Once online poker, always online poker? Poker modality trajectories over two years

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ABSTRACT

Online poker is considered more at-risk than land-based poker in terms of intense gambling behaviors and gambling problems. The development of many online gambling sites has raised public health concerns about the potential increase in online poker players. Longitudinal studies are useful to better understand the evolution of gambling behaviors; however, very few consider online poker players. Using a prospective design, this study aims to identify online and land-based trajectories over a two-year period and the factors influencing those trajectories.

Results are based on data collected at three time-points over the course of a prospective cohort study conducted in Quebec (n = 304). A latent class growth analysis was performed to determine trajectories based on the main poker modality played, either online or land-based poker. Multinomial multivariable logistic regression analyses were conducted to determine the correlates of poker playing trajectories.

Over two years, three poker playing trajectories were identified, comprising two stable trajectories [stable land-based (51.5%) and stable online (36.3%)] and an unstable trajectory [unstable online land-based (12.1%)]. The second trajectory included online poker players at baseline who transitioned to land-based poker. Number of gambling activities increased the odds of being in the first trajectory as compared to the others. Severity of gambling problems was a significant predictor of the second "unstable" or the third "stable online" trajectories, but not for the first "stable land-based" poker trajectory.

The majority of poker players remained in either the land-based or online trajectories over two years. No poker players transitioned from land-based to online poker.

1. Introduction

Since the early 2000s, the gambling industry has grown significantly, both with the arrival and development of online gambling and in the traditional land-based offer. In fact, the current annual growth rate of online gambling revenue is about 10.8%, and global online revenues are expected to double by the end of 2024 (iGamingDirect, 2018). Poker playing and sports betting are the most popular forms of online gambling (Gainsbury, Russell, Wood, Hing, & Blaszczynski, 2014; Hing, Gainsbury, Blaszczynski, Wood, Lubman, & Russell, 2014; Kairouz, Paradis, & Nadeau, 2012). The increasing availability of online gambling and the development and promotion of many online gambling sites have raised public health concerns about a significant increase in online gamblers (Nadeau, Dufour, Guay, Kairouz, Ménard, & Paradis, 2014), and therefore in what is considered to be risky behavior.

In response to this concern, numerous studies have tried to better understand the population of online gamblers. In those studies, gambling online once seemed sufficient to be considered an online gambler (Kairouz et al., 2012). The "online player label" was applied even to

individuals who had gambled online a single time (i.e. gambling online once) without any consideration to whether this behavior recurred during the year or for the next few years. Until now, different studies identified online gamblers as being more frequently male, young, relatively highly educated, employed full-time and with high incomes (Griffiths, Wardle, Orford, Sproston, & Erens, 2009; Hing et al., 2014). Compared to land-based gamblers, online gamblers are found to have more intense gambling activities, both in terms of number of games, frequency of play and amount of money bet (Barrault & Varescon, 2016; Dufour, Brunelle, & Roy, 2015; Gainsbury et al., 2014; Hing et al., 2014; Mihaylova, Kairouz, & Nadeau, 2013). Several studies have also reported that online gamblers use more alcohol and drugs (Kairouz et al., 2012; Mihaylova et al., 2013) and have more gambling problems (Barrault & Varescon, 2016; Mihaylova et al., 2013). In a 2014 study by Gainsbury et al., almost two-thirds of the online gamblers included reported subsequent gambling problems after starting to gamble online. A recent literature review reported that the proportion of gambling problems among online poker players is higher than among land-based poker players (Moreau, Chabrol, & Chauchard, 2016). Problem gambling in online poker players was associated with diverse predictive factors such as stress, irrational beliefs, negative emotions, anxiety, and impulsivity (Moreau et al., 2016). Beyond player characteristics and the differences between online and land-based poker, the players themselves mentioned, in a qualitative study, the importance of considering their chosen poker modality to better understand their gambling behaviors, motivations and even risk-taking behaviors (Dufour, Petit, & Brunelle, 2012).

While almost all studies converge to highlight the risk of gambling online, the cross-sectional nature of most of these studies raises different questions. In fact, is gambling once in a year a sufficient risk to be associated with development of future gambling problems? More specifically, will the online poker modality last over time? Does the fact that a person played online once predict the choice of this modality for future years? Conversely, do land-based players maintain their poker habits over time? Has the increase in accessibility of online betting encouraged the transition from land-based to online poker? If online gambling is a dangerous practice, it becomes very important to understand if many players are switching to online gambling.

Poker modality (i.e. land-based or online poker) has always been presented as a stable state and never been measured or questioned until now. Yet, further understanding of poker modality trajectories (i.e. land-based vs. online) will put into perspective the cross-sectional results obtained so far, and will help clarify if the attractiveness of online poker has grown over the years as well as risks associated with it. A better understanding of the trajectories of gambling modalities will clarify not only the theoretical concept of online gambling but also the populations at risk of becoming online gamblers. Accordingly, the aim of this study is to identify online and land-based trajectories over a two-year period as well as the factors influencing the trajectories.

2. Material and methods

2.1. Participants

This prospective cohort study is part of a broader study conducted among poker players from 2008 to 2016 (Dufour et al., 2019). The aim of the main study was to better understand factors influencing gambling problem trajectories over time (Dufour et al., 2019). A convenience sample was recruited through ads on websites, in newspapers and on poker-playing sites (i.e. casinos, bar tournaments, poker room tournaments) across 16 regions in Quebec, Canada. To be eligible, individuals had to consider themselves as poker players, have bet money on poker in the past year, be at least 18 years old and speak French or English. The study sample included individuals who agreed to take part in the longitudinal component, as well as in one baseline and two follow-up assessments scheduled at 12-month intervals. In-person or over the

phone interviewer-administered questionnaires lasting 60–90 min were conducted. Participants received a gift certificate of CAD $30 at each interview. Ethical approval was provided by the Lettres et sciences humaines ethical boards at Université de Sherbrooke. Response rates were defined as the number of people who completed the interview over the number of people eligible at that moment. The rates were calculated at each measurement time and ranged from 90% at T0 to 76% in T2.

2.2. Measures

All data were measured at baseline (T0) and at each follow-up time (i.e. T1 and T2). General sociodemographic information was collected for each participant: sex, age, education, marital status and economic situation.

Main poker modality played - The main outcome of interest was principal poker modality played (i.e. land-based vs. online), measured by the choice between two options: "I mostly or exclusively play poker on the Internet" or "I mostly or exclusively play land-based poker".

Co-variables - Variables potentially associated with poker modality examined in this study included sex and education.

The number of games played (excluding poker) could range from 0 to 16 and was defined as number of games played at least once during the past year among the following gambling activities: (1) lotto tickets, (2) instant prizes or scratch-and-win, (3) raffle tickets, draws or fundraisers, (4) horse track races, (5) bingo, (6) slot machines at the casino, (7) black jack at the casino, (8) roulette at the casino, (9) keno at the casino, (10) video lotteries in bars, (11) sports betting, (12) betting on card or board games with family or friends, (13) betting on card games in a non-regulated gaming room, (14) betting on pool, bowling and dart games, (15) betting on video games, and (16) trading stocks.

Severity of gambling problems was evaluated using the Problem Gambling Severity Index (PGSI) (Ferris & Wynne, 2001), a 9-item subscale with scores ranging from 0 to 27. The PGSI distinguishes four categories of gamblers: (0) no risk; (1–2) low risk; (3–7) moderate risk; and (8–27) problem gamblers.

The Beck Anxiety Inventory (BAI) (Beck, Epstein, Brown, & Steer, 1988) is a 21-item scale that assesses intensity of affective, cognitive, and somatic symptoms of anxiety in the past week. The validated French version has excellent methodological qualities (Freeston, Ladouceur, Thibodeau, Gagnon, & Rhéaume, 1994).

The Beck Depression Inventory (BDI), a 21-item test, evaluates the main symptoms of depression in the past week (Beck, Steer, & Brown, 1996). The French version has good methodological qualities (Bourque & Beaudette, 1982).

The DEBA-Alcohol and DEBA-Drugs questionnaires (Dépistage-évaluation du besoin d'aide-alcool ou drogue) (Tremblay, Rouillard, April, & Sirois, 2001) were used to assess severity of alcohol and drug use as well as addiction to these substances during the past year. They showed good validity and reliability indices (Tremblay, Rouillard, April, & Sirois, 2001).

The Eysenck Impulsiveness Questionnaire (EIQ) assesses impulsivity with 43 items (Eysenck & Eysenck, 1977) and was validated through a process of translation into French followed by back-translation into English (Jacques, Ferland, Giroux, & Bouchard, 1997).

Illusion of control was assessed by the Inventaire des croyances liées aux jeux (ICROLJ), an inventory of eleven gambling-related beliefs, was developed in French by Ladouceur, Jacques, Giroux, and Sévigny, (2005).

2.3. Statistical analyses

To determine if changes occurred in players' main poker modality over two years, a latent class growth analysis (LCGA) was performed using SAS Proc Traj (Jones, Nagin, & Roeder, 2001). The number of trajectories to retain in the final models was identified by fitting two to

four trajectories to the data with linear, quadratic and cubic temporal trends. The optimal model was chosen based on Bayesian information criterion (BIC) and Akaike information criterion (AIC). Multinomial multivariate logistic regression analyses were conducted to determine the correlates of poker modality trajectories. With the exception of DEBA scores, continuous scores were used for all mental health variables. All variables with alpha levels of <0.10 in univariate analyses were included in the multivariate model. Following the backward procedure, significant variables with p-values <0.05 (Wald's test) were kept in the final models. SAS 9.3 software was used for the analysis.

3. Results

3.1. Characteristics of study participants at baseline (T0)

Of the 304 poker players at baseline, the majority were men (88.2%) born in Canada (95.1%), and the mean age was 32.6 years old (standard deviation (SD) = 11.5). At first measurement time, an approximately equal proportion of participants mainly played online poker (n = 147, 48.4%) or land-based poker (n = 157, 51.6%); they also shared similar sociodemographic and mental health characteristics. However, significant differences were observed regarding gambling behaviors. Compared to land-based poker players, online players had higher PGSI scores (mean (M) = 2.2, SD = 2.6 vs. M = 1.5, SD = 2.1; p = 0.005) and illusion of control scores (M = 21.8, SD = 15.6 vs. M = 16.6, SD = 16.0; p = 0.004). On average, land-based players bet on 4.4 (SD = 2.3) different gambling activities—excluding poker—in the past year compared to 3.4 (SD = 2.1) for their online counterparts (p < 0.0001).

3.2. Three poker modality trajectories

Based on the BIC and AIC, the three-class model (BIC = −452.54; AIC = −441.39) was selected over the four-class (BIC = −460.67; AIC = −443.94) and two-class (BIC = −453.62; AIC = −446.18) models. The entropy estimate, which reflects the ability of a mixture model to provide well-separated clusters, was computed using the procedure described by Celeux and Soromenho (1996). The three-class model had an entropy of 0.66, which is an acceptable classification (Clark, 2010). Below, the three classes are referred to as 'trajectories' (Fig. 1).

Three poker modality trajectories emerged, comprising two constant stable trajectories (1st and 3rd) and one unstable online land-

based trajectory (2nd). The majority of poker players remained either land-based or online poker players over a two-year period. No trajectory indicated that land-based players would become online poker players. The first and third trajectories are characterized by players who maintained the same poker modality over two years, that is, land-based (1st trajectory: stable land-based poker; n = 157, 51.5%) and online (3rd trajectory: stable online poker; n = 110, 36.3%). The second trajectory (unstable modality of poker; n = 37, 12.1%) included participants who played mainly online poker at baseline but switched to mainly land-based poker over the two-year follow-up period.

3.3. Two associated variables of poker modality trajectories

According to univariate and multivariate logistic regression analyses, neither sociodemographic nor mental health characteristics were associated with poker modality trajectories (Table 1). In multivariate analyses, number of gambling activities increased the odds of following the stable land-based trajectory as compared to either unstable or stable online trajectory. The odds of following the unstable or stable online trajectory rose by 27% and 28% per unit increase in PGSI score respectively (i.e. severity of gambling problems), compared to the land-based trajectory. However, neither number of gambling activities nor severity of gambling problems predicted stable online trajectories compared to the unstable trajectory.

4. Discussion

To our knowledge, this is the first study to assess changes in main modality of poker playing over a two-year period. The results indicate that the majority of players stayed with the same (87,8%) poker modality over time, with 51.5% of participants presenting stable land-based poker and 36.3% stable online poker. In fact, only a minority of participants changed poker modality, switching from online to land-based poker over the two-year follow-up. These data therefore suggest that based on knowledge of poker modality played, it is possible to make inferences about continuing this behavior in the short term. Contrary to what was expected and feared by public health authorities, the only transition observed among poker players was movement towards land-based gambling, that is, towards the modality considered less at risk. In fact, there is no land-based to online poker trajectory in this cohort. The fear of a rise in the number of online gamblers through a transition from land-based to online gambling is not supported, which is quite reassuring for public health. The advertising and easy availability of online gambling do not seem to be sufficient for those poker players to change their poker modality preference or shift move to an online offer. Over time, online poker appears to lose its appeal, with lack of interest probably linked with changes in motivation observed in qualitative studies. Although the motivations of online players are often centered on money, some online poker players have reported changing their playing modality to reconnect with the pleasure of playing poker (Dufour, Petit, & Brunelle, 2013). Further studies are needed to examine rationales and motivations behind choice of poker modality over time to better guide public health authorities and develop responsible gambling recommendations.

However, results show that poker modality trajectories are associated with gambling characteristics, namely gambling problems and number of gambling activities. Even though the poker players are considered to be low-risk gamblers based on their PGSI scores, slightly higher scores were observed among online players compared to land-based players. This result validates, in part, inferences developed in cross-sectional studies linking gambling modality and gambling problems. High rates of at-risk and problematic gambling among online poker players have been previously reported (Hopley & Nicki, 2010; Hopley, Dempsey, & Nicki, 2012; Mihaylova et al., 2013; Wood, Griffiths, & Parke, 2007). This study adds further evidence of the risks associated with online poker, since the odds of unstable and stable
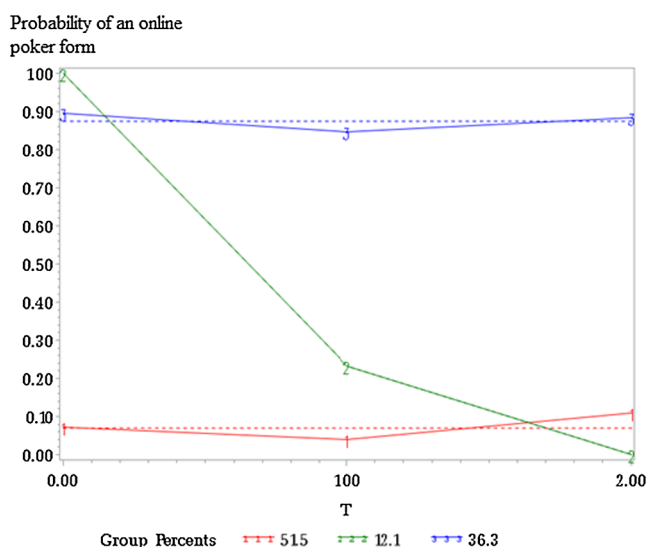

Fig. 1. Poker modality trajectories over two years.

Table 1

Univariate and multivariate logistic regression analyses of associations between sociodemographic, gambling and mental health variables and the three poker modality trajectories.

	All poker players	Unstable poker vs. Stable land-based poker (ref) (trajectory #2 vs. #1)	Stable online poker vs. Stable land-based poker (ref) (trajectory #3 vs. #1)	Stable online poker vs. Unstable poker (ref) (trajectory #3 vs. #2)
Univariate analysis	n (%)	OR (95% CI)		
Sociodemographic characteristics				
Female	36 (11.8)	1.46 (0.47–4.53)	1.36 (0.64–2.92)	0.94 (0.28–3.09)
Completed high school or higher level	295 (97.0)	2.00 (0.24–16.74)	5.74 (0.70–47.33)	2.87 (0.18–46.97)
Gambling behaviors				
Number of gambling activities[a,b]	3.9 (2.3)[c]	0.71 (0.59–0.85)***	0.84 (0.75–0.94)**	1.19 (0.99–1.43)[†]
Illusion of control	19.1 (16.0)[c]	1.03 (1.00–1.05)*	1.02 (1.00–1.03)*	0.99 (0.97–1.02)
Severity of gambling problems[a]	1.8 (2.4)[c]	1.13 (0.97–1.31)	1.18 (1.06–1.32)**	1.05 (0.91–1.21)
Mental health				
At-risk alcohol or drug use[a]	120 (39.5)	0.96 (0.47–1.94)	0.95 (0.57–1.56)	0.99 (0.48–2.06)
Anxiety[d]	3.7 (5.8)[c]	1.04 (0.98–1.10)	1.02 (0.97–1.06)	0.98 (0.93–1.03)
Depression[d]	3.0 (4.8)[c]	1.05 (0.98–1.12)	1.04 (0.99–1.10)	0.99 (0.93–1.06)
Impulsivity	12.2 (11.4)[c]	1.03 (1.00–1.06)[†]	1.02 (0.99–1.04)	0.99 (0.96–1.02)
Multivariate analysis		AOR (95% CI)		
Number of gambling activities[a,b]	3.9 (2.3)[c]	0.66 (0.55–0.80)***	0.77 (0.68–0.87)***	1.17 (0.97–1.41)
Severity of gambling problems[a]	1.8 (2.4)[c]	1.27 (1.07–1.50)**	1.28 (1.13–1.45)***	1.01 (0.86–1.18)
Total	304 (100.0)			

Legend: OR: Odds Ratio; CI: Confidence Interval; AOR: Adjusted Odds Ratio.
[a] Past 12 months.
[b] Excluding poker.
[c] Mean (SD, Standard Deviation).
[d] Past week.
[†] Wald's test: p < 0.10.
[*] Wald's test: p < 0.05.
[**] Wald's test: p < 0.01.
[***] Wald's test: p < 0.001.

online modalities increase PGSI scores compared to those for land-based poker. The online component of the second and third trajectories and links with at-risk gambling support the relevance of doing prevention on online poker sites. Prevention is especially important given the unlimited and convenient accessibility of gambling sites and considering other studies that show problem gambling is strongly and positively correlated with time spent playing online poker (e.g. Hopley & Nicki, 2010; Hopley et al., 2012).

In the literature, the number of gambling activities is generally identified as a predictor of gambling problems among poker players (Brosowski, Meyer, & Hayer, 2012; Dufour et al., 2019; Morvannou, Dufour, Brunelle, Berbiche, & Roy, 2017; Williams et al., 2015). In contrast with the results of Mihaylova et al. (2013), the land-based poker players in this study reported engaging in a greater number of gambling activities compared to online players. Another recent study is concordant with our findings; it reported that land-based gamblers' participation in gambling activities was higher than that of online gamblers (Blaszczynski, Russell, Gainsbury, & Hing, 2016). In fact, it appears that online gambling is not related to an increased risk of gambling problems when controlling for other factors, including gambling participation (Gainsbury et al., 2014). In the present study, number of gambling activities was a risk factor for the land-based trajectory (vs. 2nd and 3rd). Finally, it is interesting to note that variables associated with poker playing trajectories are only related to gambling behaviors but not to either sociodemographic or mental health characteristics. This finding contrasts with previous studies that showed online gamblers have distinct characteristics compared to offline gamblers: more men, young people and students among online gamblers (e.g. Kairouz et al., 2012). One explanation could be the specificity of

the study sample—comprised of a cohort of poker players—which suggests that online and land-based poker players are distinguished only by gambling variables. Our results infer that poker players share common characteristics regardless of modality, but differ from gamblers who engage in other types of gambling activities. This result highlights the need to consider the specificities of poker players compared to other gamblers so as to develop prevention and intervention strategies specific to the former.

Our study is subject to some limitations. Data collected were self-reported, which could have led to recall and social desirably biases. It should be noted that the outcome of interest refers to a player's main poker modality, and does not exclude the possibility that a player may have also played the other modality. This factor is not surprising: playing only one modality of poker is uncommon, if not non-existent, an observation also made in other studies (Dufour et al., 2012; Mihaylova et al., 2013). Finally, participants were not randomly recruited and the proportion of women in the sample was low, thereby limiting the generalizability of the findings. Despite these limitations, this study makes a meaningful contribution by examining evolution of poker modality trajectories over two years, which remained mostly stable for a majority of players. Future studies should further explore rationales and motivations behind choices of poker modality.

CRediT authorship contribution statement

Magali Dufour: Conceptualization, Funding acquisition, Investigation, Project administration, Supervision, Validation, Writing - original draft. **Adèle Morvannou:** Conceptualization, Investigation, Methodology, Writing - original draft. **Émélie Laverdière:** Data

curation, Project administration, Resources, Writing - original draft. **Natacha Brunelle:** Funding acquisition, Project administration, Validation, Writing - review & editing. **Marc-Antoine Nolin:** Resources, Data curation, Writing - review & editing. **Louise Nadeau:** Funding acquisition, Writing - review & editing. **Frederic Dussault:** Methodology, Validation, Writing - review & editing. **Djamal Berbiche:** Formal analysis, Validation.

Declarations of interest

None.

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