

Real Limits in the Virtual World: Self-Limiting Behavior of Internet Gamblers

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Published online: 12 August 2008
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Abstract The recent expansion of Internet gambling has stimulated debate, policy, and research on this relatively new phenomenon and its potential consequences. The current study focuses on bettors experiencing problems by sampling Internet gamblers who imposed limits on the amount they were allowed to deposit to a betting site. We analyzed the betting transactions over 18 months of all gamblers who subscribed to an online betting site in February, 2005 ($N = 47,134$), 567 of whom utilized the site's self-limit feature. Self-limiting gamblers played a wider variety of games and placed more bets than others prior to imposing limits. After imposing limits, self-limiters reduced their activity, but did not reduce the amount they wagered per bet. Time spent gambling, not just money spent, appears to be an important indicator of gambling problems. Self-limit programs appear to be promising options for Internet gamblers at-risk for gambling problems.

Keywords Gambling · Internet gambling · Gambling problems · Self limits · Harm reduction

Introduction

The advent and expansion of Internet gambling during the past decade has caused considerable controversy among policymakers (e.g., Richtel 2004), advocates (e.g., No More Gambling 2005), and researchers alike (e.g., Smeaton and Griffiths 2004). User anonymity, increased access to gambling, and lack of regulation of online betting services raise

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suspicions that Internet gambling might facilitate the development of gambling-related problems (Griffiths 2003). Given the number of poor mental health outcomes associated with disordered gambling, the potential that Internet gambling can lead to gambling problems is a significant public health concern (Petry 2006).

Research on Internet Gambling

Speculation about the risks of Internet gambling is abundant, but there is little consensus about the prevalence of Internet gambling (estimates range from 0.2% in the UK to 36.5% among Detroit casino-goers; American Gaming Association 2006; Griffiths 2001; Ialomiteanu and Adlaf 2002; LaBrie et al. 2003; Ladd and Petry 2002; Meerkerk et al. 2006; Petry 2006; Petry and Mallya 2004; Welte et al. 2002; Woodruff and Gregory 2005). Further, there is very little research about the prevalence of disordered Internet gambling. Three published studies (Ladd and Petry 2002; Petry 2006; Petry and Mallya 2004), all using convenience samples, have investigated the relationship between Internet gambling and gambling problems. One of these studies found that among a sample of people seeking free or reduced-cost treatment at a health care center, participants who reported Internet gambling endorsed more gambling problems according to the South Oaks Gambling Screen (SOGS; Lesieur and Blume 1987) than other gamblers (Ladd and Petry 2002); another found that, among a similar sample of people seeking health care, disordered gamblers (i.e., those endorsing 5+ criteria on the SOGS) were more likely to report Internet gambling than other gamblers (Petry 2006); the last found no relationship between Internet gambling and SOGS scores among health center employees (Petry and Mallya 2004). All of these studies relied on self-reported gambling behavior.

The first empirical study of actual Internet gambling behavior (LaBrie et al. 2007a) examined the betting behavior during eight months of more than 40,000 online gamblers who subscribed consecutively to an Internet betting service. The study found that Internet sports gamblers typically made a few small bets every four or five days, and that those who bet the most were not necessarily the bettors who lost the most. Only a few bettors (i.e., approximately 1% for each variable) deviated from this basic pattern. The authors concluded that detecting problem gamblers might require knowing more than their typical gambling behavior; unusual patterns of play and changes in behavior could contribute to improving identification. A consequent study confirmed this suspicion; among the same sample of Internet betting service subscribers, most subscribers adapted their behavior by reducing their participation, bets, and bet size, but heavily involved bettors failed to adapt, instead maintaining a high level of involvement (LaPlante et al. 2008).

One way to identify people for whom gambling has become problematic, both on land and online, is to study people who seek treatment or employ self-help strategies for their gambling behavior (LaBrie et al. 2007b). Self-exclusion and self-limit programs employed by casinos are two examples of self-help programs whose enrollees likely have problems with gambling.

Self-Exclusion and Self-Limit Programs: Land-Based Casinos

Self-exclusion and self-limit programs have become popular tools for casinos attempting to provide responsible gaming services to their patrons. Self-exclusion programs allow patrons to ban themselves from casinos (see Napolitano 2003; Nowatzki and Williams 2002), requesting that these casinos do not allow them on the premises or accept their money and, in some cases, that their trespass result in criminal prosecution (e.g., the

Missouri Voluntary Exclusion Program: LaBrie et al. 2007b; Nower and Blaszczynski 2006). Self-limit programs, enforced by casinos, allow patrons to impose limits on certain gambling-related activities (e.g., the ability to cash checks or obtain credit at a given casino: American Gaming Association 2003). Though self-exclusion and self-limit programs are not equivalent and likely attract different clientele, both serve gamblers who are seeking help to regulate their gambling behavior.

Research about self-exclusion programs has demonstrated that, not surprisingly, the majority of people who utilize the service meet criteria for having clinically significant problems with gambling (Ladouceur et al. 2000), and that self-exclusions, to some extent, increase with closer gambling proximity and greater availability (LaBrie et al. 2007b). These findings support the concept that self-exclusion is a good indicator that gambling problems are present among those seeking exclusion.

Self-limit programs, which might be considered a harm reduction technique, likely attract people with gambling problems who wish to regulate better, but not necessarily stop, their gambling. However, prior to this report, there has been no published empirical research about self-limit programs or their enrollees.

In addition to serving as potentially useful markers of samples with gambling problems, self-exclusion and self-limit programs can be evaluated to assess their effectiveness in reducing or eliminating gambling problems. As stated above, to date, no empirical research has been conducted on self-limit programs. The one available *longitudinal* study of casino self-exclusion found that participants, interviewed 6–24 months after self-excluding, were generally satisfied with the program and reported a reduction in gambling problems after joining the program (Ladouceur et al. 2007).

Self-Exclusion and Self-Limit Programs: Applications to Internet Gambling

Until now, no research has examined how self-exclusion and self-limit tools might extend to online gambling. As part of a research collaboration with the Division on Addictions, the online betting company, *bwin* Interactive Entertainment, AG (*bwin*) implemented a self-limit program. At the time of this study, *bwin* had a default limit on deposits €5,000 in a 30 day period and €1,000 in a 24-h period. Through the *bwin* self-limit program, subscribers can impose lower limits on the amount they are allowed to deposit in a given month; the company computer system then enforces these limits. Our interest in this potentially at-risk population segment (i.e., subscribers who impose self-limits) rests on the assumption that self-imposition of limits, similar to enrollment in self-exclusion and self-limit programs in land-based casinos, could be an indicator of potential disordered gambling. Subscribers who impose limits on their online gambling accounts likely recognize that they are, or perhaps have been in the past, (a) capable of gambling more than they intend, (b) not able to control their gambling involvement without help, and/or (c) at-risk for excessive gambling. Given the possibility that this population segment has experienced these or other gambling concerns or problems, examining their gambling behavior prior to initiating self-limits might provide information about how disordered gambling manifests among online gamblers. In turn, examining how that behavior changes after adopting lower limits will measure the effectiveness of a self-limit strategy.

Current Study

The current study investigates the prospective longitudinal gambling behavior of *bwin* subscribers who elected to self-limit their gambling expenditures. The database for this

study consists of the daily aggregate of individuals' betting transactions and avoids the inaccuracies incumbent in self-report. Based on the assumptions listed above, we hypothesized that subscribers who imposed self-limits would be more heavily involved than other subscribers in Internet gambling prior to self-limiting their gambling behaviors, and that their gambling behaviors would improve (i.e., decreased stakes, bets, and frequency of betting) after the imposition of limits. We also explored how self-limitation related to type of bets placed (i.e., fixed-odds or live-action sport betting, poker, or other games).

Method

Participants

Participants included 47,603 Internet gamblers who subscribed to *bwin* during February 2005 and placed bets on that site between February 2005 and September 2006. We excluded participants who had not placed a bet by August 1st, 2006 to ensure at least a month of exposure after active betting behavior began. This reduced the sample to 47,478 subscribers. Five hundred and ninety-three of those subscribers imposed self-limits on their accounts between the beginning of November 2005—when *bwin* implemented their self-limit policy—and the end of March 2006. This sampling time period allowed us to measure these participants' gambling behavior for at least six months after they had elected self-limits. We excluded participants who placed limits on their accounts between April 1st 2006 and August 31st 2006, as well as participants who placed self-limits on their accounts that were the same or higher than *bwin*-imposed limits, resulting in a final sample of 47,134 [567 self-limiters (1.2%) and 46,567 other subscribers (98.8%)].

Though the vast majority of *bwin* subscribers engage primarily in sports betting, subscribers also can engage in other activities, such as casino games or poker. Within the sample of 47,134, there were 12,121 subscribers (25.7%) who played games on the site in addition to or instead of placing fixed-odds and/or live-action wagers on sport events.

Procedures

We obtained from *bwin* de-identified datasets of all transactions made on their site over the 18 month study period by individuals who subscribed to the betting service during February, 2005. We obtained approval from the Cambridge Health Alliance Institutional Review Board to conduct secondary data analyses on these datasets.

Measures

The daily aggregate betting database provided by *bwin* includes information necessary to create variables measuring betting behavior. These include days from first to last bet within the 18 month time period of the study (i.e., duration), percents of days on which a bet was placed within that duration (i.e., frequency), number of bets placed per day (i.e., bets/day), average bet size (i.e., stakes/bet), stakes wagered (i.e., total wagered), stakes wagered minus winnings (i.e., net loss), and net loss divided by amount wagered (i.e., % loss). The database also provides information about demographics and types of games played. In this paper, we focus on two forms of sports gambling—fixed-odds, and live-action—as well as betting on poker and other games (e.g., casino, lottery). Fixed-odds betting refers to the

more familiar type of sports wager in which players bet on the outcome of future athletic events. Live-action bets can be placed in real time on propositions posed by *bwin* while the sporting event is in progress (e.g., who will score the next goal). Fixed-odds bets are relatively slow-cycling betting propositions. The bets can be made well in advance of the event and the outcome of bets made just before the event begins may not be known for hours. Live-action sports betting provides many relatively quick-paced betting propositions. For both types of bets the players accept the payoff offered at the time of the bet. The other games available at *bwin* include casino games, supertoto, soft games, lottery, flash casino, and poker.

Analysis Plan

We first aggregated daily betting behavior and derived measures for self-limiting subscribers before and after they first imposed limits. Because the time periods of pre-limit and post-limit betting varied for each self-limiting subscriber and were not directly comparable to the betting time periods of subscribers who did not utilize self-limits, we focused our analysis on betting behaviors that were averages (e.g., bets/day) or proportions (e.g., % loss) rather than sums (e.g., total number of bets). We also created variables that controlled for duration, as we describe in more detail later.

We conducted descriptive analyses of the characteristics of self-limiting subscribers compared to the rest of the sample, as well as the limits they imposed. Next, we compared the pre-limit behavior of self-limiting subscribers to the rest of the sample. We then examined the change in the betting behavior of self-limiters after they imposed limits. We conducted all of these analyses separately for participants' live-action and fixed-odds betting, as well as their betting on poker and other games (i.e., casino, supertoto, soft-games, lottery, and flash games combined). We also conducted analyses examining the change in betting behavior of self-limiting subscribers by their preferred game, defined as the game on which they wagered the most money. Subscribers who did not have pre-limit data for a given game were excluded from comparisons to the rest of the sample. Subscribers who did not have both pre-limit and post-limit data for a given game were excluded from pre-post analyses. To adjust for the number of comparisons (i.e., approximately 60 primary comparisons), we utilized a Bonferroni correction resulting in an alpha level for each test of $p = .0009$, which we rounded to $p < .001$, to obtain a study-wide alpha level of $p < .05$.

Results

Five hundred and sixty-seven subscribers to *bwin* (1.2% of the final sample) chose to impose self-limits between November 1st, 2005 and March 31st, 2006. Self-limits, which subscribers imposed on the amount they were allowed to deposit within a 30 day period, ranged from €9.27 to €4,177.55. Approximately seven percent (7.1%) of self-limiters (SLs) placed limits on their accounts prior to engaging in any betting, and 10.6% ceased all betting after imposing self-limits.

Four hundred and ninety-eight (87.8%) of SLs made no further changes to their self-imposed limits during the course of the study (i.e., by the beginning of September, 2006). Fifty-two SLs (9.2%) changed their self-limit once, 6 (1.1%) changed their limits twice, and 11 (1.9%) changed their limits three or more times. SLs who changed their limits only once tended to decrease the amount they were allowed to deposit (41 of 52, 78.8%); those

who changed their limit more than once tended to fluctuate (16 of 17 fluctuated; the other increased steadily).

Self-Limiter Demographics

SLs came from 20 different countries; the five most prevalent countries of residence were Germany (61.2%), Turkey (7.2%), Poland (6.5%), France (6.3%), and Spain (3.4%). These were also the five most prevalent countries of residence in the rest of the sample (i.e., non-SLs). Compared to non-SLs, SLs were slightly younger ($M = 29.3$, compared to $M = 30.4$, $t[47132] = 2.53$, $p < .05$), and slightly more likely to be male, (95.9% compared to 91.7%, $\chi^2[1] = 13.30$, $p < .01$), though these findings did not reach significance at $p < .001$.

Self-Limiter Game Choices

All but five SLs placed fixed-odds bets (99.1%); this proportion was only slightly higher than that of non-SLs (96.0%, $\chi^2[1] = 14.1$, $p < .001$). However, 81.7% of SLs placed live-action bets, compared to only 65.8% of other subscribers, $\chi^2(1) = 63.0$, $p < .001$. More than 30% (31.4%) of SLs played other games online at *bwin*, compared to 25.6% of other subscribers, $\chi^2(1) = 9.7$, $p < .01$. Figure 1 illustrates the pattern of games played by SLs and non-SLs. On average, SLs played 2.5 types of games (including fixed-odds and live-action betting), compared to an average of 2.1 games for non-SLs, $t(47132) = 9.57$, $p < .001$.

Self-Limiter Pre-Limit Gambling Behavior

Five hundred and twenty-seven SLs (92.9%) placed bets prior to imposing limits on their play. The average duration from first bet to self-imposition of limits for these 527 was 213 days (median = 247 days). For comparison, the study duration was 549–577 days,

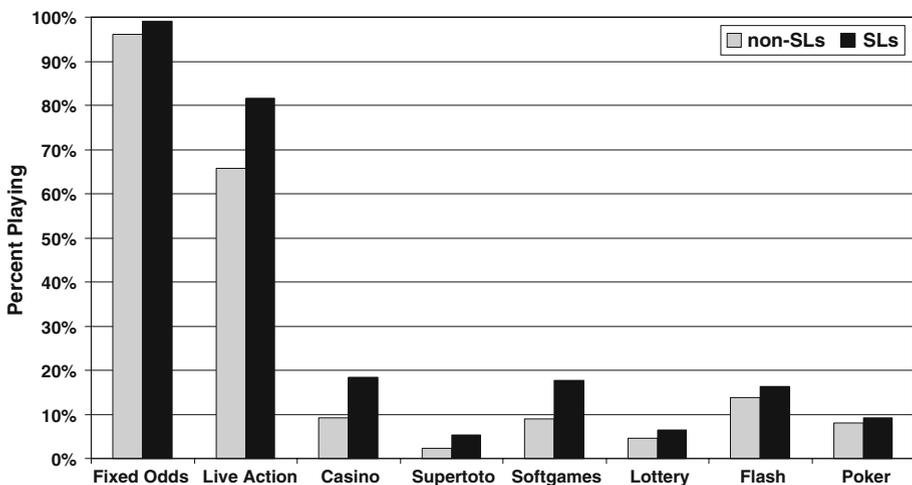


Fig. 1 Game choice of SLs and non-SLs. SL = self-limiter; non-SL = non-self-limiter (i.e., rest of the sample)

depending on date of enrollment, and the average duration from first to last bet in the entire sample was 299 days (median = 350 days).

We first compared SLs' behavior to that of non-SLs for all sports gambling, and then compared their behavior to that of non-SLs for fixed-odds and live-action betting separately. We also compared SL's and non-SL's behavior for poker and for other games (i.e., casino, softgames, supertoto, flash, and lottery).

For combined betting on both fixed-odds and live-action propositions, prior to imposing self-limits, SLs bet on more days within their interval of betting and placed more bets per day than non-SLs. However, they wagered less money per bet. Their total wagered and net loss were not significantly different from non-SLs ($M = 3224.98$ vs. $M = 2724.81$, $t[45960] = 0.94$, $p > .05$, and $M = 362.98$ vs. $M = 253.78$, $t[45960] = 2.15$, $p > .01$, respectively), even though they did not have the full range of possible betting days afforded the rest of the sample (i.e., their duration could only entail the time from registration to limit-setting, whereas non-SLs' duration entailed the time from registration until either account close or the end of the study). To correct for this, we created two variables, net loss divided by duration and amount wagered divided by duration. On these variables, SLs and non-SLs did not differ significantly. Finally, SLs' % loss was similar to that of non-SLs. Table 1 summarizes these findings.

Separate comparisons of fixed-odds and live-action betting revealed similar patterns. Almost everyone placed fixed-odds bets (SLs = 98.7%; non-SLs = 96.0%) and fixed-odds betting mirrored the pattern of significant differences observed for total sports wagering; SLs bet more frequently and made more but smaller bets per day than non-SLs. Prior to placing their limits, live-action betting was more popular among SLs (75.3%) than non-SLs (65.8%), $\chi^2(1) = 21.2$, $p < .001$. For live-action betting, SLs also placed more bets per day but wagered less money per bet than non-SLs. However, the live-action frequency did not differ significantly between SLs and non-SLs (see Table 1).

SLs who played poker prior to placing limits (5% of SLs) did not differ significantly on any of the available poker variables from non-SLs who played poker (8% of non-SLs). The 22% of SLs (prior to placing limits) and 22% of non-SLs who played other games (i.e., casino, supertoto, flash, lottery, and/or softgames) did not differ significantly on any variables related to those other games except the amount wagered per bet. Non-SLs wagered more per bet on other games than SLs (see Table 1).¹

Though the comparisons between SLs and non-SLs detected statistically reliable differences, the effect sizes, presented in Table 1, indicate that all of these differences were small.

Self-Limiter Post-Limit Gambling Behavior

Five hundred and seven SLs (89.4%) continued to bet after imposing limits on their play. We first compared SLs' post-limit behavior to their pre-limit behavior for combined sports gambling, and then compared their behavior for fixed-odds and live-action betting, as well

¹ Previous analysis of this sample (LaBrie et al. 2007) empirically established that the top 1% of the sample on certain variables exhibited behavior that was extreme compared to the rest of the sample. Based on that finding, we repeated the comparisons between SLs and non-SLs presented in Table 1 excluding non-SLs whose bets per day, stakes per bet, total wagered, or net loss placed them in the top 1% of the sample. (Frequency and % loss did not exhibit the same discontinuous distribution.) This resulted in 1,410 non-SLs being excluded. These comparisons revealed a pattern of differences identical to the pattern presented in the Table with the following exception: for live-action betting and betting on other games, euros per bet were no longer significantly different between SLs and non-SLs.

Table 1 Gambling behavior of SLs before imposing limits, compared to the rest of the sample

Variable	All sports betting $M(SD)$			Fixed-odds betting $M(SD)$			Live-action betting $M(SD)$			Poker ^a $M(SD)$			Other games $M(SD)$		
	SL pre-limit (n = 522)	Non-SL pre-limit (n = 45,439)	η^2	SL pre-limit (n = 520)	Non-SL pre-limit (n = 44,705)	η^2	SL pre-limit (n = 397)	Non-SL pre-limit (n = 30,626)	η^2	SL pre-limit (n = 30)	Non-SL pre-limit (n = 3,703)	η^2	SL pre-limit (n = 121)	Non-SL pre-limit (n = 10,657)	η^2
Frequency	33.42* (29.72)	28.05* (29.89)	0.0004	32.62* (30.28)	26.60* (29.32)	0.0004	34.12 (34.38)	33.04 (37.57)	<0.0000	–	–	–	43.26 (41.20)	42.55 (41.71)	<0.0000
Bets/day	6.72* (6.74)	4.76* (5.00)	0.0010	4.69* (5.21)	3.70* (4.01)	0.0004	5.45* (5.44)	3.97* (4.10)	0.0009	–	–	–	19.93 (19.06)	20.04 (17.08)	<0.0000
Stakes/bet (Euros)	6.57* (11.12)	12.00* (30.08)	0.0025	6.15* (10.51)	11.46* (30.85)	0.0027	7.73* (15.28)	11.05* (24.82)	0.0006	–	–	–	14.01* (41.67)	31.44* (171.14)	0.0016
Wagered/ duration	16.90 (55.81)	16.06 (73.11)	<0.0000	7.00 (14.86)	8.80 (35.67)	0.0002	17.40 (59.29)	16.55 (81.05)	<0.0000	23.50 (26.58)	41.50 (201.61)	0.0025	159.29 (1093.40)	172.81 (1184.23)	<0.0000
Netloss/ duration	3.00 (9.93)	3.75 (24.77)	0.0001	2.09 (8.39)	3.07 (23.19)	0.0001	1.71 (7.00)	2.33 (20.24)	0.0001	7.82 (15.77)	7.56 (88.90)	<0.0000	7.02 (36.84)	11.69 (62.79)	0.0002
% Loss	0.25 (0.37)	0.29 (0.49)	0.0001	0.28 (0.49)	0.31 (0.55)	<0.0000	0.19 (0.43)	0.23 (0.59)	0.0001	0.30 (0.30)	0.26 (0.60)	0.0002	0.20 (0.28)	0.20 (0.45)	<0.0000

Note: SL = self-limiter; non-SL = rest of the sample. Frequency = percent of days within interval from first to last bet (or first bet to limit imposition for pre-limit behavior of SLs) on which a bet was placed; Wagered = total amount wagered; Net loss = sum of wagers minus sum of winnings; % Loss = net loss/amount wagered; Duration = interval from first to last bet. Bonferroni correction resulted in an alpha criterion of .001 for significance

* Significant difference between SLs and non-SLs, $p < .001$

^a Information for poker limited to aggregate wager and winning amounts

as poker and other games separately. Finally, we considered SLs' pre- and post-limit betting behavior on their preferred game, defined as the game on which they wagered the most money prior to imposing limits.

Generally, SLs' behavior after imposing self-limits moved in the direction of fewer bets and less money bet. As Table 2 shows, overall, SLs significantly reduced their number of sports bets per day after imposing self-limits. Amount wagered on sports bets, controlling for duration, also decreased. Frequency of betting days, amount wagered per bet, net loss, and % loss did not change for overall sports betting.

Table 2 also summarizes separate comparisons of fixed-odds and live-action betting, as well as poker and other games. Fixed-odds betting demonstrated a similar pattern of change to that found for overall sports betting. For fixed-odds betting, SLs reduced the frequency of days on which they bet, placed fewer bets per day, and reduced their total amount wagered, controlling for duration, after imposing limits. For live-action betting, poker, and other games, SLs who continued to play did not significantly change their behavior after imposing limits; this might be due, particularly for poker and other games, to the limited number of cases in these subsamples.

As measured by the amount they wagered on each game, the majority of SLs preferred fixed-odds (64.1%) or live-action (22.4%) betting prior to imposing limits. Less than 2% (1.9%) preferred poker, and 9.9% preferred other games. Analysis of post-limit changes in betting behavior by preferred game did not reveal any unique trends. SLs significantly reduced the number of bets they placed per day on their preferred game after imposing limits. Their frequency of betting, and the overall amount they wagered also decreased, but these decreases did not reach significance ($.001 < p < .01$). SLs did not alter the size of their bets and their net loss and % loss did not change (see Table 3).

Self-Limiter Post-Limit Strategies: Abstinence vs. Harm Reduction

Some differences between fixed-odds, live-action, and other forms of betting behavior before and after self-limits possibly reflect different player strategies to stop or limit play on these different types of betting. The previous analyses examined behavior only from individuals who continued to engage in each type of betting after imposing limits. To address this issue, we compared the proportion of SLs who initiated and ceased different types of betting before and after imposing limits (see Fig. 2), and also investigated whether SLs' preferred game changed after imposing limits (see Table 4).

SLs' likelihood to stop betting on a given game after imposing limits differed significantly by game ($\chi^2(3) = 22.2, p < .001$). More SLs stopped placing bets on live-action after imposing limits (20.9%) than stopped placing bets on fixed-odds (13.8%). SLs who played poker or other games were even more likely to stop play on those games after imposing limits—23.3% and 31.4%, respectively. Figure 2 displays pre- and post-limit play for fixed-odds, live-action, poker, and other games. The percentages in the figure differ from percentages presented above because the percentages presented above consider all SLs who played a given game prior to imposing limits, whereas the percentages in the figure reflect all SLs who played a given game either before or after imposing limits.

Analyses by preferred game revealed that the majority of players continued to prefer the same game after imposing limits, but that the proportion who stopped betting or switched their preferred game differed by type of game ($\chi^2(16) = 542.6, p < .001$). Three quarters of SLs who initially preferred fixed-odds betting continued to prefer fixed-odds after imposing limits, and 11% stopped betting. However, only 64% of preferred live-action

Table 2 Gambling behavior of SLs before and after imposing limits

Variable	All sports betting <i>M</i> (SD) [<i>n</i> = 461]			Fixed-odds betting <i>M</i> (SD) [<i>n</i> = 448]			Live-action betting <i>M</i> (SD) [<i>n</i> = 314]			Poker ^a <i>M</i> (SD) [<i>n</i> = 23]			Other games <i>M</i> (SD) [<i>n</i> = 85]		
	SL pre-limit	SL post-limit	η^2	SL pre-limit	SL post-limit	η^2	SL pre-limit	SL post-limit	η^2	SL pre-limit	SL post-limit	η^2	SL pre-limit	SL post-limit	η^2
Frequency	32.45 (29.20)	28.88 (25.99)	0.0100	31.85* (29.80)	25.19* (23.85)	0.0340	33.79 (33.66)	32.26 (33.41)	0.0010	–	–	–	39.12 (39.11)	29.32 (34.23)	0.0340
Bets/day	6.88* (6.84)	5.88* (6.87)	0.0350	4.82* (5.39)	3.91* (4.57)	0.0500	5.81 (5.64)	4.98 (6.24)	0.0300	–	–	–	19.33 (17.50)	13.73 (11.63)	0.0870
Stakes/bet (Euros)	6.54 (11.35)	7.41 (13.29)	0.0080	5.98 (10.59)	6.34 (10.36)	0.0020	8.18 (16.51)	8.92 (16.45)	0.0030	–	–	–	13.53 (30.57)	12.38 (31.06)	0.0010
Wagered/ duration	17.77* (59.03)	12.63* (33.71)	0.0100	7.10* (15.44)	4.31* (8.91)	0.0340	20.39 (66.18)	15.39 (43.23)	0.0060	21.12 (25.75)	21.50 (30.78)	<0.0000	76.02 (181.27)	64.10 (227.00)	0.0030
Netloss/ duration	3.02 (10.24)	2.56 (8.98)	0.0010	2.04 (8.80)	1.18 (5.13)	0.0070	2.17 (7.38)	3.65 (20.29)	0.0050	4.02 (5.54)	2.37 (3.60)	0.0880	3.66 (8.62)	3.86 (12.84)	<0.0000
% Loss	0.23 (0.36)	0.25 (0.49)	<0.0000	0.26 (0.47)	0.26 (0.57)	<0.0000	0.19 (0.40)	0.23 (0.45)	0.0050	0.26 (0.28)	0.18 (0.21)	0.1080	0.14 (0.23)	0.22 (0.27)	0.0590

Note: SL = self-limiter; non-SL = rest of the sample. Frequency = percent of days within interval from first to last bet (or first bet to limit imposition for pre-limit behavior of SLs) on which a bet was placed; Wagered = total amount wagered; Net loss = sum of wagers minus sum of winnings; % Loss = net loss/amount wagered; Duration = interval from first to last bet. Bonferroni correction resulted in an alpha criterion of .001 for significance

* Significant difference between pre-limit and post-limit, *p* < .001

^a Information for poker limited to aggregate wager and winning amounts

Table 3 Gambling behavior of SLs on preferred game before and after imposing limits. [*M*(*SD*)]

Variable	SL pre-limit	SL post-limit	η^2
Frequency (<i>N</i> = 441)	32.52 (30.08)	27.80 (26.30)	0.0160
Bets/day (<i>N</i> = 441)	7.79 (9.42)*	6.28 (7.91)*	0.0460
Stakes/bet (Euros) (<i>N</i> = 441)	9.20 (19.01)	9.48 (20.16)	<0.0000
Wagered/duration (<i>N</i> = 452)	29.34 (97.79)	18.64 (61.89)	0.0170
Net loss/duration (<i>N</i> = 452)	3.31 (10.47)	3.23 (17.25)	<0.0000
% Loss (<i>N</i> = 452)	0.22 (0.35)	0.21 (0.52)	<0.0000

Note: SL = self-limiter; non-SL = rest of the sample. Frequency = percent of days within interval from first to last bet (or first bet to limit imposition for pre-limit behavior of SLs) on which a bet was placed; Wagered = total amount wagered; Net loss = sum of wagers minus sum of winnings; % Loss = net loss/amount wagered; Duration = interval from first to last bet. *N*'s differ for each analysis because three variables were not available for SLs who preferred poker. Bonferroni correction resulted in an alpha criterion of .001 for significance

* *p* < .001

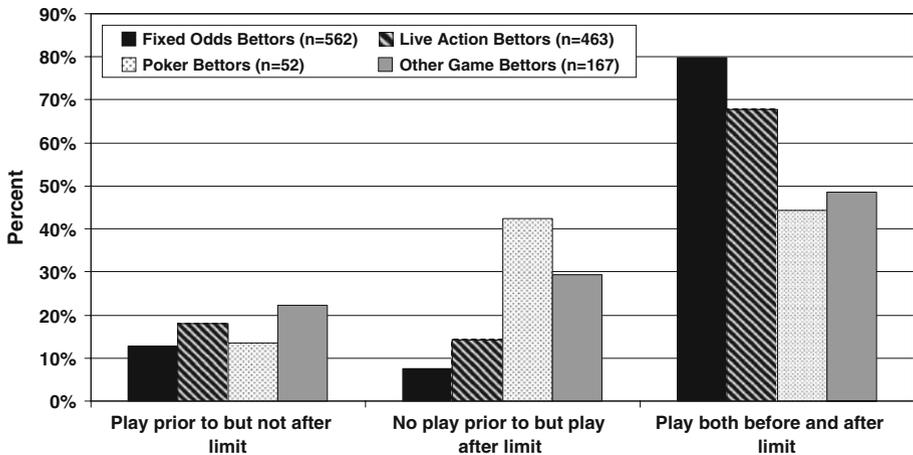


Fig. 2 Play patterns of self-limiters before and after imposing limits. The y-axis refers to percent of SLs playing the given game who fell into the given category on the x-axis

bettors continued to prefer live-action after imposing limits—21% switched to fixed-odds, and 13% stopped betting. See Table 4.

Discussion

Previous research with this sample of *bwin* subscribers has shown that, as a whole, the sample demonstrates relatively moderate betting behavior, as demonstrated by frequency of betting (i.e., less than half of available days and fewer than 4 bets per betting day) and amount bet (i.e., <5 Euros per bet) (LaBrie et al. 2007a). The current study focused on a sub-sample who likely experienced or were at-risk for gambling problems: subscribers who placed limits on the amount they could deposit into their *bwin* betting account. Analyses of these subscribers’ betting behavior before and after they placed self-limits confirmed our

Table 4 Preferred games of SLs before and after imposing self-limits

Preferred game prior to self-limit	Preferred game after self-limit				
	None (no bets placed)	Fixed-odds	Live-action	Poker	Other games
None (no bets placed)	0 (0.0%)	24 (60.0%)	13 (32.5%)	0 (0.0%)	3 (7.5%)
Fixed-odds	37 (10.9%)	252 (74.6%)	37 (10.9%)	2 (0.6%)	10 (3.0%)
Live-action	16 (12.6%)	27 (21.3%)	81 (63.8%)	2 (1.6%)	1 (0.8%)
Poker	0 (0.0%)	1 (10.0%)	0 (0.0%)	8 (80.0%)	1 (10.0%)
Other games	6 (11.5%)	8 (15.4%)	6 (11.5%)	6 (11.5%)	26 (50.0%)

Note: SL = self-limiter. Preferred game = game on which most money wagered. Percentages use number of SLs who played a given game prior to imposing self-limits as the denominator. Bold numbers indicate SLs who maintained stable preferences from pre- to post-limit

hypotheses that their betting behavior was meaningfully different from that of other subscribers who did not place limits on their account deposits; these results also confirmed that SLs altered that behavior after imposing limits. In addition, these analyses allowed us to determine what types of behaviors might be markers of risk for gambling problems and whether SLs' game preferences differed from the rest of the sample.

Activity vs. Expenditure

The overall pattern that emerged across analyses was that SLs were more active bettors than the rest of the sample across a variety of measures. They placed less money at stake per bet and did not lose a greater percent of their wagers than the rest of the sample, but they were more likely to bet on live-action in addition to fixed-odds propositions and more likely to play other games at *bwin*. In addition, they placed more bets, and they bet on more of the days during which their account was active, though these differences were small.

These findings indicate that *involvement*, as measured by the time spent engaging in gambling behaviors might be as important a potential indicator of gambling problems as money wagered or lost. Indeed, previous research has shown that gambling expenditure and frequency are strong *independent* predictors of gambling problems (Currie et al. 2006). Inclusion of time spent engaging in gambling as another criterion for diagnosis of disordered gambling could help clinicians and public health practitioners to identify a wider range of disordered gamblers in need of treatment services. People who exhibit disordered gambling because of time spent gambling and not due to money lost or wagered might represent a subtype of disordered gamblers with unique treatment needs. As with other expressions of addiction (e.g., substance use disorders), disordered gambling supplants other previously valued and important activities and relationships (e.g., time with family, work, hobbies, etc.) with gambling activity. Thus, over-involvement in gambling activities might have as much potential to destroy these relationships as money lost from gambling.

Game Type

As noted above, SLs were more likely to engage in live-action betting than the rest of the sample. Live-action betting is rapid-cycling and provides nearly immediate results. This type of betting might be riskier for some subscribers because of these characteristics, which allow for continued play without much reflection. In contrast to fixed-odds betting, SLs who continued to play live-action after imposing limits did not significantly alter their

betting behavior. However, it is notable that SLs who played both games were more likely to cease live-action play after imposing their limits than to cease fixed-odds play, suggesting that players considered live-action play more perilous.

SLs and non-SLs who played other games, a small proportion of the total sample, did not differ in their betting behavior on those games, and SLs did not significantly alter their betting on those games after imposing limits. However, SLs were more likely than non-SLs to play these other games, again indicating *level of involvement* (i.e., number of types of games played) as a possible risk marker for gambling problems.

SLs' preferred game type tended to remain consistent before and after they placed self-limits. However, SLs who initially preferred live-action or betting on other games were more likely to either stop gambling or switch their preference to fixed-odds than other SLs. This might indicate that these SLs recognized that these games were more risky for them than fixed-odds betting.

Self-Limits as a Self-Help Tool?

Like land-based casino self-limit and self-exclusion programs, *bwin*'s self-limit option allows subscribers to seek help in controlling their gambling behavior by establishing external controls. Research about the effectiveness of self-exclusion programs is limited but promising (see Ladouceur et al. 2007), and research about self-limit programs, online or otherwise, is non-existent.

A limited number of *bwin* subscribers (approximately 1.2%) participated in the self-limit program. To date, we cannot determine whether this is because of the nature of the program provided by *bwin*, general hesitancy to self-limit online gambling behavior, the absence of need, or other reasons. Future research ought to investigate the accessibility of self-limit programs, as well as gamblers' impressions of these programs.

The current study found that subscribers who imposed self-limits did reduce some of their gambling behaviors after imposing those limits, and did so in a way that shifted their behavior toward that of the rest of the sample. Primarily, SLs reduced their frequency of play, both the number of days on which they placed bets and the number of bets they placed per betting day. The amount they wagered per bet did not change significantly, though they did reduce the total amount they wagered. These behavioral changes again highlight the importance of activity level, not just money bet or lost, as a risk for gambling problems and as a target for change.

More than 10% of the sample ceased all betting on *bwin* after imposing limits. It is possible that for this group, the very act of using *bwin*'s self-limit feature influenced them to reconsider their gambling behavior.

Limitations

A strength of the current study is the access it provides to the real-time betting transactions of a large cohort of online gamblers. However, because the study includes only behavioral measures and no self-report measures, we do not know how satisfied subscribers were with the self-limit program, which behaviors they believed were problematic, and how their expenditure related to their income.

Another caveat is that, though self-limiting subscribers are likely to have experienced gambling problems, they might not be representative of all subscribers with problems. Only a small minority of people with a gambling problem will actively seek help for that problem (Slutske 2006). Thus, we are limited in the conclusions we can draw about the

online gambling behavior of people with gambling problems who do not seek help. Similarly, some self-limiting subscribers might not be experiencing problems but instead be using the self-limit option to avoid potential problems. This is especially likely for the 7% of self-limiters we found who placed limits prior to engaging in any betting activity.

These analyses included only subscribers' *bwin* betting activity. It is possible that SLs began or increased betting on other sites after imposing limits on their *bwin* betting. In particular, the 10.6% who ceased all *bwin* betting might have switched their activity to another site. However, *bwin* self-limits can be changed, so it is unlikely that subscribers participated in betting on other sites just to avoid their limits.

Finally, *bwin* is primarily a sports betting site; consequently, these analyses mainly focused on sports bettors. The gambling behaviors and effects of a self-limit program on those behaviors might be very different for Internet gamblers who focus on other games, such as casino games or poker. Future research will be necessary to clarify this issue.

Implications

If the history of Internet commerce and casinos are indicators, Internet gambling will grow exponentially during the next decades. Responsible gambling programs, similar to those now implemented by almost all casinos, likely will accompany that growth. *bwin*'s self-limit program is one of the first of its kind and, as the findings from this study show, might be a promising option for subscribers experiencing or at-risk for gambling problems. This type of program appears to help subscribers reduce their betting activity (i.e., frequency of betting, bets per day, and total wagered) and in some cases possibly cease their gambling behavior. More studies of this kind are necessary both to examine the effect of responsible gaming efforts on Internet gambling and to continue to assess the effect of casino self-exclusion and self-limit programs on patrons' behavior.

In addition, the analyses from this study reveal that individuals who believe that they are having problems with gambling (i.e., those who imposed self-limits) exhibit higher activity levels, but not necessarily higher expenditures than other bettors. This implies that, in considering risk, researchers and clinicians might need to pay at least as much attention to time spent gambling in relation to other activities as to money spent or lost.

Acknowledgments *bwin*, Interactive Entertainment, AG provided primary support for this study. The authors extend special thanks to Christine Reilly, Christine Thurmond, and Ziming Xuan for their support and work on this project. Dr. Nelson had full access to all of the data in the study and takes responsibility for its integrity and the accuracy of the data analysis. None of these supporters or any of the authors has personal interests in *bwin* and its associated companies that would suggest a conflict of interest.

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