

RESEARCH ARTICLE



Age of gambling onset and resultant gambling behavior during young adulthood in the United States

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Abstract

Background and Objectives: Previous research has examined how the age at which an individual first gambles (age of gambling onset) correlates with problematic behavior later in life, such as problematic alcohol or substance use; however, much less is known about how age of gambling onset, particularly as a child or as a young adult, might influence future gambling. We assessed how self-reported age of gambling onset may have shaped more recent gambling and propensity to take risks.

Methods: We analyzed questionnaire data and neurocognitive assessment data collected from young adults in the United States ($n = 579$) and conducted ordinal logistic regression to model our study variables.

Results: Upon examining three distinct age categories (under 18, 18–20, 21, and over), we found that earlier age of gambling onset was significantly associated with betting a higher overall proportion during a neurocognitive task.

Conclusions and Scientific Significance: Gambling more points on a laboratory-based task was correlated to earlier age of gambling onset. There were no statistically significant associations between age of gambling onset and severity of recent pathological gambling, nor gambling expenditure in the past year, nor gambling frequency in the past week. Future longitudinal study should discern the causality of these findings in both directions and ascertain whether these findings can be extended to older and clinical populations. Future work should explore other variables, such as ethnicity and socioeconomic background, that may be relevant to understanding variations in age of gambling onset and its repercussions.

INTRODUCTION

Gambling refers to the wagering of money or other item[s] on a chance event to accrue a return of greater value; it is an activity that dates back to the civilizations of ancient history.¹ However, unlike in ancient and more recent history when gambling was regarded as a leisure activity for adult gentlemen,¹ gambling has become pervasive among males and females of all ages especially with the introduction of online gambling.^{2–5} This literature highlights the prevalence of underage gambling in the United States as an ongoing concern

despite all forms of gambling being illegal under the age of 18 in all states and some forms of gambling being illegal under the age of 21 in some states.* As gambling can precede problematic gambling both during adolescence and adulthood, there is a need for an improved understanding of underlying risks and protective factors.⁶

*For example although legislation is continually changing, see National Research Council for insight into how legal age, gambling opportunities, and restrictions can differ across the United States. <https://www.ncbi.nlm.nih.gov/books/NBK230619/?report=reader>

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Research involving children, adolescents, and young adults should be cognizant of comorbidities between gambling and other forms of addiction and maladaptive behavior during childhood and beyond.⁷ There has been examination of associations between age of gambling onset, characteristics and behavior during childhood and later in life. Correlations have been noted between early age of gambling onset and (co-occurring) problematic alcohol use,^{8,9} drug or substance use,^{8,10} smoking,⁹ depression,^{8,9} poor physical health,¹¹ bankruptcy,^{12,13} attention-deficit hyperactivity disorder (ADHD)^{10,14} and at-risk gambling as a minor.^{8,15} These studies highlight concerns such as heightened problem gambling severity among minors with an earlier age of gambling onset⁸ and maladaptive gambling during childhood serving as a coping mechanism for dysfunctional family environment and as a precursor to bankruptcy during adulthood.¹³ Evidence also points to a positive relationship between the amount spent on gambling and the level of credit repayments.¹⁶ These findings concur with life-course studies that investigated how continued gambling (-related) experiences often worsen with age due to heterogenous factors.¹⁷⁻¹⁹

In light of negative outcomes of continued gambling over the life course, particularly from a young age, there are opportunities to identify characteristics of gambling behavior that might serve as conduits towards these outcomes. More specifically, there is an opening for research to examine whether age of gambling onset correlates with an individual's gambling frequency, incurred gambling losses and performance in a neurocognitive gambling task. This is important so that prevention efforts can be put in place to limit these detrimental behaviors where they are found to be significant indicators of gambling disorder and a possible antecedent to co-occurring risks. It has been found both that gambling later in life is shaped by gambling as a child or adolescent²⁰ and that it is not.²¹ However, scholarly work is consistent in its call for closer investigation of how childhood upbringing can shape gambling in later life so that precursors to the adult clinical presentation of pathological gambling are better understood.²¹⁻²³

Identification of subtypes and groups at increased risk of gambling is imperative from a clinical and a neurological perspective.²⁴ Therefore, we examined strength of associations in young adults between age of gambling onset, and gambling behavior (self-report and using an objective computerized laboratory-based task). Given the body of evidence demonstrating that early age of gambling onset is closely associated with various negative consequences later in life, we hypothesized that there might be associations between more problematic gambling and the age category of individuals when they first gambled. We predicted that at least one variable relating to gambling as a young adult (gambling frequency, gambling expenditure, scores on a scale for pathological gambling, score on a neurocognitive task) would be a significant predictor of age of gambling onset and thus further evidence that the age when young people start gambling merits serious consideration by researchers and policy makers.

METHODS

Subjects

The data for this study were collected from 579 respondents. Participants were between 18 and 29 years of age (mean = 22.3; standard deviation = 3.6) and were recruited in two large US cities. Participants were self-selected in response to media announcements and they were compensated with a \$50 gift card. The sample was comprised of non-treatment seeking young adults who were recruited as part of a longitudinal study on the development of gambling disorder. The inclusion criteria were that participants had gambled on at least five separate occasions in the previous year.

The only exclusion criterion was an inability to understand and/or to undertake the study procedures and to provide written informed consent. Since this research study sought to examine a naturalistic sample of people reflective of the broader population, participants with psychiatric and substance use comorbidity, as well as those currently taking psychotropic medications, were all allowed to participate. All participants provided informed consent and the study was granted full ethical approval by the Institutional Review Board at the University of Chicago.

Questionnaire assessment

To measure gambling behavior/symptoms, participants were asked how much on average they had gambled in the past week (our variable name: AvgGamFreqWeek), how much they had lost on gambling in the past year (\$LostLastYear) [an amount that can be over-reported and under-reported²⁵] and to undertake a clinical interview including the Yale-Brown Obsessive-Compulsive Scale for Pathological Gambling (PG-YBOCS); a 10-item clinician-administered questionnaire that measures recent pathological gambling.²⁶ The scale generates a total score for urges, for behavior, and for a combination of these²⁶ (YBOCSurges; YBOCSbehav; YBOCStotal).

Neurocognitive assessment

Participants completed the Cambridge Gambling Task (CGT),²⁸ which is a computerized laboratory-based paradigm that quantifies aspects of decision-making during gambling. The outcome measure of interest was the overall proportion of points gambled (CGToverallbet). The CGT is a validated tool that has been used extensively to assess decision-making and risk-taking among those with gambling disorder and those at risk of gambling disorder. Proportion of points bet was measured on a scale between 0 and 1 with scores closer to 1 indicating greater proportion of points having been bet.

Data collection procedure

Data were collected at an academic assessment center during an in-person visit by participants. The study questionnaire and the neurocognitive assessment were undertaken in private and overseen by a qualified member of the study team. Data were also collected through evaluations of emotional health, physical health, and intelligence however, these were beyond the scope of this analysis.

Statistical analysis

Responses to the question asking for *age (in years) at first gambling* were computed into an ordinal variable (AgeCat1stGambled) so that they aligned with gambling legislation across the US: *under 18 (not adult and underage for all types of gambling in all states)*, *18–20 (adult but underage for some forms of gambling in some states)* and *21 and over (adult and all forms of gambling permissible)*. 424 participants stated that they first gambled under the age of 18; 129 participants stated they were between the ages of 18–20 and 22 participants reported they were age 21 or older.

An ordinal logistic regression was conducted with one dependent categorical variable (AgeCat1stGambled) and six independent scale variables (AvgGamFreqWeek; \$LostPastYear; CGTOverallbet; YBOC-Surges; YBOCSbehav; YBOCStotal) to model the relationship between age of gambling onset and gambling behaviors. Possible confounders such as gender and gambling experience in years (calculated as the difference between current age and age of gambling onset) were included to understand their effect on the models under study.

We investigated if the combined information collected about gambling during adulthood could be indicative of retrospectively reported childhood gambling experiences (rather than lots of information about childhood being used to predict a single outcome during adulthood). Being cross-sectional, this study addressed association and not causality. The threshold of statistical significance was set at $p < .05$ uncorrected.

RESULTS

The regression model was a significant improvement in fit over a null model ($\chi^2(9) = 155.094, p < .05$). Both the Pearson chi-square ($\chi^2(1121) = 1024.156, p = .444$) and the Deviance chi-square ($\chi^2(1121) = 617.375, p = 1.000$) confirmed that the null hypothesis (stating that the model was not a good fit) was rejected. Within an ordinal logistic regression, the relationship between independent variables must be the same across all comparisons involving the dependent variable.²⁹ This assumption was satisfied by the non-significant result of the test of parallel lines ($p = .101$). In the regression model, overall proportion bet during the CGT were significant statistical predictors of the age category of gambling

onset. Total dollars lost in the past year, average gambling frequency in the past week, total and individual score categories (thoughts/urges and behavior) on the PG-YBOCS were not statistically significant predictors.

For every unit increase in overall proportion bet during the CGT, there was a predicted decrease of 1.55 in the log odds of the age category of gambling onset (Supporting Information: Table S1). There was a decreasing probability of being in an older age category as overall proportion bet during the CGT increased ($\text{Exp}(B) = 0.213$) (Supporting Information: Table S2). This indicates that those who bet a higher overall proportion during the CGT were more likely to have started gambling at an earlier age. Gender and gambling experience in years were statistically significant predictors; comparing models with and without them revealed that a small part of the effect of overall proportion bet during the CGT was as a result of these confounders and that higher gambling frequency was not consistently statistically significant.

Post hoc analysis, using multiple regression, specified which age categories contained statistically significant differences for CGToverallbet. These were found between under 18s and 18–20 year olds (see Supporting Information: Table S3). Statistically significant mean differences were not observed for the “21 and over” cohort. This is possibly due to the relatively small number of participants within the study sample who reported being 21 or older when they first gambled ($n = 22$). It was noted that, with or without the inclusion of outliers, the median score of CGToverallbet decreased (i.e., there was a lower overall proportion bet) as age category increased (Figure 1). There was a smaller range of scores on the CGT as age category increased which suggests that underage gambling might have a significant role to play in whether (young) adults become prone to gamble a lot or a little.

Generally females had an older age of gambling onset (15 years old) than males (14 years old) and their overall proportion bet during the CGT was less than for males; however, there were exceptions to this. Figure 2 provides a visualization of the scores of participants on the CGT alongside their age when they first gambled, their gambling experience and their gender. Females who had the youngest age of gambling onset (and therefore the highest number of years gambling experience) obtained the highest scores on the CGT. One male participant with an age of gambling onset of 7, obtained one of the lowest scores on the CGT whilst a female with an age of gambling onset of 19 and gambling experience of 1 year or less, obtained one of the highest scores.

DISCUSSION

Our results indicate that earlier age of gambling onset was significantly associated with betting a higher overall proportion during a neurocognitive task. Interestingly, while gambling more points on a laboratory-based task was significantly linked to earlier age at first gambling, statistically significant associations between age, gambling frequency, severity of recent pathological gambling,

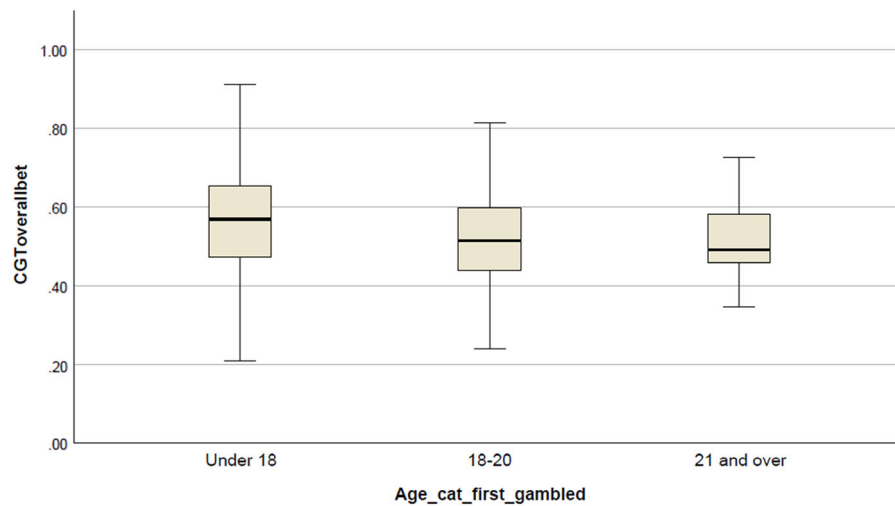


FIGURE 1 Boxplot of age of gambling onset category by CGTOverallbet

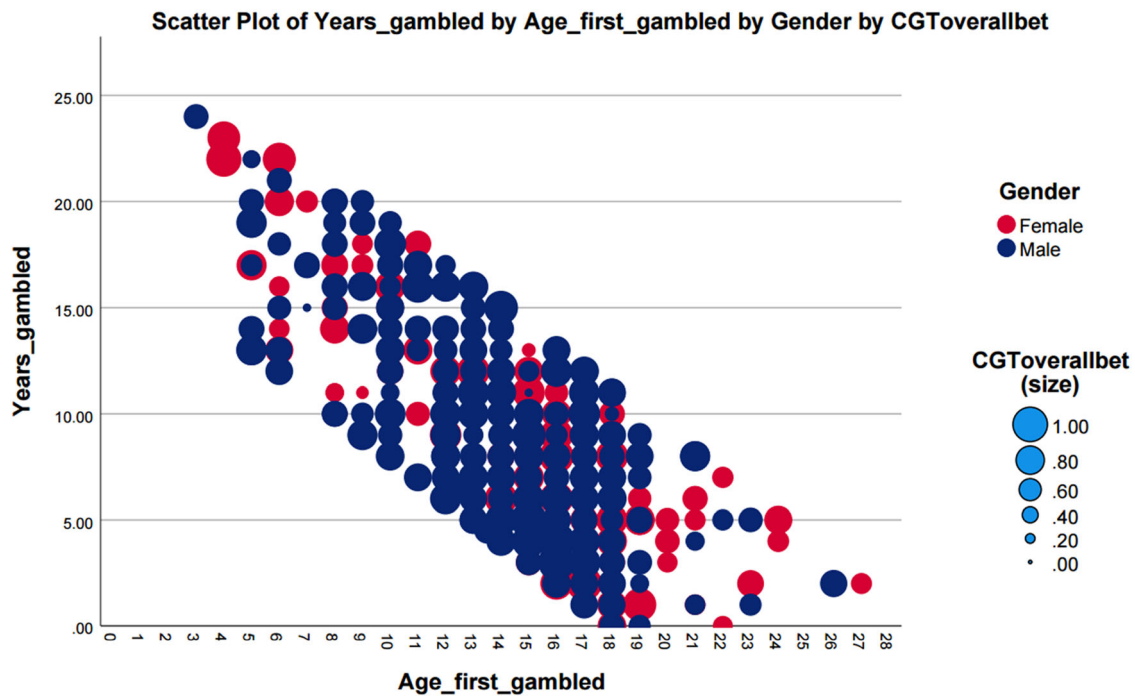


FIGURE 2 Scatterplot of age of gambling onset by gambling experience, grouped by gender and CGTOverallbet

and expenditure on gambling in the past year were not found. There could be several reasons for this. It may be that retrospective recall of amount lost to gambling constitutes a relatively complex variable; that is, there may be error in recall and high variability (if someone won \$3000 today and a week later lost \$5000, would the total lost to gambling be reported as \$2000 or \$5000?).

Researchers and clinicians cannot readily validate reports of gambling losses and the accuracy of gambling expenditure questions may be questionable.⁵ Another possibility is that during the CGT, participants were willing to stake higher overall proportions but that this should be treated as distinct (in terms of level of measurement) from self-reported gambling losses. It is possible that while gambling

in a controlled research setting identified signs of impaired decision-making and risk of developing pathological gambling,^{29,30} this sample of relatively young non-treatment seeking adults had not yet experienced financial pressures at the household level that might trigger susceptibility to increased gambling (expenditure) especially among those with low-income.¹⁶

This analysis focused upon age of gambling onset and gambling behaviors during young adulthood; important next steps should be to ascertain if these impact upon cognitive performance more generally and how these might co-occur alongside related disorders such as compulsivity and impulse control disorder. For example, a study among adolescents and young adults discussed the relevance of

cannabis use to other problematic behavior such as driving under the influence and high-risk sexual behavior.³¹ Future research should investigate how risk-taking identified in the context of gambling might relate to other hazardous activities and to what extent they continue beyond young adulthood.

While this study sheds new light on variables associated with earlier age of gambling onset, several limitations should be considered. First, this study was cross-sectional and included only young adults; future research should examine how our findings might extend to older age cohorts. Second, some of the data that were collected as part of this study were self-reported. When participants are asked to provide self-reported information, there is a possibility they may disclose (more) socially acceptable responses^{32,33} and that inconsistencies can arise when asking people to recall their age when they first engaged in any form of gambling. Inaccuracies can be as large as 2 years and participants have tended to self-report a younger age for their first gambling activity (than was actually the case).³⁴ As a result, these data might not be a completely accurate reflection of the lived experiences of the sample population and an examination of real-life gambling data (ecological data) would also be beneficial. However, gambling organizations who could provide these data do not usually allow them to be scrutinized by independent researchers.

In conclusion, by studying a relatively large sample of young adults we found that earlier age of gambling onset was linked to gambling more points on a computerized decision-making task. There were statistically significant mean differences between the scores of participants who were under 18 when they first gambled and those who were between the ages of 18 and 20. Subsequent longitudinal studies would be valuable to address potential causality in both directions. It could be that earlier age of gambling onset correlates with greater accrued exposure to gambling and consequent tendency to gamble more; or that propensity to gamble more leads to earlier age of engaging in this behavior. Another possibility (not mutually exclusive) is that the association between age of gambling onset and the variables of interest can be explained by other variables that were not examined in this study. An original aspect of this study is that our findings demonstrate that analysis of neurocognitive measures alongside self-reported measures can provide a multi-faceted understanding of gambling experiences and propensity to gamble.

In future work, it would be valuable to address whether our findings extend to clinical populations and if earlier gambling onset is linked to greater financial expenditure on gambling once symptoms are more ingrained and severe. It would also be informative to investigate to what extent these findings extend over the life course, beyond young adulthood. For instance, the findings of this study could be further tested by including individuals who are age 30 and older so that they can be compared with the age cohorts that we have analyzed. In doing so a robust evidence base can be produced to inform policy makers about appropriate actions to limit the detrimental impacts that gambling can have on those whose first experience of gambling is at a young age.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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REFERENCES

- Bloch HA. The sociology of gambling. *Am J Sociol.* 1951;57(3): 215-221.
- Gainsbury S. *Internet Gambling: Current Research Findings and Implications.* Springer; 2012.
- Gómez P, Feijóo S, Braña T, Varela J, Rial A. Minors and online gambling: prevalence and related variables. *J Gambl Stud.* 2020;36: 735-745. doi:10.1007/s10899-019-09923-3
- National Gambling Impact and Policy. *National Gambling Impact Study Commission: Final Report.* National Gambling Impact Study Commission; 1999.
- Wood RT, Williams RJ. Internet gambling: past, present and future. In: Smith G, Hodgins D, Williams RJ, eds. *Research and Measurement Issues in Gambling Studies.* Elsevier Publishing; 2007:491-514.
- Låftman SB, Modin B, Olsson G, Sundqvist K, Svensson J, Wennberg P. School ethos and adolescent gambling: a multilevel study of upper secondary schools in Stockholm, Sweden. *BMC Public Health.* 2020;20:130. doi:10.1186/s12889-020-8230-y
- Derevensky JL, Gupta R, Della Cioppa G. A developmental perspective of gambling behavior in children and adolescents. *J Gambl Stud.* 1996;12:49-66.
- Lynch WJ, Maciejewski PK, Potenza MN. Psychiatric correlates of gambling in adolescents and young adults grouped by age at gambling onset. *Arch Gen Psychiatry.* 2004;61:1116-1122.
- Rossen FV, Clark T, Denny SJ, et al. Unhealthy gambling amongst New Zealand secondary school students: an exploration of risk and protective factors. *Int J Ment Health Addict.* 2016;14:95-110. doi:10.1007/s11469-015-9562-1
- Black DW, Shaw M, Coryell W, Crowe R, McCormick B, Allen J. Age at onset of DSM-IV pathological gambling in a non-treatment sample: early- versus later-onset. *Compr Psychiatry.* 2015;60:40-46. doi:10.1016/j.comppsy.2015.04.007
- Burge AN, Pietrzak RH, Molina CA, Petry NM. Age of gambling initiation and severity of gambling and health problems among older adult problem gamblers. *Psychiatr Serv.* 2004;55:1437-1439. doi:10.1176/appi.ps.55.12.1437

12. Grant JE, Kim SW, Odlaug BL, Buchanan SN, Potenza MN. Late-onset pathological gambling: clinical correlates and gender differences. *J Psychiatr Res.* 2009;43:380-387. doi:10.1016/j.jpsychires.2008.04.005
13. Grant JE, Schreiber L, Odlaug BL, Kim SW. Pathologic gambling and bankruptcy. *Compr Psychiatry.* 2010;51:115-120. doi:10.1016/j.comppsy.2009.04.002
14. Aymamí N, Jiménez-Murcia S, Granero R, et al. Clinical, psychopathological, and personality characteristics associated with ADHD among individuals seeking treatment for gambling disorder. *BioMed Res Int.* 2015;2015:1-11. doi:10.1155/2015/965303
15. Rahman AS, Pilver CE, Desai RA, et al. The relationship between age of gambling onset and adolescent problematic gambling severity. *J Psychiatr Res.* 2012;46:675-683. doi:10.1016/j.jpsychires.2012.02.007
16. Brown S, Dickerson A, McHardy J, Taylor K. Gambling and credit: an individual and household level analysis for the UK. *Appl Econ.* 2012;44(35):4639-4650. doi:10.1080/00036846.2011.593502
17. Andronicos M, Beauchamp G, DiMambro M, Robert M, Besson J, Séguin M. Do male and female gamblers have the same burden of adversity over their life course. *Int Gamb Stud.* 2015;15(2):224-238. doi:10.1080/14459795.2015.1024706
18. Breen H, Hing N. Life course analysis of gambling trajectories: an indigenous Australian study. *Int Gamb Stud.* 2014;14(3):357-373. doi:10.1080/14459795.2014.891636
19. Séguin M, Robert M, DiMambro M, et al. Gambling over the life course and treatment-seeking. *Int Gamb Stud.* 2013;13(3):302-318.
20. Jacobs DF, Marston AR, Singer RD, Widaman K, Little T, Veizades J. Children of problem gamblers. *J Gamb Behav.* 1989;5:261-268.
21. Schreiber L, Odlaug BL, Kim SW, Grant JE. Characteristics of pathological gamblers with a problem gambling parent. *Am J Addict.* 2009;18:462-469. doi:10.3109/10550490903206007
22. Jacobs DF. Juvenile gambling in North America: an analysis of long term trends and future prospects. *J Gamb Stud.* 2000;16(7):119-152.
23. Langhinrichsen-Rohling J, Rohde P, Seeley JR, Rohling ML. Individual, family, and peer correlates of adolescent gambling. *J Gamb Stud.* 2004;20:23-46.
24. Chamberlain SR, Stochl J, Redden SA, Odlaug BL, Grant JE. Latent class analysis of gambling subtypes and impulsive/compulsive associations: time to rethink diagnostic boundaries for gambling disorder. *Addict Behav.* 2017;72:79-85. doi:10.1016/j.addbeh.2017.03.020
25. Wood RT, Williams RJ. 'How much money do you spend on gambling?' The comparative validity of question wordings used to assess gambling expenditure. *Int J Soc Res Methodol.* 2007;10(1):63-77. doi:10.1080/13645570701211209
26. Pallanti S, DeCaria CM, Grant JE, Urpe M, Hollander E. Reliability and validity of the pathological gambling adaptation of the Yale-Brown Obsessive-Compulsive Scale (PG-YBOCS). *J Gamb Stud.* 2005;21(4):431-443. doi:10.1007/s10899-005-5557-3
27. Rogers R, Everitt BJ, Baldacchino A, et al. Dissociable deficits in the decision-making cognition of chronic amphetamine abusers, opiate abusers, patients with focal damage to prefrontal cortex, and tryptophan-depleted normal volunteers: evidence for monoaminergic mechanisms. *Neuropsychopharmacology.* 1999;20:322-339.
28. Osborne J. *Best Practices in Logistic Regression.* SAGE Publications Ltd.; 2015:388-433. doi:10.4135/9781483399041
29. Grant JE, Chamberlain SR, Schreiber LRN, Odlaug BL. Neurocognitive deficits associated with shoplifting in young adults. *Compr Psychiatry.* 2012;53:1049-1055. doi:10.1016/j.comppsy.2012.04.012
30. Grant JE, Chamberlain SR, Schreiber L, Odlaug BL. Neuro-psychological deficits associated with cannabis use in young adults. *Drug Alcohol Depend.* 2012;121:159-162. doi:10.1016/j.drugalcdep.2011.08.015
31. Stone AA, Shiffman S, Atienza AA, Nebeling L. *The Science of Real-Time Data Capture: Self Reports in Health Research.* Oxford University Press; 2007.
32. Van der Maas M, Nower L, Matheson FI, Turner NE, Mann RE. Sources of bias in research on gambling among older adults: considerations for a growing field. *Curr Addict Rep.* 2021;8:208-213. doi:10.1007/s40429-021-00365-9
33. Dussault F, Dufour M, Brunelle N, et al. Consistency of adolescents' self-report of gambling age of onset: a longitudinal study. *J Gamb Stud.* 2019;35:533-544. doi:10.1007/s10899-019-09834-3

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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