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# Examining Attitudes, Expectations, and Tobacco Cessation Treatment Outcomes Among Incarcerated Tobacco Smokers

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## Abstract

People who are incarcerated have limited resources to help them quit tobacco smoking. This study assessed the association between baseline attitudes and expectations of the program with final smoking status as the outcome. A 6-week group-based counseling with nicotine patches was provided to incarcerated individuals to quit smoking. A cross-sectional survey was given at the first session. Questions surrounding attitudes such as interest, confidence, motivation, and expectations were used to assess associations with smoking cessation. Exhaled carbon monoxide (CO) levels were taken at each sessions. Participants were categorized as nonsmoking or continued smoking at a 6.0 parts per million (ppm) CO at their final session attended. Overall, 123 participants had a CO higher than 6.0 ppm or missed more than two sessions at their final session, and 54 had a CO under 6.0 ppm. A total of 102 participants completed the 6-week program. Differences among the two groups in exhaled CO began at Session 3 and continued throughout the study.

**Keywords:** attitudes, cigarettes, group-based counseling, prison, smoking cessation

## Introduction

In the United States, tobacco smoke is still one of the leading preventable public health concerns (National Center for Chronic Disease Prevention and Health Promotion, 2014). Although the prevalence of smoking is on the decline at 13.7% (Creamer et al., 2019), smoking rates remain high among those who are incarcerated, as 50% to 83% of incarcerated adults smoke cigarettes (Binswanger et al., 2009; Cropsey et al., 2006). High smoking rates in the incarcerated population can be at-

tributed to the prison culture, stressful life events, access to cigarettes and tobacco products, and boredom with prison life (Richmond et al., 2009; Valera et al., 2020).

These routines are quite different than in the general population as a person's day is planned out accordingly, given little room for freedom. Tobacco smoke is a vital part of prison culture because people who are incarcerated might choose to smoke as a way to have social support and interaction and to distract themselves from

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emotional distress due to the isolation they experience in correctional facilities (Belcher et al., 2006; Eldridge & Cropsey, 2009). The criminal justice system has disproportionately affected Black and Hispanic individuals more than their White counterparts (Kreager & Kruttschnitt, 2018). Black individuals experience greater rates of smoking prevalence than other people in correctional settings (Kennedy et al., 2016).

In addition, people who are incarcerated are more likely to have a history of mental illness (James & Glaze, 2006; Prins, 2014), substance use (National Center on Addiction and Substance Abuse at Columbia University, 2010), and low educational attainment (Harlow, 2003) compared with those in the general adult population (Eldridge & Cropsey, 2009). Studies show that people who have a history of mental illness or substance use are more likely to have higher smoking rates (Dani & Harris, 2005; Leonard et al., 2001). Individuals with low socioeconomic status, including low educational attainment and low-income employment, also have a higher smoking prevalence (Barbeau et al., 2004).

These circumstances (e.g., low educational attainment, being poor, a history of mental illness, or substance use) can lead to an increased likelihood of smoking initiation and nicotine dependence among people who are incarcerated (Baldwin et al., 2006; Barbeau et al., 2004). This is extremely concerning, especially because incarcerated smokers do not have the appropriate cessation resources to help them reduce or quit smoking as many correctional facilities adopt smoke-free policies, forcing individuals to go “cold turkey” (Kennedy et al., 2015). One evidence-based approach that has proven to be efficacious in the general community to address tobacco dependence is group-based smoking cessation treatment (Kotsen et al., 2019; Stead et al., 2017).

Group-based counseling can be implemented in institutionalized settings (Valera et al., 2020). The intervention focuses on bringing individuals together and aiding in smoking cessation, usually facilitated by a tobacco trained specialist, by creating a sense of self-autonomy within the group, ensuring group cohesion, and building off each other’s experiences on how to cope without using cigarettes (Hajek et al., 1985). Group-based counseling has been shown to help individuals in the community who want to quit smoking and has higher quit rates than self-intervention or one-to-one counseling (Bauld et al., 2009; Stead et al., 2017).

Although a plethora of tobacco dependence interventions incorporate a form of counseling to quit, some of the factors that aids in successful cessation (behavioral change) may be attributed to one’s attitudes. Attitudes toward behavioral change are embedded in the Theory of Reasoned Action for smoking cessation (Bledsoe, 2006).

Examining factors that impact successful smoking cessation, especially in a unique cohort such as people

who are incarcerated, may help inform how tobacco cessation interventions need to be tailored within prison settings. Consequently, we sought to address these research gaps by analyzing data from a cohort of incarcerated cisgender male tobacco users who participated in a group-based counseling program for smoking cessation using pharmacotherapy nicotine replacement therapy in patches (NRT patches). This study aimed to explore how interest, confidence, motivation, and expectations of the intervention are associated with smoking abstinence. We hypothesized that higher scores surrounding these internal factors (i.e., interest, confidence, and motivation) and expectation of the program would have higher odds of being abstinent from tobacco at the end of the program.

## Method

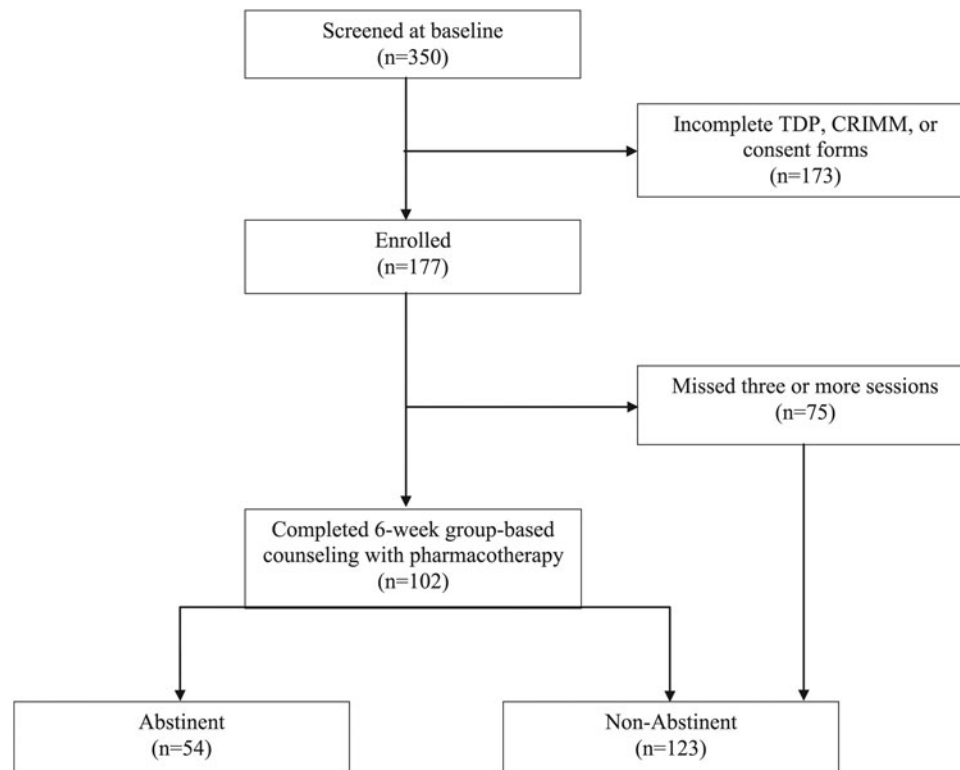
### Study Population

Seven state prison sites located in one Northeastern state participated in a 6-week group-based counseling program with NRT patches from May 2019 to August 2019. Prison contacts introduced the study to the men enrolled in a substance abuse program. An orientation about the study was provided and, during this time, eligible participants completed an initial screening to determine eligibility.

Participants were eligible for the study if they (1) were above 18 years of age; (2) could speak, read, and write in English well enough to understand the informed consent and complete the study; (3) smoked at least five cigarettes per day over the past 7 days, as confirmed by exhaled carbon monoxide (CO) level (Perkins et al., 2013); (4) resided in the general population section (not in solitary confinement); (5) were able to provide informed consent; and (6) were medically eligible to use NRT patches, as determined by the prison medical staff.

Participants who met the following criteria were not eligible: (1) undergoing extensive medical care during the length of the study (e.g., chemotherapy, radiation, surgery); (2) due for court appearances within 3 months of the study (using prison records, date of parole, or transfer); (3) currently use any smoking cessation pharmacotherapy (e.g., NRT, bupropion, and varenicline); and/or (4) are expected to be paroled/released or transferred to another facility at or before 9 to 12 months.

Figure 1 describes the flow of the study. A total of 350 individuals were screened at baseline and 177 were enrolled in the study after completion of informed consent procedures and review of the eligibility criteria. Among the 177 individuals who were enrolled, 60.5% ( $n = 102$ ) completed the program, defined as missing no more than two sessions. At baseline, participants completed a cross-sectional survey, and at each subsequent session, they used a coVita Smokerlyzer to measure exhaled CO



**Fig. 1.** Flowchart of incarcerated individuals' final smoking status from the 6-week group-based counseling with pharmacotherapy. CRIMM, Cancer Risk in Incarcerated Men's STUDY; TDP, Tobacco Dependence Program.

in parts per million (ppm; coVita, 2022). This study received Institutional Review Board (IRB) approval from Rutgers University Health Science and the State Department of Corrections.

### Intervention

The 6-week program consisted of group-based counseling with NRT patches. A detailed explanation of the intervention has been published previously (Valera et al., 2020). At baseline, participants were given a cross-sectional survey covering information on their sociodemographic characteristics, incarceration history, smoking behaviors, quit attempts, and medical history.

### Sociodemographic Characteristics

Self-reported characteristics were categorized as follows: race/ethnicity into four groups (White, Black, Latino, and Other); highest level of education attained into three levels (high school/General Educational Development [GED] or less, some technical school, and college/graduate degree); age at baseline was kept as continuous. Current mental health status was categorized as yes if a physician on med-

ical staff indicated an individual has depression, anxiety, bipolar disorder, schizophrenia, insomnia/difficulty sleeping, urges to hurt themselves, cognitive disorder, or seizures/convulsions/epilepsy; otherwise, it was categorized as no.

### Smoking Cessation Attitudes and Program Expectations

To quantify program expectations and attitudes from baseline, we used 5-point Likert scales (1 = "not at all" to 5 = "very much") for interest, motivation, and confidence in quitting smoking. We also used a 5-point Likert scale to gauge their perceived thoughts on how much nicotine patches and group therapy will help them in quitting smoking.

### Smoking Behaviors

To understand nicotine dependence at baseline, participants answered questions from the Fagerstrom Test for Nicotine Dependence (Heatherton et al., 1991). Based on scores ranging from 0 to 10, we categorized nicotine dependence into four levels (low dependence, low to moderate dependence, moderate dependence,

and high dependence). Moreover, we asked participants how many years they smoked tobacco cigarettes regularly.

### Smoking Cessation Status

After the intervention, to categorize whether an individual was a continued smoker or abstained from smoking, we used a CO cutoff point of 6 ppm, which has been shown to be an effective cutoff point to differentiate a smoker versus a nonsmoker (Middleton & Morice, 2000). Although previous studies indicate an optimal CO cutoff point between 3.0 and 4.0 ppm (Cropsey et al., 2014; Kauffman et al., 2010), we decided to go with a higher cutoff point due to our sample being heavily or moderately dependent on nicotine (86%), to account for secondhand smoke inside a prison facility (Hammond & Emmons, 2005).

In addition, endogenously expiring CO attributed to other chronic conditions (i.e., chronic obstructive pulmonary disease, asthma, and diabetes) has been reported in those entering maximum-security state prison facilities (Bai et al., 2015; Binswanger et al., 2009). Using a 6.0 ppm cutoff point for exhaled CO still provides a sensitivity of 90.7% and specificity of 83.8% for determining smoking status (Cropsey et al., 2014).

### Statistical Analysis

An intent-to-treat approach was used where participants who did not complete the program (i.e., those who missed more than two sessions) were recorded as continued smoking. Thus, a total of 123 participants were recorded as continued smoking and 54 were recorded as abstaining from smoking. Univariate and bivariate analyses were

**Table 1. Demographic Characteristics of Individuals Enrolled (N = 177)**

Variables	Total sample (N = 177), mean (SD) or n (%)	Abstained (N = 54), mean (SD) or n (%)	Did not abstain (N = 123), mean (SD) or n (%)	p
Age at enrollment	42.97 (10.29)	40.64 (10.10)	43.99 (10.25)	0.048
Race/ethnicity				0.873
White/Caucasian	111 (62.71)	34 (62.96)	77 (62.60)	
African American/Black	49 (27.68)	14 (25.93)	35 (28.46)	
Hispanic/Latinx	10 (5.65)	3 (5.56)	7 (5.69)	
Other	7 (3.95)	3 (5.56)	4 (3.25)	
Education status <sup>a</sup>				0.679
High school/GED or less	97 (54.80)	27 (50.00)	70 (56.91)	
Some college/technical school	62 (35.03)	20 (37.04)	42 (34.15)	
College/graduate degree	14 (7.91)	5 (9.26)	9 (7.32)	
Missing/unknown	4 (2.26)	2 (3.70)	2 (1.63)	
Total years smoked cigarettes	26.65 (11.26)	25.57 (11.25)	27.17 (11.27)	0.395
Total months for current incarceration	95.62 (109.19)	85.28 (105.90)	100.30 (110.80)	0.408
Fagerstrom Test for Nicotine Dependence, y <sup>a</sup>	7.05 (1.95)	6.98 (2.07)	7.08 (1.90)	0.767
Fagerstrom Test for Nicotine dependence <sup>a</sup>				0.799
Low dependence	5 (2.82)	2 (3.70)	3 (2.44)	
Low to moderate dependence	14 (7.91)	6 (11.11)	8 (6.50)	
Moderate dependence	67 (37.85)	19 (35.19)	48 (39.02)	
High dependence	81 (45.76)	24 (44.44)	57 (46.34)	
Missing/unknown	10 (5.65)	3 (5.56)	7 (5.69)	
Current comorbidities				0.411
Yes	67 (37.85)	18 (33.33)	49 (39.84)	
No	110 (62.15)	36 (66.67)	74 (60.16)	
Current mental health <sup>b</sup>				0.199
Yes	58 (32.77)	14 (25.93)	44 (35.77)	
No	119 (67.23)	40 (74.07)	79 (64.23)	
Interest in quitting <sup>c</sup>	4.64 (0.77)	4.64 (0.85)	4.65 (0.74)	0.939
Confidence in quitting <sup>c</sup>	4.17 (1.02)	4.15 (1.05)	4.18 (1.02)	0.842
Motivation in quitting <sup>c</sup>	4.39 (0.95)	4.32 (1.04)	4.42 (0.92)	0.534
Expectation group therapy will help quitting <sup>c</sup>	3.12 (1.42)	3.09 (1.38)	3.13 (1.45)	0.895
Expectation nicotine patch will help quitting <sup>c</sup>	4.38 (0.80)	4.48 (0.82)	4.33 (0.79)	0.722

<sup>a</sup>Fisher's exact test computed.

<sup>b</sup>Individuals indicating they are currently experiencing depression, anxiety, schizophrenia, bipolar disorder, seizures/convulsions/epilepsy, cognitive disorders, wanting to self-harm, insomnia, or eating disorder.

<sup>c</sup>5-point Likert scale ("not at all" to "very much"), but statistics calculated as continuous (1.0–5.0).

GED, General Educational Development; SD, standard deviation.

**Table 2. Attitudes and Program Expectation Logistic Regression Model Among Those Enrolled (N = 177)**

Variables	Unadjusted model			Adjusted model <sup>a</sup>		
	OR	95% CI	p	AOR	95% CI	p
Interest in quitting	0.98	0.64–1.51	0.938	1.12	0.63–1.97	0.708
Confidence in quitting	0.97	0.70–1.34	0.841	1.02	0.69–1.51	0.907
Motivation in quitting	0.90	0.64–1.26	0.532	0.91	0.60–1.38	0.668
Expectation group therapy will help quitting	0.98	0.76–1.26	0.894	1.09	0.78–1.54	0.609
Expectation nicotine patch will help quitting	1.27	0.79–2.04	0.318	1.50	0.86–2.64	0.156

<sup>a</sup>Adjusted for total years smoked cigarettes, baseline exhaled carbon monoxide level, nicotine dependence, and current mental health status. Variables of interest are reported on a 5-point Likert scale and are calculated as continuous.

AOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio.

calculated by smoking status, and *t*-test and chi-square analyses were done appropriately.

To understand whether baseline attitudes and expectations had an influence whether or not an inmate quit smoking at the end of the intervention, we ran binary logistic regression models for each of the attitudes and expectations with smoking status as the outcome. We calculated unadjusted and adjusted models for each of the attitudes and we controlled for years smoked, baseline CO levels, nicotine dependence, and current mental health status. Confounders were determined a priori, and collinearity was assessed to ensure the model was not overadjusting confounders. Age at baseline and years smoking cigarettes were highly correlated. The years smoked variable had a parameter change greater than 10%, whereas age at baseline did not, from the unadjusted model, and thus years smoked was kept in the final regression model.

In addition, we ran exploratory analyses to compare how exhaled CO differed by each session based on whether a participant abstained from smoking. All tests were two-sided, and  $p \leq 0.05$  was considered statistically significant. Analyses were computed on SAS version 9.4.

## Results

Of the 177 men who were enrolled at baseline, almost 60% completed the 6-week program. Study participants who abstained from smoking were slightly younger than those reported as continued smoking ( $40.64 \pm 10.10$  vs.  $43.99 \pm 10.25$ ). There was a roughly equal proportion of individuals who quit tobacco smoke and did not quit across racial and ethnic groups. On average, participants were smoking cigarettes for about 27 years and were either moderately or highly dependent on nicotine (83.62%). Moreover, almost a third of participants who enrolled in the program had a current mental health diagnosis (32.77%), as reported by a physician.

Overall, participants, at baseline, indicated a strong interest in quitting (mean [M]=4.64, standard deviation [SD]=0.77) and had high confidence (M=4.17, SD=1.02) and motivation (M=4.39, SD=0.95) to quit smoking. There were no significant differences in these

attitudes among those who abstained from tobacco smoke and the continued smokers. In addition, there were no significant differences for expectations on group therapy (3.09 vs. 3.13,  $p=0.895$ ) and nicotine patches (4.48 vs. 4.33,  $p=0.722$ ) between nonsmokers and smokers, respectively (Table 1).

Unadjusted and adjusted logistic regression models, controlling for total years smoked cigarettes, baseline exhaled CO level, nicotine dependence, and current mental health status, demonstrate no statistical significance association between any of the covariates of interest and whether or not an individual abstained from smoking (Table 2).

Exploratory analyses demonstrate statistical differences in exhaled CO level at Session 4 and beyond between those who continued tobacco smoking and nonsmokers (Table 3; Fig. 2).

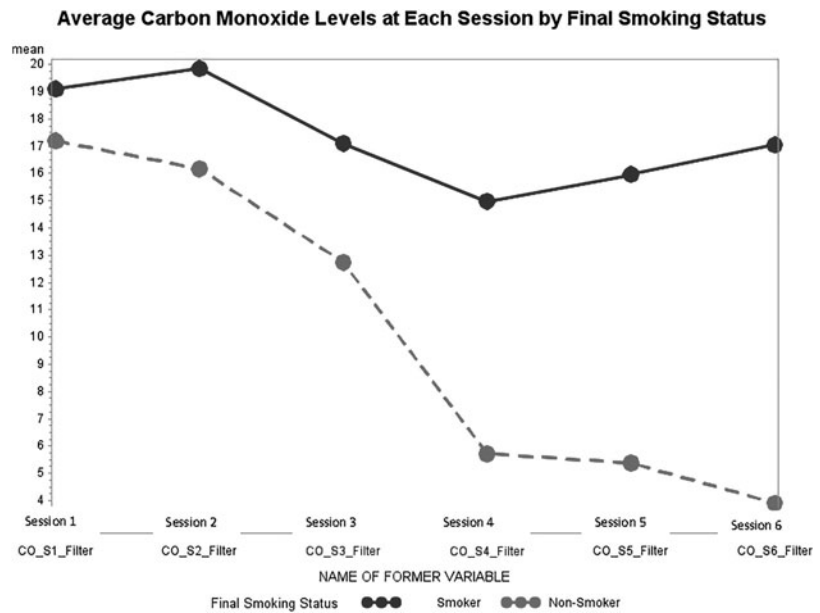
## Discussion

This analysis assessed the differences in smoking abstinence among incarcerated adult smokers related to baseline attitudes (e.g., confidence and motivation to quit) and expectations of the smoking cessation intervention. Among our sample at baseline, we did not observe any statistical significance between attitudes and expectations that impact whether or not an individual abstained from smoking. Based on our hypothesis, we expected continued smoking to be associated with lower scores on attitudes and expectations of the program. We did not see

**Table 3. Exhaled Carbon Monoxide Levels (ppm) Among Those Who Abstained and Did Not Abstain From Smoking by Each Session Attended**

Session	Abstained (N=54), mean (SD)	Did not abstain (N=123), mean (SD)	p
1	17.20 (11.52)	19.11 (10.98)	0.370
2	16.17 (10.34)	19.86 (11.16)	0.235
3	12.74 (10.51)	17.10 (11.78)	0.207
4	5.71 (6.79)	14.98 (12.11)	<0.001
5	5.38 (5.02)	15.97 (8.55)	<0.001
6	3.91 (1.33)	17.06 (9.43)	<0.001

**Fig. 2.** Average CO levels at each session by final smoking status. CO, carbon monoxide.



that this relationship is associated with smoking cessation with our sample.

Although our population overall did demonstrate positive attitudes regarding expectations and successful completion of the program, not all participants abstained from smoking. However, we did see a trend of decreasing exhaled CO in both groups throughout the intervention, described in other studies examining group-based counseling (Stead et al., 2017). Although we do not describe the efficacy of the program, we noticed cautiously optimistic results of decreased exhaled CO with the use of group-based counseling and pharmacotherapy among those who did abstain and those who continued smoking when compared with baseline.

The season in which the study was conducted may have played a role in how individuals handled their nicotine withdrawal symptoms and coping mechanisms. During the summer months, individuals had designated times during the day when they could go outside for recreational activities. Physical activity has been shown to be important for incarcerated males who are in the process of quitting tobacco products (Richmond et al., 2009). Therefore, having recreational time outside of a prison cell may have aided those in our sample to reduce their nicotine intake during the intervention. Further studies are needed to see how seasonal variation directly impacts smoking cessation and smoking behaviors, particularly among people who are incarcerated.

### Clinical Implications

Based on exploratory analyses, there was a statistical difference in exhaled CO starting on week 4. From that point until the end of the study period, we saw differences

among those who ultimately abstained from tobacco smoking and those who did not. We believe that follow-up among the men starting week 4 and reassessing their needs, both in behavioral counseling and pharmacotherapy, is critical in sustaining the intervention. Many in our study were highly dependent on nicotine, and thus addressing the physiological addiction to nicotine and the behavioral habit of using tobacco is critical to smoking cessation. Using a combination of the seven Food and Drug Administration-approved medications for treating tobacco dependence (bupropion, varenicline, nicotine patch, nicotine gum, nicotine lozenge, nicotine inhaler, and nicotine nasal spray) with high-intensity counseling will improve quit rates (Tobacco Use and Dependence Guideline Panel, 2008).

### Limitations and Strengths

Our study had some limitations. The present secondary analysis utilized data collected from a feasibility pilot study (Valera et al., 2020). Incarcerated individuals who were enrolled in the study intervention were part of a substance abuse program. There is a concern for internal validity that these individuals may not represent the general incarcerated population and how we infer the results. Study participants were managing co-occurring addictions and thus may have had greater difficulty with abstaining from tobacco smoking completely. It would have helped to offer combination medications other than NRT patches with group-based behavioral counseling.

Still, we were not permitted, which may be an institutional implementation barrier for treating highly dependent smokers on nicotine. Future researchers could

work with prison administrators to ensure that tobacco dependence treatment receives standard of care, including a combination medication to increase quit rates and cessation. Another limitation of the study was the lack of treatment fidelity. We did not measure adherence to the daily NRT patch, which may have affected the outcomes of this study. Since this was a pilot study to determine its feasibility, future researchers should measure the adequate treatment dose because NRT is clinically needed for highly dependent tobacco users.

In addition, we utilized exhaled CO as a proxy for categorizing whether an individual was a continued smoker or nonsmoker at the end of the sixth session. Biological markers to measure nicotine and cigarette smoke would have been a preferred mechanism (Chang et al., 2017). However, given the unique circumstances of implementing this study in a correctional setting, it was not feasible to collect biological samples.

Another limitation was that we could not collect CO levels among those who missed or did not show up to group. Participants were allowed to miss up to two sessions if they had other circumstances such as educational sessions, work, or cellblock in lockdown. However, to ensure we did not encounter high missing data, we did not continue enrolling individuals in the program if they missed more than two sessions. This allowed for group cohesion. In addition, we only followed incarcerated individuals for six sessions and a 1-month follow-up. Exhaled CO levels at 1-month follow-up data were not analyzed due to a small sample size reporting to the session. Further studies warrant increasing sample size and following them for a more extended period to analyze long-term smoking abstinence when using group-based counseling with NRT patches.

Our study did have considerable strengths. This was the first study to examine the association between attitudes and expectations and smoking cessation outcomes among incarcerated smokers enrolled in group-based behavioral counseling with NRT patches. Overall, those who completed the program showed trends of decreasing CO levels compared with baseline. Although we do not describe the efficacy of the intervention, the preliminary analyses warrant further study of this intervention in correctional settings to aid in smoking cessation. Moreover, we were able to look at baseline attitudes of quitting tobacco smoke and expectations of the programs and seeing if they differed among smokers and nonsmokers, which, to our knowledge, has not been examined previously among incarcerated smokers.

## Conclusion

Group-based behavioral counseling with pharmacotherapy is an evidence-based approach for smoking cessation treatment (Stead et al., 2017). We aimed to look at differ-

ences among those who abstained from smoking and those who continued smoking to see if there was an association between baseline attitudes and expectations of the intervention. We were unable to demonstrate these associations based on our results. However, our results show that differences among the two groups in exhaled CO began at Session 3 and continued throughout the study. Further studies need to enroll larger samples and collect these measures at every session to see where the intervention may need to be altered for the needs of incarcerated smokers.

## Author Disclosure Statement

The authors disclosed no conflicts of interest with respect to the research, authorship, or publication of this article.

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