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Do gambling activity patterns predict gambling problems? A latent class analysis of gambling forms among Australian youth

JENNIFER M. BOLDERO¹, RICHARD C. BELL¹, and SUSAN M. MOORE²
Psychological Sciences, University of Melbourne, Australia, ²Faculty of Life and Social Sciences, Swinburne University of Technology, Australia
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Abstract

Although gambling frequency and easy access to gambling are predictive of gambling problems among young people, little is known about their patterns of gambling activities. The current study investigated the gambling patterns of a large sample of youth (N = 1061) using latent class analysis. Six activity classes of young gamblers were identified: Rare, Lottery/Scratch card, Broad Ranging, Pool, Unrestricted Access, and Heavy gamblers. The classes differed significantly on age, gender, number and type of gambling activities, gambling frequency, problem gambling, and amount spent on gambling. In addition, the relationship between problem gambling and the amount spent differed across classes. The results indicate the value of assessing gambling patterns as well as gambling frequency in research examining problem gambling. Although older youth have more opportunity to legally engage in a wider range of gambling activities, young people’s gambling activity patterns are more indicative of potential gambling problems than age.
Introduction

Evidence suggests that adolescents typically engage in different combinations of gambling activities from adults (Welte, Barnes, Tidwell, & Hoffman, 2009), probably because of both limited finances and legal restrictions on young people entering gambling venues. Such restrictions are more difficult to enforce for some gambling activities (e.g., gambling among friends, Internet gambling) than others (e.g., entering casinos, using electronic gaming machines [EGMs]). There has been speculation that participation in particular gambling activities (Griffiths, 2002; Productivity Commission, 2009) is associated with problem gambling. It is possible that choice of gambling activity and particular combinations of activities may be as important as overall frequency of gambling in predicting gambling problems.

One review examining this proposition found that the activities associated with problem gambling differ across countries (Welte et al., 2009). In the United States youth problem gambling is associated with betting on card games, sports events, and games of skill (Engwall, Hunter, & Steinberg, 2004; Welte, Barnes, Tidwell, & Hoffman, 2007). In Australia, a study of high school students by Defrabbro, Lahn, and Grabosky (2005) found that problem gamblers were significantly more likely to gamble on card games, racing, EGMs, sports, and the Internet than non-problem gamblers. Among adult problem gamblers residing in Victoria, Australia, the most frequent gambling activities appear to only marginally overlap with those of problem gambling youth. These adult problem gamblers were more likely to wager on EGMs, Lotto/Powerball, and the pools (Department of Justice, 2009).

Alongside country differences, sex and age differences are often reported. Like their adult counterparts, young males are more likely than young females to
gamble, to participate in more gambling activities, and to be problem gamblers (Bakken, Götestam, Gråwe, & Wenzel, 2009; Delfabbro, King, Lambros, & Puglies, 2009; Delfabbro et al., 2005; Kessler et al., 2008; Molde, Pallesen, Bartone, Hystad, & Johnsen, 2009; Moodie & Finnigan, 2006). Similarly, like adults, young males prefer skill-based activities (e.g., poker, card games) whereas young females prefer those that are chanced-based (e.g., bingo, lotto) (Delfabbro et al., 2005, 2009; Gausset & Jansbøl, 2009; Holtgraves, 2009). Finally, not surprisingly given that gambling by those under 18 is illegal in Australia, the number of Australian adolescents who report gambling increases with age as does the percentage classified as problem gamblers (Delfabbro et al., 2005, 2009).

Recently, some studies of adult gamblers have examined whether problem gambling is associated with engaging in specific activities in combination with others (Goodie & Lakey, 2007; Papoff & Norris, 2009). This has been motivated by the recognition that those who gamble typically engage in more than one activity (e.g., Moodie & Finnigan, 2006). Goodie and Lakey (2007) found that although lottery gambling was a predictor of college students’ gambling-related problems, among frequent lottery gamblers, participation frequency was unrelated to gambling problems. In contrast, Papoff and Norris (2009) found that among their sample of adults from Ontario, Canada, those who gambled on scratch cards engaged in more activities, and were more likely to be problem gamblers, than those who did not.

Welte and colleagues (2009) found that participation in certain gambling activities, like Internet gambling, was associated with gambling on a greater range of other activities than was participation in other forms of wagering, such as buying lottery tickets. The implication is that some forms of gambling may be more indicative of potential problems. They also found that engaging in any one of four
specific activities in the last year, along with gender, was related to gambling problems. These activities were betting on card games, games of skill, ‘routine daily events’ (e.g., betting on elections), and casino gambling. In addition, betting on card games or games of skills during the past year were more strongly associated with problem gambling for females than for males.

The results of Goodie and Lakey (2007), Papoff and Norris (2009), and Welte et al. (2009) suggest that considering the associations between problem gambling and gambling activity type is likely to be profitable. What these studies neglected to examine was whether there were specific patterns of gambling activities that were associated with problematic gambling. Latent class analysis, in which gambling activity data are dichotomized (e.g., engaged or not engaged in a particular gambling activity), is a powerful statistical technique that can be used to determine whether groups of individuals who do or do not engage in specific activities exist. The technique assumes that if there are distinct latent classes (or groups) of individuals based on observed multivariate categorical variables. These can be distinguished from one another using these multiple categorical indicators (Lazarsfeld & Henry, 1968). Although not widely used in gambling research, latent class analysis has been reported in two recent studies.

Hong, Sacco, and Cunningham-Williams (2009) modeled older adult gamblers’ (i.e., those over 50 years of age) responses to the DSM-IV gambling criteria (e.g., preoccupation with gambling, chasing losses) with respect to both lifetime and current gambling. They found two latent classes for both time frames; gamblers with no problems and those with problems. Of the ten criteria, higher conditional probabilities of endorsement of all criteria except engaging in illegal activities differentiated between the classes.
Examining the gambling activities of a cohort of Missouri undergraduate students over a four-year period, Goudriaan, Slutske, Krull, and Sher (2009) found a four-class solution for each year. One small class, (i.e., < 4% of participants) were ‘extensive’ gamblers in that they engaged in all 10 surveyed activities. This group was predominantly male and had the highest proportion of self-reported problem gamblers. They participated in more activities and gambled more frequently than those in the other classes. The second class, which included casino/slot machine gamblers, was small in the first two years (i.e., < 5% of participants) but increased in size in subsequent years to 24% and 31%, respectively. The transition between Years 2 and 3 of undergraduate study was attributed to the fact that some participants were between 17.5 and 19.5 years when recruited and thus attained the legal age for casino gambling (i.e., 21 years) in Year 3. Interestingly, those in this group were more likely to be females. The third class, including between 13% and 19% of participants across the four years, engaged in card playing and lottery gambling. Consistent with the results of US studies that have shown betting on card games is associated with youth problem gambling (Engwall et al., 2004; Welte et al., 2007), those in this class were also at risk of problem gambling. Finally, there was a class with low involvement in all activities that gambled less frequently than those in other classes. This class was larger in the first two years (> 70%) than in the last two (< 60%). Those in it were more likely to be females and unlikely to be problem gamblers.

These studies demonstrate the utility of latent class analyses to differentiate groups of student- and older gamblers. However, to date no studies have considered whether groups of young gamblers can be differentiated on the basis of whether or not they have engaged in particular gambling activities and whether gambling is more problematic for some groups. This is particularly important given the cumulative body
of research that demonstrates a link, at least for males, between problem gambling and beginning gambling at an early age (Shead, Derevensky, & Gupta, 2010). If those who are relatively young and have problematic gambling patterns can be identified, early intervention strategies can be developed.

The western suburbs of Melbourne, Australia, have a relatively large number of gambling venues, possibly rendering residents vulnerable to problem gambling (Moore & Ohtsuka, 2001). The participants in the current study were those attending secondary schools in these suburbs. Of interest, first, was the identification of latent classes with homogeneous patterns of gambling activities. Second, whether the number of activities engaged in, gambling frequency, the amount spent, and problem gambling differed as a function of class was also examined. We also examined whether, consistent with Goudriaan et al.’s (2009) findings, the proportions of males and females differed across classes. In addition, because the engagement in some activities by those younger than the legal age (i.e., 18 years) is rigorously restricted whereas engagement in other activities is not (e.g., gambling in clubs vs. gambling on scratch cards), we examined whether those in some classes (e.g., those including individuals who engaged in restricted activities) were older than those in others. Finally, because spending more money has been linked to problem gambling (Hansen & Rossow, 2008; Moodie & Finnigan, 2006), we examined whether any relationship was the same across latent classes, thus examining whether spending money on particular combinations of activities is more problematic.

Method

Participants
Participants were 1061 adolescents and young people. Of these, 479 were male, 577 were female, and five did not specify their gender. They were volunteers from Years 10 ($N = 218, 21\%$), 11 ($N = 438, 46\%$), and 12 ($N = 358, 34\%$) (i.e., the last three years of secondary school) of five secondary schools in the western suburbs of Melbourne Australia. The sample ranged in age from 14 to 21 years ($M = 16.61$ years, $SD = 1.44$).

Measures
As part of a larger survey of gambling and risk-taking, participants completed the following measures:

*Gambling Frequency.* Participants rated the frequency of engagement in 12 different types of gambling (see Table 1), on a 5-point Likert scale ranging from participated never (0), once a year (1), more than once/year but less than once/month, (2), more than once/month but less than once/week (3), to once a week or more (4). The mean rating across the 12 gambling types was used as an index of gambling frequency.

*Amount spent on gambling.* Participants rated the amount spent on gambling in any one week period and the total amount they had spent in the last 12 months on two 7-point Likert scales, from $0$ (0), less than $10$ (1), between $10$ and $99$ (2), between $100$ and $499$ (3), between $500$ and $999$ (4), between $1000$ and $4999$ (5), more than $5000$ (6). We formed a composite index by averaging the two ratings. This index had adequate internal consistency; Cronbach’s $\alpha = .83$.

*Gambling Problems.* A modified version of the South Oaks Gambling Screen (SOGS, Lesieur & Blume, 1987) was used as the measure of problem gambling, with statements in the screen adapted to the Australian idiom and to the age of the population (as in the case of the South Oaks Gambling Screen–Revised Adolescent
Idiom alterations included changing the word “intend” to “meant”, and the phrase “skipped or been absent” (from school or work) to “took time off” (from school or work). Age-related alterations involved changing the item concerning keeping the amount of gambling secret from “spouse, children, and other important people” to “family and friends”. The major change was that a 5-point Likert scale (strongly agree to strongly disagree) was applied to the problem gambling statements, rather than a yes/no format. This was to maintain some consistency in response requirements across the questionnaire and to increase potential discriminability of the measure in a sample likely to have few problem gamblers. Ratings across the 10 items were summed to form a measure with a possible range of scores from 10 to 50, such that high scores represent higher levels of perceived problem gambling. Evidence of reliability and validity are available for the modified scale from previous studies of youth gambling (Moore & Ohtsuka, 1997, 2001). In the current study, the scale’s internal consistency was excellent, Cronbach’s $\alpha = 0.94$. The modified scale can be interpreted as providing a continuous measure of problem gambling readily administered for research purposes, but it is important to note that it does not supply data that are directly comparable to the SOGS, SOGS-RA, or other diagnostic instruments. Cut-off points to diagnose clinical levels of problem gambling have not been established.

Procedure

In 1998 and 2000, young people in Years 10, 11 and 12 at five state secondary schools in the western suburbs of Melbourne were surveyed regarding their gambling behaviour. After attaining ethics approval from the Victorian Education Department (Australia) and the employing universities of the third author, principals of the five schools were approached. All gave permission for the study to proceed. Both parental
and student approval was necessary for students under 18 years to be part of the study, whereas parental approval was not required for those who were 18 or older. In the current study, students who completed the survey twice (in both 1998 and 2000) only had one set data. As surveys were anonymous, this was achieved by removing the Year 10 data gathered in 1998 and by asking any student who had repeated (or was repeating) a year level to refrain from participating in 2000. Volunteer students were surveyed in class groups while non-participating students in the class engaged in other work or went to the library. The survey took approximately 15 minutes to complete. Teachers administered the survey after consultation with a research assistant. Schools were given small donations toward sporting equipment or books for the library in recognition of their students’ participation in the study.

Results

Descriptive Summary

As the frequencies of gambling in each activity were skewed, we dichotomized responses so that they reflected whether or not individuals had participated in each. On average, our adolescent sample reported that they had engaged in approximately four activities at least once ($M = 3.7$, $SD = 2.6$). Despite most surveyed activities being illegal for those under 18 (e.g., betting on horse races, playing poker machines, table gambling, gambling at pubs and clubs), all were engaged in to some extent (see Table 1). Most participants engaged in unrestricted (e.g., cards) or poorly supervised (e.g., lottery and scratch cards, betting on horse races) activities whereas relatively few engaged in those that occur in venues where the age of those entering is monitored (i.e., restricted activities). No activity was undertaken on its own. Those engaging in any one activity also engaged in two or three others.
There were 4096 possible patterns of the 12 surveyed activities. Of these, our sample engaged in 401 different patterns. Although the most common one was engagement in no activities (12%), 72% of patterns involved engaging in between three and seven different activities.

*Latent class analysis*

Using latent class analysis, we fitted two through seven latent class models that were evaluated using appropriate statistical fit indices, specifically the likelihood ratio chi-square (LR$\chi^2$), the Akaike information criterion (AIC; Akaike, 1987), the Bayesian information criterion (BIC; Schwartz, 1978), and the sample-size adjusted BIC (SSABIC; Sclove, 1987). As non-significant values of LR$\chi^2$ and smaller values of AIC, BIC, and SSABIC indicate that a model fits, all models fit the data (see Table 2). As a result, we used the Lo-Mendell-Rubin adjusted Likelihood Ration Test (LMR LRT; Lo, Mendell, & Rubin, 2001) to compare models. A non-significant value (i.e., $p > .05$) for this index indicates that the model with one fewer class should be accepted. Thus, the best-fitting model was the six-class model.

The six classes were defined by the distinct types of gambling activities engaged in by individuals in them. The first class was relatively large and included individuals with the lowest probability of engaging in all activities (see Table 3).
Thus, they were “rare” gamblers. The second class was the largest. This included individuals with relatively high probabilities of lottery and scratch card gambling and moderate probabilities of gambling on cards and horse races. As a result, they were “lottery/scratch card” gamblers. Class III was a smaller group that included individuals who were likely to engage in all activities. Consequently, this class included those who were “broad” gamblers. The fourth class, which was slightly larger than the third class, included those with a higher probability of gambling on pool, moderate probabilities of gambling on card, races, and sport, but no involvement with lottery, scratch card, or legally-restricted gambling. Thus, those in this class were predominantly “pool” gamblers. Class V was a moderately large class and included those who had the highest probability of gambling on pool, high probabilities of gambling on cards, lotteries, and scratch cards, and moderate probabilities of gambling on races, sport, and bingo, all of which are activities that have relatively unrestricted access. As a result, this class included those who were “unrestricted activity” gamblers. The sixth class was the smallest. The individuals in this class had highest probabilities of gambling on all activities except at gaming tables. As a result they were termed “heavy” gamblers.

To further explore the nature of the differences between our latent classes, we examined whether class membership was associated with sex and whether there were age differences across the classes. We also examined the number of gambling activities engaged in and scores on our gambling frequency index as a function of
class. Finally, we examined whether the classes differed in the amount they reported spending on gambling and gambling problem levels, operationalized by scores on our modified version of the SOGS-RA.

Class membership was associated with sex, $\chi^2 (5) = 111.62, p < .001$. Those in the Pool, Unrestricted Activity, and Heavy classes were more likely to be male (73.3%, 61.1%, and 66.7%, respectively). Females dominated the remaining three classes. Additionally, there were more females in the Lottery/Scratch card class (70.5%) than in the Rare and Broad classes, which had similar proportions of females to that in the total sample (i.e., 60.7% and 61.3%, respectively).

Our latent classes differed with respect to age, $F (5, 105) = 15.32, p < .001$. Those in the Pool and Unrestricted Activity classes were the youngest whereas those in the Broad class were the oldest (see Table 4). The remaining three classes did not differ in age.

INSERT TABLE 4

The mean number of activities engaged in and rated gambling frequency across all activities differed across classes, $F (5, 1055) = 983.14, p < .001$, and $F (5, 1055) = 360.75, p < .001$, respectively. Those in the Heavy class engaged in the most activities and gambled most frequently, whereas those in the Rare class engaged in the least activities and gambled least frequently. In addition, those in the Lottery/Scratch card and Pool classes did not differ in the number of activities engaged in or gambling frequency but they engaged in fewer activities and gambled less frequently than those in either the Broad or Unrestricted Activity classes.

There were differences in our index of the amount gambled as a function of
latent class membership, $F(5, 1052) = 135.52, p < .001$. Those in the Rare class spent the least whereas those in the Heavy class spent the most. The amounts spent by the Pool and Lottery/Scratch card classes did not differ nor did that spent by the Broad and the Unrestricted Activity classes. The Broad and the Unrestricted Activity classes indicated that they spent more than the Pool and Lottery/Scratch card classes.

Finally, there were differences in problem gambling scores as a function of class membership, $F(5, 1055) = 16.61, p < .001$. Those in the Lottery/Scratch card and Rare classes had the lowest levels whereas those in the Heavy, Unrestricted Activity, or Pool classes had the highest. The level of those in the Broad class fell between these two extremes.

**Prediction of problem gambling from amount gambled index**
To examine whether the amount gambled is uniformly problematic or whether spending money on particular activity patterns is more problematic, we examined whether our index of this factor differentially predicted problem gambling levels within each of our six latent classes. We tested this with an analysis of covariance model, using Type I sums of squares decomposition, to hierarchically model the effects of the amount gambled (i.e., the covariate), latent class (i.e., the categorical factor), and their interaction.

As expected, there was relationship between the amount gambled index and problem levels, $F(1, 1046) = 93.36, p < .001$. However, latent class was also a predictor, $F(5, 1046) = 7.39, p < .001$, as was the interaction of latent class and amount gambled, $F(5, 1046) = 3.54, p < .01$. Thus, the relationship of the amount gambled with problem levels differed as a function of class.

To determine the exact nature of this interaction, we examined the
standardized regression coefficients (i.e., $\beta$) for each class. All $\beta$s, except those for the Rare and Pool classes, were significantly different from 0 (i.e., $p < .05$). In addition, the value of $\beta$ for the Broad and Heavy classes was .47 and .41 respectively, whereas for the remaining four classes it was less than .17. Thus, it was possible that the interaction effect occurred because our index was more strongly related to problem levels for the Broad and Heavy classes than for others.

To test this, we examined the fit of models that allowed $\beta$ in any class to be constrained to be zero or equal to that in other classes. The model that was the best fit to the data was that in which the coefficients for the Rare and Pool classes were zero, and those for the Broad and Heavy classes were equal but greater than those for the Lottery/Scratch ticket and Unrestricted Activity classes, that were likewise equal, $\chi^2 (4) = 6.02, p = .198$.

**Discussion**

The greater majority of our school-based sample reported gambling and, like those in Welte et al.’s (2009) student sample, engaged in a number of different activities. Not surprisingly, given their age, relatively few engaged in activities that occur in venues where access by those under the legal age may be monitored and restricted. Despite this, their patterns of engagement were complex and six latent classes accounted for these. Those in only two latent classes engaged in (mostly) specific activities (i.e., the Pool and Lottery/Scratch card classes). Of the remaining four classes, one comprised individuals who gambled rarely (i.e., Rare class) whereas the remaining three comprised individuals who engaged a broad range of activities.

The Heavy class was the smallest and included individuals who had the highest probabilities of engaging in all activities, except playing poker machines,
although their probability of engaging in this activity was also comparatively high. The majority in this class were male and of average age for the sample (i.e., about 16 and a half years). This is interesting given that they gambled in venues where access is monitored (e.g., pubs and clubs). Their age also likely explains why the probability of poker machine gambling was not higher. Of course older family members may have facilitated their gambling on some activities (e.g., Fabiansson, 2006). They also indicated that they spent the most and had the highest problem levels. Finally, our index of the amount spent was relatively strongly related to problem levels. Thus, using Gambling Research Australia’s (2005) definition of problem gambling as “characterized by difficulties limiting money and/or time spent on gambling which leads to adverse consequences for the gambler, others, or for the community” (p. i), they could be considered to be a high-risk group.

The Unrestricted Activity class was numerically large and comprised more males than females. They were among the youngest in our sample. Although they bore some resemblance to those in Pool class, having substantial probabilities of betting on card and pool games, they were also like those in the Broad class because they had substantial probabilities of engaging in other activities, gambled with the same frequency, at the same number of activities, and indicated that they spent the same amount.

The Unrestricted Activity and Broad classes could be differentiated by their activity patterns. Those in the Unrestricted Activity class had lower probabilities of gambling in restricted-access venues whereas those in Broad class were less likely to gamble on sport and the pool games. Two factors likely account for this. First, those in the Broad class were among the oldest whereas those in the Unrestricted Activity class were among the youngest. Thus, the access of the latter class to pubs and clubs
and to venues in which there are poker machines and gaming tables was likely more
difficult. In addition, consistent with the results of studies that have shown that
females are less likely than males to gamble on skill-based activities (Delfabbro et al.,
2005, 2009), those in the Broad class were more likely to be female. A final feature
that distinguished these classes was the relationship between the index of the amount
gambled and gambling problems. This relationship was moderate for the Unrestricted
Activity class whereas for the Broad class, as for the Heavy class, it was relatively
strong. As the individuals in these latter two classes were those who were more likely
to gamble on poker machines and in pubs and clubs (where poker machines are
available), this suggests that spending more money on these activities is particularly
problematic.

The Lottery/Scratch card class was the largest class. Those in it had moderate
probabilities of gambling on cards and horse racing and similar probabilities to those
in Broad and Unrestricted Access classes of gambling on lotteries and/or scratch
cards. However, their probability of engaging in the other activities was low. They
were of average age and, along with the Rare class, had the lowest problem levels.
They engaged in approximately half the number of activities and with half the
frequency of those of in the Broad and Unrestricted Access classes. Finally, consistent
with the results of studies that have found that females are more likely to gamble on
chance-based activities (Delfabbro et al., 2005, 2009), the proportion of females in
this class was relatively high.

Those in the Pool class were distinguished by their relatively high probability
of gambling on pool. They also had moderate probabilities of gambling on cards,
races, and sport, but no involvement with lotteries, scratch cards, or legally-restricted
activities. Like those in Lottery/Scratch card class, they gambled on relatively few
activities and they indicated that they gambled relatively infrequently. They nevertheless spent more than those in the Lottery/Scratch card class and were more likely to be male.

Finally, the Rare class was the second largest class. The individuals in it had low probabilities of engaging in, and engaged in the least number of, gambling activities. Additionally, along with those in the Lottery/Scratch card and Pool classes, they gambled less frequently than those in other classes. Furthermore, not surprisingly, they spent the least amount on gambling. The ratio of males to females in this class was like that of the total sample. Similarly, they were of average age.

Overall, our latent class analysis showed that adolescents’ patterns of gambling activities are complex. Three of our classes, specifically the Heavy, Broad, and Rare classes, are similar to the ‘extensive’, casino/slot, and low-gambling classes identified by Goudriaan et al. (2009). In their sample of college students, the individuals in these classes engaged in all sampled activities, at poker machines and other restricted activities, and were infrequent gamblers, respectively. However, our other three classes were different to the remainder of Goudriaan et al.’s classes. These were individuals who had high probabilities of gambling in activities that do not occur in restricted-access venues and those that gamble predominately on pool and on lotteries and scratch cards (i.e., the Unrestricted Access, Pool, and Lotteries/Scratch card classes). This difference in classes across the studies likely occurred for two reasons. First, our sample was younger than that of Goudriaan et al., being school rather than college students. This likely restricted their access to some venues. Second, the relative access to activities differs across countries. In Australia, gambling on lotteries and scratch cards is relatively easy as tickets can be purchased in most suburban shopping centres, and informal betting among friends or
acquaintances on pool, cards, or sports is easy to arrange and almost impossible to restrict.

The mean number of activities differed across our latent classes as did our indices of the frequency of gambling on the surveyed activities and the amount gambled. Moreover, the differences in these factors were identical across latent classes. This result is not surprising as these factors likely covary substantially.

Consistent with the results of other studies (Gausset & Jansbøl, 2009; Welte et al., 2009), females in our sample were more likely to be in classes with lower problem gambling scores. The males and females in our sample did not form homogeneous groups, engaging in the majority of activities and being at risk for problem gambling, although it is possible that young men are at greater risk than young women if they begin gambling earlier (Shead et al., 2010).

Our latent classes differed in age. As in previous studies (Delfabbro et al., 2005, 2009), there was some evidence that age is associated with more frequent gambling, notably increases with age in engagement in forms that occur in restricted-access venues. Thus, our results, like those of Goudriaan et al. (2009), suggest that legally restricting access to venues is effective for those well below the legal gambling age. However, these individuals do, nevertheless, gamble on other activities. Furthermore, as those in the Unrestricted Activity and Broad classes were similar, it is possible that when they become older their gambling may escalate to include more types/venues. As a result, they may transition into the Heavy class, bringing a concomitant rise in the extent to which their gambling is problematic. This proposition, while speculative, could be the topic of further research.

Finally, like the results of other studies (Hansen & Rossow, 2008; Moodie & Finnigan, 2006), spending more on gambling was related to reporting higher problem
levels. This relationship was strongest for the Broad and Heavy classes, who gambled on activities that occur in restricted-access venues. Consistent with the results of studies using adult samples (Petry, 2003), our results suggest that engaging in these activities might be more problematic than the other activities surveyed. However, because our index of the amount spent had a moderate impact on problem gambling for those in the Lottery/Scratch card and Unrestricted Access classes, these activities are not entirely unproblematic.

Our study is not without limitations. First, as the sample came from one area of metropolitan Melbourne, Australia, the activity patterns may have been influenced by activity availability within this area. Thus, it is possible that the same classes of individuals may not be found in other locations. Second, because our study was cross-sectional, it was not possible to examine how class membership changes over time, particularly when individuals reach the legal gambling age. Finally, we did not assess any individual difference factors associated with problem gambling in older samples (e.g., novelty seeking, Goudriaan et al., 2009). Understanding whether and how these factors are associated with class membership would appear to be a next step for research.

In conclusion, the results of our study suggest, like those of Goudriaan et al. (2009), that gambling in a wide range of activities is problematic, particularly those that occur in venues with restricted access. They also suggest that spending more money on these activities is particularly problematic for young people. Finally, they suggest that understanding the patterns of activities engaged in is important and the factors associated with engaging in these patterns should be considered in future research alongside consideration of factors associated with other characteristics, such as gambling frequency and amount spent, which are also related to gambling
problems.
References


Table 1.

Percentage of participants engaging in each form of gambling and mean and standard deviation of the number of other forms of gambling engaged in.

<table>
<thead>
<tr>
<th>Gambling Form</th>
<th>Percentage</th>
<th>Number of other forms</th>
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<td>Mean</td>
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<tr>
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<tr>
<td>Races</td>
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<td>3.95</td>
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<tr>
<td>Other</td>
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<td>5.10</td>
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Table 2.

Fit indices for two through six latent class models for the gambling activities.

<table>
<thead>
<tr>
<th>Model</th>
<th>( LR^a \chi^2 )</th>
<th>( p )</th>
<th>AIC</th>
<th>BIC</th>
<th>SSABIC</th>
<th>LMR</th>
<th>LRT</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 classes</td>
<td>1857 (4039)</td>
<td>1.00</td>
<td>16166</td>
<td>1629</td>
<td>7</td>
<td>16217</td>
<td>1603</td>
<td>.000</td>
</tr>
<tr>
<td>3 classes</td>
<td>1533 (4024)</td>
<td>1.00</td>
<td>15785</td>
<td>1598</td>
<td>4</td>
<td>15863</td>
<td>403</td>
<td>.000</td>
</tr>
<tr>
<td>4 classes</td>
<td>1348 (4010)</td>
<td>1.00</td>
<td>15647</td>
<td>1591</td>
<td>4</td>
<td>15752</td>
<td>162</td>
<td>.019</td>
</tr>
<tr>
<td>5 classes</td>
<td>1267 (4000)</td>
<td>1.00</td>
<td>15557</td>
<td>1589</td>
<td>2</td>
<td>15689</td>
<td>115</td>
<td>.009</td>
</tr>
<tr>
<td>6 classes</td>
<td>1211 (3989)</td>
<td>1.00</td>
<td>15509</td>
<td>1591</td>
<td>2</td>
<td>15667</td>
<td>73.5</td>
<td>.243</td>
</tr>
</tbody>
</table>

\(^a df\) are included in parentheses.
Table 3.
Number and percentage of participants in each latent class and conditional probabilities for each gambling activity as a function of latent class membership.

<table>
<thead>
<tr>
<th>Latent Class</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cards</td>
<td>.12</td>
<td>.45</td>
<td>.55</td>
<td>.63</td>
<td>.97</td>
<td>.98</td>
</tr>
<tr>
<td>Races</td>
<td>.13</td>
<td>.50</td>
<td>.67</td>
<td>.47</td>
<td>.67</td>
<td>.89</td>
</tr>
<tr>
<td>Sport</td>
<td>.03</td>
<td>.16</td>
<td>.25</td>
<td>.54</td>
<td>.56</td>
<td>.88</td>
</tr>
<tr>
<td>Lottery</td>
<td>.00</td>
<td>.71</td>
<td>.78</td>
<td>.00</td>
<td>.82</td>
<td>.83</td>
</tr>
<tr>
<td>Scratch cards</td>
<td>.10</td>
<td>.61</td>
<td>.71</td>
<td>.00</td>
<td>.75</td>
<td>.83</td>
</tr>
<tr>
<td>Tables</td>
<td>.00</td>
<td>.00</td>
<td>.48</td>
<td>.01</td>
<td>.02</td>
<td>.33</td>
</tr>
<tr>
<td>Poker machines</td>
<td>.02</td>
<td>.04</td>
<td>.71</td>
<td>.01</td>
<td>.03</td>
<td>.46</td>
</tr>
<tr>
<td>Pubs</td>
<td>.00</td>
<td>.10</td>
<td>.75</td>
<td>.06</td>
<td>.11</td>
<td>.99</td>
</tr>
<tr>
<td>Clubs</td>
<td>.00</td>
<td>.00</td>
<td>.36</td>
<td>.03</td>
<td>.05</td>
<td>1.00</td>
</tr>
<tr>
<td>Bingo</td>
<td>.00</td>
<td>.23</td>
<td>.36</td>
<td>.25</td>
<td>.47</td>
<td>.46</td>
</tr>
<tr>
<td>Pool</td>
<td>.00</td>
<td>.09</td>
<td>.26</td>
<td>.80</td>
<td>1.00</td>
<td>.93</td>
</tr>
<tr>
<td>Other</td>
<td>.00</td>
<td>.05</td>
<td>.17</td>
<td>.16</td>
<td>.22</td>
<td>.33</td>
</tr>
<tr>
<td>N</td>
<td>208</td>
<td>370</td>
<td>106</td>
<td>118</td>
<td>177</td>
<td>82</td>
</tr>
<tr>
<td>Percentage</td>
<td>20</td>
<td>35</td>
<td>10</td>
<td>11</td>
<td>16</td>
<td>8</td>
</tr>
</tbody>
</table>

*I= Rare; II= Lottery/Scratch card; III= Broad; IV= Pool; V= Unrestricted Access; VI= Heavy.*
Table 4.
Means age, number of forms of gambling engaged in, problem gambling score, gambling frequency index, and amount gambled index as a function of latent class.

<table>
<thead>
<tr>
<th>Latent Class</th>
<th>Age in years</th>
<th>Number of Gambling Forms</th>
<th>Problem Gambling Score</th>
<th>Gambling Frequency Indexa</th>
<th>Amount Gambled Indexb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score Range</td>
<td>14 - 21</td>
<td>0 - 12</td>
<td>10 - 50</td>
<td>0 - 4</td>
<td>0 - 6</td>
</tr>
<tr>
<td>Rare</td>
<td>16.69</td>
<td>0.41</td>
<td>13.31</td>
<td>0.45</td>
<td>0.27</td>
</tr>
<tr>
<td>(1.11)</td>
<td>(0.52)</td>
<td>(7.07)</td>
<td>(0.07)</td>
<td>(0.57)</td>
<td></td>
</tr>
<tr>
<td>Lottery/Scratch Card</td>
<td>16.64</td>
<td>2.90</td>
<td>12.53</td>
<td>0.38</td>
<td>1.07</td>
</tr>
<tr>
<td>(0.93)</td>
<td>(1.06)</td>
<td>(5.32)</td>
<td>(0.22)</td>
<td>(0.75)</td>
<td></td>
</tr>
<tr>
<td>Broad</td>
<td>17.23</td>
<td>6.03</td>
<td>14.88</td>
<td>0.85</td>
<td>1.86</td>
</tr>
<tr>
<td>(0.95)</td>
<td>(1.45)</td>
<td>(7.01)</td>
<td>(0.41)</td>
<td>(0.87)</td>
<td></td>
</tr>
<tr>
<td>Pool</td>
<td>16.27</td>
<td>2.95</td>
<td>15.96</td>
<td>0.43</td>
<td>1.31</td>
</tr>
<tr>
<td>(0.91)</td>
<td>(1.04)</td>
<td>(8.32)</td>
<td>(0.23)</td>
<td>(1.00)</td>
<td></td>
</tr>
<tr>
<td>Unrestricted Access</td>
<td>16.31</td>
<td>5.60</td>
<td>16.75</td>
<td>0.87</td>
<td>1.85</td>
</tr>
<tr>
<td>(0.91)</td>
<td>(1.16)</td>
<td>(8.72)</td>
<td>(0.37)</td>
<td>(0.83)</td>
<td></td>
</tr>
<tr>
<td>Heavy</td>
<td>16.68</td>
<td>8.78</td>
<td>18.58</td>
<td>1.47</td>
<td>2.44</td>
</tr>
<tr>
<td>(0.92)</td>
<td>(1.59)</td>
<td>(9.06)</td>
<td>(0.61)</td>
<td>(0.96)</td>
<td></td>
</tr>
</tbody>
</table>

*Note: Standard deviations are in parentheses.

a 0 = never, 1= once a year, 2= more than once/year but less than once/month, 3= more than once/month but less than once/week, 4= once a week or more;
b 0 = $0, 1= less than $10, 2= between $10 and $99, 3= between $100 and $499, 4= between $500 and $999, 5= between $1000 and $4999, 6= more than $5000.