Depressive mood and tobacco use: Moderating effects of gender and emotional attention

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ARTICLE INFO

ABSTRACT

Introduction: Depressive symptomatology is a predictive variable of tobacco use. The objective of the present study was to evaluate the influence that this symptomatology has on tobacco use when moderated by emotional attention.
Methods: A total of 289 participants (127 males, 162 females) completed a survey to measure perceived emotional intelligence, depressive symptomatology, tobacco use and sociodemographic variables. Results were analyzed using a multiple regression model that included self-perceived emotional attention as a moderating variable.
Results: In women, an interaction was found between depressive symptomatology and gender for predicting the number of cigarettes smoked ($t = 2.45$; $p = .01$), but not in men ($t = -.74$; $p = .45$). This interaction was moderated by emotional attention ($t = 2.83$; $p = .005$), such that women with medium and high levels of attention consumed a larger number of cigarettes.
Conclusions: In women, the effect of depressive symptomatology on tobacco use was moderated by the amount of attention that women paid to those symptoms. Such a moderating effect of attention was not observed in men. We recommend that smoking cessation programs incorporate interventions designed specifically for women, in particular to help them manage depressive symptomatology.

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1. Introduction

Tobacco use continues to be one of the principal causes of avoidable death. The association between smoking and appearance of disease has been demonstrated in numerous studies (Corrêa et al., 2009; Foulds et al., 2010; U.S. Department of Health and Human Services, 2004). Smoking is responsible for approximately 30% of cancer deaths in developed countries (Vineis et al., 2004). In these countries, chronic obstructive pulmonary disease (COPD) is a significant cause of morbidity and mortality (Mannino and Buist, 2007), and smoking is the principal cause of this disease (Buist et al., 2008). Cessation of tobacco use is the main treatment for COPD; it reduces the risk not only of developing COPD, but also of suffering diverse types of cancer and coronary disease (Taylor et al., 2002). The likelihood of developing disease increases with the level of tobacco use (Burrows et al., 1977; Doll and Crofton, 1996), although a threshold for the number of packet-years associated with the appearance of disease has not been established. The packet-year, obtained by multiplying the number of packs per day by the number of years,

has become a standard unit for describing cigarette consumption (Hill, 1992).

Negative affect is an important psychological factor in the maintenance of tobacco use (Fucito et al., 2010) and in the occurrence of relapses after cessation (Schleicher et al., 2009; Vogel et al., 2003; Wiesbeck et al., 2008). Numerous studies have clearly established a relationship between depressive symptomatology and smoking. Escobedo et al. (1998) have shown that adolescents with depressive symptoms are more likely to start smoking than those without such symptoms. Other studies have reported a higher prevalence of depressive symptomatology among smokers (Farrell et al., 2001; Korhonen et al., 2007), greater difficulty in quitting smoking among those with depressive symptomatology (Prochaska et al., 2004), and susceptibility to depression as a predictive variable of cigarette consumption (McChargue and Cook, 2007; Morrell et al., 2010).

Smokers often experience increased depressive symptoms immediately after cessation. Piccioto et al. (2008) examined the evidence around the mechanism by which nicotine modulates affectivity. Nicotine both activates and desensitizes nicotinic acetylcholine receptors, and which of these actions leads to the appearance of depressive symptoms is unknown. Regardless, it has been suggested that dysregulation of the cholinergic system may contribute to the appearance of such symptoms after cessation (Mineur and Piccioto, 2010). Some investigators have linked

activation of acetylcholine-based neurotransmission to relief of dysphoric symptoms that persons who quit smoking may feel (Lucas-Meunier et al., 2003; Pomerleau and Rosencrans, 1989). In this way, smoking behavior is immediately reinforced, both positively and negatively (Doran et al., 2007).

In a study of adolescents, Heinz et al. (2010) found that expectations of a reduction in the negative affective experience (tension, bad mood, low spirits) are a risk factor to continue smoking. Webb et al. (2010) used similar reasoning to explain relapses by people who stop using tobacco. When people decide to stop, they may deal with the resulting neurobiological changes using their own strategies or through cognitive behavioral psychological therapy involving, for example, anticipation of positive consequences, social support or engagement in pleasurable activities (Hall et al., 2010). If they do not deal appropriately with these neurobiological changes, then problems may occur: Carmody et al. (2007) suggested that negative affectivity can become significant in the absence of abilities or strategies to modulate it.

Not all strategies for dealing with neurobiological changes, such as those that result from quitting smoking, are effective. Studies have shown that high attention to emotions, an inappropriate strategy, can become a ruminative cycle that generates depressive symptomatology (Extremera et al., 2006). Indeed, a systematic review concluded that there is an association between depressive symptomatology and high emotional attention in women (Fernández-Berrocal and Extremera, 2008). Emotional attention has been defined as the first step necessary to become aware of the type of emotion that one is feeling (positive or negative), in order to initiate strategies to regulate it (Gohm, 2003). People who have difficulties regulating their emotions or who adopt ineffective coping strategies may be paying attention to their emotions but not using that information to regulate negative emotions (Thayer et al., 2003). It has been hypothesized that people who do not use the information gained from emotional attention to regulate their negative emotion engage in ruminative thinking aimed at explaining the emotion, its causes and its consequences, thereby increasing the negative emotion (Fernández-Berrocal and Extremera, 2008; Thayer et al., 2003). According to Nolen-Hoeksema (1991), ruminative thinking consists of repetitive thoughts about the causes of depression, its meaning and its consequences. Some studies have highlighted that ruminative thoughts increase depressive symptoms (Grassia and Gibb, 2008; Nolen-Hoeksema et al., 2008). Using the Trait Meta-Mood Scale (TMMS; Salovey et al., 1995), which metacognitively measures three factors (attention, clarity, repair), some authors have found that high emotional intelligence (EI) is characterized by a profile of low attention to emotions, high clarity and high repair. Low EI is associated with the opposite profile of high attention to emotions, low clarity and low repair, and this profile correlates with anxiety and depression (Lischetzke and Eid, 2003; Williams et al., 2004).

Some authors have analyzed the influence of emotional intelligence on smoking behavior and on the quantity of tobacco used (Ruiz-Aranda et al., 2006; Trinidad and Johnson, 2002). However, no studies on tobacco use have explored the possibility that emotional attention moderates depressive symptomatology, despite the fact that this attention can be measured reliably using the TMMS.

Previous work has shown that gender can influence the relationship among negative affectivity, depressive symptomatology and tobacco or drug use (Schnoll and Patterson, 2009). These studies have shown greater tobacco use among men (Baumert et al., 2010), an association between EI and drug use in men (Brackett et al., 2004), and an association between susceptibility to depression and smoking behavior in women (Luk and Tsoh, 2010; Morrell et al., 2010; Whitbeck et al., 2009). These results highlight the need to take into account the moderating effects of gender when analyzing these affective variables.

The objective of this study was to analyze the influence of depressive symptomatology on tobacco use. Based on previous research, we hypothesized that people with greater depressive symptomatology would use more tobacco. In addition, we used the TMMS to determine whether emotional attention moderates the relationship between depressive symptomatology and tobacco use, and whether this effect of attention is in turn moderated by gender.

2. Methods

2.1. Participants

A total of 289 people with ages between 22 and 78 years ($M = 48.67$; $SD = 10.5$) participated in the study. Participants were invited to take part after attending a smoking cessation program in 2009 organized by the Málaga chapter of the Spanish Association Against Cancer (AECC). The sample included 127 men (43.2%) and 162 women (56.8%). Participants smoked a mean of 26 cigarettes per day, and 20% of the group smoked fewer than 20 cigarettes per day. This study received the approval of the Ethical Committee of the University of Málaga.

2.2. Materials

Participants were assessed using the instruments below.

2.2.1. Trait Meta-Mood Scale (TMMS; Salovey et al., 1995). This instrument measures perceived emotional intelligence (PEI). It was adapted for use in Spanish by Fernández-Berrocal et al. (2004). It consists of 24 items that the respondent evaluates using a Likert scale from 1 (completely disagree) to 5 (completely agree). The scale measures three factors: emotional attention, emotional clarity and emotional repair. Only emotional attention was analyzed in the present study. The Cronbach coefficient (α) for this factor was .87. Emotional attention consists of 8 items measuring the amount of attention paid to one's emotional states and includes items such as "I often think about my feelings." The questionnaire is not scored globally, since high EI is thought to correspond to a low score on attention and high scores on clarity and repair. Thus, the three factors on the TMMS should be analyzed separately (Fernández-Berrocal and Extremera, 2008). Since the TMMS is a self-report questionnaire, it is thought to measure a person's perception of his or her own emotional abilities. As an intrapersonal skill, emotional attention is difficult to measure through tasks evaluated by external observers. Despite being a self-reported measure, emotional attention has been shown to have predictive validity for explaining well-being and emotional health in different populations (Gohm and Clore, 2002; Lischetzke and Eid, 2003).

2.2.2. Beck Depression Inventory-II (BDI-II; Beck et al., 1996). The BDI consists of 21 items assessing severity of symptoms such as feelings of guilt and worthlessness, irritability, fatigue and changes in weight, sleep, appetite and libido over a two-week period. Higher scores indicate greater depression. It was adapted for use in Spanish by Sanz et al. (2003). Each item has four possible responses, from 0 to 3, according to the severity of the sign or symptom. The BDI-II has been shown to have good one-week test–retest reliability (Pearson $r = .93$) and high internal consistency ($\alpha = .91$) (Beck et al., 1996). It showed a Cronbach's α of .82 in our study.

2.2.3. Sociodemographic variables. A questionnaire was designed to capture various sociodemographic variables: gender, age, education level, age at the start of smoking, number of attempts to quit and cohabitation with smokers.

2.3. Statistical analysis

Preliminary analyses were carried out to detect relationships between the criterion variable (number of cigarettes) and the remaining variables. Correlation analysis was performed for continuous sociodemographic variables, while intergroup differences were analyzed using analysis of variance (ANOVA) and Student's t test. The regression procedure of Hayes and Matthes (2009) was used to analyze the effects of moderating variables on predictive ones. Using the Johnson–Neyman computational technique, this approach tests interactions between variables at different values of the moderating variable, chosen using nonarbitrary criteria (e.g., ± 1 SD). In this way, the approach identifies for what range of values the moderating variable has a significant effect on predictive variables.

3. Results

3.1. Preliminary analysis

Descriptive analysis of the demographic variables showed that 33.9% of subjects did not live with a partner, while 66.1% were either married or living with a partner. Nearly half (45%) had studied at

the university level, while proportions ranging from 8% to 15% had studied at the primary, secondary, baccalaureate, and professional levels. Overall, the study group had smoked an average of 31.28 years (SD: 10.39). While 15.7% had never attempted to stop using tobacco, the remainder had attempted to do so at least once. The proportion of subjects living with smokers was 44.8%.

In order to detect covariates or confounders in our data, we examined possible relationships between sociodemographic variables and the number of cigarettes smoked daily. Specifically, we carried out correlation analysis (age, age at the start of smoking, number of attempts to quit) and analysis of variance (at the level of study, marital status) with the number of cigarettes smoked. These analyses did not show any associations ($p > .05$). We also applied Student's t test to analyze the effect of the dichotomous predictive variables of gender and cohabitation on smoking. We found that gender was associated with the number of cigarettes smoked [$t(260) = 3.34$, $p < .001$], with men smoking more cigarettes per day than women ($M = 27.8$ vs $M = 23.2$).

3.2. Regression analysis

Multivariate regression was used to determine whether depressive symptomatology was associated with tobacco use. The possible moderating effect of gender on this association was tested using the MODPROBE macro of Hayes and Matthes (2009).

The results showed an interaction effect of depressive symptomatology and gender ($t = 2.45$; $p = .01$) on tobacco use. In women, depressive symptoms were associated with higher use ($t = 2.57$; $p = .01$). In contrast, this association was not significant in men ($t = -.74$; $p = .45$). Thus, the following analyses were carried out only in women.

Multivariate regression was used to determine to what extent depressive symptomatology predicted tobacco use in women. The possible moderating effect of emotional attention on this association was tested using the MODPROBE macro. The results showed an effect of depressive symptomatology on tobacco use, and this effect was moderated by emotional attention (Table 1). The variance explained by depressive symptomatology was $R^2 = .225$, which increased by .07 when the moderating variable of emotional attention was included. This variable began to exert a moderating effect at a mean emotional attention of 24.59 ($t = 2.34$; $p = .02$); the effect was particularly high for a mean emotional attention of 30.88 ($t = 4.04$; $p < .001$) (see Fig. 1).

4. Discussion

As expected, the number of cigarettes smoked daily in our sample of women was associated with the presence of depressive symptomatology, as measured with the BDI-II, and this association was moderated by the level of attention that the women paid to their emotions. In contrast, our results with men showed no association between depressive symptomatology and number of cigarettes smoked daily. The basis for this gender difference is
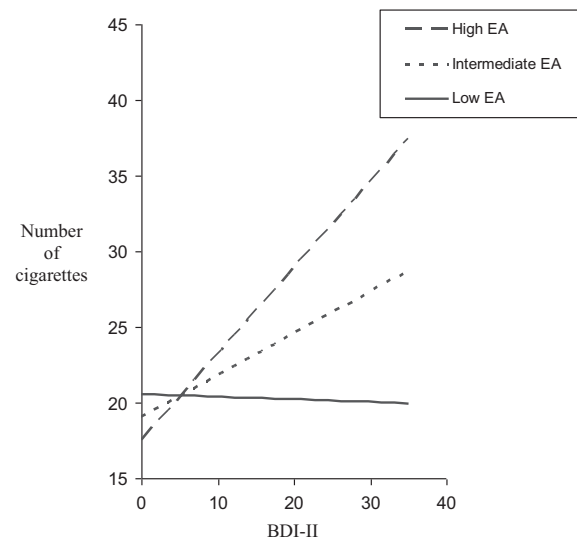
Fig. 1. Number of cigarettes smoked daily by women ($n = 162$) plotted against depressive symptomatology, as measured by the BDI-II. Women were divided into three subgroups based on their emotional attention (EA) level.

unclear; as Kun and Demetrovics (2010) pointed out in their meta-analysis, "We also have poor knowledge on the possible effects of gender. . . in the relationship between substance use and emotional intelligence." Future studies should analyze differences in how EI influences drug use in general and, in particular, tobacco use, as well as how EI interacts with relevant variables such as gender, age, and socioeconomic status.

Why this model did not apply to our sample of men, even though their level of depressive symptomatology was similar to that in our women, remains to be explained. Some authors have pointed out that women are more affected by depressive symptomatology and mood changes than are men because of hormonal changes linked to the menstrual cycle (Borrelli et al., 1996). In addition, men may smoke a greater number of cigarettes in response to variables other than depressive symptomatology; these variables remain unclear and should be addressed in future studies (Morrell et al., 2010).

Our results are consistent with those found by other authors in studies with adolescents (Borrelli et al., 1999; Whitbeck et al., 2009) and with adults (Luk and Tsoh, 2010). In those studies, depressive symptomatology was associated with increased tobacco use only in females.

As Carmody et al. (2007) explains, the existence of negative affectivity is not enough to induce drug use; the absence of coping strategies to face those emotions is also required. Following this reasoning, we can consider high attention to negative emotions as an inadequate coping strategy, since it may increase ruminative thoughts, generating more depressive symptoms (Extremera et al., 2006; Nolen-Hoeksema et al., 1999, 2008).

Table 1
Univariate and adjusted analysis of cigarette use, depressive symptomatology and emotional attention in women ($n = 162$).

Variable	Univariate regression, unadjusted			Multivariate regression, adjusted		
	β (95% CI)	t	p	β (95% CI)	t	p
EA[a]	.37 (.12 .62)	2.97	.004	.16 (−.14 .46)	1.02	.31
DS[b]	.47 (.22 .72)	3.76	.0001	.32 (.05 .60)	2.34	.02
EA × DS[c]				.05 (.02 .09)	2.83	.005

$R^2 = .225$; R^2 increase due to interaction: .07.

[a] Emotional attention.
[b] Depressive symptomatotology.
[c] Interaction between emotional attention (EA) and self-perceived depressive symptomatology (DS).

4.1. Limitations

Before generalizing our conclusions, it is important to take into account some methodological limitations of this study. First, the cross-sectional design of this study does not allow us to establish causal relationships. Second, our study population and the manner in which it was recruited may have biased our results. Our sample comprised individuals who voluntarily attended a smoking cessation program. This subgroup of people seeking to stop their tobacco use may not be completely representative of smokers in general. Nevertheless, we believe our results still have clinical significance because professionals who help people quit smoking do not work with the general population but rather with people who voluntarily seek to quit. In this way, our study population was more representative of a clinical sample than a random sample of smokers would have been.

4.2. Conclusions and future directions

The majority of smoking cessation programs, especially group-based ones, do not differentiate between interventions for men and women. The results of the present study may have direct implications for clinical practice because they argue for the design of interventions specifically for women, in particular to help them manage depressive symptomatology. These interventions may include teaching women techniques to pay less attention to negative emotions, thereby avoiding ruminative thinking (Nolen-Hoeksema et al., 2008); to increase and nurture positive emotions (Lyubomirsky et al., 2005); and to distract themselves, such as by engaging in sports or expanding their social network, which leads to more adaptive coping (Thayer et al., 2003).

Future work should analyze what factors are associated with high cigarette use and with the ability of anti-smoking programs to progressively reduce such use. Indeed, a reduction in cigarette smoking may be considered a first step towards complete cessation (Okuyemi et al., 2010) and, at the same time, towards reduced risk of serious disease and of smoking-related death.

Role of funding sources

Contributors

José Manuel Perea-Baena and Pablo Fernández-Berrocal designed the study, wrote the protocol, and conducted the statistical analysis. Salvador Oña-Compan conducted literature searches and provided summaries of previous research studies. José Manuel Perea-Baena wrote the first draft of the manuscript and all authors contributed to and have approved the final manuscript.

Conflict of interest

All authors declare that they have no conflicts of interest.

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