994). Despite its relatively low influence by comparison with other variables, such as peer smoking, this influence operates though modeling, rules and parental style, from initiation to the regular use of cigarettes (Turner, Mermelstein, and Flay, 2004). However, smoking in the adolescent's group of peers is one of the most frequently cited variables, and appears to be the most determinant (Bauman and Ennett, 1994; Derzon and Lipsey, 1999; Hoffman, Sussman, Unger, and Valente, 2006). More specifically, the most common risk factor for tobacco use among adolescents is related to the number of one's friends who smoke (Hoffman *et al.,* 2006). Furthermore, research has identified several dimensions of adolescent peer relations (embeddedness, friendship quality or peer social status), as well some reference points in social networks (best friend or partner) as being related to adolescent smoking (Ennett *et al.,* 2008; Kobus, 2003).

Price and availability of cigarettes have also been cited as risk factors. On average, an increase of 10% in the price of a pack of cigarettes would reduce demand for cigarettes from 4% to 8%, and children and adolescents are actually more responsive to price rises than older adults (The World Bank, 1999). Likewise, the adolescent's amount of available money has also been related to the prevalence of tobacco use (Vitoria, Kremers, Mudde, Pais-Clemente, and de Vries, 2006), while increased availability of cigarettes in the family context predicted tobacco use among children (Jackson and Henriksen, 1997).

Perceived risk of harm or negative consequences has been associated with later smoking initiation (Chassin, Presson, Sherman, and Edwards, 1991; Pederson, Koval, and O'Connor, 1997), and the belief that cigarette smoking is addictive was also detected as a protective factor (Calleja and Aguilar, 2008). Other individual variables, such as body weight and concern about body weight were identified as important factors in tobacco onset among adolescents, particularly females (Larsen, Otten, and Engels, 2009; Potter, Pederson, Chan, Aubut, and Koval, 2004) More specifically, some studies have found that girls concerned about body weight has an idea of smoking as a diet strategy when depression symptoms works as a mediator variable. This findings related to smoking behavior are consistent with general studies about mood and weight loss (Annesi, 2010). At the same time other studies shown that females who perceived themselves to be either overweight or underweight were more likely to smoke. Self-esteem was detected as a smoking predictor in some studies, but the relation between this variable and tobacco use is not clear. Some studies found that low self-esteem was related to smoking in early adolescence (Engels, Hale, Noom, and de Vries, 2005; Nebot *et al.,* 2004), but other studies either failed to find a clear relation between these two variables or found an association in the opposite direction (Byrne and Mazanov, 2001; Oliva, Parra, and Sánchez-Queija, 2008; Pastor, Balaguer, and García-Merita, 2006). Furthermore, associations between peer relations and variables related to body weight and self esteem have been also found in several studies (Cunha, Relvas, and Soares, 2009; Zaitsoff, Fehon, and Grilo, 2009).

Lastly, an interesting study established a dose-response relationship between many of the above-mentioned psychosocial variables and smoking status in high school students (Pederson, Koval, McGrady, and Tyas, 1998). The implications of this study for reducing or preventing adolescent tobacco use are quite remarkable, if we are to assume that, as risk factors decrease, so will adolescent smoking, with the potential applications of this for the field of prevention.

Nevertheless, little is known about the relative influence of the aforementioned risk factors on adolescent smoking. In order to improve not only the efficacy but also the efficiency of preventive interventions, it would be useful to know which of these variables have the greatest influence on tobacco use, so as to select them as the focus of attention in prevention strategies and policies. The main goal of this *ex post facto* study (Montero and León, 2007; Ramos-Álvarez, Moreno-Fernández, Valdés-Conroy, and Catena, 2008) was to determine as accurately as possible the association of some well-known psychosocial variables and adolescent smoking in Spain.

Method

Participants

Study participants were 2,840 adolescents (52.2% males, 47.8% females) from ten high schools in Barcelona (Spain), aged 12 to 16 (M = 14.01; SD = 1.34). Response rate for the students registered at these high schools was 83.26%.

Instruments and variables

Participants were asked to complete an *ad-hoc* instrument for the assessment of tobacco use and traditional smoking risk factors (perceived availability, weekly income, perceived risk of harm, and family- and peer-use). Items were taken from the bank of assessment instruments of the European Monitoring Centre for Drugs and Addiction EMCDDA, (2008). Perceived availability was assessed on a Likert-scale ranging from 0 (*Very low availability*) to 4 (*Very high availability*). To measure weekly income, participants were asked for the amount of euros available for his/her weekly expenditure. Perceived risk of harm was assessed on a Likert-scale ranging from 0 (*Very low perceived risk*) to 4 (*Very high perceived risk*) with regard to smoking one pack of cigarettes. For family and peer tobacco use, participants were asked for smoker mother and smoker father and for tobacco use among most friends and by couple.

Participants were also asked to complete a scale to assess Drive for thinness (DT from EDI-2) (Garner, 1998) and the Rosenberg Self-esteem Scale (Rosenberg, 1965). The Eating Disorder Inventory (EDI-2) is a self-report measure of symptoms frequently related to anorexia nervosa or bulimia nervosa. The *Drive for thinness* dubscale consist of 7-item that measures excessive concern with dieting, preoccupation with weight, and the fear of gaining weight assessed on a 6-point Likert-scale. The Rosenberg Self-esteem Scale is a 10-item Likert-scale with items answered on a 4-point scale that provides unidimensional measure of global self-esteem.

Tobacco use was considered the main dependent variable. It was created and recorded as a categorical variable with 4 levels of frequency (*I smoke every day*, *I smoke two or three times per week*, *I smoke sometimes*, and *I don't smoke at all*) and then dichotomized for the statistical analyses (I smoke *vs*. I don't smoke at all). Independent variables were all the other variables referred to above.

Procedure

Data was collected by a trained psychologist during school hours, and informed consent was requested of participants and their parents through the head teacher's office at each school.

Data analysis

In order to determine psychosocial variables related to adolescent cigarette smoking, a three-step analysis was carried out. First, K-means cluster analysis (Hair, Tatham, Anderson, and Black, 1999) was performed in order to make specific adolescent context latent variables admitted as predictors: family context (smoking context *vs*. non-smoking context) and social context (smoking context *vs*. non-smoking context). After determining the smoking context variables, non-parametric tests (Chi-square and Mann-Whitney) were carried out to detect the variables related to adolescent smoking. The last step was

to quantify the relationship between tobacco use and the significant variables associated with the use of tobacco by means of a logistic regression model (Hair *et al.,* 1999). Confidence level was 95%, and the statistical package used was SPSS-15.

Results

Defining smoking context variables

Cluster analysis defined two context variables:

– Tobacco use in the adolescent's family context. This variable includes items assessing smoking (*Yes/No*) by the adolescent's father and mother. With this variable we classified the sample of adolescents according to tobacco use in his/her family context: non-smoking family context: the adolescent's parents are non-smokers (69.2%) *vs*. smoking family context: the adolescent's parents are smokers (30.8%).

– Tobacco use in the adolescent's social context. This variable includes items assessing smoking by the adolescent's partner (*Yes/No*) and peers (*Most of them smoke*, *Half of them smoke*, and *Most of them don't smoke*). With this variable we classified the sample of adolescents according to tobacco use in his/her social context: non-smoking social context: the adolescent's partner does not smoke and most of his/her friends do not smoke (65.7%) *vs*. smoking social context: the adolescent's partner smokes and most of his/her friends are smokers (34.3%).

Detecting the variables related to adolescent smoking

In order to identify the variables related to adolescent smoking (19.1%) we used non-parametric tests. These tests showed significant statistical relationships between tobacco use and age, gender (boys were less likely to be non-smokers), family context, social context, weekly income, perceived availability and perceived risk of harm ($p < .05$). The other predictive variables considered (self-esteem and drive for thinness) were not relevant ($p > .05$).

TABLE 1. Variables related to adolescent smoking.

	Smokers (n = 543)	*Non-smokers (n = 2,297)*	*p-value*
Age (Years)[a]	14.82 ± 1.22	13.82 ± 1.29	.000
Gender (Men)[b]	47.7	53.2	.02
Family context[b] (Non-smoking context)	55.8	72.3	.000
Social context[b] (Non-smoking context)	32.3	81.3	.000
Weekly income (€)[a]	15.57 ± 12.37	11.21 ± 9.14	.000
Perceived availability[b] (Easy availability)	93.0	72.8	.000
Perceived risk of harm[b] (Non-risk)	4.2	1.1	.000
Self-esteem[a]	7.75 ± 0.50	7.76 ± 0.45	.99
Drive for thinness[a]	5.07 ± 5.71	4.50 ± 5.08	.45

Note. [a] Mean ± Standard Deviation; [b] Percentage.

Quantifying the relationship between tobacco use and the significant variables

With the aim of quantifying the influence of the main predictive variables on adolescent smoking, a logistic regression analysis was performed. The dependent variable was use of tobacco (Yes = 0/No = 1). Age, gender, family context (Smoking context/Non-smoking context), social context (Smoking context/Non-smoking context), weekly income (€), perceived availability (Easy/Hard), and perceived risk of harm (Risk/Non-risk) were considered as independent variables.

Table 2 shows the estimation of the logistic model. Gender, weekly income, perceived availability, and perceived risk of harm are not present because these variables were not statistically significant in the multivariate analysis (logistic analysis) ($p > .05$).

TABLE 2. Estimation of the logistic model for not smoking.

	B	*Wald Contrast*	*df*	*p-value*	*Exp(B)*
Family context[a]	0.44	5.46	1	.019	1.55
Social context[a]	1.94	103.52	1	.000	7.01
Age	-0.24	11.67	1	.001	0.78
Constant	2.85	7.14	1	.008	17.35

Note. [a]Non-smoking context

Note that smoking in the adolescent's social context is the most determinant variable for tobacco use [*Exp(B)* = 7.01]. Living in a smoking social context increases the probability of smoking. The rest of the variables included in the model (age and family context) showed a smaller influence on tobacco use [*Exp(B)* = 1.55 and *Exp(B)* =0.78, respectively].

The logistic regression model allows us to compute the probability of smoking as a function of the adolescent's social context, family context and age. The estimated model expression to compute the probability is:

$$P(Smoking)=1-\frac{Exp(2.854 + 0{,}444 * Family\ Context\ (Non\text{-}smoking) + 1948 * Social\ Context\ (Non\text{-}smoking) - 2.854 * Age)}{1 + Exp(2.854 + 0{,}444 * Family\ Context\ (Non\text{-}smoking) + 1948 * Social\ Context\ (Non\text{-}smoking) - 2.854 * Age)}$$

In accordance with this model, Table 3 shows the probability that an adolescent aged 12 to 16 will smoke when living in a smoking and in a non-smoking context (family and social context), respectively. As expected, the probability of smoking increases with age in both the smoking and non-smoking context, but having a social and family smoking context increases the likelihood of smoking by 15% for all ages.

TABLE 3. Probability of smoking by age and context.

	Probability of smoking (%)	
Age (years)	Smoking context	Non-smoking context
12	51.8	36.2
13	57.8	42.0
14	63.6	48.0
15	69.1	54.1
16	74.0	60.1

The goodness of fit of the logistic model is revealed by the Chi-square test (χ^2 = 180.11; $p < 0.001$), by the Hosmer-Lemeshow test (χ^2 =10.90; $p = .20$) and by the predictive efficacy of the model, which reached 77.5%.

Discussion

The purpose of this study was to determine the influence on adolescent smoking of several psychosocial variables that have shown an association with it in previous studies. The logistic regression analysis showed that the adolescent's social context (tobacco use among the group of friends as well as by his or her partner) appears to be the most influential variable for adolescent smoking. These results are in the line of previous studies showing social disapproval as the main variable affecting smoking behavior (MacPherson and Myers, 2010). Other traditional risk factors for adolescent smoking, such as tobacco use among parents and age, also showed some link to it, but this influence was less determinant than social context. These findings confirm the results of previous studies analyzing the differential influence of parents and peers on tobacco use (Bauman, Carver, and Gleiter, 2001; Nasim, Belgrave, Corona, and Townsend, 2009; Webster, Hunter, and Keats, 1994).

As can be seen in the results section, the adolescent's social and family context may predict the likelihood of using tobacco. More specifically, the probability that adolescents living in a smoking context will be smokers is 15% higher than that for those living in a non-smoking context. Other variables, such as weekly income, drive for thinness or self-esteem were included in the study because previous studies found some relation between them and smoking. Nevertheless, these variables were discarded because they did not reach statistical significance in the logistic analysis.

The implication of this study for intervention is that strategies aimed at reducing tobacco use among adolescents should focus on the most proximal context (parents, peers and partner), and not only on reducing risk factors but also on increasing protective factors. As noted above, it would appear that protective social and family contexts have a strong influence on not smoking. Increasing protective factors in non-specific health promotion programs as well universal and selective preventive strategies (Gordon, 1987) could contribute to reducing tobacco use in this population before the problem starts. Furthermore, the social context in our study was empirically defined as peer and partner smoking, so that interventions in school and community settings that

focus on groups of peers and even on young couples may also be effective. The knowledge of these variables may increase working and therapeutic alliance between the adolescents and the professionals applying specific interventions (Auerbach, May, Stevens, and Kiesler, 2008).

Despite the breadth of the sample, its geographical source was somewhat restricted, and this aspect could be improved upon with a view to reaching a more generalizable conclusion; for example, the study could be replicate with samples from other countries. Nevertheless, previous studies that have examined risk and protective factors for tobacco and other drug use seem to obtain similar patterns, at least in developed countries (Ciairano, Bosma, Miceli, and Settanni, 2008; Kelly and Jackson-Carroll, 2007; Nebot *et al.,* 2004; Schepis and Rao, 2005; Secades-Villa, Fernandez-Hermida, and Vallejo-Seco, 2005; Tyas and Pederson, 1998).

Another interesting future line of research would be the study of age differences in the factors that influence smoking. Studies about changes in health-related variables across ages could help to prevent decreases in healthy behaviors as age increases (Ramos, Moreno, Rivera, and Pérez, 2010). Specifically, peer influence in adolescence could be more important than perceived risk of harm, but the relative influence of these two variables may become reversed over time, and negative consequences may have greater impact on older adults than on adolescents. Furthermore, it would be interesting for future studies to include the analysis of the influence of other protective factors such as alternative reinforcers to smoke, complementary activities for smoking, and individual differences in the reinforcing value of smoking (Audrain-McGovern *et al.,* 2004).

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Received March 19, 2010
Accepted September 24, 2010