

Assessing the Playing Field: A Prospective Longitudinal Study of Internet Sports Gambling Behavior

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Abstract Internet gambling is growing rapidly, as is concern about its possible effect on the public's health. This paper reports the results of the first prospective longitudinal study of actual Internet sports gambling behavior during eight study months. Data include recorded fixed-odds bets on the outcome of sporting contests and live-action bets on the outcome of events within contests for 40,499 Internet sports gambling service subscribers who enrolled during February 2005. We tracked the following primary gambling behaviors: daily totals of the number of bets made, money bet, and money won. We transformed these variables into measures of gambling involvement. We analyzed behavior for both fixed-odds and live-action bets. The median betting behavior of the 39,719 fixed-odds bettors was to place 2.5 bets of €4 (approximately \$5.3 US) every fourth day during the median 4 months from first to last bet. This typical pattern incurred a loss of 29% of the amount wagered. The median betting behavior of the 24,794 live-action bettors was to place 2.8 wagers of €4 every fourth day during the median duration of 6 weeks at a loss of 18% of the amount wagered. We also examined the behavior of empirically determined groups of heavily involved bettors whose activity exceeded that of 99% of the sample.

Keywords Gambling · Internet gambling · Internet · Epidemiology · Public health

Gambling, and more specifically, excessive gambling, is associated with a number of poor physiological and psychosocial outcomes (Shaffer, LaPlante, et al., 2004), such as poor mental health, poor social relationships, and poor financial situations. Prevalence estimates of international rates of past year pathological gambling have ranged between .2% and

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2.1% and have been stable during the past 30 years, with some studies showing increases and others decreases (Shaffer, LaBrie, LaPlante, Nelson, & Stanton, 2004). Nevertheless, the advent of a new form of gambling, Internet gambling, has researchers and advocates around the world concerned about its impact on public health.

The Internet might contribute to an expansion of excessive and/or disordered gambling by generating exposure among individuals who under different circumstances would have minimal exposure to gambling. Increased exposure to potential public health toxins can be associated with increases in both related behavior and problems (Shaffer, LaBrie, & LaPlante, 2004). In addition to increasing access, because using the Internet is most often a solitary activity that can provide instant or rapid gratification, it holds the potential to accelerate individuals' existing problems—akin to drinking alone.

Unfortunately, there currently is very little empirical research on Internet gambling. Existing rates rely on self-reported behavior. One study conducted in the UK involving a weighted nationally representative sample of over 2,000 people found that of 495 Internet users only five (1% of Internet users and .3% of the sample) reported that they used the Internet to gamble and suggested that there was no evidence of problematic gambling (Griffiths, 2001). Similarly, Petry and Mallya found that in a sample of over 900 university health center employees, approximately 1.2% (i.e., 11 people) reported using the Internet to gamble (Petry & Mallya, 2004). A third study of Internet gambling prevalence rates in Ontario involved a randomly selected telephone sample of almost 1,300 people (Ialomiteanu & Adlaf, 2002). The study found that 5.3% (i.e., 69 people) reported Internet gambling during the past 12 months. An additional survey study conducted by Ladd and Petry (2002) found that among 389 visitors to university medical and dental clinics, 8.1% (i.e., 31 people) reported Internet gambling in their lifetimes. A study least representative of the general population (Woodruff & Gregory, 2005), in which two Detroit casinos randomly surveyed 200 guests, identified the highest rate of Internet Gambling. This study found that 36.5% (i.e., 73 people) reported gambling online.

Though the extant research suggests that Internet gambling—compared to other forms of gambling—is limited, concerns about Internet gambling are growing across various interest groups (Bray, 2006; Federal Trade Commission, 2003; General Accounting Office, 2002; McBride, 2006; Mitka, 2001; Wall Street Journal, 2006). There are a number of reasons that people are alarmed about Internet gambling. As mentioned earlier, the Internet increases accessibility to gambling and is particularly amenable to fast action play. Some have argued that Internet gambling lacks a number of important fail-safes such as the ability to protect underage and problem gamblers and the ability to restrict unprincipled marketing techniques, such as embedding (i.e., gambling sites using keywords like “compulsive gambling” for search engines) and serial pop-ups (Griffiths & Parke, 2002). Similarly, some observers have speculated that the Internet does not have the capacity to prevent gambling while intoxicated or gambling at work (Griffiths, 1999). Twenty-four hour easy access to gambling also might provide an outlet for urges that otherwise would go unfulfilled. Prototypical exposure effects coupled with an as yet unknown product safety level warrant empirical examination of Internet gambling behavior.

Present Study

This paper describes the actual Internet gambling behavior of a large cohort of participants during the first 8 months of a longitudinal study. Longitudinal studies of gambling are increasing in number (Abbott, Williams, & Volberg, 2004; Barnes, Welte, Hoffman, &

Dintcheff, 2005; DeFuentes-Merillas, Koeter, Schippers, & van den Brink, 2004; Hodgins & el-Guebaly, 2004; Jacques, Ladouceur, & Ferland, 2000; Shaffer & Hall, 2002; Slutske, Caspi, & Moffitt, 2005; Slutske, Jackson, & Sher, 2003; Vachon, Vitaro, Wanner, & Tremblay, 2004; Vander Bilt, Dodge, Pandav, Shaffer, & Ganguli, 2004; Wiebe, Single, & Falkowski-Ham, 2003; Winters, Stinchfield, Botzet, & Anderson, 2002; Winters, Stinchfield, Botzet, & Slutske, 2005); however, none of these studies specifically focus on Internet gambling. For the present study, we established a research cohort and accumulated their subsequent recorded gambling transactions at a sports gambling website. The cumulative information base of these transactions documents each player's gambling behavior at that site. Using actual behavior avoids the difficulties inherent in self-report (National Research Council, 1999) as well as the need to compress the information about actual behavior occurring during long intervals into a few summary descriptions elicited by survey questions.

In this study, we collected information about two types of sports bets: (1) fixed-odds betting, or bets made on the outcomes of sporting events or games in which the amount paid for a winning bet is set by the betting service; and (2) live-action sports betting, bets made on propositions about outcomes within a sporting event (e.g., which side will have the next corner kick or whether the next tennis game in a match will be won at love by the server). Fixed-odds bets are relatively slow-cycling betting propositions. The outcomes of a bet are generally not known for hours or even (in the case of cricket matches) days. Alternatively, live-action sports betting provides many, relatively quick-paced, betting propositions posed in real-time during the progress of a sporting event.

We present three types of results never before available in the professional literature: (1) an epidemiological description of characteristics of 40,499 sequentially subscribed Internet gamblers, (2) an epidemiological description of the gambling behavior of these Internet gamblers, and (3) an epidemiological description of the gambling behavior of empirically determined groups of the heavily involved bettors.

Methods

Sample

This research cohort included 42,647 people who opened an account with the Internet betting service provider, bwin Interactive Entertainment, AG (bwin), from February 1 to February 27, 2005. This includes *all* individuals who subscribed during this time. This consumer subscriber design is comparable to a treatment entry design that enrolls 100% of new admissions. We excluded from the current study participants who did not deposit their own money into their accounts (i.e., those who received and only used promotional funds from bwin). To assure that all participants had the opportunity for at least a modicum of exposure to the gambling offered on this site, we also excluded participants who did not first gamble with their own money until less than 1 month before the end of study period (i.e., before September 30, 2005). Almost all (98%, $n = 41,722$) of the people who opened an account during February had at least 1 month of betting with their own money.

Bwin is primarily an Internet sports gambling service. A very small fraction of the 41,722 enrolled and participating bettors (<3%) did not engage in sports gambling. Because this study focuses on sports gambling, participants with no sports betting behavior also were excluded from the study, thereby reducing the longitudinal cohort to 40,499 sport

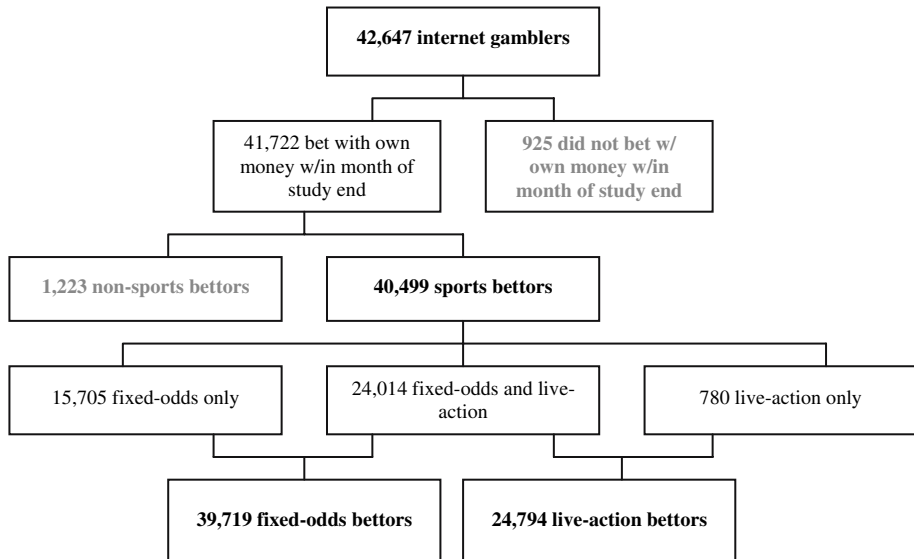


Fig. 1 Subsamples of Internet gamblers used for analyses

bettors: of these, 15,705 bet only on fixed-odds, 780 bet only on live-action, and 24,014 bet on both types of propositions. Figure 1 illustrates the sample composition.

Measures

The available demographic characteristics of the research sample included age, gender, country of residence, and preferred language. At enrollment, participants elected to interact with the wagering system in one of 20 languages.

The gambling behavior measures in this report are based on participants' monetary deposits to and withdrawals from their wagering accounts, as well as daily aggregates of betting activity records. The daily betting activity records are identified by calendar day and report the aggregate number of bets made and monies wagered for both fixed-odds and live-action betting on that day. The daily betting activity records include winnings credited to the bettors' accounts on that day and can include outcomes from wagers made on previous days.

The daily aggregations provided summary measures of gambling behavior. We obtained Number of Bets and Total Wagered by summing the daily aggregations. We measured the duration of gambling involvement as the number of days from the first eligible bet to the last (i.e., Duration). We defined the frequency of involvement as the percent of days within that period that included a bet (i.e., Frequency). We obtained the average bets per day by dividing the total number of bets made by the total number of betting days (i.e., Bets per Day) and the average size of bets by dividing the total monies wagered by the total number of bets (i.e., Euros per Bet). The net result of gambling (i.e., Net Loss) is the difference between total wagers and total winnings. The dominant outcome is a net loss and, by subtracting total winnings from total wagers, positive values indicate net losses, the cost of gambling. Converting net losses to a percent of total wagers (i.e., Percent Lost) provides an index of losses that is independent of the total amount wagered.

Procedures

We conducted a secondary data analysis of the subscriber database obtained from bwin as described above. We received approval from our Institutional Review Board to conduct secondary data analyses of the available information.

Data Analysis

We summarized the participants' demographics and gambling behavior using descriptive statistics. Tests for differences between group means included testing the assumption of equal variances and, if necessary, adjusting for unequal variances. We organized the analyses into three sections: (1) cohort characteristics; (2) cohort gambling behavior; and (3) the behavior of heavily involved bettors. For cohort characteristics, we report gender and country distributions, as well as differences by gender and country in gambling behavior. For cohort gambling behavior, we report gambling involvement by time (i.e., Duration and Frequency), betting intensity (i.e., # of Bets, Bets per Day, Euros per Bet), Total Wagered, Net Loss, and Percent Lost. For the heavily involved bettors, we report basic gambling activity, as well as inter-group overlap.

The large sample size greatly reduces the likelihood that observed differences between types of gambling (i.e., fixed-odds versus live-action) can result by chance, limiting the usefulness of tests of statistical significance. For example, the difference in the size of fixed-odds and live-action bets for bettors who bet on both types of games is €5, and the difference is statistically significant (paired $t(24,014) = 3.99, p < .001$). Consequently, it is important to keep in mind that the practical significance of any reported statistically significant differences might be limited.

Results

Cohort Characteristics

Demographics

The average age of the cohort was 31 years ($SD = 10.0$) and most (91.6%) were male. The players were from 85 countries. The majority (58%) were from Germany. Greece, Poland, Spain, and Turkey each comprised 6% of the cohort. There were 5% from France, 3% from Austria, 3% from Denmark, 2% from Italy, and 1% from Switzerland. People from the 75 other countries accounted for the remaining 4% of the cohort.

Gender Differences among Sports Gamblers: Women were very similar to men in their gambling behavior on both fixed-odds and live-action bets. However, on average, women bet for a shorter period of time than men for both fixed-odds ($n = 3,239, M_{\text{women}} = 20$ days, $SD = 27$ versus $n = 36,479, M_{\text{men}} = 25, SD = 30, p < .001; n = 1$ with gender missing) and live-action betting ($n = 2,055, M_{\text{women}} = 12, SD = 21$ versus $n = 22,739, M_{\text{men}} = 14, SD = 23, p < .001; n = 1$ with gender missing). Women compensated for the shorter duration by betting on more days within that time for both fixed-odds ($n = 3,239, M_{\text{women}} = 38\%, SD = 31$ versus $n = 36,479, M_{\text{men}} = 31\%, SD = 27, p < .001$) and live-action betting ($n = 2,055, M_{\text{women}} = 51\%, SD = 38$ versus $n = 22,739, M_{\text{men}} = 42\%, SD = 37, p < .001$). Women also made significantly larger bets on both fixed-odds ($n = 3,239, M_{\text{women}} = €15,$

$SD = 37$ versus $n = 36,479$, $M_{\text{men}} = \text{€}11$, $SD = 32$, $p < .001$) and live-action ($n = 2,055$, $M_{\text{women}} = \text{€}14$, $SD = 31$ versus $n = 22,739$, $M_{\text{men}} = \text{€}10$, $SD = 24$, $p < .001$), but their overall net loss was less than men for both types of betting (fixed-odds $n = 3,239$, $M_{\text{women}} = \text{€}63$, $SD = 965$ versus $n = 36,479$, $M_{\text{men}} = \text{€}100$, $SD = 531$, $p < .001$; live-action $n = 2,055$, $M_{\text{women}} = \text{€}58$, $SD = 517$ versus $M_{\text{men}} = \text{€}87$, $SD = 575$, $p = .01$). Given the relatively small number of women in the cohort and the generally off-setting differences, we chose not to conduct additional gender analyses.

Country Differences among Sports Gambler: We compared German bettors, the majority of our sample, to all other bettors. For both fixed-odds and live-action bets, the non-Germans had greater average total wagers (fixed-odds $n = 16,645$, $M_{\text{other}} = \text{€}877$, $SD = 4,412$ versus $n = 23,074$, $M_{\text{German}} = \text{€}623$, $SD = 2,508$, $p < .001$; live-action $n = 10,440$, $M_{\text{other}} = \text{€}1,482$, $SD = 9,307$ versus $n = 14,354$, $M_{\text{German}} = \text{€}1,200$, $SD = 8,031$, $p < .001$), and placed larger bets (fixed-odds, $n = 16,645$, $M_{\text{other}} = \text{€}16$, $SD = 40$ versus $n = 23,074$, $M_{\text{German}} = \text{€}9$, $SD = 24$, $p < .001$; live-action $n = 10,439$, $M_{\text{other}} = \text{€}14$, $SD = 31$ versus $n = 14,354$, $M_{\text{German}} = \text{€}8$, $SD = 19$, $p < .001$). Germans, on the other hand played for a longer duration (i.e., days from first to last bet) (fixed-odds, $n = 23,074$, $M_{\text{German}} = 127$ days, $SD = 88$ versus $n = 16,645$, $M_{\text{Other}} = 105$ days, $SD = 88$, $p < .001$; live-action, $n = 14,354$, $M_{\text{German}} = 83$ days, $SD = 84$ versus $n = 10,439$, $M_{\text{Other}} = 73$ days, $SD = 81$, $p < .001$), and made more live-action bets ($n = 14,354$, $M_{\text{German}} = 105$, $SD = 446$ versus $n = 10,439$, $M_{\text{Other}} = 91$, $SD = 344$, $p < .001$). The differences were offsetting and there was not a significant difference in total net losses for either type of betting proposition. There was a significant difference in the percent of wagers lost, but the differences were small and inconsistent by type of betting proposition. Bettors from Germany lost an average of 31.5% (SD 64.0) of their wagers on fixed-odds; slightly less than bettors from other countries who lost 32.5% (SD 58.9). For live-action wagers, people from other countries lost 21.8% (SD 62.5), which is less than the 24.5% (SD 59.3) lost by Germans. Additional analyses breaking out participants by country of origin are beyond the scope of this paper.

Cohort Gambling Behavior

Gambling Involvement by Time

Duration: The average length of time that the cohort actively placed fixed-odds bets (i.e., the number of days between the first and last betting days) was about 4 months. As Table 1 shows, subscribers placed live-action bets for a shorter mean duration than fixed-odds.

Frequency: We measured the frequency of betting activity as the fraction of days of recorded play within individuals' duration of betting. The mean percent of betting days within the betting interval was similar for fixed-odds and live-action betting, albeit slightly higher for live-action. The median measure of frequency was also similar for fixed-odds and live-action betting (See Table 1).

Gambling Involvement by Betting Intensity

This cohort of sequentially subscribed sports gamblers placed 5.3 million fixed-odds and 2.5 million live-action bets during the 8 month study period.

Number of Bets: As shown in Table 1, this measure is highly skewed in the direction of fewer bets, as evidenced by the large standard deviations relative to the means and the

Table 1 Gambling behavior of fixed-odds and live-action bettors

Measure	Fixed-odds ^a (n = 39,719)		Live-action ^a (n = 24,794)	
	Mean (SD)	Median	Mean (SD)	Median
Duration	118 (89)	116	79 (83)	40
Frequency (%)	32 (27)	23	42 (37)	27
# of Bets	135 (496)	36	99 (407)	15
Bets/Day	4.1 (7.7)	2.5	4.3 (5.0)	2.8
Euros/Bet	12 (32)	4	11 (25)	4
Total wagered	729 (3,439)	148	1,319 (8,592)	61
Net loss	97 (579)	33	85 (571)	9
% Lost	32 (62)	29	23 (61)	18

Note: Duration = interval in days between first and last bet; Frequency = percent of days within duration when a bet was placed; Net loss = total wagers minus total winnings; % Lost = Net loss divided by total wagered.

^a These two groups are not independent; therefore differences between groups are not tested. An analysis using a paired *t*-test of the 24,014 subscribers who played both types of betting propositions indicated that all measures were significantly different (*p* < .001) in the direction indicated by the Table 1 means.

difference between the means and medians. Both the average total number of bets and the median were larger for fixed-odds bets than live-action play.

Bets per Day: Fixed-odds play resulted in an average of slightly more than four bets per day (see Table 1), but the standard deviation is nearly double the mean and the median is smaller than the mean. These characteristics indicate a measure skewed in the direction of fewer bets per day with some extremely large numbers of bets per day. The descriptive statistics for live-action play show a smaller median but a less extreme variation.

Euros per Bet: Rounded to the nearest Euro (currency conversions yield bets in fractions of Euros), the average fixed-odds bet was slightly larger than the average live-action bet (see Table 1). However, both of these measures also were heavily skewed toward smaller values (see the medians and variances).

Gambling involvement by Money Wagered

As shown in Table 1, daily estimates of total money wagered are also highly skewed with standard deviations 4–5 times the mean for both types of bets. The more rapid live-action play had higher mean total amounts wagered than fixed-odds but the median amount wagered was lower.

Gambling Involvement by Money Lost

Net Loss: On average, our sample of bettors experienced a net loss. Mean net losses were greater for fixed-odds bets than live-action bets, and as with total amount wagered, the median net loss was smaller for live-action bets.

Percent Lost: Table 1 also describes the cohort statistics for the percent of each individual’s wagers that were lost. The net fixed-odds loss was greater than that for live-action betting. These average percent of monies lost are larger than the expected costs of gaming and merit a brief explanation. If we recalculate percent loss based on the total money

wagered across the cohort, as opposed to individually, we obtain percentages that agree with the target returns expected by the operator (Betandwin.com, 2005). The total sum of fixed-odds losses for this cohort during the study period (€3.836,145) divided by the sum wagered (€28,961,646) yields a percent loss of 13%; the percent loss computed using the total monies wagered (€32.692.867) and loss (€2.106.775) on live-action play is 6%. The larger than expected percent losses calculated individually in this cohort result from the large number of small and infrequent bettors who tend to have larger percent losses (i.e., bet a few times, lose those bets, and then stop playing).

Gambling Activity Matrix

We examined the correlations among measures of gambling behavior to gauge the dependence among different areas of involvement and to identify the effect of different types of gambling propositions on these relationships. The distributions of the measures violate the assumptions of bivariate normality required for product-moment correlations. Consequently, we used rank-order correlations, which do not assume normality. Table 2 presents the correlations for both the fixed-odds bets and live-action bets.

With a small number of exceptions, the relationships among the various gambling behaviors are similar for the two types of betting. For both types of betting, notable correlations (i.e., those greater than .30 for both types that are not artifacts of the variables) include negative correlations between duration and frequency, duration and percent lost, number of bets and euros per bet, number of bets and percent lost, bets per day and euros per bet, and total wagered and percent lost. Two exceptions to this consistent pattern involve frequency: for live-action play, frequency negatively correlated with the total number of bets and total monies wagered. Frequency had small positive correlations with these measures for fixed-odds bets, however. The other difference of note is the larger correlation between total wagered and euros per bet among live-action bettors compared to fixed-odds bettors.

Table 2 Correlations among gambling behavior measures for fixed-odds (above diagonal, $N = 39,719$) and live-action (below diagonal, $N = 24,794$) betting

	Duration	Frequency	# of Bets	Bets/Day	Euro/Bet	Total wagered	Net loss	% Lost
Duration	–	–.52	.64	.23	–.16	.54	.20	–.35
Frequency	–.78	–	.07	.09	–.01*	.06	.05	.03
# of Bets	.70	–.29	–	.70	–.37	.75	.33	–.43
Bets/Day	.34	–.05	.81	–	–.41	.43	.26	–.20
Euros/Bet	.03	.04	.03	–.02	–	.27	.16	.01*
Total wagered	.59	–.21	.83	.65	.54	–	.46	–.46
Net loss	.27	–.07	.41	.37	.28	.50	–	.42
% Lost	–.25	.11	–.32	–.21	–.10	–.31	.47	–

Note: Duration = interval in days between first and last bet; Frequency = percent of days within duration when a bet was placed; Net loss = total wagers minus total winnings; Percent lost = Net loss divided by total wagered. Nonparametric Spearman correlations all $p < .001$, unless indicated by *

Gambling Behavior of Heavily Involved Bettors

The cohort exhibits a profile of modest betting activity but most measures included large values. Consequently, to provide a complete description of Internet sports gambling behavior, we examined the extreme cases that the general tendencies do not represent well.

Similar to interpreting a scree plot by identifying the “elbow” of that plot, we examined subject centile plots to identify empirically whether subgroups within our sample evidenced discontinuously high values on each measure. We found that indeed this was the case for bettors in the top 1% on several measures: number of bets, bets per day, euros per bet, total wagered, and net loss (cf. Fig. 2 for an example). We conducted an analysis of live and fixed-odds betting focusing on the members of the cohort who “spent” the most

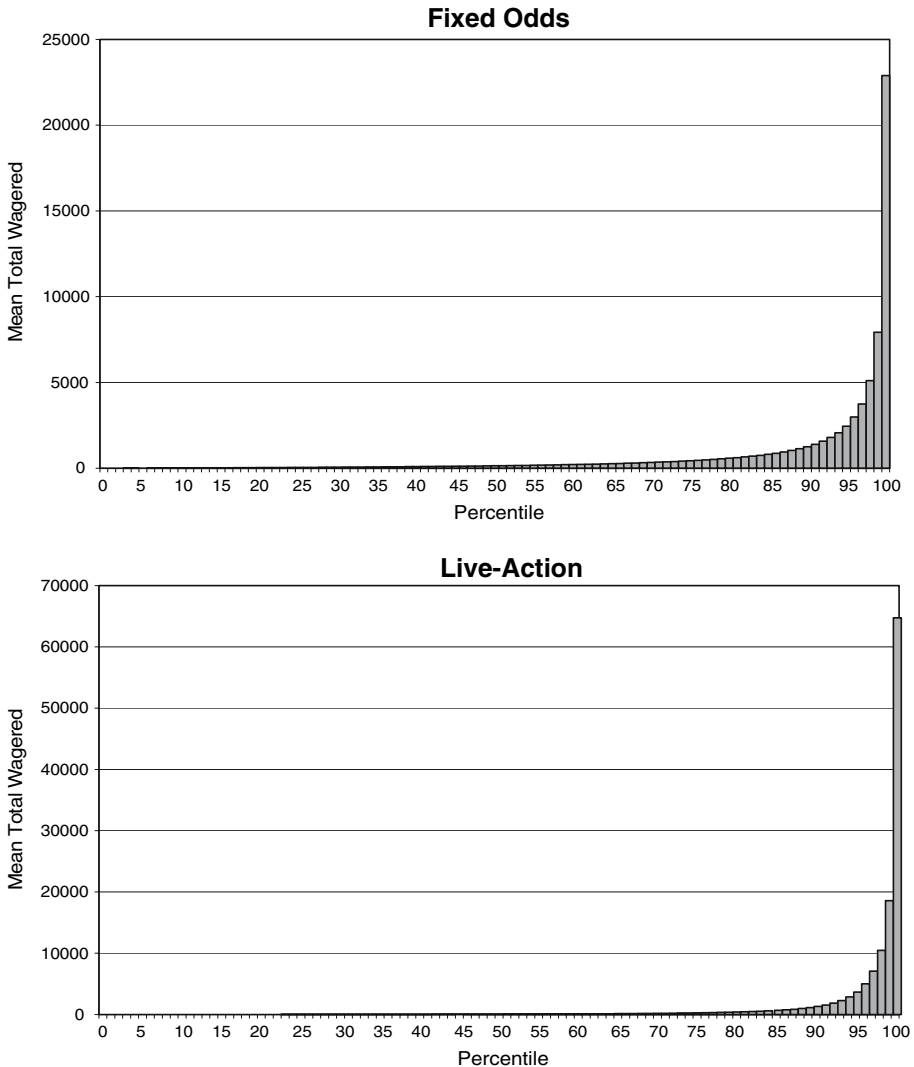


Fig. 2 Means of total wagered by centile groups: fixed-odds and live-action

money and made the most bets. We defined “spent” in two ways: (1) total amount of money bet (i.e., total wagered) and (2) total amount of money lost (i.e., net loss) during the study period. Therefore, based on our analysis of the centile plots, we analyzed the betting behavior of three groups of heavily involved bettors: those who fell in the top 1% on total wagered, those who fell in the top 1% on net loss, and those who fell in the top 1% on number of bets. We defined these groups and conducted these analyses separately for fixed-odds and live-action betting. We did not examine the top 1% on bets per day or euros per bet because of the overlap of these variables with total wagered and number of bets.

Table 3 presents the gambling behavior for the heavily involved 1% groups defined by net loss, total wagered, and number of bets made for both types of betting. Some interesting heavily involved group differences were apparent and are worth noting. First, the median amount per fixed-odds bet for the heavily involved number of bets group was one Euro; the heavily involved total wagered and heavily involved net loss groups had median average bets of €44 and €23. Second, for both types of play, the heavily involved total

Table 3 Gambling behavior of heavily involved bettors

Measure	Fixed-Odds ^a					
	Heavily involved on net loss (<i>n</i> = 397)		Heavily involved on total wagered (<i>n</i> = 397)		Heavily involved on # of bets (<i>n</i> = 397)	
	Mean (<i>SD</i>)	Median	Mean (<i>SD</i>)	Median	Mean (<i>SD</i>)	Median
Duration	189 (57)	215	194 (53)	217	204 (43)	220
Frequency (%)	45 (22)	42	51 (21)	48	57 (21)	57
# of Bets	1,545 (3,241)	423	1,438 (3,151)	423	3,497 (3,153)	2,371
Bets/Day	18.0 (51.0)	5.4	13.0 (27.2)	4.7	37.3 (51.2)	26.4
Euros/Bet	55 (94)	23	77 (96)	44	3 (5)	1
Total Wagered	15,037 (15,709)	10,259	22,891 (23,879)	16,784	8,421 (12,898)	4,144
Net Loss	3,491 (2,617)	2,645	1,838 (4,547)	1,544	1,261 (2,232)	740
% Lost	35 (22)	29	10 (16)	9	19 (17)	18
Measure	Live-action ^a					
	Heavily involved on net loss (<i>n</i> = 247)		Heavily involved on total wagered (<i>n</i> = 247)		Heavily involved on # of bets (<i>n</i> = 247)	
	Mean (<i>SD</i>)	Median	Mean (<i>SD</i>)	Median	Mean (<i>SD</i>)	Median
Duration	189 (53)	213	188 (50)	209	206 (34)	217
Frequency (%)	50 (23)	49	57 (21)	56	64 (18)	65
# of Bets	1,767 (2,678)	973	1,700 (2,315)	1,034	2,938 (2,451)	2,150
Bets/Day	16.1 (16.5)	11.3	14.6 (13.9)	10.7	23.0 (15.7)	18.5
Euros/Bet	59 (63)	34	81 (79)	53	15 (26)	6
Total wagered	47,954 (56,687)	29,144	64,740 (53,046)	44,111	36,115 (54,215)	15,743
Net loss	4,189 (3,062)	3,052	2,642 (4,270)	1,973	2,159 (3,115)	1,111
% Lost	15 (12)	12	4 (7)	4	9 (7)	7

Note: Duration = interval in days between first and last bet; Frequency = percent of days within duration when a bet was placed; Net loss = total wagers minus total winnings; Percent lost = Net loss divided by total wagered

^a The groups are not independent and the differences among groups are not tested

Table 4 Overlap among groups of heavily involved bettors—*N* (%)

	Heavily involved on NL only	Heavily involved on TW only	Heavily involved on NoB only	Heavily involved on NL & TW	Heavily involved on NL & NoB	Heavily involved on TW & NoB	Heavily involved on all 3
<i>Fixed-Odds (887)</i>							
Net loss (397)	170 (43)	–	–	143 (36)	32 (8)	–	52 (13)
Total wagered (397)	–	177 (45)	–	143 (36)	–	25 (6)	52 (13)
# of Bets (397)	–	–	288 (73)	–	32 (8)	25 (6)	52 (13)
<i>Live-action (492)</i>							
Net loss (247)	91 (37)	–	–	65 (26)	24 (10)	–	67 (27)
Total wagered (247)	–	89 (36)	–	65 (26)	–	26 (11)	67 (27)
# of Bets (247)	–	–	130 (53)	–	24 (10)	26 (11)	67 (27)

Note: NL = net loss; TW = total wagered; NoB = # of bets

wagered group had mean and median percent losses that were less than the percent targeted by the provider. This is consistent with the results of the correlation analysis in which the measure of total monies spent were negatively correlated with percent losses. The heavily involved total wagered group made larger bets but they lost a smaller fraction of those bets. Third, the heavily involved net loss group made smaller bets but they lost a larger fraction of those bets.

Overlap of Heavily Involved Bettors

The three classes of heavily involved bettors across types of bets are not exclusive; that is, subscribers might be members of more than one group. Table 4 displays the extent of overlap of each group with other groups, beginning with no overlap, each pair of groups, and all three groups. Among the fixed-odds groups, the heavily involved number of bets group is relatively independent; three-quarters do not overlap. Thirteen percent of heavily involved fixed-odds bettors were heavily involved on all three behaviors. There was a greater level of overlap among live-action heavily involved group bettors; almost one third were heavily involved on all three behaviors. Consistent with fixed-odds, the live-action number of bets group was the most independent.

Discussion

This study presents the first ever analysis of real-time betting behavior of Internet sport gamblers. Although Internet gambling is often the subject of debate and concern, there is little empirical evidence available to inform such debate and address that concern. The absence of empirical evidence has not limited these debates. In fact, the debates about

Internet gambling abound: stakeholders have speculated about Internet gambling within the popular press, public policy, and public health circles (e.g., Bray, 2006; General Accounting Office, 2002; e.g., Griffiths, 1999; Griffiths & Parke, 2002; Ladd & Petry, 2002; McBride, 2006; Mitka, 2001). The presented research findings provide a description of the sports gambling behavior evidenced by a large cohort of bettors during eight continuous months. We also identified heavily involved bettors using three types of behaviors: total amount of money put at risk, total amount of money lost, and total number of bets placed.

Cohort Characteristics

The research cohort of Internet sports gamblers was comprised predominantly of males, of European descent, in their early 30s. However, we did observe two interesting demographic differences. Although research on treatment seekers for problems related to types of gambling other than sports gambling (LaPlante, Nelson, LaBrie, & Shaffer, 2006) found that gender was not an important predictor of games of choice, women comprise only 8% of our research cohort of sports gamblers indicating a strong gender preference. Our analysis of the sports gambling behavior of 3,239 women who did participate in sports gambling indicates that women sports gamblers are very similar to men. The differences, that women had more betting days within a shorter interval of betting and had smaller net losses despite making larger bets, favor women as exhibiting more effective sports gambling behavior than men.

We also observed some nationality differences. At the time we established the research cohort, bwin was in the early stages of evolving from its initial target market, Germany, and the majority of subscribers were German. German bettors differed from others on some gambling behaviors. It is difficult to interpret the differences between German sports gamblers and those from many other countries. The differences, generally in the direction of more moderate betting behavior by Germans, is consistent with attracting more fan bettors from an area with a longer history and more complete coverage of local sports betting opportunities. Additional research is necessary to examine these suggestions.

Cohort Gambling Behavior

We examined gambling activity in multiple ways to determine whether any attributes of online betting activity could illustrate excessive gambling behavior within our population of subscribers. Population level statistics indicated that the subscribers' gambling activity levels were moderate, as evidenced by analyses of time (e.g., people were active less than ½ the time possible, despite infinite access), activity (e.g., most placed less than 4 bet/day during such limited active periods), and expenditures (e.g., most placed bets less than 5 euros). The findings reported here do not support the speculation that Internet gambling has an inherent propensity to encourage excessive gambling among a large proportion of players.

One reason that our findings, derived from actual gambling behavior, might be different from people's self-reported online gambling behavior and/or researchers' speculations is that people's recollection of losses are likely to be particularly salient and often inaccurate (Volberg, Gerstein, Christiansen, & Baldrige, 2001). This salience might bias self-recalled estimates of amounts spent gambling.

It is notable that individuals seemed to moderate their behavior based on their wins and losses. For example, as percent lost increased, duration of play, number of bets, bets per day, Euros per bet and total wagers all decreased. This suggests that at the level of the population, losing discourages ongoing play and winning encourages continued play. These findings might relate to changes in finances, or to rational decision-making. Additional research on this phenomenon is necessary because a hallmark feature of gambling-related problems might be the continuation of gambling despite adverse consequences. Although the uniqueness and lack of fail-safes associated with Internet gambling suggest that the relationship should have been reversed, at the population level, we did not find evidence to support such a pattern.

Most of the gambling behavior variables in this study indicated a large skew. This suggests that the majority of the sample participated in various gambling-related activities similarly to each other, but differently than the high end of the distribution. In other words, Internet gambling at the population level was not particularly notable or variable, but a segment of the population deviated from this and required an in-depth analysis.

Gambling Behavior of Heavily Involved Bettors

Our results indicated a clear discontinuity of activity. That is, we observed graduated (e.g., dimensional) gambling activity patterns within the population, with the exception of the individuals who comprised the heavily involved 1% of the population on important gambling-activity variables. Furthermore, most of these top 1% groups represented distinct cohorts: that is, individuals who met criteria for the heavily involved 1% on one variable (e.g., amount wagered) did not necessarily meet criteria for the heavily involved 1% on another variable (e.g., number of bets). This suggests that individuals were not necessarily uniformly “excessive” in their gambling activity, but tended to moderate their activity in various ways that allowed for heavily involved behavior on one activity balanced by more controlled behavior on others—contributing to an overall appearance of moderation. This pattern of control has been observed among psychoactive substance (e.g., heroin, cocaine) users (Zinberg, 1984; Zinberg & Harding, 1982; Zinberg, Harding, & Winkeller, 1977; Zinberg & Jacobson, 1976).

For fixed-odds, the greatest overlap occurred among heavily involved 1% groups for losses and amount wagered (36%). For live-action, the greatest overlap occurred among the convergence of the three heavily involved 1% groups (27%). It is unclear from this first study whether such individuals represent especially risky and/or unhealthy gambling. However, groups of individuals who meet criteria for multiple heavily involved 1% groups warrant additional research and attention in the future.

One final remarkable finding is that the size of heavily involved group individuals' wagering relates to losses in an unpredicted manner. The top 1% of the sample on amount wagered had lower percent losses than both the rest of the sample and the other heavily involved groups. This finding is consistent with what we observed at the population level, that the correlations between percent loss and the aggregated total of monies wagered are negative. These negative relationships are consistent with the observation that more successful betting leads to continued betting; winning encourages continued play—and conversely, losing discourages ongoing play. More specifically, individuals who made larger wagers lost proportionately less than individuals who made smaller wagers. Often people presume that large wagering is a necessary hallmark feature of problematic gambling. Although in many cases large wagering might hold

diagnostic potential, especially if it is graduated and follows closely after losses, these findings suggest that this is not necessarily the case among Internet sports gamblers. These players place extreme amounts of money at-risk but extreme losses did not moderate their play.

Implications

This study reports the first ever analysis of actual Internet gambling activity among a large randomly selected cohort followed over time. The study does not include information about rates of clinical or subclinical gambling pathology. However, spending large amounts of money on gambling is consistent with some of the criteria in the DSM-IV-R (American Psychological Association, 2000) (i.e., needing to gamble with increasing amounts of money in order to achieve the desired excitement; after losing money gambling, often returning another day in order to get even, often referred to as “chasing” one’s losses; committing illegal acts in order to finance gambling; and relying on others to provide money to relieve a desperate financial situation caused by gambling). There is also a concern that extensive involvement with gambling can cause problems not reflected in money spent but in the amount of time and appropriateness of time spent gambling (i.e., choosing to gamble rather than meet other obligations). Future research is necessary to understand the clinical significance of our findings.

Limitations and Caveats

This study is not without limitations. The observed Internet betting behavior might not represent a participant’s total online gambling behavior. Unlike land-based gambling venues, bettors can access Internet sites easily, play at several venues, and move among them readily. The proffered odds vary from site to site and it would not be unusual for sports gamblers to “shop” for the most favorable odds. It is also possible that multiple individual might have bet using the same account. We reported gambling behavior observed during the first 8 months of the study period. It is possible that the course of activities leading to problem gambling might require longer exposure to Internet gambling. We continue to collect information about this cohort.

The ultimate purpose of this analysis is to empirically guide bwin as they develop, implement, and promote responsible gambling. We chose to analyze and report the first 8 months of activity because during this period, bwin participants used a gaming system that had not yet been enhanced with policy, procedures, and materials to promote responsible gambling. For example, during the 8-month study period, all bettors played under the same, vendor-defined betting limits. That is, bwin customers could not add money to their accounts in excess of €1,000 within a 24-h period or €5,000 within a 30-day period. The day following the study period reported here, bwin installed changes to their operating system that allowed players to easily reduce their own betting limits (i.e., the amount that they could deposit into their betting account at a particular time). Research reports submitted for publication and others in preparation will report on our examinations of the effects of self-limits, closing and opening accounts when gambling becomes a problem for the bettor, changes in player patterns indicative of greater loss-risk, and the possible Internet-specific effects of exposure and adaptation.

Concluding Thoughts

This study takes the first steps necessary toward informing the wide range of gambling stakeholders about the behavioral epidemiology of Internet gambling. Future research must now move to replicate these findings using a variety of other Internet sites and a variety of other types of Internet gambling, for example, casino games and poker playing. Also, research must begin to identify the population segments at greater or lesser risk for developing Internet gambling-related problems. The determinants for increasing or decreasing the likelihood of developing Internet gambling problems can then serve as a guide for the development of prevention and treatment programs.

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