



## Reactivity to negative affect in smokers: The role of implicit associations and distress tolerance in smoking cessation



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### HIGHLIGHTS

- Implicit associations between negative affect and avoidance in smoking cessation was examined.
- We examine the relationship between this implicit association and distress tolerance.
- The PASAT and implicit associations between avoidance/negative affect predicted time to relapse.
- In a Cox survival analysis the IAT predicted time to relapse over the PASAT.

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### ABSTRACT

Avoidance of negative affect is one motivational factor that explains smoking cessation relapse during cessation attempts. This negative reinforcement model of smoking cessation and relapse has demonstrated the importance of one's ability to tolerate nicotine withdrawal symptoms, particularly negative affect states, in remaining abstinent from smoking. Distress tolerance and implicit associations are two individual constructs that may influence the strength of this relationship. In this pilot study the authors examined implicit associations related to avoidance and negative affect using a modified Implicit Association Test (IAT), a measure designed to examine implicit associations related to negative affect and avoidance, and the relationship of these associations to distress tolerance and smoking relapse. In total, 40 participants were recruited through community flyers as part of a larger smoking cessation study. Participants completed a brief smoking history, behavioral distress tolerance assessments, and the modified IAT. Smoking status was assessed via phone 3 days and 6 days post-quit date. Results from a Cox proportional hazard model revealed that implicit associations between avoidance and negative affect were significantly negatively correlated with time to relapse after a smoking cessation attempt, whereas the behavioral distress tolerance assessments did not predict time to relapse. This study provides novel information about the cognitive associations that may underlie avoidant behavior in smokers, and may be important for understanding smoking relapse when negative affect states are particularly difficult to tolerate. Authors discuss the importance of implicit associations in understanding smoking relapse and how they can be targeted in treatment.

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### 1. Introduction

Smoking continues to be a significant public health concern, with relapse rates as high as 75–80% among treatment-seeking smokers (Fiore et al., 2000). In attempts to identify risk factors for relapse, researchers have found that increases in withdrawal-related negative affect is a potential predictor of relapse among smokers attempting cessation (Abrantes et al., 2008; Brandon & Baker, 1991; Nakajima & al'Absi, 2012; Piasecki, Jorenby, Smith, Fiore, & Baker, 2003; Piper, Schlam, Cook, et al., 2011; Shiffman & Waters, 2004; Shiffman et al.,

2007). For example, in a real-time study of 1500 smokers who were attempting cessation, increases in mean level of negative affect from pre- to post-smoking cessation predicted relapse at eight-weeks after cessation (Piper et al., 2011).

Negative reinforcement models of addictive behaviors maintain that individuals use tobacco in order to escape or avoid aversive stimuli, such as withdrawal-related negative affect (Baker, Piper, McCarthy, Majeskie, & Fiore, 2004; Eissenberg, 2004; Stasiewicz & Maisto, 1993). Smoking is negatively reinforced by the avoidance of negative affect and tobacco use becomes associated with relief of negative affect. The avoidance of these uncomfortable symptoms thus maintains smoking and can prevent successful abstinence. Complicating matters further, negative affective states can become conditioned stimuli (such as feelings of irritability) that elicit conditioned responses (i.e., smoking). Smokers may be smoking not only during withdrawal, but also upon

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experiencing other negative affect states whose relief has previously been associated with smoking. Although there has been accumulating research supporting this connection between negative affect and smoking, emerging findings have shown more equivocal results. Yeh, McCarthy, and Baker (2010) used ecological momentary assessment to identify risk factors for smoking relapse, and showed complex and possibly conditional relationships between negative affect and smoking relapse. Interestingly, compared to those with little change in negative affect prior to quitting those participants with steeper increases in negative affect had better short-term cessation outcomes. One possible explanation for these findings may be that those reporting minimal pre-quit changes in negative affect were smoking to neutralize their anticipatory anxiety about smoking cessation, while those with sharp increases in negative affect may have actually been demonstrating the ability to tolerate distress. Although not directly measured, the findings from the Yeh, McCarthy and Baker study may be demonstrating individual differences in distress tolerance and beliefs about the ability to tolerate negative affect. Thus, the relationship between negative affect and tobacco is complex, involving bidirectional causal, contextual and predisposing factors, and individual differences in response to emotional distress (Kassel, Stroud, & Carol, 2003).

### 1.1. Distress tolerance and smoking cessation

Distress tolerance has been conceptualized as the tendency to persist at a task that is associated with frustration or uncomfortable affect (Brandon et al., 2003) and a tendency to continue pursuing a goal despite encountering various types of affective discomfort (Brown et al., 2008). Indeed, mounting evidence suggests that individual differences in the ability to tolerate distress are predictive of smoking cessation outcomes (Brandon et al., 2003; Brown, Lejuez, Kahler, & Strong, 2002; Brown et al., 2008). For example, Perkins, Karelitz, Giedgowd, Conklin, and Sayette (2010) found that smoking reinforcement following overnight abstinence was greater in individuals with low distress tolerance. In addition, a study of 81 smokers who completed laboratory-based, behavioral tasks designed to provoke distress, such as the Paced Auditory Serial Addition Task (PASAT; Diehr, Heaton, Miller, & Grant, 1998), breath-holding, and carbon-dioxide enriched air inhalation, found that individuals with lower persistence on these tasks were more likely to lapse on quit day (Abrantes et al., 2008). Further, of the smokers that were able to remain abstinent on quit day, the low-distress tolerant smokers reported greater negative affect in response to cessation. This suggests that smokers who are low in distress tolerance may be particularly vulnerable to the negative affect states that occur upon smoking cessation and may be more prone to avoid negative affect, therefore perpetuating smoking and making it more difficult to successfully quit.

Despite the growing body of literature indicating that distress tolerance is an important construct related to various forms of psychopathology, recent research has brought into question how to best define distress tolerance. Some studies indicate that the perceived ability (measured by self-report) to tolerate negative emotional states best predicts clinical outcomes of interest (e.g. Howell, Leyro, Hogan, Buckner, & Zvolensky, 2010; Marshall-Berenz, Vujanovic, Bonn-Miller, Bernstein, & Zvolensky, 2010; Simons & Gaher, 2005). Self-report measures of distress tolerance have been associated with self-report measures of related constructs such as experiential avoidance (Iverson, Follette, Pistorello, & Fruzzetti, 2012) but have not consistently been associated with behavioral measures of distress tolerance (e.g. Bernstein, Marshall, & Zvolensky, 2011; Marshall-Berenz et al., 2010; McHugh et al., 2011; Schloss & Haaga, 2011) highlighting questions of construct validity and measurement. One possible explanation is that the belief about one's ability to tolerate negative affect is influenced by both past behavioral responses and one's current evaluation of negative affect. Although the research supporting distress tolerance as an important factor related to smoking cessation has been fairly well established, it

does not take into account implicit beliefs or attitudes (i.e., implicit associations) about negative affect that may influence the extent to which a person evaluates their ability to tolerate negative affect. These types of thoughts may be conscious, such as "I can't stand feeling so irritable and stressed," and also implicit, operating outside of conscious awareness and influenced by past experiences, such as smoking when feeling irritable and stressed (Chassin, Presson, Sherman, Seo, & Macy, 2010; Waters et al., 2007).

### 1.2. Implicit associations, distress tolerance and smoking cessation

The IAT is a performance-based categorization task that measures the strength of implicit associations between mental concepts or schema (Greenwald, McGhee, & Schwartz, 1998). Implicit associations may be useful in smoking cessation research because they reflect automatic thoughts and processes that are important regulators of substance use, but which may not be examined by explicit self-report research due to issues of social desirability. A few investigators have examined how implicit associations are associated with substance use and relapse (Houben & Wiers, 2006; Kahler, Daughters, Leventhal, Gwaltney, & Palfai, 2007; Ostafin & Palfai, 2006; Wiers et al., 2002). A recent meta-analysis by Rooke, Hine, and Thorsteinsson (2008) substantiated the utility of implicit associations in this line of research, finding that implicit associations were a reliable predictor of substance use.

In research on cigarette smoking, implicit associations have been linked to craving and motivation to smoke (e.g., Waters et al., 2007), but few studies have examined whether implicit associations predict smoking lapse. It is conceivable that smokers who demonstrate poor distress tolerance may develop an implicit association between negative affect and avoidance over time that automatically triggers avoidant behavior in response to negative affect or distress. Thus, smokers with a strong implicit association linking negative affect and avoidance may unintentionally respond to this association upon experiencing withdrawal symptoms. The behavior and the association may then be reinforced through the removal of aversive feelings.

There are two main purposes to the current pilot study. First, the utility of using the *Implicit Association Task* (IAT) (Greenwald et al., 1998) to measure the strength of associations between the negative affect that is commonly experienced during withdrawal (such as irritability, grouching and frustration) and the target categories of approach and avoidance was explored. If this is indeed a useful tool for examining the role that implicit associations of avoidance of negative affect play in relapse to smoking, then we would expect that the IAT would demonstrate concurrent validity with the behavioral measures of distress tolerance and self-report measures of experiential avoidance. It was hypothesized that smokers with a strong implicit association between negative affect and avoidance will also have a lower threshold for distress tolerance and will relapse to smoking faster than those with a weak implicit association between negative affect and avoidance. Second, we explored the incremental gain in using this IAT to explore smoking relapse, above and beyond the behavioral measures of distress tolerance. Distress tolerance measures (originally designed as neuropsychological assessment tools) are not necessarily designed or intended to measure the capacity to tolerate distress, or elicit the particular type of negative affect and context in which smokers use tobacco to relieve negative affect (such as at work, or interpersonally, or prior to a party). Additionally, since verbal behavior often sets the context for overt behavior and can thus generalize to various stimuli (e.g. believing a thought that "Smoking relieves my stress and irritability" can apply to various contexts where stress might occur) we believe that these types of associations (i.e. stress-avoid) are stronger predictors of behavior because they have multiple opportunities for reinforcement in smokers' lives. It was our hypothesis that the implicit association between avoidance and negative affect will be a stronger predictor of time to relapse upon smoking cessation than will distress tolerance. Examining these implicit beliefs in addition to distress tolerance may provide a clearer

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