Gambling Harms and Neurodivergence: Mapping the Evidence Landscape

IFF Research
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1 Executive Summary

Introduction

The intersection of gambling harm and neurodivergence[1] is currently under-researched. This means there is little evidence of how gambling harm is experienced by those who are neurodivergent or how best to deliver gambling treatment and support to those who seek it.

In March 2024, GambleAware awarded funding as part of an open grant to IFF Research, in collaboration with Dr Amy Sweet (Honorary Research Fellow at the University of Bristol), Dr Tim Morris (Senior Research Fellow at UCL and the University of Bristol), and Ara (a charity that has been providing drug, alcohol and gambling treatment services since 1987), to carry out research into the relationship between neurodivergence and gambling harms. Specifically, this research aimed to understand whether, for neurodivergent people, there is any increased risk of gambling harms, what the drivers of gambling harms are, any barriers to formal and informal gambling support, and best principles and practices for appropriate gambling treatment, support, communication, and engagement for neurodivergent people.

The research spans three phases to enable it to build on the available evidence at every stage, including secondary analysis of existing evidence; primary research with neurodivergent people experiencing gambling harms; and developing and workshopping solutions to translate insights into practice. An Advisory Panel of six expert advisors with lived and professional experience of both neurodivergence and gambling provided guidance on project design and delivery and interpretation of the findings throughout.

Methodology

This report summarises findings, evidence gaps and implications for future research from Phase 1 of this research, mapping the landscape of neurodivergent people in gambling. Findings are from a Rapid Evidence Assessment (REA) and analysis of data from the Avon Longitudinal Study of Parents and Children (ALSPAC) longitudinal cohort study. Findings were shared and discussed with the Advisory Panel and their reflections are also included in this report. It is important to note that GambleAware had no role in the design, analysis or interpretation of the data presented in this report.

- REA: Review of 48 academic articles published in journals subject to peer review, in line with Government Social Research guidelines. The REA included literature citing behavioural or individual risk factors attributed to neurodivergence, as well as specific individual neurodivergent conditions, that could be related to gambling harm.
- ALSPAC analysis: Analysis of gambling and neurodivergent measures among ALSPAC children to derive differences between those with and without indicators of neurodivergence

[1] Neurodivergence is a non-medical umbrella description of people with variation from neurotypical presentation in their mental functions and behaviour; that is to say, they process and experience the world differently to the majority of people. The most commonly cited types of neurodivergence are Attention Deficit Hyperactivity Disorder (ADHD, sometimes also called Attention Deficit Disorder or ADD), Autism Spectrum Disorder (ASD), Dyslexia, Dyscalculia and Dyspraxia.

in terms of gambling behaviours and harms experienced, and the strength of these associations.

Language used in this report

In consultation with our Advisory Panel, we have aimed to balance using sensitive and neuro-affirming language[2] (Hartman et al., 2023c), while still accurately reflecting the findings of previously published research by using the original language used, even if this may be considered stigmatising or disempowering for neurodivergent people and/or people experiencing gambling harms. We also recognise that clinical descriptions of experiences as documented by previous research may not sensitively or accurately represent the full range of experiences of neurodivergent people who gamble.

Gambling behaviour among neurodivergent people

There were no consistent differences found in how often neurodivergent and neurotypical people gamble across the REA and ALSPAC analysis. Specifically, in the ALSPAC analysis, ALSPAC children with ADHD or ASD were more likely to gamble frequently than those without each form of neurodivergence at some age points (age 17 and 20), and less likely at others (age 24 and 30). ALSPAC children with dyslexia or dyspraxia less commonly reported gambling at least weekly at almost all age points where gambling measures were recorded, compared to those without each type of neurodivergence.

There was some evidence in both the REA and ALSPAC data that neurodivergent people are more likely to experience gambling harm as a result of their gambling behaviour, compared to those without indicators of neurodivergence. In particular, the links between ADHD or ASD and experiencing gambling harm are strong, with the ALSPAC analysis indicating that such people's probability of experiencing negative consequences from gambling was twice as high as peers without ADHD or ASD, respectively. There is also evidence in the literature that ADHD traits in childhood and adolescence are associated with "excessive" gambling behaviour. Evidence of a link between gambling harm and dyslexic and dyspraxic people and those with dyscalculia was limited, and the ALSPAC analysis was inconclusive.

In the ALSPAC data, there was limited evidence that neurodivergent people's experiences of gambling harm were influenced by their gender or socioeconomic background. However, there was an indication that neurodivergent people from ethnic minority backgrounds may report more frequent gambling than white neurodivergent people, and greater levels of gambling harms. Small sample sizes mean caution should be taken in interpreting these results, with further research needed.

Drivers of gambling harms

There was limited evidence found for exactly what may cause some neurodivergent people to be at increased risk of gambling harm. However, previous research suggested traits associated with ADHD and autism, including impulsivity and challenges in risk assessment, can increase the risk of gambling frequently or experiencing gambling harm. Differences in motivations, sensory sensitivities, engagement in repetitive behaviours, and information processing could contribute to people with ADHD or autism being at greater risk of gambling harms. . There is also some evidence that co-

[2] Neurodivergent-affirming language is a direct result of the neurodiversity movement and focuses on using language that encourages, accepts and acknowledges the neurodivergent existence.

occurring mental health conditions may further interact with experiences of harm among neurodivergent people.

Gambling treatment and support

Gambling treatment, support and messaging in Great Britain is predominantly designed and tested on neurotypical people, despite evidence that there are higher rates of ADHD among people seeking gambling treatment compared to the general population. Research suggests that adapting gambling treatment and support could help them to be more effective for neurodivergent people. The Advisory Panel agreed that screening for neurodivergence and adapting treatment accordingly would be more effective for neurodivergent individuals. The REA found no evidence on neurodivergent people's experiences or the impact of informal gambling support or support outside clinical settings.

Evidence from adjacent sectors further indicated that adapting communication, gambling treatment and support approaches to neurodivergent people's needs may improve effectiveness. This could include the use of autonomy-supportive approaches, which aim to foster independence, self-regulation and problem-solving skills to build motivation and self-management skills; cognitive behavioural therapy (CBT), a talking therapy that supports people to break negative cycles of behaviour; taking regular breaks during support sessions; and the use of clear signposting to gambling treatment and support in communications. There may also be a benefit to including lived experience in the design of support.

Conclusions

This research demonstrated how nuanced the relationship between neurodiversity and gambling is and how little is known about neurodivergent people's experiences of gambling, gambling harm, and gambling treatment and support. The key knowledge gaps identified in this research that need to be addressed in future studies are:

- Lack of intersectionality. Despite identifying a relationship between neurodivergence and gambling harm, the current evidence base has very little focus on the overlapping social identities of gender, race, ethnicity, class, or religion among neurodivergent people and how they intersect and affect their experiences in relation to gambling harm.
- Lack of coverage of all neurodivergent identities, with more evidence of links between ADHD or autism and gambling harms compared to dyslexia, dyspraxia or dyscalculia.
- Weak evidence for which types of gambling are practised by neurodivergent people and how this relates to experiences of gambling harm; and the types of gambling harm experienced by neurodivergent people (e.g. financial harms, criminal activity, relationship harms).
- Limited evidence on how to deliver successful formal (clinical) gambling treatment or support for neurodivergent people (e.g. tailoring resources and communication approaches) or the extent to which current treatment and support is successful for neurodivergent people.
- No evidence on experiences of neurodivergent people not currently engaging with formal gambling treatment or support, or experiences of informal gambling support outside clinical settings.

- Limited social (in contrast to clinical) research on what drives neurodivergent people to gamble. This means the available evidence is limited in its applicability to the wider neurodivergent population experiencing gambling harms, who may not (yet) be seeking gambling treatment or have received a formal diagnosis.
- Challenges and limitations of using data collected in the past, given changes in the way neurodivergence is identified and diagnosed. Further, this research highlighted the importance of using language that is respectful to neurodivergent individuals when designing and communicating research.

While it is not possible to cover all knowledge gaps in the remaining phases of this research, a clear focus for Phase 2 of the research is outlined to ensure we can meaningfully build evidence and add to sector knowledge.

2 Introduction

Despite evidence of the disproportionate burden of gambling harms on those already marginalised or experiencing inequalities, there has only recently been a shift in the focus of research undertaken in Great Britain away from a 'catch all' approach (Levy et al., 2020). In making this shift, it is evident that the intersection of gambling harm and neurodivergence is currently under researched. This means there is little evidence of how gambling harm is experienced by those who are neurodivergent or how best to deliver gambling treatment and support to those who seek it.

In March 2024, GambleAware awarded funding as part of an open grant to IFF Research, in collaboration with Dr Amy Sweet (Honorary Research Fellow at the University of Bristol), Dr Tim Morris (Senior Research Fellow at UCL and the University of Bristol), and Ara (a charity that has been providing drug, alcohol and gambling treatment services since 1987), to carry out research into the relationship between neurodivergence and gambling harms. Specifically, the aims of this research were to understand whether there is any increased risk of gambling harms, the drivers of gambling harms, any barriers to formal and informal gambling support, and best principles and practices for appropriate gambling treatment and support, communication and engagement for neurodivergent people.

The research is iterative in nature, spanning three phases. This approach builds on the available evidence at every stage, ensuring that we do not repeat what's already known but instead add to the existing evidence base. An Advisory Panel of six expert advisors, including experts by experience and by professional background, was also set up to provide guidance on project design and delivery as well as interpretation of findings throughout. The three phases of this research are:

- **Phase 1: Mapping the landscape of neurodivergent people in gambling.** Secondary analysis of existing evidence on neurodiversity and gambling. This involved a rapid evidence assessment (REA), and analysis of data collected from the Avon Longitudinal Study of Parents and Children (ALSPAC). *Carried out April – August 2024 and the focus of this report.*

- **Phase 2: Understanding context and needs of neurodivergent people in gambling.** Primary research carried out by IFF Research to explore views of neurodivergent individuals in Great Britain experiencing gambling and gambling harms. In-depth interviews and an online community with 45 neurodivergent people. *Planned for September 2024 – January 2025.*

- **Phase 3: Developing and testing solutions to translate insights into practice**. Ara will develop draft solutions for identifying, communicating and engaging with neurodivergent people who gamble, with input from consortium members. *Planned for January – April 2025.*

Methodology

This report summarises findings, evidence gaps and implications for future research from Phase 1: Mapping the landscape of neurodivergent people in gambling. Findings are from the **REA** as well as the **analysis of ALSPAC data**, both of which were conducted between April and July 2024. These findings were shared and discussed with the Advisory Panel in a workshop convened by IFF Research in July 2024. The Panel's reflections from this session are also included in this report. It is important to note that GambleAware had no role in the design, analysis or interpretation of the data presented in this report.

Rapid evidence assessment (REA)

The REA was conducted in line with Government Social Research guidelines. A total of 52 papers were identified and screened, of which 12 were excluded as they did not focus on gambling harms, but instead used a gambling related task as a measure of risk taking. Snowballing (i.e. consulting reference lists in key documents to source other relevant items) was also used to supplement the search, which identified an additional 8 studies. The report is therefore based on 48 papers, all of which are academic articles published in journals that were subject to peer review. There were no policy reports or grey literature identified in the search.

Given the lack of research specifically on gambling, the REA included literature citing behavioural or individual risk factors attributed to neurodivergence that could be related to gambling harm. It also focused on the specific individual conditions classed as being neurodivergent (including ADHD, ADD, Autism, Dyslexia, Dyscalculia, Dyspraxia and behavioural disorders) and their relationship to gambling and gambling harm. The full list of search terms and the process for identifying relevant papers is outlined in Appendix A: REA search terms and process.

Evidence from academic peer-review journal articles and working papers in fields including gambling studies, behavioural science, psychology, health studies and public health have been included. The REA considers both UK and international evidence published in the English language, using a range of studies including meta-analyses; systematic and narrative reviews; empirical quantitative or qualitative research. Limitations noted by authors of the articles were recorded and presented in this report where appropriate.

Analysis of ALSPAC data

Secondary analysis was carried out on data from the Avon Longitudinal Study of Parents and Children (ALSPAC), a longitudinal birth cohort based in Avon, near Bristol in the UK. Pregnant women resident in Avon with expected delivery dates between 1st April 1991 and 31st December 1992 were invited to take part in the study. These mothers, their children, and their partners were followed up over three decades through a series of surveys spanning their child's lifetime from early years, through to adolescence and adulthood. There was a boost to the initial sample when the oldest children were approximately 7 years of age, resulting in a total sample size of c.15,000 children in the study.

The ALSPAC cohort is largely representative of the UK population when compared with 1991 Census data; there is under representation of some ethnic minorities, single parent families, and those living in rented accommodation (Boyd et al., 2013).

The gambling and neurodiversity measures included in ALSPAC that were used in this analysis are summarised below, with full detail outlined in Appendix B: ALSPAC technical detail.

- Gambling frequency: ALSPAC children were asked about their gambling behaviour, including types of gambling (e.g. slot machines, online gambling, table games) and the frequency with which they gambled at ages 17 (2009), 20 (2012), 24 (2016) and 30 (2022).

- Problem Gambling Severity Index (PGSI): This is a widely used and validated tool that is a proxy for measuring gambling harms. ALSPAC children were asked to complete the PGSI at ages 19, 20, 24 and 30.

- Attention Deficit Hyperactivity Disorder (ADHD): Mothers of ALSPAC children were asked to complete the Development and Well-Being Assessment (DAWBA) for their children at ages 7, 10, 13 and 15. The child's schoolteacher was also asked to complete the DAWBA for the child at age 7.

- Autism Spectrum Disorder (ASD): Mothers of ALSPAC children completed the Skuse Social Communication Disorder Checklist (SCDC), a widely validated and reliable screening instrument of verbal/nonverbal communication and social reciprocity for measuring ASD related traits, for their child at age 8.

- Behavioural disorders: 3 measures of behavioural disorders were included in the DAWBA at the same ages outlined for ADHD above. A fourth measure was based on ALSPAC children self-reports at age 22 about whether they had ever received additional support at school, college/university, or in the workplace for behavioural problems or hyperactivity.

- Dyslexia: ALSPAC children were assessed on the accuracy component of the Neale Analysis of Reading Ability (NARA II) at age 9, using deviations of equivalent reading age from biological age. Additionally, mothers of ALSPAC children were asked to report whether they had been told that the child had dyslexia by age 9; and ALSPAC children were asked to self-report whether they had ever received additional support at school, college/university or in the workplace for dyslexia at age 22.

- Dyspraxia: ALSPAC children were directly assessed on motor impairment and IQ at age 8. Additionally, mothers of ALSPAC children were asked to report whether they had been told that the child had dyspraxia by age 9; and ALSPAC children were asked to self-report at age 22 about whether they had ever received additional support at school, college/university or in the workplace for dyspraxia.

For this study, the analysis first consisted of descriptive statistics of gambling and neurodivergence measures to assess the prevalence of gambling behaviours and harms, and how these differ between participants with identified neurodivergent traits and those without these traits. A series of regression models were then run to estimate the associations between neurodivergence and gambling frequency and harm at each age (17, 20, 24, 30). Given the ordered nature of the gambling frequency and PGSI group measures, ordered logistic regression models were used with gambling frequency and PGSI group as the outcome measures respectively. To assess the role of potential confounder variables, all regression models were run twice. First, covariates for sex, ethnicity and birth order were included; second, covariates for parental socioeconomic position, parental education, and parental age were also added. The measures of neurodivergence used in this report largely predate the gambling measures, making the results in this report largely robust to reverse confounding, whereby gambling behaviour could influence neurodiversity.

It is important to note that the gambling and neurodiversity measures used will be susceptible to measurement error, whereby the observed measures are an imperfect representation of gambling behaviour and neurodiversity across all survey participants in ALSPAC. By combining information from multiple time points, the summary measures of gambling and neurodiversity are likely to be better proxies for long-term underlying gambling behaviour, gambling harms, and neurodiversity. Details on the effect size can be found in Annex B of this report.

When reporting on the ALSPAC analysis throughout this report, where comparisons are made to understand relative prevalence or likelihood, these compare participants who do and do not fall into the category relating to the specific measure of neurodivergence (e.g. those identified as having ADHD vs. those identified as not having ADHD, in line with the measures described above). As participants may fall into one category of neurodivergence but not another, comparisons do not indicate a simple comparison of neurotypical with neurodivergent (e.g. those identified as not having ADHD may at the same time be categorised as dyslexic).

Language used in this report

We have aimed to balance using sensitive and neuro-affirming language in our commentary and discussion of implications, while still accurately reflecting the findings of previously published research. Some of this prior research uses language that may be stigmatising or disempowering for neurodivergent people and/or people experiencing gambling harms, but in some instances meaning may not accurately be conveyed if this language is altered. Similarly, our Advisory Panel stressed the importance of recognising that clinical descriptions of experiences as documented by previous research may not sensitively or accurately represent the full range of experiences of neurodivergent people who gamble.

Language to describe autism

Throughout this report, we have used identity-first language (‘autistic people’) wherever possible. Although there is not universal agreement among autistic people on the best term to use (Vivanti 2020), research with autistic people indicates that person-first language (‘person with autism’ or ‘person with autism spectrum disorder/condition’) is least preferred (Botha et al., 2021; Bury et al., 2020; Bradshaw et al., 2021; Kenny et al., 2016; Lei et al., 2021).

Similarly, we have minimised use of the term Autism Spectrum Disorder (ASD), as previous research indicates that pathologising terms implying someone is in some way ‘broken’ or ‘less than’ due to their autistic traits (such as ‘deficit’ or ‘disorder’) tend to be viewed negatively among autistic people (Bottema-Beutel et al., 2021; Kenny et al., 2016; Ryan and Runswick-Cole, 2009). However, in some places the use of ‘ASD’ has been retained:

- When findings from the REA relay the results of published research that uses clinical or outdated terms (including ‘ASD’, or ‘symptoms of ASD’), we have reflected this language to ensure findings are accurately represented.
- When referring to findings from analysis of the ALSPAC data, those who scored over the threshold to indicate a social communication disorder using the Skuse Social Communication Disorder Checklist (SCDC) are referred to as having ASD. The SCDC has been validated as a reliable screening tool to measure verbal and non-verbal communication and reciprocity (Skuse et al., 2005). However, although this group is referred to as having ASD given the high correlation of traits, it is important to interpret these findings with caution, as high scores on the SCDC do not represent a clinical diagnosis of autism. Additionally, due to limitations of the screener tool, this data category may not fully represent the broader autistic population.

Language to describe gambling and gambling harms

In line with previous research on the preferences of people experiencing gambling harms, throughout our commentary and discussion of implications we have used non-stigmatising, non-pathologising, person-centred language about gambling (‘people experiencing gambling harms’) (GambleAware 2023). This language can help to reduce shame about seeking support, by acknowledging that a person experiencing gambling harm has an identity beyond this, and not blaming an individual for what they are experiencing (Pliakas et al., 2022).

However, where previous research analysed in the REA uses outdated or stigmatising terms to identify behaviours with greater risk, such as "excessive gambling", we have reflected this language in this report when directly relaying findings to ensure accuracy.

3 Gambling behaviour among neurodivergent people

There was little evidence from the ALSPAC analysis, and no evidence found by the REA to suggest that gambling frequency differed between neurodivergent and neurotypical people across most of our indicators of neurodivergence. However, some evidence from both the REA and ALSPAC analysis indicated that people with ADHD and autistic people may be at increased risk of gambling harm. There is weak evidence that neurodivergent people with different intersectional characteristics may experience gambling harm differently. Among people with indicators of neurodivergence in the ALSPAC dataset, there was weak evidence for differences in experience of gambling harm according to their gender or socioeconomic background. However, experiences of neurodivergent people from ethnic minority backgrounds may differ from the experience of white neurodivergent people.

How often neurodivergent people gamble

Analysis of the ALSPAC data found no consistent differences in gambling frequency for participants with ADHD, ASD, behavioural disorders, dyslexia or dyspraxia. However, there were some differences in how often specific, cross-sectional groups of neurodivergent people gamble.

Depending on their age, people with ADHD or ASD were at points more likely to gamble frequently than participants without each condition, and at other ages less likely. At ages 17 and 20, ALSPAC participants with ADHD, ASD or behavioural disorders more commonly reported gambling at least weekly, compared to other participants of the same age. Specifically, participants with ADHD aged 17 and 20 were around 40% more likely to gamble frequently compared to other participants without ADHD of the same age. However, this was not consistent across all ages: at ages 24 and 30, participants with ADHD were around 40% less likely than those without ADHD to gamble at least weekly, and participants with ASD were 10-20% less likely. The inconsistency across ages suggests that caution should be exercised when interpreting these results.

Interestingly, neurodivergent people with dyslexia less commonly reported gambling at least weekly at any age compared to those without dyslexia, and those with dyspraxia less commonly reported gambling at least weekly at age 20, 24 and 30 (but not age 17) compared to those without dyspraxia.

Prevalence of gambling harm by neurodivergence

ADHD

The ALSPAC analysis provided strong evidence that people with ADHD were more likely to experience high levels of gambling harm than their peers without ADHD, with their probability of experiencing negative consequences from gambling twice as high as peers without ADHD.

This was supported by the wider literature, with research suggesting that ADHD can increase the risk of gambling harm or 'problem gambling' behaviour (Brunault et al., 2020; Breyer et al., 2009; Aymami et al., 2015; Retz et al., 2016; Fatseas et al., 2016; Jacob et al., 2018; Faregh and Derevensky, 2020;

Mestre-Bach et al., 2021), and one study identifying ADHD as an independent risk factor for gambling severity (Dai et al., 2016). People who reported traits of ADHD into adulthood appeared to experience greater severity of gambling problems compared to those without ADHD, as well as those who did not report ADHD traits in adulthood (Breyer et al., 2009). Another study found that people with ADHD spent more time gambling and developed gambling disorder at a faster rate than people without ADHD (Retz et al., 2016).

Further, within the literature there was evidence of a link between ADHD traits, frequent gambling, and experiencing gambling harm in adolescents (Faregh and Derevensky, 2011; Hellström et al., 2017; Grall-Bronnec et al., 2011). Some studies found that ADHD traits experienced either in adulthood or childhood were associated with "excessive" gambling behaviour (Romo et al., 2015) or were more frequently reported among those seeking gambling treatment (Fatseas et al., 2016). Another study found that young adults who reported ADHD symptoms persisting into adulthood experienced a greater severity of gambling problems compared to those without ADHD, or compared to those whose ADHD traits in childhood did not persist into adulthood (Breyer et al., 2009).

Autism (ASD)

Similar to findings for ADHD, the ALSPAC analysis showed that people with ASD were twice as likely as people without ASD to experience gambling harm. The wider literature included one study with young adults with ASD (aged 18-29 years old) which found that those with higher scores on an ASD screening tool were more likely to have higher levels of gambling disorder symptoms (Grant and Chamberlain, 2021). However, the REA found limited published research on the link between autism and gambling harms beyond this one study.

Dyslexia, dyspraxia and dyscalculia

People with dyslexia or dyspraxia may be less likely to experience gambling harms compared to people without dyslexia or dyspraxia, but the evidence was inconclusive. Problem Gambling Severity Index (PGSI) scores reported by ALSPAC survey participants with dyslexia or dyspraxia were slightly lower than for those without dyslexia or dyspraxia, suggesting lower levels of harm than for participants without each condition.

The REA found no research undertaken to explore gambling harm among people with dyslexia, dyspraxia and dyscalculia.

It is worth noting that while these findings are similar to the 'harms paradox' evidenced among other communities, in which those who gamble less frequently tend to experience greater harms (Wardle et al., 2019), there is no clear evidence as to whether neurodivergent people gamble more or less frequently than others.

Intersectionality

Analysis of the ALSPAC data for neurodivergent participants by sex at birth, ethnicity and socioeconomic background showed broadly similar patterns of gambling frequency and PGSI scores for gambling harm across participants. However, neurodivergent ethnic minority participants more commonly reported frequent gambling than white neurodivergent participants. Further, white neurodivergent participants less commonly reported experiencing gambling harms (PGSI score of 1 or above) than neurodivergent ethnic minority participants. Very low sample sizes among these subgroups mean these results should be treated with caution, with further research needed.

4 Drivers of gambling harms

There was limited evidence found for exactly what may cause some neurodivergent people to be at increased risk of gambling harm. We found some evidence that the presence of certain traits can increase the risk of gambling more frequently or of experiencing more harm, and that co-occurring mental health conditions may also contribute to experiences of harm.

Traits that may increase risk

Some previous research suggested certain traits associated with ADHD and/or autism may increase the likelihood that someone may engage in more frequent or more risky gambling behaviours. These traits include:

- Impulsivity, including challenges inhibiting urges or making impulsive decisions (Jacob et al., 2018; Aymamí et al.; 2015, Tobias-Webb and Clark, 2015).

- Challenges in risk assessment, including risk-taking behaviour or challenges in making decisions (Goris et al., 2020; Wu et al., 2018; Jacob et al., 2018; Aymamí et al., 2015; Luke et al., 2012).

Some previous research has also identified other traits that may increase the risk of people with ADHD experiencing gambling harm. This included research suggesting that people with ADHD may experience a sedative effect from gambling (Retz et al., 2016), and that people with traits of ADHD may also be more likely to gamble without premeditation (Cairncross et al., 2019). People with ADHD may also exaggerate the potential benefits of a good outcome due to differences in processing delayed or probabilistic rewards, making risky gambling behaviours seem more appealing and putting them more at risk of gambling harm (Dai et al., 2016, Shoham et al., 2016).

Other research about motivations for gambling found that people with ADHD reported gambling for social, coping and enhancement reasons such as adrenaline and euphoria as it tended to increase the appeal and engagement of gambling activities (Cairncross et al., 2019). In the same vein, research suggested that autistic peoples' differences in processing information, sensory sensitivities and repetitive behaviours may also increase their risk of experiencing gambling harm (Grant and Chamberlain, 2021).

Co-occurring mental health conditions

There was some evidence to suggest a link between co-occurring mental health conditions or low wellbeing and increased risk of gambling harm. Previous research found that people with ADHD seeking treatment for gambling harm were more likely to have co-occurring mental health conditions, compared to neurotypical people seeking treatment (Brandt and Fischer, 2019; Waluk et al., 2016). However, the relationship between gambling harms and co-occurring mental health conditions was unclear. Even without considering gambling harms, ADHD in adulthood is associated with high levels of unemployment (Kooij et al., 2010) and links have been drawn between ADHD, co-occurring mental health conditions and substance use (such as drugs or alcohol) (Wilens et al., 2011; Black et al., 2013; Reid et al., 2020). Similarly, stigma against autistic people can contribute to a range of poor outcomes such as lower well-being (Turnock et al., 2022).

5 Gambling treatment and support

There was no information in the ALSPAC data on gambling treatment and support available, and very little research was found on effective treatment and support for neurodivergent people experiencing gambling harm in the REA. Further, the REA found no evidence on neurodivergent people's experiences on the impact of informal gambling support or support outside of clinical settings.

Seeking gambling treatment

Gambling treatment, support and messaging (including signposting to services) in Great Britain is predominantly designed and tested on neurotypical people (GambleAware, 2022). There is no published research or documentation from GB on adaptations to treatment, support or messaging for neurodivergent people.

However, previous research has shown that there are higher rates of ADHD among people seeking treatment for gambling harms than in the general population (Waluk et al., 2016; Fatseas et al., 2016; Jacob et al., 2018). No data was found on the prevalence of autistic people or other neurotypes among people seeking treatment.

Effective gambling treatment approaches

Some previous research indicated that gambling treatment plans, treatment objectives and intervention approaches may be more effective for people with ADHD when adapted to accommodate their neurodivergence (Waluk et al., 2016). The research suggested that more extensive assessments would give time and space to enable support workers or practitioners to identify additional needs or plan how support can be adapted (Waluk et al., 2016). The Advisory Panel agreed that, in their experience, screening for neurodivergence and adapting gambling treatment accordingly would be more effective, especially in allowing flexibility of approach.

The REA found no research on the effectiveness of tailored approaches for autistic people, or people with dyslexia, dyspraxia or dyscalculia.

Effective communication approaches

Evidence from adjacent sectors suggested two communication styles that may be most effective for neurodivergent people when used by practitioners during gambling treatment: autonomy-supportive approaches and cognitive behavioural therapy (CBT).

- An autonomy-supportive approach is a style of providing support that aims to foster a person's motivation by encouraging a sense of autonomy. These approaches acknowledge the person's individual perspective, allow for free choice, and provide meaningful rationales for tasks and instructions. This promotes independence, self-regulation and problem solving skills, which can help neurodivergent people to feel more motivated and build their self-management skills (Reeve, 2009). Overall, it can create more positive outcomes for people with ADHD (Waluk et al., 2016), and possibly other neurotypes.

- Cognitive Behavioural Therapy (CBT) can help to identify triggers relating to gambling and target impulsivity which can be a common trait of some neurotypes including ADHD and ASD, as explored above (Grall-Bronnec et al., 2011). CBT is a talking therapy based on the idea that actions, thoughts, feelings and physical sensations are all interconnected. It supports people to break negative cycles of behaviour by finding ways to interrupt one of these interconnected aspects. Previous research suggests intensive and prolonged CBT may help neurodivergent people experiencing gambling harms by helping to manage impulsivity and reduce the feeling of needing to use gambling urgently to regulate intense emotions (Grall-Bronnec et al., 2011). However, although they recognise the previously published research, our Advisory Panel noted that CBT can be ineffective or even a negative experience for neurodivergent people in their personal and professional experience, especially if it hasn't been specifically adapted for neurodivergent people.

Further evidence from research about the best way to support neurodivergent people in the criminal justice system suggested that adequate staff training, taking regular breaks and clearly signposting key information may support good communication with neurodivergent people (Clasby et al., 2022). As many neurodivergent people experiencing gambling harms are also likely to be managing other co-occurring conditions, other research suggested it is important that support is holistic (Grant and Chamberlain, 2021; Brandt and Fischer, 2019; Waluk et al., 2016). There may also be a benefit to including lived experience in the design of support. Almost none of the studies assessed by the REA involved people with lived experience in the development of support, but one study about the criminal justice system in New Zealand that did include lived experience in the design process, indicated that this may be important for developing successful support (Clasby et al., 2022).

6 Conclusions

This research demonstrates how nuanced the relationship between neurodiversity and gambling is and how little is known about neurodivergent people's experiences of gambling, gambling harm, and gambling treatment and support. The knowledge gaps identified present great opportunities for researchers, service designers and deliverers to add to the existing evidence base in future work.

Knowledge gaps requiring further research

Despite identifying a relationship between neurodiversity and gambling harm, the current evidence base has very little focus on the intersecting or overlapping social identities of gender, race, ethnicity, class, or religion among neurodivergent people, all of which may result in different experiences of harm. There is also an imbalance in the types of neurodivergence accounted for in the current evidence base with evidence of links between ADHD or autism and gambling harms, but limited or no evidence exploring the relationship between gambling harms and dyslexia, dyspraxia or dyscalculia. More research is needed to get a comprehensive and nuanced understanding of neurodivergent experiences of gambling, with consideration of intersectionality and neurodivergent identities, and intersecting neurodivergences, factored into future studies.

There was weak evidence found on the types of gambling practiced by neurodivergent people (e.g. casino table games, online slots, sports betting) and how this relates to how they begin gambling (including motivations); experiences of gambling harm; and the types of gambling harm experienced by neurodivergent people (e.g. financial harms, criminal activity, relationship harms). Further research into these aspects is needed to understand the full picture of neurodivergent people's experiences of gambling harm.

There was limited evidence uncovered on how to deliver successful formal (clinical) gambling treatment and support for neurodivergent people experiencing gambling harms, or the extent to which current treatment and support services for gambling harms are successful for neurodivergent people, including time to enter recovery and experiences with relapse. Evidence from adjacent sectors indicates that tailoring gambling treatment and support could be beneficial for neurodivergent people, and there are suggestions for communication approaches that could be used (e.g. autonomy-supportive approaches and CBT). However, more research with people with lived experience is needed to understand how best to tailor support to neurodivergent people and the impact this could have in relation to their experiences of gambling harm specifically.

Further, there was no evidence found on the experiences of neurodivergent people not currently engaging with formal gambling treatment or support, or their experiences or the impact of informal gambling support outside clinical settings. Evidence is also lacking in relation to barriers to support, both formal and informal, and barriers to engagement with services.

Broadly speaking, this research found limited social research (in contrast to clinical research) on what drives neurodivergent people to gamble and their experiences of gambling harm. This means the evidence is limited in its applicability to the wider neurodivergent population experiencing gambling harms, who may not (yet) be seeking gambling treatment or be diagnosed with a neurodivergent condition. More research is required on the relationship between neurodiversity and gambling harms in non-clinical settings.

This research highlighted some of the challenges and limitations of using data collected in the past, given changes in the way neurodivergence is identified and diagnosed, and the language used to speak about it. Sharing findings with the Advisory Panel highlighted the importance of using language that is respectful to neurodivergent individuals when designing and communicating research. Language choices should be informed by the preferences of the neurodivergent community and ideally verified by a lived experience advisory panel or the study participants themselves to ensure their experiences are accurately reflected in research design.

The Advisory Panel also suggested coverage of the following topics in future research, to further deepen an understanding of the relationship between neurodivergent people and gambling harm: people becoming aware of their neurodivergence while seeking support for gambling and the impact this had; and relapses or non-linear recovery patterns.

Focus for the next stages of this research

It is not possible to cover all identified knowledge gaps in the remaining phases of this research. **Error! Reference source not found.** outlines the specific research questions, corresponding to the study objectives, that we propose to cover in Phase 2 to ensure we can meaningfully build evidence and add to sector knowledge.

Table 1 Proposed research questions to explore in Phase 2

Nº	Objectives (unchanged)	Research questions
O1	**To understand whether there is any increased risk of gambling harms through being neurodivergent, including what the increased risks are, and how the risks interact with each other.**	What does gambling behaviour look like for neurodivergent individuals? *To cover types of gambling practiced for example, casino table games, online slots, etc.* How, if at all, does it vary compared to neurotypical individuals? How do neurodivergent individuals view and describe the risks of gambling in their lives?

O2	**To understand the drivers of gambling harms experienced by neurodivergent people, focusing on how this compares to other demographic markers such as age, gender and ethnicity.**	What do gambling harms look and feel like for neurodivergent individuals? What are the triggers for gambling harms and how do these differ across different neurotypes?
O3	**To understand the barriers to formal and informal gambling support for neurodivergent individuals.**	What, if any, have been the barriers to accessing support for neurodivergent individuals? What formal routes such as information sources, networks and services are neurodivergent individuals at risk of or experiencing gambling harms aware of or are accessing? How does this vary by neurotype? What worked well/less well? What informal routes have neurodivergent individuals been accessing? What worked well/less well? What are the gaps in services, interventions and policies for gambling support for neurodivergent individuals?
O4	**To identify principles and practices for appropriate gambling treatment and support, communication and engagement with neurodivergent people, including how this varies by neurotype.**	What would ideal support look like for neurodivergent individuals and how if at all does it vary by neurotype? What do neurodivergent individuals think are the principles of effective gambling prevention and treatment support? For those accessing treatment and support for gambling harms, what has their experience been like? *To cover time to enter recovery and experiences with relapse.* How should treatment and support options be communicated about, or awareness raised, to ensure they meet the needs of neurodivergent people?

Appendix A: REA search terms and process

This REA only considered peer reviewed journal articles for inclusion to ensure a high quality of evidence considered. A total of 52 articles were identified using a title/abstract search on PubMed using the following terms:

- Relating to neurodivergence:
  - 'Neurodiver* (to include neurodiversity, neurodivergent and neurodivergence)
  - 'Autism Spectrum Disorder', 'ASD', 'Autism', 'ASC', 'Autistic'
  - 'Attention Deficit Hyperactivity Disorder' and 'ADHD'
  - 'Dyslexia' and 'developmental language disorder'
  - 'Dyspraxia'
  - 'Dyscalculia'
- Relating to gambling:
  - Gambl* (to include gambling, gambling harm, 'problem gambling or gambler', gambling disorder)
  - Gaming
  - Gambling-related terms within gaming, e.g. 'loot boxes'
- Relating to gambling treatment and support
  - Cognitive Behavioural Therapy
  - Treatment
  - Support

The texts were then screened to check that the papers were relevant to the search terms and aims of the REA. Of the 52 papers identified, 12 were excluded from the review because they used decision-making cognitive tasks (Cambridge Gambling Task or Iowa Gambling Task) related to gambling but did not focus in any way on gambling harms or risks associated with gambling or used clinical or medical interventions that would not be practiced within the UK (Hosozawa et al., 2021). Snowballing (i.e. consulting reference lists in key documents to source other relevant items) was also used to supplement the search, this identified an additional 8 studies. This REA is therefore based on 48 published papers.

Appendix B: ALSPAC technical detail

For full details of the cohort profile and study design, see (Boyd et al., 2013) and (Fraser et al., 2013). Please note that the study website contains details of all the data that is available through a fully searchable data dictionary and variable search tool.

Ethics

Ethical approval for this study was obtained from the ALSPAC Ethics and Law Committee and the Local Research Ethics Committees. Informed consent for the use of data collected via questionnaires and clinics was obtained from participants following the recommendations of the ALSPAC Ethics and Law Committee at the time.

Sample sizes

20,248 pregnancies were identified as eligible, and the initial number of pregnancies enrolled was 14,541. Of the initial pregnancies, there was a total of 14,676 foetuses, resulting in 14,062 live births and 13,988 children who were alive at 1 year of age.

When the oldest children were approximately 7 years of age, an attempt was made to bolster the initial sample with eligible cases who had failed to join the study originally. As a result, the total maximum sample size for our analyses is therefore 15,447 pregnancies, resulting in 15,658 foetuses. Of these, 14,901 children were alive at 1 year of age.

The ALSPAC cohort is largely representative of the UK population when compared with 1991 Census data; there is under representation of some ethnic minorities, single parent families, and those living in rented accommodation (Boyd et al., 2013). We use the largest available samples in each of our analyses to increase precision of estimates, regardless of whether study participants contributed data to the other analyses. Participants were excluded from the study if they had missing information on sex or ethnicity or had died before the age of one.

Gambling measures

Gambling frequency

ALSPAC children were asked about their gambling behaviour and the frequency with which they gamble at ages 17, 20, 24 and 30. This included information on the types of gambling (e.g. slot machines, online gambling and table games). Responses were coded as “not within the past 12 months”, “Within the past 12 months”; “Every week”; “Every day/almost every day”. We derived a measure of gambling frequency by taking the most frequent value from responses to all types of gambling excluding the National Lottery given, consistent with other studies such as the Health Survey for England (NHS, 2023). Given differential patterns of missingness in gambling frequency measures across different ages, a summary measure of highest level of gambling frequency as measured at any age was derived for the analysis.

PGSI

The Problem Gambling Severity Index (PGSI) is a widely used and validated tool that is a proxy for gambling harms, to measure gambling harm (Ferris & Wynne, 2001). ALSPAC children were asked to complete the PGSI at ages 19, 20, 24 and 31. The PGSI consists of nine individual items about gambling that are scored on a four-point scale: never (0); sometimes (1); most of the time (2); almost always (3). These scores are summed to give a total PGSI score ranging from 0 to 27. PGSI scores were recoded into four groups representing differing levels of harm: 0 “Gamblers who gamble with no negative consequences”; 1-2 “Gamblers who experience a low level of problems with few or no identified negative consequences”; 3-7 “Gamblers who experience a moderate level of problems leading to some negative consequences”; 8+ “Gambling with negative consequences and a possible loss of control”. Questions in the PGSI are as follows:

1. Have you bet more than you could really afford to lose?
2. Have you needed to gamble with larger amounts of money to get the same feeling of excitement?
3. When you gambled, did you go back another day to try to win back the money you lost?
4. Have you borrowed money or sold anything to get money to gamble?
5. Have you felt that you might have a problem with gambling?
6. Has gambling caused you any health problems, including stress or anxiety?
7. Have people criticized your betting or told you that you had a gambling problem, regardless of whether or not you thought it was true?
8. Has your gambling caused any financial problems for you or your household?
9. Have you felt guilty about the way you gamble or what happens when you gamble?

Given differential patterns of missing scores in PGSI measures across different ages, a summary measure of highest PGSI category as measured at any age was derived for this analysis.

Neurodiversity measures

Our analyses were restricted by the measures that are available in ALSPAC for identifying neurodiversity. Our results must be interpreted in light of the fact that these measures will not perfectly capture clinical diagnosis of underlying ADHD, autistic and behavioural problems for all participants nor are they able to consider such neurodiversity beyond a binary measure. These measures have however been widely validated as good proxies for clinical diagnoses (McEwen et al., 2016; Goodman et al., 2011; Skuse et al., 2005), reducing the likely impact of this limitation on our conclusions.

Attention deficit hyperactivity disorder

Multiple indicators were used to identify attention deficit hyperactivity disorder (ADHD). Five of these were measured using responses about ADHD to the Development and Well-Being Assessment (DAWBA) at ages 7, 10, 13, 15 reported by the child’s mother, and at age 7 reported by the child’s schoolteacher. The DAWBA is a widely validated and reliable tool for deriving diagnoses of ADHD symptoms. DAWBA responses covered 18 questions on hyperactivity, inattention and impulsivity, such as “often fidgets with hands or feet” and “often interrupts or intrudes on others”. Responses were coded as “no”, “a little more than others”, and “a lot more than others”, with the values of 0, 1 and 2 respectively giving a total score of 0 to 36. The final indicator was based upon child self-reports at age 22 whether they had ever received additional support at school, at college/university or in the workplace for ADHD. We recorded children as having ADHD where any of these measures were positive.

Autism Spectrum Disorder

Autism Spectrum Disorder (ASD) traits were measured using the Skuse Social Communication Disorder Checklist (SCDC) reported by the study mother at 8. The SCDC is a widely validated and reliable screening instrument of verbal/nonverbal communication and social reciprocity for measuring ASD related traits. Mothers reported on their child's behaviour in response to 12 questions, such as “not aware of other peoples’ feelings” and “does not seem to understand social skills”. Responses were recorded on a 3-point scale of “not true”, “quite or sometimes true” and “very or often true”, with the values of 0, 1 and 2 respectively giving a total score of 0 to 24. Children with an SCDC score of 9 or greater are typically classified as displaying sufficient ASD traits to warrant an assessment for diagnosis. SCDC scores were dichotomised at a cut-point of 9 and above for analysis in this study.

Behavioural disorders

Multiple indicators were used to identify behavioural disorders. The first three of these were measured using responses about behavioural disorders to the DAWBA at ages 7, 10, and 13 reported by the child’s mother. The fourth indicator was based upon child self-reports at age 22 whether they had ever received additional support at school, at college/university or in the workplace for behavioural problems or hyperactivity. Children were recorded as having behavioural disorders where any of these four measures were positive.

Dyslexia

Three indicators were used to identify developmental dyslexia in the study children. The first was based on the accuracy component of the Neale Analysis of Reading Ability (NARA II) at age 9, using deviations of equivalent reading age from biological age. Children were classed as having developmental dyslexia if their reading age was greater than or equal to 30 months behind their actual age and their IQ was greater than or equal to 85 as measured using the short-form Wechsler Intelligence Scale for Children (WISC) at age 8. The second measure was based upon mother reports of whether she had been told by age 9 that the child had dyslexia. The third measure was based upon child self-reports at age 22 whether they had ever received additional support at school, at college/university or in the workplace for dyslexia. Children were recorded as having developmental dyslexia where any of these three measures were positive.

Dyspraxia

Three indicators were used to identify developmental coordination disorder (dyspraxia) in the study children. The first was based on measures of motor impairment and IQ during direct assessment of the study child at age 8. Children who were below the 15th percentile of motor impairment and who had an IQ of at least 70 were classed as having dyspraxia. The second measure was based upon mother reports of whether she had been told by age 9 that the child had dyspraxia. The third measure was based upon child self-reports at age 22 whether they had ever received additional support at school, at college/university or in the workplace for dyspraxia. Children were recorded as having developmental dyspraxia where any of these three measures were positive.

Covariates

Sex

Participants' biological sex at birth, as recorded in obstetric records.

Ethnicity

The study child's ethnicity was reported by the study mother at 9 months of age. Given the ethnic homogeneity of the ALSPAC sample, ethnicity was recoded into "white" and "non-white" to maintain statistical power.

Birth order

The participants birth order in their family was coded as 1 if they were the first-born child, etc.

Parental age

Mothers' and fathers' ages at study child's birth.

Parental socioeconomic position

A measure of parental socioeconomic position (SEP), based on the widely used Social Class based on Occupation (formerly Registrar General's Social Class), was used in this analysis. This measure contains the following groupings: (I) professional occupations; (II) managerial and technical occupations; (III-N) non-manual skilled occupations; (III-M) manual skilled occupations; (IV) partly skilled occupations; and (V) unskilled occupations. SEP was measured during pregnancy and reported for each parent by the study mothers. For dual parent families, the highest of the mother's and father's SEP was used.

Parental education

Highest parental education as reported by the study mothers during pregnancy was used. Mothers were asked to report their own and the father's highest level of education based on the following categories: Common Certificate of Education; Vocational qualification; O-level/GCSE; A-level; university degree or higher. For dual parent families, the highest of the mother's and fathers' education level was used.

Analysis tables

Table 1: Distribution of gambling frequency and PGSI scores at different ages

	17y		20y		24y		30y	
	n	%	N	%	N	%	n	%
PGSI category								
0	825	73.86	1,794	72.14	1,473	78.69	1,126	80.14
1-2	229	20.50	536	21.55	288	15.38	193	13.74
3-7	56	5.01	133	5.35	85	4.54	50	3.56
8+	7	0.63	24	0.97	26	1.39	36	2.56
Gambling frequency								

Not in last 12 months	1,777	51.99	1,999	50.70	1,452	38.13	2,204	65.05
In last 12 months	1,396	40.84	1,611	40.86	2,043	53.65	973	28.72
Every week	226	6.61	304	7.71	281	7.38	185	5.46
Every day	19	0.56	29	0.74	32	0.84	26	0.77

Table 2: Distribution of neurodivergence measures in ALSPAC

	n	%
ADHD		
No	8,725	96.02
Yes	362	3.98
ASD		
No	7,108	92.30
Yes	593	7.70
Behavioural disorders		
No	8,346	92.97
Yes	631	7.03
Dyslexia		
No	7,761	91.46
Yes	725	8.54
Dyspraxia		
No	8,145	96.23
Yes	319	3.77

Table 3: Percentages of gambling frequency by neurodivergence measure

	ADHD		ASD		Behavioural		Dyslexia		Dyspraxia	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Gambling frequency 17y										
Not in last 12 months	52.48	47.31	52.20	55.00	52.35	50.58	52.35	52.60	52.62	45.90
In last 12 months	40.97	33.33	41.77	30.63	41.13	36.63	40.66	40.58	40.52	44.26
Every week / every day	6.56	19.35	6.03	14.37	6.52	12.79	6.98	6.82	6.86	9.84
Gambling frequency 20y										
Not in last 12 months	50.97	41.49	50.84	50.27	50.91	48.29	50.59	52.84	50.63	56.80
In last 12 months	40.82	42.55	41.37	35.68	41.07	38.05	40.83	40.91	40.86	40.00
Every week / every day	8.21	15.96	7.80	14.05	8.02	13.66	8.57	6.25	8.51	3.20
Gambling frequency 24y										
Not in last 12 months	38.00	49.02	38.37	42.31	38.36	37.95	37.83	43.16	38.08	45.86
In last 12 months	53.91	43.14	53.53	49.45	53.75	50.26	53.83	51.21	53.83	47.37

Every week / every day	8.09	7.84	8.09	8.24	7.89	11.79	8.34	5.63	8.09	6.77
Gambling frequency 30y										
Not in last 12 months	64.82	72.22	64.38	67.12	64.85	67.20	64.62	69.81	65.02	68.22
In last 12 months	28.91	21.11	29.53	26.71	28.91	25.81	28.76	26.95	28.59	28.04
Every week / every day	6.27	6.67	6.09	6.16	6.25	6.99	6.62	3.25	6.39	3.74

Table 4: Mean PGSI scores by neurodivergence measure

	ADHD		ASD		Behavioural		Dyslexia		Dyspraxia	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
PGSI 17y	0.55 (1.65)	0.82 (1.71)	0.49 (1.43)	0.83 (2.2)	0.53 (1.54)	1.10 (3.05)	0.56 (1.65)	0.43 (0.97)	0.54 (1.61)	0.62 (1.25)
PGSI 20y	0.59 (1.57)	1.38 (2.75)	0.57 (1.54)	1.07 (2.32)	0.58 (1.58)	1.05 (2.26)	0.60 (1.59)	0.56 (1.64)	0.60 (1.58)	0.45 (1.62)
PGSI 24y	0.57 (2.02)	1.02 (2.57)	0.56 (1.98)	0.78 (2.11)	0.55 (2.00)	1.14 (2.62)	0.59 (1.99)	0.53 (2.11)	0.59 (2.03)	0.48 (1.24)
PGSI 30y	0.60 (2.13)	0.56 (1.11)	0.51 (1.84)	0.59 (1.21)	0.57 (2.08)	1.11 (2.57)	0.62 (2.19)	0.44 (1.55)	0.62 (2.17)	0.22 (0.54)

Tables 5-7 display the frequencies and percentages of gambling frequency by other intersections of disadvantage that were measured in the ALSPAC dataset; gender, ethnicity, and socioeconomic background.

Table 5: Gambling frequency, neurodivergence, and gender

		Not in last 12 months	In last 12 months	Every week	Every day
Neurotypical	Female	513 (26.04)	1,036 (52.59)	368 (18.68)	53 (2.69)
	Male	976 (33.67)	1,653 (57.02)	253 (8.73)	17 (0.59)
Neurodivergent	Female	168 (33.8)	240 (48.29)	77 (15.49)	12 (2.41)
	Male	168 (33.47)	273 (54.38)	54 (10.76)	7 (1.39)

Table 6: Gambling frequency, neurodivergence, and ethnicity

		Not in last 12 months	In last 12 months	Every week/day
Neurotypical	White	1,407 (30.18)	2,588 (55.51)	667 (14.31)
	Non-white	82 (39.61)	101 (48.79)	24 (11.59)
Neurodivergent	White	323 (33.65)	495 (51.56)	142 (14.79)
	Non-white	13 (33.33)	18 (46.15)	8 (20.51)

Table 7: Gambling frequency, neurodivergence, and socioeconomic background

		Not in last 12 months	In last 12 months	Every week/day
Neurotypical	I	270 (32.85)	477 (58.03)	75 (9.12)
	II	659 (31.14)	1168 (55.2)	289 (13.66)
	III-NM	316 (27.55)	660 (57.54)	171 (14.91)
	III-M	122 (28.84)	217 (51.3)	84 (19.86)
	IV & V	55 (35.71)	61 (39.61)	38 (24.68)
Neurodivergent	I	60 (37.74)	88 (55.35)	11 (6.92)

II	155 (33.48)	241 (52.05)	67 (14.47)
III-NM	66 (32.2)	99 (48.29)	40 (19.51)
III-M	26 (27.37)	49 (51.58)	20 (21.05)
IV & V	6 (27.27)	11 (50)	5 (22.73)

Regression modelling

Table 8 displays the results from separate ordered logistic regression results estimating the associations between neurodivergence measures and gambling frequency.

Table 8: Ordered logistic regression results for gambling frequency by individual neurodivergence measures.

	OR	95% CI	p value
ADHD			
Gambling frequency 17y	1.41	0.93, 2.16	0.108
Gambling frequency 20y	1.38	0.92, 2.06	0.120
Gambling frequency 24y	0.58	0.39, 0.86	0.007
Gambling frequency 30y	0.60	0.38, 0.97	0.036
Gambling frequency ever	0.81	0.60, 1.10	0.184
ASD			
Gambling frequency 17y	1.00	0.72, 1.39	0.981
Gambling frequency 20y	1.03	0.77, 1.39	0.825
Gambling frequency 24y	0.80	0.59, 1.08	0.139
Gambling frequency 30y	0.82	0.57, 1.16	0.261
Gambling frequency ever	0.92	0.73, 1.16	0.472
Behavioural disorders			
Gambling frequency 17y	1.10	0.81, 1.49	0.554
Gambling frequency 20y	1.09	0.82, 1.44	0.546
Gambling frequency 24y	1.04	0.78, 1.39	0.801
Gambling frequency 30y	0.82	0.59, 1.12	0.207
Gambling frequency ever	0.91	0.73, 1.14	0.429
Dyslexia			
Gambling frequency 17y	0.99	0.78, 1.24	0.909
Gambling frequency 20y	0.88	0.71, 1.09	0.234
Gambling frequency 24y	0.77	0.63, 0.95	0.014
Gambling frequency 30y	0.76	0.59, 0.98	0.035
Gambling frequency ever	0.92	0.77, 1.10	0.353
Dyspraxia			
Gambling frequency 17y	1.25	0.88, 1.78	0.211
Gambling frequency 20y	0.68	0.48, 0.98	0.036

Gambling frequency 24y	0.70	0.50, 0.99	0.042
Gambling frequency 30y	0.81	0.54, 1.23	0.325
Gambling frequency ever	0.81	0.62, 1.06	0.124

Table 9 displays the results from separate ordered logistic regression results estimating the associations between neurodivergence measures and PGSI category.

Table 9: Ordered logistic regression results for gambling PGSI category by neurodivergence measures.

	OR	95% CI	p value
ADHD			
PGSI group 17y	1.81	0.91, 3.58	0.091
PGSI group 20y	2.55	1.55, 4.20	<0.001
PGSI group 24y	1.87	1.00, 3.52	0.052
PGSI group 30y	1.54	0.73, 3.25	0.259
PGSI group ever	2.03	1.40, 2.93	<0.001
ASD			
PGSI group 17y	1.38	0.74, 2.57	0.310
PGSI group 20y	1.84	1.26, 2.70	0.002
PGSI group 24y	1.40	0.84, 2.33	0.197
PGSI group 30y	1.46	0.82, 2.60	0.194
PGSI group ever	1.69	1.27, 2.26	<0.001
Behavioural disorders			
PGSI group 17y	1.90	1.11, 3.26	0.020
PGSI group 20y	1.77	1.23, 2.55	0.002
PGSI group 24y	1.78	1.13, 2.82	0.013
PGSI group 30y	1.82	1.08, 3.05	0.023
PGSI group ever	1.96	1.49, 2.57	<0.001
Dyslexia			
PGSI group 17y	0.96	0.58, 1.57	0.865
PGSI group 20y	0.79	0.57, 1.11	0.174
PGSI group 24y	0.88	0.59, 1.32	0.543
PGSI group 30y	0.72	0.42, 1.23	0.226
PGSI group ever	0.81	0.63, 1.03	0.085
Dyspraxia			
PGSI group 17y	1.41	0.72, 2.80	0.319
PGSI group 20y	0.64	0.36, 1.13	0.125
PGSI group 24y	0.87	0.46, 1.62	0.651
PGSI group 30y	2.09	1.35, 6.04	0.504
PGSI group ever	0.86	0.59, 1.26	0.438

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