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Psychosocial correlates in treatment seeking gamblers: differences in early age onset gamblers vs later age onset gamblers

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ABSTRACT

Background: Age of onset is an important factor in the development and trajectory of psychiatric disorders; however, little is known regarding the age of onset in relation to disordered gambling in treatment seeking samples in the UK. Utilising a large residential treatment seeking gambler cohort, the current study examined the relationship between age of gambling onset and a range of variables thought to be associated with disordered gambling.

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Method: Data were collected from 768 gamblers attending residential treatment for disordered gambling. Individuals were grouped per the age they started gambling as either a child (≤12), adolescent (13-15), or young adult / adult (≤16). Data were analysed using linear, backward stepwise, and multinomial logistic regressions to identify significant relationships between age of onset and variables of theoretical significance.

Results: Results indicate the younger age of gambling onset was associated with increased gambling severity. Those who began gambling at an earlier age were more likely to have abused drugs or solvents, committed an unreported crime, been verbally aggressive and experienced violent outbursts. They are less likely to report a positive childhood family environment and are more likely to have had a parent with gambling and / or alcohol problems.

Discussion: Gamblers who began gambling at an earlier age experience negative life events and exhibit some antisocial behaviors more than later onset gamblers, indicating that when addressing gambling behavior, it is important to consider the developmental trajectory of the disorder, rather than merely addressing current gambling behavior. However, the direction of the relationship between gambling and significant variables is in some instance unclear, indicating a need for further research to define causality.

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INTRODUCTION

Gambling is a common activity, with figures indicating that 56.2% of adults aged 16 or over in England had spent money on at least one gambling activity (including the lottery) in the last year (Gambling Commission, 2018a). However, gambling does not begin at 16; recent figures report 39% of 11-16-year olds have spent their own money on gambling in the past year (Gambling Commission, 2018b). An increase in gambling marketing has resulted in a concurrent increase in childhood

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exposure: research has demonstrated that consistent exposure to gambling marketing solidifies brand recognition amongst children (Bestman, Thomas, Randle, & Thomas, 2015; Djohari, Weston, Cassidy, Wemyss, & Thomas, 2019; Thomas et al., 2016) and introduces children to gambling at a younger age, thus normalising gambling within sport for children (Pitt, Thomas, Bestman, Stoneham, & Daube, 2016).

Age of onset is thought to be significant in the development and trajectory of psychiatric disorders including alcohol use disorders (Hingson, Heeren & Winter, 2006), and has relevance in diagnosis, prognosis and treatment adherence (Leggio et al., 2009). Age of onset is a key factor is distinguishing typologies of alcohol dependence in the Cloninger typologies model (Cloninger, Bohmanm & Sigvardsson, 1981), however few gambling studies have considered the age individuals commenced the activity. Lynch, Maciejewski, & Potenza (2004) sought to examine psychiatric correlates of gambling in adolescents aged 16-17, and young adults aged 18-29 and found that earlier onset of gambling problems was associated with more severe psychiatric issues, particularly in relation to substance use disorders. Additionally, gamblers who began gambling at a younger age were more likely to experience depression and substance use disorders than their non-gambling counterparts. In a later study recruiting high school students, Rahman et al., (2012) found that age of gambling onset was associated with problem gambling severity, whilst in a general population sample, Carneiro et al. (2014) found that at-risk gamblers who began gambling before they turned 20, were more likely to be male, and to chase gambling losses. Recruiting a more elderly sample of gamblers, Burge, Pietrzak, Molina, & Petry (2004) found that those who started gambling earlier in life experienced more medical and psychiatric problems than later onset gamblers.

In treatment seeking gamblers, there is increased gambling severity, more suicidal ideation and a history of inpatient psychiatric treatment, alongside psychosocial and substance abuse problems in early onset gamblers (Burge, Pietrzak & Petry, 2006). Likewise, late onset gamblers have been shown to be less likely to declare bankruptcy, to have a parent with a gambling problem (Grant, Kim,

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Odlaug, Buchanan, & Potenza, 2009), and to have lower rates of pathological gambling severity (Jiménez-Murcia et al., 2010). More recently, compared to older onset gamblers, early onset gamblers were more likely to gamble online and take anti craving medication such as naltrexone, however, were less likely to engage in non-strategic gambling (e.g. lotteries) and to be an escape-type gamblers (Shin et al., 2014). A further study reported that gender had a direct effect on the onset of gambling disorders and depression symptoms, with males experiencing gambling related harm earlier than females, and reporting fewer depression symptoms (Jiménez-Murcia et al. 2016).

Previous studies have found mixed evidence for a relationship between age at treatment start, and treatment drop out, e.g. no association (Leblond et al., 2003), and increased risk of drop-out associated with older (Echeburua et al., 1996), or younger age (Aragay et al., 2015). Research that has investigated the relationship between age of gambling onset and treatment outcome has generally found that despite being significantly associated with the development and trajectory of the disorder, age of onset was not associated with treatment outcome (Jiminez-Murcia et al., 2010; Ronzitti et al., 2017; Shin et al., 2014). Although past research has sought to understand how age of gambling onset relates to subsequent gambling behaviour, no studies have sought to relate different adolescent age of onset groups with subsequent adult gambling behaviour. For example, early age onset has been categorised as under 25 (Grant et al., 2009; Shin et al., 2014), under 21 (Burge et al., 2004) or under 20 (Caniero et al., 2014; Jiminez-Murcia et al., 2010); categorisation of adolescent gamblers in to a homogenous group creates the potential overlook more nuanced differences between age of onset at different stages of adolescence. Rahman et al. (2012) classified early onset as ≤11, however then only classified an older onset group as ≥12 and up to age 18, therefore not allowing comparison with adult age onset.

To date, no studies have utilised a large UK treatment seeking sample to specifically investigate the relationship between age of gambling onset and a range of variables thought to be associated with the development and maintenance of disordered gambling, specifically examining differences

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between children, adolescents and young adults / adults. Therefore, the current study sought to address this gap in the literature, and aimed to explore the relationship between age of gambling onset and other associated variables, with the following predictions:

In accordance with previous results (e.g. Burge et al., 2006; Jiminez-Murcia et al., 2010; Rahman et al., 2012), it was predicted that early-age onset gamblers would report increased gambling severity compared to later age onset gamblers. Furthermore, it was hypothesised that earlier-age onset of gambling would be associated with increased likelihood of demonstrating antisocial behavior such as getting in to physical fights, stealing and substance use disorders (e.g. Burge et al., 2006; Jackson, Dowling, Thomas, Bond, and Patton, 2008; Lynch et al., 2004) and with experience of a negative family background (e.g. parental gambling, Grant et al., 2009). Finally, consistent with previous literature (Jiminez-Murcia et al, 2010; Shin et al., 2014; Ronzitti et al., 2017) it was hypothesised that age of onset would not be associated with treatment outcome.

METHODS

Treatment Facility

The Gordon Moody Association (GMA) is a UK-wide gambling support service that provides different treatment options, including an intensive residential treatment programme at one of two UK centres (located in Dudley, West Midlands, and Beckenham, South-East London), relapse prevention housing, a mixed model of care (short intensive residential stays with at-home counselling support), post-treatment outreach support, and online support through Gambling Therapy. Individuals can be referred by themselves, or their friends, family, other treatment services, probation, social or health workers. Eligible applicants for residential treatment must be male, ≥18 years of age, have made previous unsuccessful committed attempts to quit, have a manageable perceived risk of harm to self or others, have no co-occurring addictions that will inhibit the individual's ability to undertake the treatment programme, be self-sufficient in a community rehabilitation setting, and be able to make any required payments.

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Participants

Data was collected from individuals applying for residential treatment for disordered gambling at the GMA facilities between January 2000 and November 2015. Due to the residential nature of the rehabilitation programme, GMA residents are primarily male. Therefore, only data from male gamblers are reported (n = 768). Mean age at point of entry was 34.82, ($s.d.$ 9.98; M^{in} 17, M^{ax} 70), and 88% identified as being British, White Irish, or White Other. The mean number of different types of gambling activities engaged in was 4.58 ($s.d.$ 2.88, range 1-18, n = 739). Substance use is reported in Table 1:

**** Insert table 1 about here ****

Measures and procedure

Individuals entering treatment completed a comprehensive assessment battery and a range of service specific measures, including a gambling audit for gambling behavior, a need audit to understand health needs, a safety audit to understand current dynamic risk factors, and a life audit to understand the individual's life history. Gambling severity was measured with the South Oaks Gambling Screen (SOGS, Lesieur & Blume, 1987). Full data collection procedures are described in detail elsewhere (Sharman et al., (2018), supplementary material). Participant data were grouped by age the individual started gambling (12 and under, 13-15, and 16+). Age categorisation was dictated by the categorisation of data collected by GMA, and allowed analysis to differentiate between children, adolescents, and young adults / adults.

Statistical analysis

A between-groups ANOVA with Bonferroni post-hoc multiple corrections was run to ascertain any group differences in gambling severity, and a linear regression was used to identify any relationship between age of onset and gambling severity.

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A series of multinomial logistic regressions were conducted based on characteristics and behaviors thought to be important to disordered gambling. Significant variables were reported; all other variables were non-significant (p >.05, see Appendix 1). Additionally, a series of six backward stepwise logistic regression analyses were performed to assess the association of membership to one of three age categories of outcome, namely, age at which gambling commenced. The oldest age group (16 and above) was used as the reference category in each of the stepwise logistic regressions described below. The six regressions were themed, and labelled self-destructive behavior, substance use, childhood experience, mental health, gambling behavior and adult experience, and were chosen because of their theoretical importance identified in previous literature (See Table 2).

Insert table 2

The limiting factors to including all variables in one large hierarchical model are sample size and sufficient cell count. A nominal regression model was used to establish the relationship between age of gambling start and treatment completion. Evaluation of adequacy of expected frequencies for the independent variables revealed no need to restrict model goodness-of-fit tests.

Ethics

The study was approved by the (Identifying Information removed) School of Psychology Research Ethics Committee (SOPREC, Ref: PSY1415127). When submitting an initial application to GMA, the applicant agrees to all information provided being used to facilitate the development and improvement of service provision through statistical analysis.

RESULTS

Gambling Severity

Analysis indicated a statistically significant difference across the three groups for gambling severity (SOGS scores (Mean (*s.d.*): age ≤ 12 = 16.26 (2.47); age13-15= 16.19 (2.36); age ≥ 16 = 15.35 (2.68)), $F(2,353) = 5.247$, $p=.006$. Post hoc Bonferroni tests (corrected for multiple comparisons) using a

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probability value of .006 indicated a non-statistically significant difference between the 16+ age group and the 13-15-year-old group (p=.035) as well as a non-statistically significant difference between the 16+ age group and the under 12's, (p=.02). These results were reported despite the post-hoc probability values falling above the .006 Bonferroni-corrected figure. Using Eta^2 to compute the effect size, only 3% of the variance in the SOGS score was attributable to age.

The linear regression to investigate any associations between the age of onset and gambling severity indicated that age of commencement predicted 2.5% of the variance (R^2 =.025, $F(1,354)$=9.031, p=.003). Age of commencement significantly predicted SOGS scores (β = -.158, p=.003). The β value was negative underscoring the direction of the trend with higher severity scores for the younger cohorts and lower severity scores for the older cohorts.

Multinomial logistic regressions

A series of multinomial logistic regressions indicated that nine of the target variables were statistically significantly associated with age of onset of gambling.

Model fit indices

Gamblers who started gambling aged 12 or younger were more likely to have witnessed violence during childhood, χ^2 (2, N=761) = 9.83, p = < .01, known a family member who drank heavily during childhood, χ^2 (2, N=654) = 5.72, p = < .05, experienced parental divorce/separation, χ^2 (2, N=657) = 14.18, p = < .01, and abused drugs or solvents, χ^2 (2, N=724) = 7.35, p = < .05. Gamblers who started gambling below the age of 16 were more likely to have known a family member who gambled heavily during childhood, χ^2 (2, N=655) = 15.99, p = < .01, committed an unreported crime, χ^2 (2, N=747) = 12.88 p = < .01, stated that it did not matter what type of gambling they engaged in, χ^2 (2, N=656) = 17.2, p = < .01, been verbally aggressive, χ^2 (2, N=707) = 8.4, p = < .05, and demonstrated violent outbursts, χ^2 (2, N=654) = 14.95, p = < .01, than those who started gambling aged ≥16.

Odds ratios

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Table 3 below shows the odds ratio (OR) for each of the nine regressions listed above. ORs below 1 indicate that the specified age group, with reference to the 16+ age group is less likely to have endorsed a 'no' to the question posed. ORs above 1 indicated that the specified age group, with reference to the 16+ age group is more likely to endorse a 'no' to the question posed.

Insert Table 3 about here**

Stepwise logistic regressions

Six backward stepwise logistic regression analyses were performed to assess the association of membership to one of three age categories of outcome, namely age at which gambling commenced.

Model fit indices

Associations were assessed for the relationship between substance use and age of onset of gambling. There was a good model fit based on substance use χ^2 (12, N=550) = 13.45, p = .337, using a deviance criterion. Comparison of log-likelihood ratios with stepwise backward entry of all three variables resulted in the retention of drug or solvent abuse only and showed statistically significant improvement in the model, χ^2 (2, N=550) = 12.07, p < .05. Gamblers who started gambling below the age of 13 were less likely to answer 'no' to the question of drug or solvent abuse when compared to gamblers who started gambling at older ages.

Associations were assessed for the relationship between childhood experience and age of onset of gambling. There was a good model fit based on childhood experience χ^2 (40, N=653) = 36.2, p = .642, using a deviance criterion. Comparison of log-likelihood ratios with stepwise backward entry of all four variables resulted in the retention of family environment which showed statistically significant improvement in the model, χ^2 (4, N=653) = 9.73, p < .05 as well as a family member gambling heavily which showed statistically significant improvement in the model, χ^2 (2, N=653) = 13.91, p < .01. Gamblers who started gambling below the age of 13 were less likely to have experienced positive family environments when compared to gamblers who started gambling at older ages. Gamblers

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who started gambling below the age of 16 were less likely to answer 'no' to the question of knowing a close family member who gambled heavily whilst they were growing up when compared to gamblers who started gambling at older ages.

Associations were assessed for the relationship between participants' gambling behavior and age of onset of gambling. There was a poor model fit based on gambling type and number of gambling activities χ^2 (16, N=630) = 29, p = .02, using a deviance criterion. Models for associations assessing the relationships between self-destructive behavior, participant's mental health, adult experience, and age of onset of gambling, indicated that none of the included variables were statistically significantly associated with age of gambling onset.

Nominal regression

Treatment completion (those who completed treatments and those who did not complete treatments) was not statistically related to age of gambling onset, χ^2 (2, N=650) = 1.191, p = > .05.

DISCUSSION

The current study sought to examine the relationships between age of gambling onset and a range of variables thought to be important to the development and maintenance of disordered gambling, in a cohort of pathological gamblers receiving treatment at a residential treatment facility. Implications of the results are discussed and avenues for further research are suggested.

SEVERITY AND GAMBLING FORM

Results in the current study indicate that those who started gambling at a younger age reported more severe gambling problems at point of entry into treatment, than those who started gambling at a later age, supporting our first hypothesis. Although this finding is consistent with data reported by Burge et al, (2006), Jiménez-Murcia et al. (2010) and Rahman et al. (2012), the effect size was small and only a small amount of variance in SOGS scores was accounted for by age of gambling onset. It should be noted that gamblers seeking residential treatment are likely to be on the more

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severe end of the harm spectrum and are likely to score highly on any gambling screening tool. It is therefore possible that only a small amount of variance in gambling severity being accounted for by age of onset is a function of a ceiling effect, with high scores on screening tools reflecting the extreme harm experienced by those seeking residential treatment. However, increased gambling severity in early onset gamblers suggests that increased attention to reducing child gambling exposure and under-age gambling is needed, such as reducing access to low stake, low prize gaming machines, on which there is no age restriction, thus allowing children to legitimately gamble or reducing child exposure to gambling marketing.

ANTI-SOCIAL BEHAVIOR

Our mixed results reflect inconsistencies observed in previous studies. The current study found younger age onset gamblers were more likely to abuse drugs or solvents, findings that although not directly comparable due to screening tools used, are broadly in line with the direction of previous findings in which early onset gamblers were more likely to have received treatment for alcohol use disorder, have started drinking at an earlier age, and to report lifetime cannabis and cocaine use (Burge et al., 2006). Similarly, the current study indicated that younger age onset gamblers are more likely to have committed an unreported crime. However previous research has reported no differences in crime (e.g. committing theft, embezzlement, and stealing from family / friends) (See Grant et al., 2009). Furthermore, our results indicate younger age onset gamblers are more likely to have been verbally aggressive and demonstrate violent outbursts, however no group differences were observed for physical aggression and reports of damaging property. In related analyses, previous studies have found no differences in violence between early and late onset gamblers (e.g. trouble controlling violent behavior, serious fights, carried a weapon; (Burge et al., 2006; Rahman et al., 2012). Whilst an increased likelihood of engaging in these behaviors support our hypothesis, at least in part, it should be noted that other anti-social behaviors were also examined that did not yield significant differences between younger and older gambling onset groups. These included

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current smoking, current unhealthy drinking, have been physically aggressive, damaged property, and damaged an intimate relationship through lying, deceit and/or stealing. Furthermore, the temporal resolution of the development of substance use disorders and engagement in anti-social behavior relative to gambling onset is not known, therefore although results indicated more early onset gamblers were more likely to use substances, commit crime and display some anti-social behaviors, it is unclear whether such behaviors increase gambling risk, or whether gambling contributed to the behaviors. Future research could measure the sequence of events to establish the relationship between age of gambling onset, and engagement in anti-social behaviors.

NEGATIVE EXPERIENCES

Analysis indicates that gamblers who started at or under the age of 12 are significantly more likely to have endured a variety of negative experiences than gamblers with a later age of gambling onset, supporting our hypothesis, in part. Although not directly comparable as different screening tools were used, results are broadly congruent with previous research: Burge et al. (2016) found younger age onset gamblers scored higher on ASI subscales (Addiction Severity Index, McLellan et al., 1985) for psychiatric, and family/social problems, whilst the current study found younger onset gamblers were less likely to report a positive family environment. Furthermore, the current study found early onset gamblers were more likely to have had a parent with gambling and / or alcohol problems, largely consistent with Grant et al. (2009), who found that younger onset gamblers were more likely to have a mother or father with gambling problems, but not with alcohol problems. Results in the current study indicate that negative family background and the impact of parental behavior could be an influential factor in the development and maintenance of disordered gambling. However, although statistically robust, this analysis cannot inform the nature of the relationship; thus, subsequent research could utilise qualitative methodology to unpack the relationship between childhood experience and subsequent gambling behavior.

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Finally, it was hypothesised that age of onset would not be associated with treatment. This hypothesis was supported, and current results are consistent with previous studies that found age of onset was not related to relapses or dropout during treatment (Jiminez-Murcia et al., 2010; Ronzitti et al., 2017; Shin et al., 2014). However, cross-study comparisons of treatment dropout and completion must be made with caution due to the nature of the treatment programme engaged in; participants in the Jiminez-Murcia et al., (2010) study followed a 4-month out-patient cognitive behavioral therapy (CBT) group programme, whilst participants studied by Ronzitti et al., (2017) received 8 weeks of out-patient CBT. Participants recruited by Shin et al., (2014) received individual outpatient therapy based on motivational enhancement therapy, CBT, and pharmacotherapy, however treatment duration was not specified. In contrast, participants in the current study followed an intensive mixed therapy residential programme ranging from three to nine months in length. As GMA is the only residential gambling specific treatment facility in the UK, future research could examine the association between age of onset in a residential treatment setting in comparable samples from alcohol and substance misuse rehabilitation centres. Gambling has been reclassified in DSM-5 from an impulse control disorder to an addictive disorder due to underlying similarities between the disorder and established substance use disorders. Establishing if the age of onset is correspondingly associated with specific variables across disorders could further highlight similarities between substance misuse disorders and addictive behaviour disorders.

The relationship between age of gambling onset and the individual is complex. It is conceivable that different experiences may affect gamblers in different ways as a consequence of individual differences, shaped by the complex interplay of environmental, sociological and psychological factors (e.g. Blaszczynski & Nower, 2002). However, is it also conceivable that inconsistent results are related to methodological differences in previous studies, including the age range classification of older and younger onset gamblers, as emotional and cognitive development is widely variable in adolescents (Steinberg, 2005) which can mitigate the influence of a particular experience and influence an individual's decision-making capacities (Blakemore & Robbins, 2012).

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Results in the current study indicate that the developmental trajectory of gambling disorders, the childhood environment and experience, and the engagement in and influence of other anti-social behaviours can differ depending on the age of gambling onset. This is the first study in a UK sample to investigate disorder trajectory whilst differentiating between younger onset age groups. As results indicate that younger age of onset is associated with more negative experience and behaviors, it can be argued that gambling could be considered and asked about (either by teachers, parents, social workers or other relevant authority figures) if a child or adolescent is displaying other anti-social behaviors, such as committing petty crime or using or abusing substances, thus assisting in early disorder detection. Alternatively, gambling could be considered as an expression of dissatisfaction, and act as an indicator of negativity in the individual's developmental environment. Furthermore, increased negative experiences and behaviours in younger onset gamblers emphasises the need for those providing treatment and support for gamblers to provide an integrated approach to cognitive, behavioural, emotional, physical and practical support, rather than a siloed approach.

Limitations

The present study faced some methodological limitations. The sample represents the most severe problem gamblers that have been accepted into the GMA programme and as such, may not be representative of a wider spectrum of disordered and at-risk gamblers. It is unclear if our results are generalisable to other treatment seeking gamblers, or are just specific to our residential treatment seeking sample. Data were drawn from a service-specific initial assessment designed to give an overall picture of the individual, and therefore did not utilise clinically validated scales to assess for psychiatric co-morbidity or prior AXIS I disorders. Furthermore, participants retrospectively detailed their gambling career, which could be affected by memory biases and may likely include some inaccuracies. From the current data, it is not possible to establish whether gambling was the cause of associated problems, if gambling is an escape from and/or a coping mechanism for dealing with such negative experiences, or if all these experiences emanate from a shared set of causal factors. Finally,

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analyses are restricted to male gamblers. It is unknown if these results are male -gambler specific, or generalisable to all gamblers. As GMA is primarily a male oriented service, comparable analysis for female gamblers was not possible, highlighting both the historic lack of provision for female gamblers, and the need for more work in this neglected area.

Conclusions

Results demonstrate that earlier age onset gambling is associated with subsequent gambling severity, but not treatment outcome. Age of onset is associated with childhood experience and environment, and concurrent anti-social behaviors, however the directionality of the relationship remains unclear. As such, although younger age onset gamblers are less likely to report a positive family environment and are more likely to engage in certain anti-social behaviours which has potential implications for disorder identification and treatment, further research is required to delineate the nature of the associations. However, it can be concluded that age of onset is associated with elements of subsequent disorder trajectory.

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Contributors

RM conducted the statistical analysis. SS wrote the first draft of the manuscript and all authors contributed to and have approved the final manuscript. All views expressed are those of the author(s).

Declaration of interest:

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References

Aragay, N., Jiménez-Murcia, S., Granero, R., Fernández-Aranda, F., Ramos-Grille, I., Cardona, S., Garrido, G., Anisul Islam, M., Menchón, J. M., & Vallès, V. (2015). Pathological gambling: understanding relapses and dropouts. *Comprehensive Psychiatry*, *57*, 58-64.

Bestman, A., Thomas, S. L., Randle, M., & Thomas, S. D. (2015). Children's implicit recall of junk food, alcohol and gambling sponsorship in Australian sport. *BMC public health*, *15*(1), 1022.

Blakemore, S. J., & Robbins, T. W. (2012). Decision-making in the adolescent brain. *Nature neuroscience*, *15*(9), 1184.

Blaszczynski, A., & Nower, L. (2002). A pathways model of problem and pathological gambling. *Addiction*, *97*(5), 487-499.

Burge, A. N., Pietrzak, R. H., Molina, C. A., & Petry, N. M. (2004). Age of gambling initiation and severity of gambling and health problems among older adult problem gamblers. *Psychiatric services*, *55*(12), 1437-1439.

Burge, A. N., Pietrzak, R. H., & Petry, N. M. (2006). Pre/early adolescent onset of gambling and psychosocial problems in treatment-seeking pathological gamblers. *Journal of Gambling Studies*, *22*(3), 263-274.

Carneiro, E., Tavares, H., Sanches, M., Pinsky, I., Caetano, R., Zaleski, M., & Laranjeira, R. (2014). Gambling onset and progression in a sample of at-risk gamblers from the general population. *Psychiatry research*, *216*(3), 404-411.

Cloninger, C. R., Bohman, M., & Sigvardsson, S. (1981). Inheritance of alcohol abuse. Cross-fostering analysis of adopted men. *Archives of General Psychiatry*, 38, 861–868.

Dion, J., Collin-Vézina, D., De La Sablonnière, M., Philippe-Labbé, M. P., & Giffard, T. (2010). An exploration of the connection between child sexual abuse and gambling in Aboriginal communities. *International Journal of Mental Health and Addiction*, *8*(2), 174-189.

Djohari, N., Weston, G., Cassidy, R., Wemyss, M., & Thomas, S. (2019). Recall and awareness of gambling advertising and sponsorship in sport in the UK: a study of young people and adults. *Harm reduction journal*, *16*(1), 24.

ACCEPTED MANUSCRIPT

Echeburúa, E., Báez, C., & Fernández-Montalvo, J. (1996). Comparative effectiveness of three therapeutic modalities in the psychological treatment of pathological gambling: Long-term outcome. *Behavioral and Cognitive Psychotherapy*, 24(1), 51-72.

Gambling Commission (2018a) https://www.gamblingcommission.gov.uk/PDF/survey-data/England-Health-Survey-Findings-2016.pdf Accessed 05/10/2018

Gambling Commission (2018b) https://www.gamblingcommission.gov.uk/PDF/survey-data/Young-People-and-Gambling-2018-Report.pdf Accessed 18/12/2018

Grant, J. E., Kim, S. W., Odlaug, B. L., Buchanan, S. N., & Potenza, M. N. (2009). Late-onset pathological gambling: clinical correlates and gender differences. *Journal of psychiatric research*, *43*(4), 380-387.Hingson, R. W., Heeren, T., & Winter, M. R. (2006). Age of alcohol-dependence onset: associations with severity of dependence and seeking treatment. *Pediatrics*, *118*(3), e755-e763.

Jackson, A. C., Dowling, N., Thomas, S. A., Bond, L., & Patton, G. (2008). Adolescent gambling behavior and attitudes: A prevalence study and correlates in an Australian population. *International Journal of Mental Health and Addiction*, *6*(3), 325-352.

Jiménez-Murcia, S., Alvarez-Moya, E. M., Stinchfield, R., Fernández-Aranda, F., Granero, R., Aymamí, N., ... & Menchón, J. M. (2010). Age of onset in pathological gambling: clinical, therapeutic and personality correlates. *Journal of Gambling Studies*, *26*(2), 235-248.

Jiménez-Murcia, S., Granero, R., Tárrega, S., Angulo, A., Fernández-Aranda, F., Arcelus, J., ... & Grall-Bronnec, M. (2016). Mediational role of age of onset in gambling disorder, a path modeling analysis. *Journal of gambling studies*, *32*(1), 327-340.

Leblond, J., Ladouceur, R., & Blaszczynski, A. (2003). Which pathological gamblers will complete treatment? *British Journal of Clinical Psychology*, *42*(2), 205-209.

Leggio, L., Kenna, G. A., Fenton, M., Bonenfant, E., & Swift, R. M. (2009). Typologie s of alcohol dependence. From Jellinek to genetics and beyond. Neuropsychology Review, 19, 115–129.

Lesieur, H. R., & Blume, S. B. (1987). The South Oaks Gambling Screen (SOGS): A new instrument for the identification of pathological gamblers. *American journal of Psychiatry*, *144*(9).

Lorains, F. K., Cowlishaw, S., & Thomas, S. A. (2011). Prevalence of comorbid disorders in problem and pathological gambling: Systematic review and meta-analysis of population surveys. *Addiction*, *106*(3), 490-498.

Lynch, W. J., Maciejewski, P. K., & Potenza, M. N. (2004). Psychiatric correlates of gambling in adolescents and young adults grouped by age at gambling onset. *Archives of general psychiatry*, *61*(11), 1116-1122.

Manning, V., Dowling, N. A., Lee, S., Rodda, S., Garfield, J. B. B., Volberg, R., ... & Lubman, D. I. (2017). Problem gambling and substance use in patients attending community mental health services. *Journal of behavioral addictions*, *6*(4), 678-688.

May-Chahal, C., Humphreys, L., Clifton, A., Francis, B., & Reith, G. (2017). Gambling harm and crime careers. *Journal of gambling studies*, *33*(1), 65-84.

ACCEPTED MANUSCRIPT

McLellan, A. T., Luborsky, L., Cacciola, J., Griffith, J., Evans, F., Barr, H. L., & O'Brien, C. P. (1985). New data from the Addiction Severity Index: reliability and validity in three centers. *Journal of Nervous and mental Disease*.

Pitt, H., Thomas, S. L., Bestman, A., Stoneham, M., & Daube, M. (2016). "It's just everywhere!" Children and parents discuss the marketing of sports wagering in Australia. *Australian and New Zealand journal of public health*, *40*(5), 480-486.

Rahman, A. S., Pilver, C. E., Desai, R. A., Steinberg, M. A., Rugle, L., Krishnan-Sarin, S., & Potenza, M. N. (2012). The relationship between age of gambling onset and adolescent problematic gambling severity. *Journal of psychiatric research*, *46*(5), 675-683.

Rai, D., Hall, W., Bebbington, P., Skapinakis, P., Hassiotis, A., Weich, S., ... & Farrell, M. (2014). Estimated verbal IQ and the odds of problem gambling: a population-based study. *Psychological medicine*, *44*(8), 1739-1749.

Räsänen, T., Lintonen, T., & Konu, A. (2015). Gambling and problem behavior among 14-to 16-year-old boys and girls in Finland. *Journal of Gambling Issues*, (31), 1-23.

Roberts, A., Coid, J., King, R., Murphy, R., Turner, J., Bowden-Jones, H., ... & Landon, J. (2016). Gambling and violence in a nationally representative sample of UK men. *Addiction*, *111*(12), 2196-2207.

Roberts, K. J., Smith, N., Bowden-Jones, H., & Cheeta, S. (2017). Gambling disorder and suicidality within the UK: an analysis investigating mental health and gambling severity as risk factors to suicidality. *International Gambling Studies*, *17*(1), 51-64.

Ronzitti, S., Soldini, E., Smith, N., Clerici, M., & Bowden-Jones, H. (2017). Gambling disorder: Exploring pre-treatment and in-treatment dropout predictors. A UK study. *Journal of gambling studies*, *33*(4), 1277-1292.

Sharman, S., Dreyer, J., Aitken, M., Clark, L., & Bowden-Jones, H. (2015). Rates of problematic gambling in a British homeless sample: A preliminary study. *Journal of Gambling Studies*, *31*(2), 525-532.

Sharman, S., Murphy, R., Turner, J. J., & Roberts, A. (2019). Trends and patterns in UK treatment seeking gamblers: 2000–2015. *Addictive behaviors*, *89*, 51-56.

Shaw, M. C., Forbush, K. T., Schlinder, J., Rosenman, E., & Black, D. W. (2007). The effect of pathological gambling on families, marriages, and children. *CNS spectrums*, *12*(8), 615-622.

Shin, Y. C., Choi, S. W., Ha, J., Mok, J. Y., Lim, S. W., Choi, J. S., & Kim, D. J. (2014). Age of pathological gambling onset: Clinical and treatment-related features. *Journal of addiction medicine*, *8*(3), 205-210.

Steinberg, L. (2005). Cognitive and affective development in adolescence. *Trends in cognitive sciences*, *9*(2), 69-74.

Thomas, S., Pitt, H., Bestman, A., Randle, M., Daube, M., & Pettigrew, S. (2016). Child and parent recall of gambling sponsorship in Australian sport. *Victoria: Victorian Responsible Gambling Foundation*.

ACCEPTED MANUSCRIPT

Welte, J., Barnes, G., Wieczorek, W., Tidwell, M. C., & Parker, J. (2001). Alcohol and gambling pathology among US adults: prevalence, demographic patterns and comorbidity. *Journal of studies on alcohol*, *62*(5), 706-712.

Table 1 - Substance use in whole sample

	n (answered question)	***n (engaged in behavior)***	***Percentage***
Any Alcohol	577	444	76.9
Alcohol (above DoH guidelines)	577	202	35
Any Smoking	656	404	61.6
Any Drug use*	728	172	23.6

* *Recreational or habitual use of non-prescription drugs*

Table 2- Stepwise Regression Models: Themes and variables

Backward Stepwise Logistic Regression Model Themes	**Variables Included in Model**
Self-Destructive Behavior	Attempted Suicide (Roberts, Smith, Bowden-Jones, & Cheeta, 2017); Committing a crime (May-Chahal, Humphreys, Clifton, Francis, & Reith, 2017).
Substance Use	Any solvent / drug use (Manning et al., 2017); Unhealthy alcohol consumption (Welte, Barnes, Wieczorek, Tidwell, & Parker, (2001); Smoking (Manning et al., 2017)
Childhood Experience	Close family member drinking / gambling as you were growing up, negative family environment (Grant et al., 2009); Experience of bullying (Räsänen, Lintonen, & Konu, 2015); Sexual abuse (Dion, Collin-Vézina, De La Sablonnière, Philippe-Labbé,, & Giffard, 2010); or Witnessing violence (Roberts et al., 2016)
Mental Health	Co-occurring mental health disorder; sought treatment for a mental health disorder (Lorains, Cowlishaw, & Thomas, 2011)
Gambling Behavior	Form specificity (matter what you gambled on), need for

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	increased stake, number of gambling activities engaged in (Sharman, Murphy, Turner, & Roberts, 2019)
Adult Experience	Educational attainment (Rai et al., 2014); Experienced homelessness (Sharman, Dreyer, Aitken, Clark, & Bowden-Jones (2015); Suffered marital or relationship difficulties (Shaw, Forbush, Schlinder, Rosenman, & Black, 2007)

Table 3: Independent Associations between age of gambling onset and significant Multinomial Logistic Regression variables

	Age ≥ 16+ (N=372)		**Age 13-15 (N=204)**		**Age ≤ 12 (N=185)**	
	% (n)	**OR**	**% (n)**	**OR (CI)**	**% (n)**	**OR (CI)**
Violence during childhood	49(372)	1	26(204)	-	24(185)	.5*(.33-.77)
Close family members gambling heavily during childhood	47(308)	1	27(178)	.52**(.36-.77)	25(169)	.53*(.36-.78)
Close family members drinking heavily during childhood	47(309)	1	27(178)	-	25(167)	.63*(.43-.92)
Parental divorce/separation	47(310)	1	27(178)	-	25(169)	.4**(.32-.7)
Committing a crime that was not reported to the police	48(363)	1	27(202)	.57*(.4-.81)	24(182)	.6*(.41-.86)
Whether type of gambling mattered	47(310)	1	27(178)	2**(1.37-2.91)	25(168)	1.85*(1.25-2.69)
Abuse of drugs or solvents	49(357)	1	26(194)	-	24(173)	.56*(.37-.85)
Propensity toward verbal aggression	50(354)	1	26(188)	.65*(.45-.95)	23(165)	.6*(.41-.89)
Whether violent outbursts damaged their main relationship	47(309)	1	27(178)	.62*(.38-1)	25(167)	.4**(.25-.64)

***P≤ 0.05; ** P≤ 0.01**

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Appendix 1 – Variables analysed in multinomial regression

Question asked of respondent [annotations for the reader]	Type of variable coding
Did you have to increase your stake to get the same buzz of excitement as you used to get from a smaller stake?	Binary yes/no.
Did it matter what you gambled on?	Binary yes/no.
Do you smoke?	Binary yes/no.
What is your highest level of education? [This variable originally captured 21 ordinally progressive categories ranging from no education through to a Doctorate. A derived three-levelled ordinal variable was subsequently created and used in the analysis]	Three level ordinal variable with the following codes: 'None'; Up to GCSE/O Level' and 'Other/ Above'.
Have you ever been a victim of bullying?	Binary yes/no.
Did you experience violence in your childhood?	Binary yes/no.
Did you experience sexual abuse in your childhood?	Binary yes/no.
Have you ever had suicidal thoughts?	Binary yes/no.
Do you suffer from mental ill-health (other than gambling addiction)?	Binary yes/no.
Have you received treatment for a mental health disorder?	Binary yes/no.
Do you forget to look after self? (e.g. have a wash, get something to eat, etc.)	Binary yes/no.
Did you grow up in your natural family?	Binary yes/no.
Do you remember anyone close to you drinking heavily whilst you were growing up?	Binary yes/no.
Did your parents get divorced/separated?	Binary yes/no.
On average, how much alcohol do you consume weekly? [Participants' reported number of units was recorded, and more than 14 units was classified as unhealthy. A binary variable was derived]	Binary yes/no.
The following three questions were asked of respondents and the answers to each were combined and recoded to create a derived binary variable. If respondents answered 'yes' to any one of these questions, the derived variable was coded as a 'yes'. They are as follows: Did you experience violence in your childhood? Did you experience sexual abuse in your childhood? Have you ever been a victim of bullying?	Each of the three variables were coded as binary yes/no. The derived variable consisting of all three was similarly coded as a binary yes/no variable.
Have your marital or intimate relationships been harmed by your gambling?	Binary yes/no.
Do you remember anyone close to you gambling heavily whilst you were growing up?	Binary yes/no.
Have you ever self-harmed?	Binary yes/no.
Have you committed a crime?	Binary yes/no.
Have you committed a crime that resulted in legal punishment?	Binary yes/no.
Have you committed a crime that was not reported to the police?	Binary yes/no.
Have you committed a gambling related crime?	Binary yes/no.
Do you use solvents or drugs?	Binary yes/no.
Have you ever attempted suicide?	Binary yes/no.
Have you ever been homeless?	Binary yes/no.
Are there certain occasions or circumstances that make you verbally aggressive, or seen by others as verbally aggressive?	Binary yes/no.
Are there certain occasions or circumstances that make you physically	Binary yes/no.

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aggressive, or seen by others as physically aggressive?	
Are there certain occasions or circumstances that make you work out your anger by damaging property?	Binary yes/no.
Are there certain occasions or circumstances that make you set fire to property?	Binary yes/no.
Which behaviors damaged your main relationships? Angry outbursts?	Binary yes/no.
Which behaviors damaged your main relationships? Violent outbursts?	Binary yes/no.
Which behaviors damaged your main relationships? Stealing?	Binary yes/no.
Which behaviors damaged your main relationships? Lying?	Binary yes/no.
Which behaviors damaged your main relationships? Betrayal?	Binary yes/no.
Which behaviors damaged your main relationships? Deceits?	Binary yes/no.
Other losses – family	Binary yes/no.
Other losses – partner	Binary yes/no.

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Psychosocial correlates in treatment seeking gamblers: differences in early age onset gamblers vs later age onset gamblers: Highlights

- Early age onset gamblers (12 and under) reported increased gambling severity
- They were more likely to have abused drugs or solvents than the older age of onset group
- Early age onset gamblers were more likely to have committed an unreported crime.
- They were more likely to have a parent with a gambling problem
- Age of onset was not associated with treatment completion or dropout

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