



# Differences in Withdrawal Symptomatology during Short-Term Smoking Abstinence in Menthol versus Non-Menthol Female Smokers

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## Introduction

- Most cigarette flavorings, such as grape and strawberry, were prohibited by the Family Smoking Prevention and Tobacco Control Act of 2009 (U.S. House), however, menthol remains an unregulated cigarette additive.
- Menthol has a unique cooling effect, which may cause smokers to inhale the smoke more deeply without feeling respiratory discomfort (TPSAC 2011).
- Menthol cigarette smoking is most prevalent among African Americans, youth ages 12-17, women of any age, and people who have recently started smoking (NSDUH 2009).
- In terms of quit attempts, studies have widely shown reduced success in smoking cessation in menthol cigarette smokers as compared to non-menthol cigarette smokers (Ghandi et al. 2009; Okuyemi et al. 2007).
- While menthol smokers have a more difficult time quitting smoking, the specific mechanism for this observation is unknown, though more severe withdrawal symptoms have previously shown to lead to reduced success in quit attempts.
- **Therefore, we aim to examine the differences in withdrawal symptomatology in menthol versus non-menthol cigarette smokers during short-term smoking abstinence.**
- **It is hypothesized that menthol cigarette smokers will have more severe withdrawal symptoms than the non-menthol smokers during the short-term abstinence.**



## Methods

This is a secondary data analysis from a study titled “Menstrual Phase and Depressive Symptoms in Acute Smoking Abstinence” (PI: S. Allen), which aimed to determine the effect of depressive symptoms and ovarian hormones on withdrawal symptoms, nicotine craving, smoking urges, premenstrual symptoms, and cortisol levels during short-term smoking abstinence.

### Eligibility Criteria

- Healthy women ages 18-40 with regular menstrual cycles
- $\geq 5$  cigarettes/day for  $\geq 1$  year
- No exogenous hormones or psychotropic medications
- No recent or planned pregnancy or breastfeeding

### Protocol

- Participants participated in a six-day testing week with two days of ad libitum smoking followed by four days of biochemically verified smoking abstinence, with symptomatology measures taken each day.

- Menthol status was determined on the first day

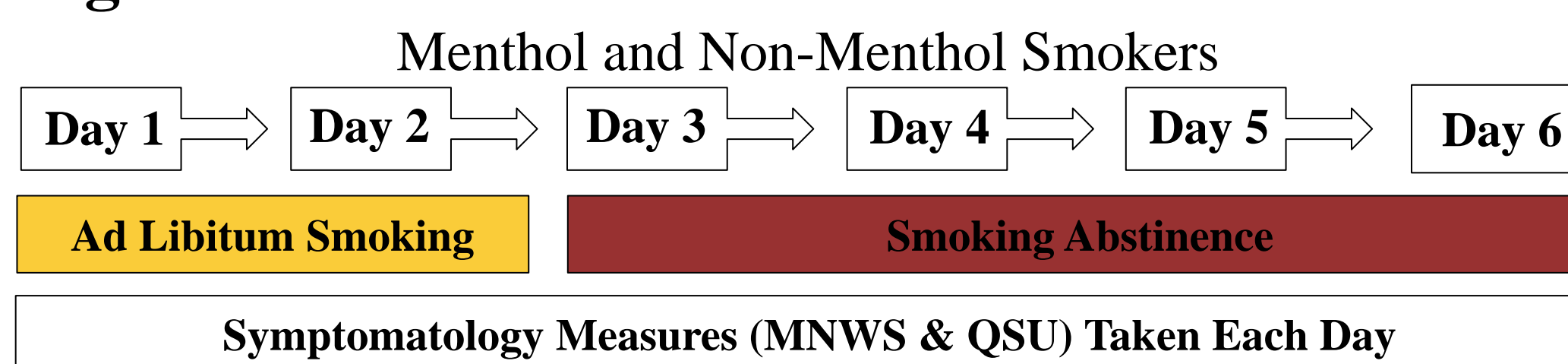
### Statistical Analysis

- Descriptive statistics
- Linear regression models comparing each day of smoking abstinence to the baseline (ad libitum, day 2)

Table 1. Smoking-Related Symptomatology Measures

Questionnaire	Reference	Subscales	Range
Minnesota Withdrawal Scale (MNWS)	Hughes & Hatsukami 1986	Craving Withdrawal	0-4 0-28
Questionnaire on Smoking Urges (QSU - Brief)	Tiffany & Drobes 1991	Desire to Smoke Anticipated Relief from Negative Affect	5-35 5-35

Figure 1. Data Collection Procedures



## Results

### Description of Study Sample

Table 2. Demographics and Smoking Behavior (n=221)

	All (n=221)	Menthol (n=110)	Non-Menthol (n=111)	p-value
<b>Demographics</b>				
Age*	28.9 $\pm$ 6.6	30.0 $\pm$ 6.6	27.7 $\pm$ 6.5	0.010
Race (% White)*	59.1%	40.9%	77.3%	<0.001
Education (% < Some College)*	32.9%	43.5%	22.5%	0.004
<b>Smoking-Related</b>				
Cigarettes/Day	12.6 $\pm$ 5.7	11.9 $\pm$ 5.5	13.3 $\pm$ 5.8	0.064
Time to First Cigarette (minutes)	41.0 $\pm$ 52.0	38.3 $\pm$ 58.6	43.7 $\pm$ 44.7	0.450

\*Because menthol and non-menthol smokers were significantly different in age, race, and education levels, these variables were controlled for in the analyses.

### Significant Demographic Differences Between Menthol and Non-Menthol Smokers

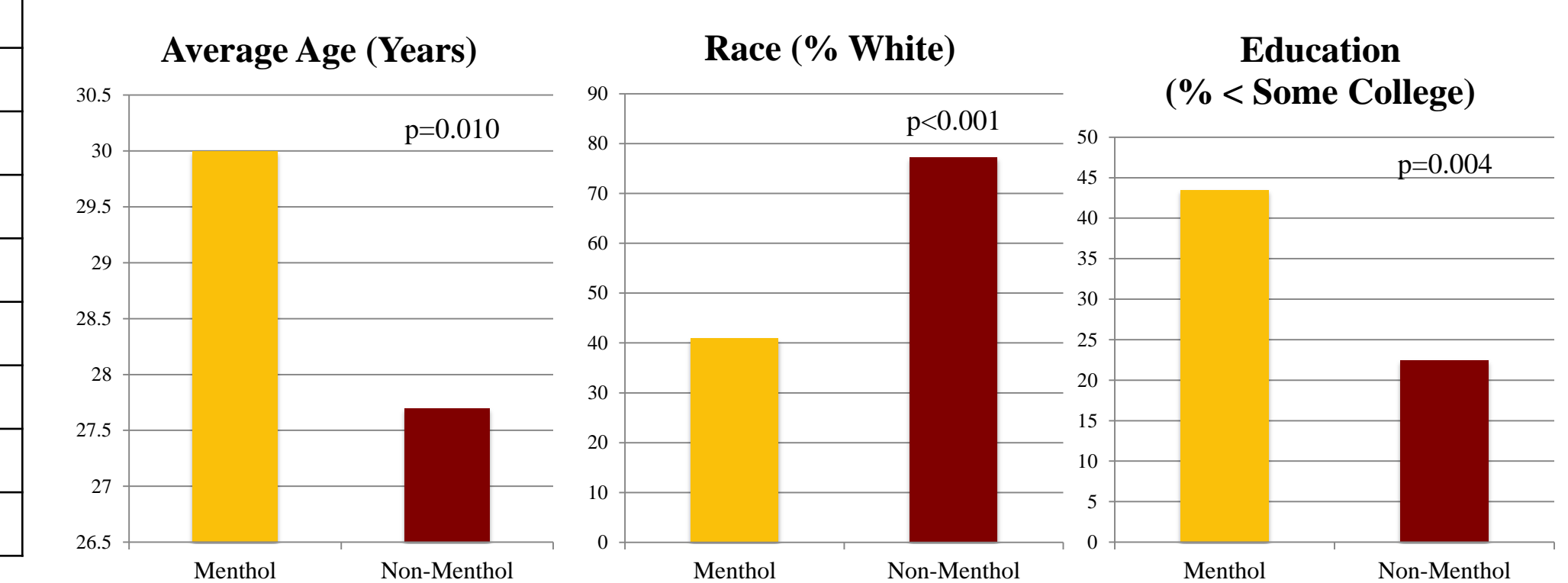
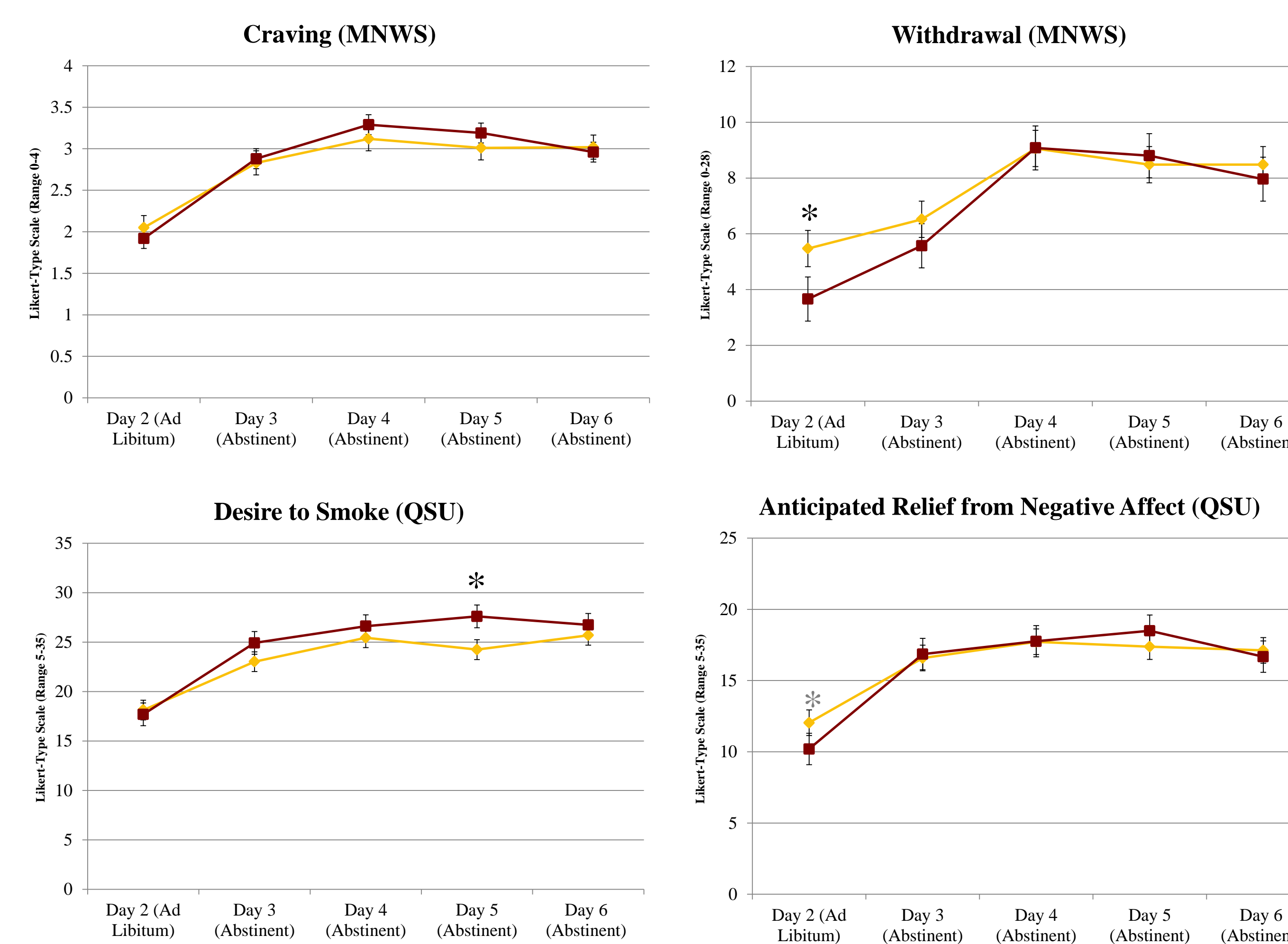


Figure 2. Absolute Values (Adjusted Mean  $\pm$  Standard Error) of Withdrawal Symptoms by Menthol Status



### Highlights

- Menthol smokers showed greater “withdrawal” and “anticipated relief from negative affect” during ad libitum smoking (p=0.027, p=0.079).
- Non-menthol smokers showed greater “desire to smoke” on the third day of smoking abstinence (p=0.031).
- Non-menthol smokers also showed a greater increase in “desire to smoke” and “anticipated relief from negative affect” from ad libitum smoking to the 3<sup>rd</sup> day of smoking abstinence (p=0.011, p=0.047).

## Discussion

- Contrary to our hypothesis, non-menthol cigarette smokers showed more severe withdrawal symptoms during the short-term smoking abstinence.
- Further, menthol cigarette smokers showed higher withdrawal symptoms during ad libitum smoking.
- These data suggest that non-menthol smokers experience greater withdrawal during abstinence whereas menthol smokers experience greater withdrawal on an everyday basis.

- This analysis does not help to explain why menthol smokers have higher relapse rates than non-menthol smokers.
- This study included a large, diverse sample and was the first to examine differences in withdrawal symptoms between menthol and non-menthol smokers.
- However, this was a secondary data analysis project. An even larger study including both men and women should aim to primarily examine the differences between menthol and non-menthol cigarette smokers’ withdrawal symptoms during an actual smoking cessation to determine whether more severe withdrawal symptoms affect relapse rates.

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