



# Evaluation of smokers with and without asthma in terms of smoking cessation outcome, nicotine withdrawal symptoms, and craving: Findings from a self-guided quit attempt



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## HIGHLIGHTS

- Smokers with and without asthma were compared during a self-guided quit attempt.
- There were no group differences in abstinence rates or likelihood of smoking lapse.
- Smokers with asthma had a slower rate of decline in nicotine withdrawal and craving.

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## ABSTRACT

**Introduction:** The aim of the current study was to evaluate smoking cessation outcome, nicotine withdrawal symptoms, and craving between smokers with ( $n = 47$ ; 46.8% male,  $M_{age} = 40.0$  years,  $SD = 11.7$ ) and without ( $n = 45$ ; 51.1% male,  $M_{age} = 37.5$  years,  $SD = 11.1$ ) asthma during a self-guided quit attempt.

**Methods:** After completing a baseline assessment visit, participants attended study sessions on their scheduled quit day as well as follow-up visits (3 days, 7 days, 14 days, and 28 days) after their quit day.

**Results:** Smokers with and without asthma did not differ in abstinence rates, smoking lapse, and rate of change in urge to smoke to reduce negative affect. However, smokers with asthma demonstrated a slower rate of decline in nicotine withdrawal symptoms and craving over time.

**Conclusions:** These findings suggest that smokers with asthma may benefit from specialized smoking cessation treatments to address prolonged withdrawal symptoms and craving.

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## 1. Introduction

Despite the known negative health effects of smoking, cigarette smoking is more common among individuals with asthma compared to those without (Gwynn, 2004; McLeish, Cogle, & Zvolensky, 2011). Not surprisingly, smoking negatively impacts asthma, resulting in greater asthma severity, poorer asthma control, increased risk of morbidity and mortality, more frequent healthcare utilization, and decreased effectiveness of inhaled corticosteroids (Althuis, Sexton, & Prybylski, 1999; Chaudhuri et al., 2008; Eisner & Iribarren, 2007; Lazarus et al., 2007; McLeish & Zvolensky, 2010; Siroux, Pin, Oryszczyn, Le Moual, & Kauffmann, 2000). Although quitting smoking results in significant

improvements in lung function, reductions in asthma medication use, and improved quality of life (Chaudhuri et al., 2006; Tønnesen et al., 2005), there is highly limited empirical data focused on smoking cessation among individuals with asthma.

In the earliest study, fourteen smokers with asthma completed a self-guided quit attempt and only 50% were able to remain quit for only 24 hours and the other half for only 7 days (Fennerty, Banks, Ebdon, & Bevan, 1987). Tønnesen et al. (2005) also found that a substantial percentage (76.8%) of smokers with asthma trying to quit using nicotine replacement therapy (NRT) were not abstinent at the end of 4 months. Most recently, Gratzou et al. (2014) retrospectively evaluated the effectiveness of an intensive smoking cessation program among smokers with and without a history of pulmonary disease or respiratory symptoms in Greece. Participants received pharmacotherapy for 8–12 weeks and nine sessions of individualized counseling over the course of a year after their quit date. Results indicated that there were no group

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differences in abstinence rates, suggesting asthma may not negatively impact smoking cessation outcomes.

Although past work provides important information on asthma and smoking cessation, the empirical literature is limited in a number of key respects. First, there has not been a prospective evaluation comparing abstinence rates among smokers with and without asthma. Second, in the only between group test, Gratziou et al. (2014) did not directly compare smokers with asthma to those without a history of pulmonary disease. Rather, they combined smokers with asthma and smokers with COPD and compared this larger group of smokers with lung disease to smokers without lung disease. Third, as nearly two-thirds of smokers try to quit without treatment (Centers for Disease Control [CDC], 2011; Hughes, 2003) it is important to understand how smokers with and without asthma compare in cessation success during a self-guided quit attempt (i.e., unaided by treatment). Finally, factors other than abstinence rates have yet to be explored, including such processes as withdrawal symptoms and craving. The examination of such factors is clinically relevant, as they are routinely among the most consistent predictors of cessation success (Allen et al., 2008).

Together, the aim of the current study was to compare smoking cessation rates, changes in nicotine withdrawal symptoms, and changes in craving between smokers with and without asthma during a self-guided quit attempt. It was hypothesized that, after controlling for participant race and level of pre-cessation nicotine dependence, smokers with asthma, compared to those without, would have a (1) shorter time to first lapse to smoking; (2) lower point-prevalence abstinence (PPA) rates; (3) slower rate of decrease in nicotine withdrawal symptoms over the 28-day follow-up period; and (4) slower rate of decrease in craving (i.e., desire to smoke and urges to smoke to reduce negative affect) over the 28-day follow-up period. These hypotheses were developed based on extant biopsychosocial models and empirical evidence focused on asthma indicating that persons with this medical condition tend to be fearful of pulmonary-based and other bodily sensations (Goodwin, Jacobi, & Thefeld, 2003; Hasler et al., 2005) and may react with greater levels of anxiety or related negative affect when confronted with such stressors (McLeish, Luberto, & O'Bryan, 2016). As a result, smokers with asthma may be prone to be emotionally reactive and regulate their affect via functionally-oriented self-regulation tactics that may paradoxically amplify unwanted symptoms (i.e., escape and avoidance). Thus, smokers with asthma are likely to be especially sensitive and emotionally reactive to smoking deprivation and the ensuing nicotine withdrawal-related aversive interoceptive cues that routinely occur during smoking abstinence; particularly in the early stages of a quit attempt where such aversive internal cues are most likely to be present.

## 2. Methods

### 2.1. Participants

Participants were 92 daily cigarette smokers between the ages of 18 and 65. For inclusion in the study, participants had to: (1) be a regular smoker for at least one year; (2) be currently smoking at least 10 cigarettes per day; (3) have expired carbon monoxide (CO) levels of at least 8 parts per million (ppm) at the baseline assessment; (4) report a motivation to quit smoking of at least 5 on a 10 point scale; and (5) be interested in quitting smoking in the next month. Participants were excluded from the study based on: (1) current substance dependence (excluding nicotine dependence); (2) decreased smoking rate by more than a half in the past six months; (3) current use of or intention to use nicotine replacement therapy, bupropion, or varenicline; or (4) regular, current use of other tobacco products. Participants in smokers without asthma group were eligible if they did not have a lifetime history of asthma. Participants in the smokers with asthma group were required to have received a physician diagnosis of asthma prior to the onset of smoking and meet criteria for asthma diagnosis verification using spirometry.

#### 2.1.1. Smokers with asthma

The smokers with asthma group ( $n = 47$ ; 46.8% male,  $M_{age} = 40.0$  years,  $SD = 11.7$ ) was 36.2% Caucasian, 61.7% African American, and 2.1% Native Hawaiian or other Pacific Islander. No participants endorsed Hispanic ethnicity. In terms of education, 54.3% had a high school degree or less, 28.3% had completed some college education, 13.0% had a 2- or 4-year college degree, and 4.4% had completed some graduate school education or had a graduate degree. On average, smokers with asthma considered themselves regular smokers by the mean age of 18.9 ( $SD = 5.7$ ), had been regular smokers for 21.6 years ( $SD = 11.3$ ) and were 9.0 ( $SD = 7.9$ ) years of age when diagnosed with asthma. Participants reported having made an average of 3.81 ( $SD = 3.42$ ) serious quit attempts and that the average length of their longest quit attempt was 207.8 ( $SD = 409.1$ ) days.

#### 2.1.2. Smokers without asthma

The smokers without asthma group ( $n = 45$ ; 51.1% male,  $M_{age} = 37.5$  years,  $SD = 11.1$ ) was 60.0% Caucasian, 35.6% African American, and 4.4% American Indian or Alaskan Native. 2.5% of participants reported Hispanic ethnicity. In terms of education, 44.4% had a high school degree or less, 42.2% had completed some college education or were current college students, 8.9% had a 2- or 4-year college degree, and 4.4% had completed some graduate school education or had a graduate degree. On average, smokers without asthma considered themselves regular cigarette smokers by a mean age of 18.9 ( $SD = 6.9$ ) years and had been regular smokers for 18.1 years ( $SD = 10.5$ ). Participants reported having made an average of 3.4 ( $SD = 3.42$ ) serious quit attempts and that the average length of their longest quit attempt was 2316 ( $SD = 629.1$ ) days.

## 2.2. Measures

### 2.2.1. Asthma diagnosis

Asthma status was verified by spirometry assessed using a KoKo Legend portable office spirometer (nSpire Health, Inc., Longmont, CO). Based on current guidelines (National Heart Lung and Blood Institute, 2007), individuals who demonstrated significant airflow obstruction, as indicated by a reduction in values for forced expiratory volume in 1 s ( $FEV_1$ ) and the ratio of  $FEV_1$  to forced vital capacity (FVC) relative to predicted values, with 12% or greater improvement after administration of short-acting bronchodilator (or 20% or greater improvement in forced expiratory flow 25–75% [ $FEF_{25-75}$ ]) were considered to have a positive asthma status (Alberts, Ferris, Brooks, & Goldman, 1994).

### 2.2.2. Expired carbon monoxide (CO)

Biochemical verification of smoking status was completed by CO analysis of breath samples assessed using a Bedfont Micro 4 Smokerlyzer CO Monitor (Model EC50; coVita, Haddonfield, NJ). Research indicates that 8 ppm is an optimal cutoff score for reliably discriminating smoking status (Benowitz et al., 2002). Obtained values at or above this cutoff were considered indicative of regular smoking and scores of 7 ppm or less were considered indicative of smoking abstinence.

### 2.2.3. Fagerström Test for Nicotine Dependence (FTND)

The FTND (Heatherton, Kozlowski, Frecker, & Fagerström, 1991) is a 6-item measure designed to assess gradations in nicotine dependence. The FTND has shown good internal consistency, positive relations with key smoking variables (e.g., cotinine; Heatherton et al., 1991; Payne, Smith, McCracken, McSherry, & Antony, 1994) as well as high degrees of test-retest reliability (Pomerleau, Carton, Lutzke, Flessland, & Pomerleau, 1994).

### 2.2.4. Motivational Aspects of Smoking Cessation (MASC)

The MASC is an 11-item self-report measure that assesses the degree to which participants are motivated to quit smoking (Rundmo,

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