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The Efficacy of Computer-Delivered Treatment for Smoking Cessation

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Abstract

Background: The current study evaluated the efficacy of an individualized, hand-held computer-delivered treatment (CDT) versus standard treatment (ST) for the maintenance of smoking abstinence following a quit attempt.

Methods: Participants were 303 adult daily smokers randomized to CDT or ST, plus pharmacotherapy. Abstinence though 1 year was examined using logistic random intercept models, a type of generalized linear mixed model regression.

Results: Results did not support the efficacy of the CDT program through 1 year postquit in analyses adjusted for time and study site (OR = 0.84, 95% CI = 0.55–1.30), or after further adjusting for race/ethnicity, age, gender, education, marital status, and the number of cigarettes smoked per day before quitting (OR = 0.89, 95% CI = 0.57–1.39).

Conclusions: CDT did not increase short- or long-term abstinence rates over ST in this study.

Impact: Findings differ from some in the literature and suggest the need for continued research on the use of CDT for smoking cessation. *Cancer Epidemiol Biomarkers Prev; 20(7); 1555–7. ©2011 AACR.*

Introduction

Smoking is the most preventable cause of premature morbidity and mortality in the United States (1) and the health benefits of quitting are substantial. Unfortunately, of the 34% of adult smokers who make a serious quit attempt each year, only 7.5% are successful (2). One promising approach to increasing cessation rates may be the use of computer-delivered treatment (CDT) provided via a small, mobile computer or smartphone. CDT might be particularly efficacious because it could be individualized on the basis of smoking preferences and empirical data, and would allow the provision of treatment in-the-moment when high-risk situations arose. The current study examined the efficacy of an individualized CDT program for smoking cessation used as an adjuvant to a standard treatment (ST). We hypothesized that CDT would increase abstinence rates through 1 year postquit relative to ST.

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Method

Study design

This study was a 2 group randomized controlled trial of a palmtop computer-delivered, individualized smoking cessation intervention for adult smokers ($N = 303$). Smokers were randomized into CDT ($n = 152$) or ST ($n = 151$).

Participants

Participants were recruited from Seattle, WA ($n = 139$), and Houston, TX ($n = 164$). Enrollment spanned 1999 to 2003. Data collection completed in 2004. Inclusion criteria were as follows: aged 18–70 years; ≥10 cigarettes per day for the past year; expired breath carbon monoxide level of ≥10 ppm; and the ability to speak/read/write in English. Exclusion criteria were as follows: regular use of tobacco products other than cigarettes; active substance abuse disorder; current psychiatric disorder; current use of bupropion; or contraindications for nicotine replacement therapy (NRT).

Procedure

Participants provided written informed consent, completed baseline measures, and were assigned a quit date. All were asked to complete assessments on a palmtop computer during the week before quitting. Assessments queried high-risk situations for smoking and efficacy and outcome expectancies for context-specific coping strategies. All participants received ST, which consisted of a self-help manual, information about how to access the

Committed Quitters Program, and 6 weeks of the NRT patch. Participants randomly assigned to the CDT group also utilized individualized CDT through 1 month postquit.

CDT intervention consisted of 3 components: *Treatment Information* about smoking (e.g., risks of smoking, benefits of quitting) and specific tips on quitting (e.g., managing negative emotions, what to do if a lapse occurs); *Motivational Messages* to encourage quitting; and *Managing My Urge,* a list of situation-specific and affectively relevant coping strategies that could be accessed at the moment of an urge. Coping strategies were personalized to each person's preferences and experiences based on the pretreatment assessment and rating period. Participants were instructed to access the CDT program components to get assistance managing urges or whenever they needed additional information/guidance.

Measures

Sociodemographic and tobacco-related characteristics were measured at baseline and included self-reported race/ethnicity, age, gender, education, marital status, and the number of cigarettes smoked per day before quitting (smoking rate).

Smoking abstinence was assessed at week 1, and months 1, 6, and 12 after the target quit date. Abstinence was defined as a self-report of no smoking during the previous 7 days and an expired air carbon monoxide level of less than 10 ppm. Participants with missing data were classified as smokers per intent-to-treat procedures.

Data analyses

All analyses were conducted using Statistical Analysis Software (version 9.1). Preliminary analyses compared the ST and CDT groups on sociodemographic characteristics and smoking rate. Primary analyses examined the efficacy of CDT on abstinence over time using logistic random intercept models. Model 1 controlled for study site and time, and model 2 further adjusted for race/ethnicity, age, gender, education, marital status, and smoking rate.

Results

Preliminary analyses

There were no significant differences between the CDT and ST groups on any of the sociodemographic characteristics or smoking rate (Table 1).

Primary analyses

Abstinence rates for CDT versus ST at week 1, and months 1, 6, and 12 were as follows: 52.6% versus 55%,

Table 1. Participant characteristics by treatment group

	ST ($n = 151$) *n* (%)	CDT ($n = 152$) *n* (%)	Total sample ($N = 303$) *n* (%)	*P*
Sociodemographics				
Age, y (mean ± SD)	41.2 ± 10.2	41.7 ± 10.1	41.4 ± 10.1	0.6668
Race/ethnicity				
White	117 (77.5)	112 (73.7)	229 (75.6)	0.4415
Other[a]	34 (22.5)	40 (26.3)	74 (24.4)	
Gender				
Male	74 (49.0)	83 (54.6)	157 (0.52)	0.3295
Female	77 (51.0)	69 (45.4)	146 (0.48)	
Marital status				
Married	57 (37.8)	54 (35.5)	111 (36.6)	0.6881
Not married	94 (62.3)	98 (64.5)	192 (63.4)	
Education				
≤High school/GED	38 (25.3)	42 (27.6)	80 (26.5)	0.8697
Tech/Voc/some college	102 (68.0)	99 (65.1)	201 (66.6)	
≥College degree	10 (6.7)	11 (7.2)	21 (6.9)	
Study site				
Seattle	70 (46.4)	69 (45.4)	139 (45.9)	0.8664
Houston	81 (53.6)	83 (54.6)	164 (54.1)	
Smoking rate				
Cigarettes per day (mean ± SD)	22.7 ± 10.8	22.3 ± 10.0	22.5 ± 10.4	0.7267

[a]Due to limited sample sizes among the non-White participants, African Americans ($n = 38$), Latinos ($n = 15$), Asian/Pacific Islanders ($n = 13$) and other Races ($n = 8$) were grouped as "Other Race/ethnicity" for the purpose of these analyses.

Table 2. Relationship between treatment group and 7-day point-prevalence abstinence over time

	OR	95% CI
Model 1		
Treatment group		
ST[a]	–	–
CDT	0.842	0.547–1.297
Model 2		
Treatment group		
ST[a]	–	–
CDT	0.891	0.571–1.391
Age, y	1.001	0.978–1.025
Race/ethnicity		
White[a]	–	–
Other	0.841	0.489–1.446
Gender		
Male[a]	–	–
Female	0.872	0.551–1.380
Marital status		
Married	1.082	0.674–1.737
Not married[a]	–	–
Education		
$\leq$ High School/GED[a]	–	–
Tech/Voc/some college	1.073	0.633–1.818
$\geq$ College degree	2.069	0.816–5.247
Cigarettes per day	0.970	0.946–0.994

[a]Reference group for calculating/testing the ORs. Both Model 1 and Model 2 were additionally adjusted for study site and time. With a planned sample size of 150 per group, the study had 80% power to detect an abstinence difference of 25% versus 40% between the ST and CDT groups at 12 months using a 2-sided χ^2 test at a significance level of 0.05 (with intraclass correlation = 1). This represented a worst case scenario, as the present analysis was longitudinal in nature and incorporated 4 follow-up time points (week 1, and months 1, 6, and 12 after the target quit date).

41.4% versus 47%, 14.5% versus 14.6%, and 11.2% versus 13.9%, respectively. There were no significant differences in abstinence by treatment group in models 1 or 2 (Table 2).

Discussion

Recent reviews of electronic portable devices suggest the efficacy of these modalities in affecting behavior change across a variety of behavioral areas including smoking cessation (3, 4). Contrary to expectations, CDT was not more efficacious for smoking cessation than ST in this trial. Several possible explanations must be considered. It is possible that the intervention delivery device, format, or content was not appealing to participants. It is important to note that hand-held computers were not common at the time and were unfamiliar to most. Exposure to the pretreatment assessment required to individualize treatment may have diminished group differences, as may have use of NRT. In addition, the intervention may not have been intensive enough. While we report null findings, CDTs that are integrated with more commonly used and carried electronic devices (e.g., smartphones), that offer greater treatment personalization or are used for longer duration, may be more effective.

Disclosure of Potential Conflicts of Interest

The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute of Drug Abuse or the NIH. No potential conflicts of interest were disclosed.

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