University of BRISTOL

Innovation, transition, change: What socio-technical innovations can help combat gambling harms?

Jamie Wheaton, Sharon Collard, Agnes Nairn

May 2024

Bristol Hub for

GAMBLING HARMS RESEARCH

Innovation, transition, change: What socio-technical innovations can help combat gambling harms?

About this report

This report was published by the Bristol Hub for Gambling Harms Research, University of Bristol in May 2024.

Bristol Hub for Gambling Harms Research, University of Bristol, 13 Berkeley Square, Bristol, BS8 1HB.

www.bristol.ac.uk/gambling-harms

About the Bristol Hub for Gambling Harms Research

Established in 2022, our purpose is to build interdisciplinary capacity in gambling harms research nationally and globally, in order to prevent and reduce harms at individual, community and society level. For more information, visit www.bristol.ac.uk/gambling-harms.

Funding

The Bristol Hub for Gambling Harms Research is funded by a £4 million grant (2022-2027) from the national charity GambleAware which is funded by voluntary donations from the gambling industry. Governance procedures and due diligence provide safeguards to ensure the Hub's independence from GambleAware and the gambling industry.

Accessibility

Our reports are tested for accessibility before they are published to make them easier for people to read.

Please note that some PDF files cannot be made fully accessible to all screen reader software. If this document is not accessible to you or you would like to read it in a different format, email gambling-harms@bristol.ac.uk or write to us at the address opposite.

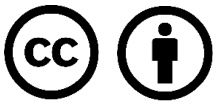
About the authors

Jamie Wheaton is a Senior Research Associate at the Bristol Hub for Gambling Harms Research.

Sharon Collard is Co-Director of the Bristol Hub for Gambling Harms Research and Professor of Personal Finance.

Agnes Nairn is Co-Director of the Bristol Hub for Gambling Harms Research and Professor of Marketing.

Citation



Our preferred citation is: Wheaton, J., Collard, S., and Nairn, A. (2024) *Innovation, transition, change: What socio-technical innovations can help combat gambling harms?* Bristol Hub for Gambling Harms Research: University of Bristol.

Contents

Executive Summary

The work of the Bristol Hub for Gambling Harms Research is framed around four challenges:

These four Challenges broadly represent a 'gambling pathway' and are designed to create space for interdisciplinary approaches to the different dimensions of harmful gambling, namely: what initiates harmful gambling; what is the everyday practice and portrayal of gambling in social groups; what social and spatial inequalities exacerbate gambling harms, and what socio-technical innovations can help prevent or reduce gambling harms.

To inform the work of the Hub, we conducted four scoping reviews, each of which addresses one of the Challenges set out above. Our scoping reviews followed the process outlined by Arksey and O'Malley (2005). They were pre-registered on Open Science Framework and conducted according to PRISMA guidelines.

This report sets out the evidence from the scoping review for Challenge 4: What socio-technical innovations can help prevent or reduce gambling harms?

Socio-technical innovations are new systems or tools that have emerged from the interaction between actors and technologies, and seek to encourage best practice or influence industry standards. The evidence presented in this

scoping review report is drawn from 142 academic papers and 15 pieces of grey literature. It focuses on four key areas of socio-technical innovation:

1. 'Responsible gambling' messaging;
2. 'Responsible gambling' tools;
3. Gambling product design;
4. Treatment for gambling harms.

We summarise the findings for each of these areas below.

In presenting this evidence, it is important to highlight the industry-derived narratives around 'responsible gambling' and 'safer gambling' as a potential source of stigma for those experiencing harms. These narratives imply that people who experience harmful gambling have been gambling irresponsibly and should have been able to curtail their behaviour. This ignores the ways in which the design and advertising of gambling products may exacerbate the risk of harm; and the fact that someone who becomes addicted to gambling will find it very difficult to stop.

'Responsible gambling' messaging

- **Non-personalised 'responsible gambling' messaging** can make a small impact on people's beliefs about gambling outcomes. The findings were more mixed in terms of the impact of such messages on actual behaviours.
- 'Responsible gambling' messaging in the form of **personalised feedback** has been shown to reduce the amount of money and time spent gambling. Feedback received via telephone or e-mail appears to have the biggest impact, with evidence that the industry could do more to provide messaging tailored to individuals and based on their gambling behaviours.
- However, it is still the case that personalised 'responsible gambling' messages emphasise **individual responsibility**, possibly increasing stigma and 'othering' those who experience harms. They may also serve to deflect attention away from changes to industry products and practices that could more effectively reduce harm from gambling.
- There was evidence that **reframing 'return-to-player' information** (e.g. "this game has an average percentage payout of 90%") as **'house-edge'** information (e.g. "this game keeps 10% of all money bet on average") could improve people's understanding of the risks, and possible costs, of gambling.

'Responsible gambling' tools

- **Time and deposit limits** for gambling are prevalent across numerous jurisdictions and there is evidence they can lead to decreases in theoretical loss (i.e. the difference between the amount bet and the total amount won). However, these limits are easily circumvented by those who wish to increase their gambling spend. Studies also show

that play breaks set by operators are ineffective at promoting long-term behaviour change.

- While studies have explored various aspects of **self-exclusion schemes** (including perception and uptake, predicting factors, and ways to improve awareness and uptake), there was limited evidence of their longer-term effectiveness.
- A small sample of literature explored the use of other responsible gambling tools such as **self-assessments and financial statements,** where the main issue was low take-up.

Product design

- The product design features most commonly discussed in our sample of literature were associated with slots- and casino-based products found online and on electronic gaming machines (EGMs). The findings are largely based on laboratory-based experiments.
- **Multiline products** – or slots games that allow people to place concurrent bets across multiple paylines on a single spin – are found to be particularly immersive and can also be linked to a feature known as **losses disguised as wins** (LDWs). LDWs are associated with arousal and the reinforcement of the desire to continue gambling, which could lead players to overestimate their winnings.
- The desire to continue gambling can also be increased by the **near miss effect**, a feature that can lead an individual to believe that a return is due imminently. The near miss effect has been explored in slots-based products, scratchcards and land-based roulette, although the effects on gambling within the latter are not proven.
- Moderating the **speed-of-play** has been shown to impact gambling behaviours, with faster speeds of gambling leading participants to make inaccurate estimations of the money they have gambled and won.
- **Jackpots** were found to encourage faster gambling or gambling at higher stakes, particularly if people perceived them to be offering larger payouts. Jackpot expiry – whereby the availability of jackpots expires after a fixed period of play and players receive a message to that effect – has been shown to discourage continued gambling.

Socio-technical innovation in treatment for gambling harms

- The evidence in our scoping review on treatment mostly comes from small trials with people undergoing treatment for gambling addiction, as measured using standard indicators such as the Problem Gambling Severity Index. There was evidence about a range of different treatments, although cognitive-behavioural therapy (CBT) was the most well-established.

- **Therapeutic treatments such as CBT** have been widely adopted as ‘social innovations’ and the evidence suggests that these treatments are effective. Breaking barriers to access is important, as is tailoring treatment to different gender and cultural needs.
- Internet-based interventions have started to integrate social practices with evolving technologies, particularly with the use of **‘i-CBT’ programmes**.
- **Communication technologies** – whether mail-, telephone- or email-based – can be used to encourage the take-up of treatment options or as interventions in their own right. The research highlights the importance of communicating with those receiving treatment and that evolving technology makes it easier to reach those who may be experiencing harm.
- The pool of literature which explores communications sent from gambling operators is extremely small, with scope for gambling operators (and their regulators) to further explore the use of technologies available to them to deliver communications to those who may be at risk of harm.

1 Introduction

1.1 Background

The work of the Bristol Hub for Gambling Harms Research is framed around four challenges:

These four Challenges broadly represent a 'gambling pathway' and are designed to create space for interdisciplinary approaches to the different dimensions of harmful gambling, namely: what initiates harmful gambling; what is the everyday practice and portrayal of gambling in social groups; what social and spatial inequalities exacerbate gambling harms; and what socio-technical innovations can help prevent or reduce gambling harms.

To inform the work of the Hub, we conducted four scoping reviews, each of which addresses one of the Challenges set out above. Scoping reviews aim to address wide-ranging topics where different study designs might be applicable (e.g. qualitative studies, quantitative surveys, laboratory experiments). As a result, they tend to be guided by broader research questions and do not assess the quality of included studies (Arksey and O'Malley, 2005).

This report sets out the evidence from the scoping review for Challenge 4: What socio-technical innovations can help prevent or reduce gambling harms? The purpose of this scoping review is, firstly, to examine the extent, range and nature of research activity on this topic; and secondly to describe the findings of the research we identified for dissemination to academic and non-academic audiences (Arksey and O'Malley, 2005).

Socio-technical innovations emerge from the interplay between developing technologies, their users and specific cultural or societal norms or laws which help to shape them. The following section introduces socio-technical innovations in more depth, while later chapters explore how socio-technical innovations have evolved to combat gambling harms.

1.2 What is a socio-technical innovation?

Technological transformation and liberalised regulation have facilitated the significant growth of the gambling sector in recent years (Cassidy, 2020). An industry once comprising land-based gambling premises has transformed to a sector where a significant number of gambling products are available on smartphones, all of which can be funded through cashless forms of payment. Such proliferation of gambling opportunities presents further opportunities for gambling-related harms.

It is equally important to explore how interactions between technology and society can be leveraged to combat gambling-related harms. In this exploration, we use the concept of socio-technical innovations which are **technological innovations shaped by societal actors to achieve specific goals** (Geels, 2004). Socio-technical innovations develop from the standards which emerge from society's use of technology, with innovations specifically influenced by the linkage of societal and cultural values, and of legislation with developing technologies. Socio-technical innovations could be adopted to mitigate gambling harms which may occur through industry innovations, marketing, or the significant volume of markets and products available. This affords the possibility of innovations as preventing harmful behaviours from arising, delivering help to those who need it most or – as Geels (2004) would argue – setting the standards for new legislation or policy.

Socio-technical innovations could also be tailored for communities who are at higher risk of experiencing gambling harms. As we explore elsewhere (Wheaton et al., 2024), the evidence shows that gambling harms disproportionately impact the most economically deprived groups, as well as minoritised ethnic groups. Socio-technical innovations should therefore pay attention to the social, cultural and economic settings at which they are aimed. Socio-technical innovations could help to generate a societal awareness of gambling harms, which in turn would enable innovations to be readily accessible to communities and individuals identified as at risk.

1.3 Research methods

Our scoping review followed the process outlined by Arksey and O'Malley (2005). It was pre-registered on Open Science Framework and conducted according to PRISMA guidelines (Page et al., 2021). We carried out the scoping review in two stages, which involved two separate literature searches, as described below. The second search was necessary because we felt it was important to include evidence related to gambling product design, which was not returned in our initial search. The first search resulted in the inclusion of 84 academic papers and 15 grey literature reports, while the second search resulted in the inclusion of 58 academic papers. The findings in this report therefore emerged from a total sample of 142 academic papers and 15 pieces of grey literature.

1.3.1 First search

The first search was guided by the research question 'what socio-technical innovations can help combat gambling harms?', we used key search terms to identify relevant studies from multiple academic databases: EBSCO, ProQuest, EconLit, International Bibliography of the Social Sciences, SCOPUS, Social Services Abstracts, Sociological Abstracts, ProQuest, Anthropology Plus, and Web of Science. Full details of the search terms and databases can be found in **Appendix One.**

To be included, research articles had to explicitly explore societal, technological, or socio-technical innovations deployed to combat gambling-related harms. Papers also needed to be published in English, focused on the economies of OECD member countries, and published in or after 2005 (the year when the Gambling Act 2005 was passed). The process of the literature review is introduced in Figure 1. Papers were sought and found in January 2023, and the initial search found 73,718 papers across all databases, with a working sample of 13,997 papers identified after deduplication. Papers were then first sifted by title, according to the inclusion criteria, reducing the sample to 643 possible papers. Sifting by abstract reduced the working sample of papers further to 168 included studies.

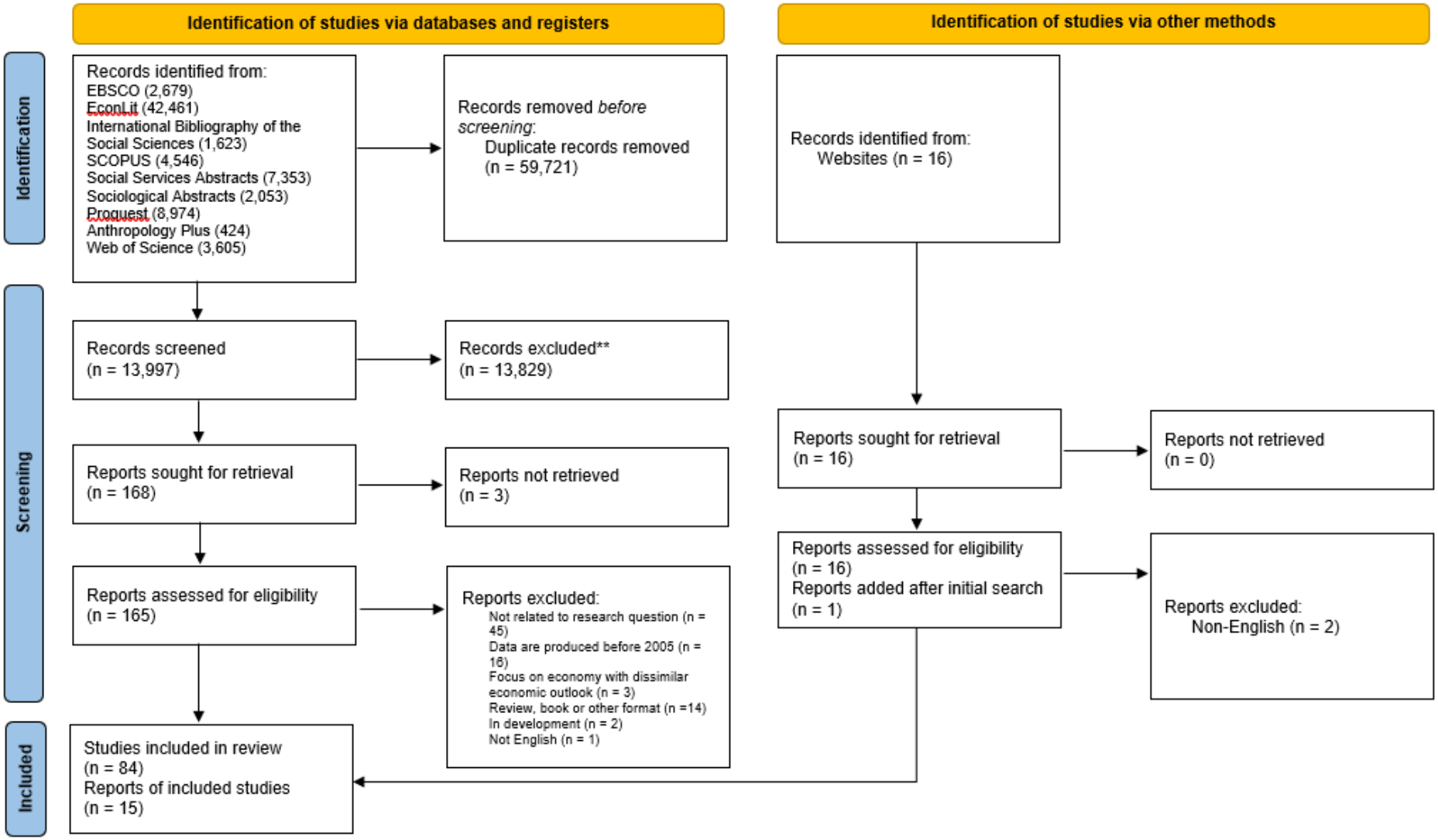
The final sift by full text resulted in the final sample size of 84 papers, the data of which were extracted to inform the findings of the scoping review. The 84 papers were categorised by innovations which were social (n = 41), technical (n = 8), and socio-technical (n = 35). More details on the number of included papers and the number of excluded papers at each stage of the scoping review can be found in **Appendix Two.**

The first search incorporated non-academic 'grey' literature, identified by using similar terms to search the websites of charities, organisations (for example, Bournemouth University and the Behavioural Insights Team), and industry bodies. **Fifteen** pieces of grey literature were used to supplement the sample of academic literature (N = 84), making 99 items in total. Details of grey literature can be found in **Appendix Three**. Data were abstracted from the sample of 84 academic papers and 15 grey literature papers and used to develop a narrative analysis, the findings of which are set out in this report.

1.3.2 Second search

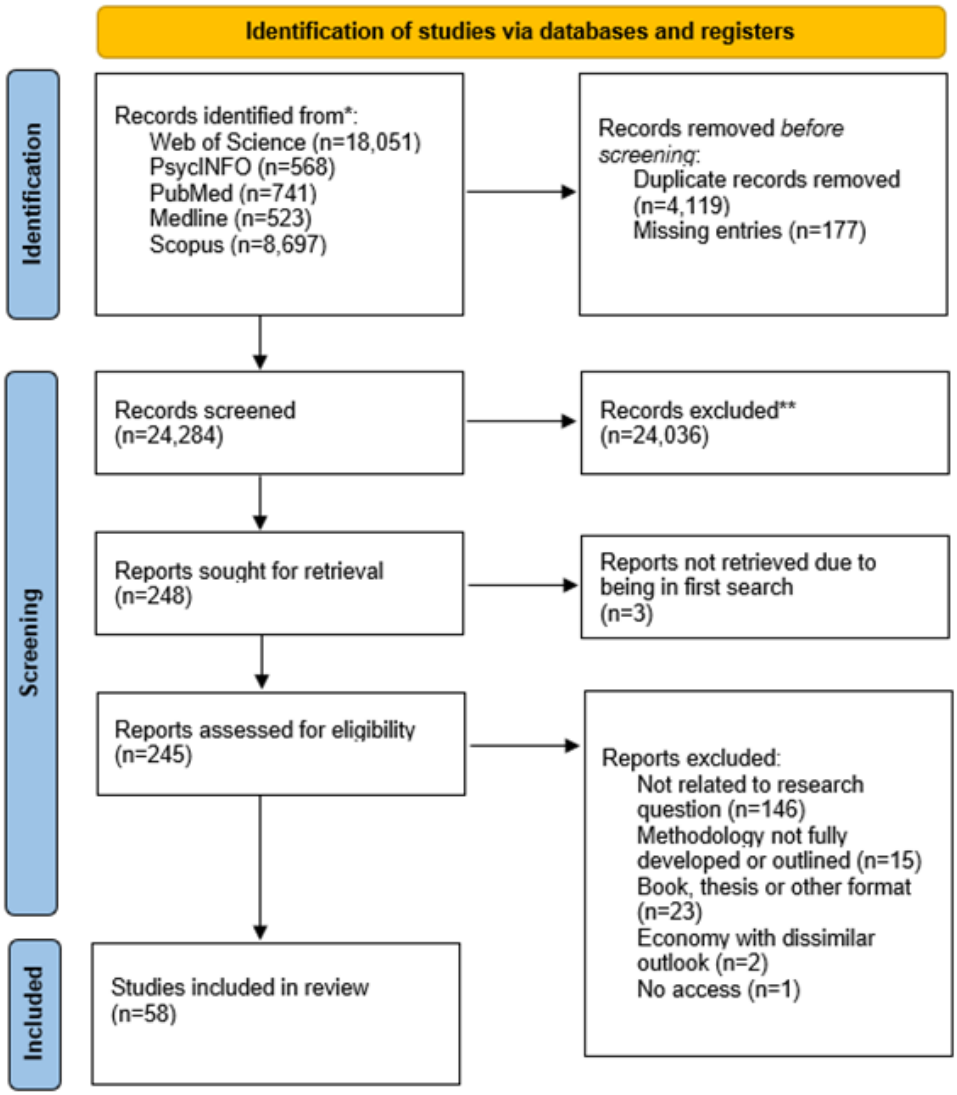
Our analysis of the themes emerging from the first literature search returned no literature on gambling product design. As we highlight later in the report, amendments to product designs – themselves socio-technical innovations developed by the gambling industry – can form an important approach to combatting or preventing gambling harms. We therefore added a second stage to our scoping review. Guided by the same research question but with an additional focus on product design, we used key search terms – based on product design - to identify relevant studies from multiple academic databases: Web of Science, PsycINFO, PubMed, Medline, and Scopus. Full details of the search terms and databases can be found in **Appendix One.**

Figure 1: PRISMA flow chart for first literature search for Challenge Four Scoping Review



To be included, research articles had to explicitly explore the different features of gambling products, their impact upon gambling behaviours or gambling harms, and modifications to features that may prevent or combat harms. Papers needed to be published in English, focused on jurisdictions with a similar economic outlook to the United Kingdom, as well as published in or after 2005 (post-Gambling Act 2005). The process of this additional literature review is detailed in Figure 2. We also found more recent papers relating to innovations that were relevant to the first stage. These papers were included to ensure a fully updated sample of literature. Due to time constraints, grey literature was not sought during the second literature search. Papers during the second search were sought and found in October 2023, and the initial search found 28,580 papers across all databases, leaving 24,284 papers after deduplication. As before, papers were sifted by title and abstract and then full text, with data of the findings abstracted to add to the initial, narrative analysis developed during the first part of the scoping review. The final sift by title left a sample of 58 papers. Therefore, the final sample to emerge from both scoping reviews totalled 142 academic papers, and 15 pieces of grey literature.

Figure 2: PRISMA flow chart for second literature search for Challenge Four Scoping Review



1.4 This report

This report highlights the key findings of the scoping review of published evidence about the socio-technical innovations developed to date that could combat gambling-related harms. Findings are reported within three main chapters on the use, efficacy and discourse of:

1. "Responsible gambling" *messages*.
2. "Responsible gambling" *tools*.
3. Gambling product design features.
4. Socio-technical innovation in the treatment of gambling harms.

The concluding chapter summarises the key findings from the scoping review and describes the main research gaps.

1.4.1 A note on terms used in this report

Gambling harms are the short and long-term adverse impacts from gambling on the health and wellbeing of individuals, families, communities, and society. These harms are diverse but three commonly referenced categories are resource harms, relationship harms, and health harms (Wardle et al., 2018).

However, much of the extant literature focuses on the narrower concepts of "problem gamblers/gambling" and "pathological gamblers/gambling" which are defined in Table 1. These terms refer only to the person who gambles and are measured using standard screening tools, for example to estimate prevalence rates or for analytical or descriptive purposes.

We use the terms "problem gamblers/gambling" and "pathological gamblers/gambling" in this report in the same way as they are reported in the original studies, while acknowledging concerns that these terms are stigmatising, and that their use in measuring prevalence underestimates the harms caused by gambling. We use 'harmful gambling' as a default term to refer to gambling behaviours that may harm the individual and others, as this offers an alternative term that seeks to reduce stigma.

Table 1: Definitions of 'Pathological' and 'Problem Gambling'

Pathological Gambling	Persistent and maladaptive gambling behaviour that disrupts personal, family, or vocational pursuits (American Psychiatric Association, 2000, p. 671).
Problem Gambling	Gambling behaviour that creates negative consequences for the gambler, others in his or her social network, or for the community (Ferris and Wynne, 2001, p. 8).

In addition, Table 2 sets out all the different measures that are mentioned in this report and the screening tools from which they derive, along with the original papers that first described them. The descriptions within each table also highlight how they are intended to be used in relation to their outcome measure. For example, some of the surveys intend to measure the prevalence of problem gambling in the general population, whilst others may measure pathological gambling, or urges to gamble in an individual.

Table 2: Glossary of gambling screening tools

Screening tool	Description	Outcome Measure
Addiction Severity Index amended for Gambling (ASI-G) (Lesieur and Blume, 1982).	A screening tool derived from the Addiction Severity Index, normally deployed to measure drug and substance addiction, developed to measure pathological gambling.	Pathological Gambling
Canadian Adolescent Gambling Inventory (CAGI) (Wiebe et al., 2007).	A 26-item screening tool comprising measurements of types of gambling activities, frequency of participation, time spent gambling, total money spent gambling, and psychological, social, financial aspects related to gambling risk or harm.	Pathological Gambling
Canadian Problem Gambling Index (CPGI) (Ferris and Wynne, 2001).	A 31-item screening tool to determine whether a person in the general population is experiencing problem gambling.	Problem Gambling
Fourth edition of the Diagnostic and Statistical Manual of the American Psychiatric Association (DSM-IV) (American Psychiatric Association, 2000).	Ten criteria created by clinicians for diagnosis of pathological gambling.	Pathological Gambling
Gambling Abstinence Self-Efficacy Scale (GASS) (Hodgins et al., 2004)	A 21-item measure of gambling abstinence self-efficacy.	Gambling Abstinence
Gambling Symptom Assessment Scale (G-SAS) (Kim et al., 2009).	A 12-item self-rated scale designed to assess gambling symptom severity.	Gambling Symptom Severity
Gambling Related Cognition Scale (GRCS) (Raylu and Oei, 2004a).	A 23-item scale designed to assess gambling-related cognitions held by gambling. Aspects explored by the scale include interpretive control/bias, illusion of control, predictive control, gambling-related expectancies, perceived inability to stop gambling.	Gambling-related Cognitions.
Gambling Urge Scale (GUS) (Raylu and Oei, 2004b).	A six-item self-screening tool designed to measure gambling urges.	Gambling Urges

Table 2, cont.: Glossary of gambling screening tools

Screening tool	Description	Outcome Measure
Game Experience Questionnaire (GEQ) (IJsselsteijn et al., 2013).	A modular questionnaire that measures the multifaceted experience of gaming. The questionnaire has three modules: core, social presence, post-game	Flow, competence, positive and negative affect, tension, and challenge (core).
National Opinion Research Center DSM Screen for Gambling Problems (NODS) (Wickwire et al., 2008).	A 34-item telephone-screening tool that identifies gambling problems as defined by the DSM-IV.	Problem and Pathological Gambling
Problem Gambling Severity Index (PGSI) (Ferris and Wynne, 2001).	A nine-item measure constructed specifically to measure problem gambling in the general population.	Problem Gambling
Short Gambling Harm Screen (SGHS) (Browne et al., 2018).	A short, 10-item screening tool to measure gambling harms.	Gambling Harms
South Oaks Gambling Screen (SOGS). (Stinchfield, 2002).	A 20-item questionnaire based on DSM-III criteria.	Pathological Gambling
Victorian Gambling Screen Harm to Self-Scale (VGS-HS). (Ben-Tovim et al., 2001).	A 15-item screening tool designed to measure the harm occurring to self as a result of gambling	Harm as a result of Problem Gambling

2 ‘Responsible gambling’ messages

Chapter Summary

- In our scoping review, the evidence base for 'responsible gambling' messages comprised 25 academic papers and two pieces of grey literature.
- In terms of empirical evidence, 'responsible gambling' messages were explored in twelve different studies that were conducted in North America, Europe and Australia. The methodologies used in these studies included messaging developed and tested by researchers, analysis of personalised feedback within operator datasets, and content analysis of industry-devised advice.
- The evidence suggests that non-personalised – or standardised – responsible gambling messaging could have a small effect on people's beliefs about gambling outcomes but the overall findings on actual behaviours are mixed.
- There was some evidence that personalised feedback could reduce the amount of money and time spent gambling. Feedback received via telephone or e-mail appeared to have the biggest impact, with evidence that the industry could do more to provide such feedback. However, the 'responsible gambling' messages explored here still emphasise individual responsibility, thus possibly increasing stigma and 'othering' those who experience harms. They may also serve to deflect attention away from changes to industry products and practices that could more effectively reduce harm from gambling.
- There was evidence that 'return-to-player' information could be reframed as 'house-edge' information to improve the understanding of the risks, and possible costs of gambling.

2.1 Introduction

This chapter begins by introducing the narratives and practices around 'responsible gambling'. We then describe the evidence base before exploring the substantive findings in relation to non-personalised messaging and the efficacy of personalised messaging.

'Responsible gambling' is a term which promotes individual responsibility among those who participate in gambling. Forming a key part of Blaszczynski et al.'s (2004) Reno model, 'responsible gambling' – the authors argue – is an optimum public health strategy which encourages individual choice-making when in possession of all the facts in relation to the risks of gambling. This assumes that an individual can know, and act upon, all the risks related to gambling activities.

The industry trade body for gambling operators in Britain – the Betting and Gaming Council (BGC, 2023a) – have responded by developing a narrative which encourages 'safer gambling', adopting GamCare's 'Safer Gambling

Standard'.[1] GamCare (2023) itself defines safer gambling as "a term used to describe the industry's approach to limiting the risk of problem gambling and gambling-related harm. The term is often used interchangeably with 'responsible gambling' and can also be referred to as the industry's 'social responsibility'". The Gambling Commission's License Conditions and Codes of Practice for gambling operators includes a social responsibility code which stipulates that "licensees must make information readily available to their customers on how to gamble responsibly and how to access information about, and help in respect of, problem gambling" (Gambling Commission, 2022, section 3.3.1). This information must cover tools provided by the operator which help individuals monitor or control their gambling; timers, other reminders or 'reality checks' where available; self-exclusion options; and information about the availability of further help or advice.

Like 'responsible gambling', 'safer gambling' places the onus on the individual exercise of personal responsibility to avoid harm. The BGC (2023a) itself promotes 'safer gambling' through principles which include 'empowering' its customers, as well as an annual 'safer gambling week'. According to the BGC (2023b), 200,000 accounts in Britain set deposit limits during the month-long safer gambling campaign in October 2022, an increase of 12.5% compared to October 2021. The number of players using reality checks (on-screen messages that alert customers about the time they have spent gambling) also rose by 300%. Whilst these numbers represent a substantial increase in the number of people heeding safer gambling messages during that period, the BGC (2023b) does not say how many operators took part in the research.

However, there are concerns that the rhetoric of 'responsible' and 'safer gambling' can cause further stigma for those experiencing harms, implying that they have been gambling irresponsibly and should have been able to curtail their behaviour. This ignores the ways in which the design and advertising of gambling products may exacerbate the risk of harm; and the fact that someone who becomes addicted to gambling will find it very difficult to stop. In other words, 'responsible gambling' implies that the onus is on the individual to control their own gambling even when they are not able to do so (Livingstone and Rintoul, 2020). Previous research has highlighted how industry messaging around 'responsible gambling' has influenced societal conceptions around responsibility and duty of care (Marko et al., 2022). 'Responsible gambling' messages adopted by industry could therefore be problematic when they are used to transform perceptions of responsibility, as well as the risk of stigmatising those experiencing harms.

2.2 About the evidence base

Our evidence base for 'responsible gambling' messages comprised 25 academic papers and two pieces of grey literature. These messages - which seek to promote more informed decisions and encourage individuals to take

[1] GamCare provides information, advice and support for people affected by gambling harms in Britain.

responsibility for their own gambling behaviours – were explored in twelve different empirical studies, conducted in:

- **Australia** (Monaghan et al., 2009; Monaghan and Blaszczynski, 2010; Blaszczynski et al., 2014; Gainsbury et al., 2015; Hing et al., 2019; Byrne and Russell, 2020).
- **The UK** (McGivern et al., 2019; Van Schalkwyk et al., 2021; Newall et al., 2022a; Newall et al., 2022b; Newall et al., 2023).
- **Canada** (Gallagher et al., 2011; Hing et al., 2019; Hollingshead et al., 2019).
- **The United States** (USA) (Jardin and Wulfert, 2009; Ginley et al., 2016; Newall et al., 2022b).
- **Sweden** (Wood and Wohl, 2015; Berge et al., 2022).
- **France** (Caillon et al., 2021).
- **New Zealand** (Landon et al., 2016)
- **Norway** (Jonsson et al., 2021).
- **The Netherlands** (Auer and Griffiths, 2023a), and
- **Across Europe** (Auer and Griffiths, 2015a; Auer and Griffiths, 2015b).

The evidence from these studies varies widely in terms of research methods and sample sizes. Studies included experimentation of different messaging devised by researchers on amended electronic gaming machines (EGMs), and specifically devised games exploring the impact of messages on small sample sizes, often consisting of groups of students. They also included explorations of the impact of messages across large-scale samples of customers that were provided by gambling operators.

Within the sample of literature that explored ‘responsible gambling’ messaging targeted at individuals, personalised feedback - designed to influence the individual’s gambling behaviours based on their own engagement with gambling - demonstrated a greater effect in terms of reducing specific gambling behaviours. For example, “In the last month you played 25.75 hours” (Auer and Griffiths, 2015a, p. 4). While this effect was evidenced in large-scale studies, these studies were not without their shortcomings. Berge et al.’s (2022) study – while demonstrating that personalised feedback had a positive impact on individuals – did not contain a comparative, control group of participants. This means we do not know whether these changes were a result of the messaging or would have happened anyway.

The need for a control group is addressed by Auer and Griffiths (2015a, 2023a) in both of their studies. However, the samples within their studies were either individuals self-reporting changes (Auer and Griffiths, 2015a), or consisted only of the highest spenders (Auer and Griffiths, 2023a), and therefore were not representative of wider populations. The efficacy of personalised feedback would be best proven by datasets generated from a wide range of people who gamble across the widest spectrum of spend possible. This would most likely be achieved by a centralised storage of customer data for research purposes, therefore alleviating pressure on researchers to obtain data from operators. This type of data access remains some way off in most countries, however.

2.3 Non-personalised 'responsible gambling' messages

Non-personalised 'responsible gambling' messages (i.e. general messages shown to people who gamble, such as "when the fun stops, stop" - see Newall et al., 2022a, p. e438) were explored by evaluating either the impact on participants' beliefs about outcomes (generally a small impact) or the impact on actual gambling behaviours (mixed impact). This section begins by highlighting papers that explored the impact of non-personalised messages on gambling beliefs, before exploring their impact upon gambling behaviours. Finally, the use of control strategies is explored.

2.3.1 Non-personalised messages have a small impact on beliefs about gambling outcomes

We found five studies that indicated that non-personalised messages have a small impact on beliefs about gambling outcomes. The nature of the message tested, where they were located and how their impact was measured is highlighted in Table 3.

Monaghan et al. (2009) explored the impact of messages on stickers placed on EGMs in an experiment involving 93 undergraduate students. They specifically tested if informative messaging – devised by researchers – produced a bigger impact than messaging mandated by legislation on irrational beliefs about the outcomes of gambling, and if they impacted the thought processes of participants during play. Beliefs in relation to gambling are defined as irrational when they reflect an incorrect representation of chance and the independence of outcomes that occur in a gambling-related outcome (see Ladouceur and Walker, 1996). The irrational beliefs measured by the authors included the misunderstanding of random outcomes, the misunderstanding of the independence of chance events, illusions of control, superstitious beliefs, and the 'gambler's fallacy', or the belief that the chance of a random event occurring in the future is influenced by its occurrence in the past. The study found that messages produced only a small decrease in 'gambler's fallacy' amongst participants. Indeed, the experiment resulted in a decrease from 97.8% of participants believing in the 'gambler's fallacy' to 90.3%. Additionally, only 22.6% of participants indicated that warning signs had affected their thought processes during play.

Table 3: Studies exploring non-personalised 'responsible gambling' messages on beliefs about gambling outcomes

Authors	Message Tested	Devised by Industry or Researchers	Location of Message	Outcome Measure
Blaszczynski et al. (2014)	Not specified. Messages were 'animated signs displayed on the gaming machine advocating play within affordable limits' (p. 700)	Industry	EGM screens	Enjoyment of play, time and money spent playing, impact on beliefs about responsible gambling tools.
Caillon et al. (2021)	Either informative or self-appraisal messages. Informative: Four brief informative messages designed to inform participants on the risks of gambling. "'Gambling involves risks: debt, loneliness, and addiction,' 'When gambling, sometimes we lose not only money but also time,' 'Play only with the money you can lose,' and "All gambling games are part chance'" (p. 4). Self-appraisal: Four brief self-appraisal messages designed to encourage participants to examine gambling behaviour: "Do you know how long you have been playing?," "Have you spent more money than you intended?," "Do you need to think about taking a break?," and "Are you trying to recover the money you lost previously while playing?." (p. 4).	Researchers	Messages programmed to appear during online gambling session.	Gambling behaviour (money wagered and time spent), craving, cognitive distortions, gambling experience, message recall.

Table 3, cont.: Studies exploring non-personalised 'responsible gambling' messages on beliefs about gambling outcomes

Authors	Message Tested	Devised by Industry or Researchers	Location of Message	Outcome Measure
Gallagher et al. (2011).	Warning banners appeared on video lottery terminals: "WARNING: PAYOUTS ARE RANDOM AND NOT CONTROLLED BY PLAYERS. NEAR WINS ARE ALWAYS LOSSES" (p. 129). Message appears in both French and English.	Researchers	Message appeared on the screens of video lottery terminals in all the bars with terminals in Fredericton, Canada over a two week period. Message had a duration of approximately 25 seconds, and was electronically scrolled on each screen approximately every 15 seconds.	Two-week PGSI, Informational Biases Scale, Time Sheet
Monaghan et al. (2009)	Either standard: 'Your chance of winning the maximum prize on a gaming machine is generally no better than one in a million'. Or Informative: 'The outcome of every game is randomly generated by the machine. It is not linked by the machine or the player' (p. 176).	Standard: New South Wales Gaming Machines Regulation Act of 2002. Informative: Researchers	Standard: Printed on a sticker placed to the left of the screen in bold black font on a white background. Informative: Identical in design	Erroneous estimates and irrational beliefs
Monaghan and Blaszczynski (2010)	Informative (for example: 'Your chances of winning the maximum prize are generally no better than one in a million') Self-appraisal (for example: 'Do you know how long you have been playing? Do you need to think about a break?)' (p. 72).	Researchers	Static: Placed on the side of the screen in a red-bordered box with message in bold, black text. Pop-up: Middle of the screen, taking up approximately 2/3 of the screen and remaining visible for 15 seconds.	Message recall, and questionnaires relating to self-awareness of gambling behaviours

A separate paper by Monaghan and Blaszczynski (2010) details the findings of two studies, with one conducted in laboratory settings and the other conducted in a real-life gambling setting. Both studies explored the effects of signage which differed by mode of presentation (whether pop-up or static), as well as by information content (whether informative, self-appraisal, or blank). Across both studies which numbered 127 and 124 regular EGM 'gamblers' respectively, participants were more likely to frequently and accurately recall the content of pop-up messaging compared to that of static messaging, as well as reporting an impact on gambling behaviour. Indeed, 54% and 14% reported an impact of pop-up messaging within closed and actual gambling conditions respectively, compared to 29.7% and 3.3% in relation to the static messaging. Whilst these differences are significant, messaging was still considerably less effective in actual gambling conditions. Messages were also found to be more effective at changing thoughts and behaviours if they encouraged self-appraisal. For example, messages may have asked participants or individuals in real-life settings to consider answers to '"Do you know how long you have been playing? Do you need to think about a break?'' or ''Have you spent more than you intended? Do you need to think about a break?"' (Monaghan and Blaszczynski, 2010, p. 72).

In another study, Blaszczynski et al. (2014) tested several 'responsible gambling' messages with 300 patrons of an EGM venue, including industry-derived, animated messages designed to pop-up on-screen. These messages were evaluated alongside other specific features: a "bank meter", an alarm clock, a demo mode play, and charity donations. In relation to 'responsible gambling' messages, they found that 49.7% of participants had previously noticed messages on EGMs, whilst 22% of the sample noticed the animated, 'responsible gambling' messages during the experiments. Only 7.0% of all participants reported that they thought the messages made them stop and think, 14.7% thought that the messages would make a "positive difference" to their gambling behaviour, and 4.2% thought the messages influenced their "actual behaviour" (Blaszczynski et al., 2014, p. 706). Recommendations by participants to improve the impact of signage included changing the message more frequently, making the signs more "obvious", and using "more insulting language as they are designed to make you think you are going to win" (Blaszczynski et al., 2014).

Gainsbury et al. (2015) also measured the impact of dynamic pop-up messages appearing on EGMs within five venues in Brisbane on recall. The results supported the authors' hypothesis that the placement of dynamic messages affects recall. Of the 667 respondents surveyed, 290 (43.5%) recalled seeing messages on the EGMs either in the middle of the screen and/or at the top/bottom of the screen. Of those, 74.5% recalled seeing messages in the middle of the screen, 22.1% recalled seeing the message at the top and/or bottom, and 3.4% recalled seeing messages at both top/bottom and in the middle. Importantly, the format of message placement had minimal impact on participants' enjoyment of EGM play. The perceived usefulness of messages in the middle of the screen was apparent amongst those experiencing lower levels of harmful gambling. However, 'problem gamblers'

were more likely to consider messages as useless, although they were also less likely to report the messages as frustrating or annoying.

Finally, Caillon et al. (2021) explored the effectiveness of Internet pop-up warning messages for different types of games and gambling behaviours. They tested pop-up warning messages that appeared on computers during the real-life online gambling sessions of 58 participants aged 18 or over. Participants were assigned to conditions: either self-appraisal pop-up messages, informative pop-up messages, or a control condition (blank pop-up messages) in a semi-naturalistic setting and with a 15-day follow-up. Participants were invited to gamble on their favourite website with their own money in the laboratory. Participants played either pure skill and chance bank games (sports betting), or skill and chance social games (poker). In relation to beliefs – measured according to the Gambling Related Cognition Scale (GRCS) – the study found no significant differences between the three conditions on gambling cognitions. They did find that participants betting on horse racing and sports assigned to the control group decreased their GRCS related to expectancies from gambling (a mean value of -1.08), compared to those in the self-appraisal condition whose score actually increased (a mean value of +0.95). This means that the participants were more likely to reduce their expectations from gambling when confronted with a blank pop-up message. On the other hand, GRCS scores in relation to the illusion of control decreased for ‘at-risk gamblers’ in the informative, pop-up condition (mean value: -1.86) compared to ‘at-risk gamblers’ within the control condition whose scores increased (mean value: +2.70). This indicates that informative, pop-up messaging can aid ‘at-risk gamblers’’ understanding of control over the outcome of a gambling activity.

In Canada, Gallagher et al. (2011) tested the impact of an electronic banner that appeared on the screens of video lottery terminals on gambling behaviour and beliefs within a field setting, over a six-week period. Messages appeared on screens in every bar that contained lottery terminals in Fredericton, Canada. Participants met with researchers on three occasions during the test, with data collected on a range of measures (two-week PGSI, an amended PGSI pertaining to the previous two weeks’ gambling activity, scales related to informational biases, and self-reported timesheets detailing participants’ gambling). Gambling beliefs were measured through an Informational Biases Scale (IBS). The study found that the warning banners had no significant impact on the IBS scores of ‘non-problem gamblers’ from baseline (mean score of 91.22) to follow-up (mean score of 95.63), but they did have a significant impact on the IBS scores of ‘problem gamblers’ which decreased from a mean of 115.11 at baseline, to 107.15 at follow-up. The authors concluded that inaccurate gambling beliefs of ‘problem gamblers’ can be altered by warning banners.

2.3.2 Non-personalised messages have a mixed impact on gambling behaviours

A small number of studies explored the impact of non-personalised messages on gambling behaviours, with mixed results. Table 4 shows that the impact of non-personalised or standardised messages on gambling behaviours was tested in experimental settings, as well as within large operator datasets.

Caillon et al.'s (2021) study (described earlier) uncovered mixed evidence of the impact of informative or self-appraisal messages on money wagered and time spent on gambling. The authors found a significant effect of pop-up messages on money wagered, but analysis showed that money wagered did not differ between self-appraisal condition and the control groups, nor between the informative condition and the control groups. The authors also found a significant effect of the interaction of pop-up messages on time spent gambling for participants playing skill and chance bank games, with a lower duration in self-appraisal condition compared to control condition. The authors concluded that there were no significant differences between the three groups in relation to gambling behaviour. However, they also highlighted how follow-up analysis revealed an effect of self-appraisal messaging compared to the control group with a decrease on time spent gambling, but only for participants betting on sports and horse racing.

Also introduced earlier, Gallagher et al. (2011) tested the impact of an electronic banner on the screens of VLTs on gambling behaviour, over a six-week period. The authors found that the average number of hours played decreased from the baseline of 8.59 hours, to 6.91 hours during the banner period, and then to 7.58 hours during the follow-up. Over the three time periods, the 'problem' and 'non-problem gamblers' together were found to significantly decrease their number of hours playing VLTs. However, follow-up t-tests carried out by the authors revealed only a significant decrease in hours spent gambling from the baseline to the banner period. Therefore, the findings indicate that while the evidence resulted in fewer hours spent playing VLT, this reduction was only statistically significant over a period of two weeks.

Two studies in our sample of literature specifically tested the impact of 'responsible gambling' messaging on the gambling behaviours of students. Firstly, Jardin and Wulfert (2009) explored the impact of pop-up messages on the gambling behaviour of 104 undergraduate psychology students in the US who were tasked with playing a chance-based, computerised gambling game. Participants could play until they decided to stop or until they lost their $500 play money, with messages programmed to appear at various points during their 'gambling' sessions. The study found that 89.4% of participants kept playing until they ran out of money, meaning that pop-up messages did not stop most participants from spending all of their play money.

Table 4: Studies exploring non-personalised 'responsible gambling' messages on gambling behaviours

Authors	Message Tested	Devised by Industry or Researchers	Location of Message	Outcome Measure
Auer and Griffiths (2015b)	Messages presented on slot machines in field settings within two separate conditions. The original message informed the player that 1,000 games had been played, and gave the player the option to continue or stop playing. The Enhanced messaging read: "We would like to inform you, that you have just played 1,000 slot games. Only a few people play more than 1,000 slot games. The chance of winning does not increase with the duration of the session. Taking a break often helps, and you can choose the duration of the break" (p. 3).	Industry	Pop-up message on screen.	Number of sessions terminated after playing 1,000 consecutive slot games.
Caillon et al. (2021)	Either informative or self-appraisal messages. Informative: Four brief informative messages designed to inform participants on the risks of gambling. "'Gambling involves risks: debt, loneliness, and addiction,' 'When gambling, sometimes we lose not only money but also time,' 'Play only with the money you can lose,' and "All gambling games are part chance'" (p. 4). Self-appraisal: Four brief self-appraisal messages designed to encourage participants to examine gambling behaviour: "Do you know how long you have been playing?," "Have you spent more money than you intended?," "Do you need to think about taking a break?," and "Are you trying to recover the money you lost previously while playing?." (p. 4).	Researchers	Messages programmed to appear during online gambling session.	Gambling behaviour (money wagered and time spent), craving, cognitive distortions, gambling experience, message recall.

Table 4, cont.: Studies exploring non-personalised 'responsible gambling' messages on gambling behaviours

Authors	Message Tested	Devised by Industry or Researchers	Location of Message	Outcome Measure
Gallagher et al. (2011).	Warning banners appeared on video lottery terminals: "WARNING: PAYOUTS ARE RANDOM AND NOT CONTROLLED BY PLAYERS. NEAR WINS ARE ALWAYS LOSSES" (p. 129). Messages appear in both French and English.	Researchers	Message appeared on the screens of video lottery terminals in all the bars with terminals in Fredericton, Canada over a two week period. Message had a duration of approximately 25 seconds, and was electronically scrolled on each screen approximately every 15 seconds.	Two-week PGSI, Informational Biases Scale, Time Sheet.
Ginley et al. (2016)	Five separate messages. 'The next spin has nothing to do with your previous spins'. 'If you continue gambling, you will eventually lose your money'. 'Winning is not due to luck. It's random'. 'Are you losing more than you want? Maybe it's time to quit?' 'Are you having fun? Or are you just losing your money?' (p. 933).	Researchers	Static, within white rectangles covering the screen of play.	Slot machine behaviour (Total number of spins, time spent placing a bet over the course of play).
Jardin and Wulfert (2009)	Messages which 'accurately described the contingencies (e.g., "You cannot control the outcome of this game") (p. 245)	Researchers	Pop-up messages on screen after specific phases of play.	Gambling behaviour of male and female participants.

Secondly, a study of 154 undergraduate students in the US saw participants gamble on a bank of three machines in a simulated casino, with participants randomly allocated to messages which would occasionally appear on screen (Ginley et al., 2016). These messages differed between participants according to 'warning message-win' ('Winning is not due to luck. It's random') or 'warning message-loss' ('Are you having fun? Or are you just losing your money?') conditions (Ginley et al., 2016, p. 933). Two control conditions (control-win and control-loss) were also included, where no message was shown to participants. The study found that the message-win condition had the greatest impact on the gambling behaviour of 39 students allocated to that message condition – they placed the smallest number of bets, made the fewest bets, and did not speed up their bet rate as much as participants in other conditions. However, the authors also acknowledged that messages are received differently, influenced by whether the person gambling is winning or losing as well as the other environmental determinants which may also encourage gambling.

Finally, Auer and Griffiths (2015b) used operator data to investigate the effects of normative and self-appraisal feedback given on slot machines within a real-life field setting. The authors analysed an anonymous dataset given by an industry operator (German-speaking site), to explore the effects of different feedback given after a player had played 1,000 consecutive spins. The authors explored the outcome within two separate conditions, both the original pop-up message (based on 11,232 sessions where at least 1,000 consecutive slot games had been played) and the enhanced pop-up message (based on 11,878 sessions where at least 1,000 consecutive slot games were played). Of the sessions that received the original pop-up message, 75 sessions immediately terminated after the pop-up message was shown at the 1,000th consecutive game (0.67%), compared to 169 sessions immediately terminated after the enhanced pop-up message was shown at the 1,000th game (1.39%). The authors concluded that the percentage of players stopping at 1,000 spins after the enhanced message was statistically significantly higher than the percentage stopping after seeing the original pop-up message. On the other hand, the authors could not guarantee from the anonymous dataset that players were not included in both categories.

2.3.3 Non-personalised messages that advocate self-control are not sufficient on their own to curb harmful gambling

Other research has explored non-personalised messages that encourage people to exercise control over their own gambling. By advocating the use of limits and self-control, these strategies are centred on the notion of personal responsibility. Papers that explored the impact of these strategies are introduced in Table 5.

Table 5: Studies exploring the impact of control strategies

Authors	Control Strategies	Devised by Industry or Researchers	Location of Message	Outcome Measure
Hing et al. (2017)	Control strategies designed as part of responsible gambling consumption. For example, "Only gamble with money you can afford to lose" or "Set a money limit in advance" (p. 157).	Statutory Authority (Victorian Responsible Gambling Foundation)	General	Knowledge of responsible gambling behaviours, understanding and support for the term 'responsible gambling', upper limits of responsible gambling, erroneous gambling beliefs, gambling motivations, strategies for staying in control of gambling, highest spend form of gambling, gambling risk group, demographics.
Hing et al. (2019)	Control strategies designed as part of responsible gambling consumption. For example, "If you're not having fun gambling, stop" (p. 14).	Researchers	General	SGPS, SGHS, PGSI, risk factors.
Landon et al. (2016)	The study documented experiences of EGM-based pop-up messages from a range of people who gambled and venue-level staff.	Not applicable	Not applicable	Thematic analysis of experiences.
Newall et al. (2022a).	Three online, randomised experiments to test the impact of the Senet Group's message "when the fun stops, stop" on the decision to accept (or reject) betting options (experiment 1), or the proportion of available funds bet (experiments 2 and 3).	Industry	Experiment 1: Message presented during nine mock gambling adverts preceding betting selections. Experiments 2 and 3: Message appeared as participants learned about the game(s) and while they were betting.	Experiment 1: ability to accept or reject series of football bets. Experiment 2: Proportion of available funds bet.

Table 5, cont.: Studies exploring the impact of control strategies

Authors	Control Strategies	Devised by Industry or Researchers	Location of Message	Outcome Measure
Van Schalkwyk et al. (2021)	Framing analysis and critical appraisal of the campaign deployed by the Senet Group around the message, “when the fun stops, stop”.	Industry	General	Critical evaluation of the message.

Landon et al. (2016) conducted qualitative research with 40 people who gambled as well as venue staff in New Zealand to gather their experiences in relation to pop-up messages that appear on EGM screens. The focus groups with participants found four key themes that highlighted how the messages – despite content that may promote 'safer gambling' behaviours – were not viewed as sufficient to curb harmful gambling. While there were some discussions of the benefits of pop-up screens, one theme ("It doesn't matter what's there… nothing will stop you" - see p. 55) highlighted views of pop-up messages as ineffective in relation to reducing harmful gambling. Another theme ("everyone wants them gone" - see p. 58), also reflected comments which viewed pop-up screens as an ineffective intervention. Additionally, people who gambled and received pop-up messages preferred to simply wait for the pop-up message to disappear so they could continue gambling, rather than interact with venue staff to discuss their gambling behaviours. While the message – an example of which is featured in the paper – does not encourage those gambling to interact with staff, staff have the opportunity to observe and interact with players who receive the messages during their session.

Hing et al. (2017) explored a range of messaging strategies in an Australian study of 860 participants, described as 'regular gamblers' on high-risk products such as EGMs. They were recruited through gambling venues and an online wagering operator. The strategies were those promoted by the Victorian Responsible Gambling Foundation (the major 'responsible gambling' agency in that territory) and included "Don't think of gambling as a way to make money", "Only gamble with money you can afford to lose", "Set a money limit in advance", "Set a time limit in advance", "Never chase your losses", "Don't gamble when you're depressed or upset", "Balance gambling with other activities", "Don't take your ATM card with you", "Take frequent breaks", "Don't gamble more than once a week", and "Don't drink alcohol or use drugs when gambling" (Hing et al., 2017, p. 157). Participants were asked to rate how strongly they agreed with these control strategies as an essential part of 'responsible gambling', their understanding of and support for the term 'responsible gambling', in addition to outcomes related to their own gambling behaviours. The authors concluded that most participants endorsed these strategies as essential to 'responsible gambling', whilst suggesting that communication efforts have been effective in promoting behaviours which inform non-harmful consumption. They also concluded that knowledge of these strategies alone is not enough to prevent harm from occurring, as evidenced by the levels of harm experienced in their sample of participants. 'Non-problem' and 'low-risk gamblers' (according to PGSI) were also significantly more confident in their understanding of the meaning of the term 'responsible gambling', whilst 'low-risk' and 'moderate-risk gamblers' were significantly more supportive of the term compared to 'problem gamblers'. 'Non-problem gamblers' were also significantly more supportive of the term compared to 'moderate-risk gamblers'.

A separate study that surveyed 1,174 'regular gamblers' in Canada identified nine evidence-based, 'responsible gambling' strategies from a list of potential approaches identified through a prior literature review (Hing et al., 2019), which are set out in Table 6. The authors also asked participants which of

these strategies they used as part of their own 'responsible gambling'. The most commonly endorsed statements by participants were "If I'm not having fun gambling, I stop", "My leisure time is busy with other hobbies, social activities and/or sports", "I keep a household budget", and "When I gamble, I always set aside a fixed amount to spend" (Hing et al., 2019, p. 13). Again, the study acknowledged that promoting these types of strategies is rarely sufficient on its own to curb harmful behaviours, due to the varied and complex characteristics of addictive behaviours.

Table 6: 'Responsible Gambling' Strategies Outlined by Hing et al. (2019, p.14)

If you're not having fun gambling, stop.
Keep a household budget.
If you gamble, have a dedicated budget for your gambling.
Engage in other leisure activities, hobbies, social activities or sports.
Do not gamble if you're feeling depressed or upset.
When you gamble, always set aside a fixed amount you can spend.
Do not use credit, or cash advances on your credit card, to gamble.
Do not use gambling to make money or supplement your income.
Do not think that systems or strategies will ensure your success at gambling.

Such strategies risk absolving gambling industries from any responsibility or duty-of-care towards those experiencing harm. One UK-based study explored how a widely deployed non-personalised message advocating individual self-control – "When the Fun Stops, Stop" – was developed and used by the industry in order to address 'problem gambling' (Van Schalkwyk et al., 2021). This was carried out through a framing analysis of campaign materials used by the Senet Group (the industry body that devised the message/strategy), as well as a critical appraisal of the Senet Group-funded campaign evaluation. Through their framing analysis, the authors argued that the Senet Group sought to (1) conceptualise a "small minority of vulnerable gamblers who lack control and understanding" (Van Schalkwyk et al., 2021, p. 6), therefore creating a division between those experiencing gambling harms and the rest of society; (2) frame gambling harms as experienced by individuals thus avoiding solutions which address operator practices; and (3) promote industry self-regulation, with an onus on the promotion of self-responsibility. In summary, the authors argue that framing gambling harms in this way leads to solutions that are focused on individuals and personal responsibility, thus deflecting attention away from the need for changes to the industry or its products in order to reduce harm.

Other research within the sample explored the efficacy of the tagline "When the Fun Stops, Stop" as a means of offering protection to individual players (Newall et al., 2022a). This involved testing the impact of the message across

three different experiments on participants' decisions to accept or reject a series of football bets (experiment 1), or upon the total amount wagered (experiments 2 and 3). The tagline either appeared during mock football-related adverts followed by a series of possible football bets (experiment 1), or during activities where participants learned about and gambled within a game – roulette in experiment 2 and football betting in experiment 3 – upon which participants were given an endowment to gamble with. The tagline specifically appeared during nine mock adverts which appeared before the series of available football bets (experiment 1), or while learning about – or betting within – the gambling activities in experiments 2 and 3. During the first experiment, the 41.3% of available bets made by the 254 participants in the gambling message condition was not significantly different to the 37.8% of available bets made by the 252 participants in the non-message, control condition. Experiment 2 also tested the impact of a yellow version of the tagline, in addition to a black-and-white version. Although the 501 participants within the yellow tagline condition gambled 3.64% more than the 499 participants in the control group, there were no significant differences between the bets made by the 500 participants in the black-and-white message condition and the other conditions. In experiment 3, there were no significant differences between the 502 participants in the gambling message condition and the 501 participants in the control condition. In summary, the authors found no evidence across the three experiments for a protective effect of this 'safer gambling' message.

2.4 Personalised 'responsible gambling' messages

This section reviews the findings of studies which explore the efficacy of giving *personalised* feedback to people who gamble as a way of preventing gambling harms. As opposed to non-personalised messages that contain general advice disseminated to all people who gamble, personalised feedback aims to prevent or reduce harms by providing specific information about the time or money that an individual has spent during the current session of gambling. Personalised feedback may also provide information on someone's gambling behaviours compared to previously set limits, for example, "You have reached the budget of [insert dollar amount] or [insert credit amount] you set for yourself today" (Hollingshead et al., 2019, p. 124). Table 7 sets out the studies in our sample that explored personalised messaging. All of these studies focused on the outcomes of personalised messages in relation to gambling behaviours such as theoretical loss, total amount wagered, gambling intensity, and limit adherence. These outcome measures are explained in Table 7.

Table 7: Studies exploring personalised 'responsible gambling' messages

Authors	Message Tested	Devised by Industry or Researchers	Location of Message	Outcome Measure
Auer and Griffiths (2015a)	Behavioural feedback system, with feedback presented in number of ways: numerical, graphical, and textual. "In the last month you played 25.75 hours" (p. 4).	Industry	Online	Theoretical loss,[2] playing duration.
Auer and Griffiths (2023a)	Same behavioural feedback system as Auer and Griffiths (2014), with feedback presented in number of ways: numerical, graphical and textual.	Industry (state-owned)	Contact via email or telephone.	Reduction in gambling intensity (consisting of the amount of money wagered, amount of money deposited, number of monetary deposits, amount of time spent gambling, and gambling frequency) in the 30 days post-intervention.
Berge et al. (2022)	Normative, objective feedback given to customers based on their answers to questions on norms and beliefs about their – and peer's – own gambling habits. Feedback given through a state-owned industry tool. No example given. Test consisted of questions related to the customer's "frequency of gambling (days per month), his/her gambling losses during a typical month, beliefs about peers' frequency of gambling and typical monthly loss for the same gambling type… and the client's estimated loss during the past month" (p. 3).	Industry (state-owned)	Feedback given on-screen, displaying player data on frequency of play and monthly loss against that of an average customer within the operator's sports or casino arms.	Average daily wager during the 60 days post-intervention.

[2] 'Theoretical Loss' is defined in an earlier paper by Auer and Griffiths (2014), as 'the same measure that the gambling industry describes as Gross Gaming Revenue… This is the difference between 'Total Bet' and 'Total Win' (p. 880).

Table 7, cont.: Studies exploring personalised 'responsible gambling' messages

Authors	Message Tested	Devised by Industry or Researchers	Location of Message	Outcome Measure
Forrest et al. (2022)	None specifically tested. Operator use of interactions was explored as part of the Patterns of Play report.	Industry	Telephone and email	None. Usage highlighted as part of the Patterns of Play report.
Hollingshead et al. (2019)	Two messages. General: 'a message that simply informs the player that a pre-set money limit was reached'. Personalised: 'A message that informs the player how many credits and how much money was lost' (p. 124).	Researchers	Static or pop-up on screen. Second study also included a pop-up message with time delay.	Recall of messages, limit adherence, disordered gambling symptomatology (PGSI).
Jonsson et al. (2021)	Motivational letter-based and telephone-based interventions asking customers to reflect on loss during the past year. No example given. "The customers were asked to estimate their past year's net result… and were asked if they wanted to hear the actual figure." Staff encouraged customers to reflect on habits, and "informed participants about possible RG strategies" (pp. 390-391).	Industry (state-owned)	Provided by telephone or mail.	Theoretical loss.
McGivern et al. (2019)	Expenditure-specific ('Remember you started with £1,000. You have now spent £*amount* of your money'). Generic ('Gambling is a financially risky activity') (p. 5).	Researchers	Pop-up message on screen.	Total Amount Wagered.

Table 7, cont.: Studies exploring personalised 'responsible gambling' messages

Authors	Message Tested	Devised by Industry or Researchers	Location of Message	Outcome Measure
Wood and Wohl (2015)	Responsible gambling tool that provides behavioural feedback about their gambling. No example of feedback given, but authors outline the "RG tool that tracks behaviour and then informs players whether they are playing problematically" (p. 327).	Industry (state-owned)	RG tool used by customers with information presented on screen. Customers' behaviour is graded according to a traffic light metaphor. Customers are graded as "green", "yellow" or "red" (p. 327) depending on risk of behaviour.	Amount deposited, and amount wagered.
Byrne and Russell (2020)	An EGM-based system that incorporated a more dynamic, informative interface with additional information. For example, total deposited, total won, total spend, net profit, number of games played and session time. Also, pop-up messages that were displayed every 35 spins, asking participants if they were aware of their spend: "Do you know how much you've spent?" (p. 1237).	Researchers	Information or pop-up message given on screen.	Keeping track of play, estimation accuracy, cues to quit, player experience, PGSI.

2.4.1 Personalised messages can reduce time and money spent gambling

McGivern et al. (2019) explored the use of personalised pop-up messaging within online roulette in a small-scale pilot study which recruited 45 university students who gambled. Participants - who were given £1,000 of play money - were tasked with playing online roulette, betting £50 per spin. They also received feedback based on their expenditure, as described in Table 7. As the authors hypothesised, personalised expenditure-specific messaging was more effective at encouraging reduced spend. Participants who received expenditure-specific messaging demonstrated a significantly lower average spend (£150.07) compared to generic messaging (£235.27), or the control group (£305.67). The authors concluded that this translated into more 'responsible gambling' behaviours for those receiving personalised messaging based on their expenditure, compared to generic and control messages.

Hollingshead et al. (2019) explored the impact of personalised feedback on players' adherence to spending limits within two small-scale studies carried out in Canada. The two studies comprised 124 and 109 participants respectively, who were customers at a local casino that were invited to participate in a gambling study on a virtual reality EGM. Both studies also used different types of messaging, one which informed players when their initial limit had been reached, while in the other players received additional, personalised behavioural feedback on how much money and credits they lost. In the first study, the limit was pre-set by the authors at CAN$10 with participants – awarded CAN$20 preloaded on to the virtual reality EGM to gamble – given the opportunity to continue playing or to adhere to the limit. In the second study, participants were given CAN$10 to gamble, but were asked to set their own limit. The second study additionally explored whether leaving the pop-up message on the screen for 10 seconds had any effect. The authors found across both studies that most participants adhered to their limits, regardless of the intervention group they were in. Both studies showed that neither the pop-up messages – including where content was formed by information relating to the participant's own preset limit – nor the inability to remove the pop-up screen influenced limit adherence. The first study found that 43.5% of participants recalled seeing a message, only half of whom could recall the message's content; the second study produced very similar findings in terms of low recall of message content.

In a larger study using gambling operator data, Auer and Griffiths (2015a) evaluated the effectiveness of personalised feedback within a sample of 1,358 customers from a European online gambling website. The personalised feedback – accessed via an opt-in system – provided information on wins and losses, time duration of session, number of playing days, and number of games played. The study compared the effect of the personalised feedback against a control group, with the characteristics of customers who opted-in to receive personalised feedback matched against those who did not subscribe to the messaging system. The study found that personalised messaging achieved the anticipated impact in reducing time and money spent gambling.

However, it only achieved what the authors described as 'modest' (Auer and Griffiths, 2015a, p. 9) impacts, with customers who received feedback demonstrating an average 12% decrease of theoretical loss[3] and 10% decrease in play duration, compared to those who received no feedback. Additionally, the authors also highlight in their study how personalised messaging was a feature which required customer sign-up. Personalised feedback – if proven to be effective – could instead be incorporated into the customer journey. This would require a change of approach from gambling operators whose 'responsible gambling' information can often be easy to miss (Bournemouth University, 2022).

Byrne and Russell (2020) developed – and tested in laboratory conditions – a dynamic EGM interface that provides players with information on their gambling behaviours such as total money deposited, total won, total spend, net profit, number of games played, and time spent gambling. They also devised a system of pop-up messages that were designed to appear on screen every 35 spins to pause play for seven seconds, and to ask the player if they could accurately recall the amount of money they had spent. The interface and pop-up messages were tested amongst 213 adults in Australia who – after being given AUS$6.00 of credit to play - were assigned to either a standard (no information) or informative interface condition, and absent or present pop-up conditions. The study found that the informative interface seemed to influence gameplay and had multiple benefits including increased play tracking by participants, generated more accurate estimations of credits and time spent, and provided additional cues to quit, although it did not reduce overall level of credits spent. Pop-up messages also increased tracking and accuracy of credits spent. Importantly, neither interface type nor pop-ups diminished player experience in terms of enjoyment. Estimation accuracy for amount of credits spent was also improved with pop-up messages. Findings supporting the informative interface were therefore encouraging, although the authors acknowledged their study's lack of ecological validity as a result of the laboratory conditions.

Separately, Berge et al. (2022) explored the effect of normative personalised feedback on the gambling behaviours and average daily wagers of 1,453 people who gambled online in Sweden. The study was designed to encourage people who gamble to reflect on their own gambling behaviours as well as compare it to that of their peers. Specifically, participants were surveyed on their gambling beliefs according to the Gambling Quantity and Perceived Norms Scale, then provided with personalised feedback. The study found that the median, average daily wager within the sample decreased from SEK 74.10 in the 28 days prior to the use of personalised feedback and to SEK 57.70 in the 28 days following feedback. Average daily wagers also generally decreased in the 12 weeks *after* the use of feedback.

[3] 'Theoretical Loss' is defined in an earlier paper by Auer and Griffiths (2014), as 'the same measure that the gambling industry describes as Gross Gaming Revenue… This is the difference between 'Total Bet' and 'Total Win' (p. 880).

Wood and Wohl's (2015) study explored the use of a personalised 'responsible gambling' feedback tool by 779 people who gambled online with *Svenska Spel*, the Swedish gambling operator. The tool - the use of which at the time of the study was voluntary – tracks gambling behaviour and informs players if they are playing 'problematically'. The authors explored if this tool influenced changes in weekly deposit and wager amounts by analysing wagering and deposit data during the week of enrolment, the week following enrolment, and 24 weeks after enrolment. Players were categorised according to their gambling behaviours by the tool as being 'problematic', 'at-risk', or having 'no issues', and were matched to a control group of similar players who did not enrol in the use of the tool. Results showed that 'at-risk' players that received feedback significantly reduced their wagering compared to at-risk players who did not use the tool. This finding was observed both during the week following enrolment, as well as 24 weeks later. The authors concluded that the tool could therefore have the most impact on at-risk players.

2.4.2 Feedback via telephone or e-mail seems effective

Auer and Griffiths (2023a) carried out a study with 2,576 Dutch gambling customers who had been identified by tracking software as showing signs of 'problematic' gambling behaviour and subsequently received personalised feedback via telephone or email from the state-owned operator. The authors found that the 1,208 customers who received an email intervention and were matched with the control group demonstrated a significant reduction in money deposited and wagered as well as time spent gambling during the 30 days after being contacted. The same was true for 384 matched customers who received a telephone-based intervention. The study also explored the effects of email and telephone interventions across different intensities of gambling behaviours and found no significant statistical differences between the two interventions. Nonetheless, out of the 1,208 customers who received an email intervention, 62% reported a smaller amount of money deposited compared to 66% who received a telephone-based intervention, while 54% of email receivers had reduced time spent gambling in comparison to 59% of those who had received a telephone-based intervention.

Another study measured the effect of motivational, personalised feedback delivered to 3,009 Norwegian online gambling customers via letter or telephone (Jonsson et al., 2021). The study concluded that telephone-based feedback translated into the most significant long-term decreases in theoretical losses for customers across a wide variety of products, thanks to the personalised nature of communication.

The effectiveness of telephone-based interventions is also highlighted in a study that involved the analysis of transaction data for customers in Great Britain from several major gambling operators (Forrest et al., 2022). Although personalised feedback via these channels may achieve a greater level of prevention of harms, Forrest et al (2022) found that only 3.9% of customers were contacted by operators in 2018/2019, while just 0.13% were contacted

by telephone. Although the evaluation of telephone-based interventions was outside the scope of the study, it concluded that individuals who received a 'safer gambling call' showed more signs of disengagement with gambling. Strong evidence, the authors contend, was demonstrated in the greater number of customers showing an amount of 'zero' for the number of bets made, total gambling spend, and total gaming duration in the month following a telephone intervention.

2.4.3 The reframing of return-to-player information could improve understanding of risks

Related to the notion of 'responsible gambling' messages is the messaging deployed with gambling products that informs players about the average return they can expect from the money staked over a specific length of time. This is often framed as a 'return-to-player' percentage of stakes, highlighting the average return to players if the game is played over a long period. For example, "This game has an average percentage payout of 90%" (Newall et al., 2022b, p. 3). Research has explored if awareness of the risk associated with certain products can be improved if this percentage is framed differently, with a specific focus on the 'house edge', or the stakes that the operator is likely to keep on each product as opposed to what is won on average. This would change the message to "This game keeps 10% of all money bet on average" (Newall et al., 2022b, p. 3).

Newall et al. (2022b) tested the difference between house-edge and return-to-player information on an online slot machine on the behaviour of 2,433 US-based 'gamblers'. The authors hypothesised that participants would play fewer spins when house-edge information was given instead of return-to-player information, when a volatility warning was present, when a total amount bet counter was provided, and that these would interact to influence the number of spins made. The inclusion of a volatility warning was designed to inform players of the long period of play required to achieve the return-to-player – or house-edge – percentage of money gambled. This message consisted of the statement: "It takes millions of plays for a gambling game to tend towards its average return. A gambling game will not return a minimum value of prizes in any given period of gambling" (Newall et al., 2022b, p. 3). The authors found that number of spins played were reduced when house-edge information was shown instead of a return-to-player information, and similarly when players were presented with a volatility warning. An average of 15.7 spins were played when house-edge information was shown, compared to 19.3 spins when return-to-player information was shown. Equally, 15.5 spins were played when a volatility warning was shown, compared to 19.5 spins when no warning was shown. As they hypothesized, the authors found a statistically significant reduction in spins played from house-edge information, and a statistically significant reduction in spins played from the volatility warning. However, the authors found that the effects were small, thus leading them to argue that

messaging alone is not sufficient to prevent harms. The authors also found that showing the total amount wagered did not affect the number of spins.

Newall et al. (2022c) also tested the effect of volatility statements on the perceived chances of winning held by 2,025 UK-based individuals who gambled. They were assigned to conditions consisting of either a return-to-player statement or a house-edge statement, along with (or without) a volatility statement. Two messages were presented in the return-to-player format: “This game has an average percentage payout of 90%”, and two messages were presented in the house-edge format: “This game keeps 10% of all money bet on average” (p. 360). These statements – when participants were assigned to the respective conditions – were also presented with a volatility warning: “It takes millions of plays for a gambling game to tend towards its average return. A gambling game will not return a minimum value of prizes in any given period of gambling” (p. 360). After these statements, participants were asked to choose the correct response from the following: “1. "90% of people who play this game will win something."; 2) "This game will give out a prize nine times in 10."; 3) "If you bet £1 on this game you are guaranteed to win 90p."; and 4) "For every £100 bet on this game about £90 is paid out in prizes” (p. 360). The fourth statement was the correct response. The correct response was given by just under three quarters (70.3%) of those presented with a house-edge message only, while 66.3% of those presented with a house-edge message along with a volatility statement chose the correct response, 40.4% of those presented with a return-to-player message only, and 45% of those presented with a return-to-player message with a volatility statement also answered correctly. On average, participants also reported a lower chance of winning within the house-edge message condition compared to the return-to-player formats. The same was also true of those who received volatility statements compared to those who did not. The authors concluded that house-edge messages resulted in lower perceived chances of winning compared to return-to-player messages, while adding a volatility statement also reduced perceived chances of winning.

Newall et al. (2023) applied a similar approach with a sample of 3,333 UK-based individuals who gambled online, testing the impact of return-to-player and house-edge information on their perceived chances of winning as well as a measure of their correct understanding in relation to their chances of winning. Participants were assigned to either two different house-edge conditions, or a return-to-player condition. The authors found that 57.7% of those assigned to original house-edge condition chose the correct statement of understanding related to products compared to 39.0% in the alternative house edge condition, and 37.5% in the return-to-player condition. However, the alternative house edge condition produced the lowest perceived chances of winning. The effects size within these results, however, was small. Nonetheless, the authors argue that they support the use of house-edge over return-to-play messaging.

2.5 Conclusion

This chapter explored ‘responsible gambling’ messaging as a socio-technical innovation within the sample of literature covered by this scoping review. The evidence suggests that personalised messaging is most effective. The adoption of such feedback requires the move from general messages warning about the potential harms from gambling, to messaging tailored to individuals and based on their gambling behaviours. From a socio-technical perspective, this messaging requires the development of technology which facilitates the monitoring of gambling behaviours. However, personalised messaging still emphasises individual responsibility which may not be of help to those experiencing addiction. From a societal perspective, ‘responsible gambling’ messaging is not enough to address gambling harms on its own.

3 ‘Responsible gambling’ tools

Chapter Summary

- Our evidence base on 'responsible gambling' tools comprises 26 academic papers and four pieces of grey literature. As with the literature on 'responsible gambling' messaging described in the previous chapter, the evidence base emerges from a wide variety of methodologies.
- **Time and deposit limits** for gambling are prevalent across numerous jurisdictions and could lead to decreases in theoretical loss. However, they are also easily circumvented by those who wish to increase their gambling spend. Play breaks set by operators were shown to be ineffective at promoting long-term behaviour change.
- While studies have explored **self-exclusion schemes** in terms of perception and uptake, predicting factors, and ways to improve awareness and uptake, there was limited evidence of their longer-term effectiveness.
- A small sample of literature also explored the use of other responsible gambling tools such as **self-assessments and financial statements,** where the main issue was low take-up.

3.1 Introduction

In addition to 'responsible gambling' messages, specific 'responsible gambling' tools were also explored within the sample of literature covered by this scoping review. Evidence suggests that while 'responsible gambling' tools were easily accessible by the individuals and populations included in the studies, uptake and effect on harmful gambling behaviours was mixed. This chapter begins by reviewing the literature which explored the use of **time and deposit limits** in the reduction of gambling-related harms. It then moves on to consider **self-exclusion schemes**; and finally looks at the evidence on other types of 'responsible gambling' tools.

3.2 About the evidence base

Our evidence base exploring 'responsible gambling' tools comprises 26 academic papers and four pieces of grey literature, which between them utilise a wide variety of approaches. Studies on limit-setting tools and self-exclusion schemes either explored the perception of the tools, the impact upon gambling behaviours or ways in which they could be improved or made more accessible. Studies into the use of limits benefitted from the analysis of large-scale operator data, with the impact of limits on theoretical loss. Whilst lending a valuable insight, this loss is *theoretical*, and does not tell us about harmful gambling behaviours; nor can the analysis of data from a single operator shed any light on spend with other operators. Equally, research around self-exclusion schemes suggests that they do not reduce people's PGSI scores, and therefore those who have self-excluded may still be at risk once their self-exclusion has concluded. This scoping review therefore cannot conclude that

limits and self-exclusion alone are enough to protect those experiencing harmful gambling.

Surprisingly, the sample of literature we identified did not include any research on software that facilitates industry-wide or multi-website self-exclusion, or software that blocks access to gambling websites. Gamstop (2023), for example, is a socio-technical innovation that has been adopted widely across the industry, offering self-exclusion from gambling websites and apps operated by companies based in Great Britain. Gamban (2023), meanwhile, is an app that blocks access to 60,000 websites across the world. The current scoping review found no evaluation of these or similar services.

3.3 Setting time and deposit limits

Time and deposit limit-setting tools were the most prominent form of 'responsible gambling' tool explored within the sample, with 16 academic papers focusing on limits as a means of encouraging more 'responsible gambling' behaviours. Limit-setting tools are prevalent across jurisdictions and are perceived as positive tools by people who gamble. The scoping review also found some evidence that limit-setting could lead to lower theoretical losses and gambling frequency among 'high-spending gamblers'. On the other hand, limit-setting systems can be circumvented, for example by setting very high limits which have no effect in terms of curtailing gambling spend. Mandatory play breaks which can also be enforced by operators – while effective as reducing deposits in the short term – appear to be ineffective at impacting gambling behaviours in the long term.

3.3.1 Limit-setting tools are prevalent across jurisdictions and are perceived positively

The sample of literature demonstrated the global prevalence of time and deposit limits. In terms of geographical spread, academic studies include those with a global focus (Gainsbury et al., 2013), and others focusing on:

- **Australia** (Nower and Blaszczynski, 2010; Blaszczynski et al., 2014; Heirene et al., 2021);
- **Canada** (Currie et al., 2020; Wohl et al., 2014; Wohl et al., 2023);
- **Europe** (Auer et al., 2020a; Auer and Griffiths, 2013);
- **Norway** (Auer et al., 2019a; Auer et al., 2020b; Engebø et al., 2022; Hopfgartner et al., 2023a);
- **South Korea** (Park et al., 2021)
- **the US** (Edson et al., 2021) and
- **the UK** (Auer and Griffiths, 2023b).

The grey literature also highlighted the use of limit-setting tools in Britain (Behavioural Insights Team, 2021a; Behavioural Insights Team, 2021b;

Forrest et al., 2022), where providing information on limits is a condition of gambling licences:

"Licensees must make information readily available to their customers on how to gamble responsibly and how to access information about, and help in respect of, problem gambling. The information must cover: any measures provided by the licensee to help individuals monitor or control their gambling, such as restricting the duration of a gambling session or the amount of money they can spend." (Gambling Commission website, 2023a).

An analysis of 140,000 online gambling accounts in Britain in the period 2018-2019 found that deposit limits were used by 21.5% of these accounts (Forrest et al., 2022).

Studies in other jurisdictions explored individual's perceptions of limit-setting tools. Gainsbury et al. (2013) surveyed 10,838 global online casino and poker players to explore consumer attitudes towards 'responsible gambling' tools available within online gambling sites. While no single limit was overall endorsed, 70.4% of survey respondents found voluntary spend limits to be at least quite useful, while 50.3% rated voluntary time limits as at least quite useful. In a study of 10,054 Canadian adults who were 'regular gamblers', Currie et al. (2020) found that setting a limit in advance was rated as a helpful 'responsible gambling' tool by 78.8% of those who used this tool at least sometimes. Participants who deployed time or monetary limits were most likely to be female, married and importantly, have a higher PGSI score in addition to spending more days and money per month gambling. The authors therefore imply that limits are at least partly effective in reaching those with a higher PGSI score.

This is also implied by Engebø et al. (2022) who explored the usage of 'responsible gambling' tools within a Norwegian nationwide prevalence survey. Their analysis of 5,878 participants found that loss limits, "pre-committed to affordable amounts" (Engebø et al., 2022, p. 6) were the most used tool, used by 23.1% of participants. However, the study does not deliver any analysis on the effect of tools on specific gambling behaviours. Auer et al. (2020b) surveyed 2,352 individuals who had gambled with Norway's state operator to gauge their perceptions of loss limits set by the operator. They found that 76% of participants perceived limits as easy to understand, although almost all of them agreed partly (11%) or entirely (80%) with the statement "I believe that generally I have a sufficient overview of, and control over, how much money I lose."

In summary, these studies indicate that limits are generally perceived as a positive tool by people who gamble, even if individuals themselves did not feel that they needed them. Only two studies in our sample produced findings that

implied limits were not widely used. Firstly, Blaszczynski et al.'s (2014) study – as introduced earlier – evaluated the effectiveness of five proposed responsible gambling features on EGMs with 300 patrons, with one feature comprising an alarm clock. This alarm clock allowed players to voluntarily pre-set a duration of play, with a notification when the end of this time period is reached. Nearly half (46.9%) of participants noticed the alarm clock, although only 5.8% stated they used it, 5.4% left the EGM after the time expired, and 3.7% reported it affected the amount of time and money spent. If alarm clocks were installed on all machines, 87.7% of participants – when asked about the potential impacts of clocks upon their own gambling behaviour - thought it would not influence the amount of money they spent on gambling, whilst 80.0% thought it would affect the length of gambling session.

A second study found that of 1,951 people who gambled in land-based setting in the US, only 153 had ever enrolled in setting limits voluntarily and of those, 42 had unenrolled (Edson et al., 2021). The main reasons for enrolling were because of curiosity (38.5%), to keep track of gambling as intended (36%), or to obtain a complementary US$5 food voucher on enrolling (35.8%). These findings imply that an added incentive could encourage voluntary uptake of limits, although it was the only paper to do so. The main reasons why individuals reported unenrolling from the system were preferring to play without being monitored; not wanting reminders and warnings; and finding the budget notifications annoying.

3.3.2 Limit-setting could lead to decreases in theoretical loss, wagers or deposits

Several studies in our sample explored the impact of limit-setting tools on gambling behaviour using a variety of outcome measures. These showed that limit-setting can deliver positive outcomes for certain populations, such as those who spend the most on gambling.

Auer and Griffiths (2013) tracked 5,000 players of a European gambling website for three months after they had set a monetary or time limit. Their results demonstrated that the 10% most 'intense gamblers'[4] who had set a monthly monetary limit produced only 86% of the theoretical loss after doing so in comparison to the 30 days before the limit. Equally, the 10% most intense players who had set a voluntary daily time limit produced 90% of theoretical loss in comparison with the same time period. The authors argued that this 10% reduction in theoretical loss represented a "significant impact" (Auer and Griffiths, 2013, p. 653) of time limits on spending behaviour. In summary, voluntary time and monetary limits had a specific and statistically significant effect on 'high intensity gamblers', with the authors concluding that voluntary limit setting had a positive effect amongst the most intense players. Voluntary monetary limits had led to a 14% decrease in daily theoretical

[4] Gambling intensity is defined by Auer et al. (2020a) as 'the total amount of money wagered in a 3-month period' (p. 114).

losses, while time limits led to a 10% reduction, implying that monetary limits were more effective.

Auer et al. (2020a) explored the impact of deposit limits on the size of median wager in a sample of 49,560 people who wagered online with a European operator between January and March 2017, and between January and March 2018. They were all categorised according to gambling intensity. Gambling intensity was assessed using the total amount of money wagered during these three-month periods. The authors also highlighted that none of the selected players had put in place a voluntary self-exclusion at anytime between January and March 2017. However, it is unclear whether self-exclusion formed part of the selection criteria. Of these, 649 players (1.31%) set a voluntary deposit limit for the first time between January and March 2017. The authors found that among the most 'intense gamblers' who had set a limit, the median wager decreased from €22,179 between January and March 2017 to €8,042 between January and March 2018. This was a bigger decrease compared to a similar group of 'intense gamblers' who did not set a limit, whose median wager had decreased from €21,963 to €10,986.[5] The study argues that limits could be helpful to the biggest spenders. However, the same study also shows that limits do not help groups with the lowest gambling intensity. During the same period, the least 'intense gamblers' who had set a deposit limit saw their median wager increase from €6 to €1,074[6], while the least 'intense gamblers' who did not set a deposit limit saw their median wager increase from €8 to €26, although this difference was not statistically significant. Nonetheless, this could imply that limits may not be effective for the least 'intense gamblers'. In any case, these findings represent only a reduction in the size of the average *wager*, not money lost.

Some studies within the sample sought to co-create limit-setting tools with people who gambled. Wohl et al. (2014) developed a limit-setting tool based on the principles of Human Computer Interaction (HCI) and Persuasive Systems Design (PSD) - i.e. technology to influence user behaviour - with features specifically developed with feedback from end users (17 undergraduate students who gambled on EGMs). From their viewpoints, the authors developed a pop-up, monetary limit tool which incorporated a self-monitoring system – allowing people who gamble to monitor their spend against their limit, with a traffic light system used to alert players when they were close to reaching their present monetary limit. The tool was then tested under laboratory settings where 56 undergraduate students who gambled on EGMs were assigned to either the new tool or standard tool conditions, measuring the impact of the different tools on participants' adherence to the preset limit; their engagement with the pop-up tool; and dissociation (i.e. the susceptibility of people who gamble to enter a trance-like state). The authors found that participants who used the HCI- and PSD-inspired tool perceived it

[5] It is important to note that the authors do not discuss the potential reasons for such large reductions in median wagers across the two groups between 2017 and 2018.
[6] The authors acknowledged that the group of the 'least intense gamblers' comprised only nine players. They concluded therefore that such a high median was a result of four or five players spending higher than €1,040 in 2018.

as more engaging (mean rating of 5.77 out of 7), compared to those who used the standard tool (4.94 out of 7). Participants within the HCI- and PSD-inspired tool also adhered to their preset monetary limits more closely than participants in the standard tool. 92.0% of participants in the HCI and PSD condition stayed within their limits, compared to 62.2% within the standard tool condition. There was no significant difference between the two conditions in relation to dissociation. The authors therefore found that limit-setting tools designed with user feedback may be more affective at encouraging limit adherence. The study was however not generalisable due to the inclusion of participants only from an undergraduate population.

Two separate trials by the UK's Behavioural Insights Team (BIT) (2021a, 2021b) took an innovative approach to the relationships between limits and deposits made. These trials are significant, given their explorations of limits within real settings, and across large samples derived from an operator's customer base. The first trial (BIT, 2021a) explored whether a deposit limit tool could be enhanced by including a commitment made by the customer from the outset, and whether this commitment could encourage use of limits and subsequently impact gambling behaviours. This trial involved 23,592 customers from a UK-based operator, who were randomly assigned to three groups:

- 'Control' i.e., using the operator's standard process for setting a deposit limit.
- 'Self-persuasion' i.e., the opportunity to allow individuals to write advice which is then sent to them at checkpoints after the limit is set, with a reminder once the limit is reached, and
- 'Personal commitment' i.e., the opportunity for individuals to choose a reason for setting a limit, with reminders of these reasons when a limit is reached.

BIT analysed the behaviours of these 23,592 customers and found that only 861 (3.6%) customers opted to set a deposit limit. They observed a small but not statistically significant difference in the amounts deposited by customers after setting a limit. More notably, they found that significantly fewer customers opted to set deposit limits in each of the two intervention groups i.e., 'self-persuasion' (3.6%) and 'personal commitment' (2.9%) than the control (4.4%). This suggested the intervention had a backfire effect within the context of the trial, for example because there were discouraging factors in terms of setting a limit.

Secondly, BIT (2021b) explored the use of limits with lower 'anchors', or preset limit amounts displayed to customers when choosing to set a deposit limit, which the researchers hypothesised would result in individuals setting lower average deposit limits. The trail deployed three limit systems, with participants – 45,000 existing customers with a UK-based online operator – randomly allocated to either:

- A control group, with the operator's standard limit choice of denominations from £5 to £100,000 or the option to choose 'no limit'.

- A ‘lower anchor’ limit, with the highest available choice for a limit being £250 with the addition of a text box to set a higher limit and the option to choose ‘no limit’, and
- A ‘no anchor’ limit, with a text box to enter the desired deposit limit (maximum of £100,000) and no visible amounts.

Only 4% of customers invited to set a limit actually did so (1,731 of 45,000 customers), with impact measured on the amount deposited over the next 30 days. Those who used the ‘no anchor’ free text box option deposited less (average of £360.78) than those in the lower anchor group (£426.37) and control group (£445.96). The interventions also resulted in customers setting lower daily deposit limits in both intervention groups, compared with the control group. The main recommendation from the study was therefore to redesign limit tools so that customers are encouraged to set their own limits, with no suggested minimum or maximum amounts on display.

3.3.3 Limit-setting tools can be easily circumvented and increased to allow further spend

The scoping review revealed how limits – while perceived positively – may also be circumvented by those showing a higher gambling spend. Auer et al. (2020b) explored the impact of a global loss limit set by Norway’s state operator, where customers – both online and land-based – were only permitted to lose NOK 20,000 per month. Additionally, the operator also required that players set their own personal spending sub-limits on the most harmful products. The overall sample consisted of 2,352 players who had gambled during October 2016. The authors found that personal limits were adjusted to a higher limit by customers categorised as medium risk (‘yellow’) or high risk (‘red’), specifically to ensure a personal sub-limit which “was high enough to ensure that I could spend all I wanted to” (p. 21). In total, 1,406 participants altered their personal spending limit, with 29% of ‘yellow’ medium-risk players and 28% of ‘red’ high-risk players increasing their limit specifically to facilitate further spend, compared to 18% of ‘green’ low-risk players. This highlights how higher risk players are more likely to circumvent initial limits where the opportunity exists to do so. In relation to the global loss limits set by the operator, a total of 752 players reached their global limit during October 2016. Seventy-four percent of low-risk (‘green’) players who reached their global limit did not play again until the limit was reset, compared to 74% of ‘yellow’ players, and 71% of ‘red’ players. However, ‘moderate’ and ‘high-risk gamblers’ were more likely to gamble elsewhere with 16% of red players and 12% of yellow players who had reached their global limit playing with different providers, compared to 6% of green players. Whilst the majority of high-risk players did not report gambling elsewhere after they reached their global limits, the authors highlight a sizable minority who do continue to gamble and would therefore benefit from further initiatives to prevent ‘problematic’ gambling behaviours.

In Australia, Heirene et al. (2021) explored the use of consumer protection tools within an anonymised operator player dataset of 39,853 customers. Deposit limits were the most prevalent tool used, deployed by 6,313 customers. However, deposit limits were commonly changed by customers, with 72% of limit setters increasing their deposit limit, while 3% removed their limit altogether. The authors acknowledge that their study contained no self-reported data on the risk of gambling behaviours or gambling harms, so they were unable to report usage of limits according to harmful gambling behaviours. These findings accord with Nower and Blaszczynski (2010), whose study of 127 adults explored perceptions of pre-paid EGM cards as a means of setting limits. While their sample size was much smaller than that of Heirene et al.'s (2021) study, the authors were able to draw upon PGSI data to compare attitudes towards pre-paid cards. Participants were asked to state their level of agreement with a range of attitudes towards EGM cards according to a seven-point Likert scale. Individuals categorised as 'problem gamblers' according to the PGSI recorded a higher level of agreement with the statement "If I had a choice, I would buy a SC [smart card] I could refill with more cash rather than one that is only good for one preset amount" (Nower and Blaszczynski, 2010, p. 369) compared to other participants. They were also more likely to buy another card to continue gambling if their original card ran out, compared to 'moderate-risk' or 'low-risk gamblers'.

Wohl et al. (2023) explored the effects of hard and soft money and time limits using land-based player account data by comparing play data before and after enrolment in a tool operated by a Canadian provincial operator that offers the option between hard and soft limits. A hard time or money limit prevents gambling once reached, whereas a soft limit – once reached – still allowed further gambling. The authors obtained anonymised player data of players who enrolled between March 2017 and September 2022, analysing data up to 1,609 days before enrolment, and up to 1,949 days after enrolment to measure for impact on number of visits, average number of minutes played, money spent, and net win or loss per visit. Their sample included 61 players who used hard limits, and 2,387 players who used soft limits. The authors found that players who chose the hard limit option decreased their gambling expenditures by about 50% per visit compared to approximately 10% for those who chose soft limits, their losses per visit by between 25% and 38% compared to between 5% and 14% for those who chose soft limits, and their average minutes played per visit following enrolment by 30 to 40 minutes compared to approximately 12 minutes for those who chose soft limits. Those who used hard limits did not change the frequency of visits to the casino after enrolment, however those who used soft limits significantly increased their visits. Soft limits appeared to be relatively ineffective at limiting play, with the authors' results suggesting that setting a limit whilst also allowing flexibility to exceed that limit may be counterproductive.

Similarly, Park et al.'s (2021) explored the implementation of a system of electronic players cards – or registered, electronic cards designed to be used by those who gamble in order to protect them from gambling harms - on gambling behaviours. Their study conducted within nine gambling (horserace betting and cycling betting) venues in South Korea found that cash was still

dominant in ‘mandatory’ venues where people who gambled were required to use cards for bets of KRW50,000 (US$45) or more. This was true within mandatory venues which offered horse betting (where 88.66% of revenue was cash-based, and 11.34% was card-based) and cycle betting (91.65% cash and 8.35% card). Importantly in relation to limits, high price betting (over KRW50,000) on horse racing occurred more often within autonomous venues where there were no limits on cash betting. The authors also found that cycling bettors tended to spend more in autonomous venues by cash, since no limit was placed on cash betting. Although the authors conclude that electronic cards and limits can help to prevent harmful gambling behaviours (by restricting the size of bets that can be placed), they found that larger sized bets across both sports were most often carried out at autonomous venues, where there are no limits on cash betting. Individuals can therefore circumvent limits set within ‘mandatory’ venues, if they are able to access autonomous venues. Electronic card usage was also lower amongst cycling bettors, suggesting that they demonstrate different structural characteristics in gambling behaviour compared to horserace bettors.

3.3.4 Forced play breaks appear ineffective at preventing intensive gambling in the long term

The sample of literature also contained research that explored the use of mandatory play breaks which can be deployed by operators to discourage intensive gambling. Auer and Griffiths (2023b) explored if a 60-minute mandatory break influenced subsequent depositing and wagering amongst a sample of 2,021 anonymous customers of several UK-based online casino sites. Specifically, they explored the impact of play breaks on customers who deposited at least ten times during a calendar day on at least one occasion during the 27 days prior to the introduction of a mandatory play break. They did so by exploring their depositing and wagering during a 27-day period after mandatory play breaks were introduced. The percentage of players who stopped depositing money on the day of a play break (and as a consequence of the mandatory play break) rose from 27% to 68%. The percentage of players who stopped wagering as a consequence of the mandatory play break rose from 0.1% to 45% on the day of a play break. The authors therefore argue that the findings demonstrate the efficacy of a 60-minute mandatory play break towards the reduction of players' depositing and wagering immediately after the play break. The effects of a 60-minute mandatory break on the next day's gambling behaviour were inconclusive.

Auer et al. (2019) explored the effect of mandatory play breaks on video lottery terminal players, in the form of a 90-second break after 60 minutes of play. The authors were given access to the anonymised data of 7,190 Norsk Tipping terminal players who gambled between January and March 2018, with 218,523 playing sessions eligible for analysis. Within this analysis, the authors focused on 7,666 sessions that were terminated after 60 minutes of play and

followed by a 90-second play break. The authors used a matched-pairs design to compare those who were forced to terminate with those who were not focusing on the subsequent amount of money staked, length of time spent gambling, and length of play break. The 7,666 terminated sessions were paired with non-terminated sessions that were within 2% of the money staked of the terminated session, 5% of money won, and had lasted for at least 55 minutes. The authors found no significant effect of the forced termination upon the amount of money staked in – or the duration of – subsequent gambling sessions. However, the amount of money staked over the next 24 hours was significantly higher following terminated sessions (mean of NOK4,972) compared to non-terminated sessions (NOK3,519). The authors argued that this increased expenditure during the following 24 hours may have been carried out by more 'intensive gamblers' who are more likely to demonstrate "heavier" (Auer et al., 2019, p. 527) gambling behaviours, and were more likely to gamble more money than those whose sessions are never terminated. The authors acknowledge that this is due to the selection bias of the underlying study due to all sessions that lasted 60 minutes being subject to a mandatory play break compared to matched sessions lasting slightly less than 60 minutes. They therefore conclude that their findings should be interpreted with caution, and that further experimental research into the optimal forced break length is required.

Hopfgartner et al. (2023a) explored the effects of mandatory play breaks in a sample of 23,234 people gambling on Norsk Tipping's online platform over a one-month period. Prior to the study, all players who gambled for a continuous period of approximately 60 minutes received a mandatory play break of 90 seconds. This was displayed as a pop-up message containing a countdown that informed the players that they could not gamble for the next 90 seconds. During the experiment, players were assigned to one of four intervention groups: the existing control group (mandatory 90-second play break), a 90-second break group (as with the control group but with an additional logout button), a five-minute break with logout option group, or a 15-minute break with logout option group. The effects were measured by analysing players' patterns of play in the 32 days before the experiment, 34 days during the experiment, and 72 days after the experiment, focusing on customers' engagement with the play break pop-up message, and the time to next gambling session. It found that players who tended to gamble again quickly after the mandatory break experienced a greater increase in time between gambling sessions when experiencing longer mandatory play breaks, compared to those who did not tend to gamble again quickly.

Logging out during a mandatory play break led to the strongest increase in the time-lapse to the next gambling session, and a 15-minute mandatory play break led to the highest proportion of individuals logging out. The experiment produced no significant long-term effects, meaning that most players who received longer mandatory play breaks reverted towards their pre-experiment level of gambling once the experiment ended. Player retention – or the proportion of players still active across the experiment – remained the same across all intervention groups. However, customer satisfaction concerns on

the part of the operator meant that approximately 60% of the customers were kept in the control group, leaving their gambling experience unaltered.

3.4 Self-exclusion

After the use of limits, self-exclusion was the second most prevalent 'responsible gambling' tool within our sample of literature, explored by twelve papers. Self-exclusion is a process which allows people to ask one or more gambling operators to exclude them for a set length of time. In Great Britain, gambling operators must offer customers who gamble online the option to self-exclude whether via telephone or online (Gambling Commission, 2023b), as well as within land-based venues (Gambling Commission, 2023c). Self-exclusion was explored within the sample in both online and land-based settings and included some studies with relatively large samples of individuals. The evidence focuses on perceptions and take-up of self-exclusion; the factors that can predict self-exclusion; and ways to improve the uptake of self-exclusion. We found limited evidence about the longer-term efficacy of self-exclusion in our sample of literature.

3.4.1 Perceptions and take-up of self-exclusion

The available evidence suggests that individuals have less positive perceptions and lower take-up of self-exclusion schemes compared with time or spend limits.

Within Gainsbury et al.'s (2013) global study 57.4% of participants perceived self-exclusion as being at least quite useful, compared with 70.4% who felt positively about voluntary spend limits. Engebø et al. (2022) found that only 2.8% of people who gambled included in a nationwide prevalence survey in Norway had permanently excluded themselves from one or more games. Data from 140,000 UK-based online accounts shows that 2.3% of account holders used self-exclusion between 2018 and 2019 (Forrest et al., 2022). The available evidence suggests that there is a stark difference between the perception of the usefulness of self-exclusion, and the actual take-up of the self-exclusion process. So, while efforts to communicate self-exclusion seem to have had some success, the participants in these studies felt that they did not need the self-exclusion process.

3.4.2 Predictors of self-exclusion

Three studies explored elements of individual behaviour that may predict self-exclusion. The findings from these studies could be useful to detect individuals who may benefit from future self-exclusion.

Firstly, Dragicevic et al. (2015) used operator data from an unspecified jurisdiction to explore people's gambling behaviours prior to self-exclusion. Within the anonymised dataset of 240,000 online accounts, 347 individuals

had self-excluded, compared to a control group of 871 non- self-excluded individuals. Sixty-one percent of self-excluded individuals did so within the first 15 days of gambling, with 25% doing so on the same day as opening an account. The authors also found that self-excluded customers did not spend more time gambling prior to self-exclusion when compared to customers who did not self-exclude. However, self-excluded customers did lose more money in the 12 months prior to self-exclusion compared to non-self-excluded customers. This implies that level of loss was a better predictor of self-exclusion than time spent gambling. Self-excluded customers lost an average of €897 per month, compared to the €646 lost by the control group, while self-excluded individuals also reported a proportion of 100% loss-making months, in comparison to the 86% of loss-making months reported by the control group.

Haefeli et al. (2011) studied an anonymised dataset from a European operator to generate a communications-based, predictive model to identify customers likely to self-exclude and, therefore, at risk of harmful gambling behaviours. The authors carried out semi-structured interviews with eight people working in customer service at three online gambling operators to explore the key words and indicators that could emerge from communications with customers who may be experiencing 'problem gambling' behaviours. Uncovered key words and indicators were then subjected to a confirmatory investigation to explore how far the indicators identified were able to predict gambling-related problems. The sample consisted of 150 self-excluded customers and 150 controls. The study found that self-excluded customers were more likely to communicate with the operator, with 52.7% of the 150 self-excluded customers studied communicating with the operator prior to self-exclusion compared to 39.3% in the control group. Those who self-excluded were also more likely to communicate with the operator on specific areas. For example, customers who subsequently self-excluded were more likely to communicate with operators beforehand on the results of games or bets (16.9% of self-excluders compared to 11.0% within the control group), as well as account reopening (8.6% compared to 2.7%). Self-excluding customers were more likely to use complaining (40.0% compared to 35.0% of control group) and threatening (12.9% against 3.8%) language. These findings led the authors to conclude from their pilot study that it is possible to predict self-exclusion through the communication-based behaviours of customers.

A more recent study explored if future self-exclusion could be predicted by the identification of an individual's behaviour, and whether aspects of gambling intensity (such as stake size, losses, and deposits) improved this prediction (Hopfgartner et al., 2023b). Using player tracking data from three online gambling platforms operating across six countries, the authors analysed the past behaviour of a total of 25,720 active online customers (as of December 2020), of whom 414 (1.61%) had gone on to initiate a future self-exclusion. The authors found that behavioural variables that predicted future self-exclusion included: a higher number of previous voluntary limit-setting changes and self-exclusions, an increase of different payment methods for deposits, a higher percentage of money wagered on slots games, a higher average number of deposits per session and in total, a higher number of

cancelled and total withdrawals, higher standard deviation in amount bet, lower number of active days, and higher number of different game types played. Recent self-exclusions were also predictive of future self-exclusions. Except for Sweden, the authors found that addition of monetary intensity features – for example – the amount of money deposited, staked, and lost - did not impact the prediction of future self-exclusions.

3.4.3 Ways to improve awareness and uptake of self-exclusion

The scoping review also uncovered literature which explored ways in which the self-exclusion process could be made more accessible. Pickering et al. (2019) explored consumer perceptions of a multi-venue self-exclusion scheme in Australia, through the study of twenty participants (13 were currently self-excluded during the study, while seven had formerly self-excluded). It identified a lack of publicly available information on self-exclusion which could be improved by digital marketing strategies, while registration could be made easier through the availability of online self-registration. There was also support for a reminder before the end of the initial self-exclusion term and penalties for venues that allowed self-excluded individuals to gamble.

A subsequent study (Pickering et al., 2022) involved the co-design of a self-directed online form that would enable individuals to self-exclude from multiple gambling venues in Australia, with 25 stakeholders within the gambling sector, including consumers, gambling counsellors, venue staff and policy makers. Key aspects for the development of online forms included the ease of access for all users, the collection of relevant information, data security measures, additional help, and government support. While this form was produced for a specific jurisdiction, the need for an easily accessible form is transferrable to other settings.

3.4.4 There is limited evidence of the longer-term efficacy of self-exclusion

While self-exclusion could be made more accessible, evidence presented within our sample of literature demonstrated that self-exclusion schemes are not always effective at preventing harms over the long-term, with studies exploring the impact of self-exclusion on individuals during the self-exclusion period and *after* their self-exclusion agreement has ended.

Håkansson and Åkesson's (2022) Swedish study of 74 patients receiving treatment for gambling disorder highlights how self-exclusion alone was insufficient in protecting patients from future, disordered gambling. Out of the 60 patients that had previously self-excluded, 41 (68%) continued to gamble, mainly on unlicensed sites (28 of the 41) and gambling with somebody else's identity or unlicensed gambling in land-based venues (9 of the 41). The authors highlight the shortcomings of a state-operated self-exclusion scheme

which uses a national database, which cannot prevent those experiencing gambling disorder from accessing offshore, unregulated sites.

On the other hand, Turner et al. (2021) explored how individuals re-engage with gambling *after* a period of self-exclusion. Specifically, the authors explored the efficacy of an online tutorial designed to reduce the risk of harm to those who reinstate their ability to gamble after self-exclusion amongst a sample of 235 participants in Canada. Of these, 131 were in the control group who reinstated themselves in the year prior to the implementation of the tutorial and 104 were in an experimental intervention group who reinstated themselves after the tutorial. The study confirmed its main hypothesis that self-exclusion reduced harmful gambling behaviour as measured by PGSI. Indeed, mean PGSI scores decreased for both men (11.2 to 7.5) and women (9.7 to 6.7) from before self-exclusion to 12 months post-reinstatement, with no significant difference between the two groups. On the other hand, the authors found that the online tutorial had no significant impact on gambling, gambling problems, knowledge of gambling, desire to gamble or help-seeking.

Pickering and Blaszczynski (2022) similarly explored experiences at the end of self-exclusion. Their study of 85 participants in Australia who had already completed a period of self-exclusion found that 32 participants who returned to gamble did so as they believed they could gamble responsibly, to reduce negative feelings, and because they had a strong urge to gamble. Those who renewed their self-exclusion agreement (n = 16) did so because they viewed self-exclusion as a serious agreement, they were worried about being caught, or they felt happier when not gambling. Crucially, the study found that there was no significant difference in mean PGSI scores between those who renewed their self-exclusion (14.43) and those who discontinued (14.31). In summary, both groups were classified as 'problem gamblers' regardless of self-exclusion status. Whilst these data were self-reported, they do nonetheless indicate that self-exclusion does not impact the PGSI score of people at risk of gambling harm. These findings contrast with those of Turner et al. (2021) which indicated that self-exclusion did result in lower PGSI scores.

Hopfgartner et al. (2023c) explored the efficacy of voluntary self-exclusions by analysing the number of people who returned to gambling after having self-exclusions. Through the analysis of 3,203 anonymous British online casino players who opted for a voluntary self-exclusion between January 2021 and August 2022, the authors also explored what type of gambling profile is associated with returning after a voluntary self-exclusion, and the change in the amount of money wagered after the voluntary self-exclusion. The sample included players who placed at least one bet in the 30 days prior to self-exclusion and aggregated their gambling behaviour during that period. If players returned after a voluntary self-exclusion, the gambling behaviour in the 30 days after they started to gamble again was also aggregated. To ensure that all players had at least 30 days to gamble, those who self-excluded less than 30 days after their registration were removed from the dataset. The authors also created a control group using a matched-pair design based on criteria such as age, gender, money wagered, number of active days and

game type profile. Based on analysis that explored the distribution of the duration of voluntary self-exclusions, the authors found that the most common self-exclusion durations were 30, 90 and 180 days. Players who opted for a short-term self-exclusion (defined as up to 38 days) were significantly more likely to be female, wagered significantly more money in the 30 days prior to self-excluding, and gambled significantly more often in the same period compared to those who opted for a long-term self-exclusion. A quarter of players who opted for a short-term self-exclusion did not return to gamble, and more than 99% of players who opted for a long-term self-exclusion did not return to gamble. The authors concluded that the higher number of players who returned after a short-term self-exclusion may demonstrate the inefficacy of short-term self-exclusions compared to long-term. Their findings also indicated that males were less likely to return to gambling from a voluntary self-exclusion compared to females. However, the authors concluded that further research was needed into the behavioural markers that might identify those at risk of returning to gambling after voluntary self-exclusion. The authors acknowledge a lack of data on the motivations for voluntary self-exclusion as a limitation. Regression analysis carried out by the authors also suggested that there was no significant change in the amount of money wagered after players returned from a self-exclusion compared to the matched control group.

3.5 Other 'responsible gambling' tools

In addition to limits and self-exclusions, some studies in our scoping review explored opinions about and use of financial statements and self-assessment tools intended to allow individuals to make more informed choices about gambling.

In Gainsbury et al.'s (2013) study described earlier, 75.1% of 10,838 online casino and poker players considered the idea of receiving regular financial statements – designed to allow individuals to appraise their own gambling-related spend – at least quite useful; indeed, it was the most popular of the options presented to study participants. However, the likely gap between people's perceptions of tools and their actual use is illustrated by Engebø et al.'s (2022) study of 5,878 Norwegian people who gambled, in which only 3.4% had downloaded an overview of their expenditure; these statements were however more likely to be used by 'moderate' and 'high-risk gamblers'.

Gainsbury et al. (2013) and Engebø et al. (2022) also explored consumer perceptions of self-assessments, or tests which allowed individuals to self-assess for harmful gambling behaviours. They were perceived as less helpful than financial statements within Gainsbury et al.'s (2013) study, with 62.4% of participants perceiving tests to be at least quite useful. Whilst these findings highlight the positive perception of self-testing, uptake within Engebø et al.'s study (2022) was low, with 4.9% of participants having used the self-assessment.

Forsstrom et al. (2020) meanwhile explored a self-assessment tool in a study of 835 Norwegian people who gambled; who had started to use a 'responsible

gambling' tool including self-assessments; and then dropped out of using this tool between January 2014 and March 2015. Most (97.8%) had never accessed any advice within the tool, whilst 90.4% had used self-tests at least once. Not all who started self-tests had completed them, however, with 79.1% of the sample having ever completed a self-test at least once, and then subsequently dropped out between January 2014 and March 2015. The results suggested that users did not gamble less after using the tool. For those classed as 'low-risk' ('green'), average losses increased, as did the number of days gambled. However, this increase was associated with a low effect size, with the authors suggesting that 'green' users may have increased gambling after previously overestimating their risk or having a different view of their gambling than the self-tests presented to them. The authors therefore suggest that further research is needed on the effects of 'responsible gambling' tools on 'low-risk gamblers'.

3.6 Conclusion

This chapter has explored the 'responsible gambling' tools identified in our scoping review. The most prevalent were limit-setting tools and self-exclusion, both of which were explored across a wide variety of methodologies. However, we found limited evidence that either of these tools worked. Importantly, from a societal perspective, the scoping review highlighted the need for a standardised approach to limit setting, as well as seeking to remove ways to circumvent limits. We also found evidence of the need for improvements to the awareness of and access to self-exclusion schemes.

4 Product design

Chapter Summary

- Our evidence base on aspects of product design was formed of 44 academic papers. The majority of papers explored the impact of product features on gambling behaviours in laboratory settings. A range of product design modifications were explored, and we report the most commonly investigated here.
- **Multiline products** – or slots games that "allow players to place concurrent bets across multiple paylines on a single spin" (Murch and Clark, 2019, p. 68) – are shown to be particularly immersive and can also linked to a feature known as **losses disguised as wins** (LDWs). LDWs are associated with arousal and the reinforcement to continue gambling and can lead to players overestimating their winnings.
- The desire to continue gambling is shown to be increased by the **near miss effect**, a feature that can lead an individual to believe that a return is due. The near miss effect has been explored on slots-based products, scratchcards and land-based roulette, although the effects on gambling within the latter are not proven.
- Moderating the **speed-of-play** has been shown to impact gambling behaviours because faster speeds of gambling lead participants to make inaccurate estimations of money gambled and won.
- **Jackpots** were found to encourage faster gambling or gambling at higher stakes, particularly if people perceived them to be offering larger payouts. Implementing the expiry of jackpots can discourage continued gambling.

4.1 Introduction

While the first stage of our literature search found socio-technical innovations that could potentially moderate gambling harms, it did not contain any literature that highlighted the features of gambling products that can make them harmful. Newall (2023) argues that amendments of harmful features would be an effective public health policy to reduce gambling harms. They could include modifications that have already been adopted in Great Britain, such as a minimum time between spins and the prohibition of reverse withdrawals (i.e. the ability to cancel a withdrawal of funds from an online gambling account to a bank account that would facilitate further gambling), and could be extended to include modifications that address the asocial nature of in-play betting (i.e. betting on events as they are taking place). Indeed, the modification of product features developed by operators may prevent gambling harms from occurring in the first place.

A second literature search was therefore undertaken to incorporate product design features, exploring how product features impact gambling behaviours, and how they can accordingly be altered to prevent harms. This chapter starts by briefly highlighting the evidence base, before exploring the most common product design features to emerge from the second literature search: the

development of multiline products, losses disguised as wins, the near miss effect, speed-of-play, and the use of jackpots.

4.2 About the evidence base

The evidence base exploring the different elements of product design comprised 44 academic papers. The majority of these papers explored how different features impacted gambling behaviours, and most reported findings of experiments that were carried out in laboratory settings. The findings of these experiments should be considered alongside their limitations, namely a lack of ecological validity due to the artificial environment (rather than a real-life gambling environment), or the non-representative nature of the sample, e.g. a sample of undergraduate students who do not represent the wider population of people who gamble. A small number of studies explored the effects of product design on gambling behaviour across large samples provided by anonymised player data. While these findings are more representative of wider populations, it is important to bear in mind that customers can play with more than one operator (meaning the findings based on data from one operator do not give a full picture of someone's gambling behaviour), or there may be selection bias inherent in any matched pairs sample design.

This chapter reports papers within the sample that focused on the five most researched aspects of product design that are considered harmful: multiline products and losses disguised as wins; the near miss effect; the speed-of-play; and jackpot features.

4.3 Multiline products

Slots-based games are now commonly developed as multiline products, or games "that allow players to place concurrent bets across multiple paylines on a single spin. As the many paylines occupy most of the EGM display and often overlap, playing the game on this setting is a perceptually-demanding experience" (Murch and Clark, 2019, p. 68). Research has explored how multiline products can be immersive and preferred by those who gamble, and are also linked to another feature called losses designed as wins (LDWs, described below) that can encourage further gambling. The subsequent impact of multiline products may induce a state of 'dark flow' for players, defined by Dixon et al. (2018) as the "potential negative consequences of becoming absorbed in slot machine games (e.g., mounting losses as time imperceptibly passes and the seeking of this state as a form of escape)" (p. 76). Studies into the impact of multiline products also explored their relationship with the positive or negative affect of players, i.e. the emotions or moods they encounter when playing these games. The relationship between multiline products, dark flow and positive or negative affect was often measured through the Game Experience Questionnaire (GEQ), a modular questionnaire that gathers self-reported data on an individual's experience of gameplay (IJsselsteijn et al., 2013).

Our review also found that multiline slots products can generate dark flow through their use of LDWs. LDWs are returns that are lower than the original stake, yet are still celebrated as a win despite being a net loss, for example using celebratory sounds and animations. As the sample of literature will show, LDWs used in multiline products can be associated with arousal, reinforcement to gamble, and can lead to players overestimating their winnings.

Eleven papers explored the impact of multiline products or LDWs on gambling behaviour, with studies carried out in:

- **Canada** (Dixon et al., 2010; Dixon et al., 2014; Templeton et al., 2015; Dixon et al., 2018; Graydon et al., 2018; Graydon et al., 2021; Scarfe et al., 2021; Kruger et al., 2022);
- **Australia** (Myles et al., 2023);
- **Norway** (Leino et al., 2016), and
- **USA** (Salaghe et al., 2023).

An additional study carried out in the UK (Sharman et al., 2015) explored the impact of LDWs alongside that of the near miss effect. Given its primary focus on the near miss effect, this paper is explored in section 4.4. Out of the eleven papers explored in this section, nine were carried out in laboratory-based or simulated conditions, with two studies (Myles et al., 2023; Salaghe et al., 2023) used player datasets made available by operators.

4.3.1 Multiline products can be immersive

Dixon et al. (2014) explored how participants preferred multiline games over single-line games. The study measured the post-reinforcement pauses following the outcome of each spin (specifically, the time between outcome delivery and the next spin) of simulated games played by 102 participants. They were recruited from a casino in Ontario, Canada. The authors also measured the participants' subjective responses after each game related to arousal, pleasantness, GEQ, and estimated winnings. Participants played both a simulated multiline and single-line game. They played 250 spins on the single-line game, wagering one credit per spin, and 250 spins on the multiline game where they wagered one credit on 20 winlines, equating to 20 credits per spin. Most participants (94%) preferred the multiline game over the single-line game. Additionally, participants overestimated their wins in the multiline game (estimated 60.48 credits compared to actual of 45) compared to the single-line game (estimated 46.75 credits compared to actual of 45). Post-reinforcement pause times showed that players found 2-credit gains that were LDWs (equating to losses of 18 credits) in the multiline game as rewarding as 2-credit gains that were wins in the single-line game. Importantly, 'high-risk gamblers' gave higher endorsements to flow-related questions in the GEQ compared to 'low-risk' and 'non problem-gamblers', indicating that they were more likely to find multiline products more immersive.

Kruger et al. (2022) also used a slot machine simulator containing a multiline game and a single-line game to explore the effects of multiline games on 110

participants recruited from a casino in Canada. They tested six hypotheses that, in summary, expected participants to find the multiline game more immersive and more enjoyable (through positive affect) than single-line games, and find a relationship between 'problem gambling' (according to PGSI) and depression. While players did report greater dark flow during multiline play than during single-line play - with a mean dark flow rating of 1.42 (according to GEQ) reported for the multiline game compared to 1.32 for the single-line game - the effects were not as strong as anticipated. They did not find stronger correlations between multiline, dark flow and PGSI scores compared to single-line dark flow and PGSI scores, neither did they find a statistical difference in positive affect between the multiline and single-line games. However, the single-line game did cause players to experience significantly greater negative affect. The authors acknowledge that the long chains of losses in the single-line game may have contributed to a lowering of mood relative to the multiline game where the rate of reinforcing feedback was far higher.

4.3.2 The 'losses disguised as wins' feature is associated with arousal and reinforcement to gamble

As introduced above, losses disguised as wins (LDWs) are returns given on slots-based products – often multiline products – that are less than the money staked on the spin but are celebrated as a positive return. Research has shown that LDWs are associated with arousal and reinforce the need to continue gambling. Dixon et al. (2010) – through an experiment with 40 undergraduate students without gambling problems – measured the effect of LDWs on interbeat intervals and skin conductance responses as participants played a multiline game in laboratory settings. These outcome measures – as the authors highlight – demonstrate how heartbeat levels and skin and sweat levels react to gambling outcomes. The authors hypothesised that interbeat intervals – and heart deceleration – would be largest for a win, and smaller for LDWs and full losses, with skin conductance responses larger for wins and LDWs than for losses. Results showed that participants become equivalently aroused following a win or an LDW but were less aroused following a loss. Participants' skin conductance responses were sensitive to the absence of positive reinforcement following losses, compared to the plethora of flashing sights and rolling sounds that accompany credit gains on wins and LDWs. The findings therefore indicated that LDWs were as arousing as wins, although the study was limited in wider applicability by its sample of students.

Dixon et al. (2018) explored the relationship between dark flow and 'problem gambling' through four hypotheses: (1) that LDWs would be reacted to as though they were wins rather than losses, measured through the force applied to the spin button; (2) that players would experience greater positive affect – and dark flow - on multiline games over single-line games; (3) that there would be a relationship between dark flow and 'problem gambling'; and (4) there

would be a relationship between dark flow and depression, with dark flow used as a means of escapism. A sample of 136 participants – recruited from a casino in Canada – played both a multiline and single-line game. Outcome measures included self-reported data such as PGSI, GRCS and Depression, Anxiety and Stress Scale (DASS21) scores, GEQ, a Cognitive Reflection Test and estimates of how much time elapsed during each game, and the number of winning spins that they experienced during each game. Using force applied to the spin button as a measure of arousal, the study found that participants applied the same amount of force following small wins and LDWs. The authors argue that these findings demonstrate how players can miscategorise LDWs as wins, thus leading to increased gambling. Importantly, 94% of players preferred the multiline game compared to the single-line game. There were also strong, positive correlations between PGSI scores and dark flow for both the multiline and single-line game, although these correlations were more pronounced for the multiline game. The study also found a strong correlation between PGSI scores and depression scores (using DASS21) which they argue highlights a significant relationship between depression and dark flow, a state that can be induced by gambling, thus providing a means of escapism.

The impact of LDWs on continued gambling has also been explored within anonymised player data provided to researchers by industry. Leino et al. (2016) examined the relationship between LDWs and subsequent gambling persistence within data provided from video lottery terminal play on terminals owned by Norsk Tipping, the state-owned gambling provider in Norway. The analysis consisted of 2,035,339 observations within 28,963 game sessions from a total of 8,636 individuals. The authors found that LDWs were associated with continued gambling. Compared to LDWs, the odds of continuing a game session decreased by 26% following a loss. The likelihood of a future spin also increased by 54% when preceded by a previous regular win outcome of a return between 100% and 199% of the original stake. The results showed that the relative size of the previous outcome influenced the number of bets made within a game session. Importantly, LDWs were more likely to encourage continued gambling than a loss.

Scarfe et al. (2021) hypothesised over two experiments that players would react differently to LDWs when they were paired with negative sounds, compared to when they were paired with positive sounds. Both experiments were carried out with undergraduate psychology students. In the first experiment (n = 73), a counter-balanced design meant that participants either began with 200 spins on a simulated machine that presented the positive sound condition (where a positive sound followed both wins and LDWs), followed by a machine that presented the negative sound condition (where LDWs and losses were followed by a negative sound), or vice versa. The authors measured the impact of LDWs on post-reinforcement pauses (the time between outcome delivery and the next spin) and flow (i.e. measured through Likert scale ratings in relation to immersion, awareness of surroundings, awareness of time, concentration on the game, and connection with the outside world), positive and negative affect, and win estimates reported by participants. Notably, the authors did not specifically refer to any measurement of dark flow as discussed in other studies above. They found that LDWs

elevated post-reinforcement pauses - i.e. led to a longer pause between spin outcome and the next spin. Participants reacted to LDWs as though they were wins. However, negative sounds made LDWs less win-like. The analysis showed that while flow, positive affect, and negative affect were impacted by the order in which participants played each machine, there were clear effects of negative sounds. Those playing the positive sounds version first reported a deeper flow during the first game, compared to the flow experienced during the negative sounds version that followed. There was no difference in flow ratings between the positive and negative sound ratings for those who played the negative sound version first. The second experiment was identical to the first, with the sole exception being that only LDWs were paired with the negative sound. Losses were followed by silence. The second experiment replicated the findings from the first in relation to post-reinforcement pauses - that negative sounds rendered LDWs more loss-like. The authors argued that both experiments provide novel evidence that pairing negative sounds with LDWs leads to a change in participant behaviour, with participants' post-reinforcement pauses becoming more loss-like and less win-like, thus leading to lower levels of arousal.

Finally, one study explored the effect of LDWs on subsequent slot machine gambling in a land-based casino setting. Salaghe et al. (2023) explored anonymous player data from a casino in an undisclosed location in the United States that included the gambling behaviour of 42,669 carded slot machine players. Carded players are frequent players who insert a loyalty card while gambling on slot machines. Data was collected by a slot machine manufacturer over a period of 108 consecutive days, from June 30 to October 15, 2015. Importantly, the authors found that the size of the returns within LDWs can impact subsequent gambling behaviour. Streaks of three LDWs greater than 75% of the original amount bet were followed by an increased amount bet on the next spin. In contrast, streaks of three LDWs less than 25% of the original amount wagered resulted in players decreasing their bet size on the next spin. The speed-of-play also increased when players experienced streaks of three LDWs compared to losses. The number of spins within a session increased when players had larger LDWs (characterised by bigger 'wins' or smaller losses), whereas a greater percentage of small LDWs (characterised by smaller 'wins' or bigger losses) decreased the number of wagers, relative to losses. An increase in the percentage of LDWs experienced in the previous session also led to an increase in the number of wagers in the subsequent session, suggesting that LDWs may have reinforced the need to reinitiate gambling.

4.3.3 Losses disguised as wins can impact game selection

Research has also explored if LDWs can impact people's game selection. Graydon et al. (2018) specifically investigated whether LDWs affected the game selection of 33 undergraduate students, all of whom played a slot machine at least once in the previous 12 months. Participants played on a

simulated EGM in a laboratory setting with a choice of four games, each containing different levels of payback and LDWs. These four games consisted of 1) 85% payback with no LDWs, 2) 85% payback with LDWs, 3) 115% payback and no LDWs, and 4) 115% payback with LDWs. Participants were informed they would be playing 100 spins in total on any of the games they liked. Participants then played ten spins on their preferred game, with the researchers then informing them that they could continue playing for as long as they liked. The authors tested the impact of different games with LDWs on game preference ratings, persistence of gambling, and skin conductance responses. As predicted, LDW frequency and payback percentage had an effect on players' game choices and game preferences. Importantly, significantly more participants chose to play the 115% game with LDWs over the 115% game without LDWs. The 115% game with LDWs was also rated more highly by participants (mean rating of 74.59) compared to the 115% game without LDWs (mean rating of 53.28). Both of these were rated higher than the 85% games with LDWs (30.39) and without LDWs (40.89). Although persistence of gambling was highest for those who played the 115% game with LDWs, analyses found no significant relationship between game choice and persistent gambling. They also found no significant differences between the 115% game with no LDWs, and the 85% game with LDWs. Skin conductance responses were recorded, but readings were compromised by movement artifacts associated with playing the four games. The authors argued that LDWs therefore impact game preference and gambling behaviour, although they acknowledge the lack of ecological validity inherent in the sample and the experiment's laboratory settings.

Templeton et al. (2015) explored: (1) if Canadian people who gambled wagered the minimum stake per line over the maximum number of winlines during a multiline game; (2) whether a slot game with more LDWs would be preferred over a slot machine with fewer LDWs, and whether celebratory feedback following LDWs drove preferences; and (3) whether players would miscategorise LDWs as actual wins. Eighty-three participants played 250 spins on two games with different LDW rates, and completed the GEQ after playing either game. Participants then gave their win estimates for each game, and answered questions related to their preference for both games. The hypothesised strategy of minimum stake per line over maximum winlines was not found to be common during play, although players preferred playing the maximum number of lines. Participants preferred their multiline game to induce a greater state of flow and more feelings of positive affect. Importantly, participants who self-reported 'problem gambling' scored higher than other participants on GEQ questions related to flow, highlighting their tendency to be more immersed in multiline games compared to other players.

4.3.4 Losses disguised as wins can lead to players overestimating their winnings

Research has also found that the use of LDWs can lead to players overestimating the amount of money they have won during their gambling

session. Graydon et al. (2021) explored if a specific number of LDWs – when designed into a slots-based product – caused players to overestimate winnings. The authors hypothesised that a 'sweet spot' frequency of LDWs (between 15% and 25% of total spins) would maximise the LDW-triggered win-overestimation effect. In an experiment conducted in Canada with 126 'experienced gamblers'[7], the authors developed a realistic 20-line slots simulator to control outcomes and frequency of LDWs, which they set at 19.6% of spin outcomes. After playing, participants were asked to estimate the number of times they had spun and won more than they had wagered. It was predicted that players would significantly overestimate the number of times they won and the amount of overestimation would be aligned with the most elevated data points thanks to the specific proportion of LDWs. Analysis of the data from this study - and others' data – showed that players overestimate the number of times they won when playing slots with LDWs in the playing session. A 'sweet spot' frequency of LDWs of between 15% and 25% of total spins maximises the win overestimation effect; increases in the LDW frequency past this point causes the amount of overestimation to decrease.

Myles et al. (2023) specifically sought to replicate an LDW-triggered win-overestimation effect in a large online sample of 940 participants in Australia. Participants were randomly assigned to view one of two videos that were composed using recordings of an online demonstration of a slot game. Each video began with the cursor selecting the number of active lines and the amount bet per line, before proceeding to make 10 spins. Outcomes per spin differed between control and LDW videos, although both contained only two genuine wins. The participants were then asked to respond to a question: "On how many spins did the player win more than they bet? If you are unsure of the exact number, please enter your best guess" (p. 2). Authors observed a tendency for participants exposed to LDWs to overestimate the number of wins relative to both the number of genuine wins that occurred, and to estimates made by participants in a control group who were not exposed to LDWs. Indeed, the mean number of estimated genuine wins was larger amongst those in the LDW condition (3.02) compared to the control condition (2.14). The analysis also found no interaction between self-reported gambling risk (PGSI) and the accuracy of responses amongst participants in the LDW condition, meaning that the over-estimations of wins were not influenced by the risk of participants' gambling behaviour.

4.4 The near miss effect

Research also explored the impact of the near miss effect on gambling behaviour, or the motivation to continue gambling. The near miss effect is a feature built into slot machine games where an unsuccessful outcome is close to that required for a win. For example, when two out of three symbols are displayed on a slot game winline. Five papers within the sample explored the impact of the near miss effect, and its encouragement of continued gambling. Papers were carried out in the UK (Clark et al., 2009; Sharman et al., 2015),

[7] The definition of an 'experienced gambler' within the study is unclear.

the US (Sundali et al., 2012), Canada (Stange et al., 2020), and Germany (Ulrich et al., 2016). Four of the five studies were conducted in either simulated or laboratory-based settings, with Sundali et al.'s (2012) drawing upon operator data.

4.4.1 Near misses can increase the desire to continue gambling

During the course of two experiments in the UK, Clark et al. (2009) devised a task to elicit near-miss and control phenomena in lab settings. They also explored the impact of the near-miss effect on neural mechanisms underlying cognitive distortions, using fMRI[8], and examined associations between level of activation in brain circuitry during gambling and gambling-related cognitions. The authors developed a gambling task resembling a slot machine with two reels. On each trial, the participant could either win (£0.50) or not win. The outcomes of spins were fixed so that wins occurred on one out of six spins, and near misses occurred on two of six spins. During the first experiment, 40 undergraduate students were asked "How do you rate your chances of winning?" before spinning, as well as "How pleased are you with the result?" and "How much do you want to continue to play the game?" after the outcome of each spin. Participants' answers were then transformed for statistical analysis. In experiment 2, brain responses during gambling play were measured using fMRI in a group of 15 volunteers with no history of psychiatric or neurological disorder. Although the objective outcomes of the spins across the trials of near-miss and full misses were the same (i.e. zero-gain), the authors found significant differences between the patterns of neural response to the near-misses and full-misses. Near-misses were rated by participants as more unpleasant than full-misses, but they also increased the desire to play the game. There was a significant positive correlation between neural activity to near-misses and gambling-related cognitions, as measured by the GRCS.

Ulrich et al. (2016) measured the responses to near and full outcomes (including wins and losses) on a wheel of fortune-based task. Their sample consisted of 50 males, 20 of whom had a South Oaks Gambling Screen (SOGS) score of five or greater, indicating 'pathological gambling'. The experiments were based on the wheel of fortune, where participants – who started with an endowment of 200 virtual cents - wagered on one of the two colours on the wheel. Participants played 80 spins, with 20 spins resulting on each of the following: full wins, narrow wins, full misses and near misses. Responses to each outcome were gathered through interbeat intervals and skin conductance responses. Follow-up questionnaires included the GRCS, and scales related to impulsivity and the perception and taking of risks. The analysis found that near misses resulted in longer interbeat intervals compared to full outcomes, but only for the first two interbeat intervals following the outcome. There were no significant effects of outcome types on

[8] A functional magnetic resonance (fMRI) scan can show areas of brain activity and is able to show changes if the brain is responding to light and sounds.

skin conductance response. The authors also found that 'problem gamblers' showed increased arousal – through skin conductance responses - to near misses when compared to full outcomes, and a more irregular IBI response to full misses only. In summary, those experiencing 'problem gambling' found near misses to be more enjoyable, and more likely to encourage continued gambling.

4.4.2 Near misses can result in further gambling when combined with losses disguised as wins

Sharman et al. (2015) specifically explored the effects of near misses delivered in the presence or absence of LDWs on gambling behaviour. A sample of 40 participants was halved into a LDW group and a non-LDW group, and played a total of 124 spins on a simulated slot-machine consisting of a game with three reels all displaying three symbols. While the LDW group encountered LDWs, the non-LDW group encountered spin outcomes consisting of only wins or complete losses. The winline was a horizontal line across the middle of the three reels requiring three matching symbols for a winning outcome. Outcome valence (the value placed on an outcome) was measured using the question "How happy are you with that result?" (p. 216), while motivation to continue playing was measured by the question "How much do you want to continue playing?" (p. 216). Both were rated between 0 and 100. The authors also tested the effects of the different position of the third symbol, specifically whether it landed *before* (above) or *after* (below) the horizontal winline on the third reel. Across both groups, near misses with winning symbols on the third reel occurring *above* the payline increased the motivation to continue the game, while near-misses occurring *below* the winline were reported as less pleasing. The authors argued that a near miss caused by a symbol landing *before* the payline reinforced the view that a win was due or yet to come, with LDWs increasing the motivation to keep playing. The LDW group also gave higher valence ratings to all non-win outcomes compared to the group that did not experience LDWs, while LDW trials were also rated as more enjoyable than trials without LDWs. The authors conclude that LDWs – despite still resulting in negative payouts – increased enjoyment of the game.

4.4.3 Near misses on scratchcards may increase the urge to gamble

Our sample of literature also contained research on the effects of near misses when experienced during scratchcard play. Stange and Dixon (2020) explored the effect of near misses on scratchcard purchasing behaviour by asking them to either "cash out" or risk all of their winnings to purchase another card. The sample comprised 138 undergraduate students in Canada, all of whom were 18 years of age or older, had experience playing scratchcards, and were not in

- or had not previously received - treatment for gambling problems. Participants were asked to choose two scratchcards. The first group of scratchcards consisted of either a loss, a small win of CAN$5, and another loss, while the second group consisted of a mixture of cards that contained either three regular losses or two regular losses and a near-miss. After completing the first two scratchcards, participants were given the choice to purchase another card for CAN$5.00. If participants decided to purchase, they chose a third card that contained two losses and a win of CAN$5. Outcome measures included gambling-related cognitions (according to GRCS), a measure of gambling urge, and CPGI. Overall, the authors found that scratchcard outcomes influenced participants' urge to continue gambling, as predicted, with wins and near misses leading to increased urges to continue gambling compared to regular losing outcomes. There was no association between urge ratings at the final outcome and the decision to purchase additional cards in a near-miss condition occurring after a second scratchcard.

4.4.4 Near misses do not seem to encourage continued gambling on land-based roulette

In an older study, Sundali et al. (2012) explored the effect of near-miss events on roulette play by exploring a large sample of player data. Data were collected from a large casino in Nevada, via a computer printout that was provided to the researchers documenting the play on a game where roulette was played on individual touchscreens, around a roulette wheel spun in-person. The time period of play was 9pm to 1am on April 26, 2006, where 401 unique games or spins of the wheel were recorded and analysed from an estimated 36 players, totalling 6,390 unique bets. A near miss was defined by the authors as a near miss table bet (for example, the outcome was a number next to the player’s selection on the table), or a near miss wheel bet (the outcome was a number next to the player’s selection on the wheel). While a near miss affected players’ future selections and amount of money gambled, there was no evidence to support that near misses led players to gamble longer. Evidence did not support findings that near misses resulted in arousal or reinforcement.

4.5 Speed-of-play

The literature on product modification highlights how EGMs, or online slots and casino-based games are especially harmful. The speed-of-play of these products has been widely explored within the literature, at times alongside other modifications. Auer and Griffiths (2023c) studied the relationship between the structural characteristics of online casino and slots games and gambling behaviours with operator data covering 763,490 sessions from 43,731 players across Europe between November 2020 and April 2021. The analysis showed that:

- During the period of analysis significantly more bets were placed on slots games (1.0 billion), than on blackjack (3.1 million), live blackjack, featuring a live dealer (3.8 million), live roulette (19 million), and video poker (4.4 million).
- The time between bets was considerably shorter on slots games, with an average of 6.14 seconds (the second quickest was 10.00 seconds on blackjack).
- The average session for slots game was also longer, with average of 66.95 minutes (the second longest was video poker with 48.42 minutes).

The authors concluded that, "*the most important structural characteristic with respect to the number of games played in the present study was the event frequency [the number of seconds between two consecutive wagers]"* (Auer and Griffiths, 2023c, p. 269). Gambling harms could therefore be prevented through the regulation of the speed at which gambling can continuously occur.

The following sections review nine papers from studies carried out in the UK (Thompson and Corr, 2013; Corr and Thompson, 2014; Worhunsky and Rogers, 2018; Harris et al., 2021; Newall et al., 2022d); Norway (Mentzoni et al., 2012); Australia (Blaszczynski et al., 2005); Canada (Cloutier et al., 2006); and the USA (Siemens and Kopp, 2011). All these studies explored the impact of the speed-of-play on simulated or experimental gambling settings.

4.5.1 Slowing speed-of-play could help reduce gambling harms

Evidence shows that, at least in experimental settings, adding friction and slowing down the speed-of-play within gambling products increases reflection time and could contribute towards the reduction of gambling harms.

Using a specially-developed, computer-based card game, one study explored the impact of a forced 5-second pause on the response perseveration - or the tendency to continue with a task despite continued, negative outcomes - of 42 participants in the UK (Corr and Thompson, 2014). The authors found that a 5-second pause led to a reduction in the number of cards played (mean for standard no-pause group: 65.81, compared to the mean for pause group: 39.62), which they argued pointed to an effect of reduced response perseveration after a 5-second pause. In other words, a short pause led to participants being less likely to persist in gambling when it was no longer beneficial.

A similar experiment was conducted with 42 participants recruited from a betting shop in Swansea, UK who were categorised as 'problem gamblers' according to SOGS, as well as 39 non-gambling participants drawn from the general public (Thompson and Corr, 2013). Those who played the game with a 5-second pause *across both groups* demonstrated a lower number of cards played and cash won. The findings suggested that imposing a short delay before the next bet could reduce gambling problems on EGMs by strengthening inhibitory control.

A separate UK study focused solely on the speed-of-play during simulated EGM play amongst 72 males who reported gambling at least on a monthly basis (Worhunsky and Rogers, 2018). Participants played a series of computerised, simulated slot-machines, choosing either a faster speed-of-play or a slower speed-of-play. Participants who chose the faster speed-of-play demonstrated a higher average bet size (4.01 credits compared to 3.96 credits), a faster interplay reaction time (499 milliseconds compared to 542 milliseconds), demonstrated longer periods of continued spending (231 credits compared to 49 credits) and longer periods of continued-play duration (40.5 seconds compared to 33.5 seconds), compared to those who chose the slower speed-of-play. Those who played on the faster speed-of-play also showed greater under-estimations of the amount of money they spent compared to the slower speed-of-play group. Importantly, more participants within the faster speed-of-play group showed a desire to play again (28%) compared to the slower speed-of-play group (13%). This indicates that a faster speed-of-play is more likely to ensure continued spend, with the amount of that spend being under-estimated.

Harris et al. (2021) tested the effects of different speeds of play on 50 non-'problem gamblers' using an electronic slot machine simulation with five different speeds: fast (1.5 second event frequency), moderate (3 second event frequency), slow (4.5 second event frequency), moderate with pause (a fast spin of 1.5 seconds plus a 1.5 second pause in play, totalling an event frequency of 3 seconds), and slow with pause (a fast spin of 1.5 seconds plus a 3 second pause in play, totalling an event frequency of 4.5 seconds). The study tested the impact of speed on dissociation, valence, arousal, and self-control. The authors concluded that "*increased speed of play during slot machine gambling results in impairments in self-control during gambling among a sample of non-problem gamblers"* (p. 265). Objective results obtained from the behavioural tasks also contradicted ratings of *perceived* self-control, with speed-of-play differences having a negligible impact on participants' perceived self-control. This disparity may have occurred, according to the authors, due to two separate factors. Firstly, reductions in inhibitory control observed at fast speeds of play occurred subconsciously due to high levels of engagement with the gambling simulation. Alternatively, the perception of self-control held by people who gamble may consist of behavioural markers such as time and money spent gambling. The authors nonetheless argue that the speed of play, as a structural characteristic of gaming machines, can produce impulsive behaviours amongst those who gamble regardless of the level of vulnerability they may experience, as demonstrated by the change in behaviour in 'non-problem gamblers'.

Mentzoni et al. (2012) explored the use of speed as a structural characteristic within experiments on 62 undergraduate psychology students. Participants were assigned to three different bet-to-outcome intervals of fast (400 milliseconds), medium (1700 milliseconds), and slow (3000 milliseconds), with each participant required to complete 100 spins. Experiments were conducted on computers, with sound effects delivered through headphones for bets, reel spins, and outcomes. In contrast to the other literature presented here, the study showed no overall main effect of the speed-of-play on average bet size,

the evaluated entertainment from the game, nor the illusion of control. Nonetheless, the authors concluded that for people categorised as ‘problem gamblers’ very fast games might result in more intensive gambling as their findings indicated that ‘problem gamblers’ had significantly higher bet sizes compared to ‘non-problem gamblers’. The authors therefore conclude that restrictions on gambling speed might be effective in the reduction of harms.

4.5.2 Combining speed-of-play with other modifications could reduce harm from gambling

Other studies have explored how speed-of-play could be amended alongside other features in order to reduce harm from gambling.

Blaszczynski et al. (2005) tested different modifications on machines in hotels and EGM clubs in New South Wales, Australia, to see if ‘problem gamblers’ would be more likely to recognise the modifications than ‘recreational gamblers’ and if they affected satisfaction and enjoyment. Ninety-five participants in hotels, and 110 participants in clubs were asked to play an unamended EGM and an EGM which had a combination of interventions consisting of maximum bet acceptance (either AUS$1 or AUS$10 depending on the machine), reel spin (either 3.5 or 5 seconds), and maximum denomination of notes (a maximum of either AUS$20 or AUS$100). Control machines allowed a maximum bet of AUS$10, a reel spin of 3.5 seconds, and accepted AUS$50 and AUS$100 notes. The study found that between 75% and 86% of participants were unable to identify any of the modifications, with the slower speed-of-play the only feature reliably identified. The authors found that a slower speed-of-play of 5 seconds between spins impacted satisfaction and enjoyment. However, the effects were small, and the authors concluded that they did not appear to influence a player’s intentions. The authors concluded that modifications would bring little, detrimental impact to the enjoyment of players, if they were proven to be effective in minimising gambling harms.

In Canada, Cloutier et al. (2006) explored the effects of pauses and messages presented on video lottery terminal screens on the erroneous beliefs and persistence to play of 40 undergraduate students who obtained high scores on the Inventory of Erroneous Beliefs Related to Gambling (ICROLJ), a measure related to the illusion of control. Ten men and ten women were included in the pause group, while the messages group included 11 men and nine women. Participants were given CAN$20 to gamble with, and they were presented at the beginning of each session with a pop-up message that informed them the outcome of games could not be predicted. Within the message condition, a correcting pop-up message targeting the illusion of control appeared on screen after every 15 games played. At the end of the session, participants completed the ICROLJ. The same procedure was followed for the control condition as the experimental condition, except "pause" appeared on the screen for seven seconds. The authors found that interruptions within a

gambling session – whether through pauses only or through messages and pauses – decreased the strength of erroneous thoughts. However, a pause accompanied by an additional message targeting participants' illusion of control had the greatest impact on erroneous beliefs – average of 109.15 decreased to a post-test score of 57.15 - compared to pause only (115.80 to 86.15).

A US-based paper explored speed-of-play and the use of balance displays as part of structural characteristics of online gambling that impact self-control. Siemens and Kopp's (2011) paper comprised two studies. The first study consisted of qualitative interviews with five men to establish their experiences in relation to online gambling environments. The second study consisted of a controlled experiment using a computer-mediated gambling task, incorporating elements highlighted during the first study. This second study specifically explored the development of a delay between choices and the display of their account balance (tangible currency). A sample of 150 male and female undergraduate students played a controlled programme, similar to roulette. For a sequence of 20 choice intervals, participants selected a colour (red or black) and number combination (1-5) and wagered between $0.10 and $0.30. Participants were randomly assigned to a condition consisting of different time between decisions, and whether their account balance was visible on screen. Participants in the intangible currency condition had to keep track of their balance mentally. Outcome measures included recollection of their balance after each of the six games, recollection of their overall balance at the end, and a rating of the delay between each game. The results of Study 2 indicate that participants were more likely to lose track of their balance when it was not visible on screen. Importantly, the authors' tests of the effects of a time delay showed that participants' awareness of their balance during the session itself in the long delay condition were more accurate than those in the short delay condition. However, the length of the delay did not seem to have any effect on the accuracy of recollection of the end balance.

A more recent study carried out in the UK explored the impact of a delayed speed-of-play on a sample of 1,002 adults who had experience playing online roulette (Newall et al., 2022d). Participants were asked to play a game specifically amended by researchers with a gambling endowment of £4. This endowment was given to participants to gamble on the 'real-effort task', although participants were free to take the endowment without gambling. This was designed to create a sense of ownership over the endowments and the feeling of gambling with their own money. Participants were assigned to a control group of no time delay, or an intervention group where the speed-of-play condition was one spin every 60 seconds. In addition, the game incorporated a £2 maximum stake limit for both the intervention and control groups. The study found that one-fifth of the participants (19.2%) took the £4 gambling fund without making a bet. Around 14.4% bet and lost everything. The remaining participants gambled a proportion of their money. The 60-second speed-of-play limit did not reduce the likelihood that participants would gamble at all or gamble and lose everything. However, it reduced the proportion bet – or the total amount bet by the sum of initial available stake plus any winnings from successful bets - by 4% for the remaining participants.

The average proportion bet was 41.7% in the normal speed condition and 37.1% in the slow speed condition. In summary, the 60-second speed-of-play limit reduced gambling spending as well as the number of spins on which the player bet (an average of 1.6 spins fewer than the control group). The reduction of speed-of-play *may* also reduce the average bet size – which was 4% lower in the intervention group – as well as likelihood of players gambling everything (4.3% lower in the intervention group). However, differences in relation to average bet size and gambling everything were not statistically significant when compared to the normal speed group.

4.6 Jackpots

Finally, the scoping review found a small sample of literature that highlighted the use of jackpots, again deployed as part of slot- and casino-based products. Jackpots on EGMs or online slots- or casino-based games may prove lucrative to players as they offer potentially large payouts. The three studies identified in our literature search – all carried out in Australia - explored the impact of jackpots and possible amendments on gambling behaviour and arousal.

4.6.1 Jackpots can impact gambling behaviour in ways that might cause harm

Li et al. (2016) explored the impact upon gambling behaviour of progressive jackpots, deterministic jackpots, and jackpot size. The authors tested different types of jackpots on a sample of 123 participants (51 male, 72 female), 10.6% of whom were 'problem gamblers' according to PGSI. Progressive and non-progressive jackpots were related to whether the jackpot size increased during play, while deterministic and non-deterministic jackpots were related to whether the jackpot size was known. Jackpot sizes (small or large) were also tested. Experiments were conducted on computer-simulated EGMs. Eight EGMs had different jackpot features, and one did not. Participants were given AUS$20 to wager. All EGMs were programmed to generate the same winning outcomes on five bets (specifically the 2nd, 6th, 8th, 13th, and 20th bet) and the same losing outcomes. EGMs were programmed without any jackpot wins. The authors tested for the impact of jackpots on average bet size, speed of betting (bets per minute), persistence (total trials or spins played), EGM attitudes, and physiological arousal. The authors found a significant interaction between the progressive feature, deterministic feature, and jackpot size on participants' average bet size on the EGM. Specifically, the largest bets were made on high jackpot machines (AUS$25,000) that were represented as deterministic and non-progressive. The average bet size for the largest jackpot was an average of 54.93 cents, compared to the average of 45.67 cents across all studied jackpot feature combinations. The authors argued that incrementally higher bet sizes may have placed the participant – from their perspective - closer to the goal of winning the jackpot prize. Importantly, the

analysis found that participants with higher PGSI scores tended to bet more on EGMs with jackpots.

Similar to the notion of non-deterministic jackpots, Donaldson et al. (2016) explored the effects of hidden and mystery jackpots in an experiment with 107 adults who had gambled on a casino style game at least once within the last 12 months. Participants were given AUS$20 to play on a three-reel, simulated EGM programmed with a fixed sequence of wins on specific spins up to spin number 50 with infinite losses thereafter. The authors measured the impact of hidden or mystery jackpots on average bet size, speed of betting (bets per minute), persistence (total trials played), self-rated enjoyment (one-item Likert scale of six points), and physiological arousal through galvanic skin response. Authors found no systematic effects for either hidden or mystery jackpots on player behaviour, with the exception of physiological arousal. Positive changes in physiological arousal - from the baseline period to the experiment - were most evident when the winning jackpot combination was unknown (mean of 0.273, standardised), compared to the known winning jackpot combination which saw a negative change in physiological arousal (mean of -0.310, standardised). The authors also found that suggestively large jackpots - where the value of the prize was hidden from players, but the winning symbol combination was displayed - contributed to the fastest gambling speeds and greatest persistence while losing.

4.6.2 Jackpot expiry messages may help reduce gambling harm

Rockloff et al. (2015) explored the impact of a feature which saw the availability of jackpots expire after a fixed interval of play, as part of a pre-commitment or player identification system. 130 volunteers played a three-reel simulated EGM, all of which were programmed with a fixed sequence of wins up to trial 20, with infinite losses thereafter. Players were given AUS$20 to wager. However, 23 participants quit the EGM before reaching the 21st trial and were thus not included in the final analyses. One-hundred-and-seven participants wagered past the 20th trial, including 45 males and 62 females. Participants were assigned to a condition that either offered the chance to win a cash jackpot or a jackpot that offers the chance to win a ticket to win the jackpot prize, along with three other conditions. In the test condition, players were shown a "relevant" message stating that the promised jackpot had expired and could no longer be won. In the irrelevant message condition, a similar pop-up message simply said to push the button to continue. In the control condition, participants were not shown any message. The authors tested the impact of jackpot expiry on arousal, skin conductance, and skin temperature. The results showed some evidence that behaviour was modified by expired jackpots. Bet speed was significantly slower within the jackpot expiry message (approximately 7.0 bets per minute) compared to the irrelevant message condition (approximately 7.7 bets per minute) and the no-message control condition (approximately 8.1 bets per minute). Player losses past the 20th trial were significantly reduced in the cash-jackpot expiry

condition, with a near AUS$9 reduction in player losses. Skin conductance did not show evidence for reliable changes in physiological arousal. Nonetheless, the authors argue that their study provides preliminary evidence that jackpot expiry might be a feature that can help to prevent harmful gambling behaviours.

4.7 Conclusion

This chapter has explored the most prevalent product design features uncovered during the scoping review. These were associated with slots- and casino-based products found online and on EGMs. Features that are built in – such as multiline wins, LDWs, and the near miss effect – can be immersive, are associated with arousal, and can lead to players not keeping an accurate record of their winnings or balance. Addressing such product features - that may reinforce further gambling - could be an effective way of preventing gambling harms. It is important to note that while the scoping review has uncovered important work in this area, a limitation of the evidence is that most of the research was carried out in laboratory settings.

5 Socio-technical treatments

Chapter Summary

- The evidence on socio-technical treatments in our scoping review is from 23 academic papers and three pieces of grey literature. Most of the studies are small trials with people undergoing treatment for gambling addiction.
- Different types of treatment were prevalent in the sample of literature, although cognitive-behavioural therapy (CBT) was the most well-established.
- The evidence suggests that treatments such as CBT are effective, and that breaking barriers to access is important, as is tailoring treatment to different gender and cultural needs.
- Internet-based interventions have started to integrate social practices with evolving technologies, particularly with the use of 'i-CBT' programmes.
- Communication technologies – whether mail-, telephone- or email-based – can be used to encourage the take-up of treatment options or as interventions in their own right. The pool of literature which explores communications sent from gambling operators is extremely small, with scope for gambling operators (and their regulators) to further explore the use of technologies available to them to deliver communications to those who may be at risk of harm.

5.1 Introduction

The final socio-technical innovation to emerge from our scoping review focuses on treatment provision for people who have gambling problems. This chapter highlights how treatments and interventions have grown as 'social' innovations, with technology allowing treatments to be targeted to those experiencing barriers to access. The use of Internet-based technologies could allow more personal communications with individuals about their gambling, in a setting where the individual feels comfortable.

The chapter addresses these points in turn, exploring the wide use of CBT before reviewing how technology has been used by operators to interact with customers. Finally, we explore the development of Internet-based CBT as well as other web-based interventions.

5.2 About the evidence base

The evidence on socio-technical treatments and communications in our scoping review is based on 23 academic papers and three pieces of grey literature. The evidence base for treatments emerges mainly from trials amongst small groups of help-seeking clients. Not all studies benefitted from comparison with control groups, with impact limited to the measurement of 'problem gambling' scores before and after intervention. Out of all the treatments explored, cognitive-behavioural therapy is the most established treatment for harmful gambling behaviours, including Internet-delivered, 'i-

CBT' programmes. This treatment was again tested with small samples of people. There was also evidence that telephone, email and letter communications can be effectively used in conjunction with treatments.

5.3 Treatments for gambling addiction

The scoping review uncovered numerous forms of treatment delivered to those assessed as having a gambling addiction. The most common form of treatment was cognitive-behavioural therapy (CBT), the objective of which is to challenge cognitions, beliefs and attitudes that cause harmful gambling behaviours with the overall aim of altering long-term behaviour (López Viets and Miller, 1997). Other forms of treatment included motivational behavioural therapy (alongside CBT), cue exposure therapy, dialectical behavioural therapy, and counselling.

5.3.1 Cognitive behavioural therapy was the most prevalent form of treatment for harmful gambling behaviours

The sample of literature provided examples of different treatments for harmful gambling behaviours. The most prevalent form of treatment was cognitive behavioural therapy (CBT), which was explored across a wide variety of settings.

The earliest example was found in Dowling et al.'s (2006) study of 19 women in Australia who were experiencing 'pathological gambling'. Compared to a control group, those who completed the CBT course – which included sessions covering financial limit setting, alternative activity planning, cognitive correction and relapse prevention - demonstrated a significant reduction in gambling frequency, duration and expenditure which were sustained during the six-month follow-up phase compared to the waiting list control group. Importantly, out of the 19 women under study, 16 (89%) no longer met the criteria for 'pathological gambling' after finishing treatment.

A further study in Australia with 77 females requiring treatment for 'pathological gambling' explored client factors associated with CBT treatment attrition, or an instance where a person who has started CBT drops out of treatment before completing the programme (Dowling, 2009). The author explored the possibility of attrition according to demographic characteristics, gambling characteristics, and characteristics related to depression, state of anxiety and substance abuse. However, the two groups did not significantly differ on any measure of pre-treatment evaluation. The findings indicated that women assessed as 'pathological gamblers' who reported more severe gambling behaviour prior to, and at the completion of, treatment, were at higher risk of treatment failure six months following treatment. Greater emphasis on relapse prevention approaches in clinical interventions was recommended.

Another study of 57 females – 29 of whom completed follow-up individual treatment and 28 completed follow-up group treatment – explored the specific impact of abstinence or controlled gambling goals within a CBT programme (Dowling et al., 2009). The study found that gambling sessions per week decreased from pre-treatment to follow-up for those who chose abstinence (1.8 to 0.8) and controlled gambling (1.9 to 1.0). Weekly gambling expenditure also fell for both clients who chose abstinence (AUS$188 to AUS$70) and controlled gambling (AUS$122 to AUS$59). Importantly, 89% of participants who selected abstinence no longer satisfied criteria for 'pathological gambling' after the 28-week follow-up period as did 82% who selected controlled gambling. The authors concluded that these findings provided support for the practice of offering controlled gambling as an alternative goal to abstinence in the CBT programmes to treat 'pathological gambling' (Dowling et al., 2009).

Boudreault et al. (2018) also demonstrated the benefits of self-help programmes that incorporated CBT in a French-Canadian context. Their study explored the use of a self-help treatment to 62 participants (31 assigned to treatment, 31 assigned to control group). Delivered over 11 weeks, the programme comprised three telephone interviews alongside a cognitive-behavioural self-help workbook. Those who completed the treatment and completed the 12-month follow-up screening registered decreased DSM-IV scores for 'pathological gambling' (from 5.71 to 1.89), average monthly hours spent gambling (from 36.19 to 6.06), and monthly gambling expenditure (CAN$1612.58 to CAN$425.45). These scores all remained elevated for the control group (addiction: 4.70, hours: 24.92, expenditure: CAN$1267.28), highlighting the effectiveness of CBT.

While the evidence base for CBT programmes mostly supports their use to treat harmful gambling behaviours, one small UK study based on participants' experiences of CBT produced less positive results. Penfold and Ogden's (2022) qualitative study explored the experiences of ten UK-based individuals with gambling addiction in relation to interventions. The participants had received a wide range of interventions. Four participants were actively involved in Gamblers Anonymous whilst two had attended previously, eight participants had accessed online help, while five had undertaken CBT and counselling. Additionally, two participants had tried interventions delivered through mobile apps, and two had used books. Participants who had undertaken CBT programmes felt they were less effective at encouraging long-term behaviour than interventions which encouraged group-sharing of ideas and comparisons of experiences such as Gamblers Anonymous. As one participant reported, "I've done some CBT and I do find it's useful at the time but at the minute its stops, it's gone" (Penfold and Odgen, 2022, p. 9). This was the only study which identified the relative inefficacy of CBT. However, in contrast to the other studies reviewed here, it was informed by self-reported experiences as opposed to behavioural data. The study nonetheless provides a reminder that there is no 'one size fits all' treatment for gambling addiction.

5.3.2 CBT should be tailored to different needs

In addition to the studies described above, other research has highlighted that CBT should be tailored to different needs – specifically in relation to gender and culture.

Toneatto and Wang (2009) compared differences between men and women in treatment outcomes from a CBT course delivered by therapists in Canada. Outcomes were evaluated across 44 men and 16 women. The study found that men reported significantly more positive treatment outcomes and reduced severity of gambling compared to women. Conversely, a significantly higher proportion of women continued to meet DSM-IV diagnostic criteria for 'pathological gambling' compared to men at the post-treatment follow-up. The percentage of men who fulfilled the diagnostic criteria for 'pathological gambling' fell from 77.3% at baseline to 20.6% at the six-month follow-up; the equivalent figures for women were 87.5% to 58.3% during the same period. Men were also more likely to indicate additional treatment was not required, with 44.1% of men not requiring further treatment, compared to 16.7% of women. However, this difference was not statistically significant. Overall, women who reported experiencing a more severe gambling problem compared to men at baseline did not benefit from treatment to the same extent as men. However, these findings may be distorted by the small sample size at follow-up, particularly of women (n. 14, with n. 32 for men). Nonetheless, the authors argue that the content of CBT should be nuanced according to sex differences in order to achieve greatest impact for all.

One small qualitative study also highlights the importance of tailoring CBT programmes for different cultures, an important topic covered in our scoping review on socio-economic inequalities in gambling harms (Wheaton et al., 2024). Okuda et al. (2009) described a case study of a CBT programme delivered to a Haitian woman who had settled in the USA and had begun gambling shortly after her arrival to improve her financial outlook. Importantly, the authors highlighted how the client was encouraged to gamble by specific cultural beliefs. The CBT programme therefore was amended to address these beliefs, with the client avoiding gambling outlets and triggers as a result. The client was still abstinent at her ten-month follow-up. This provides a useful example of how CBT can be amended for patients from different cultures.

5.3.3 CBT in combination with other treatments may be effective in treating gambling problems

There is some evidence about the efficacy of delivering CBT programmes alongside other forms of treatment, although the studies are limited by relatively small sample sizes.

Petry et al. (2009) explored the efficacy of CBT when offered alongside a session of motivational enhancement therapy (MET) which "*employs motivational strategies to mobilize the client's own change resources*" (Miller et al., 1999, p. 1). They explored the impact of different treatment options on the Addiction Severity Index amended for Gambling (ASI-G) scores of 117 US college students who were 'problem' or 'pathological gamblers'. Participants were randomly assigned to a control group of assessment only; ten minutes of advice and a session of MET; or a session of MET with three sessions of CBT. Participants who received any of the above interventions experienced reduced ASI-G scores, days spent gambling, and US dollars gambled per month to a greater extent than those in the control group. The authors therefore concluded that brief interventions were effective.

There were also examples of CBT programmes being used alongside other innovative options. A small-scale study of 16 treatment-seeking males in Spain explored the impact of a serious video game (i.e., one aimed toward problem-solving rather than entertainment) deployed alongside a CBT programme (Tárrega et al., 2015). Ten sessions of the serious video game were interwoven with 16 weekly group CBT sessions, with researchers measuring their impact on 'problem gambling' scores, as well as impulsiveness, anger, anxiety, and novelty seeking. The study found that average 'problem gambling' scores were reduced within the sample who completed the treatment (n. 13) from a baseline average of 11.3 to 7.58 post-treatment, along with marginal decreased scores in impulsiveness and anxiety. However, these findings should, as the authors acknowledge, be considered cautiously due to the small sample size and lack of a control group.

5.3.4 Other therapies appear to be effective in treating harmful gambling behaviours

The sample also provided examples of cue exposure therapy (CET), dialectical behavioural therapy (DBT), and counselling as potential alternatives to CBT as treatments for harmful gambling. While the studies were based on small samples of individuals, the findings suggested they could all be effective treatments for harmful gambling.

Cue exposure therapy (CET) uses controlled exposures to prompt urges to gamble, in order to reduce cue-induced gambling (Oakes et al., 2008). In other words CET '*aims to directly break the two-way maintenance relationship between gambling and external triggers and such factors such as boredom, isolation, relationship problems and financial difficulties*' (Oakes et al., 2008, p. 109). Riley et al. (2021) explored the effectiveness of CET in the treatment of individuals experiencing smartphone sports betting addiction in a case study of six patients who received up to ten weekly sessions of CET. Riley et al. (2021) measured the impact of CET scores upon participants scores for the Victorian Gambling Screen Harm to Self-Scale (VGS-HS), the Gambling Urge Scale (GUS), the Gambling-Related Cognitions Scale (GRCS), as well as clinical scores for psychological distress and social adjustment. While only

delivered to six patients, the study found that they benefitted from reduced scores across several gambling-related scales, indicating that CET programmes may result in reduced gambling harms, reduced urges to gamble, and improved cognition in relation to gambling.

In dialectical behavioural therapy (DBT), clients are made aware of polarities (i.e., internal opposing forces), while they develop an understanding that an awareness of these can allow them to learn how to better respond to their environment. Christensen et al. (2013) explored the efficacy of DBT programmes – delivered over nine sessions both individually and as a group – for 14 people seeking treatment in Australia who were 'treatment resistant' or unresponsive to primarily cognitive-behavioural interventions, and willing to commit to DBT. The DBT programme also included modules on mindfulness, distress tolerance, emotion dysregulation, and interpersonal effectiveness. For the 14 participants who completed both sets of measures (pre- and post-treatment) and attended four or more of the nine treatment sessions, the study showed no statistically significant changes in measures of gambling behaviour, but 83% (n. 10) were either abstinent or had reduced their gambling expenditure. Participants also experienced significant improvements in coping with psychological distress, mindfulness and distress tolerance. The authors conclude from these findings that DBT can be a useful intervention for 'treatment resistant problem gamblers', particularly for reducing psychological distress. The study also offered early evidence that DBT modules act as mechanisms for subsequent positive behavioural and psychological change, although further research was needed to establish a full causal effect.

Finally, Tse et al. (2013) evaluated the effectiveness of telephone and face-to-face counselling over a three-month period in influencing harmful gambling behaviours amongst 92 participants from diverse backgrounds in New Zealand. For the 27 participants who completed interventions (14 face-to-face, and 13 telephone), pre-and-post measures showed decreases in average total four-weekly money spent (NZ$3,225.70 to NZ$1,271.10), average total four-weekly hours spent gambling (23.3 hours to 6.3), average percentage of total money gambling to income (101.5% to 11.8%), and average scores within the Gambling Attitude and Beliefs Survey (92.2 to 80.9). There was no significant difference in effect size between the two groups on the study's outcome measures, suggesting that telephone and face-to-face counselling might be equally effective in reducing gambling spend, and in amending attitudes or beliefs on gambling.

5.4 Internet-based interventions

The evidence base appears to support the use of behavioural therapies for gambling problems, as described above. Beyond that, the Internet theoretically provides an easier avenue for individuals to access treatment, or for operators to contact those displaying signs of risky gambling behaviour. Studies on use of Internet-based interventions also demonstrated the development of socio-technical innovations from the interaction between social practices and methods and developing technology.

Internet-based interventions covered in our scoping review comprised i-CBT programmes; a smartphone app which can track its users' behaviours to prevent harmful gambling; and the delivery of counselling via the web or via email.

5.4.1 Internet-based CBT

The earliest example of i-CBT in our scoping review was a study carried out in Australia by Casey et al. (2017), who explored the impact of i-CBT in the treatment of harmful gambling behaviour (according to Gambling Symptom Assessment Scale, G-SAS), when compared to a waitlist control group and an active comparison condition of monitoring, feedback, and support. Out of 174 participants, 60 were randomly allocated to the i-CBT programme with 22 completing treatment. In comparison, 59 were assigned to the comparison condition, with 25 completing treatment. As a primary outcome, average G-SAS scores saw the biggest reduction in score between pre- and post-intervention for the i-CBT group (31.46 to 14.00), compared to the monitoring group (32.94 to 16.15), and the control waitlist (31.76 to 27.16). The authors also found preliminary evidence that i-CBT may be sufficiently similar to face-to-face CBT (based on comparison with an earlier study) to overcome barriers to access for traditional treatment.

In another Australian study, Dowling et al. (2021) explored whether an online i-CBT programme named 'GamblingLess' was more effective with or without therapist-delivered guidance. The programme comprised 13 to 15 activities each taking one to two hours over eight weeks to complete, either with or without therapist guidance. Out of an original sample of 206 participants, 101 completed with guidance, while 105 completed without guidance. The analysis was based on 51 participants in the guided group and 49 participants from the non-guided group who completed follow-up surveys. The findings supported the programmes with both forms of delivery, with significant decreases in G-SAS scores between baseline assessment and two years after the programme for guided participants (27.94 to 13.87) and non-guided participants (30.12 to 19.79). The authors concluded that further research was needed to establish when and for whom therapist support added value. The authors also acknowledged the low completion rate as a limitation, although they argued that the evaluation completion rate was consistent with previous studies of online psychological interventions.

In Sweden, Nilsson et al. (2018) carried out a pilot study, investigating the effects of i-CBT and Internet-based behavioural couples therapy (i-BCT), providing treatment for people experiencing harmful gambling behaviours and concerned significant others. Thirty-six participants (18 'gamblers' and 18 concerned significant others) were assigned randomly to i-CBT or i-BCT programmes, to measure the impact on a 'pathological gambling' scale – according to National Opinion Research Center DSM Screen for Gambling Problems (NODS) - and other outcomes. The study found that for 'gamblers' "*both groups went from NODS levels corresponding to pathological gambling to levels corresponding to a mild but subclinical risk for problem gambling*"

(Nilsson et al., 2018, p. 553) and significantly lowered all other gambling-related outcomes as well. Regarding concerned significant others, those in the BCT group lowered their scores on anxiety and depression more than the individual CBT group. Positive outcomes were also found in a full randomised controlled trial by Nilsson et al. (2020) which compared the efficacy of Internet-delivered CBT and BCT programmes amongst 136 'problem gamblers' and 136 concerned significant others. Participants were halved between each group, with both treatments consisting of ten therapist-guided self-help modules accompanied by weekly telephone and e-mail support from a therapist. Concerned significant others were given treatment in the BCT, but not in the CBT group. The authors found that the outcomes – including the NODS scale for 'pathological gambling' – for both groups improved, although there was no statistical difference between the two groups. While differences between the two groups were not significant, the authors found that more 'gamblers' commenced treatment in the BCT group.

As a relatively recent innovation, the literature we reviewed also highlighted the need for the further development of Internet-based interventions for gambling problems. Nilsson et al. (2018), for example, highlighted that i-BCT programmes would occasionally be delayed as couples completed modules at different speeds. Shortcomings and benefits were also highlighted by Rodda et al.'s (2019) study into the therapist experience of i-CBT modules, based on qualitative data from seven service providers. These clinicians were generally positive about i-CBT, despite practical problems around assessment of participant suitability and low participant engagement. Importantly, they highlighted that i-CBT programmes made treatment more accessible to those experiencing stigma but might be less appropriate for those experiencing severe problems.

Overall, the potential of treatment options that are more accessible to people experiencing harmful gambling behaviours, particularly those put off help-seeking by experiences of stigma, demonstrates the significant potential of Internet-based interventions.

5.4.2 Smartphone apps

Our sample of literature included a smartphone app which delivered an 'ecological momentary intervention' (EMI) for 'problem gambling'. EMI methodologies involve the repeated gathering of a user's data in order to deliver self-directed interventions to individuals within their natural environments (Merkouris et al., 2020). One study developed and tested the usability of a smartphone app which deployed EMIs to curb cravings (Merkouris et al., 2020). The 'GamblingLess: Curb Your Urge' app delivered interventions based on the user's behaviours to discourage harmful gambling. With content inspired by the programme in Dowling et al. (2021), in this study the app was developed and tested with the input of 29 stakeholders (10 consumers, nine gambling clinicians and 10 gambling researchers), who supported a wide variety of interventions available on the app that sought to discourage gambling urges. Strategies that encouraged the rationalisation of

gambling – such as tips to change thoughts or delay action - were rated through the completion of an evaluation questionnaire as more helpful by consumers than researchers. All the stakeholder groups indicated that they would recommend the app, given its potential to increase knowledge, attitudes, awareness, behaviour change, intention to change, and help-seeking for gambling cravings.

5.4.3 Interventions delivered via web or email

We identified one study carried out in Germany that explored the efficacy of a web-based intervention, and a separate form of email-based counselling.

The web-based intervention within Jonas et al.'s (2020) study consisted of a 50-minute online conversation with a counsellor, followed by a series of interactive exercises supporting control strategies and the benefits and risks of gambling lasting 50 days, and a final 30-minute conversation with a counsellor. Email counselling also lasted 50 days and contained steps and advice on how to cope with 'gambling problems'. Out of 167 participants, 54 were assigned to web-based interventions, 56 were assigned to email counselling, and 57 were assigned to a control waitlist, with PGSI scores forming the primary outcome measure.

The study found significant reductions in gambling behaviour for both the web-based intervention and email counselling groups between the baseline and 12-month follow-up. In the web-based intervention, the biggest change was in PGSI score which reduced from 16.4 points to 5.1 points; in the email counselling group, the biggest reduction was in gambling frequency. While the two interventions were similar in terms of gambling outcomes, the web-based intervention appeared to be a better support option, because participants showed significantly stronger working alliance with their counsellor and used the intervention for longer than participants in the email counselling group.

5.5 Communication

This section highlights how socio-technical innovations have evolved to facilitate personalised engagement with individuals experiencing gambling harms. We first discuss how the principles of letter- and telephone-based interventions can be innovatively used to reach those at risk of harmful gambling behaviours. Secondly, we show how the evolution of technology could inspire future targeted communications from operators.

5.5.1 Evolving means of communication offer opportunities for improved engagement

The earliest example of technological development in communication in our scoping review was Hodgins et al.'s study (2007) which explored the impact of bibliotherapy on 169 individuals in Canada who had recently stopped gambling. Participants either received a summary booklet containing

information on relapse prevention; or the summary booklet plus seven other booklets mailed at regular intervals during the year. The study found that 'problem gambling' scores decreased for all the participants at the 12-month follow-up, whether they received a single mailing or repeat mailing. The reduction was not as much as the authors had hoped, however, given that 70% of participants still met the criteria for 'probable pathological gambler' according to SOGS, and 54% indicated 'pathological gambling' according to NODS. The authors concluded that "*Despite general improvement, there was no evidence that receiving periodic booklets over the follow-up period led to improved outcomes on any of these variables*." (p. 52)

More recently, Pfund et al. (2020) explored the effect of personalised letters that incorporated principles of motivational interviewing and addressed outcome expectancies – in addition to reminder telephone calls – on the attendance of 69 clients at psychological treatment courses. These clients were randomly assigned to two separate conditions: those who interacted with providers (1) solely by phonecall, and (2) by phonecall and a reminder letter sent within twelve hours of the initial phonecall. The study found that 26 out of the 34 who received a letter went on to attend treatment, compared to 18 out of 35 who did not receive a letter; those who received a letter were also more likely to reschedule their initial session. While these results suggest that the combination of a phonecall and letter is more likely to boost attendance, the authors were unable to address any other reasons why clients may not have been able to attend treatment.

The use of telephone-based interventions was considered in a longitudinal study carried out in New Zealand (Ranta et al., 2019). The study examined the effects of a brief telephone intervention on co-existing depression for 131 individuals who had called New Zealand's national gambling helpline over 36 months, between 2009 and 2011. Out of the initial sample, 56 remained at the end of the 36 months. These remaining participants reported decreased levels of depression compared to baseline (74.4% down to 41.1%), which was the main outcome measure. In addition, PGSI scores within the sample reduced from an average of 17 at baseline to a score of 7.5 at 36 months. The authors concluded that brief telephone interventions can reduce prevalence of depression among people with gambling problems who seek help. Lessons could therefore be learned by gambling operators in relation to telephone-based interventions, as the following section outlines.

5.5.2 There is scope for operators to use customer communications to reduce gambling harms

The development of socio-technical innovations could provide gambling operators with more opportunities to communicate effectively with customers where there are concerns about harmful gambling behaviours.

A recent UK study using gambling operator data highlights that 3.9% of the 140,000 online gambling accounts in the dataset received welfare communications from operators between 2018 and 2019, usually via email; only 0.13% were contacted via telephone (Forrest et al., 2022). Based on the evidence described above, this could potentially be improved if operators used telephone-based communications more frequently as a socio-technical innovation, i.e., an innovation that emerges from the overlap of available technology and societally-accepted standards (Geels, 2004).

Our scoping review only identified one study that explored the efficacy of communications sent by operators. In Norway, Jonsson et al. (2021) examined how different subtypes of people – based upon patterns of play - are affected by telephone- and letter-based motivational interventions. A sample of 3,009 customers whose data was provided by an operator were randomly assigned to a letter-based condition, a telephone-based condition, or a no communication condition, with researchers exploring the impact of communications on theoretical loss. The findings show that customers – who were grouped according to product type - all experienced lower levels of theoretical loss after receiving any kind of intervention, with long-term reductions in theoretical losses sustained for gamblers categorised as the highest spenders on casino gambling and sports betting. The authors concluded that telephone- and letter-based interventions can help to reduce theoretical loss, although they also acknowledge that the dataset gave no analysis of gamblers' loss with other operators, implying that loss could have been incurred elsewhere.

Nonetheless, Jonsson et al. (2021) join other studies above in highlighting how actors within the industry have interacted with technology available to them in order to reduce gambling harms. On the other hand, these forms of intervention – while personalised – do not make use of the Internet which could be a more effective way of reaching individuals.

5.6 Conclusion

This chapter has explored how interventions targeted at individuals – whether a treatment or communication – can combat gambling harms, with potential for some of these to be further developed. Therapeutic treatments such as CBT have been widely adopted as 'social innovations' in gambling harm minimisation, while communication methods from treatment providers and operators demonstrate how technologies – whether mail-, telephone- or email-based – can be used to communicate with individuals with the aim of encouraging the take-up of treatment options or as interventions in their own right. The convergence of communications and treatments with evolving technology has produced socio-technical innovations which allow the access of treatment from Internet-based settings, as well as the opportunity to intervene on a smartphone within the natural environment. The pool of literature which explores communications sent from gambling operators is much smaller, with scope for gambling operators (and their regulators) to

further explore the use of technologies available to them to deliver communications to those who may be at risk of harm.

6 Summary and conclusions

This scoping review has explored the socio-technical innovations that have been developed to combat gambling harms. Socio-technical innovations are new systems or tools that have emerged from the interaction between actors and technologies and seek to encourage best practice or influence industry standards. The evidence reviewed here supports some innovations more than others. The evidence we identified in the scoping review focused on four key areas: 'responsible gambling' messaging; 'responsible gambling' tools; specific aspects of product design; and treatment.

'Responsible gambling' messages were tested across a variety of settings and were mostly explored in relation to their impact upon in-session behaviours. House-edge information was more effective at informing players on the costs of gambling compared to return-to-player information. Personalised behavioural feedback was more effective at reducing possible harmful gambling behaviour than standard messaging, at least in terms of the amount of money and time spent gambling. However, these messages still emphasise personal responsibility and individual behaviour change, which is likely to have a relatively small impact on overall levels of harm from gambling. 'Responsible gambling' advice – as a socio-technical innovation – would benefit from regulation by policy or lawmakers to ensure that it is free from vested interests.

The most prevalent 'responsible gambling' tools were deposit and time limits. These limits may be facilitated within the gambling platform itself, or through gambling registration cards. However, while these may encourage less harmful gambling behaviours and were viewed positively within studies which measured player perception, some studies found that users could easily amend the tools to facilitate further spend. Studies that focused on self-exclusion schemes explored pre-self-exclusion behaviour, how schemes can be improved, and how individuals may continue to gamble after self-exclusion has concluded. The evidence suggests it is unlikely that self-exclusion (or indeed any of the 'responsible gambling' tools) alone can combat gambling harms, with further support needed to assist individuals.

A more effective strategy could be the modification of products, specifically addressing features of products that may encourage harmful gambling behaviours. Studies that explored the impact of specific product features were mainly carried out in laboratory-based or simulated conditions, with findings limited by a lack of ecological validity compared to the real-world setting in which features may be found. Nonetheless, product modifications, tested in experimental settings, show promise as an intervention that has the potential to reach far larger numbers of people if implemented or mandated industry-wide. Studies found that multiline products and LDWs can be immersive, and can induce states of dark flow where players may encounter heightened arousal and reinforcement to gamble, along with players overestimating their winnings. The near miss effect can also increase the desire to continue gambling, whether on slots-based products of scratchcards. Slowing the speed-of-play can impact gambling behaviours thanks to the increased thinking time encouraged between spins. Jackpots, on the other hand, can

encourage higher gambling spend, with the expiry of jackpots discouraging further spending.

Finally, the report reviewed the ways in which treatments can help those experiencing gambling harms. 'Social' innovations comprising therapeutic treatments such as CBT programmes were highlighted as successful at reducing 'problem gambling' severity scores within most studies explored (albeit they tended to have small sample sizes). 'Technical' innovations have also demonstrated how operators or service providers can use means available to them such as mail or telephone to interact with individuals who may be demonstrating harmful gambling behaviour. These 'social' and 'technical' innovations can evolve into socio-technical innovations with the use of Internet-based interventions such as i-CBT. However, while important, these treatments focus on the individual. Equal focus should be given to enabling individuals to access treatment, and ensuring that discourse around the risks of gambling harms is moved away from individual responsibility that may be both stigmatising and ineffective at reducing gambling harms.

Referring back to Geels' (2004) definition, socio-technical innovations emerge from the interplay between evolving technologies, their end users, and rules (whether rules are laws or socially or culturally accepted norms). The socio-technical innovations explored here which may combat gambling harms need to be understood in the context of digital forms of gambling, the Internet-based platforms which host them, their interaction with end stakeholders (whether an operator, a person experiencing gambling harms, or a treatment provider), and the evolving norms and laws that shape them. Examples from Great Britain – such as the low contact rate from operators (Forrest et al., 2022) and the use of industry-backed messaging (Van Schalkwyk et al., 2021; Newall et al., 2022a) – reinforce that governmental bodies should play a major role in regulating operator practice.

This scoping review's findings should be considered given its limitations. Firstly, although the search terms were derived in assistance with academics from the University of Bristol, the specific nature of the search terms means that literature potentially relevant to the main research question may not have emerged during the literature search. Second, many of the studies into the modification of product design and their impact on gambling behaviours were conducted in laboratory settings, meaning that findings were not as ecologically valid as they would have been if conducted in real-world settings. Third, while the sample of literature included important findings on treatments and interventions targeted at the individual who is harmed by their own gambling, there was little research on interventions focused towards those harmed by another person's gambling. Findings from our scoping review on the everyday practice and portrayal of gambling in social groups (Ford et al., 2024a) highlight how partners, children and other family members or friends can also experience gambling harms. Finally, it is worth noting that this scoping review found a greater number of longitudinal studies compared to those carried out in relation to the Hub's other challenges (Ford et al., 2024a, 2024b; Wheaton et al., 2024), particularly where studies explored the impact of 'responsible gambling' tools. While this is encouraging, further research

using longitudinal data is needed to explore the impact of socio-technical innovations on real-life gambling behaviours. This would be best achieved through the analysis of the datasets of individual-level gambling transaction data from operators, similar to that conducted by Forrest and McHale (2022).

References and appendices

References

American Psychiatric Association. (2000). *Fourth Edition of the Diagnostic and Statistical Manual of Mental Disorder*. Arlington: American Psychiatric Association.

Arksey, H., & O'Malley, L. (2005). Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology*, 8(1), 19-32.

Auer, M., & Griffiths, M.D. (2013). Voluntary Limit Setting and Player Choice in Most Intense Online Gamblers: An Empirical Study of Gambling Behaviour. *Journal of Gambling Studies*, 29, 647-660.

Auer, M., & Griffiths, M.D. (2014). An Empirical Investigation of Theoretical Loss and Gambling Intensity. *Journal of Gambling Studies*, 30, 879-887.

Auer, M., & Griffiths, M.D. (2015a). The use of personalized behavioral feedback for online gamblers: an empirical study. *Frontiers in Psychology*, https://doi.org/10.3389/fpsyg.2015.01406.

Auer, M., & Griffiths, M.D. (2015b). Testing normative and self-appraisal feedback in an online slot-machine pop-up in a real-world setting. *Frontiers in Psychology*, https://www.frontiersin.org/articles/10.3389/fpsyg.2015.00339/full.

Auer, M., & Griffiths, M.D. (2023a). The Impact of Personalized Feedback Interventions by a Gambling Operator on Subsequent Gambling Expenditure in a Sample of Dutch Online Gamblers. *Journal of Gambling Studies*, 39, 929-945.

Auer, M., & Griffiths, M.D. (2023b). The Effect of a Mandatory Play Break on Subsequent Gambling Behaviour among British Online Casino Players: A Large-Scale Real-World Study. *Journal of Gambling Studies*, 39, 389-399.

Auer, M., & Griffiths, M.D. (2023c). The relationship between structural characteristics and gambling behaviour: An online gambling player tracking study. *Journal of Gambling Studies*, 39, 265-279.

Auer, M., Hopfgartner, N., & Griffiths, M.D. (2019). The effects of a mandatory play break on subsequent gambling among Norwegian video lottery terminal players. *Journal of Behavioral Addictions*, 8(3), 522-529.

Auer, M., Hopfgartner, N., & Griffiths, M.D. (2020a). The Effects of Voluntary Deposit Limit-Setting on Long-Term Online Gambling Expenditure. *Cyberpsychology, Behavior, and Social Networking*, 23(2), 113-118.

Auer, M., Reistad, S.H., & Griffiths, M.D. (2020b). Global Limit Setting as a Responsible Gambling Tool: What Do Players Think?. *International Journal of Mental Health and Addiction*, 18, 14-26.

Behavioural Insights Team. (2021a). *Applying behavioural insights to design better safer gambling tools*. *Part 2: Commitment devices.* Available at: https://www.begambleaware.org/sites/default/files/2021-

07/Remote_Interventions_Phase%202_BIT-Commitment%20devices_report_final_0.pdf. Accessed on 13 April 2023.

Behavioural Insights Team. (2021b). *Applying behavioural insights to design better safer gambling tools. Part 1: Anchoring*. Available at: https://www.bi.team/wp-content/uploads/2021/01/Remote-Interventions-gambling-anchoring-report-Final-Jan-15th-2021.pdf. Accessed on 22 June 2023.

Ben-Tovim, D.I., Esterman, A., Tolchard, B., and Battersby, M. (2001). *The Victorian Gambling Screen.* Gambling Research Panel: Melbourne.

Berge, J., Abrahamsson, T., Lyckberg, A., Franklin, K., & Håkansson, A. (2022). A Normative Feedback Intervention on Gambling Behavior—A Longitudinal Study of Post-Intervention Gambling Practices in At-Risk Gamblers. *Frontiers in Psychiatry*, https://www.frontiersin.org/articles/10.3389/fpsyt.2022.602846/full.

Betting and Gaming Council. (2023a). Safer Gambling Commitments. Available at: https://bettingandgamingcouncil.com/commitments. Accessed on 20 June 2023.

Betting and Gaming Council. (2023b). Betting And Gaming Industry Unites Again For Safer Gambling Week 2023. Available at: https://bettingandgamingcouncil.com/news/safer-gambling-week-2023. Accessed on 20 June 2023.

Blaszczynski, A., Gainsbury, S., & Karlov, L. (2014). Blue Gum Gaming Machine: An Evaluation of Responsible Gambling Features. *Journal of Gambling Studies*, 30, 697-712.

Blaszczynski, A., Ladouceur, R., & Shaffer, H.J. (2004). A Science-Based Framework for Responsible Gambling: The Reno Model. *Journal of Gambling Studies*, 20, 301-317.

Blaszczynski, A., Sharpe, L., Walker, M., Shannon, K., & Coughlan, M. (2005). Structural Characteristics of Electronic Gaming Machines and Satisfaction of Play Among Recreational and Problem Gamblers. *International Gambling Studies*, 5(2), 187-198.

Boudreault, C., Giroux, I., Jacques, C., Goulet, A., Simoneau, H., & Ladouceur, R. (2018). Efficacy of a Self-Help Treatment for At-Risk and Pathological Gamblers. *Journal of Gambling Studies*, 34, 561-580.

Bournemouth University. (2022). How to create safer gambling. Available at: https://www.begambleaware.org/sites/default/files/2022-10/How%20to%20create%20safer%20online%20gambling%20-%20Bournemouth%20University%20August%202022.pdf. Accessed on 13 April 2023.

Browne, M., Goodwin, B., and Rockloff, M. (2018). Validation of the Short Gambling Harm Screen (SGHS): A Tool for Assessment of Harms from Gambling. *Journal of Gambling Studies*, 34, 499–512.

Byrne, C.A., & Russell, A.M.T. (2020). Making EGMs Accountable: Can an Informative and Dynamic Interface Help Players Self-regulate?, *Journal of Gambling Studies*, 36, 1229-1251.

Caillon, J., Grall-Bronnec, M., Saillard, A., Leboucher, J., Péré, M., & Challet-Bouju, G. (2021). Impact of Warning Pop-Up Messages on the Gambling Behavior, Craving, and Cognitions of Online Gamblers: A Randomized Controlled Trial. *Frontiers in Psychiatry*, 12, https://doi.org/10.3389/fpsyt.2021.711431.

Casey, L.M., Oei, T.P.S., Raylu, N., Horrigan, K., Day, J., Ireland, M., & Clough, B.A. (2017). Internet-Based Delivery of Cognitive Behaviour Therapy Compared to Monitoring, Feedback and Support for Problem Gambling: A Randomised Controlled Trial. *Journal of Gambling Studies*, 33, 993-1010.

Cassidy, R. (2020). *Vicious Games*. London: Pluto Press.

Christensen, D.R., Dowling, N.A., Jackson, A.C., Brown, M., Russo, J., Francis, K.L., & Unemoto, A. (2013). A Proof of Concept for Using Brief Dialectical Behavior Therapy as a Treatment for Problem Gambling. *Behaviour Change*, 30(2), 117-137.

Clark, L.L., Lawrence, A.J., Astley-Jones, F., & Gray, N. (2009). Gambling Near-Misses Enhance Motivation to Gamble and Recruit Win-Related Brain Circuitry. *Neuron*, 61(3), 481-490.

Cloutier, M., Ladouceur, R., & Sévigny, S. (2006). Responsible Gambling Tools: Pop-Up Messages and Pauses on Video Lottery Terminals. *The Journal of Psychology*, 140(5), 434-438.

Corr, P.J., & Thompson, S.J. (2014). Pause for Thought: Response Perseveration and Personality in Gambling. *Journal of Gambling Studies*, 30, 889-900.

Currie, S.R., Brunelle, N., Dufour, N., Flores-Pajot, M., Hodgins, D., Nadeau, L., & Young, M. (2020). Use of Self-control Strategies for Managing Gambling Habits Leads to Less Harm in Regular Gamblers. *Journal of Gambling Studies*, 36, 695-698.

Dixon, M.J., Graydon, C., Harrigan, K.A., Wojtowicz, L., Siu, V., & Fugelsang, J.A. (2014). The allure of multi-line games in modern slot machines. *Addiction*, 109(11), 1920-1928.

Dixon, M.J., Harrigan, K.A., Sandhu, R., Collins, K., & Fugelsang, J.A. (2010). Losses disguised as wins in modern multi-line video slot machines. *Addiction*, 105(10), 1819-1824.

Dixon, M.J., Stange, M., Larche, C.J., Graydon, C., Fugelsang, J.A., & Harrigan, K.A. (2018). Dark Flow, Depression and Multiline Slot Machine Play. *Journal of Gambling Studies*, 34, 73-84

Donaldson, P., Langham, E., Rockloff, M.J., & Browne, M. (2016). Veiled EGM Jackpots: The Effects of Hidden and Mystery Jackpots on Gambling Intensity. *Journal of Gambling Studies*, 32, 487-498.

Dowling, N. (2009). Client characteristics associated with treatment attrition and outcome in female pathological gambling. *Addiction Research & Theory*, 17(2), 205-219.

Dowling, N.A., Merkouris, S.S., Rodda, S.N., Smith, D., Aarsman, S., Lavis, T., Lubman, D.I., Austin, D.W., Cunningham, J.A., Battersby, M.W., & Chul O., S. (2021). GamblingLess: A Randomised Trial Comparing Guided and Unguided Internet-Based Gambling Interventions. *Journal of Clinical Medicine*, 10(11), 2224.

Dowling, N., Smith, D., & Thomas, T. (2006). Treatment of Female Pathological Gambling: The Efficacy of a Cognitive-Behavioural Approach. *Journal of Gambling Studies*, 22, 355-372.

Dowling, N., Smith, D., & Trang, T. (2009). A Preliminary Investigation of Abstinence and Controlled Gambling as Self-Selected Goals of Treatment for Female Pathological Gambling. *Journal of Gambling Studies*, 25, 201-214.

Dragicevic, S., Percy, C., Kudic, A., & Parke, J. (2015). A Descriptive Analysis of Demographic and Behavioral Data from Internet Gamblers and Those Who Self-exclude from Online Gambling Platforms. *Journal of Gambling Studies*, 31, 105-132.

Edson, T.C., Tom, M.A., & LaPlante, D.A. (2021). Examining Player Engagement with and Attitudes Toward a Gambling Play Management System. *Journal of Gambling Studies*, 37, 1313-1334.

Engebø, J., Torshein, T., & Pallesen, S. (2022). Gamblers' use of measures to prevent gambling problems and reduce harm. *Frontiers in Psychiatry*, https://www.frontiersin.org/articles/10.3389/fpsyt.2022.857280/full.

Ferris, J., and Wynne, H. (2001). *The Canadian Problem Gambling Index: Final Report*. Canadian Consortium for Gambling Research.

Ford, B., Wheaton, J., Banissy, M., Nairn, A., & Collard, S. (2024b). *Perceptions, Motivations, Decisions: What initiates harmful gambling?* Bristol Hub for Gambling Harms Research, University of Bristol.

Ford, B., Wheaton, J., Nairn, A., & Collard, S. (2024a). *Narratives, Practice, Representation: What is the everyday practice and portrayal of gambling in social groups?* Bristol Hub for Gambling Harms Research, University of Bristol.

Forrest, D., & McHale, I.G. (2022). *Patterns of Play. Technical Report 2: Account Data Stage*. National Centre for Social Research. Available at: https://natcen.ac.uk/sites/default/files/2023-03/Patterns%20of%20Play_Technical%20Report%202_Account%20Data%20Stage%20Report.pdf. Accessed on 13 April 2023.

Forsstrom, D., Rafi, J., & Carlbring, P. (2020). Dropouts' usage of a responsible gambling tool and subsequent gambling patterns. *Cogent Psychology*, 7(1), 1715535.

Gallagher, T., Nicki, R., Otteson, A., & Elliott, H. (2011). Effects of a Video Lottery Terminal (VLT) Banner on Gambling: A Field Study. *International Journal of Mental Health and Addiction*, 9, 126-133.

Gainsbury, S.M., Aro, D., Ball, D., Tobar, C., & Russell, A. (2015). Determining optimal placement for pop-up messages: evaluation of a live trial of dynamic warning messages for electronic gaming machines. *International Gambling Studies*, 15(1), 141-158.

Gainsbury, S.M., Parke, J., & Suhonen, N. (2013). Consumer attitudes towards Internet gambling: Perceptions of responsible gambling policies, consumer protection, and regulation of online gambling sites. *Computers in Human Behavior*, 29(1), 235-245.

Gambling Commission. (2023a). 3.3.1 - Responsible gambling information. Available at: https://www.gamblingcommission.gov.uk/licensees-and-businesses/lccp/condition/3-3-1-responsible-gambling-information. Accessed on 25th May 2023.

Gambling Commission. (2023b). 3.5.4 - Self-exclusion – Remote ordinary code. Available at: https://www.gamblingcommission.gov.uk/licensees-and-businesses/lccp/condition/3-5-4-remote-ordinary-code. Accessed on 13th October 2023.

Gambling Commission. (2023c). 3.5.2 - Self-exclusion – non-remote ordinary code. Available at: https://www.gamblingcommission.gov.uk/licensees-and-businesses/lccp/condition/3-5-2-non-remote-ordinary-code. Accessed on 13th October 2023.

Gambling Commission. (2022). Licence conditions and codes of practice. Available at: https://www.gamblingcommission.gov.uk/licensees-and-businesses/lccp. Accessed on 15 August 2023.

Gamban. (2023). Effective Worldwide Gambling Blocking. Available at: https://gamban.com/product. Accessed on 1 May 2023.

Gamcare. (2023). Safer Gambling Standard. Available at: https://www.safergamblingstandard.org.uk/what-is-the-standard/what-is-safer-gambling/. Accessed on 20 June 2023.

Gamstop (2023). About. Available at: https://www.about.gamstop.co.uk/. Accessed on 1 May 2023.

Geels, F.W. (2004). From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory. *Research Policy*, 33, 897-920.

Ginley, M.K., Whelan, J. P., Keating, H. A., & Meyers, A. W. (2016). Gambling warning messages: The impact of winning and losing on message reception across a gambling session. *Psychology of Addictive Behaviors*, 30(8), 931–938.

Gosschalk, K., Webb, S., Cotton, C., Harmer, L., Bonansinga, D., and Gunstone, B. (2023). *Annual GB Treatment and Support Survey 2022. On*

behalf of GambleAware. YouGov. Available at: https://www.begambleaware.org/sites/default/files/2023-07/GambleAware%20Treatment%20and%20Support%20Report%20July%202022.pdf Accessed on 24 August 2023.

Graydon, C., Dixon, M.J., Gutierrez, J., Stange, M., Larche, C.J., & Kruger, T.B. (2021). Do losses disguised as wins create a "sweet spot" for win overestimates in multiline slots play?. *Addictive Behaviors*, 112, 106598.

Graydon, C., Stange, M., & Dixon, M.J. (2018). Losses Disguised as Wins Affect Game Selection on Multiline Slots. *Journal of Gambling Studies,* 34, 1377-1390.

Haefeli, J., Lischer, S., & Schwarz, J. (2011). Early detection items and responsible gambling features for online gambling. *International Gambling Studies*, 11(3), 273-288.

Håkansson, A., & Åkesson, G. (2022). Multi-operator Self-exclusion as a Harm Reduction Measure in Problem Gambling: Retrospective Clinical Study on Gambling Relapse Despite Self-exclusion. *JMIR Mental Health*, 9(8), e37837.

Harris, A., Gous, G., de Wet, B., & Griffiths, M.D. (2021). The Relationship Between Gambling Event Frequency, Motor Response Inhibition, Arousal, and Dissociative Experience. *Journal of Gambling Studies*, 37, 241-268.

Heirene, R.M., Vanichkina, D.P., & Gainsbury, S. M. (2021). Patterns and correlates of consumer protection tool use by Australian online gambling customers. *Psychology of Addictive Behaviors*, 35(8), 974–984.

Hing, N., Browne, M., Russell, A.M.T., Rockloff, M., Rawat, V., Nicoll, F., & Smith, G. (2019). Avoiding gambling harm: An evidence-based set of safe gambling practices for consumers. *PLOS One*, 14(10), e0224083.

Hing, N., Sproston, K., Tran, K., & Russell, A.M.T. (2017). Gambling Responsibly: Who Does It and To What End? *Journal of Gambling Studies*, 33, 149-165.

Hodgins, D.C., Currie, S.R., el-Guebaly, N., & Diskin, K.M. (2007). Does Providing Extended Relapse Prevention Bibliotherapy to Problem Gamblers Improve Outcome?. *Journal of Gambling Studies*, 23, 41-54.

Hodgins, D.C., Peden, N., and Makarchuk, K. (2004). *Self-efficacy in pathological gambling treatment outcome: development of a gambling abstinence self-efficacy scale (GASS).* International Gambling Studies, 2, 99-108.

Hollingshead, S.J., Wohl, M.J.A., & Santesso, D. (2019). Do you read me? Including personalized behavioral feedback in pop-up messages does not enhance limit adherence among gamblers. *Computers in Human Behavior*, 94, 122-130.

Hopfgartner, N., Auer, M., Helic, D., & Griffiths, M.D. (2023c). The Efficacy of Voluntary Self-Exclusions in Reducing Gambling Among a Real-World Sample of British Online Casino Players. *Journal of Gambling Studies*, 39, 1833-1848.

Hopfgartner, N., Auer, M., Griffiths, M.D., & Helic, D. (2023b). Predicting self-exclusion among online gamblers: An empirical real-world study. *Journal of Gambling Studies*, 39, 447-465.

Hopfgartner, N., Auer, M., Santos, T., Helic, D., & Griffiths, M.D. (2023a). Cooling Off and the Effects of Mandatory Breaks in Online Gambling: A Large-Scale Real-World Study. *International Journal of Mental Health and Addiction*, https://doi.org/10.1007/s11469-022-00996-7.

IJsselsteijn, W.A., de Kort, Y.A.W., & Poels, K. (2013). The Game Experience Questionnaire. *Technische Universiteit Eindhoven*. Available at: https://pure.tue.nl/ws/files/21666907/Game_Experience_Questionnaire_English.pdf#:~:text=It%20assesses%20game%20experience%20as%20scores%20on%20seven,robust%20measure%2C%20we%20need%20five%20items%20per%20component. Accessed on 20 November 2023.

Jardin, B., & Wulfert, E. (2009). The Use of Messages in Altering Risky Gambling Behavior in College Students: An Experimental Analogue Study. *American Journal on Addictions*, 18(3), 243-247.

Jonas, B., Leuschner, F., Eiling, A., Schoelen, C., Soellner, R., & Tossman, P. (2020). Web-Based Intervention and Email-Counseling for Problem Gamblers: Results of a Randomized Controlled Trial. *Journal of Gambling Studies*, 36, 1341-1358.

Jonsson, J., Hodgins, D.C., Munck, I., & Carlbring, P. (2021). Reaching Out to Big Losers: How Different Types of Gamblers are Affected by a Brief Motivational Contact Initiated by the Gambling Provider. *Journal of Gambling Studies*, 37, 387-401.

Kim, S.W., Grant, J.E., Potenza, M.N., Blanco, C., & Hollander, E. (2009). The Gambling Symptom Assessment Scale (G-SAS): A reliability and validity study. *Psychiatry Research*, 166(1), 76-84.

Kruger, T.B., Dixon, M.J., Graydon, C., Larche, C.J., Stange, M., Smith, S.D., & Smilek, D. (2022). Contrasting Mind-Wandering, (Dark) Flow, and Affect During Multiline and Single-Line Slot Machine Play. *Journal of Gambling Studies*, 38, 185-203.

Ladouceur, R., & Walker, M. (1996). A cognitive perspective on gambling, pp. 89-199 in Salkovskis, P.M. (ed). *Trends in cognitive and behavioural therapies*. New York: Wiley.

Landon, J., Palmer du Preez, K., Bellringer, M., Page, A., & Abbott, M. (2016). Pop-up messages on electronic gaming machines in New Zealand: experiences and views of gamblers and venue staff. *International Gambling Studies*, 16(1), 49-66.

Leino, T., Torsheim, T., Pallesen, S., Blaszczynski, A., Sagoe, D., & Molde, H. (2016). An empirical real-world study of losses disguised as wins in electronic gaming machines. *International Gambling Studies*, 16(3), 470-480.

Lesieur H.R., & Blume, S.B. (1992) Modifying the Addiction Severity Index for use with pathological gamblers. *American Journal on Addictions*, 1, 240–247.

Li, E., Rockloff, M.J., Browne, M., & Donaldson, P. (2016). Jackpot Structural Features: Rollover Effect and Goal-Gradient Effect in EGM Gambling. *Journal of Gambling Studies*, 32, 707-720.

Livingstone, C., & Rintoul, A. (2020). Moving on from responsible gambling: a new discourse is needed to prevent and minimise harm from gambling. *Public Health*, 184, 107-112.

López Viets, V.C., & Miller, W.R. (1997). Treatment Approaches for Pathological Gamblers, *Clinical Psychology Review*, 17(7), 689-702.

Marko, S., Thomas, S.L., Robinson, K., & Daube, M. (2022). Gamblers' perceptions of responsibility for gambling harm: a critical qualitative inquiry. *BMC Public Health*, 22, 725.

McGivern, P., Hussain, Z., Lipka, S., & Stupple, E. (2019). The impact of pop-up warning messages of losses on expenditure in a simulated game of online roulette: a pilot study. *BMC Public Health*, 19, 822.

Mentzoni, R.A., Laberg, J.C., Brunborg, G.S., Molde, H., & Pallesen, S. (2012). Tempo in electronic gaming machines affects behaviour among at-risk gamblers. *Journal of Behavioral Addictions* 1(3), 135-139.

Merkouris, S.S., Hawker, C.O., Rodda, S.N., Youssef, G.J., & Dowling, N.A. (2020). GamblingLess: Curb Your Urge: Development and usability testing of a smartphone-delivered ecological momentary intervention for problem gambling. *International Gambling Studies*, 20(3), 515-538.

Miller, W.R., Zweben, A., DiClemente, C.C., Rychtarik, R.G. (1999). *Motivational Enhancement Therapy Manual*. Rockville: National Institute on Alcohol Abuse and Alcoholism.

Monaghan, S., & Blaszczynski, A. (2010). Impact of Mode of Display and Message Content of Responsible Gambling Signs for Electronic Gaming Machines on Regular Gamblers. *Journal of Gambling Studies*, 26, 67-88.

Monaghan, S., Blaszczynski, A., & Nower, L. (2009). Do Warning Signs on Electronic Gaming Machines Influence Irrational Cognitions?, *Psychological Reports*, 105(1), 173-187.

Myles, D., Bennett, D., Carter, A., Yucel, M., Albertella, L., de Lacy-Vawdon, & Livingstone, C. (2023). "Losses disguised as wins" in electronic gambling machines contribute to win overestimation in a large online sample. *Addictive Behaviors Reports*, 18, 100500.

Newall, P.W.S. (2023). Reduce the speed and ease of online gambling in order to prevent harm. *Addiction*, 118(2), 201-392

Newall, P.W.S., Byrne, C.A., Russell, A.M.T., & Rockloff, M.J. (2022b). House-edge information and a volatility warning lead to reduced gambling expenditure: Potential improvements to return-to-player percentages. *Addictive Behaviours*, 130, 107308.

Newall, P.W.S., James, R.J.E., & Maynard, O.M.M. (2023). How does the phrasing of house edge information affect gamblers' perceptions and level of understanding? A Registered Report. *Addiction Research & Theory*, DOI: 10.1080/16066359.2023.2195171.

Newall, P.W.S., Walasek, L., & Ludvig, E.A. (2022c). Risk communication improvements for gambling: House-edge information and volatility statements. *Psychology of Addictive Behaviors*, 36(4), 358–363.

Newall, P.W.S., Weiss-Cohen, L., Singmann, H., Walasek, L., & Ludwig, E.A. (2022a). Impact of the "when the fun stops, stop" gambling message on online gambling behaviour: a randomised, online experimental study. *Lancet Public Health*, 7: e437-446.

Newall, P.W.S., Weiss-Cohen, L., Singmann, H., Boyce, W.P., Walasek, L., & Rockloff, M.J. (2022d). A speed-of-play limit reduces gambling expenditure in an online roulette game: Results of an online experiment. *Addictive Behaviors*, 127, 107229.

NHS England (2023). NHS doubles gambling clinics as referrals soar [online]. Available at https://www.england.nhs.uk/2023/07/nhs-doubles-gambling-clinics-as-referrals-soar/ Accessed 24 August 2023.

Nilsson, A., Magnusson, K., Carlbring, P., Andersson, G., & Gumpert, C.H. (2018). The Development of an Internet-Based Treatment for Problem Gamblers and Concerned Significant Others: A Pilot Randomized Controlled Trial. *Journal of Gambling Studies*, 34, 539-559.

Nilsson, A., Magnusson, K., Carlbring, P., Andersson, G., & Hellner, C. (2020). Behavioral couples therapy versus cognitive behavioral therapy for problem gambling: a randomized controlled trial. *Addiction*, 1330-1342.

Nower, L., & Blaszczynski, A. (2010). Gambling Motivations, Money-Limiting Strategies, and Precommitment Preferences of Problem Versus Non-Problem Gamblers. *Journal of Gambling Studies*, 26, 361-372.

Oakes, J., Battersby, M.W., Pols, R.G., & Cromarty, P. (2008). Exposure Therapy for Problem Gambling vis Videoconferencing: A Case Report. *Journal of Gambling Studies*, 24, 107-118.

Office for Health Improvement & Disparities. (2023). Gambling treatment and support in England: main findings and methodology. Available at: https://www.gov.uk/government/publications/gambling-treatment-need-and-support-prevalence-estimates/gambling-treatment-need-and-support-in-england-main-findings-and-methodology. Accessed on 7 December 2023.

Okuda, M., Balán, I., Petry, N.M., Oquendo, M., & Blanco, C. (2009). Cognitive-behavioral therapy for pathological gambling: cultural considerations. *The American Journal of Psychiatry*, 166(12), 1325-1330.

Page, M.J., McKenzie, J.E., Bossuyt, P.M., Boutron, I., Hoffmann, T.C., Mulrow, C.D. et al. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*, 372, n71.

Park, J., Choi, S., Kim, D., Boots, D., & Lee, C.K. (2021). Role of Technology in Sustainable Gambling: Policy Effects of Electronic Card System and Limit Setting. *Mathematical Problems in Engineering*, 2021, 1779535.

Penfold, K.L., & Ogden, J. (2022). Exploring gamblers' experiences of problem gambling interventions: A qualitative study. *Cogent Psychology*, 9(1), 2138805.

Petry, N.M., Weinstock, J., Morasco, B.J., Ledgerwood, D.M. (2009). Brief motivational interventions for college student problem gamblers. *Addiction*, 104(9), 1569-1578.

Pfund, R.A., Whelan, J.P., Peter, S.C., & Meyers, A.W. (2020). Can a motivational letter increase attendance to psychological treatment for gambling disorder? *Psychological Services*, 17(1), 102–109.

Pickering, D., & Blaszczynski, A. (2022). Should I Stay or Should I Go? A Comparative Exploratory Analysis of Individuals Electing to Continue or Discontinue Self-Exclusion from Land-Based Gambling Venues. *International Journal of Mental Health and Addiction*, 20, 1182-1198.

Pickering, D., Nong, Z., Gainsbury, S.M., & Blaszczynski, A. (2019). Consumer Perspectives of a Multi-Venue Gambling Self-Exclusion Program: A Qualitative Process Analysis. *Journal of Gambling Issues*, 41, 20-39.

Pickering, D., Serafimovska, A., Cho, S.J., Blaszczynski, A., & Gainsbury, S.M. (2022). Online self-exclusion from multiple gambling venues: Stakeholder co-design of a usable and acceptable self-directed website. *Internet Interventions*, 27, 100491.

Ranta, J., Bellringer, M., Garrett, N., & Abbott, M. (2019). Can a Brief Telephone Intervention for Problem Gambling Help to Reduce Co-existing Depression? A Three-Year Prospective Study in New Zealand. *Journal of Gambling Studies*, 35, 617-633.

Raylu, N., and Oei, T.P.S. (2004a). The Gambling Related Cognitions Scale (GRCS): development, confirmatory factor validation and psychometric properties. *Addiction*, 99, 757-769.

Raylu, N., and Oei, T.P.S. (2004b). The gambling urge scale: development, confirmatory factor validation, and psychometric properties. *Psychology of Addictive Behaviors*, 18, 100–105.

Riley, B.J., Harris, S., Nye, T., Javidi-Hosseinabad, Z., & Baigent, M. (2021). Graded Exposure Therapy for Online Mobile Smartphone Sports Betting Addiction: A Case Series Report. *Journal of Gambling Studies*, 37, 1263-1275.

Rockloff, M.J., Donaldson, P., & Browne, M. (2015). Jackpot Expiry: An Experimental Investigation of a New EGM Player-Protection Feature. *Journal of Gambling Studies*, 31, 1505-1514.

Rodda, S.N., Merkouris, S., Lavis, T., Smith, D., Lubman, D.I., Austin, D., Harvey, P., Battersby, M., & Dowling, N.A. (2019). The therapist experience of internet delivered CBT for problem gambling: Service integration considerations. *Internet Interventions*, 18, 100264.

Salaghe, F., Guerrero, F., Jones, D., Nichols, M.W., & Sundali, J. (2023). Behavioral Responses to Losses Disguised as Wins: A Field Study of Slot Machine Players. *Journal of Gambling Studies*, 39, 1155-1174.

Scarfe, M.L., Stange, M., & Dixon, M.J. (2021). Measuring Gamblers' Behaviour to Show That Negative Sounds Can Reveal the True Nature of Losses Disguised as Wins in Multiline Slot Machines. *Journal of Gambling Studies*, 37, 403-425.

Sharman, S., Aitken, M.R.F., & Clark, L. (2015). Dual effects of 'losses disguised as wins' and near-misses in a slot machine game. *International Gambling Studies*, 15(2), 212-223.

Siemens, J.C., & Kopp, S.W. (2011). The Influence of Online Gambling Environments on Self-Control. *Journal of Public Policy & Marketing*, 30(2), 279-293.

Stange, M., & Dixon, M.J. (2020). Scratch Card Near-Miss Outcomes Increase the Urge to Gamble, but Do Not Impact Further Gambling Behaviour: A Pre-registered Replication and Extension. *Journal of Gambling Studies*, 36(3), 887-902.

Stinchfield, R. (2002). Reliability, validity, and classification accuracy of the South Oaks Gambling Screen (SOGS). *Addictive Behaviors*, 27(1), 1-19.

Sundali, J.A., Safford, A.H., & Croson, R. (2012). The impact of near-miss events on betting behavior: An examination of casino rapid roulette play. *Judgment and Decision Making*, 7(6), 768-778.

Tárrega, S., Castro-Carreras, L., Fernández-Aranda, F., Granero, R., Giner-Bartolomé, C., Aymami, B., Gómez-Pena, N., Santamaría, J.J., Forcano, L., Steward, T., Menchón, J.M., & Jiménez-Murcia, S. (2015). A Serious Videogame as an Additional Therapy Tool for Training Emotional Regulation and Impulsivity Control in Severe Gambling Disorder. *Frontiers in Psychology*, https://doi.org/10.3389/fpsyg.2015.01721.

Templeton, J.A., Dixon, M.J., Harrigan, K.A., & Fugelsang, J.A. (2015). Upping the Reinforcement Rate by Playing the Maximum Lines in Multi-line Slot Machine Play. *Journal of Gambling Studies*, 31, 949-964.

Thompson, S.J., & Corr, P.J. (2013). A Feedback-Response Pause Normalises Response Perseveration Deficits in Pathological Gamblers. *International Journal of Mental Health and Addiction*, 11, 601-610.

Toneatto, T., & Wang, J.J. (2009). Community Treatment for Problem Gambling: Sex Differences in Outcome and Process. *Community Mental Health Journal*, 45, 468-475.

Tse, S., Campbell, L., Rossen, F., Wang, C., Jull, A., Yan, E., & Jackson, A. (2012). Face-to-Face and Telephone Counselling for Problem Gambling: A Pragmatic Multisite Randomized Study. *Research on Social Work Practice*, 23(1), 57-65.

Turner, N.E., Shi, J., Robinson, J., McAvoy, S., & Sanchez, S. (2021). Efficacy of a Voluntary Self-exclusion Reinstatement Tutorial for Problem Gamblers. *Journal of Gambling Studies,* 37, 1245-1262.

Ulrich, N., Ambach, W., & Hewig, J. (2016). Severity of gambling problems modulates autonomic reactions to near outcomes in gambling. *Biological Psychology*, 119, 11-20.

Van Schalkwyk, M.C.I., Maani, N., McKee, M., Thomas, S., Knai, C., & Petticrew, M. (2021). “When the Fun Stops, Stop”: An analysis of the provenance, framing and evidence of a ‘responsible gambling’ campaign. *PLOS One*, 16(8), e0255145.

Wardle, H., Reith, G., Best, D., McDaid, D., & Platt, S. (2018). *Measuring gambling-related harms: A framework for action*. Gambling Commission.

Wheaton, J., Collard, S., & Nairn, A. (2024). *Experience, Risk, Harm: What social and spatial inequalities exacerbate gambling-related harms?* Bristol Hub for Gambling Harms Research, University of Bristol.

Wickwire, E.M., Burke, R.S., Brown, S.A., Parker, J.D., and May, R. K. (2008). Psychometric evaluation of the national opinion research center DSM-IV screen for gambling problems (NODS). *American Journal on Addictions*, 17(5), 392-395.

Wiebe, J., Wynne, H., Stinchfield, R., and Tremblay, J. (2007). *The Canadian Adolescent Gambling Inventory (CAGI): Phase II Final Report*. Canadian Consortium for Gambling Research.

Wohl, M.J.A., Davis, C.G., & Tabri, N. (2023). Setting a hard (versus soft) monetary limit decreases expenditure: an assessment using player account data. *International Gambling Studies*, https://doi.org/10.1080/14459795.2023.2183974.

Wohl, M.J.A., Parush, A., Kim, H.S., and Warren, K. (2014). Building it better: Applying human–computer interaction and persuasive system design principles to a monetary limit tool improves responsible gambling. *Computers in Human Behavior*, 37, 124-132.

Wood, R.T.A., & Wohl, M.J.A. (2015). Assessing the effectiveness of a responsible gambling behavioural feedback tool for reducing the gambling expenditure of at-risk players. *International Gambling Studies*, 2, 1-16.

Worhunsky, P.D., & Rogers, R.D. (2018). An Initial Investigation of Individual Rate-of-Play Preferences and Associations with EGM Gambling Behaviour. *Journal of Gambling Studies*, 34, 1067-1083.

Appendix One: Search terms and databases

The initial search for literature within this scoping review was guided by the overarching research question: “what socio-technical innovations can help combat gambling harms?”. The search terms and databases were formulated with guidance from University of Bristol academics involved in the Bristol Hub for Gambling Harms Research, with expertise in economic geography and history research.

The search terms were: (gambl*) OR (bett*) AND (“innovation” OR “socio-technical” OR “systems” OR “transition” OR “identity” OR “culture” OR “social mobility” OR “economic inequal*” OR “austerity” OR “legislation” OR “polic*” OR “landscapes” OR “offshor*” OR “payment methods”).

These search terms were entered into the following databases:

- EBSCO
- British Humanities Index
- EconLit
- Current Abstracts
- Historical Abstracts
- International Bibliography of the Social Sciences
- SCOPUS
- Social Services Abstracts
- Sociological Abstracts
- ProQuest
- JSTOR
- Anthropology Plus
- Web of Science

We then conducted a second literature search to include literature related to product design which was not uncovered during the initial literature search. The search terms were focused on product design, but literature relating to previous topics uncovered during the first literature search was also included.

The search terms for the second literature search were: “gambl*” OR “betting” AND “product” OR “design” OR “features” OR “spins” OR “structural characteristics” OR “alter*”.

These search terms were entered into the following databases:

- Medline
- Medbase
- SCOPUS
- Web of Science
- EBSCO

Appendix Two: Paper inclusion and data abstraction

Two literature searches were conducted. To be included in the initial literature search, papers were required to be published after 2005, in English, focusing on economies with a similar economic outlook to the United Kingdom, and be specifically linked to the research question. Papers therefore needed to be specifically related to socio-technical innovations that prevent gambling harms. Table A1 below details the numbers of included and excluded papers, as well as the reasons for exclusion. Papers, after de-duplication, were sifted by title, abstract, and then by full text.

The second literature search followed the same methodology, but focused on socio-technical innovations and aspects of product design. Table A2 details the numbers of included and excluded papers, as well as the reasons for exclusion. Papers, after de-duplication, were sifted by title, abstract, and then by full text.

Data were then abstracted from included texts, with specific criteria. These criteria are introduced in Table A3. Data abstracted under these criteria were subjected to narrative analysis, with the most prevalent themes within the data answering the guiding research question. Themes mainly emerged from data gathered under the ‘Summary of Findings’ criteria, but these data were developed in conjunction with other data highlighted within other fields.

Table A1: Details of included and excluded papers during the initial literature search

Sift One: By Title	Sift Two: By Abstract	Full Text: Data Abstract
Titles Sifted: 13,997	Abstracts Sifted: 643	Texts Screened: 168
Titles Included: 643	Abstracts Included: 168	Texts Included: 84
Titles Excluded: 13,354	Abstracts Excluded: 475 *Reasons for Exclusion:*	Texts Excluded: 84 *Reasons for Exclusion:*
Titles excluded due to not being clearly related to the research question.	Not related to research question: 374	Not related to research question: 45
	Published before 2005: 4	Data gathered before 2005: 16
	Focus on economy not similar to UK: 6	Focus on economy not similar to UK: 3
	Non-English: 15	Non-English: 1
	Non-journal article format (for example, review, book chapter, editorial or research protocol): 76	In development: 2
		Non-journal article format (for example, review, book chapter, editorial or research protocol): 13
		No full text: 3

Table A2: Details of included and excluded papers during the second literature search

<table>
<tr><th>Sift One: By Title</th><th>Sift Two: By Abstract</th><th>Full Text: Data Abstract</th></tr>
<tr><td>Titles Sifted: 24,284</td><td>Abstracts Sifted: 248</td><td>Texts Screened: 73</td></tr>
<tr><td>Titles Included: 248</td><td>Abstracts Included: 73</td><td>Texts Included: 58</td></tr>
<tr><td>Titles Excluded: 24,036</td><td>Abstracts Excluded: 175

Reasons for Exclusion:</td><td>Texts Excluded:

Reasons for Exclusion:</td></tr>
<tr><td rowspan="7">Titles excluded due to not being clearly related to the research question.</td><td>Not related to research question: 137</td><td>Not related to research question: 9</td></tr>
<tr><td>Focus on economy not similar to UK: 1</td><td>Focus on economy not similar to UK: 1</td></tr>
<tr><td>Excluded due to unclear methodology: 12</td><td>Excluded due to unclear methodology: 3</td></tr>
<tr><td>Duplicates: 3</td><td>No access: 1</td></tr>
<tr><td rowspan="3">Non-journal article format (for example, review, book chapter, editorial or research protocol): 22</td><td></td></tr>
<tr><td></td></tr>
<tr><td>Non-journal article format (for example, review, book chapter, editorial or research protocol): 1</td></tr>
<tr><td></td></tr>
</table>

Table A3: Criteria of data abstraction

Authors	Names of the authors who produced each paper.
Year of publication	The year in which each paper was published.
Title	The title of each paper.
URL	The URL or online link through which the paper was found.
Country of focus	The jurisdiction, country or economy under focus in each paper.
Funder	The funder of each paper, if given.
Declaration of Interest	The declaration of any conflicts of interest, if given by the authors.
Research Question	The guiding research question or focus of each paper.
Sample Size	The number of participants within the sample size of each study, in addition to any sampling criteria deployed.
Research Design	The methodology deployed within each study. These data included whether the methodology was quantitative or qualitative in nature, as well as any specific research instruments deployed.
Interventions	The intervention deployed within each study, if applicable. Interventions may have sought to alter gambling-related behaviours or understandings.
Outcome Measures	Measures deployed to measure the impact of any interventions, if deployed. These may also have consisted of screens such as the PGSI or SOGS to measure the prevalence of gambling behaviours within a sample.
Summary of Findings	A summary of the findings produced within each study, in addition to conclusions reached by the authors as a result of the data they have collected. Summaries may also include implications highlighted by the authors for future studies or interventions.
Limitations	Limitations outlined by the authors of each study.

Appendix Three: Grey literature

The sample of literature was augmented by grey literature, which was searched for on the websites of relevant organisations using the same search terms introduced within Appendix One. These organisations included the following:

- Behavioural Insights Team
- Bournemouth University
- Gambling Commission
- GambleAware
- GamStop
- GamBan
- Royal Society for Public Health
- GamCare
- National Centre for Social Research
- YouGov
- Public Health England
- NHS England
- National Problem Gambling Clinic
- Ipsos MORI
- Gambling With Lives
- Betting and Gaming Council

Some of the grey literature found during the scoping review is included in the reference list detailed earlier. However, the full list of references found during the search for grey literature is as follows:

Behavioural Insights Team. (2021a). *Applying behavioural insights to design better safer gambling tools*. *Part 2: Commitment devices.* Available at: https://www.begambleaware.org/sites/default/files/2021-07/Remote_Interventions_Phase%202_BIT-Commitment%20devices_report_final_0.pdf. Accessed on 13 April 2023.

Behavioural Insights Team. (2021b). *Applying behavioural insights to design better safer gambling tools. Part 1: Anchoring*. Available at: https://www.bi.team/wp-content/uploads/2021/01/Remote-Interventions-gambling-anchoring-report-Final-Jan-15th-2021.pdf. Accessed on 22 June 2023.

Betting and Gaming Council. (2023a). Safer Gambling Commitments. Available at: https://bettingandgamingcouncil.com/commitments. Accessed on 20 June 2023.

Betting and Gaming Council. (2023b). Betting And Gaming Industry Unites Again For Safer Gambling Week 2023. Available at: https://bettingandgamingcouncil.com/news/safer-gambling-week-2023. Accessed on 20 June 2023.

Bournemouth University. (2022). How to create safer gambling. Available at: https://www.begambleaware.org/sites/default/files/2022-10/How%20to%20create%20safer%20online%20gambling%20-%20Bournemouth%20University%20August%202022.pdf. Accessed on 13 April 2023.

Bramley, S., Norrie, C., Lipman, V., & Manthorpe, J. (2020). Exploring “what works” in creating infrastructures and engagement methods for people with lived experience within public health, health and social care, and addiction research. King’s College London. Available at: https://www.begambleaware.org/sites/default/files/2020-12/final-lived-experience-infrastructure-and-engagement-project-062020.pdf. Accessed on 13 April 2023.

Forrest, D., & McHale, I.G. (2022). *Patterns of Play. Technical Report 2: Account Data Stage*. National Centre for Social Research. Available at: https://natcen.ac.uk/sites/default/files/2023-03/Patterns%20of%20Play_Technical%20Report%202_Account%20Data%20Stage%20Report.pdf. Accessed on 13 April 2023.

Gamban. (2023). Effective Worldwide Gambling Blocking. Available at: https://gamban.com/product. Accessed on 1 May 2023.

Gamcare. (2023). Safer Gambling Standard. Available at: https://www.safergamblingstandard.org.uk/what-is-the-standard/what-is-safer-gambling/. Accessed on 20 June 2023.

GamCare. (2021). Analysis of GamCare treatment clients KCL Summary 2020/2021. Available at: https://issuu.com/tgdh/docs/gamcare_kcl_summary?fr=sM2RiNDM5OTMxMzc. Accessed on 13 April 2023.

GamCare. (2022). Impacts of GamCare's Women's Programme - Year Two. Available at: https://issuu.com/tgdh/docs/j030973_gamcare_womens_programme_external_report_w/12. Accessed on 13 April 2023.

Gunstone, B., Gosschalk, K., Zabicka, E., & Sullivan-Drage, C. (2021). Annual GB Treatment and Support Survey 2021. *YouGov.* Available at: https://www.begambleaware.org/sites/default/files/2022-03/Annual%20GB%20Treatment%20and%20Support%20Survey%20Report%202021%20%28FINAL%29_0.pdf. Accessed on 13 April 2023.

Ipsos MORI. (2021). Synthesis Report: The use of research in the Bet Regret campaign. Available at: https://www.begambleaware.org/sites/default/files/2021-08/20-001116-01%20Safer%20Gambling%20Synthesis%20report%20FINAL%20v5%20ICUO_090721_clean_0.pdf. Accessed on 13 April 2023.

NHS England (2023). NHS doubles gambling clinics as referrals soar [online]. Available at https://www.england.nhs.uk/2023/07/nhs-doubles-gambling-clinics-as-referrals-soar/ Accessed 24 August 2023.

Revealing Reality. (2021). An Integrated Approach to Safer Gambling. Available at: https://www.begambleaware.org/sites/default/files/2021-03/Revealing_Reality_Integrated_Safer_Gambling_Final_0.pdf. Accessed on 13 April 2023.

Bristol Hub for

GAMBLING HARMS RESEARCH