

Gambling Habits of People With Parkinson's Disease: An Exploratory Study

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Abstract

The development of pathological gambling (PG) among people with Parkinson's disease (PD) is increasingly reported. The intake of dopamine agonists is most often associated with the emergence of this addiction. Although it is known that gambling habits contribute to the onset of gambling problems in the general population, these habits have not yet been studied in individuals with PD. Thus, this study aimed to explore gambling habits in people with PD. Twenty-five individuals with PD and 8 caregivers participated. Thirteen gamblers took part in a semi-structured interview regarding their gambling habits and the presence of a gambling problem and other impulse-control disorders. The results show that gamblers mainly play lotteries and slot machines. Most gamble for pleasure, but some reported wanting to win money to finance a cure for their PD. None of the gamblers involved a caregiver in their gambling activities and no gambler currently presented a gambling problem. However, 2 at-risk gamblers reported having developed a gambling problem in the past. This study sheds light on factors that may contribute to the development of PG among patients with PD, namely, the emergence of new reasons for gambling after a PD diagnosis, erroneous beliefs about gambling, and discretion about gambling habits. Prevention strategies are discussed in view of these results. However, given the small sample size, further studies examining the gambling habits of people with PD are required.

Keywords: Parkinson's disease, pathological gambling, gambling habits

Résumé

De plus en plus, on observe le développement du jeu pathologique (JP) chez les personnes atteintes de la maladie de Parkinson (MP). La prise d'agonistes de la

dopamine est le plus souvent associée à l'émergence de cette dépendance. Bien qu'il soit connu que les habitudes de jeu contribuent à l'apparition de problèmes de jeu dans la population en général, ces habitudes n'ont pas encore été étudiées chez les personnes atteintes de la maladie de Parkinson (MP). Dans cette optique, cette étude explore les habitudes de jeu chez les personnes atteintes de la MP. Vingt-cinq personnes atteintes de la maladie de Parkinson et huit soignants y ont participé. Treize joueurs ont participé à une entrevue semi-structurée concernant leurs habitudes de jeu et la présence d'un problème de jeu et d'autres troubles liés au contrôle des impulsions. Les résultats montrent que les joueurs jouent principalement aux loteries et aux machines à sous. La plupart jouent par plaisir, mais certains ont déclaré vouloir gagner de l'argent pour financer une thérapie contre la maladie. Aucun des joueurs n'avait avec lui un fournisseur de soins dans ses activités de jeu et aucun joueur ne présentait actuellement de problème de jeu. Cependant, deux joueurs à risque ont déclaré en avoir développé un par le passé. Cette étude met en lumière les facteurs qui peuvent contribuer au développement du jeu pathologique chez les personnes atteintes de Parkinson, à savoir l'émergence de nouvelles raisons pour le jeu après un diagnostic de MP, les croyances erronées sur le jeu et la discrétion sur les habitudes de jeu. Compte tenu de ces résultats, des stratégies de prévention sont analysées. Cependant, étant donné la petite taille de l'échantillon, d'autres études examinant les habitudes de jeu des personnes atteintes de cette maladie sont nécessaires.

Introduction

Idiopathic Parkinson's disease (PD), which affects nearly 1% of people over the age of 60, is defined as a chronic and progressive neurodegenerative disease (Fritsch et al., 2012). By the time the disease is diagnosed, there is, among other things, a lack of dopamine in the striatum, which is caused by the degeneration of neurons that produce this molecule in the substantia nigra pars compacta (Jellinger, 2012, for a review). The neurochemical dysfunctions and pathological anomalies in PD cause motor symptoms such as tremors, bradykinesia, and postural instability, which hinder the accomplishment of daily and domestic life activities (Dural, Atay, Akbostanci, & Kucukdeveci, 2003). Psychological and behavioural symptoms are also reported. Along these lines, the development of problems related to impulse control, including hypersexuality, binge eating, compulsive shopping, and pathological gambling (PG), has captured the attention of researchers for over a decade. The largest significant study that specifically addressed the prevalence of these problems included data from interviews with 3,090 people with PD from various regions in Canada and the United States (Weintraub et al., 2010). The results revealed that 13.6% of the sample presented at least one of these four impulse-control problems within the 6 months preceding data collection and that PG was reported among 5% of the sample. For comparative purposes, the rate of PG (moderate risk and probable PG) in the general population of Quebec (Canada) is 1.8% (Kairouz & Nadeau, 2014).

Some studies suggest that dopamine agonists (DAs), a medication generally prescribed to reduce motor symptoms among people with PD, are often associated with the emergence of PG (Santagelo, Barone, Trojano, & Vitale, 2013; Weintraub et al., 2010). One of the current hypotheses that attempts to explain this link is that DA overstimulates the mesolimbic pathway, a neuronal circuit that is known for its involvement in the reward system (Santagelo et al., 2013). However, taking anti-Parkinson's medication does not necessarily lead to the development of a gambling problem, as most patients treated with DA do not develop one (Weintraub et al., 2010). In fact, the development of a gambling problem is multifactorial. In addition to DA, factors such as age at the time of PD diagnosis and pre-morbid impulsivity have a role in its development (Callesen, Weintraub, Damholdt, & Moller, 2014). In this regard, further knowledge about the development of PG in the general population could enhance comprehension of this problem among people with PD.

Gambling Problems

Gambling involves irreversible betting of money or valuable objects on an outcome that is essentially based on chance (Nower & Blaszczynski, 2010). Although most people gamble on an occasional basis (Kairouz & Nadeau, 2014), some will develop a maladaptive, persistent, and repeated practice of gambling (American Psychiatric Association, 2013). Cognitive behavioural models emphasize contextual and psychological variables to explain the development of PG, such as the type of gambling activity, amounts of money bet, and reasons and motivations to gamble (Sharpe, 2002). The analysis of gambling habits also considers the involvement of family and friends, such as offering transportation to a casino.

Characteristics and Types of Gambling Activities

An overview of the literature shows that non-problem and problem gamblers are distinguishable by the amounts bet and the preferred types of gambling activities. In Quebec, a median amount of CAN\$120 per year is spent on gambling by non-problem gamblers. Among moderate-risk gamblers (i.e., those who do not meet the minimum number of diagnostic criteria for PG but who still experience various negative consequences of gambling), the median annual amount spent is CAN\$1,560 and rise to CAN\$5,344 among probable pathological gamblers (Kairouz & Nadeau, 2014). This prevalence study also reports that the proportion of at-risk and probable pathological gamblers differs from one gambling activity to another: 2.7% among lottery players, 5.8% among bingo players, 7.9% among poker players, 8.7% among casino slot machine players, and 16.4% among video lottery terminal players. In a large-scale study conducted by Hodgins et al. (2012) with 1,372 adults from the general population in Alberta (Canada), pathological gamblers mostly played on slot machines and video lottery terminals. The structural characteristics of these machines make them highly addictive, chiefly because of the presence of intermittent reinforcement and the impression stimulated in gamblers that they "almost won" (Clark, Crooks, Clarke, Aitken, & Dunn, 2012). Hence, certain types of gambling activities may be related to a greater incidence of problem gambling. To better

understand how PG develops among people with PD, it is essential to find out whether this relationship is applicable. Do people with PD gamble in games with addictive characteristics? Little data are available on the subject. In fact, many studies that aimed to understand the development of problem gambling among this population did not evaluate the types of games played or the amounts spent (see Callesen, Scheel-Kruger, Kringelbach, & Moller, 2013; Callesen et al., 2014; Voon et al., 2011; Weintraub et al., 2010).

Reasons for Gambling

The most frequently reported motives to gamble among the general population are for pleasure, to take part in an activity with friends or family, to socialize, and to experience excitement (Francis, Dowling, Jackson, Christensen, & Wardle, 2015; Nower & Blaszczynski, 2010; Wardle et al., 2011). In contrast, the results of a study by Francis et al. (2015) show that problem gamblers endorse significantly more financial reasons for gambling and significantly fewer social motives. Nower and Blaszczynski (2010) also point out that at-risk and pathological gamblers may gamble to cope with negative feelings. Further, certain subgroups of individuals may gamble for reasons specific to their respective realities. For example, people who are 55 years and over report gambling to win money to pay for a trip (Hagen, Nixon, & Solowoniuk, 2005) or to solve financial problems (Vander Bilt, Dodge, Pandav, Shaffer, & Ganguli, 2004). They are also attracted by the social occasion that certain gambling activities offer, such as bingo and casino games (Desai, Maciejewski, Dausey, Caldarone, & Potenza, 2004; Giroux et al., 2013). The onset of an illness that limits physical abilities is also a reason to gamble evoked by gamblers who are 55 years and over (Giroux et al., 2013). Given the extent of problems and limitations caused by PD, it is likely to be associated with increased gambling habits. Thus, could the progressive deterioration of physical capabilities among people with PD motivate them to gamble? Do they gamble to meet needs related to their disease? The answers to these questions will determine whether they present motivations to gamble that place them at risk for developing PG.

The Implication of Friends and Family

There is evidence that gambling problem severity is positively associated with gambling frequency and expenditure of one's close social network (Fortune et al., 2013). Moreover, problem gambling is more common among individuals whose relatives also have a gambling problem (Black, Monahan, Temkit, & Shaw, 2006; Langhinrichsen-Rohling, Rohde, Seeley, & Rohling, 2004). Relatives' attitudes may also influence gambling behaviour. Oei and Raylu (2004) demonstrated that parents' beliefs toward gambling had a direct impact on their children's gambling beliefs and, in turn, on their gambling behaviour. These observations must be explored in relation to people with a chronic disease such as PD, insofar as they often rely on caregivers. Data from Statistics Canada indicate that 56% of people with PD depend on the aid of a caregiver (Wong, Gilmour, & Ramage-Morin, 2014). For 84% of them, the caregiver is their partner, a friend, or a neighbour. Since caregivers dedicate much of their time to ensure

the well-being of the person with PD, this raises the question of whether they could also be involved in the person's gambling habits. The current literature does not provide answers to this crucial question. If caregivers are indeed involved in the gambling habits of their close one affected by PD, they should be provided with information on their potential contribution to the development of problem gambling among patients with PD.

Research Objectives

The development of PG in the general population is associated with many variables that have never been specifically assessed in patients with PD. Research on these variables could shed further light on the current understanding of PG in these patients. Hence, the main objective of this study was to explore the gambling habits of people with PD. Types of games, amounts bet, the context within which gambling behaviours began, reasons for gambling, and involvement and perception of caregivers were investigated. Gambling habits were assessed over the past 6 months. This time frame was chosen because this study is part of a larger research project that evaluated the evolution of the participants' gambling habits over the course of a year. However, these data are not included in this paper. Two other research questions were explored: (a) Do the gamblers present gambling problems and different comorbidities (alcohol and drug-related problems, compulsive shopping, hypersexualization) that are often encountered among patients with PD suffering from PG? (b) Are changes in the gambling habits of people with PD retrospectively reported after beginning PD medication? In addition, we aimed to compare the study variables with those obtained in a sample of 300 gamblers from the province of Quebec aged 55 years and older without PD (Giroux et al., 2013) in order to explore possible differences between them.

Method

Participants

Participants were recruited from the patients under the medical responsibility of the neurologist involved in the study. To be admissible to the study, participants had to have mild to moderate stage idiopathic PD (Stages 1 to 3 of Hoehn & Yahr, 1967), as diagnosed by the neurologist. The diagnostic criteria used for PD were those of the United Kingdom Parkinson's Disease Society Brain Research Centre (Hughes, Daniel, Kilford, & Lee, 1992). Participants with severe PD (Stages 4 to 5 of Hoehn & Yahr, 1967) were excluded because of the severity of their motor and elocution difficulties, which would cause complications during the data collection interview. Moreover, participants were excluded if they presented a psychotic disorder or dementia, or if they had undergone neurosurgery, as noted in their medical files. From the list of people with PD receiving care from the neurologist, 52 met the inclusion criteria. These individuals were invited to participate via a postal letter informing them of the study, to which eight people with PD replied with interest. The 44 others who did not reply were contacted by phone to request their participation.

Of these 44 individuals, 17 agreed to participate. Those who refused to participate ($n = 10$) evoked discomfort about talking about gambling and did not wish to take part in a face-to-face interview, and the remaining 17 could not be reached. In total, 25 people who agreed to participate were admissible to the study. Among them, 15 were considered gamblers and 10 were non-gamblers. Table 1 presents the sociodemographic characteristics of the sample. Only one statistical difference was observed between gamblers and non-gamblers: The data show that gamblers were diagnosed with PD at 54.69 years, whereas non-players received the diagnosis at 65.90 years, a statistically significant difference ($p < .05$).

As presented in Table 2, almost all participants (95%) were taking at least one prescription medication of the L-dopa family: 41% took a DA, 45% took another type of medication for PD, and 36% took a psychotropic medication. Data on medication were available for only 22 of the 25 participants.

Caregivers

A caregiver is defined as a friend, family member, or neighbour who assists a person with an illness in the execution of daily and domestic activities (Wong et al., 2014). In this study, caregivers who were hired by a company offering home care or health professionals from the public health system were excluded. Caregivers were recruited via the gambler's interview. Eight gamblers agreed to their caregiver being contacted, and all caregivers who were contacted accepted the invitation to participate in the study. Gamblers who refused to allow their caregiver to be contacted expressed concerns regarding confidentiality. Four caregivers had been the partner of the patient for an average of 39 years. Two caregivers were children, one was a sibling, and one was a friend who had known the patient for over 40 years. The mean age of the caregivers was 67 years.

Instruments

Gambling Habits Questionnaire. Based on the Diagnostic Interview on Pathological Gambling – Revised (Ladouceur et al., 2000), this questionnaire comprises 12 items that evaluate participation in gambling activities and associated expenses for 12 types of gambling games over the past 6 months, using yes/no questions. Two versions were used: one for the participant and one for the caregivers.

The Pathological Gambling Severity Index (PGSI). This tool, a subscale of the Canadian Problem Gambling Index, was used to screen for probable PG over the past 6 months (Ferris & Wynne, 2001). Items are rated on a 4-point Likert-type scale. The total score obtained refers to four possible categories of gambling problem severity (0 = non-problem gambling, 1 or 2 = low risk, between 3 and 7 = moderate risk, more than 8 = probable PG). The tool has good internal consistency with a Cronbach's alpha of .84. Two versions of the PGSI were used for this study: one for the participant and one for the caregivers.

Table 1
Sociodemographic Characteristics of the Sample

	Gamblers <i>n</i> = 15		Non-gamblers <i>n</i> = 10		Total <i>N</i> = 25		Study by Giroux et al. (2013) <i>N</i> = 300	
Continuous variables	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Age	65.20	6.88	73.20	10.96	68.40	9.42	65.92	6.66
Age at PD diagnosis	54.69*	2.26	65.90*	3.94	59.56	11.49	NA	NA
MMSE score	28	1.56	28.50	0.70	28.08	1.44	NA	NA
Categorical variables	<i>n</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Women	3	20.0	6	60.0	9	36.0	141	47.0
Men	12	80.0	4	40.0	16	64.0	159	53.0
Civil status								
Single	4	26.6	0	0.0	4	16.0	42	14.0
Separated/divorced	1	6.0	1	10.0	2	8.0	78	26.0
Widowed	0	0.0	2	20.0	2	8.0		
Married	8	53.3	5	50.0	13	52.0	180	60.0
Common-law	2	13.3	2	20.0	4	16.0		
Education								
Grade school	4	26.6	0	0.0	2	8.0	101	33.67
High school	4	26.6	3	30.0	9	36.0	98	32.67
College	1	6.0	1	10.0	2	8.0	44	14.67
University – bachelor's	4	26.6	3	30.0	7	28.0	57	19.0
University – master's	2	13.3	1	10.0	3	12.0		
University – doctorate	0	0.0	2	20.0	2	8.0		
Main occupation								
Working	3	20.0	0	0.0	3	12	85 ^a	28.8 ^a
Not working	1	6.67	0	0.0	1	4	210 ^a	71.2 ^a
Homemaker	1	6.67	0	0.0	1	4		
Retired	10	66.67	10	100	20	80		
Income								
Less than CAN\$15,000	1	6.0	0	0.0	1	4.0	NC	NC
Between CAN\$15,000 and \$25,000	0	0.0	0	0.0	0	0.0	NC	NC
Between CAN\$25,000 and \$35,000	1	6.0	1	10.0	2	8.0	NC	NC
Between CAN\$35,000 and \$50,000	6	40.0	2	20.0	8	32.0	NC	NC
Between CAN\$50,000 and \$75,000	3	20.0	1	10.0	4	16.0	NC	NC
CAN\$75,000 or more	0	0.0	0	0.0	0	0.0	NC	NC
Refusal	3	20.0	5	50.0	8	32.0	NC	NC
Do not know	1	6.0	1	10.0	2	8.0	NC	NC

Note. PD = Parkinson's disease; MMSE = Mini-Mental State Examination; NA = not available; NC = non-comparable.

^a *N* = 295.

**p* > .05.

Table 2
Type of Medication and Dose in the Sample

Type of medication	Gamblers <i>n</i> = 13		Non-gamblers <i>n</i> = 9		Total <i>N</i> = 22	
	<i>n</i>	Dose (mg/day)	<i>n</i>	Dose (mg/day)	<i>n</i>	Dose (mg/day)
L-dopa	13	250.96	8	234.37	21	244.64
Sinemet	11	192.04	7	182.14	18	188.19
Sinemet CR	5	40.00	0	-	5	40.00
Carbidopa-levodopa-entacapone	1	600.00	1	600.00	2	600.00
Levodopa-carbidopa	1	350.00	0	-	1	350.00
Dopamine agonist	5	2.45	4	3.00	9	2.61
Pramipexole	3	2.31	4	3.00	7	2.54
Ropinirole	2	3.00	0	-	2	3.00
Other Parkinson's disease medication	8	NC	2	NC	10	NC
Anticholinergic (trihexyphenidyl)	5	3.60	0	-	5	3.60
Catechol-O-methyltransferase inhibitor (entacapone)	2	1200.00	1	800.00	3	1066.67
Monoamine-oxidase inhibitor (rasagiline, selegiline)	6	4.50	1	1.00	7	4.00
NMDA glutamate receptor antagonist (amantadine)	2	300.00	0	-	2	300.00
Psychotropic medication	7	NC	1	NC	8	NC
Antipsychotic (teva-quetiapine)	0	-	1	25.00	1	25.00
Antidepressant (venlafaxine)	2	18.75	0	-	2	18.75
Anxiolytic (clonazepam)	5	1.67	1	NA	6	1.67

Note. Data regarding prescription medication were not available for two gamblers and one non-gambler. NA = not available; NC = not calculated because doses within this category are not comparable; NMDA = N-methyl-D-aspartate.

Gambling Habits Interview. Also based on the Diagnostic Interview on Pathological Gambling – Revised (Ladouceur et al., 2000), this instrument comprises 21 questions that aim to provide a more in-depth portrait of current and past gambling habits. Reasons for gambling, onset of gambling behaviour, and involvement of one's social network are first questioned through multiple choice response questions, followed by open-ended questions to obtain further details. Two versions were used: one for the participant and one for the caregivers.

Diagnostic and Statistical Manual of Mental Disorders (4th ed., text rev.; DSM-IV-TR; American Psychiatric Association, 2000) criteria for PG. A questionnaire based on the DSM-IV-TR criteria for PG was specifically created for this study to evaluate the presence of PG. The DSM-IV-TR criteria were transformed into yes/no questions. This questionnaire was administered only if the gambler had obtained a score of 3 or more on the PGSI.

The Alcohol And Drug Screening And Assistance Needs Assessment questionnaire. This questionnaire includes 50 dichotomous and Likert-type scale items that aim to evaluate the presence of an alcohol problem, a drug problem, or both (Tremblay & Blanchette-Martin, 2009). Developed in French, this instrument has good validity;

internal consistency is .87 for the section on alcohol-related problems and .72 for the section on drug-related problems.

Lejoyeux's Compulsive Shopping Questionnaire. This instrument comprises 19 dichotomous items that evaluate the presence of a compulsive shopping problem over the last 6 months (Lejoyeux, Tassain, Solomon, & Ades, 1997). The psychometric qualities of this instrument had yet not been evaluated while this paper was being written.

The Hypersexuality Questionnaire. This instrument is composed of five dichotomous (yes/no) items. The psychometric qualities of this tool had not been evaluated while this paper was being written. However, it was developed within the scope of a study that specifically evaluated impulsivity problems among people with PD (Voon et al., 2006).

Procedure

The study procedure is presented in Figure 1. Recruitment and data collection were conducted from March to October 2010 by the first author. An individual telephone interview of approximately 30 min was conducted with each of the 25 participants. This interview aimed to evaluate the types of gambling games played and the amounts spent gambling over the past 6 months, as well as the presence of at-risk and problem gambling habits. Non-gamblers (i.e., those who revealed they had not gambled over the past 6 months) were questioned about their reasons for not gambling. Gamblers (i.e., those who reported having gambled at least once over the past 6 months) were invited to take part in a face-to-face interview lasting around 2 hours at their home or the university. Every instrument was administered verbally. The interviewer (first author) read the questions, named the response choices when available, and wrote down the responses. The interviews were not recorded, but the interviewer noted responses to the open-ended questions as precisely as possible. At the end of the interview, a gift certificate worth CAN\$10 and a list of help resources on gambling were offered. Finally, individual face-to-face interviews of approximately 30 min were conducted with caregivers.

Data Analysis

Descriptive analyses were first performed, followed by non-parametric analyses of variance (Mann-Whitney *U*) to compare continuous data. Proportion tests (Pearson chi-square test and Fisher's exact test) were also conducted on categorical data. SPSS version 20 software was used. The selected alpha threshold was .05. Further, a qualitative analysis was conducted with the responses obtained on the open-ended questions of the semi-structured interview. There were no verbatim transcriptions of these data, as they were not audio-recorded. However, to ensure validity of the data, we subjected them to a rigorous thematic analysis (Braun & Clarke, 2006; Piercy, 2004). This analysis procedure consisted of five steps. First, raw data for each of the questions were gathered into computerized documents on Microsoft Word software.

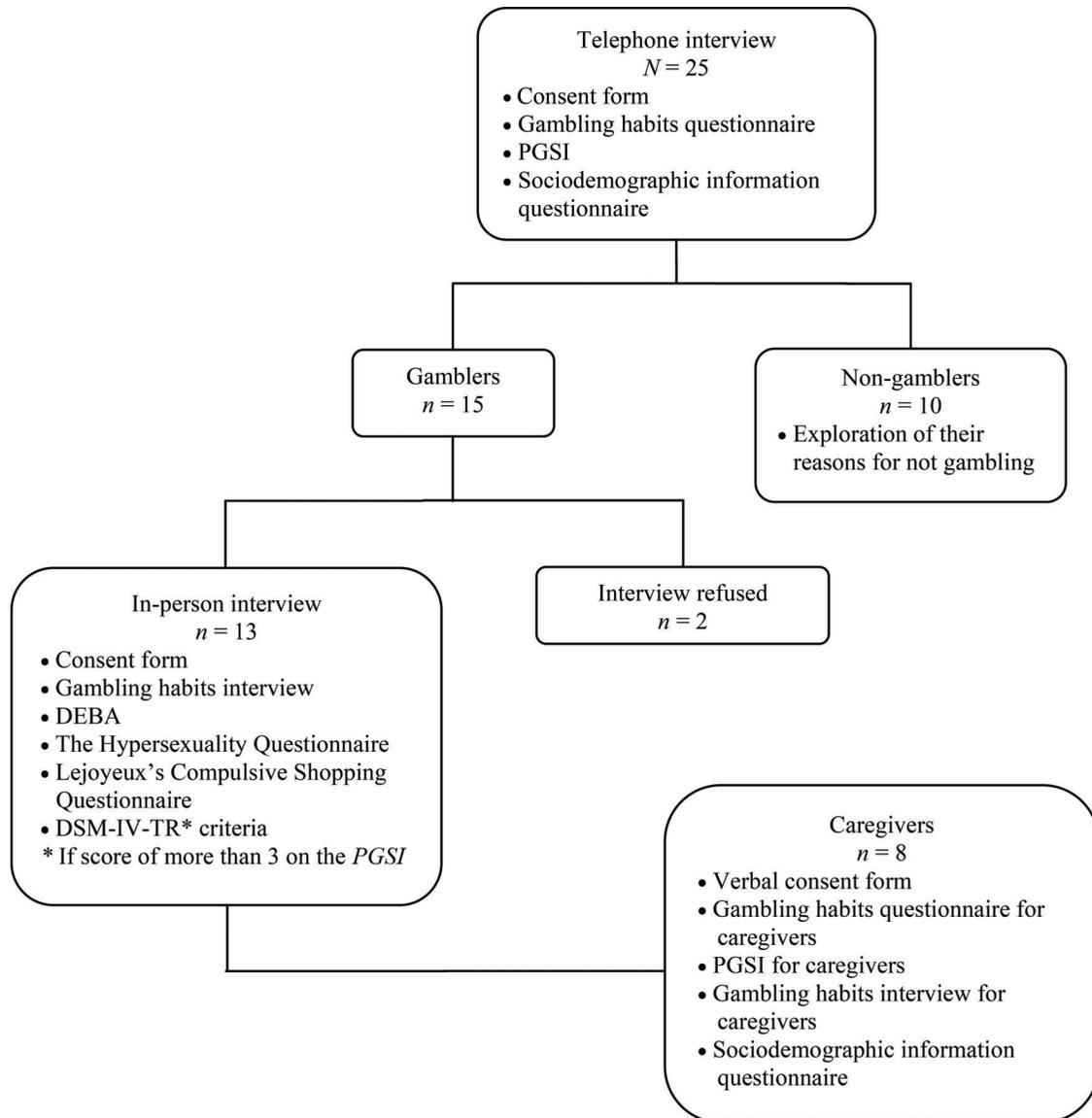


Figure 1. Study procedure sequence. DEBA = Alcohol and drug screening and assistance needs assessment questionnaire; *DSM-IV-TR* = *Diagnostic and Statistical Manual of Mental Disorders*, 4th ed., text rev.; PGSI = Pathological Gambling Severity Index.

Second, raw data were carefully read several times by the first author and a doctoral level research assistant to identify categories for grouping similar content. Third, categories were revised and refined by the first author and the doctoral research assistant. Fourth, raw data were carefully read and assigned to the proper category. This task was performed by the first author and the doctoral research assistant in a double-blind independent process. Finally, to ensure the validity of the identified categories, an inter-rater agreement statistic (93%) was calculated on all content. According to Lombard, Snyder-Duch, and Bracken (2002), this rate is satisfactory.

A post hoc theoretical comparative analysis (Pearson chi-square) was conducted to compare certain study variables (gambling practice proportions, at-risk gambler

proportions) with those obtained in a sample of 300 gamblers from the province of Quebec who were 55 years and older without PD (Giroux et al., 2013). Data collection for the latter study was conducted in 2011; the PGSI was also used to assess gambling problem severity. Participants were recruited in the province of Quebec (Canada) through advertisements on message boards and in newspapers. Forty-seven percent of the sample were men, 35% had a college education or higher, 28% were employed, and 60% were in a relationship. The mean age of the 300 participants in this sample was 65.92 years ($SE = 6.66$). Among the sociodemographic variables, one significant difference was found between the current study sample and that of Giroux et al. (2013) for gender: The sample in the current study contained significantly more men than did the reference group, $\chi^2(1, N = 15) = 6.624, p = .01$.

Results

Gambling Problem

Among the gamblers in this study ($n = 15$), none were problem gamblers. However, three gamblers met the criteria for low-risk gambling and one gambler met the criteria for moderate-risk gambling. These four gamblers were men and represented 26.7% of the sample. Two of them reported having developed a gambling problem in the past associated with DA use. A thorough description of these two gamblers is presented in the subsection Changes Reported Following the Introduction of a DA. For exploratory purposes, the proportion of at-risk gamblers in the study was compared with the proportion obtained by using the same instrument among 300 gamblers aged 55 years and older recruited in the province of Quebec (33.4%; Giroux et al., 2013). The distributions did not differ statistically, $\chi^2(1, N = 15) = 0.039, p = .578$.

Types of Games and Amounts Spent

As presented in Table 3, the lottery was the most popular game among gamblers ($n = 15$). The tickets purchased were bi-weekly lottery draws (86%), instant lotteries (scratch and win; 36%), and fundraising lottery tickets (7%). Gambling on slot machines in casinos was the second most popular game, representing the preference for five gamblers. The third most popular game was cards for money (two gamblers) followed by bingo, which was played by one gambler. Bets on games of skill (billiards) and sports were also played by one gambler. Seven gamblers played two or more games. The mean monthly amount of money spent per gambler was CAN\$33.96.

For exploratory purposes, the proportion of participation in the various games played by the gamblers with PD was compared with that of a comparison sample of gamblers aged 55 years and over (Giroux et al., 2013). No significant differences were found between the proportion of gamblers in the present study and that of the reference group for lottery tickets (93.3% vs. 88.3%, respectively), card games (13.3% vs. 26.1%, respectively), playing and betting on games of skill (6.7% vs. 2.3%, respectively), and sports betting (6.7% vs. 3.4%, respectively). However, significantly fewer participants in the present study than in the comparison sample gambled on

Table 3
Games Played and Mean Monthly Amount Spent by Gamblers

Type of game	Gamblers, <i>n</i> = 15			
	Participation		Amount spent ^a	
	<i>n</i>	% ^b	<i>M</i>	<i>SD</i>
Lottery tickets	14	93.33	29.30	32.21
Video lottery terminals	0	0.0	0	0.0
Casino (slot machines)	5	33.33	27.00	15.56
Bingo	1	6.67	20.00	-
Card games	2	13.33	7.50	3.53
Internet	0	0.0	0	0.0
Races	0	0.0	0	0.0
Stock market	0	0.0	0	0.0
Games of skill	1	6.67	100.00	-
Dice	0	0.0	0	0.0
Sports betting	1	6.67	20.00	-

^a Values are in Canadian dollars.

^b Percentages are not mutually exclusive.

slot machines (33% vs. 61.9%, respectively), $\chi^2(1, N = 15) = 5.281, p = .022$, and bingo (6.67% vs. 30.14%, respectively), $\chi^2(1, N = 15) = 3.987, p = .046$.

The four at-risk gamblers in this study spent a monthly mean of CAN\$46.75 in lottery tickets. Two of them played on slot machines in a casino and spent on average CAN\$66.67 per month. Finally, only one at-risk gambler bet on a game of skill (billiards) and sports results, with mean monthly amounts spent of CAN\$100 and CAN\$20, respectively.

Onset of Gambling Behaviour

Most gamblers interviewed (77%) reported having begun gambling before receiving the PD diagnosis. Only three participants (33%) began gambling after the PD diagnosis. All at-risk gamblers interviewed reported having begun gambling before receiving their PD diagnosis.

Reasons for Gambling and Context of Gambling Behaviours

Most gamblers interviewed (53.8%) reported gambling with the hope of winning money, and almost one quarter (23.1%) reported doing so for pleasure. Three participants (23.1%) named other reasons: voluntary tax to help finance the state and habit. Regarding the context of gambling behaviours, most participants gambled alone (69.2%). Forty-six percent of the gamblers mentioned having minimal interest in gambling and said they were rather indifferent to the activity. These same gamblers reported that their gambling depended on the state of their finances: When they considered themselves to be in a good financial situation, they felt more at ease to

gamble, but they stopped gambling when their finances were less satisfactory. Further, some gamblers (31%) mentioned gambling to participate in a social outing. Helping others or even the community (e.g., donations to organizations) with earnings from gambling was a theme mentioned by 31% of the gamblers. For some participants, new reasons for gambling surfaced after they received the PD diagnosis. These reasons included wanting to win money to find a means to cure PD, which was identified by 31% of the gamblers. Notably, half of the gamblers who mentioned this theme were at-risk gamblers. This same proportion of gamblers (31%) mentioned wanting to win money to hire a person to perform daily domestic tasks and to travel.

Furthermore, the at-risk gamblers mentioned themes that were unique to them. Two gamblers referred to erroneous beliefs about gambling, such as the beliefs that only those who gamble often will win and that wins will compensate for losses. They all mentioned being preoccupied by gambling, enjoying the sensations induced by gambling, having difficulty delaying gambling or the verification of results, and not setting limits. They also reported that a significant win in the past motivated them to pursue their gambling habits and to purchase lottery tickets when there was a large amount of money to be won—the greater the pot, the more they spent.

Reasons for Not Gambling

The 10 non-gamblers revealed that they did not gamble because they did not believe in chance (7), did not feel the desire to gamble (6), considered it a mathematical loss to gamble (5), did not want to lose their money (3), and feared a loss of control (1). Among these 10 non-gamblers, seven had never gambled in their lives. The three other non-gamblers had not gambled for over 20 years. At the time, their gambling behaviour consisted of purchasing a few lottery tickets.

Comorbidities

Among the 13 gamblers, there were no problems related to alcohol or drug use or to binge eating. However, one gambler presented a hypersexuality problem and another presented a compulsive shopping problem; these two people were at-risk gamblers.

Caregivers

None of the eight caregivers reported having been asked by their close one with PD to participate in his or her gambling practices. In fact, two caregivers mentioned not knowing whether their loved one gambled (25%). The six other caregivers (75%) were aware of their close one's gambling habits. A comparison of the amount of money bet as reported by the gamblers with PD ($M = \text{CAN}\$33.96$; $SD = \text{CAN}\$33.43$) and the amount estimated by the caregivers ($M = \text{CAN}\$20.6$; $SD = \text{CAN}\$16.17$) revealed a 39.26% underestimation by the caregivers. One caregiver reported having observed changes in the gambling habits of an at-risk gambler following the introduction of a DA. This caregiver noticed an increase in time spent gambling and amounts bet since beginning the medication.

Changes Reported Following the Introduction of a DA

Of the 13 gamblers interviewed, only two at-risk gamblers reported developing PG following the introduction of a DA. In the first case, problem gambling lasted nearly 4 years and the gambler never informed his relatives. This patient's partner, who was included in the study as a caregiver, was never informed of her partner's problem gambling behaviour and never suspected it. Before taking a DA (pramipexole), this gambler bought only a few lottery tickets (mean of CAN\$2/month). Upon introduction of the medication (he described the urge to gamble as having developed quickly, within a few weeks), this gambler would play the slot machines twice a day, spending roughly CAN\$1,800/month. He mentioned having started to gamble for fun and because the venue was close to his residence. Gambling, however, became what he described as an uncontrollable obsession after a few weeks and his reason for gambling changed; he started to gamble to chase his losses. He also highlighted his difficulty in stopping gambling during each session. The participant described a certain "loss of contact with reality" during which he was highly concentrated on gambling (as if he were in his own bubble) and unaware of the time passing. This difficulty in stopping gambling was also associated with a certain feverishness. Problem gambling stopped when the patient attended a conference given by an individual with PD who explained how he had developed problem gambling because of the medication. The participant then informed his neurologist, who adjusted the medication according to evidence-based recommendations (withdrawal of DA); problem gambling subsided in the following weeks. The patient described having abruptly lost the urge to gamble and completely stopping gambling on slot machines. He did, however, continue to buy lottery tickets (mean of CAN\$2/month).

In the second case, problem gambling lasted around 6 months and the gambler never informed his relatives. This gambler was not assisted by a caregiver in his daily life. Before taking DA, the patient would gamble on slot machines, play cards for money, and purchase lottery tickets. After the introduction of the medication, his gambling habits remained the same, but he began spending higher amounts quickly (lottery tickets: CAN\$100/month, slot machines: CAN\$400/month, cards for money: CAN\$150/month). Although he originally used to gamble for pleasure, he mentioned that gambling became an enjoyable source of physical excitement and that he developed an uncontrollable craving for the unknown. Much like the first participant described, this gambler also reported difficulty in stopping gambling during each session. According to the participant, this difficulty was associated with physical excitement experienced while gambling. Problem gambling stopped when the patient was informed by a friend with PD of a case in which another patient had possibly developed a gambling problem because of the medication. The participant then informed his neurologist, who re-evaluated the medication dosage according to evidence-based recommendations (withdrawal of DA), and the problematic gambling behaviour subsided in the following days. The patient described having suddenly lost the urge to gamble and having completely stopped gambling on slot machines and card games. He continued to buy lottery tickets, but spent significantly smaller amounts (mean of CAN\$10/month).

Discussion

This study aimed to explore the gambling habits of individuals with PD by questioning them about the games they played, the amounts they bet, their reasons for gambling, and the context within which they began to gamble. The perceptions and involvement of a close friend or family member were also evaluated, as well as the presence of PG and other disorders. Changes in gambling habits following the introduction of a DA were also assessed.

The absence of pathological gamblers in the sample is surprising considering that the prevalence of PG among individuals with PD is 5% (Weintraub et al., 2010). The small sample size may explain this observation. Although the proportion of at-risk gamblers (13%) does not differ significantly from the proportion observed in the comparison sample (33.4%; Giroux et al., 2013), this shows that certain patients with PD may present problematic gambling habits without reaching the clinical threshold for PG. Because the subgroup of at-risk gamblers is not considered in most studies on this subject, it is possible that a large proportion of individuals with PD experience difficulties with gambling. Hence, it would be interesting if future studies were to include at-risk gamblers to obtain a more precise portrait of patients with problematic gambling habits.

The game most often played was the lottery, in which participation began before the PD diagnosis. The participants' preference for the lottery is not surprising, as it was also found to be the preferred game in the general population of Quebec (Kairouz & Nadeau, 2014) and in a sample of gamblers aged 55 years and older (Giroux et al., 2013). This game can easily blend into the daily life habits of people, for example, who buy tickets at the grocery store. Slot machines were the second most popular game with participants, but they were played less often than in the normative sample from Giroux et al. (2013). Bingo was also less popular in the present study sample compared with the normative sample. This can be explained by the fact that, in order to play these games, it is necessary to go to gambling sites. Hence, the physical limitations caused by PD (Dural et al., 2003) may explain why fewer participants in this study played bingo and slot machines. Nevertheless, the results show that slot machines are the game at which the greatest amount of money was spent by the two gamblers who revealed having developed PG in the past. These gamblers were already playing the slot machines before the PD diagnosis. In light of these data, it seems relevant to further understand slot machine gambling among people with PD.

Slot machines are known to be the most addictive game because of intermittent reinforcement (Clark et al., 2012). Interestingly, studies tend to show that DAs are molecules that influence the neuronal processes involved in reinforcement. A study conducted among 14 people with PD taking a DA and 14 control subjects who participated in an experimental gambling task showed that the former group presented a positive bias toward risk taking when positive reinforcements were presented to them and that this bias was explained by DA intake (Voon et al., 2011).

Furthermore, when a person faces a possible monetary gain, DA is considered to be a molecule that increases the emotional response through the bilateral overactivation of the nucleus accumbens (Ye, Hammer, Camara, & Munte, 2011). In light of these findings, there is reason to believe that patients with PD who gamble on slot machines and while taking a DA may be more sensitive to intermittent reinforcement provoked by these machines. However, the small sample size of this study warrants careful interpretation regarding the negative impact of slot machine gambling on the gambling behaviours of patients with PD. Studies that directly assess the effect of this molecule in large samples of patients with PD while they play the slot machines would be pertinent. If people with PD present a greater risk of developing PG when playing slot machines, it would be relevant for the medical team to pay specific attention to the types of games played by these individuals.

In addition to slot machines, other factors could be considered. Interestingly, the results show that gamblers received their PD diagnosis at a significantly younger age than non-gamblers did. This difference could be because the sample of gamblers in the study comprised those who had a gambling problem during their PD. In the literature on this topic, patients affected by PD who have a gambling problem received their PD diagnosis at a significantly younger age than did individuals with PD who did not have a gambling problem (Gallagher, O'Sullivan, Evans, Lees, & Schrag, 2007; Voon et al., 2007; Weintraub et al., 2010). Moreover, gamblers identified their desire to win money to find a means to cure PD. Faced with powerlessness before their gradual loss of autonomy, the dream of a cure may be alluring and gambling may appear to be a means to obtain money to accomplish this dream. This result is consistent with observations drawn from studies with seniors who mention gambling as a way to cope with illness (Poupard, 2013) or even to stimulate their cognitive functions (Hong, Sacco, & Cunningham-Williams, 2009; Laditka et al., 2009; Southwell, Boreham, & Laffan, 2008). Indeed, the literature indicates that addictions may serve as dysfunctional coping mechanisms in response to the consequences of aging (Clarke & Clarkson, 2009; Stewart & Oslin, 2001). Hence, gambling to win money in order to pay a doctor who claims to cure PD can become a motivation for these individuals to gamble and then potentially develop problematic gambling habits, especially if they play the slot machines, in consideration of the addictiveness of this game (Clark et al., 2012; Griffiths, 1999).

This study also revealed that caregivers are little informed and thus not involved in the gambling habits of their loved ones with PD. The two gamblers who had PG in the past mentioned not having informed their family about this problem because of feelings of shame. This result is in line with recent observations pointing out that people with PD significantly underestimate the excessive nature of certain of their behaviours and that inclusion of caregivers allows a more valid evaluation of the problems affecting people with PD (Baumann-Vogel, Valko, Eisele, & Baumann, 2015). These findings support the importance of providing caregivers with tools to monitor behaviour changes in their loved one with PD. From a preventive standpoint, informative brochures about potential behaviour changes in people with PD could be handed out to caregivers. Thus, well-informed caregivers could

intervene earlier by informing the neurologist about signs of potential problem gambling.

Some results that specifically concern at-risk gamblers with PD may help extend knowledge about the development and maintenance of PG in this population. At-risk gamblers from this study mentioned erroneous beliefs commonly found in pathological gamblers, such as believing that wins always offset losses and that only those who gamble heavily can win (Joukhador, Maccallum, & Blaszczyński, 2003). Notably, non-problem gamblers did not verbalize such beliefs but stated accurate beliefs regarding randomness and the low odds of winning. Could these adequate beliefs represent a protection factor against the development of a gambling problem, whereas the erroneous beliefs represent a risk factor? This interpretation is limited, as erroneous beliefs were not formally assessed by a validated questionnaire but rather observed via an analysis of open-ended questions. Nonetheless, this study is the first to report this type of belief within a population of patients with PD. Future studies should use standardized measures to better understand the gambling-related beliefs of these patients.

Participants who developed PG from DA intake in the past but retained at-risk gambling habits after DA withdrawal is a concerning finding. This observation is consistent with results from a recent study that explored the gambling history of patients with PD and its connections with medication (Olley, Blaszczyński, & Lewis, 2015). These researchers pointed out that some patients with PD and a history of PG related to DA intake continue to experience difficulties following a change of medication, though to a lesser extent. These results, in conjunction with those from the current study, raise concerns about the type of pharmacological treatment offered to individuals with PD. To date, DA withdrawal is the most common method used to treat PG among PD's patients XXX (Tanwani, Fernie, Nikcevic, & Spada, 2015). However, given recent observations, the inclusion of a psychological intervention such as cognitive behavioural therapy could be relevant to provide these people with proper tools to control their gambling habits and even correct erroneous beliefs. This type of treatment could be promising. A recent study has shown a decrease in gambling disorder symptoms in people with PD after cognitive behavioural therapy (Jimenez-Murcia et al., 2012).

This study contains methodological limitations that should be considered. The small sample size limits generalization of the findings, and the absence of a verbatim transcription of the data limits the possible interpretation of the qualitative analyses. Moreover, the self-selection recruitment processes may have distorted the observed frequency of gamblers and problem gamblers in the PD group. Thus, the results must be considered as explorative data. Furthermore, a comparison of the data to those of another study (Giroux et al., 2013) entails certain limitations given that the populations are different and the data were not obtained during the same period. In addition, the financial compensation offered to participants may have introduced significant recruitment bias given the nature of the study, as some participants were gambling to earn money to fund personal projects. Despite these limitations,

conducting semi-structured interviews with each of the gamblers allowed us to collect rich and nuanced information.

The findings of this study pave the way to explore new variables and their role in the development of problem gambling in patients with PD. They also emphasize the potential role of different gambling habits in the development of PG among people with PD, which could in turn serve to elaborate diverse gambling prevention strategies.

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