



## Modelling the contribution of negative affect, outcome expectancies and metacognitions to cigarette use and nicotine dependence



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### HIGHLIGHTS

- We examined how negative affect, expectancies and metacognitions predicted cigarette use and nicotine dependence.
- Depression, but not anxiety, directly predicted cigarette use and nicotine dependence.
- Metacognitions were a stronger predictor than outcome expectancies of both cigarette use and nicotine dependence.

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### ABSTRACT

**Background:** Both positive smoking outcome expectancies and metacognitions about smoking have been found to be positively associated with cigarette use and nicotine dependence. The goal of this study was to test a model including nicotine dependence and number of daily cigarettes as dependent variables, anxiety and depression as independent variables, and smoking outcome expectancies and metacognitions about smoking as mediators between the independents and dependents.

**Methods:** The sample consisted of 524 self-declared smokers who scored 3 or above on the Fagerstrom Test for Nicotine Dependence (FTND; Uysal et al., 2004).

**Results:** Anxiety was not associated with either cigarette use or nicotine dependence but was positively associated with all mediators with the exception of stimulation state enhancement and social facilitation. Depression, on the other hand, was found to be positively associated with nicotine dependence (and very weakly to cigarette use) but was not associated with either smoking outcome expectancies or metacognitions about smoking. Only one smoking outcome expectancy (negative affect reduction) was found to be positively associated with nicotine dependence but not cigarette use. Furthermore one smoking outcome expectancy (negative social impression) was found to be positively associated with cigarette use (but not to nicotine dependence). All metacognitions about smoking were found to be positively associated with nicotine dependence. Moreover, negative metacognitions about uncontrollability were found to be positively associated with cigarette use.

**Conclusions:** Metacognitions about smoking appear to be a stronger mediator than smoking outcome expectancies in the relationship between negative affect and cigarette use/nicotine dependence. The implications of these findings are discussed.

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## 1. Introduction

### 1.1. Anxiety, depression and nicotine use

Research has shown that nicotine users have significantly higher rates of psychiatric comorbidity compared to non-users (Buckley et al., 2005; John, Meyer, Rumpf, & Hapke, 2004; Lasser et al., 2000). In a large study involving over 43,000 computerized personal interviews, Grant, Hasin, Chou, Stinson, and Dawson (2004) reported that the odds ratio of nicotine dependence with a comorbid anxiety disorder ranged between 2.6 for a specific phobia to 4.6 for panic disorder with agoraphobia compared to the general population. Similarly, major depression and dysthymia both demonstrated an odds ratio of 3.3 compared to the general population, with findings slightly higher in individuals who experienced episodes of mania and hypomania.

Leventhal, Kahler, Ray, and Zimmerman (2009a) found that specific depressive symptoms, including low mood, hopelessness, decreased appetite and psychomotor agitation were associated with nicotine dependence in psychiatric outpatients and that these associations varied as a function of remission status. With regards to the association between depression and cigarette use, past research has yielded conflicting results. Breslau, Novak, and Kessler (2004), for example, reported a significant relationship between the rate of daily cigarette use and the onset of major depression. When looking specifically at the role of anhedonia as a symptom of depression, though, past research has concluded that there is a non-significant correlation with cigarette use (Cook, Spring, & McChargue, 2004; Leventhal, Waters, Kahler, Ray, & Sussman, 2009b). Without knowing the specific symptoms reported by the participants of this study, it is uncertain whether low mood or anhedonia were more prominent, and this is supported by the very small effect size found in this relationship.

Evidence on the association between anxiety, cigarette use and nicotine dependence is unclear. For example, Moylan, Jacka, Pasco, and Berk (2012), who recently conducted a systematic review of the link between anxiety and nicotine dependence, concluded that there appears to be a link between forms of anxiety disorder (panic disorder and generalized anxiety disorder) and nicotine dependence, although this has not been a consistent finding across studies.

Leventhal and Zvolensky (2015) attempted to explain the link between negative affect (anxiety and depression) and nicotine use by formulating a transdiagnostic model based on underlying emotional vulnerabilities implicated in using nicotine. These vulnerabilities include anhedonia, anxiety sensitivity and distress tolerance and collectively appear to underpin negative affect, as well as promote and amplify nicotine use. Furthermore, they claim that the relationship between nicotine use and negative affect becomes self-reinforcing, as nicotine heightens the risk of developing symptoms of emotional disorders (Breslau et al., 2004; Kahler, Spillane, Busch, & Leventhal, 2011; Khaled et al., 2012; Leventhal & Zvolensky, 2015).

### 1.2. Smoking outcome expectancies

Outcome expectancies refer to the anticipated reinforcing and punishing consequences related to using a substance, in both the short and long-term (Rash & Copeland, 2008). Several studies have demonstrated that smoking outcome expectancies predict smoking-related behaviours in both adults (Brandon & Baker, 1991; Copeland, Brandon, & Quinn, 1995) and adolescents (Anderson, Pollak, & Wetter, 2002; Hine, Honan, Marks, & Brettschneider, 2007; Lewis-Esquerre, Rodrigue, & Kahler, 2005; Wahl, Turner, Mermelstein, & Flay, 2005). Although the development of these smoking outcome expectancies is not well understood, parental behaviour, interaction with peers, and media representation of smoking might direct and reinforce their formation (Flay et al., 1994; Khoddam & Doran, 2013; Tickle, Hull, Sargent, Dalton, & Heatherton, 2006).

The broad spectrum of smoking outcome expectancies has been

captured by the Smoking Consequences Questionnaire (SCQ; Brandon & Baker, 1991) which focuses on the ‘subjective expected utility’ of smoking. The SCQ has undergone several iterations that have been used to measure smoking outcome expectancies in adults in the general and clinical populations (Buckley et al., 2005; Copeland et al., 1995; Rash & Copeland, 2008). Current versions suggest 10 different factors used in formulating outcome expectations, including the impact that smoking can have on mood, health, and social engagement. A distinction has been made between positive smoking outcome expectancies, such as the stimulation that smoking provides and the taste of the cigarette that one might enjoy, and negative smoking outcome expectancies, such as the risk to health and potential dependence. The former smoking outcome expectancies are typically linked to use, whilst the latter are typically linked to non use.

Prior research has that found university students and young adults with history of major depression versus no history of depression and higher dispositional negative affect report stronger positive and negative smoking outcome expectancies predicting current smoking status (McChargue, Spring, Cook, & Neumann, 2004; Morrell, Cohen, & McChargue, 2010). In addition, both depression symptoms and proneness have been found to be positively correlated with greater smoking reinforcement expectancies (Friedman-Wheeler, Ahrens, Haaga, McIntosh, & Thorndike, 2007). Evidence also suggests that anxiety and anxiety sensitivity may be linked to smoking outcome expectancies (e.g. McNally, 2002).

### 1.3. Metacognitions about smoking

Metacognitions are defined as the information individuals hold about inner cognitive-affective experiences and coping strategies involved in regulating these experiences (Wells, 1995, 2000). Wells (2000) delineates between two broad categories of metacognitions: positive and negative. Positive metacognitions are conceptualized as beliefs about the benefits of specific coping strategies in helping to regulate cognition and affect (e.g. “Worry will help me to prepare” or “If I ruminate I will understand”). Negative metacognitions, on the other hand, reflect the perceived inability to control cognitive-affective states and associated coping strategies and the potential dangers that might ensue without this control (e.g., “If I could not control my thoughts, I would not be able to function” or “When I start worrying, I cannot stop”). Research has demonstrated that metacognitions play a key role in the development and maintenance of psychological and behavioral problems including depression, generalized anxiety disorder, obsessive compulsive disorder, post-traumatic stress disorder and social anxiety disorder (for a review see: Wells, 2009, 2013).

Over the last fifteen years there has been a growing interest in the role of metacognitions in addictive behaviours (for a review Spada, Caselli, Nikčević, & Wells, 2015a). Positive and negative metacognitions about engagement in addictive behaviours have been identified in alcohol misuse, nicotine dependence and gambling. Positive metacognitions relate to the effects of engaging in addictive behaviour as a means of controlling and regulating cognition (e.g. “Smoking helps me to control my thoughts”) and affect (e.g. “Gambling will improve my mood”) (Nikčević & Spada, 2010; Spada, Giustina, Rolandi, Fernie, & Caselli, 2015b; Spada & Wells, 2006, 2008; Toneatto, 1999). Negative metacognitions concern the perception of lack of executive control over the engagement in the addictive behaviour (e.g., “My smoking persists no matter how I try to control it”), uncontrollability of thoughts related to the addictive behaviour (“The thought of gambling is stronger than my will”), thought-action fusion (“Thinking about using alcohol can make me drink”), and the negative impact of the engagement in the addictive behaviour on cognitive functioning (“Drinking will damage my mind”) (Hoyer, Hacker, & Lindenmeyer, 2007; Nikčević & Spada, 2010; Spada & Wells, 2006, 2008; Spada et al., 2015b; Toneatto, 1999). Table 1 presents findings linking metacognitions with different forms of addictive behaviours, highlighting key

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