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Self-initiated gradual smoking reduction among community correction smokers

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Abstract

Introduction: Smoking remains the leading cause of preventable death in the United States. Many smoking cessation guidelines advise smokers to quit precipitately; however, most quit attempts involve a more gradual cessation. Characteristics of individuals who tend to reduce prior to quitting and the effectiveness of pre-quit reduction are not well understood. This study examined individual differences and smoking cessation outcomes between individuals who self-initiated gradual reduction in cigarettes per day (CPD) and those who did not reduce prior to quit date.

Methods: This study is a secondary analysis from a randomized clinical trial of smoking cessation with pharmacotherapy among individuals under community corrections supervision. We compared participants who self-initiated smoking reduction by at least 25% between baseline and the first treatment session ($n = 128$) to participants who either increased or did not reduce smoking between baseline and the first treatment session ($n = 354$).

Results: African American race, no previous cigar smoking, no previous use of pharmacotherapy for smoking cessation, less withdrawal symptoms at baseline, and older age at first smoking were associated with being a self-initiated gradual reduction in univariate analyses. Individuals who self-initiated gradual reduction also had a greater likelihood of achieving at least one quit during the one-year study period as compared to those who did not reduce prior to the intervention.

Conclusions: Individuals who self-initiate gradual reduction differ from those who increase or do not change their smoking prior to a quit date. Gradual reduction also increased success in quitting.

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Contributors

Karen Cropsey Psy.D. Conceptualized the project, contributed to the analysis and interpretation of the data, writing the manuscript, and the decision to submit the paper for publication. Caitlin Wolford-Clevenger M.S. conducted and interpreted analyses and contributed to writing and preparing the manuscript for publication. Michelle Sisson, M.A. conducted, interpreted analyses and contributed to writing and preparing the manuscript for publication. Mickeah Hugley conducted literature searches, provided summaries of previous research relevant to the manuscript, contributed to writing and preparing the manuscript for publication.

Conflicts of interest

The authors declare no conflicts of interest.

Keywords

Tobacco use; Pre-quit; Cessation; Motivation; Criminal justice

1. Introduction

In the United States, tobacco use remains the leading cause of preventable diseases and death, with cigarettes being the most widely used tobacco product among adults.(Centers for Disease Control and Prevention, 2016; Centers for Disease Control and Prevention, 2017) To reduce this public health burden, national efforts have been coordinated to decrease the morbidity and mortality related to tobacco. (Centers for Disease Control and Prevention, 2018) Since smoking continues to have a major impact on public health, finding what treatment approaches work for specific populations is critical. Individuals under community corrections supervision are in particular need of empirical attention, as they have high smoking rates with little restrictions to their smoking behaviors.(Cropsey, Jones-Whaley, Jackson, & Hale, 2010)

Reducing smoking prior to a set quit date (i.e., gradual reduction) is one strategy that may improve quit rates through decreasing nicotine dependence and enhancing self-efficacy. (Begh, Lindson-Hawley, & Aveyard, 2015; Lindson-Hawley et al., 2016) However, gradual reduction has demonstrated mixed effects on smoking cessation. A randomized controlled trial (RCT) demonstrated that gradual reduction was superior to abrupt reduction in smoking cessation at 12 month follow-up.(Cinciripini et al., 1995) In contrast, other RCTs showed that immediate quit resulted in greater abstinence rates than gradual reduction, even among participants who preferred gradual reduction. (Lindson-Hawley et al., n.d.; Ho et al., 2018) Some studies, including a meta-analysis, have revealed no differences in gradual and immediate reduction in cessation.(Carpenter, Hughes, & Keely, 2003; Lindson-Hawley et al., 2016; Wang, Li, Cheung, et al., 2017)

However, these studies assigned participants to gradual reduction rather than examining self-initiated gradual reduction. Self-initiated reduction is important to examine, as those who initiate reduction may differ from those who abruptly quit in self-efficacy and expectations regarding smoking cessation. One study with incarcerated women showed that self-initiated gradual reduction was more effective than abrupt quitting during early treatment; however, these differences did not remain after treatment or 12-month follow-up.(Cropsey, Jackson, Hale, Carpenter, & Stitzer, 2011) Additional tests of whether self-initiated gradual reduction is associated with positive smoking cessation outcomes are needed.

In addition, individuals who self-initiate gradual reduction may differ from those who abruptly quit in psychosocial and smoking characteristics. One study showed that individuals who gradually reduced engaged in heavier smoking than those who quit abruptly, which may be due to greater withdrawal symptoms among heavier smokers. (Cropsey et al., 2011) However, these groups did not differ in their motivation to quit.(Cropsey et al., 2011) Examining differences between those who gradually reduce and those who abruptly quit may shed light on how to tailor interventions to reducers versus non-reducers. This may help

streamline intervention efforts with individuals under community corrections supervision, as it may help identify who is likely to initiate and potentially benefit from gradual reduction.

The present study sought to expand previous research by exploring these questions in a community corrections sample, a population in great need of improved smoking cessation treatment.(Howell, Guydish, Kral, & Comfort, 2015) First, we explored whether those who self-initiated reduction differed in psychosocial characteristics and smoking history from those who abruptly quit. Second, we examined whether gradual reduction was associated with long-term smoking outcomes, including cessation and cigarettes per day, while controlling for individual differences established in the first aim. We also determined whether the effects of self-initiated reductions on smoking cessation differed across the time of the intervention.

2. Materials & methods

2.1. Participants

This was a secondary data analysis from an RCT testing the effects of bupropion on smoking cessation among 500 participants recruited from a community corrections center. Inclusion criteria were: age 19 or older, under community corrections supervision, smoking five cigarettes per day (CPD) with a cotinine level above 200 mg/mL at baseline, living in an environment that allows smoking, and being willing to take bupropion and receive four sessions of behavioral counseling to quit smoking. Participants were excluded from the study if they had a history of eating or seizure disorders, mania, current suicidal ideation or a suicide attempt within the past six months, were non-English speaking, were pregnant or nursing, were medically unstable or had cognitive impairment that interfered with their ability to provide consent. Participants (M age = 37.22 years) were primarily male (67.9%), never married (53.9%), and primarily Black/non-White(67.9%). Education level was fairly evenly distributed: 37.5% high school diploma or GED, 31.1% less than high school, and 31.3% education beyond high school.

2.2. Measures

2.2.1. Reduction status—Reduction was calculated by taking the difference between the average CPD at baseline and average CPD at the first intervention session (Session 1; approximately a week later). We used this classification method because reduction occurring between baseline and Session 1 was self-initiated, whereas any reductions made after Session 1 were due to study instructions. Participants who reduced CPD by 25% were classified as “reducers” ($n = 128$) while those who reduced by < 25% (or increased CPD) were classified as “non-reducers” ($n = 354$). This percent reduction in one week is consistent with studies on instructed reduction.(Lindson-Hawley, Aveyard, & Hughes, 2010)

2.2.2. Individual differences—Participants’ psychosocial characteristics including age, gender, race, highest educational attainment, marital status, and self-reported history of substance use and mental illness (yes/no) were obtained via a demographic questionnaire. Baseline smoking characteristics were assessed through a questionnaire created by the authors, which inquired about age when first started smoking, cigar/cigarillo smoking,

intention to quit in the next month, prior use of nicotine replacement products, prior smoking cessation counseling, prior smoking cessation medication, prior use of self-help materials for smoking cessation, physician-advised smoking cessation, living with people who smoke, confidence about quitting, and motivation to quit (1 = not at all to 7 = very much). Baseline nicotine withdrawal and dependence symptoms were assessed using the Minnesota Nicotine Withdrawal Scale (Cropsey et al., 2015; Hughes & Hatsukami, 1986; Toll, O'Malley, McKee, Salovey, & Krishnan-Sarin, 2007) and the Fagerstrom Test for Nicotine Dependence (Fagerström, 2012).

2.2.3. Smoking outcomes—Carbon monoxide (CO) levels were assessed at each time point using the Vitalograph, with quit defined as a CO < 3 ppm. (Cropsey et al., 2014) CPD at each time point post-intervention were also used as a smoking outcome.

2.3. Procedure

Participants were recruited via flyers posted at a community corrections site, screened for inclusion and exclusion criteria, and scheduled for a baseline assessment at the community corrections offices. During this assessment, participants provided informed consent, completed assessments, completed urine screening, had their CO measured, and had blood drawn to assess for general health. At the next session (Session 1), all participants received 12 weeks of bupropion and were randomized to receive either four weekly 30-min smoking cessation-counseling sessions or brief physician advice to quit smoking. At Session 1, all participants were instructed to reduce smoking, with participants in the counseling condition receiving more instruction on how to reduce. Therefore, reduction occurring between baseline and Session 1 was self-initiated. Ten time points were collected (baseline, Weeks/Sessions 1–4, Weeks 8 and 12, and follow-up at Months 6, 9, and 12). This study was registered with [ClinicalTrials.gov](https://clinicaltrials.gov) () and received approval by the University of Alabama at Birmingham Institutional Review Board. Additional details describing this study are described elsewhere. (Cropsey et al., 2015)

2.4. Data analytic approach

Chi-square analyses and analysis of variance (ANOVA) were conducted to examine the association between reduction status (i.e., reducer or non-reducer) and baseline categorical and continuous variables, respectively. To examine the multivariate correlates of reduction status, variables significantly associated with reduction in univariate analyses were included as predictors in a logistic regression model, with reduction status (reducer vs. non-reducer) as the criterion variable.

Differences between reducers and non-reducers in cessation were calculated at each time point from time of scheduled quit attempt (Session 3) through one year using Chi-Square analyses. CPD was calculated across time by reduction status using ANOVA. Generalized estimating equation (GEE) methods then estimated the impact of the self-initiated reduction on CPD across all time points, while controlling for multivariate correlates determined in the first aim. The GEE included reduction status, time (10 time points), and the reduction status by time interaction term as predictors. CPD was the outcome variable.

3. Results

African American race, no previous use of smoking cessation medication (98.3% vs. 93.2%, $p = .04$), less withdrawal symptoms at baseline ($M = 9.84$, $SD = 6.72$ vs. $M = 11.99$, $SD = 6.99$, $p = .004$), no previous cigar smoking (90% vs. 79.5%; $p = .009$), and older age at first daily smoking ($M = 18.40$, $SD = 5.99$ vs. $M = 17.05$, $SD = 4.58$; $p = .03$) were associated with being a reducer in univariate analyses. Reducers were also more likely to be in the treatment group receiving only bupropion (61%) as compared to the counseling in combination with bupropion treatment group (39%). The overall model predicting reduction status for the logistic regression including these covariates was significant, $X^2 = 19.89$, $p < .001$. African American race was associated with reduction status, as African Americans were more likely to be reducers than Whites ($B = -0.79$, $SE = 0.26$, $OR = 0.45$, 95% $CI[0.27-0.76]$, $p = .003$).

Compared to non-reducers, reducers smoked fewer CPD across all time points ($ps < 0.05$) and were more likely to achieve any quit across time (33.1% reducers vs. 21.9% non-reducers, $p = .02$). See Fig. 1. GEE analysis controlling for race revealed that reducers smoked fewer CPD across almost all time points except baseline compared to non-reducers. An interaction was observed between self-initiated reduction and CPD across time, such that reducers smoked fewer CPD at earlier time points relative to those who did not reduce.¹ See Table 1.

4. Discussion

The characteristics of people who self-initiate gradual reduction and the relation of such reduction with smoking cessation outcomes within the criminal justice population are not well understood. This study found that self-initiated gradual reduction correlated with earlier smoking cessation and more rapid reduction in CPD. Furthermore, this study revealed that individuals who were reducers were more likely to be African American, to be non-cigar smokers, to be older when first started daily smoking, to experience less withdrawal symptoms at baseline, and to have no prior usage of smoking cessation medications. Reducers did not report higher baseline levels of motivation or self-efficacy for quitting relative to non-reducers.

The present finding that individuals who gradually reduce may have better smoking cessation outcomes both contradicts (Lindson-Hawley et al., n.d.; Carpenter et al., 2003; Ho et al., 2018; Lindson-Hawley et al., 2016; Wang et al., 2017) and supports (Cinciripini et al., 1995) prior work that randomized individuals to gradual reduction or abrupt quitting. Our findings support one prior study that found self-initiated gradual reduction to improve 6-month outcomes, but contrasts that study's finding that such outcomes fade at 12 months. (Cropsey et al., 2011) Self-initiation may be key in the utility of gradual reduction in smoking cessation; however, the literature remains in its infancy and is in need of future work.

¹We also ran identical analyses using a cut-off criterion of 50% reduction for "reducer" classification. The results were similar to those reported here, with exception to some additional individual differences between reducers and non-reducers; however, the resultant reduced sample size in reducer group makes these results less reliable.

Our findings also added to work that found heavier smokers to be more likely to self-initiate gradual reduction,(Cropsey et al., 2011) finding that reducers differed from non-reducers in that they were more likely to be African American, to be non-cigar smokers, to be older when first started daily smoking, to experience less withdrawal symptoms, and to have no prior usage of smoking cessation medications. These variables may be indicative of a lesser severity of nicotine addiction and therefore a greater ability to self-initiate gradual reduction. Race was the sole correlate of reduction status in multivariate analysis and may be the most pertinent factor. Black participants may have been more able to reduce smoking in a short, one week timeframe due to their already lighter levels of smoking compared to Whites. A trend in prior work showed that Black individuals were more likely to reduce than White individuals.(Farkas, 1999)However, in the only other study of self-initiated gradual reduction in a criminal justice population, race was not associated with reduction.(Cropsey et al., 2011)

Consistent with prior work,(Cropsey et al., 2011) reducers did not report higher baseline levels of motivation or confidence regarding quitting relative to non-reducers. Gradual reduction may be a prognostic indicator, regardless of motivation or self-efficacy for cessation. Future work examining whether Black individuals under community corrections supervision benefit from gradual reduction would inform treatment efforts.

This study is not without limitations. No other minorities were represented in this study, given the racial distribution in Alabama. A comparison among racial groups on these smoking characteristics should be conducted. The practice of self-report measures may not distinguish an accurate distribution of smoking characteristics. However, CO measurements were obtained in order to confirm self-reported smoking. Additionally, given that there was only one week between baseline and session 1 (quit date), participants who reduced prior to this time point could represent individuals who smoke erratically. Further, the randomization of participants to different treatment conditions confounds the present study. Finally, self-initiated gradual reduction cannot be randomized; therefore, the causal nature of these variables could not be assessed. Future work should assess other variables that may explain the relation between gradual reduction and smoking cessation.

Nonetheless, the present study enhances our conception of reducers and non-reducers amid an underrepresented group of smokers that has the highest prevalence of smoking and smoking-related chronic illnesses. Overall, racial variances showed that there is a significantly higher prevalence of African American smokers under criminal justice supervision who reduce their smoking behaviors compared to Caucasian smokers. Future studies should focus on interventions that capitalize on the benefits of self-initiated gradual reduction.

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HIGHLIGHTS

- Smokers who reduced prior to quitting differed in demographics and smoking behavior
- Individuals who reduced prior to quit date had more success quitting long term.
- Reduction prior to quit date may be promising in tailoring future interventions.

Fig. 1.
Quit rates by reduction groups across time.

Table 1

GEE results.

Variable	Wald Chi square	df	p-Value
Intercept	1242.59	1	<0.001
Race	96.18	1	<0.001
Reduction status	7.35	1	<0.001
Time	354.03	9	<0.001
Reduction status * Time	399.80	9	0.007