Original Investigation

Prevalence of Video Game Use, Cigarette Smoking, and Acceptability of a Video Game–Based Smoking Cessation Intervention Among Online Adults

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Abstract

Introduction: Video games may serve as an ideal platform for developing and implementing technology-based contingency management (CM) interventions for smoking cessation as they can be used to address a number of barriers to the utilization of CM (e.g., replacing monetary rewards with virtual game-based rewards). However, little is known about the relationship between video game playing and cigarette smoking. The current study determined the prevalence of video game use, video game practices, and the acceptability of a video game–based CM intervention for smoking cessation among adult smokers and nonsmokers, including health care professionals.

Methods: In an online survey, participants ($N = 499$) answered questions regarding their cigarette smoking and video game playing practices. Participants also reported if they believed a video game–based CM intervention could motivate smokers to quit and if they would recommend such an intervention.

Results: Nearly half of the participants surveyed reported smoking cigarettes, and among smokers, 74.5% reported playing video games. Video game playing was more prevalent in smokers than nonsmokers, and smokers reported playing more recently, for longer durations each week, and were more likely to play social games than nonsmokers. Most participants (63.7%), including those who worked as health care professionals, believed that a video game–based CM intervention would motivate smokers to quit and would recommend such an intervention to someone trying to quit (67.9%).

Conclusions: Our findings suggest that delivering technology-based smoking cessation interventions via video games has the potential to reach substantial numbers of smokers and that most smokers, nonsmokers, and health care professionals endorsed this approach.

Introduction

Contingency management (CM) is an intervention that involves delivering incentives, usually money, to smokers based on objective verification of smoking abstinence (Higgins, Silverman, & Heil, 2007). Some barriers to the use of CM include (a) the costs associated with incentives (Olmstead & Petry, 2009); (b) the time required to train staff and implement treatments (Helgason & Lund, 2002); (c) the accessibility of the intervention (Nemet & Bailey, 2000); (d) the embarrassment that some smokers might face with participating in interventions (Substance Use and Mental Health Services Administration, 2009); and (e) the difficulty of reaching certain groups of smokers (Messer et al., 2007; Taylor, Hasselblad, Henley, Thun, & Sloan, 2002).

It may be possible to address these barriers by using video game technology to deliver CM interventions. Approximately 39.3 million U.S. Internet users report that they play casual online games daily (Verna, 2010), and the potential for video games to have a positive social impact by design is becoming more widely appreciated. Health behavior in children was significantly affected by computer games concerning asthma (Homer et al., 2000) and diabetes (Lieberman, 2001). In each case, studies reported a 70–77% reduction in emergency room visits. Although there are currently four video games that have been developed for the purposes of smoking cessation and prevention (Rex Ronan—The Experimental Surgeon; Blast ‘n Quit, Smoke Rings, Lit2Quit, Nicot; Abroms, Padmanabhan, Thaweethai, & Phillips, 2011; Lieberman, 2001), only one (Nicot) has been tested using a randomized clinical trial. Nicot involves having players crush virtual cigarettes in a 3D game environment, and it improved smoking cessation rates by 13% compared with a balloon popping game–based control group, suggesting the promise of video game–based approaches to smoking cessation (Girard, Turcotte, Bouchard, & Girard, 2009).

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Indeed, video games may be an ideal medium for implementing a technology-based smoking cessation intervention because they would make the intervention widely accessible to a large number of smokers who wish to quit by capitalizing on an already preferred leisure-time activity. Video game-based CM interventions hold the promise of replacing costly monetary incentives with game-based “virtual reward” incentives, which can be instantiated and delivered by the game software at essentially no cost. In 2009, it was estimated that Zynga, Inc., the makers of the popular online games CityVille and FarmVille, received more than \$100 million in revenue from purchases for virtual rewards made by their nearly 5 million game players (Shambora, 2009), suggesting the powerful reinforcing properties of gaining access to virtual rewards.

Despite the potential for video games to serve as an effective medium for delivering smoking cessation interventions, research on the relationship between video game playing and smoking is scarce and, to our knowledge, has focused exclusively on children and teenagers (Armstrong, Bush, & Jones, 2010; Desai, Krishnan-Sarin, Cavallo, & Potenza, 2010). The goals of the

current study were to determine the prevalence of video game use and video game practices among a sample of online adult smokers and nonsmokers and to determine the acceptability of a video game-based CM intervention for smoking cessation. Health care professionals were also asked to report the acceptability of a video game-based CM intervention and the likelihood of recommending such an intervention to smokers who wish to quit.

Methods

Participants

Participants (see Table 1) were recruited for a larger study about Internet-based CM interventions. Recruitment was conducted online, primarily via Craigslist (a free classified advertisement service) and by sending emails to health care professionals at hospitals and county health departments. The advertisement specified that University of Florida (UF) researchers were seeking participants to complete an online survey to get their opinion about a new smoking cessation intervention and that for

Table 1. Demographics of Excluded Survey Responses and Retained Survey Responses Among Video Game Players and Nonplayers

	Excluded (<i>n</i> = 740)	Retained (<i>n</i> = 499)			Video game players (<i>n</i> = 334)	Nonplayers (<i>n</i> = 165)		
	<i>n</i> (%)	<i>n</i> (%)	χ^2	<i>p</i> Value	<i>n</i> (%)	<i>n</i> (%)	χ^2	<i>p</i> Value
Gender			21.48	<.001			7.38	.007
Male	314 (50.2)	180 (36.2)			135 (40.4)	45 (27.6)		
Female	312 (49.8)	317 (63.8)			199 (59.5)	118 (72.4)		
Race								
White	373 (59.6)	329 (66.2)	4.97	.026	211 (63.4)	118 (72.0)	3.27	.071
Black	115 (13.4)	71 (14.3)	3.06	.080	53 (15.9)	18 (11.0)	1.73	.189
Hispanic	61 (9.7)	37 (7.4)	1.87	.172	25 (7.5)	12 (7.3)	0.01	.925
Asian	61 (9.7)	44 (8.9)	0.27	.603	33 (9.9)	11 (6.7)	1.44	.230
Other	16 (2.6)	16 (3.2)	0.43	.511	11 (3.3)	5 (3.0)	0.03	.871
Age (years)								
18–24	91 (15.0)	122 (24.8)	17.25	<.001	86 (25.8)	36 (22.8)	0.38	.540
25–34	243 (40.1)	179 (36.5)	1.59	.208	122 (36.6)	57 (36.1)	0.03	.865
35–44	163 (26.9)	108 (22.0)	3.57	.059	75 (22.5)	33 (20.9)	0.20	.658
45–54	77 (12.7)	57 (11.6)	0.32	.573	37 (11.1)	20 (12.7)	0.23	.634
55–64	32 (5.3)	25 (5.1)	0.02	.882	13 (3.9)	12 (7.6)	2.96	.085
Education								
Some H.S.	22 (3.5)	9 (1.8)	3.94	.047	7 (2.1)	2 (1.2)	0.24	.625
H.S. or GED	125 (20.0)	96 (19.2)	0.01	.740	70 (20.9)	26 (15.9)	0.89	.346
Associates	103 (16.5)	99 (19.8)	2.09	.148	71 (21.2)	28 (17.1)	1.32	.251
Bachelors	202 (32.4)	180 (36.1)	1.69	.193	113 (33.7)	67 (40.9)	2.20	.138
Masters	108 (17.3)	64 (12.8)	4.29	.038	40 (11.9)	24 (14.6)	0.65	.419
Ph.D.	17 (2.7)	5 (1.0)	4.28	.039	4 (1.2)	1 (0.6)	0.39	.533
Professional	13 (2.1)	19 (3.8)	2.98	.084	12 (3.6)	7 (4.3)	0.13	.721
Other	34 (5.4)	27 (5.4)			17 (5.1)	9 (5.5)		
Smoker			24.70	<.001			10.54	.001
Yes	410 (61.9)	236 (47.3)			175 (52.4)	60 (36.6)		
No	252 (38.1)	263 (52.7)			159 (47.6)	104 (63.4)		
Health care professional			4.03	.045				
Yes	174 (26.3)	158 (31.7)			106 (31.7)	52 (31.5)	0.003	.960
No	488 (73.7)	341 (68.3)			228 (68.3)	113 (68.5)		

Note. Ten to sixteen percent of responses among excluded surveys were missing. In some instances, total responses by variable do not add up to column totals because a small number of participants skipped that particular question. H.S. = High School; GED = General Educational Development.

completing the survey they might earn a \$50.00 gift certificate. All study procedures were approved by the UF Institutional Review Board.

Materials and Procedure

The online survey (Qualtrics) was anonymous, and participants were allowed to skip questions. Participants were asked whether they were a smoker and/or health care professional and answered demographic questions. Participants who reported smoking were then asked how many years they have been smoking and their current motivation to quit (1 = *not at all*, 10 = *very much*). Smokers also completed the six-item Fagerström Test for Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerström, 1991). Those who reported working as a health care professional were asked about their job title, their role in the health care industry, and how long they had worked in the industry.

Participants were then asked to answer “yes” or “no” to whether they played video games. If participants answered “yes,” they were asked to indicate all the platforms on which they play video games (from a choice of 4), all the types of games they play (from a choice of 12), whether they play by themselves or with others, how many hours per week they play, and when was the last time that they played (from a choice of 6). Finally, all participants were asked to answer “yes” or “no” to the following question: “Imagine a fun, online, chat-enabled, multiplayer video game being used in connection with the Internet-based smoking cessation intervention. Do you think that player’s motivation to meet smoking abstinence milestones could be enhanced by rewarding players for abstaining from smoking with virtual rewards (instead of monetary rewards)?” Participants were also asked whether they would recommend such a video game to smokers who wished to quit. It took participants approximately 20 min to complete the survey.

Data Analysis

Only survey responses that met all inclusion criteria were used in the analyses. All descriptive and inferential statistics reflect answered questions only; however, precautionary measures were taken to limit the number of skipped questions (see Results section), and less than 1% of all questions were incomplete. Chi-square analyses were used for all categorical variables, and independent *t* tests were used for continuous variables. To examine factors that influenced participants’ opinions toward a video game-based smoking cessation intervention, gender, video game playing practices, smoking status, and health care professional status were entered together in a logistic regression analysis. All tests were considered significant with an alpha set to .05.

Results

Informed consent was provided by 1,239 participants, of which 499 (40.3%) met all inclusion criteria and were retained for analysis. The primary reason for excluding responses was because they were incomplete ($n = 522$), which was defined as five or more skipped questions. Among completed surveys ($n = 717$), 30.4% were excluded because of duplicate IP or e-mail addresses, incorrect answers to validation questions, or self-reports of being less than 18 years of age. Demographics for excluded and retained survey responses can be seen in Table 1.

The differences between excluded and retained surveys should be viewed with caution because a portion of the responses were excluded if the participant did not answer “probe” questions correctly, so they may also have entered invalid demographic and smoking information.

Overall prevalence of video game playing was 66.9% and was associated with gender and smoking status. Men were more likely to report playing video games (75.0%) than were women (62.8%). Of the 235 participants who reported smoking, 74.5% also reported playing video games compared with 60.4% of nonsmokers.

Among participants who reported smoking, consoles (73.1%), personal computers (67.4%), and mobile phones (66.9%) were the three top used platforms. Video games in the action genre were the most popular among smokers (50.9%) followed by adventure (49.1%), arcade (48.6%), and family entertainment (46.9%). Although smokers reported playing video games alone (81.1%), most video game players also reported engaging in social games involving other players (78.1%). On average, smokers spent 8.12 hr ($SD = 7.31$) each week playing video games, which was significantly longer than nonsmokers (5.21 hr, $SD = 5.85$, $t(328) = 3.97$, $p < .001$). Likewise, smokers reported having played a video game more recently than nonsmokers ($\chi^2 = 30.57$, $p < .001$).

Smokers who play video games reported moderate levels of nicotine dependence, as indicated by the FTND score ($M = 5.69$, $SD = 2.07$), and 78.4% smoked one pack of cigarettes or less each day. Smokers reported being highly motivated to quit smoking ($M = 7.76$, $SD = 2.28$). There were no differences on any of these characteristics between smokers who reported playing video games and those who reported not playing video games.

A total of 158 valid survey responses were received from health care professionals ($M = 9.12$ years working in field, $SD = 8.72$, of work experience). Health care professional demographics were similar to the sample as a whole; however, they did report higher education levels than non-health care professionals. A greater percentage of health care professionals had completed postgraduate (31.6% vs. 11.2%, $\chi^2 = 33.05$, $p < .001$) or postsecondary education (94.3% vs. 72.2%, $\chi^2 = 31.63$, $p < .001$). The majority of health care professionals reported playing video games (67.1%), which did not differ from non-health care professionals (66.9%). Finally, although health care professionals tended to be nonsmokers relative to non-health care professionals (58.9% vs. 49.9%), this difference was not statistically significant.

Overall, the majority of participants believed that earning virtual rewards contingent on abstinence, in the context of a multiplayer video game, would increase smokers’ motivation to quit (63.7%) and reported that they would recommend the intervention to smokers who want to quit (67.9%). Table 2 shows these percentages separated by gender, smoking status, video game player practices, and health care professional status.

Discussion

The current study provides the first account of the prevalence of cigarette smoking and video game use, as well as the

Table 2. Participants' Views Toward Game-Based Smoking Cessation Interventions

	I believe video game-based interventions could motivate smokers to quit				I would recommend a video game-based intervention to a smoker who wants to quit			
	<i>n</i>	% Agree	<i>OR</i>	95% <i>CI</i>	<i>n</i>	% Agree	<i>OR</i>	95% <i>CI</i>
Gender			2.92	1.86–4.57			2.18	1.39–3.43
Men (<i>n</i> = 180)	144	80.4			145	80.5		
Women (<i>n</i> = 317)	171	53.9			193	60.9		
Smoker			1.61	1.07–2.42			1.65	1.09–2.51
Yes (<i>n</i> = 235)	172	73.2			180	76.6		
No (<i>n</i> = 263)	144	54.7			159	60.5		
Video game player			2.19	1.46–3.29			2.14	1.43–3.21
Yes (<i>n</i> = 334)	235	70.4			249	74.6		
No (<i>n</i> = 164)	81	49.4			90	54.9		
Health care professional			1.31	0.82–2.08			1.29	0.80–2.08
Yes (<i>n</i> = 158)	103	65.2			111	70.3		
No (<i>n</i> = 341)	213	62.5			228	66.9		

acceptability of a video game-based smoking cessation intervention, among online adults. Although the majority of respondents reported playing video games, a higher percentage of smokers reported playing video games than nonsmokers. Smokers also reported playing video games for longer periods of time each week, and playing more recently, than nonsmokers. Previous research with teenagers has also found that video game playing status and smoking status are related under some conditions (Desai et al., 2010). The demographics of the current study are consistent with industry statistics, which show that the average game player is 37 years old and 42% of all game players are women (Entertainment Software Association, 2011). These findings suggest that video game-based smoking cessation interventions could reach a large number of smokers who already view video games as a desirable leisure-time activity.

The majority of smokers and nonsmokers, as well as video game players and nonplayers, reported that video game-based CM would be likely to motivate smokers to quit and would recommend it to a smoker seeking treatment. Importantly, 70% of health care professionals reported that they would recommend video game-based CM to patients who wished to quit. These findings suggest that a video game-based CM intervention would be both accessible to a large number of smokers and an acceptable form of treatment that would be recommended to smokers by health care professionals. Smokers in the current study reported playing action, adventure, arcade, or family games, and although smokers reported playing video games alone, they also reported that they often play with others (i.e., social games). Thus, there are an endless number of possibilities for developing fun, engaging video game-based smoking cessation interventions.

One potential limitation of the current study is that participants were recruited online. Other researchers have used similar methods to recruit smokers (Ramo, Hall, & Prochaska, 2011); however, using this approach biases the sample to smokers who have Internet access. Approximately 77.3% of the U.S. population are Internet users (Internet World Stats: Usage and Population Statistics), so the sample likely reflects the majority of smokers.

In conclusion, developing and empirically testing a video game-based smoking cessation intervention would be worthwhile because many smokers already report playing video games. Furthermore, the consensus among a sample of online adults, regardless of smoking, video game playing, or health care professional status, was to endorse a video game-based CM intervention to smokers who want to quit. These results suggest that our proposed CM-based smoking cessation video game would be appropriate not only for video game players who happen to smoke but also for smokers who do not currently play video games but who might be willing to as part of a cessation program. Designing video game-based interventions using existing evidence for effectively implementing behavioral treatments, and for effectively changing behavior via informational technologies, could result in a powerful, cost-effective, acceptable, and accessible intervention that could be sustained for extended periods of time and require little or no staff training.

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No funding was obtained to conduct this study or prepare the manuscript.

Declaration of Interests

DR and Entertainment Science have applied for a utility patent on the method of using game-based virtual rewards as incentives in contingency management interventions for smoking cessation and other behavioral change interventions.

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