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BRIEF REPORT

Patterns and Motives for Electronic Cigarette Use in a Sample of Community-Recruited Gamblers

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Abstract Many smokers are replacing tobacco with electronic cigarettes (e-cigarettes) or are engaging in dual-use. Evidence indicates that smoking rates are higher amongst gamblers; however, the extent to which gamblers use e-cigarettes is unknown. The current study examined rates of e-cigarette use in gamblers, identified associations between e-cigarette use and gambling, and assessed motives for e-cigarette use during gambling. A community-recruited sample of gamblers (N = 564) completed questionnaires on e-cigarettes, smoking, and gambling. 'Ever use' of e-cigarettes was 38.7% with 17.6% reporting 'past 30-day use'. Furthermore, 11.9% used e-cigarettes while gambling in the past 12 months. Regression analyses for 'past 30-day use' revealed that occasional smoking, gambling severity, and number of gambling activities were associated with the highest odds of use. Reasons for use while gambling included: relaxation/stress, nicotine dependence and legal in casinos. These findings suggest e-cigarette use is common in gamblers and may be used to circumvent casino smoking bans.

Keywords Electronic cigarettes (e-cigarettes) · Gambling · Smoking · Co-morbidity

Electronic cigarettes (e-cigarettes) are battery-powered devices which vaporize liquid compounds (e.g., nicotine, propylene glycol, flavouring agents) contained in cartridges, which is then inhaled by the user (Grana et al. 2014). Sales of e-cigarettes continue to increase with an estimated $2 billion dollars spent in the United States in 2013 (Besaratinia and Tommasi 2014). Epidemiological evidence suggests that the prevalence of ever using e-cigarettes among

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the general adult population of the United States range from 6% (Chapman and Wu 2014; Grana et al. 2014) to 12.6% (Schoenborn and Gindi 2015). Furthermore, the same report suggests that current use is an estimated 3.7% in the general population. Among smokers; however, estimates are even higher with 47.6% of current smokers and 55.4% of recent former cigarette smokers reporting ever use of e-cigarettes. Moreover, 15.9% of current cigarette smokers and 22% of recent former smokers use e-cigarettes every day or nearly every day (Schoenborn and Gindi 2015). In aggregate, these statistics suggest that e-cigarette use is becoming increasingly common.

Importantly for the present research, smoking has been found to be most common addictive behaviour that is co-morbid with gambling (Cunningham-Williams et al. 1998; Odlaug et al. 2013; Petry et al. 2005). Gambling Disorder (GD) is a serious disorder that afflicts approximately 0.5–5.5% of the American population (Welte et al. 2014). Epidemiological studies have reported rates of nicotine dependence of over 60% in GDs (Lorains et al. 2011; McGrath and Barrett 2009). Historically, gamblers could freely smoke in gambling venues; however, the landscape has changed in recent years with widespread implementation of smoke-free policies (McGrath 2015). Smoking bans in casinos have been cited as an important contributor to decreases in revenues/admissions (Lal and Siahpush 2008; Thalheimer and Ali 2008) as well as venue substitution to casinos not covered by smoke-free ordinances (Quintana 2010). These findings suggest that gamblers who smoke may alter their behaviour in order to use nicotine during gambling. A potential way gamblers may alter their behaviour is to switch to e-cigarette use in casinos. Indeed, one reported reason for using e-cigarettes among smokers is that they can be used in social environments where smoking is prohibited (Dawkins et al. 2013; Etter and Bullen 2014; Shiplo et al. 2015). While yet to be empirically tested, it is possible that a proportion of smokers have migrated to using e-cigarettes while gambling, especially in jurisdictions where e-cigarettes are exempt from smoke-free legislation. Substituting to e-cigarettes in casinos may be problematic, as acute nicotine administration has been shown to augment betting behaviour in laboratory gambling (Barrett et al. 2015). Thus, assessing whether gamblers switch to e-cigarettes during play may have important policy implications.

The purpose of this study was to explore rates and possible correlates of e-cigarette use in a sample of gamblers. To this end, a sample of community gamblers completed questions pertaining to e-cigarette use as well as gambling and tobacco use. It was predicted that rates of e-cigarette use would be greater than those seen in the general population given high rates of co-morbid smoking among gamblers. In addition, associations between 'past 30-day use' and 'use while gambling' with demographic characteristics, smoking patterns, gambling behaviour, and gambling problem severity were examined. Lastly, given the paucity of research in this area, we asked participants to self-generate reasons for using e-cigarettes while gambling via open-ended responses.

Method

Participants

Participants were recruited from Amazon's Mechanical Turk (MTurk) – a crowdsourcing platform, which has been shown to yield high quality data amongst various clinical samples (Shapiro et al. 2013). MTurk has been shown to be a reliable and valid method of recruiting gamblers for psychological research (Kim and Hodgins in press). A recruitment notice was

posted on MTurk and respondents were re-directed to a survey hosted by Qualtrics. Participation was limited to US residents who engaged in gambling activities in the past 12 months. All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. This study received ethics approval from the Conjoint Faculties Research Ethics Board (CFREB) at the University of Calgary. Informed consent was obtained from all individual participants included in the study. A total of 650 respondents were recruited; however, 86 surveys were only partially completed and were removed from our analyses. The final sample was comprised of 564 gamblers (52.1% female). Participants ranged in age from 18 to 73 years (M = 36.10, SD = 11.25). See Table 1 for demographic and smoking characteristics.

Table 1 Demographic information for 'Ever E-cigarette Users', 'Past 30-day E-cigarette Users', 'Used E-cigarettes while gambling in the past 12 months' and the total sample of respondents

	'Ever Users' (n = 218)		'Past 30-day Users' (n = 99)		'Used While Gambling" (n = 67)		Total Sample (n = 564)	
Variable	*N*	%	*N*	%	*N*	%	*N*	%
Gender								
Male	107	49.3%	52	52.5%	36	53.7%	269	47.8%
Female	110	50.7%	47	47.5%	31	46.3%	294	52.2%
Employment*								
Full-Time	123	56.4%	52	52.5%	43	64.2%	328	58.2%
Part-Time	39	17.9%	20	20.2%	10	14.9%	94	16.7%
Full-Time Student	16	7.3%	8	8.1%	3	4.5%	45	8.0%
Part-Time Student	4	1.8%	2	2.0%	0	0.0%	14	2.5%
Self-Employed	23	10.6%	13	13.1%	9	13.4%	53	9.4%
Unemployed	19	8.7%	10	10.1%	5	7.4%	42	7.4%
Retired	7	3.2%	2	2.0%	2	2.9%	23	4.1%
Other	7	3.2%	4	4.0%	2	2.9%	15	2.7%
Marital Status								
Single	92	42.2%	41	41.4%	29	43.3%	233	41.3%
Married	79	36.2%	36	36.4%	26	38.8%	224	39.7%
Common Law	18	8.3%	10	10.1%	6	9.0%	31	5.5%
Separated	8	3.7%	3	3.0%	1	1.5%	14	2.5%
Divorced	18	8.3%	8	8.1%	5	7.5%	56	9.9%
Widowed	3	1.4%	1	1.0%	0	0.0%	6	1.1%
Ethnicity								
Caucasian	187	85.8%	84	84.8%	55	82.1%	471	83.5%
Non-Caucasian	31	14.2%	15	15.2%	12	17.9%	93	16.5%
Tobacco Use								
Non-smoker	61	28.0%	22	22.2%	22	32.8%	326	57.8%
Occasional smoker	42	19.3%	26	26.3%	16	23.9%	71	12.6%
Daily smoker	115	52.8%	51	51.5%	29	43.3%	167	29.6%

*Percentages for employment do not equate to 100% as respondents were permitted to choose more than one category

Procedure

The survey was launched on Amazon's Mechanical Turk in November, 2015. Smoking was assessed with the following question: "At the present time, do you smoke cigarettes daily, occasionally, or not at all?". This question has been used in previous investigations of smoking behaviour by our team (e.g., McGrath et al. 2012). Several e-cigarette questions were included, with three being of primary interest: "Have you ever used e-cigarettes, electronic, or vapor cigarettes?"; "Have you used e-cigarettes, electronic, or vapor cigarettes in the past 30 days?"; and "In the past 12 months, have you used e-cigarettes, electronic, or vapor cigarettes while gambling?". Finally, the Fagerström Test of Nicotine Dependence (FTND; Heatherton et al. 1991) was used to measure tobacco dependence and the Problem Gambling Severity Index (PGSI; Ferris and Wynne 2001) assessed gambling problem severity. Lastly, past 12-month participation in 12 individual gambling activities (e.g., VLTs/slots, lottery, bingo etc.) was also recorded. In total, the survey took approximately 24 min to complete and respondents were compensated with 1.00 USD for their participation.

Statistics

Data were analyzed with IBM SPSS Statistics Version 20. Categorical variables were compared with chi-square analyses and a series of binary logistic regressions were conducted to identify variables that were uniquely associated with e-cigarette use. Open-ended responses for e-cigarette use while gambling were grouped based on conceptual similarity and frequency counts were calculated to assess the most common reasons.

Results

In terms of GD, 62.4% (n = 352) of respondents were classified as non-GDs while 37.6% (n = 212) met criteria for GD defined as a score of 5 or greater on the PGSI (Currie et al. 2013). For smoking status, 57.8% (n = 326) were non-smokers with 29.6% (n = 167) reporting daily smoking and 12.6% (n = 71) occasional smoking. Average score on the FTND among all smokers was 3.84 (SD = 1.32), indicating low to moderate dependence in the sample.

For all gamblers, prevalence of 'ever use' of e-cigarettes was 38.7% (n = 218) and 17.6% (n = 99) for past 30-day use. As anticipated, gamblers who smoke were significantly more likely to report having used e-cigarettes (66.0%) than non-smokers (18.7%), χ^2 (1, N = 564) = 129.55, $p < .001$. Although not significantly different, a sizeable proportion of smokers (49.0%) and non-smokers (36.1%) who use e-cigarettes reported past 30-day use, χ^2 (1, N = 218) = 2.99, p = .084. In addition, 8.0% (n = 42) of the entire sample reported using e-cigarettes on a daily basis. Importantly, 11.9% (n = 67) of all respondents, or 30.7% of gamblers who reported 'ever use' of e-cigarettes, also used e-cigarettes while gambling in the previous 12 months. Furthermore, GDs compared to non-GDs (56.3% vs. 36.9%) were significantly more likely to report past 30-day use, χ^2 (1, N = 218) = 8.13, p = .01; as well as using e-cigarettes during gambling (44.2% vs. 21.2%), χ^2 (1, N = 213) = 12.94, $p < .001$.

Using open-ended responses, gamblers were asked to provide their primary reason for using e-cigarettes during gambling. A total of 66 participants provided responses which were grouped based on conceptual similarity into seven motive categories: 'relaxation/stress relief'

(19.7%), 'nicotine dependence' (18.2%), 'legal in casino/easier than cigarettes while gambling' (15.2%), 'like sensory/health features' (12.1%), 'to quit smoking' (10.6%), 'for enjoyment' (10.6%), and 'cognitive enhancement' (e.g., "helps me focus") (4.5%). The remaining 9.1% couldn't be meaningfully categorized and therefore were grouped as 'other'. There was substantial inter-rater reliability between two independent raters, Cohen's Kappa =0.86.

Next, we conducted two binary logistic regressions with 'past 30-day use' of e-cigarettes, and 'using e-cigarettes while gambling' as outcome measures (see Table 2). The following variables were included in both models: gender, age, non-smoking vs. smoking (occasional, daily), PGSI score, number of past 12-month gambling activities, and past 12-month participation in 12 individual gambling activities (e.g., VLTs/slots, lottery, bingo etc.). The regression model for 'past 30-day use' was significant, Cox and Snell Pseudo R^2 = .16, χ^2 (18) = 32.57, p = .019. In this model, occasional smoking, but not daily smoking, was associated with e-cigarette use. Furthermore, higher PGSI scores, greater number of activities, and *not* participating in sports gambling were associated with use. Similarly, the regression for 'using e-cigarettes while gambling' was significant, Cox and Snell Pseudo R^2 = .18, χ^2

Table 2 Odds ratios for 'Past 30-day E-cigarette Users' and 'Used E-cigarettes while gambling in the past 12 months'

	'Past 30-day Users' (N = 99)		'Used While Gambling" (N = 67)	
	OR (95% CI)	*P*	*OR (95% CI)*	*P*
Gender				
Female	1 [Ref]		1 [Ref]	
Male	0.92 (0.44–1.93)	.82	1.26 (0.55–2.88)	.58
Age in Years	1.01 (0.98–1.05)	.44	1.00 (0.96–1.04)	.97
Smoking Status				
Non-smoker	1 [Ref]		1 [Ref]	
Occasional	3.64 (1.29–10.29)	.02*	0.47 (0.15–1.45)	.19
Daily	1.39 (0.64–2.99)	.40	0.36 (0.15–0.87)	.02*
Gambling Severity				
PGSI Score	1.07 (1.01–1.14)	.04*	1.11 (1.03–1.18)	.01*
# of Activities	1.60 (1.15–2.23)	.01*	1.64 (1.11–2.35)	.01*
Gambling Activities				
Lottery	0.41 (0.13–1.29)	.13	0.60 (0.15–2.40)	.47
Scratch Tickets	0.41 (0.13–1.31)	.13	1.80 (0.40–8.14)	.44
Raffle Tickets	0.76 (0.34–1.68)	.49	0.30 (0.12–0.78)	.01*
VLTs/Slots	0.57 (0.22–1.50)	.25	0.65 (0.20–2.13)	.48
Casino Games	0.77 (0.31–1.92)	.58	0.84 (0.30–2.42)	.75
Sports	0.20 (0.08–0.51)	.01*	0.50 (0.17–1.43)	.20
Bingo	0.52 (0.21–1.30)	.16	0.64 (0.23–1.81)	.40
Internet	0.54 (0.21–1.37)	.19	0.51 (0.17–1.51)	.22
Card Games	0.57 (0.24–1.34)	.20	0.92 (0.36–2.33)	.85
Horses	0.40 (0.14–1.13)	.09	0.41 (0.13–1.33)	.14
Games of Skill	0.77 (0.26–2.28)	.63	0.47 (0.14–1.60)	.23
Stocks	0.55 (0.23–1.28)	.17	0.29 (0.10–0.82)	.02*

*P < .05

(18) = 36.37, $p = .006$. Higher PGSI scores and greater number of activities were significantly associated with use; whereas daily smoking, purchasing stocks, and raffle ticket participation were associated with *not using* e-cigarettes while gambling.

Discussion

The purpose of this study was to explore the extent to which e-cigarettes are used by gamblers and associations with gambling-related variables. Furthermore, we investigated common reasons for using e-cigarettes while gambling. As hypothesized, rates of 'ever use of e-cigarettes' (38.7%) as well as 'past 30 day e-cigarette use' (17.6%) were higher than rates reported in the general population. This is likely attributable in part to greater tobacco use by gamblers, especially GDs. Predictably, gamblers who smoke reported higher rates of 'ever use' of e-cigarettes compared to non-smokers (66.0% vs. 18.7%). Moreover, a notable percentage of gamblers (11.9%) used e-cigarettes while gambling in the past 12 months; with relaxation/stress, nicotine dependence and e-cigarette use being legal in casinos being the most frequently endorsed reasons. These findings are especially novel as the concurrent use of e-cigarettes while gambling has gone largely unexplored. Overall, results suggest that e-cigarettes are commonly used by regular gamblers, especially among those who smoke.

In terms of associations with past 30-day e-cigarette use, occasional (OR: 3.64 [95% CI: 1.29–10.29]), but not daily smoking, was related to higher odds of use. In addition, both problem gambling severity (OR: 1.07 [95% CI: 1.01–1.14]) and number of gambling activities (OR: 1.60 [95% CI: 1.15–2.23]) were associated with past 30-day use. In the second regression, using e-cigarettes while gambling was the outcome of interest. It was found that daily smoking (OR: 0.36 [95% CI: 0.15–0.87]) was associated with lower use, while problem gambling severity (OR: 1.11 [95% CI: 1.03–1.18]) and number of activities (OR: 1.64 [95% CI: 1.11–2.35]) were again associated with higher odds. After controlling for the influence of smoking status, gambling problem severity and intensity were strongly associated with past 30-day use and use during gambling. These findings could be due to higher levels of tobacco dependence in gamblers and hence a greater likelihood of using e-cigarettes for cessation purposes. Alternatively, smoking restrictions in gambling venues may facilitate e-cigarette use as a tobacco alternative where permitted. Indeed, self-generated reasons for gambling suggest that a sizable subgroup (15.2%) of gamblers used e-cigarettes because they were permitted in their casinos.

The findings of our research may have important policy implications. For instance, it was found that past 30-day e-cigarette use and e-cigarette use while gambling were significantly associated with higher gambling severity. This may be due in part to acute use of nicotine leading to more problematic gambling behaviour possibly due to its reinforcement-enhancing properties for other behaviour unrelated to smoking itself (Barrett et al. 2015). Another potential reason for the association between e-cigarette use and gambling severity could be related to reduced need to take 'smoke breaks' from gambling. In other words, using e-cigarettes in casinos allows gamblers more time on machine. Unfortunately, the more the gambler plays, inevitably, the more they are likely to lose. Moreover, smoke breaks may provide the gambler with an opportunity to cool down and reduce their 'hot cognitions', which may prevent problematic behaviours such as chasing (Blaszczynski, Parke, Harris, Parke, & Rigbye, 2015). However, this concept has recently been disputed (Blaszczynski, Cowley, Anthony, & Hinsley, 2015). Given the potential for e-cigarette use during gambling to lead to

problematic play, a potential responsible gambling strategy may be to encourage jurisdictions that still allow e-cigarette use on casino floors to reverse such policies.

Interpretation of our results must be weighed against potential limitations. First, respondents were community-recruited gamblers, not a clinical population. The prevalence rates reported here may differ in clinical samples, especially given higher rates of smoking among GDs (McGrath and Barrett 2009). That said, less than 10% of GDs seek treatment (Hodgins et al. 2011) and thus these results may better generalize to the majority of gamblers. Second, the survey collected limited information on event-level use during gambling. For instance, how e-cigarettes are used while gambling was not fully explored. It is conceivable that e-cigarette use may be a direct result of smoke-free legislation in gaming venues. More nuanced information is required to further explore this possibility. A related limitation is that information on whether e-cigarettes were permitted where respondents gamble was not available. Having said that, the open-ended responses found that using e-cigarettes due to direct smoking bans was the third most cited reason, thus providing some support for the notion that smoking bans may be an important factor for substituting to e-cigarettes among gamblers. Future studies, which inquire about the legal status of e-cigarettes in gaming venues would allow for a more thorough examination of the decision to use e-cigarettes during gambling. Lastly, this study did not include a control group of non-gamblers. A control group would allow for a more direct examination of the variability explained by gambling in rates of e-cigarette use, especially considering the high degree of comorbidity with smoking in general.

Conclusions

In conclusion, the findings from this study suggest that e-cigarette use may be especially prevalent among gamblers and is associated with problem gambling severity and intensity. More research is needed to directly assess the role that e-cigarettes plays in these enhanced rates. Future studies may want to consider further exploration of the influence of smoking policy on e-cigarette use in gaming venues as well as possible observational research of e-cigarette use on casino floors.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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