

**Boredom susceptibility as predictor of smoking cessation outcomes: sex
differences**

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Abstract

Among the smoking motives, boredom relief is one of the most reported by smokers. The tendency to experience boredom has been proposed as a personality trait related to addictive behaviors and other variables such as depression or the perception of environmental reward. Differences in boredom susceptibility have also been observed among men and women. However, so far, there have been few studies investigating the differential impact of boredom susceptibility on both sexes regarding smoking outcomes. The aim of the present study was to analyze the relationship between boredom susceptibility, depressive symptoms, and environmental reward, and the influence of boredom susceptibility separately in men and women on smoking outcomes at 6- and 12-month follow-ups. Our sample was composed of 210 smokers seeking psychological treatment to quit smoking. Results showed that boredom susceptibility was not significantly related to depressive symptoms, but it showed a significant association with a lower perception of environmental reward. Boredom susceptibility was a significant predictor of smoking outcomes in men at the 6- and 12-month follow-ups, whereas in women, this construct was not a significant predictor. These findings support the need to consider sex and personality differences in smoking cessation treatments in order to increase their effectiveness.

Keywords:

Boredom susceptibility, smoking cessation, sex differences, follow-up

1. Introduction

Despite the reduction in smoking prevalence observed in recent years, tobacco consumption is still one of public health's major concerns, as it continues to be the most preventable cause of death worldwide (World Health Organization [WHO], 2017). Psychological and pharmacological treatments have been shown to be effective to quit smoking, but long-term abstinence maintenance is still a challenge and should continue to be investigated (West, 2017). Previous studies of smoking motives have found that smokers report using tobacco for pleasure, to manage negative affect, to cope with stress, and for boredom relief (McEwen, West, & McRobbie, 2008; Twyman, Bonevski, Paul, & Bryant, 2014). The relation between smoking and variables such as negative affect and stress has been widely studied but boredom experience remains a scarcely researched topic.

Boredom has been defined as the negative experience of desiring but being unable to engage with the environment or in satisfying activities (Eastwood, Frischen, Fenske, & Smilek, 2012). It is characterized by feelings of dissatisfaction, restlessness, and weariness (Elpidorou, 2014). Such an experience is not only determined by the characteristics of the situation (e.g., a monotonous or inadequately stimulating or rewarding environment) but also by the individual tendency to experience boredom (Mercer-Lynn, Bar, & Eastwood, 2014). Such tendency can be conceptualized in two different ways: as boredom proneness or boredom susceptibility. Although both constructs are related, research has confirmed that they are different (Mercer-Lynn, Flora, Fahlman, & Eastwood, 2013; Mercer-Lynn & Eastwood, 2010). Concretely, boredom proneness is defined as "one's proneness toward experiencing boredom" (Farmer & Sundberg, 1986, p. 5)", while boredom susceptibility, is defined as "aversion

to repetition, routine, and dull people, and restlessness when things are unchanging” (Zuckerman, Eysenck, & Eysenck, 1978, p. 140).

Higher scores in boredom susceptibility have been related to substance use (e.g., alcohol, opioids) and gambling related-behaviors (Franques et al., 2003; Mercer-Lynn et al., 2013). Nevertheless, the relationship between this personality trait and smoking has not been sufficiently investigated. For example, Pettiford et al. (2007) found that smoking may serve to increase arousal in individuals with higher scores in boredom susceptibility and lower levels of intellectual functioning. Therefore, these individuals may require higher levels of environmental stimulation to achieve the same levels of arousal as individuals with lower scores of such traits and, in consequence, this could influence abstinence achievement or maintenance. Another study, conducted by Balevich, Wein, & Flory (2013), found that boredom susceptibility, together with adventure seeking, experience seeking, and disinhibited behavior, was greater in participants who smoked compared with those who did not.

On another hand, previous research has extensively documented the relationship between depressive symptoms and negative affect with smoking persistence and relapse, and also with the tendency to experience boredom (Mathew, Hogarth, Leventhal, Cook, & Hitsman, 2017). For instance, Sommers and Vodanovich (2000) found that higher levels of boredom proneness were associated with a greater frequency of symptoms of depression. Similarly, Goldberg, Eastwood, LaGuardia, and Danckert (2011) found that apathy and depression were highly correlated with the tendency to experience boredom.

In addition, it has been found that an individual is more likely to smoke in a low rewarding environment due to the expectation of positive reinforcement offered by cigarette smoking (Perkins, Karelitz, & Boldry, 2017). In line with this, Van Tilburg

and Igou (2012) suggested that the boredom susceptibility trait promotes stimulation seeking and the maintenance and/or restoration of meaningful activities. This is relevant, as, for most smokers, cigarette consumption is an important activity that provides stimulation (Fagerström, 2012). In consequence, when an individual quits, he loses not only a rewarding activity, but also the stimulating effect of tobacco. Therefore, in the absence of rewarding activities other than smoking, individuals with greater boredom susceptibility may be more likely to continue to smoke or to relapse after cessation.

Despite the relationship found between boredom and smoking, the impact of this personality trait on smoking cessation treatment has received little attention. Moreover, as sex differences have been reported in smoking-related variables (Smith, Bessette, Weinberger, Sheffer, & McKee, 2016) and boredom (McIntosh, 2006), it seems important consider sex when analyzing this relationship. Thus, to our knowledge, the present study examines for the first time the relationship between boredom susceptibility, depressive symptoms, and perceived environmental reward, and their role in medium and long term smoking status in a sample of treatment-seeking smokers according to sex. The hypotheses tested in this study are: (a) boredom susceptibility would be positively correlated with depressive symptoms, and negatively with perceived environmental reward; and (b) boredom susceptibility would predict 6- and 12-month smoking outcomes according to sex.

2. Material and method

2.1. Sample

The initial sample comprised 275 adult smokers participating in a three arm randomized controlled trial for smoking cessation ([clinicaltrials.gov#NCT02844595](https://clinicaltrials.gov/ct2/show/study/NCT02844595)).

Inclusion criteria to participate in the study were: (1) being at least 18 years old, (2) wishing to participate in the treatment program, (3) providing written informed consent, and (4) smoking at least 8 cigarettes per day. For the present study only a subset of participants who were randomized to the active conditions and attend at least to the first treatment session were selected (see below). Consequently, the final sample analyzed in the present study was composed of 210 adult daily smokers ($M_{\text{age}} = 45.20$, $SD = 12.03$; 62.4% women).

2.2. Instruments

2.2.1. Smoking Habit Questionnaire (Becona, 1994).

This consists of 56 items assessing sociodemographic variables (gender, age, marital status, educational level) and tobacco use information (i.e., number of cigarettes smoked per day).

2.2.2. Fagerström Test of Cigarette Dependence (FTCD; Heatherton, Kozlowski, Frecker, & Fagerström, 1991, Spanish version by Becona & Vázquez, 1998).

This instrument assesses cigarette dependence through six items, yielding a total score between 0 and 10. Scores ≥ 6 are considered to be indicative of dependence. The Spanish version has a Cronbach alpha of .65.

2.2.3. Boredom Susceptibility (BS subscale of the Sensation Seeking Scale Form V (SSS-V; Zuckerman, Eysenck, & Eysenck, 1978; Spanish version by Pérez & Torrubia, 1986).

This is a 10-item forced-choice (yes vs. no) subscale of the SSS-V, which assesses boredom susceptibility (e.g., “I get bored seeing the same old faces” vs. “I like the comfortable familiarity of everyday friends”). The Spanish version of this subscale has a Cronbach alpha of .69.

2.2.4. The Environmental Reward Observation Scale (EROS; Armento & Hopko, 2007; Spanish version by Barraca & Pérez-Álvarez, 2010).

This is a self-report instrument evaluating the amount and availability of environmental reward perceived. It consists of 10 items (e.g., “I have found that many experiences make me unhappy” or “The activities I engage in usually have positive consequences”), which are rated on a four-point Likert scale, with higher scores indicating higher perceived environmental reward. The Spanish version has a Cronbach’s alpha of .86.

2.2.5. Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996; Spanish version by Sanz, Perdigón, & Vázquez, 2003).

This 21-item self-report questionnaire assesses the presence of depressive symptoms during a period of 15 days, including the present day (e.g., “sadness”; “loss of pleasure”; “guiltiness”). Items are rated from 0 to 3, and the total score may range from 0 to 63, with higher scores indicating higher level of depressive symptoms. The Spanish version has a Cronbach alpha of .90.

2.2.6. Smoking outcomes.

For the purpose of this study, we created two smoking outcomes categories: (1) biochemically confirmed self-reported abstainers; and (2) self-reported smokers and participants who did not attend the follow-up sessions. Participants were considered abstinent if they reported abstinence, not even a puff of a cigarette for ≥ 30 days prior to follow-up day at 6- and 12-month follow-ups, and had an expired Carbon Monoxide (CO) reading of ≤ 10 parts per million (West, Hajek, Stead, & Stapleton, 2005). If a participant did not provide the CO measure, he was considered a smoker.

2.3. Procedure

The study was approved by the Bioethics Committee of the University of Santiago de Compostela, and all participants provided written informed consent. Before entering in the study, participants were assessed through a face-to-face interview. Participants meeting the inclusion criteria were randomly assigned (2.2.1. ratio) to one of the following three conditions: (1) a standard cognitive-behavioral treatment; (2) a cognitive-behavioral smoking cessation treatment with components of behavioral activation; or (3) a wait-list control group. The active conditions (1 and 2) were cognitive-behavioral interventions consisting of eight sessions (1 hour per week) administered in groups of 6-8 participants.

The current study is based on a secondary analysis of the mentioned randomized clinical trial. A more detailed description of the study procedures can be found in Becoña et al. (2017) and Martínez-Vispo et al. (in press).

2.4. Analytic strategy

Descriptive analyses of sociodemographic, smoking-related characteristics, and psychological variables are reported as means with standard deviations or frequencies with corresponding percentages. Sex differences were assessed with Student's *t*-test, and differences in percentages were compared with the chi-square test (χ^2). Differences according to smoking status at the 6- and 12-month follow-ups were also tested. Pearson's correlation and point-biserial correlation coefficients were calculated for continuous and for continuous and dichotomous variables, respectively.

Two multivariate binary logistic regression analyses were modeled separately for men and women to determine the predictive value of the study variables on smoking status at the 6- and 12-month follow-up. These analyses included sociodemographic variables (age, marital status, and education level), treatment condition, depressive

symptoms, perceived environmental reward, and cigarette dependence. Smoking outcomes (1 = Smoker or lost to follow-up, 0 = Abstinence) at the 6- and 12-month follow-ups was the criterion variable. Goodness of fit in these analyses was checked via chi-square using the Hosmer-Lemeshow test (Hosmer, Lemeshow, & Sturdivant, 2013). All statistical analyses were performed using the software SPSS version 24. A p -value of ≤ 0.05 was used as a test of statistical significance.

3. Results

Descriptive statistics and t -test and chi-squared comparisons by sex are reported in Table 1. Statistically significant differences according to sex were only found in the Boredom Susceptibility Scale ($t = 2.54, p = .01$, Cohen's $d = .36$).

Of the total sample, 67/210 (31.9%) at 6-months follow-up, and 80/210 (38.09%) at 12-months follow-up did not attend the follow-up session. Regarding abstinence outcomes, 53/210 (25.23%) participants at 6 months-follow-up, and 52/210 (24.76%) at 12-months follow-up were biochemically confirmed abstainers.

We examined differences according to smoking status (smokers and those who did not attend the follow-up) comparing to abstainers at the 6- and 12-month follow-ups. At the 6-month follow-up, we only found significant differences in pretreatment mean scores for cigarette dependence ($t = 2.36, p = .01$), with those who were smoking or who did not attend the follow-up session having higher scores. At the 12-month follow-up, no significant differences were found in any study variables between both groups.

As can be seen in Table 2, boredom susceptibility correlated significantly with being men, and it had a significant negative relationship with perceived environmental

reward. Depressive symptoms were found to have a significant negative relation with perceived environmental reward, and a positive relation with cigarette dependence.

Lastly, the results of the logistic regression analysis for men indicated that boredom susceptibility ($OR = 1.57$), was a significant predictor of smoking outcomes at 6-months follow-up (Table 3). At 12-months follow-up, boredom susceptibility remained as significant predictor ($OR = 1.38$). Multivariate regression models demonstrated adequate goodness of fit, predicting 6-months (Hosmer-Lemeshow $\chi^2_8 = 1.97, p = .982$); and 12-months smoking outcomes (Hosmer-Lemeshow $\chi^2_8 = 8.869, p = .353$).

In the case of women, cigarette dependence was the only significant predictor of smoking outcomes at 6- and 12-months follow-ups ($OR = 2.82$ and $OR = 3.66$, respectively). The Hosmer-Lemeshow test showed that these models fit were adequate for analysis of smoking outcomes at six (Hosmer - Lemeshow $\chi^2_8 = 6.448, p = .597$); and 12-months follow-up (Hosmer - Lemeshow $\chi^2_8 = 11.080, p = .197$).

Table 1

Descriptive statistics and *t*-test and chi-square comparisons between sexes

	Total sample ($N = 210$)		Men ($n = 79$)		Women ($n = 131$)		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>t</i>
Age	45.20	12.03	45.38	11.80	45.13	10.58	0.15
SSS-V-BS	3.89	2.28	4.40	2.31	3.58	2.22	2.54*
EROS	27.59	4.69	28.00	4.63	27.35	4.79	0.97
BDI-II	10.50	9.08	10.16	7.81	10.71	9.72	-0.42
FTCD	4.78	2.14	4.98	2.26	4.66	2.07	1.05

	<i>N</i>	%	<i>n</i>	%	<i>N</i>	%	χ^2
Marital Status							0.32
Married	109	51.9	43	54.4	66	50.4	
Other ^a	101	48.1	36	45.6	65	49.6	
Educational Level							
Basic	44	20.9	13	16.5	31	23.7	1.54
Medium	81	38.6	35	44.3	46	35.1	1.75
High	85	40.5	31	39.2	54	41.2	0.80
FTND							
Total score < 6	122	58.1	42	53.2	80	61.1	1.26
Total score \geq 6	88	41.9	37	46.8	51	38.9	
Smoking status at 6 months ^b	157	74.7	58	73.4	99	75.6	0.12
Smoking status at 12 months ^b	158	75.2	59	74.7	99	75.6	0.02

Note. FTND = Fagerström Test for Nicotine Dependence pretreatment score; SSS-V-BS: Sensation-Seeking Scale-Boredom Susceptibility; EROS: Environmental Reward Observation Scale; BDI-II: Beck Depression Inventory-II.

^adivorced/widowed/single.

^bSmoking status: included being smoker or drop-out treatment/not attend the follow-up sessions.

* $p \leq .05$.

Table 2

Bivariate correlations between study variables

	1	2	3	4	5	6	7	8
1. Sex	-							
2. Age	-0.09	-						
3. Marital status	-0.03	0.05	-					
4. Educational level	0.02	-0.03	0.15*	-				
5. SSS-V-BS	0.17*	0.06	0.12	-0.01	-			
6. EROS	-0.06	-0.08	0.01	0.11	-0.16*	-		
7. BDI-II	0.02	-0.01	-0.06	-0.21**	0.10	-0.56**	-	
8. FTND	-0.07	0.01	-0.07	-0.11	0.05	-0.25**	0.27**	-

Note: Sex (1 = men, 0 = women); age (1 = 45 years or older); marital status (1 = married, 0 = unmarried); educational level (1 = high; 0 = medium/basic); SSS-V-BS: Sensation-Seeking Scale-Boredom Susceptibility; EROS: Environmental Reward Observation Scale; BDI-II: Beck Depression Inventory-II; FTND: Fagerström Test for Cigarette Dependence (1 = nondependent [score < 6], 0 = dependent [score ≥ 6]).

* $p \leq .05$. ** $p \leq .01$.

Table 3

Binary logistic regression analysis: predictive value of depressive symptoms, perceived environmental reward, boredom susceptibility for smoking status at 6- and 12-month follow-ups ($n = 210$)

Predictors	<i>B (SE)</i>	<i>Wald</i>	<i>Exp(B)</i>	<i>CI (95%)</i>
Men				
Smoking status at 6-month follow-up				
Age	-0.77 (0.69)	1.23	0.46	0.11-1.80
Marital status	1.18(0.74)	2.50	3.26	0.75-14.13
Educational level	0.95 (0.60)	2.50	0.38	0.11-1.25
Treatment condition	1.42 (0.68)	4.35*	4.17	1.09- 15.95
FTCD	0.86 (0.69)	1.55	2.38	0.60-9.31
BDI-II	-0.08(0.05)	2.13	0.92	0.82-1.02
EROS	0.11(0.09)	1.47	1.12	0.93-1.34
SSS-V-BS	0.45 (0.18)	5.89*	1.57	1.09-2.27
Smoking status at 12-month follow-up				
Age	-0.74(0.66)	1.25	0.47	0.13-1.74
Marital status	0.77(0.69)	1.24	2.17	0.55-8.49
Educational level	-0.68 (0.58)	1.38	0.50	0.16-1.57
Treatment condition	1.13(0.64)	3.16	3.11	0.89-10.93
FTCD	0.50(0.65)	0.59	1.65	0.46-5.92
BDI-II	-0.04(0.05)	0.81	0.95	0.86-1.05
EROS	0.10(0.08)	1.33	1.10	0.93-1.31
SSS-V-BS	0.32(0.16)	3.87*	1.38	1.00-1.92
Women				

Smoking status at 6-month follow-up				
Age	-0.10(0.43)	0.06	0.89	0.38-2.11
Marital status	0.28(0.44)	0.40	1.32	0.55-3.16
Educational level	-0.32 (0.46)	0.48	0.72	0.29-1.79
Treatment condition	0.23 (0.43)	0.28	1.25	0.53-2.95
FTCD	1.29 (0.53)	5.96*	3.66	1.29-10.39
BDI-II	0.00 (0.03)	0.05	1.00	0.95-1.06
EROS	0.04(0.05)	0.65	1.04	0.93-1.16
SSS-V-BS	0.07(0.09)	0.65	1.08	0.89-1.30
Smoking status at 12-month follow-up				
Age	-0.30 (0.43)	0.48	0.73	0.31-1.74
Marital status	0.49(0.44)	1.21	1.64	0.68-3.95
Educational level	-0.39(0.46)	0.71	0.67	0.27-1.67
Treatment condition	0.31(0.43)	0.50	1.36	0.58-3.20
FTCD	1.03(0.51)	4.07*	2.82	1.03-7.73
BDI-II	0.00(0.02)	0.08	1.00	0.95-1.06
EROS	0.04(0.05)	0.76	1.05	0.94-1.17
SSS-V-BS	0.04(0.09)	0.22	1.04	0.86-1.26

Note. Age (1= 45 years or older; 0 = less than 45); Marital Status (1 = Married, 0 = unmarried); Educational level (1 = high; 0 = basic/medium); FTCD = Fagerström Test for Cigarette Dependence (1 = dependent [score \geq 6], 0 = nondependent [score $<$ 6]); BDI-II: Beck Depression Inventory-II; EROS: Environmental Reward Observation Scale; SSS-V-BS: Sensation Seeking Scale-Boredom Susceptibility.

* $p \leq .05$.

4. Discussion

The aim of the present study was to analyze the relationship between boredom susceptibility, psychological-related variables such as perceived environmental reward and depressive symptoms, and the impact of boredom susceptibility on smoking outcomes at the 6- and 12-month follow-ups in a sample of treatment-seeking smokers according to sex.

The relation between boredom susceptibility and psychological-related variables showed that this personality trait correlated inversely with perceived environmental reward. This result is congruent with previous evidence finding that people who are prone to experience boredom usually engage in fewer activities and/or stimuli that are present in their environment. For example, Warner et al. (1994) pointed out that the lack of structured activities in a clinical sample was significantly associated with mentioning boredom as the most important reason for substance use. In addition, Eastwood et al. (2012) suggested that boredom occurred when an individual was not able to engage with external or internal information, which is necessary to participate in a rewarding activity or the individual is focused on that lack of engagement.

We did not find a significant relation between boredom susceptibility and depressive symptoms; therefore, our first hypothesis is only partially fulfilled. Although prior research has shown that individuals who are predisposed to experience boredom are more likely to develop depressive symptoms, there are several reasons for which we could have failed to find such a relation. First of all, we used the Boredom Susceptibility Scale (Zuckerman, 1979), which has been found to be related to positive affect, to low levels of self-control, and externalizing disorders instead of internalizing ones (e.g., depression) (Mercer-Lynn et al., 2014, 2013; Mercer & Eastwood, 2010). In addition, it has been suggested that there are different types of boredom, so being prone

to experience a specific type of boredom may be more related to depression than other types. For instance, based on the degrees of valence and arousal, five types of boredom have been found: apathetic, indifferent, calibrating, searching, and reactant boredom (Goetz et al., 2014). The authors proposed that each boredom type is related to positive and negative affective states. Furthermore, neither the conceptualization nor the measure of the tendency to experience boredom are clearly established (Struk, Carriere, Cheyne, & Danckert, 2017), so more research is needed.

Regarding our second hypothesis, we found that boredom susceptibility significantly predicted subsequent smoking outcomes (e.g., being a smoker or not attend the follow-up session). These findings are in line with previous research examining the associations between smoking and approach-related personality traits, as impulsivity or sensation seeking (Loree, Lundahl, & Ledgerwood, 2015). For instance, in a recent systematic review examining specific impulsivity-related traits, including boredom susceptibility, and smoking-related variables in adults, found a positive relation of such traits with severity of nicotine dependence, and modest differences in patterns of association with smoking status in adults (Kale, Stautz, & Cooper, 2018).

In addition, boredom susceptibility is related to motivational factors and self-regulatory processes, which are also associated with smoking. Therefore, the propensity to experience boredom may be related to the persistence of smoking, because the individual seeks meaningful activities that keep him stimulated (van Tilburg & Igou, 2012), like cigarette smoking. In fact, it has been shown that the experience of boredom represents a failure of self-regulation, defined as the processes by which individuals align behaviors with their objectives (Struk, Scholer, & Danckert, 2016). Self-regulatory processes are also implicated in abstinence maintenance and smoking relapse (Hyland et al., 2006; Ochsner et al., 2014). Further research is needed to understand the

mechanisms and variables implicated in the relationship between boredom susceptibility and smoking-related variables and cessation outcomes.

Finally, we found that men obtained higher scores on boredom susceptibility than women, which is in line with previous studies (McIntosh, 2006). Additionally, our findings showed that the predictive value of boredom susceptibility was only significant in the case of men. This highlights the relevance of considering sex when analyzing the impact of psychological variables, such as boredom susceptibility, on smoking outcomes.

Several limitations of this work should be noted. Firstly, although we conducted a longitudinal study, a causal relation between study variables cannot be established. Secondly, we used self-report instruments to assess the study variables, which imply some inherent biases, such as, for example, social desirability bias. Thirdly, we grouped in the same category those participants reporting to smoke and those lost to follow-up. This prevents to establish clearly whether boredom susceptibility would predict independently be smoker and/or study drop-out, thus more research is needed to investigate this question. Finally, we have not analyzed the effect of other impulsivity and sensation seeking facets. Future studies are needed to examine the effect of such variables and boredom susceptibility on long-term smoking cessation outcomes.

To our knowledge, this is the first study to obtain an association between boredom susceptibility and smoking cessation outcomes, finding sex differences. Among the strengths of the present study, we note that a 12-month follow-up was carried out, and self-reported abstinence was biochemically confirmed through CO measure. In addition, we used a large sample of seeking-treatment smokers that included participants with a broad age range and from different education levels. Therefore, our results have several clinical implications. Considering sex differences,

men with higher scores on boredom susceptibility might benefit from psychological strategies as self-regulation training in order to reduce not only the experience of boredom but also boredom susceptibility (Struk et al., 2016).

5. Conclusion

This study indicates that boredom susceptibility is a significant predictor of smoking status in men. Future studies should explore in greater depth the contribution of this personality trait, considering sex as an important variable. Further research is also needed to understand the relationship between boredom susceptibility and depression in smokers seeking cessation treatment.

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