



Short Communication

Predictors of relapse among smokers: Transtheoretical effort variables, demographics, and smoking severity



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HIGHLIGHTS

- We examine static and dynamic variables to discern predictors of smoking relapse.
- Participants aged 25–64 compared to those aged 18–24 were less likely to relapse.
- Not being in a treatment group doubled the odds of relapsing at follow-up.
- Reinforcement Management and Self-Reevaluation were significant predictors of relapse.

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ABSTRACT

The present longitudinal study investigates baseline assessments of static and dynamic variables, including demographic characteristics, smoking severity, and Transtheoretical Model of Behavior Change (TTM) effort variables (Decisional Balance (i.e. Pros and Cons), Situational Temptations, and Processes of Change) of relapse among individuals who were abstinent at 12 months. The study sample ($N = 521$) was derived from an integrated dataset of four population-based smoking cessation interventions. Several key findings included: Participants who were aged 25–44 and 45–64 ($OR = .43, p = .01$ and $OR = .40, p = .01$, respectively) compared to being aged 18–24 were less likely to relapse at follow-up. Participants in the control group were more than twice as likely to relapse ($OR = 2.17, p = .00$) at follow-up compared to participants in the treatment group. Participants who reported higher Habit Strength scores were more likely to relapse ($OR = 1.05, p = .02$). Participants who had higher scores of Reinforcement Management ($OR = 1.05, p = .04$) and Self-Reevaluation ($OR = 1.08, p = .01$) were more likely to relapse. Findings add to one assumption that relapsers tend to relapse not solely due to smoking addiction severity, but due to immediate precursor factors such as emotional distress. One approach would be to provide additional expert guidance on how smokers can manage stress effectively when they enroll in treatment at any stage of change.

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1. Introduction

Smoking continues to be the leading cause of preventable disease, general morbidity, and mortality in the United States (CDC, 2010). Before becoming completely abstinent, most smokers make a number of quit attempts (between 4 and 14) (CDC, 2013; Kaida et al., 2004) making relapse a common factor within the behavior change process (e.g. DiClemente, 2006). Although relapse is prevalent, most smoking cessation interventions group relapsers with those who never quit in their final analyses. This ignores a potentially important subgroup

from a public health perspective (Sun, Prochaska, Velicer, & Laforge, 2007).

Utilizing a Transtheoretical Model of Behavior Change (TTM) framework provides a theoretical guide for examining how relapsers differ from individuals who never quit. The TTM is organized around individuals' Stage of Change, or their readiness to change a target behavior. Readiness to change a behavior (i.e. smoking cessation) is mediated by three core constructs or "effort" variables: Decisional Balance, Situational Temptations, and Processes of Change. Decisional Balance refers to an individual's perception of the importance of the Pros vs. the Cons of smoking. Situational Temptations assess how tempted people are to engage in smoking in specific situations. Processes of Change are the frequency with which an individual engages in ten specific cognitive and behavioral activities that have been shown to facilitate forward movement through the stages.

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Significant predictors of successful cessation/abstinence have been found to include smoking addiction severity, age, education (Velicer, Redding, Sun, & Prochaska, 2007), and Stage of Change and TTM effort variables (e.g. Blissmer et al., 2010; Redding et al., 2011). In order to better serve the full population of smokers, a more comprehensive understanding of static and dynamic variables that could differentiate those who relapse from those who stay quit could provide insights for improving tailored cessation interventions. As such, the present study aimed to determine which of the variables (demographic, smoking severity and TTM effort) could best predict relapse at 24 months among past smokers who quit at 12 months.

2. Methods

2.1. Intervention

This study involved a secondary data analysis on a combined dataset of four population-based studies (Prochaska, Velicer, Fava, Rossi, & Tsoh, 2001; Prochaska, Velicer, Prochaska, & Johnson, 2004; Prochaska et al., 2005; Velicer et al., 2004). All four studies used a common TTM-tailored expert system intervention that was printed and delivered to participants' homes. Participants also received stage-matched self-help manuals. Control groups received assessments only. Participants were assessed at 6 month intervals post-baseline through 30 months.

2.2. Participants

The original four studies recruited only current smokers (in the pre-Action stages) at baseline. Since the intention of the present study is to examine relapse, participants in the Action/Maintenance stages at 12 months post-baseline ($N = 661$) and who had complete data at 24 months post-baseline ($N = 521$) were included. Participants who reported that they were in any of the pre-Action stages (Precontemplation, Contemplation, or Preparation) at 24 months were classified as relapsers, and those who were in Action/Maintenance at 24 months were classified as maintainers.

2.3. Measures

2.3.1. Severity of smoking

Number of cigarettes smoked daily and time to first cigarette, two main parts of the Fagerstrom index that reflect the degree of addiction were assessed (Fagerstrom, Heaherton, & Kozlowski, 1990) in addition to the previous longest quit attempt in months and number of quit attempts in the past year.

2.3.2. Stage of Change

An algorithm assessed a participant's readiness to quit smoking, with response options of 1 = Precontemplation (not intending to quit smoking within the next six months), 2 = Contemplation (intending to use the quit smoking within the next 6 months), 3 = Preparation (intending to use the quit smoking within the next 30 days), 4 = Action (quit smoking within the last six months), and 5 = Maintenance (quit smoking more than six months ago) (Prochaska & DiClemente, 1992).

2.3.3. Decisional Balance

An 8-item decisional balance measure assessed the relative importance of various advantages (Pros) and disadvantages (Cons) in an individual's decision to smoke. Participants were asked to rate the importance of each item on a 5-point Likert scale, ranging from 1 = "Not At All Important" to 5 = "Extremely Important" (Velicer, DiClemente, Prochaska, & Brandenberg, 1985).

2.3.4. Situational Temptation

A 9-item measure assessed the intensity of urges to engage in smoking when faced with difficult situations. Psychometric analysis

revealed a hierarchical structure with three first-order factors: Positive Social, Negative Affect, and Habit Addictive (Velicer, DiClemente, Rossi, & Prochaska, 1990). The higher the self-efficacy individuals have, the lower are their temptations. Participants rated their confidence to be able to quit smoking in the presence of temptations on a 5-point Likert scale ranging from 1 = "Not At All Tempted" to 5 = "Extremely Tempted" (DiClemente, 1981, 1986; Velicer et al., 1990).

2.3.5. Processes of Change

This measure (Fava, Rossi, Velicer, & Prochaska, 1991) evaluates 10 processes using a five-point Likert scale of frequency of use in the past month (1 = *Never* to 5 = *Repeatedly*). Confirmatory factor analysis supported the 10-process measurement model (Prochaska, Velicer, DiClemente, & Fava, 1988), with two higher order factors of five processes each labeled: experiential and behavioral.

3. Results

Approximately half of the sample was female (58.7%), with a mean age of 41.45 ($SD = 13.45$). The majority of the sample was White (95.9%) and married or living with a partner (65.9%), and about half of the sample having some high school education or holding a high school diploma (52.4%). There were no significant differences between treatment and control groups on any of the demographic characteristics (i.e. gender, age, race, education, marital status). There was a significant difference between groups for time until the first cigarette, with the treatment group having significantly more participants waiting more

Table 1

Odds ratios for baseline demographics and severity of smoking variables evaluating the chances of participants who relapsed vs. maintained.

	<i>p</i>	Odds ratio	95% CI	
			Lower	Upper
Control group	0.00	2.17***	1.44	3.25
Female	0.86	1.04	0.70	1.53
Non-White	0.10	2.14	0.87	5.27
Education				
College and/or graduate school	0.17	0.76	0.52	1.12
Marital status				
Married or living with partner	0.82	–	–	–
Not married	0.56	1.18	0.68	2.04
Separated or divorced	0.51	0.83	0.48	1.44
Widowed	1.00	0.00	0.00	
Age				
18–24	0.05	–	–	–
25–44	0.01	0.43*	0.23	0.81
45–64	0.01	0.40*	0.2	0.8
65+	0.08	0.51	0.24	1.09
Daily cigarette use				
≤9	0.20	–	–	–
19–Oct	0.38	1.28	0.74	2.24
20–29	0.05	1.74	1.00	3.04
30+	1.14	1.68	0.85	3.33
Time to first cigarette of the day				
15 min	0.42	–	–	–
30 min	0.33	1.34	0.75	2.38
60 min	1.00	1.00	0.55	1.81
1–10 h	0.35	0.78	0.46	1.31
10–1000 h	0.74	0.85	0.33	2.19
Number of quit attempts				
None	0.19	–	–	–
1–2	0.16	1.41	0.87	2.26
3–10	0.03	1.70*	1.05	2.77
11–98	0.37	1.56	0.56	4.07
Longest time to quit				
1 month	0.15	–	–	–
2–12 months	0.3	0.77	0.47	1.26
12–36 months	0.59	0.87	0.52	1.46
36–72 months	0.02	0.42*	0.2	0.89

Note. CI = confidence interval.

*** $p < .001$.

* $p < .05$.

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