

Gender differences in susceptibility to smoking among high school students

Esperanza Santano-Mogena^{1,2}  | Cristina Franco-Antonio^{1,2}  | Sergio Cordovilla-Guardia^{1,2} 

¹Nursing Department, Nursing and Occupational Therapy College, Universidad de Extremadura, Cáceres, Spain

²Health and Care Research Group (GISyC), Universidad de Extremadura, Cáceres, Spain

Correspondence

Cristina Franco-Antonio, Nursing Department, Nursing and Occupational Therapy College, Universidad de Extremadura, Cáceres, Spain.
Email: cfrancox@unex.es

Funding information

Programa operativo FEDER Extremadura (2014–2020) y Fondo Europeo de Desarrollo General (FEDER), Grant/Award Number: GR21010

Abstract

Aims: To analyse the degree of susceptibility to smoking according to gender in students between 12 and 16 years of age and study the role of factors associated with gender and the extended index of susceptibility to smoking.

Design: Cross-sectional study.

Methods: Between November 2019 and March 2020, 12- to 16-year-old students were recruited from three educational centres in western Spain. Sociodemographic, environmental, social and personal variables were analysed. The value of the extended index of susceptibility to smoking was calculated, and the associations between the students' genders and smoking susceptibility were studied. Multinomial logistic regression was used to study associations between the independent variables and Expanded Susceptibility Index (ESSI) results. The roles of factors in this association were explored through mediation analysis.

Results: A total of 364 students participated in the study (53% females). A total of 79.3% of females and 61.4% of males presented a medium-high level of the extended index of susceptibility. Females reported greater cigarette use (28% vs. 12.3%), hookah (19.9% vs 9.9%) and alcohol consumption (20.7% risk alcohol consumption). They obtained higher scores on the impulsivity scale in the urgency domain and the negative affect scale. Regardless of other factors, females showed more than double the smoking susceptibility (aOR: 2.05, 95% CI: 1.03–4.07, $p = .041$). Mediation analysis showed that gender had a total effect on the extended susceptibility index $\beta = .023$ (95% CI: 0.07–0.38, $p = .01$). The effect appeared to be mediated only by having smoking friends (0.08; 95% CI: 0.03–0.15, $p = .001$).

Conclusions: The greater susceptibility to smoking found in females may be related to a greater influence of smoking among friends.

Impact: These results show that smoking friends have a strong influence among adolescent females; therefore, developing preventive programmes with gender approaches aimed at reducing the influence of these environmental factors would be of interest.

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial-NoDerivs](https://creativecommons.org/licenses/by-nc-nd/4.0/) License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2022 The Authors. *Journal of Advanced Nursing* published by John Wiley & Sons Ltd.

KEYWORDS

Adolescent, femalegendergender perspectivemalepublic health nursingschool
nursingsmokingsusceptibilitytobacco products

1 | INTRODUCTION

The consumption of cigarettes and other products continues to be a major public health problem (Reitsma et al., 2017; US Department of Health and Human Services, 2016) and a health priority (World Health Organization, 2019) because smoking is one of the main causes of preventable deaths worldwide (Reitsma et al., 2017; US Department of Health and Human Services, 2016). Important initiatives have been undertaken to reduce the number of smokers, such as those implemented in the MPOWER plan (World Health Organization, 2008). This initiative includes six proven measures to combat the tobacco epidemic (monitoring tobacco use, protecting people from tobacco smoke, quitting tobacco, warning about the dangers of tobacco and sponsorship bans, and raising taxes on tobacco). However, despite these efforts, tobacco use worldwide remains high (Reitsma et al., 2021), with a global age-standardized smoking prevalence among those aged 30 years and older of 19.4% (95% UI 19.2–19.6) in 2016 (Foreman et al., 2018). According to the Health Behaviour in School-Aged Children (HBSC) report, among young people and adolescents, the prevalence is approximately 15% (Zaborskis et al., 2021), which has led to the suggestion that although measures aimed at the general population have been effective for reducing smoking, a focus on developing strategies directed towards at-risk populations seems to be a coherent approach (Owen et al., 2018).

Smoking presents gender differences, with more men starting to smoke and continuing to do so (Wang et al., 2019). Globally, the smoking prevalence among men is four times higher than that among women (West, 2017); however, this gender gap seems to be narrowing in other age groups. Among adolescents, the gender difference is smaller (Higgins et al., 2015; US Department of Health and Human Services, 2012), extending from a male:female ratio of 1.38 among adult smokers to 1.07 among smokers between 12 and 15 years (Higgins et al., 2015). In Spain, among adolescents between 14 and 18 years of age, more girls than boys smoke on a daily basis (10.3% vs. 9.4%; Ministerio de Sanidad Consumo y Bienestar Social, 2020). Following the current trend, some studies suggest that in the coming decades, 12% of the global female population will be smokers (World Health Organization. Department of Gender, W. and Health., Tobacco Free Initiative (World Health Organization), & International Development Research Centre (Canada), 2007).

1.1 | Background

Adolescence is a crucial stage in human development during which unhealthy behaviours usually debut (Reyna & Farley, 2006).

Most smokers start smoking during this period (Patel et al., 2017). Extensive knowledge of the factors related to smoking in adolescents is available. These factors are associated with changes in intentionality and self-efficacy and are grouped into the following categories: sociodemographic variables, such as age, gender and family socioeconomic level; environmental-social factors, such as smoking in the household and social environment and peer pressure; and a lower perception of risk and certain personality traits, such as impulsivity and affectivity (Cole et al., 2019; O'Loughlin et al., 2009; Trinidad et al., 2017).

Before a person first smokes, he or she develops a set of cognitions related to smoking, including susceptibility to smoking (SS) and curiosity (Choi et al., 2001; Pierce et al., 2005). These cognitions increase the probability that adolescents will experience smoking in the future (Pierce et al., 1996). To assess SS, a brief questionnaire was developed to collect data about behavioural intention, the influence of the social environment and the expected self-efficacy to decline a cigarette if offered (Pierce et al., 1996). Susceptible adolescents with high-risk cognitions, such as intention and self-efficacy expectations, are more likely to start smoking than nonsusceptible adolescents (Choi et al., 2001; Nodora et al., 2014; Pierce et al., 2005); thus, these cognitions are considered predictors of smoking initiation and an important proxy for current use (Bold et al., 2018; Choi et al., 2001; Nodora et al., 2014; Pierce et al., 1996; Stone et al., 2017; Strong et al., 2015). Almost half of the adolescents were classified as susceptible to smoking according to the original index (SS) (Strong et al., 2015). Recently, the measure of SS has been reinforced with the added measurement of curiosity towards smoking (Nodora et al., 2014); the new scale that was generated is called the Expanded Susceptibility Index (ESSI; Strong et al., 2015). The ESSI classified two-thirds of young teenagers as susceptible to smoking. The enhanced index showed a sensitivity of 79% (Strong et al., 2015). The ESSI seems to have an improved baseline predictive value compared with SS alone (Coreas et al., 2021; Strong et al., 2015).

Some studies have reported differences by gender in smoking initiation and susceptibility. The results of two longitudinal studies concluded that SS presented a unique pattern of development between the ages of 11 and 18 years (Kamke et al., 2020): at approximately 14 years old, one-third of the participants were susceptible to smoking (El-Toukhy et al., 2016; Kamke et al., 2020), and girls had the highest levels of susceptibility (Kamke et al., 2020). Smoking in the social and household environments has an important influence on smoking initiation. Socially, the influence is governed by interpersonal relationships, and the results of a review suggest that the normative reference groups closest to the adolescent seem to exert a greater influence on both initiating and maintaining the habit (Liu

et al., 2017); furthermore, having friends who smoke increases the likelihood that adolescents will start and continue to smoke (Ennett et al., 2006; Liu et al., 2017), promotes access to the product and improves the perception of cigarettes as an accessible product. These are associated with having the intention and willingness to smoke among girls (Epperson et al., 2021). Although exposure to household smoking affects both genders, some results suggest that the influence seems greater among girls (Okoli et al., 2013).

Ample evidence supports the relationship between the trait of impulsivity, which is understood as the tendency to act hastily or without thinking, and risk behaviours such as smoking (Kale et al., 2018; Mathew et al., 2015; Roys et al., 2016). Although the gender differences that were found were weak (Cross et al., 2011), they show a higher level of impulsivity than girls but a lower level of sensation seeking (Kong et al., 2013). Of the dimensions that comprise impulsivity, sensation seeking has been associated with experimentation and cigarette smoking (Doran et al., 2011; Kong et al., 2013).

The states of positive and negative affect seem to be closely related to smoking (Heinz et al., 2010; Miller et al., 2020; Veselska et al., 2011). A higher baseline negative affect score increases the probability of progressing to smoking (Audrain-McGovern et al., 2015). Many adolescents report a reduction in negative affect after smoking a cigarette (Kassel et al., 2007), while positive affectivity has been associated with habitual smoking (Veselska et al., 2011). According to the results of longitudinal research on high school students in the USA, lower scores for positive affect in middle adolescence predicted smoking initiation and progression only among girls, while negative affect predicted smoking initiation regardless of gender (Audrain-McGovern et al., 2015).

School is one of the places where teenagers spend the most time. School-based health services may be one of the best options for reaching adolescents (Williams & Dickinson, 2017). The school nurse provides care for students in several health areas, including sexual and reproductive health, nutrition, mental health and substance use (Baltag et al., 2015). These interventions have a positive impact on adolescents' health (Best et al., 2021), in addition to promoting equitable access to health care and reducing health inequalities (Mason-Jones et al., 2012; Parasuraman & Shi, 2015).

In the Spanish adolescent population, females have presented a greater prevalence of tobacco consumption since 1994 (Ministerio de Sanidad Consumo y Bienestar Social, 2020). According to a survey on drug use in secondary education, in 2018, 29.3% of female teenagers had smoked in the last month vs. 23.9% of male teenagers (Ministerio de Sanidad Consumo y Bienestar Social, 2020). A recent study by (Santano-Mogena et al., 2021) found that approximately half of the adolescents had a medium or high SS and reported that living with smokers, having friends who smoke, consuming alcohol and being impulsive were associated with the highest ESSI. However, no analysis that has differentiated the factors associated with greater SS by gender has been carried out. Identifying these factors would allow the development of specific interventions before an adolescent starts smoking.

2 | THE STUDY

2.1 | Aims

The aims of this study were as follows:

- To determine gender differences in the degree of SS in adolescents between 12 and 16 years of age.
- To identify the sociodemographic, environmental and intrapersonal factors that are associated with a higher ESSI in this age group.
- To study, through mediation analysis, the direct and indirect effects of gender on ESSI scores and the mediating roles of the different factors.

2.2 | Design

A multicentre, cross-sectional study was carried out with students in their second to fourth years (12–16 years old) of compulsory secondary education (high school) at three of the seven educational centres in the second largest city in western Spain.

2.3 | Participants and data collection

Students were recruited between November 2019 and March 2020. A list of all schools was entered into the computer software, and three schools were randomly selected. Once authorization was obtained from the school board, and all students enrolled in the second (13–14 years), third (14–15 years) and fourth (15–16 years) years of high school were invited to participate in the study. The beginning of the school year does not coincide with the calendar year; in the second year, some students were 12 years old. Informed consent was requested from the parents, guardians or legal representatives of the students by sending letters. Students for whom informed consent was obtained were required to complete a computer-assisted, self-administered questionnaire.

Questionnaire completion was voluntary, and during this process, a researcher from the project was available to assist and answer any of the students' questions.

2.4 | Ethical considerations

The research protocol was approved by the internal review board of the university (Cod. 187/2019). All participants were informed of the objectives of the study and the research methods involved and were all asked to provide signed written informed consent from their parents, guardians or legal representatives before participating. The participation of the students was voluntary, and they were free to withdraw or refuse to participate at any time. The researchers assured the absence of coercion and the privacy and confidentiality

of the data and confirmed that these data would be used only for research purposes.

2.5 | Measures

2.5.1 | Main study variable

The ESSI evaluates the parameters SS and curiosity, which have been shown to be important predictors of the initiation of smoking and an important proxy for current use. (Nodora et al., 2014; Pierce et al., 1996, 2005). The instrument developed by Pierce was used to assess SS (Pierce et al., 1996). This scale consists of the following questions: (i) "Do you think you will try cigarettes in the future?", (ii) "Do you think you will smoke a cigarette in the next year?" and (iii) "If one of your best friends were to offer you a cigarette, would you smoke it?". Four response options were established, ranging from "Definitely not" to "Definitely yes". Those students who answered "Definitely not" to all of the questions were classified as "not susceptible", those who answered "Probably yes" or "Definitely yes" to any of the three questions were classified as "highly susceptible", and the rest were classified as "susceptible" (Nodora et al., 2014). This scale has an internal reliability (Cronbach's alpha) of 0.72 (Pierce et al., 2005).

Curiosity was assessed with the question "Have you ever been curious about smoking cigarettes?" A range of four response options was established, from "Definitely not" to "Definitely yes". Based on their responses, participants were classified as "not curious" ("Definitely not"), "curious" ("Probably not") or "highly curious" ("Probably yes" or "Definitely yes" Pierce et al., 2005).

From the SS and curiosity data, the ESSI was calculated. The scoring for SS was as follows: 0: not susceptible, 1: susceptible and 2: highly susceptible; the same pattern was used to score curiosity. The scores for the two predictors (SS and curiosity) were summed to obtain the ESSI score (from 0 to 4 points), and the participants were classified based on their scores into nonsusceptible (0 points), susceptible (1–2 points) and highly susceptible (3–4 points) groups. This index presents an internal reliability (Cronbach's alpha) of .74 (Pierce et al., 2005).

2.5.2 | Independent variables

The sociodemographic variables age (years), gender (male/female/no answer), school year, household composition and parents' education level.

(none/primary/secondary/university) were collected (Ministerio de Sanidad Servicios Sociales e Igualdad, 2018a). The Family Affluence Scale (FASII) was used to assess socioeconomic status (Currie et al., 2008) because it is an additional measure of the traditional socioeconomic indicator. Each of the four items of the scale is assigned a score. Based on the summed scores, family affluence is considered low when the score is 0–2 points, medium when it is 3–5 points and high when it is 6–9 points. The Spearman rank correlation

between the FAS II and gross domestic product was 0.87 (Boyce et al., 2006).

Smoking was assessed using two questions: "Have you ever tried to smoke or tried a cigarette, even just a few puffs?" (U.S. Department of Health and Human Services, 1994). If the answer was yes, a second question was asked: "Have you ever smoked cigarettes? If all you did was take a few puffs of someone else's cigarette, please do not respond 'yes'" (Ministerio de Sanidad Servicios Sociales e Igualdad, 2018b). The age at which the person first experimented and started smoking and the frequency of cigarette and other tobacco product consumption in the last 30 days were also determined (Ministerio de Sanidad Servicios Sociales e Igualdad, 2018a).

Smoking in the participant's household and social environment was evaluated by asking about the smoking habits of each member of the household and how many of the participant's five best friends smoked. The perception of smoking in the household and among friends and classmates was assessed with the following question: How many (members of your household/friends/classmates) smoke? A five-option response scale was used (1 = "almost everyone" to 5 = "almost nobody") (Cremers et al., 2015). Exposure to second-hand smoke in the household over the previous 7 days and offers to smoke in the past 30 days were also assessed (Cole et al., 2019).

The consumption of alcoholic beverages and other substances in the previous 30 days was assessed using the Timeline Follow-back (TIFB) method (Sobell & Sobell, 1992), and the Alcohol Use Disorders Identification Test (AUDIT-C) scale was used to assess whether alcohol consumption was problematic. In the adolescent population, this scale has an internal consistency (Cronbach's alpha) of .82 (Rial Boubeta et al., 2017).

Impulsivity and affectivity were assessed using the UPPS-P impulsive behaviour scale and Positive and Negative Affective Scale (PANAS), respectively. The UPPS-P assesses four factors related to impulsivity: urgency, lack of perseverance, lack of premeditation and sensation seeking. The scale is composed of 20 items with five-point Likert-type responses. In the adolescent population, the scale has an internal reliability (Cronbach's alpha) >.7 (Herdoiza-Arroyo & Chóliz, 2018). The PANAS is composed of 20 items, half of which assess positive affect and the other half of which assess negative affect. In the adolescent population, this scale has an internal reliability (Cronbach's alpha) for positive affect of 0.73 for boys and 0.72 for girls; for negative affect, the internal reliability is 0.74 for boys and 0.75 for girls (Sandín, 2003).

2.6 | Data analysis

The descriptive analyses allowed us to verify the distribution of variables throughout the entire sample. For quantitative variables with a normal distribution and when the median and interquartile range [IQR] were not used, the mean and standard deviation (\pm SD) were used as measures of central tendency and dispersion. To compare quantitative variables with a normal distribution between groups, Student's *t* test was used; the Mann–Whitney *U* test was used when

the variables did not have a normal distribution. Pearson's chi-square test was used to compare categorical variables. To analyse the ESSI results, multinomial logistic regression was used. Two models were developed in which the dependent variable was categorized into three levels (nonsusceptible, susceptible and highly susceptible), and the other variables were independent. From these analyses, the crude odds ratio (cOR) and adjusted odds ratio (aOR) and their respective 95% confidence intervals (CIs) were obtained.

Third, to study the role of the different factors identified in the literature in the association between gender and SS, two mediation models were designed according to the methodology described by Hayes (2013) and Hayes and Rockwood (2017). In Model 1, the effect of gender on ESSI scores was studied by introducing the different dimensions of impulsivity (UPPS-P) and affectivity (PANAS) as mediators and introducing age, parents' education level, the consumption of alcohol and/or other drugs and the influences of consumption in the environment (living with smokers, having friends who are smokers and smoking among classmates) as covariables in the model. In Model 2, the effect of gender on the ESSI scores was analysed by introducing the variables related to smoking in the environment as mediators and age, parents' education level, the consumption of alcohol and/or other drugs and the different dimensions of the UPPS-P and PANAS as covariates.

All analyses were performed using SPSS Statistics for Windows, Version 24.0, released in 2016 by IBM Corp (Armonk, NY: IBM Corp.). The mediation model was analysed using the PROCESS macro for SPSS (Hayes & Rockwood, 2017). Percentile confidence intervals (CIs) were estimated for the indirect effects based on 5000 bootstrap samples of the data (Hayes & Rockwood, 2017).

2.7 | Validity and reliability

To improve the validity and reliability of the data, the measurement scales used had been validated in Spanish and had good reliability, as described in the previous section. During data collection, the students were accompanied by a trained researcher who previously reported on the variables collected in the questionnaire. This researcher remained in the class during data collection to resolve any doubts.

After data collection, all data were carefully examined and imported into SPSS. Missing data and outliers were assessed.

3 | RESULTS

A total of 488 students were contacted, and 436 (89.3%) obtained informed consent from their parents. At the time of questionnaire completion, 19 (4.4%) indicated that they did not want to participate; of the remaining participants, 16 (3.8%) did not complete the questionnaire, and 24 (5.7%) were eliminated from the analysis due to inconsistencies. Of the 377 participants with valid questionnaires, 13 (3%) did not want to report their gender. The final sample consisted

of 364 students, 171 of whom (47%) were male, while 193 (53%) were female. The mean age in years was 15 [14–15], with no differences according to gender ($p = .184$).

In terms of household composition, most of the participants lived with one of their two parents (357 [98.1%]), and 301 (79.6%) had siblings. Regarding the parents' education level, 269 (76.9%) mothers and 226 (70.9%) fathers had a high school or university education. A large majority of the students (354, 97.3%) reported having a medium-high level of family affluence (Table 1).

With respect to SS and curiosity, 217 (59.6%) participants were classified as susceptible or highly susceptible, and 209 (57.4%) were classified as curious or highly curious. When compared by gender, 128 (66.3%) and 130 (67.4%) females presented some degree of SS and curiosity, respectively, compared with 89 (52.1%) and 95 (46.2%) males ($p < .001$). As a result, a higher percentage of female adolescents (96 [49.7%]) than male adolescents (57 [33.3%]) were categorized as highly susceptible based on their ESSI scores ($p < .001$). About the consumption of cigarettes, related products and drugs, more women than men reported that they had smoked cigarettes (28.0% vs. 12.3%) ($p < .001$) or hookahs (19.7% vs. 9.9%) ($p = .01$) and had consumed alcohol (49.2% vs. 33.3%; $p = .020$) in the previous 30 days. Among those who had consumed alcohol, a greater number of girls than boys (20.7% vs. 7.6%; $p < .001$) scored positively on the screening test for risky alcohol consumption (AUDIT-C).

Females reported higher percentages of smoking by other members of the household (Table 2), although the differences were significant only for the category "other cohabitants" (64.7% vs. 42.9%; $p = .035$). They also perceived more smoking in the household environment (66.8% vs. 52%; $p = .035$), although no differences were found in exposure to second-hand smoke during the previous 7 days. In addition, smoking in the most immediate social environment (the individual's five best friends) was higher among females, and only 71 (36.8%) of them reported that none of their five best friends smoked compared with 98 (56.7%) males ($p < .001$). Females received more offers to smoke (47.2% vs. 32.7%; $p = .005$); however, no differences were observed in the perception of smoking among classmates ($p = .153$).

For impulsivity, the girls obtained an average score on the urgency dimension of 23.1 (± 5.4) compared with 22.0 (± 4.9) for the boys ($p = 0.041$); on the sensation-seeking dimension, females obtained an average score of 12.0 (± 4.5) compared with 14.0 (± 4.2) for males ($p < .001$). For affectivity, the girls obtained lower scores for positive affect, with a median of 24 [22–26], than the boys, who had a median score of 25 [23–27] ($p = .023$); furthermore, they scored higher in negative affect and had higher overall PANAS scores, 21 [18–23] and 45 [42–47], respectively; in comparison, the male scores were 19 [17–21] ($p < .001$) and 44 [40–47] ($p = .026$), respectively.

3.1 | Correlations between study variables

As the results of the multivariate analyses show (Table 3), positive magnitudes of association between female gender and the ESSI

TABLE 1 Distribution of sociodemographic and consumption variables for the entire sample and by reported gender

	Total (n = 364)	Boys (n = 171)	Girls (n = 193)	p
Age Median [IQR]	15 [14–15]	14 [14–15]	15 [14–15]	.184 ^a
Household composition n (%)				
Mother	350 (96.6)	164 (95.9)	186 (96.4)	.817 ^b
Father	319 (87.6)	152 (88.9)	167 (86.5)	.495 ^b
Mother or father	357 (98.1)	167 (97.7)	190 (98.4)	.586 ^b
Siblings	291 (79.9)	136 (79.5)	155 (80.3)	.853 ^b
Grandparents	138 (37.9)	70 (40.9)	68 (35.2)	.263 ^b
Other cohabitants	95 (25.5)	42 (24.6)	51 (26.4)	.684 ^b
Mother's education (n = 350) n (%)				
University	149 (42.6)	73 (44.4)	76 (40.9)	
Secondary	120 (34.3)	56 (34.1)	64 (34.4)	.892 ^b
Primary/none	81 (23.2)	35 (21.3)	46 (24.7)	
Father's education (n = 319) n (%)				
University	115 (36.1)	59 (38.8)	56 (33.5)	
Secondary	111 (34.8)	52 (34.2)	59 (35.3)	.784 ^b
Primary/none	93 (29.1)	41 (27.0)	52 (31.1)	
Socioeconomic status n (%)				
Low	10 (2.7)	6 (3.5)	4 (2.1)	
Medium	127 (34.9)	63 (36.8)	64 (33.2)	.493 ^b
High	227 (62.4)	102 (59.6)	125 (64.8)	
Susceptibility to smoking n (%)				
Non-susceptible	147 (40.4)	82 (48.0)	65 (33.7)	
Susceptible	92 (25.3)	48 (28.1)	44 (22.8)	<.001 ^b
Highly susceptible	125 (34.3)	41 (24.0)	84 (43.5)	
Curiosity n (%)				
Not curious	155 (42.6)	92 (53.8)	63 (32.6)	
Curious	41 (11.3)	19 (11.1)	22 (11.4)	<.001 ^b
Highly curious	168 (46.2)	76 (35.1)	108 (56.0)	
Expanded susceptibility to smoking index				
n (%)	106 (29.1)	66 (38.6)	40 (20.7)	
Low	105 (28.8)	48 (28.1)	57 (29.5)	<.001 ^b
Medium	153 (42.0)	57 (33.3)	96 (49.7)	
High				
Use in previous 30 days n (%)				
Cigarettes	75 (20.6)	21 (12.3)	54 (28.0)	<.001 ^b
E-cigarettes	35 (9.6)	12 (7.0)	23 (11.9)	.114 ^b
Hookahs	55 (15.1)	17 (9.9)	38 (19.7)	.01 ^b
Cannabis	27 (7.4)	10 (5.8)	17 (8.8)	.282 ^b
Other drugs	28 (7.7)	12 (7.0)	16 (8.3)	.646 ^b
Alcoholic beverage use n (%)				
Never	212 (58.2)	114 (66.7)	98 (50.8)	
Once a month or less	91 (25.0)	36 (21.1)	55 (28.5)	.020 ^b
2–4 times a month	52 (14.3)	19 (11.1)	33 (17.1)	
2–3 times a week or more	9 (2.5)	2 (1.2)	7 (3.6)	
Audit-C test n (%)	53 (14.6)	13 (7.6)	40 (20.7)	<.001 ^b

Abbreviations: Audit-C, Alcohol Use Disorders Identification Test-Consumption; RIC, Interquartile range.

^aMann-Whitney U test.

^bPearson Chi-square test.

TABLE 2 Perception of smoking in the household and social environment. Impulsivity and affectivity

	Total (n = 364)	Boys (n = 171)	Girls (n = 193)	p
Cigarette smoking in the household n (%)				
Mother (n = 350)	92 (25.3)	41 (25.0)	51 (27.4)	.608 ^a
Father (n = 319)	83 (26.0)	34 (22.4)	49 (29.3)	.156 ^a
Siblings (n = 291)	56 (19.2)	22 (16.2)	34 (21.9)	.219 ^a
Grandparents (n = 138)	21 (15.2)	8 (11.4)	13 (19.1)	.209 ^a
Other cohabitants (n = 93)	51 (54.8)	18 (42.9)	33 (64.7)	.035 ^a
Perception of household smoking n (%)				
Almost no one	146 (40.1)	82 (48.0)	64 (33.2)	.031 ^a
Less than half	69 (19.0)	33 (19.3)	36 (18.7)	
Half	37 (10.2)	14 (8.2)	23 (11.9)	
More than half	55 (15.1)	19 (11.1)	36 (18.7)	
Almost everyone	57 (15.7)	23 (13.5)	34 (17.6)	
Exposure to second-hand smoke in the home (in the previous 7 days) n (%)				
None	246 (67.6)	122 (71.2)	124 (64.2)	.689 ^a
1-2 days	31 (8.5)	12 (7.0)	19 (9.8)	
3-4 days	18 (4.9)	8 (4.7)	10 (5.2)	
5-6 days	7 (1.9)	3 (1.8)	4 (2.1)	
All 7 days	62 (17.0)	26 (15.2)	36 (18.7)	
Smoking among the five best friends n (%)				
No one	168 (46.2)	97 (56.7)	71 (36.8)	.001 ^a
1 friend	45 (12.4)	20 (11.7)	25 (13.0)	
2 friends	36 (9.9)	18 (10.5)	19 (9.3)	
3 friends	50 (13.7)	18 (10.5)	32 (16.6)	
4 friends	31 (8.5)	7 (4.1)	24 (12.4)	
Everyone	34 (9.3)	11 (6.4)	23 (11.9)	
Perception of classmate smoking n (%)				
Almost no one	125 (34.3)	68 (39.8)	57 (29.5)	.153 ^a
Less than half	149 (40.9)	70 (40.9)	79 (40.9)	
Half	50 (13.7)	19 (11.1)	31 (16.1)	
More than half	20 (8.0)	10 (5.8)	19 (9.8)	
Almost everyone	11 (3.0)	4 (2.3)	7 (3.6)	
Offers to smoke n (%)	147 (40.4)	56 (32.7)	91 (47.2)	.005 ^a
UPPS-P impulsivity scale Mean (SD)				
Urgency	22.6 (±5.2)	22.0 (±4.9)	23.1 (±5.4)	.041 ^b
Sensation seeking	12.9 (±4.4)	14.0 (±4.2)	12.0 (±4.5)	<.001 ^b
Lack of perseverance	8.14 (±2.7)	8.0 (±2.5)	8.3 (±2.9)	.487 ^b
Lack of premeditation	9.9 (±3.1)	10.1 (±3.0)	9.7 (±3.2)	.165 ^b
Total	53.6 (±9.4)	54.1 (±8.9)	53.1 (±9.8)	.297 ^b
PANAS affectivity scale				
Median [IQR]				
Positive affect	24 [22-26.8]	25 [23-27]	24 [22-26]	.023 ^c
Negative affect	20 [18-22]	19 [17-21]	21 [18-23]	<.001 ^c
Total	44 [42-47]	44 [40-47]	45 [42-47]	.026 ^c

Abbreviations: IQR, Interquartile range; PANAS, Positive and Negative Affect Scale; SD, Standard deviation. UPPS-P, Impulsive behaviour scale.

^aPearson Chi-square test.

^bStudent's *t*-test.

^cMann-Whitney *U* test.

TABLE 3 Multivariate analysis of sociodemographic variables, social factors, consumption of other substances and intrapersonal factors

	Expanded smoking susceptibility index (ESSI)							
	Susceptible				Highly susceptible			
	cOR (95% CI)	p	aOR ^a (95% CI)	p	cOR (95% CI)	p	aOR ^a (95% CI)	p
Gender								
Male	1.00 Ref.		1.00 Ref.		1.00 Ref.		1.00 Ref.	
Female	1.96 (1.13–3.39)	.016	1.79 (0.96–3.32)	.067	2.78 (1.67–4.63)	<.001	2.05 (1.03–4.07)	.041
Age (1-year increase)	1.13 (0.89–1.44)	.314	1.04 (0.79–1.37)	.756	1.57 (1.26–1.96)	<.001	1.19 (0.89–1.61)	.244
Parents' education								
<College graduation	1.00 Ref.		1.00 Ref.		1.00 Ref.		1.00 Ref.	
>College graduation	1.53 (0.78–3.01)	.220	0.93 (0.434–2.01)	.860	1.61 (0.86–3.02)	.133	0.63 (0.27–1.43)	.266
Social factors (increase in 1 smoker in the family or social environment)								
Family members	1.35 (0.98–1.88)	.068	1.14 (0.79–1.65)	.482	2.07 (1.53–2.78)	<.001	1.38 (0.95–2.02)	.094
Close friends	1.39 (1.10–1.74)	.005	1.36 (1.04–1.77)	.023	2.340 (1.88–2.91)	<.001	1.98 (1.53–2.57)	<.001
Classmates	1.03 (0.77–1.37)	.833	0.91 (0.66–1.26)	.569	1.43 (1.11–1.84)	.005	1.06 (0.76–1.50)	.713
Consumption of alcohol or other drugs								
No	1.00 Ref.		1.00 Ref.		1.00 Ref.		1.00 Ref.	
Yes	3.09 (0.32–30.18)	.332	2.92 (0.24–35.61)	.401	19.53 (2.60–146.80)	.004	7.03 (0.67–73.45)	.103
UPPS-P (1 point increase)								
Urgency	1.11 (1.05–1.18)	<.001	1.15 (1.07–1.24)	<.001	1.23 (1.16–1.31)	<.001	1.21 (1.12–1.31)	<.001
Sensation seeking	0.98 (0.92–1.04)	.533	0.96 (0.90–1.03)	.313	0.99 (0.94–1.05)	.804	0.99 (0.92–1.07)	.855
Lack of perseverance	1.10 (0.99–1.23)	.089	1.14 (0.99–1.30)	.069	1.25 (1.13–1.38)	<.001	1.14 (0.99–1.32)	.071
Lack of premeditation	0.96 (0.88–1.06)	.445	0.87 (0.78–0.98)	.018	1.18 (1.08–1.28)	<.001	1.04 (0.92–1.17)	.573
PANAS (1-point increase)								
Positive affect	0.94 (0.86–1.03)	.211	1.00 (0.89–1.12)	.989	0.89 (0.82–0.97)	.010	0.99 (0.88–1.12)	.899
Negative affect	1.06 (0.98–1.15)	.130	0.95 (0.87–1.05)	.317	1.17 (1.09–2.26)	<.001	0.99 (0.90–1.10)	.930

Abbreviations: aOR, Adjusted odds ratio; cOR, Crude odds ratio; CI, Confidence interval; UPPS-P, Impulsive behaviour scale; PANAS, Positive and Negative Affect Scale.

aAdjusted odds ratio using a multinomial logistic regression and adjusting for all other covariates in the table.

categories of susceptible (cOR: 1.96 [95% CI: 1.13–3.39]) and highly susceptible (cOR: 2.78 [95% CI: 1.67–4.63]) were obtained in the crude analyses; however, when this association was adjusted for the rest of the variables included in the model, a significant association appeared only between female gender and the highly susceptible category, with an aOR of 2.05 (95% CI: 1.03–4.07) ($p = 0.041$). Among the social factors, each increase in the number of friends who smoked was associated with greater SS, including both the susceptible and highly susceptible categories, with magnitudes of association that continued to be significant in the adjusted model (susceptible aOR: 1.36 [95% CI: 1.04–1.77]; highly susceptible aOR: 1.98 [95% CI: 1.53–2.57]). The consumption of alcohol or other substances was associated with high susceptibility in the crude models (cOR: 19.53 [95% CI: 2.60–146.80]), but this association was no longer significant in the adjusted models. About the domains of the UPPS-P impulsivity scale,

we found significant associations in the adjusted models between urgency and both the susceptible (aOR: 1.15 [95% CI: 1.07–1.24]) and highly susceptible categories (aOR: 1.21 [95% CI: 1.12–1.31]), while lack of premeditation had an inverse association with only the susceptible category (aOR: 0.87 [95% CI: 0.78–0.98]). Despite a significant association between the two dimensions of the PANAS (positive affect and negative affect) and a high SS (cOR: 0.89 [95% CI: 0.82–0.97] and cOR: 1.17 [95% CI: 1.09–2.26]), respectively, the association disappeared in the adjusted models.

3.2 | Mediation analysis

The results obtained in Model 1 of the mediation analysis (Figure 1) showed a slightly significant effect of gender on the ESSI score (B:

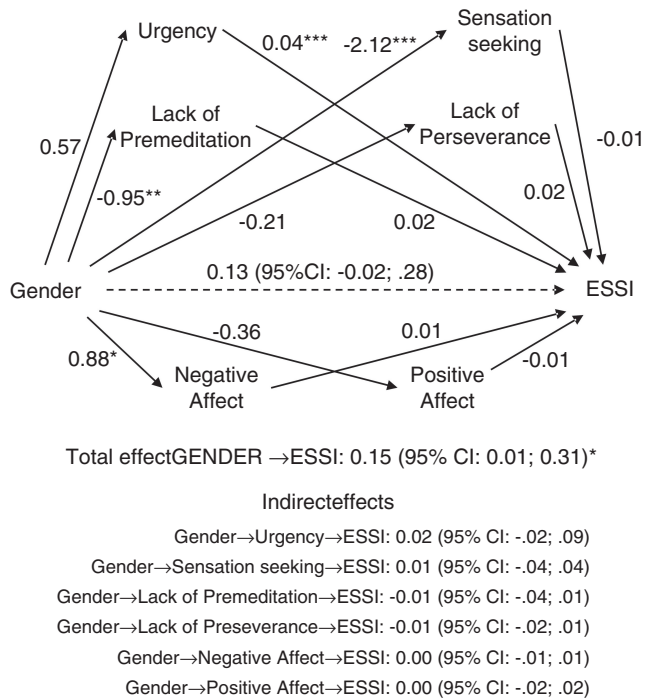


FIGURE 1 Model 1 of the mediation analysis between gender and the expanded smoking susceptibility index (ESSI). Covariates: Age, parents' education level, consumption of alcohol or other drugs, living with smokers, having friends who smoke and having classmates who smoke; * $p < .05$; ** $p < .01$; *** $p < .001$.

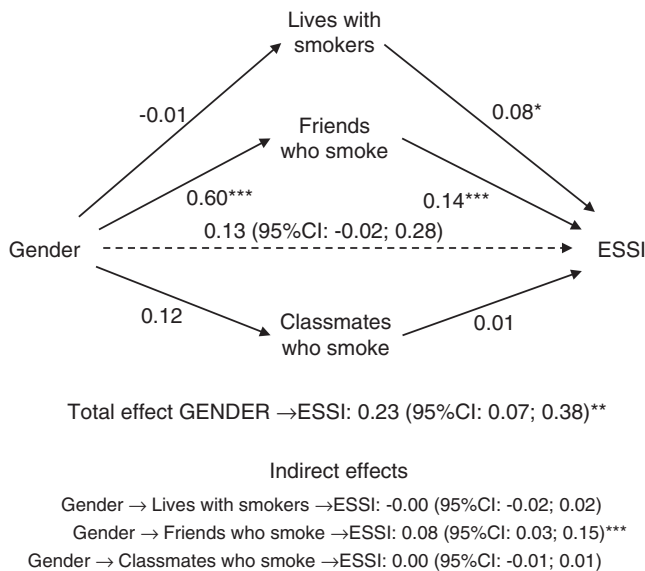


FIGURE 2 Model 2 of the mediation analysis between gender and expanded smoking susceptibility index (ESSI) scores. Covariates: age, parents' education level, consumption of alcohol or other drugs, the UPPS-P (urgency, sensation seeking, lack of premeditation, lack of perseverance, lack of perseverance) and the PANAS (negative affect, positive affect); * $p < .05$; ** $p < .01$; *** $p < .001$.

0.15 [95% CI: 0.01; 0.31]). Despite the lack of a direct association between these two variables, a significant effect size was found for the relationships between gender and lack of premeditation and

sensation seeking (two components of the impulsivity scale) and a strong effect of urgency on the ESSI score. No significant indirect effects were found between gender and ESSI scores in this model.

In Model 2 of the mediation analysis (Figure 2), we found a total significant effect of gender on the ESSI (B: 0.23 [95% CI: 0.07; 0.38]). As in the previous model, we did not find a significant direct effect between gender and the ESSI. However, we found an indirect effect between gender and the ESSI that was mediated by the number of friends who smoked (B: 0.08 [95% CI: 0.03; 0.15]).

4 | DISCUSSION

When analysing SS using the new ESSI (Coreas et al., 2021; Strong et al., 2015) in adolescents between 12 and 16 years of age, we found that females had higher levels of SS than males; almost half of them were categorized as highly susceptible compared with one-third of males. The association between female gender and greater susceptibility seems to be mediated by environmental factors, such as smoking among friends, while intrapersonal factors did not have any effect on this association.

In adolescents and young people, experimentation with tobacco products and the progression in consumption have been related to the presence of two factors, susceptibility and curiosity (Nodora et al., 2014; Pierce et al., 2005). Combining both factors into a new index seems to improve the predictive value (Strong et al., 2015). Factors related to the environment, such as social norms, modelling or perceived pressure, can affect intention and modify ESSI (Markham et al., 2009). The data from our study show that female participants have more exposure to environmental stimuli, such as household smoking and close friends, than males. A total of 66.8% of females perceived some type of smoking in the household, 63.2% reported that at least one of their five best friends smoked, and almost half indicated that they were frequently offered cigarettes. However, as a result of the adjusted models and mediation analyses, we know that of the environmental factors that were studied, only smoking among friends predicted greater SS among female students.

Our findings are consistent with those of other studies reporting that the influence of gender on intentions is mediated mainly by social determinants (Markham et al., 2009), and among girls, consumption in the environment is a factor that can influence the intention to smoke (Epperson et al., 2021). One of the characteristics of adolescence is increased engagement with and influence of the social environment (Steinberg, 2005). Having close friends who smoke can normalize smoking (Ennett et al., 2006; Liu et al., 2017), this factor has been associated with both the initiation and progression of smoking (Chung & Joung, 2014; Wellman et al., 2016) because these normative reference groups have a greater potential to influence behaviour (Liu et al., 2017). In addition, the consumption of cigarettes and e-cigarettes among friends increases the opportunities to smoke (Cole et al., 2019). This greater social pressure from friends considerably increases the likelihood that an individual will start to smoke (Hoving et al., 2007).

We found higher consumption of cigarettes, hookahs and alcohol among the adolescent females in our study. One in five presented problematic alcohol consumption according to the AUDIT-C test, and among the intrapersonal characteristics measured, urgency was the impulsivity dimension associated with ESSI scores. Higher urgency scores increased the probability of having a medium or high level of susceptibility by 11% and 21%, respectively (Liu et al., 2017). Some results indicate that among young people, specific patterns of association have been found between the different dimensions of impulsivity and age (Kelly et al., 2019), the type of consumption (Mathew et al., 2015) and the product consumed, with urgency associated with the consumption of cigarettes and hookahs (Doran & Tully, 2018). Although we found a strong association between a higher score on the urgency dimension of the UPPS-P and a higher ESSI score, no significant indirect association was identified between gender and urgency-mediated smoking susceptibility. We also did not find a mediating role of sensation seeking in the association between gender and susceptibility, despite the findings of other studies (Doran et al., 2011) that sensation seeking predicted the initiation of smoking. These differences could be explained in part by the measurement instruments that were used. In our research, we used the UPPS-P impulsivity scale (Cándido et al., 2012), which assesses the five dimensions of impulsivity, one of which is sensation seeking, rather than using a specific scale that evaluates only this dimension. Additionally, to our knowledge, no previous study has conducted an analysis of the association between gender and SS through the implementation of mediation models that consider the broad spectrum of factors that were considered in our study.

4.1 | Limitations

Nonetheless, this work is not exempt from several limitations that should be considered when interpreting the results. First, the sample of second- to fourth-year high school students represents the adolescent population of a Spanish region, whose cultural determinants may not necessarily be extrapolatable to other regions. These cultural determinants may influence the results in unforeseen ways that may reduce the external validity of the study. Second, the data were obtained through self-reports, and although we used all of the means at our disposal to create a data collection context that facilitated accurate collection of information (including the use of computer-assisted, anonymous questionnaires and the assistance of researchers in the classroom), we cannot rule out artefacts in the veracity of the data, such as confirmation biases. We also cannot be sure about the impact of nonresponding students on the results, although we assume that nonparticipation is not linked to gender, but we cannot be certain. On the other hand, for this study, we decided to measure susceptibility to smoking independently of current smoking status. Clearly, smokers incur the highest degree of

susceptibility possible, but we believe that in the absence of an objective determination of smoking, the measurement of susceptibility is a good proxy for smoking. Finally, due to the cross-sectional methodology of this research, although an association was found between the different variables studied, we cannot establish the causality of these relationships.

5 | CONCLUSION

Among adolescents, we found that a greater number of female adolescents are susceptible to smoking and have higher levels of susceptibility. One in two girls has a high level of susceptibility compared with one in three boys. The association between female gender and a higher level of susceptibility to smoking is mediated by consumption among friends. However, no significant indirect effect of other personal factors (such as impulsivity or affect) or environmental factors (such as consumption by relatives) was observed.

The increasing number of women and girls who are starting to smoke is worrisome (Ozbay et al., 2020). In our environment, the prevalence of cigarette smoking in the adolescent population continues to be high, especially among females (Ministerio de Sanidad Consumo y Bienestar Social, 2020), which necessitates the development of specific programmes to prevent smoking initiation. In this sense, community contexts, such as schools and institutes, are ideal places to increase the success of this type of campaign (Thomas et al., 2015); for example, behavioural support for preventing smoking provided by nurses is an initiative that has shown promising results (Rice et al., 2017). This finding reinforces the relevance of developing school nursing services in our environment as a cost-beneficial initiative (Wang et al., 2014). With respect to substance use, the school nurse can improve the identification of susceptible students and develop interventions before these teens start smoking. Susceptibility to smoking is a powerful predictor of smoking initiation that allows adolescents who are at risk to be identified (Choi et al., 2001; Nodora et al., 2014; Pierce et al., 1996; Stone et al., 2017). The results of this study show that among females, smoking among friends may increase ESSI scores, suggesting that interventions aimed at reducing the effect of these environmental influences may be an appropriate approach.

AUTHOR CONTRIBUTIONS

All authors have agreed on the final version and meet at least one of the following criteria (recommended by the ICMJE*):

1. substantial contributions to conception and design, acquisition of data or analysis and interpretation of data;
2. drafting the article or revising it critically for important intellectual content.

E S-M, S C-G: Made substantial contributions to conception and design, or acquisition of data or analysis and interpretation of data; S C-G, C F-A: Involved in drafting the manuscript or revising it critically

for important intellectual content; E S-M, S C-G, C F-A: Given final approval of the version to be published. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content; E S-M, S C-G, C F-A: Agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

FUNDING INFORMATION

The members of the GISyC are funded by "Programa operativo FEDER Extremadura (2014–2020) y Fondo Europeo de Desarrollo General (FEDER)" (GR21010).


CONFLICT OF INTEREST

No conflict of interest has been declared by the authors.

DATA AVAILABILITY STATEMENT

Data available on request from the authors

ORCID

Esperanza Santano-Mogena  <https://orcid.org/0000-0002-0460-2581>

Cristina Franco-Antonio  <https://orcid.org/0000-0001-8427-2836>

Sergio Cordovilla-Guardia  <https://orcid.org/0000-0001-7651-5017>

REFERENCES

- Audrain-McGovern, J., Rodriguez, D., & Leventhal, A. M. (2015). Gender differences in the relationship between affect and adolescent smoking uptake. *Addiction*, 110(3), 519–529. <https://doi.org/10.1111/add.12797>
- Baltag, V., Pachyna, A., & Hall, J. (2015). Global overview of school health services: Data from 102 countries. *Health Behavior and Policy Review*, 2(4), 268–283. <https://doi.org/10.14485/HBPR.2.4.4>
- Best, N. C., Nichols, A. O., Waller, A. E., Zomorodi, M., Pierre-Louis, B., Oppewal, S., & Travers, D. (2021). Impact of school nurse ratios and health services on selected student health and education outcomes: North Carolina, 2011–2016. *The Journal of School Health*, 91(6), 473–481. <https://doi.org/10.1111/JOSH.13025>
- Bold, K. W., Kong, G., Cavallo, D. A., Camenga, D. R., & Krishnan-Sarin, S. (2018). E-cigarette susceptibility as a predictor of youth initiation of e-cigarettes. *Nicotine & Tobacco Research*, 20(4), ntw393–ntw144. <https://doi.org/10.1093/ntr/ntw393>
- Boyce, W., Torsheim, T., Currie, C., & Zambon, A. (2006). The family AFFLUENCE scale as A measure of national wealth: Validation of an ADOLESCENT self-report measure. *Social Indicators Research*, 78, 473–487. <https://doi.org/10.1007/s11205-005-1607-6>
- Choi, W. S., Gilpin, E. A., Farkas, A. J., & Pierce, J. P. (2001). Determining the probability of future smoking among adolescents. *Addiction (Abingdon, England)*, 96(2), 313–323. <https://doi.org/10.1046/j.1360-0443.2001.96231315.x>
- Chung, S. S., & Jung, K. H. (2014). Risk factors for smoking behaviors among adolescents. *The Journal of School Nursing*, 30(4), 262–271. <https://doi.org/10.1177/1059840513505222>
- Cole, A. G., Cummins, S. E., & Zhu, S.-H. (2019). Offers of cigarettes and E-cigarettes among high school students: A population study from California. *International Journal of Environmental Research and Public Health*, 16(7), 1143. <https://doi.org/10.3390/ijerph16071143>
- Coreas, S. I., Rodriguez, E. J., Rahman, S. G., El-Toukhy, S., Compton, W. M., Blanco, C., Kimmel, H. L., & Pérez-Stable, E. J. (2021). Smoking susceptibility and tobacco media engagement among youth never smokers. *Pediatrics*, 147(6), e2020017921. <https://doi.org/10.1542/peds.2020-017921>
- Cremers, H. P., Mercken, L., de Vries, H., & Oenema, A. (2015). A longitudinal study on determinants of the intention to start smoking among non-smoking boys and girls of high and low socioeconomic status. *BMC Public Health*, 15(1), 1–8. <https://doi.org/10.1186/s12889-015-1917-9>
- Cross, C., Copping, L. T., & Campbell, A. (2011). Sex differences in impulsivity: A meta-analysis. *Psychological Bulletin*, 137, 97–130. <https://doi.org/10.1037/a0021591.supp>
- Currie, C., Molcho, M., Boyce, W., Holstein, B., Torsheim, T., & Richter, M. (2008). Researching health inequalities in adolescents: The development of the health behaviour in school-aged children (HBSC) family Affluence scale. *Social Science & Medicine*, 66(6), 1429–1436. <https://doi.org/10.1016/j.socscimed.2007.11.024>
- Cándido, A., Orduña, E., Perales, J., Verdejo-García, A., & Billieux, J. (2012). Validation of a short Spanish version of the UPPS-P impulsive behavior scale. *Trastornos Adictivos*, 14(3), 73–78. <http://www.elsevier.es/es-revista-trastornos-adictivos-182-pdf-X157509731257389X>
- Doran, N., & Tully, L. (2018). Impulsivity and tobacco product use over time. *Addictive Behaviors*, 85, 153–157. <https://doi.org/10.1016/j.addbeh.2018.06.007>
- Doran, N., Sanders, P. E., Bekman, N. M., Worley, M. J., Monreal, T. K., McGee, E., Cummins, K., & Brown, S. A. (2011). Mediating influences of negative affect and risk perception on the relationship between sensation seeking and adolescent cigarette smoking. *Nicotine & Tobacco Research: Official Journal of the Society for Research on Nicotine and Tobacco*, 13(6), 457–465. <https://doi.org/10.1093/ntr/ntr025>
- El-Toukhy, S., Sabado, M., & Choi, K. (2016). Trends in susceptibility to smoking by race and ethnicity. *Pediatrics*, 138(5), e20161254. <https://doi.org/10.1542/peds.2016-1254>
- Ennett, S. T., Bauman, K. E., Hussong, A., Faris, R., Foshee, V. A., Cai, L., & DuRant, R. H. (2006). The peer context of adolescent substance use: Findings from social network analysis. *Journal of Research on Adolescence*, 16(2), 159–186. <https://doi.org/10.1111/j.1532-7795.2006.00127.x>
- Epperson, A. E., Wallander, J. L., Song, A. V., Depaoli, S., Peskin, M. F., Elliott, M. N., & Schuster, M. A. (2021). Gender and racial/ethnic differences in adolescent intentions and willingness to smoke cigarettes: Evaluation of a structural equation model. *Journal of Health Psychology*, 26(4), 605–619. <https://doi.org/10.1177/1359105319829536>
- Foreman, K. J., Marquez, N., Dolgert, A., Fukutaki, K., Fullman, N., McGaughey, M., Pletcher, M. A., Smith, A. E., Tang, K., Yuan, C.-W., Brown, J. C., Friedman, J., He, J., Heuton, K. R., Holmberg, M., Patel, D. J., Reidy, P., Carter, A., Cercy, K., ... Murray, C. J. L. (2018). Forecasting life expectancy, years of life lost, and all-cause and cause-specific mortality for 250 causes of death: Reference and alternative scenarios for 2016–40 for 195 countries and territories. *Lancet (London, England)*, 392(10159), 2052–2090. [https://doi.org/10.1016/S0140-6736\(18\)31694-5](https://doi.org/10.1016/S0140-6736(18)31694-5)
- Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. - PsycNET. Guilford Press. <https://psycnet.apa.org/record/2013-21121-000>
- Hayes, A. F., & Rockwood, N. J. (2017). Regression-based statistical mediation and moderation analysis in clinical research: Observations, recommendations, and implementation. *Behaviour Research and Therapy*, 98, 39–57. <https://doi.org/10.1016/j.BRAT.2016.11.001>
- Heinz, A. J., Kassel, J. D., Berbaum, M., & Mermelstein, R. (2010). Adolescents' expectancies for smoking to regulate affect predict

- smoking behavior and nicotine dependence over time. *Drug and Alcohol Dependence*, 111(1–2), 128–135. <https://doi.org/10.1016/J.DRUGALCDEP.2010.04.001>
- Herdoiza-Arroyo, P., & Chóliz, M. (2018). Impulsividad en la adolescencia: Utilización de una versión breve del cuestionario UPPS en una muestra de jóvenes latinoamericanos y españoles impulsivos in adolescence: Use of a short version of the UPPS questionnaire in a sample of Latin American and S. *Revista Iberoamericana de Diagnóstico y Evaluación Psicológica*, 1(20), 123–126. <https://doi.org/10.21865/RIDEP50.1.10>
- Higgins, S. T., Kurti, A. N., Redner, R., White, T. J., Gaalema, D. E., Roberts, M. E., Doogan, N. J., Tidey, J. W., Miller, M. E., Stanton, C. A., Henningfield, J. E., & Atwood, G. S. (2015). A literature review on prevalence of gender differences and intersections with other vulnerabilities to tobacco use in the United States, 2004–2014. In *Preventive medicine* (Vol. 80, pp. 89–100). Academic Press Inc. <https://doi.org/10.1016/j.ypmed.2015.06.009>
- Hoving, C., Reubsæet, A., & de Vries, H. (2007). Predictors of smoking stage transitions for adolescent boys and girls. *Preventive Medicine*, 44(6), 485–489. <https://doi.org/10.1016/j.ypmed.2007.02.011>
- Kale, D., Stautz, K., & Cooper, A. (2018). Impulsivity related personality traits and cigarette smoking in adults: A meta-analysis using the UPPS-P model of impulsivity and reward sensitivity. *Drug and Alcohol Dependence*, 185(February), 149–167. <https://doi.org/10.1016/j.drugalcdep.2018.01.003>
- Kamke, K., Sabado-Liwag, M., Rodriquez, E. J., Pérez-Stable, E. J., & El-Toukhy, S. (2020). Adolescent smoking susceptibility: Gender-stratified racial and ethnic differences, 1999–2018. *American Journal of Preventive Medicine*, 58(5), 666–674. <https://doi.org/10.1016/j.amepre.2019.11.023>
- Kassel, J. D., Evatt, D. P., Greenstein, J. E., Wardle, M. C., Yates, M. C., & Veilleux, J. C. (2007). The acute effects of nicotine on positive and negative affect in adolescent smokers. *Journal of Abnormal Psychology*, 116(3), 543–553. <https://doi.org/10.1037/0021-843X.116.3.543>
- Kelly, E. V., Grummitt, L., Teesson, M., & Newton, N. C. (2019). Associations between personality and uptake of tobacco smoking: Do they differ across adolescence? *Drug and Alcohol Review*, 38(7), 818–822. <https://doi.org/10.1111/dar.12975>
- Kong, G., Smith, A. E., McMahon, T. J., Cavallo, D. A., Schepis, T. S., Desai, R. A., Potenza, M. N., & Krishnan-Sarin, S. (2013). Pubertal status, sensation-seeking, impulsivity, and substance use in high school-aged boys and girls. *Journal of Addiction Medicine*, 7(2), 116–121. <https://doi.org/10.1097/ADM.0b013e31828230ca>
- Liu, J., Zhao, S., Chen, X., Falk, E., & Albarracín, D. (2017). The influence of peer behavior as a function of social and cultural closeness: A meta-analysis of normative influence on adolescent smoking initiation and continuation. *Psychological Bulletin*, 143(10), 1082–1115. <https://doi.org/10.1037/bul0000113>
- Markham, W. A., Lopez, M. L., Aveyard, P., Herrero, P., Bridle, C., Comas, A., Charlton, A., & Thomas, H. (2009). Mediated, moderated and direct effects of country of residence, age, and gender on the cognitive and social determinants of adolescent smoking in Spain and the UK: A cross-sectional study. *BMC Public Health*, 9, 173. <https://doi.org/10.1186/1471-2458-9-173>
- Mason-Jones, A. J., Crisp, C., Momberg, M., Koech, J., de Koker, P., & Mathews, C. (2012). A systematic review of the role of school-based healthcare in adolescent sexual, reproductive, and mental health. *Systematic Reviews*, 1(1), 49. <https://doi.org/10.1186/2046-4053-1-49>
- Mathew, A. R., Burris, J. L., Froeliger, B., Saladin, M. E., & Carpenter, M. J. (2015). Impulsivity and cigarette craving among Adolescent daily and occasional smokers. *Addictive Behaviors*, 45, 134–138. <https://doi.org/10.1016/J.ADDBEH.2015.01.032>
- Miller, S., Pike, J., Shono, Y., Beleva, Y., & Stacy, A. W. (2020). The role of negative affect in the persistence of nicotine dependence among alternative high school students: A latent growth curve analysis. *Drug and Alcohol Dependence*, 209, 107883. <https://doi.org/10.1016/j.drugalcdep.2020.107883>
- Ministerio de Sanidad Consumo y Bienestar Social. (2020). *ESTUDES 2018/19. Encuesta sobre el Uso de Drogas en Enseñanzas Secundarias en España (1994–2018)*. http://www.pnsd.mscbs.gob.es/profesionales/sistemasInformacion/sistemaInformacion/pdf/ESTUD_ES_2018-19_Informe.pdf
- Ministerio de Sanidad Servicios Sociales e Igualdad. (2018a). *Estudio Health Behaviour in School-aged Children (HBSC-2014). Informe técnico de los resultados obtenidos por el Estudio Health Behaviour in School-aged Children (HBSC) 2014 en Extremadura*. <http://publicacionesoficiales.boe.es/>
- Ministerio de Sanidad Servicios Sociales e Igualdad. (2018b). Encuesta sobre uso de drogas en enseñanzas secundarias en España (ESTUDES) 2016/2017. http://www.pnsd.mssi.gob.es/profesionales/sistemasInformacion/sistemaInformacion/pdf/ESTUD_ES_2016_Presentacion.pdf
- Nodora, J., Hartman, S. J., Strong, D. R., Messer, K., Vera, L. E., White, M. M., Portnoy, D. B., Choiniere, C. J., Vullo, G. C., & Pierce, J. P. (2014). Curiosity predicts smoking experimentation independent of susceptibility in a US national sample. *Addictive Behaviors*, 39(12), 1695–1700. <https://doi.org/10.1016/J.ADDBEH.2014.06.002>
- O'Loughlin, J., Karp, I., Koulis, T., Paradis, G., & DiFranza, J. (2009). Determinants of first puff and daily cigarette smoking in adolescents. *American Journal of Epidemiology*, 170(5), 585–597. <https://doi.org/10.1093/aje/kwp179>
- Okoli, C., Greaves, L., & Fagyas, V. (2013). Sex differences in smoking initiation among children and adolescents. *Public Health*, 127(1), 3–10. <https://doi.org/10.1016/j.puhe.2012.09.015>
- Owen, L., Pennington, B., Fischer, A., & Jeong, K. (2018). The cost-effectiveness of public health interventions examined by NICE from 2011 to 2016. *Journal of Public Health*, 40(3), 557–566. <https://doi.org/10.1093/pubmed/idx119>
- Ozbay, N., Shevorykin, A., Smith, P. H., & Sheffer, C. E. (2020). The association between gender roles and smoking initiation among women and adolescent girls. *Journal of Gender Studies*, 29(6), 664–684. <https://doi.org/10.1080/09589236.2019.1693985>
- Parasuraman, S. R., & Shi, L. (2015). Differences in access to care among students using school-based health centers. *The Journal of School Nursing*, 31(4), 291–299. <https://doi.org/10.1177/1059840514556180>
- Patel, M., Kaufman, A., Hunt, Y., & Nebeling, L. (2017). Understanding the relationship of cigarette smoking trajectories through adolescence and weight status in young adulthood in the United States. *The Journal of Adolescent Health: Official Publication of the Society for Adolescent Medicine*, 61(2), 163–170. <https://doi.org/10.1016/j.jadohealth.2017.02.005>
- Pierce, J. P., Distefan, J. M., Kaplan, R. M., & Gilpin, E. A. (2005). The role of curiosity in smoking initiation. *Addictive Behaviors*, 30(4), 685–696. <https://doi.org/10.1016/j.addbeh.2004.08.014>
- Pierce, J. P., Choi, W. S., Gilpin, E. A., Farkas, A. J., & Merritt, R. K. (1996). Validation of susceptibility as a predictor of which adolescents take up smoking in the United States. *Health Psychology*, 15(5), 355–361. <https://doi.org/10.1037/0278-6133.15.5.355>
- Reitsma, M. B., Fullman, N., Ng, M., Salama, J. S., Abajobir, A., Abate, K. H., Abbafati, C., Abera, S. F., Abraham, B., Abyu, G. Y., Adebisi, A. O., Al-Aly, Z., Aleman, A. V., Ali, R., al Alkerwi, A., Allebeck, P., Al-Raddadi, R. M., Amare, A. T., Amberbir, A., ... Gakidou, E. (2017). Smoking prevalence and attributable disease burden in 195 countries and territories, 1990–2015: A systematic analysis from the global burden of disease study 2015. *The Lancet*, 389(10082), 1885–1906. [https://doi.org/10.1016/S0140-6736\(17\)30819-X](https://doi.org/10.1016/S0140-6736(17)30819-X)
- Reitsma, M. B., Flor, L. S., Mullany, E. C., Gupta, V., Hay, S. I., & Gakidou, E. (2021). Spatial, temporal, and demographic patterns in prevalence of smoking tobacco use and initiation among young people in 204

- countries and territories, 1990-2019. *The Lancet Public Health*, 6(7), E472–E481. [https://doi.org/10.1016/S2468-2667\(21\)00102-X](https://doi.org/10.1016/S2468-2667(21)00102-X)
- Reyna, V. F., & Farley, F. (2006). Risk and rationality in Adolescent decision making. *Psychological Science in the Public Interest*, 7(1), 1–44. <https://doi.org/10.1111/j.1529-1006.2006.00026.x>
- Rial Boubeta, A., Golpe Ferreiro, S., Araujo Gallego, M., Braña Tobío, T., & Varela Mallou, J. (2017). Validación del “Test de identificación de trastornos por consumo de alcohol” (audit) en población adolescente española. *Behavioral Psychology/ Psicología Conductual*, 25(2), 371–386.
- Rice, V. H., Heath, L., Livingstone-Banks, J., Hartmann-Boyce, J., & Group, C. T. A. (2017). Nursing interventions for smoking cessation. *The Cochrane Database of Systematic Reviews*, 2017(12), CD001188. <https://doi.org/10.1002/14651858.CD001188.PUB5>
- Roys, M., Weed, K., Carrigan, M., & MacKillip, J. (2016). Associations between nicotine dependence, anhedonia, urgency and smoking motives. *Addictive Behaviors*, 62, 145–151. <https://doi.org/10.1016/j.ADDBEH.2016.06.002>
- Sandín, B. (2003). Escalas Panas de afecto positivo y negativo para niños y adolescentes (PANASN). *Revista de Psicopatología y Psicología Clínica*, 8(2), 173–182. <https://doi.org/10.5944/rppc.vol.8.num.2.2003.3953>
- Santano-Mogena, E., Franco-Antonio, C., Chimento-Díaz, S., Rico-Martín, S., & Cordovilla-Guardia, S. (2021). Factors associated with smoking susceptibility among high school students in western Spain. *Scientific Reports*, 11(1), 1988. <https://doi.org/10.1038/s41598-021-81723-5>
- Sobell, L. C., & Sobell, M. B. (1992). Timeline follow-Back: A technique for assessing self-reported alcohol consumption. In R. Z. Litten & J. P. Allen (Eds.), *Measuring alcohol consumption: Psychosocial and biochemical* (pp. 41–72). Humana Press.
- Steinberg, L. (2005). Cognitive and affective development in adolescence. *Trends in Cognitive Sciences*, 9(2), 69–74. <https://doi.org/10.1016/j.tics.2004.12.005>
- Stone, M. D., Audrain-McGovern, J., & Leventhal, A. M. (2017). Association of anhedonia with adolescent smoking susceptibility and initiation. *Nicotine and Tobacco Research*, 19(6), 738–742. <https://doi.org/10.1093/ntr/ntw177>
- Strong, D. R., Hartman, S. J., Nodora, J., Messer, K., James, L., White, M., Portnoy, D. B., Choiniere, C. J., Vullo, G. C., & Pierce, J. (2015). Predictive validity of the expanded susceptibility to smoke index. *Nicotine & Tobacco Research: Official Journal of the Society for Research on Nicotine and Tobacco*, 17(7), 862–869. <https://doi.org/10.1093/ntr/ntu254>
- Thomas, R. E., McLellan, J., & Perera, R. (2015). Effectiveness of school-based smoking prevention curricula: Systematic review and meta-analysis. *BMJ Open*, 5(3), e006976. <https://doi.org/10.1136/BMJOPEN-2014-006976>
- Trinidad, D. R., Pierce, J. P., Sargent, J. D., White, M. M., Strong, D. R., Portnoy, D. B., Green, V. R., Stanton, C. A., Choi, K., Bansal-Travers, M., Shi, Y., Pearson, J. L., Kaufman, A. R., Borek, N., Coleman, B. N., Hyland, A., Carusi, C., Kealey, S., Leas, E., ... Messer, K. (2017). Susceptibility to tobacco product use among youth in wave 1 of the population assessment of tobacco and health (PATH) study. *Preventive Medicine*, 101, 8–14. <https://doi.org/10.1016/j.ypmed.2017.05.010>
- U.S. Department of Health and Human Services. (1994). *Guidelines for school health programs to prevent tobacco use and Addiction*. MMWR. <https://www.cdc.gov/MMWR/PREVIEW/MMWRHTML/00026213.htm>
- US Department of Health and Human Services (2016). Chapter 2, The neurobiology of substance use, misuse, and addiction. In *The surgeon General's report on alcohol, drugs, and health*. US Department of Health and Human Services. www.ncbi.nlm.nih.gov/books/NBK424849/
- US Department of Health and Human Services. (2012). Preventing tobacco use among youth and young adults: A report of the surge. In *U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, office on smoking and health* (Vol. 371, Issue 10, pp. 932–943). Centers for Disease Control and Prevention (US). <https://www.nejm.org/doi/10.1056/NEJMsa1405092>
- Veselska, Z., Madarasova Geckova, A., Reijneveld, S. A., & van Dijk, J. P. (2011). Self-efficacy, affectivity and smoking behavior in adolescence. *European Addiction Research*, 17(4), 172–177. <https://doi.org/10.1159/000326071>
- Wang, L. Y., Vernon-Smile, M., Gapinski, M. A., Desisto, M., Maughan, E., & Sheetz, A. (2014). Cost-benefit study of school nursing services. *JAMA Pediatrics*, 168(7), 642–648. <https://doi.org/10.1001/JAMAPEDIATRICS.2013.5441>
- Wang, T. W., Gentzke, A. S., Creamer, M. R., Cullen, K. A., Holder-Hayes, E., Sawdey, M. D., Anic, G. M., Portnoy, D. B., Hu, S., Homa, D. M., Jamal, A., & Neff, L. J. (2019). Tobacco product use and associated factors among middle and high school students — United States, 2019. *MMWR. Surveillance Summaries*, 68(12), 1–22. <https://doi.org/10.15585/mmwr.ss6812a1>
- Wellman, R. J., Dugas, E. N., Dutczak, H., O'Loughlin, E. K., Datta, G. D., Lauzon, B., & O'Loughlin, J. (2016). Predictors of the onset of cigarette smoking: A systematic review of longitudinal population-based studies in youth. *American Journal of Preventive Medicine*, 51(5), 767–778. <https://doi.org/10.1016/j.amepre.2016.04.003>
- West, R. (2017). Tobacco smoking: Health impact, prevalence, correlates and interventions. *Psychology & Health*, 32(8), 1018–1036. <https://doi.org/10.1080/08870446.2017.1325890>
- Williams, S., & Dickinson, A. (2017). The provision of nurse-led school based health services. *Contemporary Nurse*, 53(5), 536–544. <https://doi.org/10.1080/10376178.2017.1350587>
- World Health Organization. (2008). *WHO report on the global tobacco epidemic, 2008: The MPOWER package*. World Health Organization. www.who.int/tobacco/mpower
- World Health Organization. (2019). *WHO global report on trends in prevalence of tobacco use 2000–2025 third edition*. <http://apps.who.int/bookorders>
- World Health Organization. Department of Gender, W. and Health., Tobacco Free Initiative (World Health Organization), & International Development Research Centre (Canada). (2007). *Gender and tobacco control*. Department of Gender, Women and Health (GWH).
- Zaborskis, A., Kavaliauskienė, A., Eriksson, C., Klemera, E., Dimitrova, E., Melkumova, M., & Husarova, D. (2021). Family support as smoking prevention during transition from early to late adolescence: A study in 42 countries. *International Journal of Environmental Research and Public Health*, 18(23), 12739. <https://doi.org/10.3390/IJERPH182312739/S1>

How to cite this article: Santano-Mogena, E., Franco-Antonio, C., & Cordovilla-Guardia, S. (2022). Gender differences in susceptibility to smoking among high school students. *Journal of Advanced Nursing*, 00, 1–14. <https://doi.org/10.1111/jan.15382>

The *Journal of Advanced Nursing (JAN)* is an international, peer-reviewed, scientific journal. *JAN* contributes to the advancement of evidence-based nursing, midwifery and health care by disseminating high quality research and scholarship of contemporary relevance and with potential to advance knowledge for practice, education, management or policy. *JAN* publishes research reviews, original research reports and methodological and theoretical papers.

For further information, please visit *JAN* on the Wiley Online Library website: www.wileyonlinelibrary.com/journal/jan

Reasons to publish your work in *JAN*:

- High-impact forum: the world's most cited nursing journal, with an Impact Factor of 2.561 – ranked 6/123 in the 2019 ISI Journal Citation Reports © (Nursing; Social Science).
- Most read nursing journal in the world: over 3 million articles downloaded online per year and accessible in over 10,000 libraries worldwide (including over 6,000 in developing countries with free or low cost access).
- Fast and easy online submission: online submission at <http://mc.manuscriptcentral.com/jan>.
- Positive publishing experience: rapid double-blind peer review with constructive feedback.
- Rapid online publication in five weeks: average time from final manuscript arriving in production to online publication.
- Online Open: the option to pay to make your article freely and openly accessible to non-subscribers upon publication on Wiley Online Library, as well as the option to deposit the article in your own or your funding agency's preferred archive (e.g. PubMed).