

**Boredom susceptibility and quit smoking: the role of anxiety symptoms**

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# **Boredom susceptibility and quit smoking: the role of anxiety symptoms**

## **Abstract**

Boredom is one of the main reported motives for smoking. However, scarce research has examined the relationship between boredom susceptibility and abstinence achievement in treatment-seeking smokers. The aim of this study is to examine the mediating effect of anxiety symptoms in the relationship between boredom susceptibility and abstinence at the end of a smoking cessation treatment. The sample was composed of 481 Spanish smokers who received a cognitive-behavioral treatment to quit ( $M_{\text{age}} = 45.51$ ,  $SD = 11.16$ ; 60.6% female). The Boredom Susceptibility subscale of the Sensation Seeking Scale Form-V and the Beck Anxiety Inventory were used. Pearson correlations and mediation analyses were conducted to examine the relationships between the study variables. Boredom susceptibility was significantly and positively correlated to anxiety symptoms, but not to abstinence. Anxiety symptoms were significantly and negatively correlated to abstinence. A significant indirect effect of boredom susceptibility on abstinence at the end of treatment through anxiety symptoms was found. There was no direct relation between boredom susceptibility and abstinence. These findings extend previous literature by showing that higher boredom susceptibility is associated with less likelihood to be abstinent at the end of the treatment through higher anxiety symptoms. These results highlight the relevance of considering the inclusion of boredom and anxiety management techniques in smoking cessation interventions.

**Keywords:** boredom susceptibility, sensation-seeking, anxiety symptoms, abstinence, smoking cessation.

## **Introduction**

Cognitive-behavioral treatments have shown to be effective to quit smoking (Patnode et al., 2021). Smoking cessation outcomes of these treatments are influenced by psychological variables (Moylan et al., 2012; Rodríguez-Cano et al., 2016). One of these variables is boredom, which is defined as a negative state that happens when a person 1) desires but cannot engage attention with activities, 2) is focused on this negative state, and 3) attributes its cause to the environment (Eastwood et al., 2012). Boredom can be also understood as a personal characteristic or tendency (Mercer-Lynn et al., 2013; Bieleke et al., 2022). Following this approach, two constructs have been proposed: boredom proneness, defined as a personal tendency to experience boredom (Farmer & Sundberg, 1986); and boredom susceptibility, defined as an individual trait of “aversion to repetition, routine, and dull people, and restlessness when things are unchanging” (Zuckerman, Eysenck, & Eysenck, 1978, p. 140).

Literature has shown that higher boredom susceptibility is related to addictive behaviors (Achab et al., 2022; Mercer-Lynn et al., 2013; Windle & Windle, 2018), and, specifically, smoking. For instance, previous research has found that boredom susceptibility was greater in smokers compared with people who did not smoke (Balevich et al., 2013). Since boredom susceptibility promotes seeking stimulation and meaningful activities (van Tilburg & Igou, 2012), smoking could be seen as a way to avoid the discomfort due to its stimulant properties (Fagerstrom, 2012). Despite this relationship between boredom susceptibility and tobacco use has been studied (Baleyich, et al., 2013; Pettiford et al., 2007), the effect of boredom susceptibility on smoking cessation outcomes in clinical settings has still received little research attention. To our knowledge, one study has investigated this relationship in a sample of seeking treatment smokers, showing that boredom susceptibility was associated with a lower likelihood of

maintaining abstinence at 6- and 12-month follow-ups after treatment in males but not in females (Martinez-Vispo et al., 2019). The clinical implications of these results highlight the relevance of continuing to study the role of boredom susceptibility on abstinence outcomes.

A variable that might influence the relationship between boredom susceptibility and cessation outcomes is anxiety symptoms. Previous studies like Boschloo et al. (2013) examining the relationship between personality traits (e.g., boredom susceptibility, adventure seeking, experience seeking) and depressive/anxiety disorders, found that boredom susceptibility levels were higher in individuals with depressive and anxiety disorders compared with people without them. Consistent with this finding, Prat & Adan (2013) also showed a significant positive correlation between boredom susceptibility and anxiety symptoms. These authors suggest that this relationship could be due to a greater psychological distress experience associated with boredom susceptibility trait. Therefore, we could hypothesize that specific personality traits, like boredom susceptibility, could play a key role in the development of depressive or anxiety symptoms (Kendler & Gardner, 2011; Spinhoven et al., 2009).

Likewise, anxiety symptoms are related to smoking (Fluharty et al., 2017) and are considered a barrier to quit smoking (McDermott et al., 2013). Experiencing anxiety symptoms is associated with an increased risk of smoking onset in adults (Cuijpers et al., 2007); smoking for more years (Lawrence et al., 2010), suffering more intense nicotine withdrawal symptoms when quitting (Piper et al., 2011), less likelihood of quitting smoking (Piper et al., 2010), and higher risk of relapse (Zvolensky et al., 2008).

To our knowledge, no studies have investigated the role of anxiety symptoms on the relationship between boredom susceptibility and abstinence achievement. Therefore, the aim of this study is to explore the indirect effect of boredom susceptibility on

abstinence outcomes at the end of a cognitive-behavioral treatment to quit through anxiety symptoms.

## **Method**

### ***Participants***

The sample was composed of 481 Spanish smokers who received a cognitive-behavioral treatment to quit smoking at the Smoking Cessation and Addictive Disorders Unit of the University of Santiago de Compostela. The inclusion criteria were: (1) being at least 18 years old; (2) smoking at least six cigarettes per day; (3) providing written informed consent (4) completing the assessment at pre-treatment; (5) wishing to participate in the treatment program. The exclusion criteria were: (1) having a pathology that requires immediate intervention (e.g., chronic obstructive pulmonary disease or lung cancer); (2) concurrent dependence on other substances (e.g., alcohol dependence); (3) diagnosis of severe mental disorder (e.g., psychotic disorders); (4) not attending the first treatment session. [All participants met Diagnostic and Statistical Manual of Mental Disorders, fifth edition \(DSM-5\) criteria for tobacco use disorder.](#)

### ***Measures***

- **Boredom Susceptibility subscale of the Sensation Seeking Scale Form V (SSS-V; Zuckerman et al., 1978).** It is a 10-item 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”). We used the Spanish adaptation of the subscale, which has a Cronbach alpha of .69 (Pérez & Torrubia, 1986). [In our sample, Cronbach alpha was .52.](#)

- **Beck Anxiety Inventory (BAI; Beck et al., 1988).** It is a self-report questionnaire measuring 21 symptoms of anxiety. The Spanish version of this subscale was used, which has a Cronbach alpha of .92 (Sanz & Navarro, 2013). [In our sample, Cronbach alpha was .92.](#)
- **Abstinence.** Self-reported abstinence (defined as at least 24 hours without smoking even a puff) was measured at the end of the treatment (during the eighth session) and validated by carbon monoxide (CO) in expired air using Micro+ Smokerlyzer (Bedfont Scientific Ltd, Maidstone, Kent, UK). Since part of the sample was recruited during the COVID-19 pandemic, abstinence measures of 30.10% of participants were only self-reported. To test the possible bias this might lead, we compared abstinence percentages between those participants who had biochemical validation and those who did not. The results showed no statistically significant differences in abstinence rates ( $\chi^2 = 2.027$ ;  $p = 0.15$ ).

### ***Procedure***

Participants were recruited between September 2015 and July 2021. Following an initial telephone contact, if interested, participants attended a baseline individual assessment session where participants filled out the questionnaires. All participants provided written informed consent prior to intervention, and the study was approved by the Bioethics Committee of the University of Santiago de Compostela.

[This psychological intervention is a multi-component cognitive-behavioral smoking cessation treatment named “Programa para Dejar de Fumar” \(Becoña, 2007\). It consists of eight group sessions \(6-8 people per group\) once a week, of one hour each. It includes components as smoking self-report, information about tobacco, nicotine fading, stimulus control, activities to prevent withdrawal syndrome and relapse-prevention strategies \(e.g., changing tobacco-related misconceptions, weight control\). This](#)

intervention is usually delivered in person at the Smoking Cessation and Addictive Disorders Unit. However, due to the COVID-19 pandemic and the social-contact limitations, we delivered the intervention through video calls from March 2020 to July 2021.

### *Analytic Strategy*

In order to accomplish the main objective, mediation analyses were performed with the PROCESS macro for SPSS. Mediation analysis allows assessing how a variable's effect on an outcome (X on Y) can be partitioned into direct and indirect effects that can be quantified (Hayes & Little, 2018). In this study, mediation analysis was performed to examine the indirect effect of boredom susceptibility on abstinence outcomes at the end of treatment through anxiety symptoms. More specifically, a mediation model was conducted with boredom susceptibility as an independent variable (X), anxiety symptoms as mediator (M), and abstinence (0=smoking; 1=abstinence) as a dependent variable (Y) (Figure 1). Sex, age, and type of intervention delivery (in-person vs. online) were controlled in the analysis. The model 4 (model as a parameter in the PROCESS function) was used for the mediation model. All research variables were included in the model based on the scores obtained in the questionnaires described in the above measures section.

Bootstrapping analysis with bias correction was used (20,000 resampling) to generate the confidence intervals to analyze the study objectives (Preacher & Hayes, 2008). Mediation analysis is significant if the 95% bias corrected and accelerated lower limit (LL) and upper limit (UL) for the indirect effect (IE) do not include 0. -Furthermore, reverse model analyses were performed to test anxiety symptoms as a predictor variable and boredom susceptibility as a mediator.

## Results

### *Descriptive analysis and correlations results*

Descriptive data are presented in Table 1.

[Table 1 near here]

Correlation analysis showed that boredom susceptibility was significantly and positively associated to anxiety symptoms ( $r = 0.161$ ;  $p \leq 0.01$ ), but not to abstinence ( $r = -0.011$ ;  $p = 0.81$ ). Anxiety symptoms were significantly and negatively correlated to abstinence ( $r = -0.12$ ;  $p \leq 0.01$ ).

### *Mediation analysis*

The mediation analysis showed a nonsignificant direct effect of boredom susceptibility on abstinence at the end of treatment ( $\beta = 0.023$ ;  $SE = 0.046$ , 95% Boot CI: -0.066, 0.114). A significant indirect effect of boredom susceptibility on abstinence at the end of treatment, through anxiety symptoms ( $\beta = -0.024$ ;  $SE = 0.011$ , 95% Boot CI: -0.050, -0.006) was found (Figure 1). Similar results were obtained in the unadjusted model (without covariates), where a nonsignificant direct effect of boredom susceptibility on abstinence at the end of treatment ( $\beta = 0.008$ ;  $SE = 0.045$ , 95% Boot CI: -0.080, 0.096) and a significant indirect effect via anxiety symptoms ( $\beta = -0.018$ ;  $SE = 0.009$ , 95% Boot CI: -0.040, -0.003) were found.

[Figure 1 near here]

Reverse models were conducted to explore whether boredom susceptibility was the mediator in the relation between anxiety symptoms and abstinence. These models showed a nonsignificant indirect effect of anxiety on abstinence at the end of the treatment via boredom susceptibility ( $\beta = 0.001$ ;  $SE = 0.002$ , 95% Boot CI: -0.029, 0.005).

## Discussion

Regarding the main aim of this study, our results showed a significant indirect effect of boredom susceptibility on abstinence outcomes at the end of the treatment through anxiety symptoms. Our findings are consistent with previous studies indicating that people with higher boredom susceptibility are more likely to report anxiety symptoms (Boschloo et al., 2013; Prat & Adan, 2013). Moreover, our results suggest that some smokers could use tobacco as a strategy to cope with boredom as reported in previous studies (Cordon et al., 2021; McEwen et al., 2008). Therefore, smokers with higher boredom susceptibility could experience more difficulties to quit smoking. This could be explained by the fact that smokers with a higher boredom susceptibility could smoke to avoid or escape anxiety symptoms, increasing the negative reinforcing expectations of smoking behavior (Fagerström, 2012), and influencing abstinence achievement negatively. Moreover, these findings align with previous research suggesting that smokers who experience a negative internal state may try to cope with it through smoking (Johnson et al., 2008; Martínez-Vispo et al., 2020; Wang et al., 2016).~~and also with studies showing that among the main motives to smoke are coping with perceived stress and managing boredom (Cordon et al., 2021; McEwen et al., 2008). This study aimed to investigate the mediating role of anxiety symptoms in the relationship between boredom susceptibility and abstinence at the end of a smoking cessation treatment.~~

~~We found that boredom susceptibility was significantly and positively correlated to anxiety symptoms, which is consistent with previous studies indicating that people with higher boredom susceptibility are more likely to report anxiety symptoms (Boschloo et al., 2013; Prat & Adan, 2013). Moreover, this finding replicates the results obtained in studies targeting other populations in a clinical sample of smokers.~~

~~Regarding the main aim of this study, our results showed a significant indirect effect of boredom susceptibility on abstinence outcomes at the end of the treatment through anxiety symptoms. This finding could be explained by the fact that smokers with a higher boredom susceptibility could smoke to avoid or escape anxiety symptoms, increasing the negative reinforcing expectations of smoking behavior (Fagerström, 2012). Moreover, these findings align with previous research suggesting that smokers who experience a negative internal state may try to cope with it through smoking (Martínez-Vispo et al., 2020). In addition, these results are congruent with studies showing that among the main motives to smoke are coping with perceived stress and managing boredom (Cordon et al., 2021; McEwen et al., 2008).~~

Our findings extend previous literature that has shown a significant effect of boredom susceptibility on long-term abstinence outcomes (6- and 12-months follow-up) (Martínez-Vispo et al., 2019) by showing that this variable also influences indirectly short-term smoking cessation through anxiety symptoms. ~~Moreover, these results provide a possible explanation concerning previous studies not founding a direct relation between boredom susceptibility and smoking cessation.~~ The study of Carton et al. (2000) reported that sensation-seeking trait (which included boredom susceptibility) did not predict quitting smoking in treatment with nicotine transdermal patches. Therefore, research as the present study exploring mediational variables contributes to a better understanding of boredom susceptibility effect on smoking cessation treatment outcomes.

Some limitations of the study should be acknowledged. First, the design of the study does not allow any assumption about the direction of the effects. However, a reverse model was conducted in order to gain confidence in the proposed model. Second, self-report measures were used, which can introduce some biases in the results through social

desirability. Third, the reliability of the Boredom Susceptibility subscale in our sample (Cronbach alpha of .52) could be considered low. However, this value is similar to the reported by other studies (Ridgeway & Russell, 1980; Pérez-Fuentes et al., 2019). -Lastly, using a sample of seeking-treatment smokers prevents the generalization of the results to smokers from the general population. Future studies using longitudinal designs are needed to establish the nature and direction of the associations found in the present investigation.

The findings of the present study could be used to improve clinical outcomes. Therefore, including treatment components addressing these variables, like emotional-regulation skills or cognitive strategies, could be useful (Freund et al., 2021). In addition, scheduling new activities to change the routine may facilitate to achieve abstinence in smokers with high boredom susceptibility, who experience aversion to repetition and routine (Zuckerman et al., 1978). Since anxiety symptomatology is a relevant variable in the relationship between boredom susceptibility and abstinence, including techniques for managing anxiety symptoms could improve abstinence rates. In fact, preliminary research suggests that combined cognitive behavioral intervention for anxiety and smoking cessation could be a useful approach (Buckner et al., 2019).

Future studies are warranted to continue researching whether boredom susceptibility is associated with quitting behaviors in smokers not enrolled in a smoking cessation intervention. Moreover, examining the role of other variables, such as the circadian typology and its association with personality traits like boredom susceptibility on tobacco abstinence achievement, could be interesting due to the close relationship between this variable and substance use (Adan, 2013). Further studies are also needed to analyze the influence of boredom susceptibility on anxiety symptoms over time and whether changes in this symptomatology are associated with quitting. Finally, assessing

this relation in smokers with anxiety disorders would be interesting to elucidate the robustness of the outcomes found.

This study also has some strengths. We examined the direct and indirect association between boredom susceptibility and abstinence achievement after treatment contributing to fill a gap in the literature about the psychological variables implicated in the relationship between these variables. Additionally, this study was conducted with a large clinical sample, and finally, the analyses were carried out, controlling for numerous potential confounding effects.

In summary, the present study shows that higher boredom susceptibility has a negative indirect effect on abstinence at the end of the treatment through greater anxiety symptoms. These findings have implications, exploring the factors that may influence the effectiveness of smoking cessation treatments. Considering the impact of boredom susceptibility and including techniques for managing anxiety in smoking cessation interventions could improve abstinence outcomes.

## **Declarations**

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**Informed Consent:** Informed consent was obtained from all patients for being included in the study.

**Ethics approval:** All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. The Bioethics Committee of the University of Santiago de Compostela approved the study.

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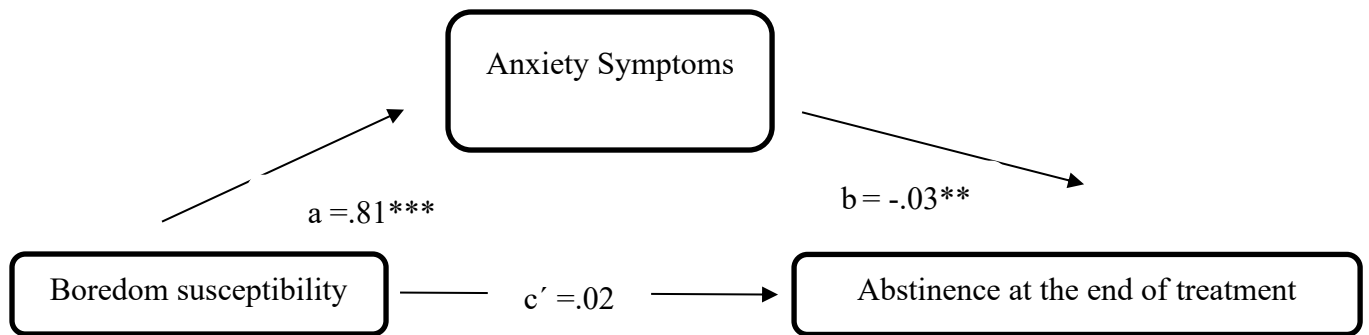
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**Table 1.** Descriptive data of study variables.

	<b>M (SD) /% (n)</b>
Age	45.51 (11.16)
Sex (Female)	60.60 (292)
<i>Education</i>	
< High school diploma	18.00 (87)
High school or general education diploma	35.50 (171)
University or technical school	46.50 (224)
<i>Marital status</i>	
Married	47.90 (231)
Single	33.20 (160)
Other marital status (eg., divorced/separated, widowed)	18.90 (91)
Cigarettes per day at pre-treatment	18.81 (8.03)
BAI at pre-treatment	9.85 (9.58)
BS subscale at pre-treatment	3.85 (2.16)
Abstinence at the end of treatment	64.90 (313)

*Note.* BAI: Beck Anxiety Inventory; BS: Boredom Susceptibility.

**Figure 1.** Results of mediation analysis controlled by covariates.



\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$