Electronic Cigarettes and Smokers' Choice to Quit

Jenny Ozga, MS[1], Nicholas Felicione, MS[1], Stuart Ferguson, PhD[2], Colleen Warren, MA[1], Nicholas Turiano, PhD[1], Geri Dino, PhD[3], Catherine Whitworth, MPA[3], Daniel Elswick, MD[4], Melissa Blank, PhD[1]

[1]Department of Psychology, West Virginia University, USA • [2] School of Medicine, University of Tasmania, AUS • [3] WV Prevention Research Center, West Virginia University, USA • [4]Department of Behavioral Medicine & Psychiatry, West Virginia University, USA

Abstract

Aims: Many cigarette smokers report use of electronic cigarettes (ECIGs) as a cessation aid. There is concern, however, that ECIG availability may hinder rather than facilitate a quit attempt. The aim of this study was to examine the influence of ECIGs on smokers' readiness and choice to quit, as well as cessation behavior. **Methods:** Cigarette smokers interested in quitting in the next 30 days to 6 months were randomly assigned to use their own brand of cigarette (OWN; n=12) or a tank-style ECIG (18 mg/mL; n=12) *ad libitum* for four weeks. During this period, they used an electronic diary every day to record their product use and visited the laboratory weekly for assessment of expired air CO and readiness to quit. They were also given the opportunity to formally accept or reject an offer to make a quit attempt. Those who chose a quit attempt were enrolled in a cessation program. All participants completed a one-month follow-up visit. **Results:** The number of smokers who chose to make a formal quit attempt was equal between conditions (58.3%). Among those smokers who chose to make a quit attempt, the majority did so in Weeks 1-2 for OWN (57.2%) and in Weeks 3-4 for ECIG (71.4%). A significant reduction in self-reported cigarettes/day was observed from baseline to follow-up for ECIG ($M \pm SEM$ difference score = -8.57±0.98) and OWN (-12.67±0.65) participants who chose to make a quit attempt, as well as for ECIG participants who declined a quit attempt (-13.0±0.53) (p's <.05). Still, the proportion of smokers who met the expired air CO cutoff of 7 ppm for confirmation of smoking abstinence did not differ as a function of condition (p>.05). As measured by the Stage of Change, more OWN participants than ECIG participants moved towards a quit attempt by the follow-up visit: 29% ECIG and 71% OWN participants who chose a quit attempt versus 40% ECIG and 0% OWN who declined a quit attempt. **Conclusions:** ECIG use may delay, but not preclude, a quit attempt. Future work requires larger sample sizes, longer assessment periods, and alternative ECIG devices.

Melissa Blank, Ph.D.; Morgantown, WV 26506, USA; mdblank@mail.wvu.edu

Introduction

- The 2009 Family Smoking Prevention & Tobacco Control Act ("The Act") calls for an evaluation of Modified Risk Tobacco Products (MRTPs).[1]
- The Act specifically notes the need to understand "*the increased or decreased likelihood that existing users of tobacco products who would otherwise stop using such products will switch*" to an MRTP.[1]
- Past products marketed as though they were an MRTP (e.g., light cigarettes):
  - Prompted many smokers to switch brands rather than quit.[2,3]
  - Failed to reduce smoking-related harm.[4]
- A current potential MRTP, the electronic cigarette (ECIG), is used by many smokers "to quit smoking" or "to reduce health risk".[5,6]
- Extant data show that ECIGs increase, decrease, or have no effect on cessation-related behaviors.[6-8]
- The primary aim of the current study was to examine the influence of ECIGs on smokers' readiness and choice to quit, as well as cessation behavior.

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Methods

- Smokers of ≥ 10 cigarettes per day for ≥ 1 year, CO level ≥ 10 ppm, currently in Contemplation or Preparation Stage of Change.[9]
- Randomized to use their own brand of cigarette (OWN) or an ECIG:
  - *Ad libitum* use of condition-assigned product for 4 weeks.
  - Ecological momentary assessments via electronic diary every day.
  - Laboratory visits once per week.
  - Offers to enter a cessation program weekly (Motivational Interviewing session, take-home booklet, and 2-week supply nicotine patch/gum).

Timeline

	Day 1	Day 8	Day 15	Day 22	Day 29	One Month Follow-up
Laboratory Visits						
Self-reported CPD	■					■
Expired Air CO	■	■	■	■	■	■
Stage of Change	■	■	■	■	■	■
Quit Attempt Choice		■	■	■	■	
Diary Assessments						
Cigarette/ECIG Use	■	■	■	■	■	
Withdrawal & Mood*	■	■	■	■	■	
Situational Factors*	■	■	■	■	■	
Biological Assessments						
Salivary Cotinine *	■	■	■	■	■	

*Data not shown

ECIG Materials

- eGO-T 3.3V constant output battery; KangerTech mini Protank-II 1.5 ml tank.
- Liquid:
  - 18 mg/ml nicotine concentration.
  - 75% propylene glycol / 25% vegetable glycerin.
  - Tobacco (n=5), menthol (n=2) or berry (n=3), or > one (n=2) flavor choice.

Baseline Characteristics (N = 24)

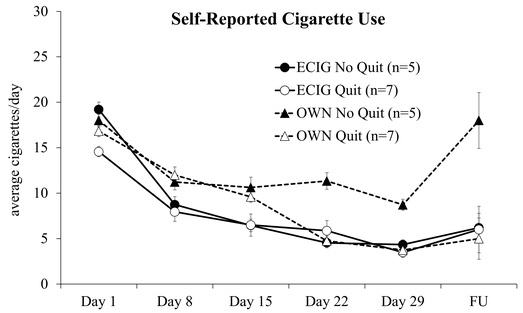
	ECIG (n=12)	OWN (n=12)
	M (SD) or %	*M* (SD) or %
% White	91.7%	75.0%
% Non-Hispanic	100.0%	88.9%
% Male	58.3%	66.7%
Age (years)	35.3 (9.3)	33.9 (11.9)
Education	14.1 (1.9)	13.8 (1.9)
Cigarettes/day	16.5 (5.3)	17.2 (4.1)
Years Smoked	12.2 (7.7)	16.3 (12.1)
% Menthol	25.0%	33.3%
Expired air CO (ppm	22.6 (13.5)	20.3 (10.5)
FTND Score[a]	5.6 (1.9)	5.7 (1.3)
SOC[b] Preparation	50.0%	33.3%
SOC[b] Contemplation	50.0%	66.7%

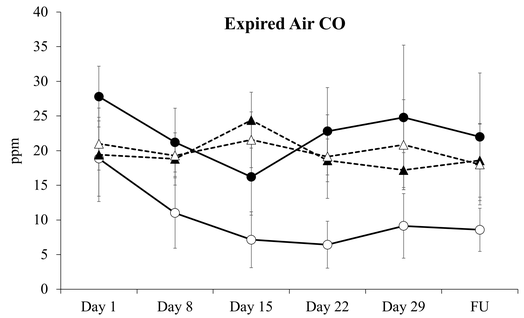
P's >.05 ECIG vs. OWN (X^2 or Independent t-tests)

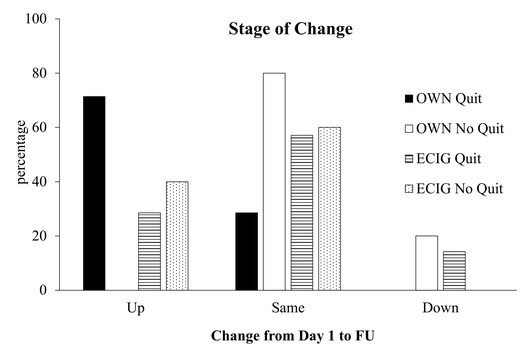
[a]Fagerstrom Test for Nicotine Dependence (1-10)[10]

[b]Stage of Change

Results







Top: Mean (SEM) self-reported cigarettes/day, measured via global question (Day 1 and follow-up (FU)) or electronic diary (all other days). **Middle**: Mean (SEM) expired air CO levels collected at in-person visits once per week and at one-month FU for each group. **Bottom**: Percentage of participants within each group who remained in the same stage ("Same"), moved up one or two stages ("Up"), or moved down one stage ("Down") from Day 1 to FU. Moving up stages indicates advancement toward quitting, while moving down stages indicates regression away from quitting.

Quit Attempts: Group x Time

Day	OWN	ECIG
8	2 (16.7%)	2 (16.7%)
15	2 (16.7%)	0 (0.0%)
22	0 (0.0%)	1 (8.3%)
29	3 (25.0%)	4 (33.3%)
Total	58.3%	58.3%

Discussion

- Reductions in self-reported CPD were observed for all groups across the 4-week intervention period. These reductions returned to baseline for OWN participants who forfeit their chance to join the cessation program.
- 7 participants provided a CO sample at FU that indicated abstinence (< 8ppm):
  - 1 ECIG No Quit and 3 ECIG Quit.
  - 1 Own No Quit and 2 Own Quit.
- ECIG use may have delayed a quit attempt:
  - Among those that chose a quit attempt, the majority did so in Weeks 1-2 for OWN (57.2%) and in Weeks 3-4 for ECIG (71.4%).
- Quit attempts during Week 4 may be a product of the study design:
  - ECIGs were taken away from ECIG-assigned participants on Day 29
  - Biochemically verified abstinence (CO < 8ppm) at follow-up was lower among those that chose to make a quit attempt during Weeks 3-4 (20%) relative to Weeks 1-2 (80%).
- More OWN (41.7%) than ECIG (33.3%) participants moved towards a quit attempt.
- Future work would benefit from:
  - Larger sample sizes for appropriate statistical analyses.
  - ECIG device/liquid combinations demonstrated to deliver pharmacologically active doses of nicotine.

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