

Perceptions of interactive, real-time persuasive technology for managing online gambling

Emily Arden-Close¹[0000-0002-5954-2598], Elvira Bolat²[0000-0003-0910-0860], Laura Vuillier¹[0000-0002-1596-9303] and Raian Ali³[0000-0002-5285-7829]

¹ Department of Psychology, Faculty of Science and Technology, Bournemouth University, Poole, UK

² Faculty of Management, Bournemouth University, Poole, UK

³ College of Science and Engineering, Hamad Bin Khalifa University, Doha, Qatar
eardenclose@bournemouth.ac.uk

Abstract. Background: Interactive persuasive techniques, supported by the ability to retrieve real-time behaviour and other contextual data, offer an unprecedented opportunity to manage online activity. An example is Responsible Gambling (RG) tools. Currently, despite vast potential, they do not make use of real time gambling behaviour data, whether captured by operators (device, location, bets, limits set) or self-reported (finance, emotion, online browsing history). To design useful interactive persuasive tools, it is important to understand users' perceptions to ensure maximum acceptance.

Aims: Explore gamblers' perceptions of the potential of future online platforms in providing data-driven, real-time, persuasive interventions for supporting responsible online gambling. *Method:* Qualitative semi-structured interviews conducted with 22 gamblers (80% men; 15 ex-problem, 7 current), regarding perceptions of the potential of persuasive techniques. *Results:* Thematic analysis showed participants were positive about data-driven, real-time, interactive technology for (i) providing information (educational, personal and comparative), (ii) limiting gambling (time and money spent, access to gambling operators) and (iii) providing support to gamblers (advice, feedback and context sensing). The technology was identified as most appropriate for low to moderate gamblers. *Conclusions:* Participants were positive about the new data access, techniques and modalities of interactions for supporting responsible online gambling. To ensure maximum reach and acceptability, such technology should be customised to fit individual profiles. Personalisation and tailoring of content, interactivity, framing and timing are necessary to enhance acceptance of such technology and avoid reactance, unintended harm, inconvenience, and information overload.

Keywords: Persuasive technology, Technology acceptance, responsible gambling.

1 Introduction

According to the latest prevalence report, over 400,000 people in the UK identify as problem gamblers, and numbers of over-16s considered problem gamblers grew by 1/3 in three years [1]. These figures will likely increase further given the rapid expansion of online betting and advertising around major sporting events [2] and increase in problem gambling [3]. The COVID-19 lockdowns likely exacerbated this. First, because people stayed at home and therefore had more opportunities to gamble [4], and second because COVID-19 had significant financial consequences for some families [4] and people often gamble more during financial crises [5, 6]. Problem gambling can cause considerable harm to not only individuals but also their social circle [7, 8] and costs the UK up to £1.2 billion annually, in terms of costs to the healthcare service and days absent from work [9]. However, UK primary care practitioners are often unaware or unsure of the referral options for treating problem gamblers [10,11]. Further, due to lack of spaces, access to treatment is limited, especially for individuals without concurrent addictions such as alcohol, or other health problems (Gambling Commission, 2019). Further, social stigma around online gambling means individuals who bet online often experience anxiety associated with rejection and conceal any problems they are experiencing, which may prevent them from seeking support [12].

Despite these risks, Internet gambling sites provide limited surveillance to protect potentially vulnerable individuals [1]. Ubiquitous accessibility (the ability to bet online from a mobile device at any time) exacerbates the scale and complexity of the problem. Online gambling enables rapid continuous play without breaks and even using multiple accounts on different gambling sites, simultaneously. This is an issue as many Internet gamblers chase losses, indicating preoccupation with gambling and irrational beliefs about likelihood of winning [13] Gambling-related harm is not restricted to those who meet clinical criteria for gambling disorders or experience severe gambling-related harms [14], but also occurs among low and moderate risk gamblers [15].

1.1 Current RG Tools

Gambling operators are usually required to provide a range of responsible gambling (RG) tools, such as deposit limits, breaks in play, messaging, and activity statements, to prevent development of gambling-related problems. Attitudes to RG tools are generally positive [16], particularly among non-problem gamblers [17]. Implementation of RG tools can enhance favourable attitudes to gambling operators [18] and users of RG tools think their gambling has changed as a result [19]. Current RG tools include Mentor and PlayScan, which led to reductions in money deposited, amounts bet, and total time spent on gambling in non-risk and at-risk, although not in high-risk users [20, 21, 22]. Further, individuals who are informed that their losses are greater than expected tend to reduce their gambling expenditure more than those informed their losses are in line with expectations [23]. However, utilisation of the functions of PlayScan was low [24] and usage reduced rapidly, in line with the ‘law of attrition’ [25]. Even when available, RG tools fail to engage gamblers significantly [26].

1.2 Limitations of current RG Tools and solutions from persuasive technology

Issues relating to RG tool usage may relate to their current functions and appeal to customers. Improvements can be made to their design to enhance appeal without compromising their effectiveness [17]. While RG tools have been in use for over a decade [27], they do not currently provide real-time feedback. The Persuasive Design model [28] classifies the features of technology as primary task support, dialogue support, social support and credibility support. Based on this model, interactive, persuasive techniques could be designed to both nudge gamblers towards responsible online betting, through multimodal interaction and involvement of different stakeholders, and provide personalised and context-aware feedback about betting as it occurs, both retrospectively and proactively, using data about gambling, personal and social life activities. Such RG tools can be designed to be used via the operator's Application Programming Interface (API) and access gambling behaviour data, including bets placed and their status (won, lost, unsettled), deposit amounts, devices accessing the gambling site, location coordinates, self-exclusion requests, and limits set. Based on evidence that persuasive system design [28] enhances adherence to web-based interventions for health behaviour change [29] and enhanced RG when added to a money limit tool [30], such techniques offer an unprecedented opportunity to manage responsible online gambling beyond what is offered by current RG tools.

Evidence suggests that adding interactive, persuasive techniques to RG tools would be received positively by customers. Users of the RG tool PlayScan felt they would benefit from tailored feedback in response to their gambling patterns, pop-up messages reminding them of the tool when logging into the site and receiving emails/ text messages [20]. However, current data-driven technologies suffer from limited engagement due to a misfit between the technology and end users following lack of end user involvement in the development process. This threatens long-term implementation [31]. Several models have been developed to explain intentions to use such technologies. For example, the unified theory of acceptance and use of technology [32], developed based on review and consolidation of the constructs of eight behaviour change models holds that performance expectancy, effort expectancy, social influence and facilitating conditions, the impacts of which are moderated by gender, age, experience and voluntariness of use, influence intentions to use information systems and subsequent user behaviour. This model suggests that it is essential to explore gamblers' attitudes to the proposed technology to determine intention to use the technology in future.

1.3 Rationale

The current study builds on previous work around perceptions of RG tools e.g., [20] by exploring gamblers' perceptions of the potential of real-time, interactive technology, utilising a rich set of cross-operator online gambling behaviour data, personal and social context data, for supporting RG. Although previous research has explored perceptions of providing information about amounts gambled and providing best practice advice, it has not explored perceptions of tailored and interactive persuasive techniques. We provide a unique perspective by listening to the voice of ex-problem gamblers, who can

retrospectively reflect on the technology in relation to their gambling experiences. As retrospective reflection is open to recall bias, we also recruited current gamblers, who could reflect on the technology in relation to their present experiences. This diversity helped identify a range of gamblers who would potentially benefit from the tools.

2 Method

2.1 Design

Qualitative semi-structured interviews explored experiences of gambling and reactions to software that could be used in an online platform designed to enable more informed online gambling. Possible content ideas were collated from a multidisciplinary team of software engineers, data scientists, health and social psychologists, gambling industry employees and individuals working with gambling addicts. See [33] for background around the platform and [34] for details about the architecture of such tools and their underlying design principles and modalities of operation.

2.2 Participants

We recruited 22 participants aged 18+ with a range of gambling levels, from occasional gamblers to problem gamblers in recovery. Ex-problem gamblers, who were abstinent at the time of interview (n=15) were recruited via 1) an open call on social media, shared by organisations working in gambling awareness and RG, including advertising on the website of a residential treatment centre for gambling addicts, and 2) snowball sampling through participants and individuals working in addiction. Current gamblers (n=7) were recruited via adverts on social media and in the local community. Recruitment stopped once saturation was reached. See Table 1 for demographic data.

Table 1. Demographics of ex-problem and current gamblers

Variable	Type of Gambler	
	Ex-problem (n = 15)	Current (n=7)
Age	38.4 (27-59)	44.6 (27-56)
Gender	13 (86.7%) male	6 (85.7%) male
Ethnicity	White: 14 (93.3%)	White: 4 (57.1%)
	Non-white: 1 (6.67%)	Mixed race: 2 (28.6%)
		Non-white: 1 (14.3%)
Educational level	Degree: 2 (13.3%)	Degree: 3 (42.9%)
Employment Status	2 (13.3%) unemployed	4 (57.1%) unemployed
	13 (86.7%) employed FT	3 (42.9%) employed FT
Worked in bookmakers	2 (13.3%)	1 (14.3%)

2.3 Procedure

Semi-structured interviews lasting 30 minutes to 2 hours were conducted face-to-face (n=7), by video conferencing (n=5), or by telephone (n=10), by the lead author, an experienced qualitative interviewer (female), audio recorded and transcribed verbatim. The interviewer had no previous knowledge or experience of gambling. However, she had knowledge of persuasion and software-assisted behaviour change. Approval was granted by the relevant ethics committee.

Participants provided written informed consent and demographic information and were shown a mobile application supported by the web platform our group designed to facilitate online RG. We emphasised that the platform: integrates with multiple operators; retrieves and utilises a wider range of data than currently offered by RG tools (i.e., accessing only data in relation to betting history and limit setting); is independent of operators and provides implicit and visual cues and social nudges. See Figure 1 for images of RG data the platform offers.

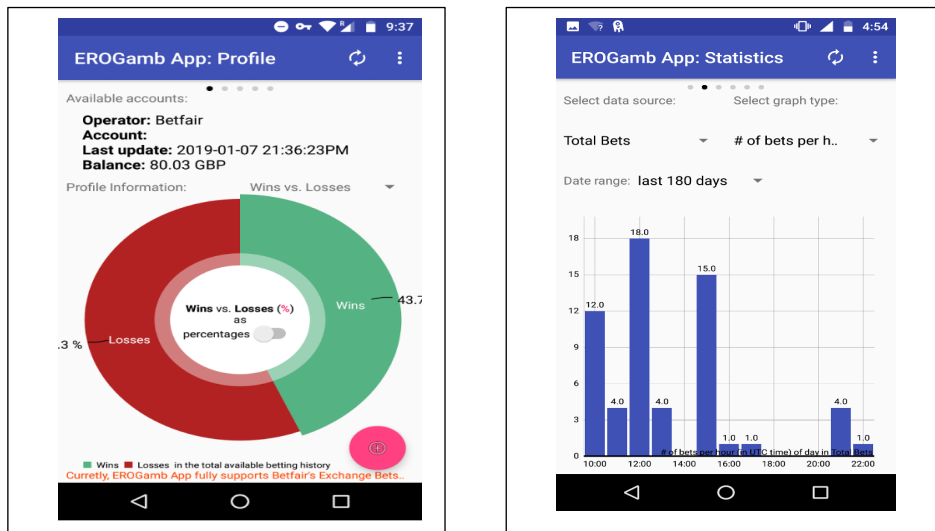


Fig. 1. Examples of data provided by the platform

Interviews comprised two parts. Part 1 explored participants' experiences of gambling, including where and when they gambled, why they stopped and started, the extent to which their family and friends knew about their gambling, and how they felt about it. Part 2 covered perceptions of potential aspects of our proposed technology-based solutions for both capturing gambling and context data and tailoring and issuing interventions. This included setting gambling goals, and how they would feel about: receiving comparative information about their gambling, receiving messages while gambling, educational materials, having access to their data, context sensing, reporting personal information, reporting emotions in relation to gambling and filling in questionnaires about their gambling. Participants were debriefed on completion.

2.4 Data Analysis

Data was analysed using thematic analysis [35]. The interviews were read, and reflexive notes made, then coded line-by-line. Codes were combined into themes and refined to produce a coding manual, which was initially created based on the first 15 interviews, and then refined based on subsequent interviews. Analysis was conducted by the first author and a proportion of interviews (20%) second coded, in line with best practice [35] and disagreements, which were minimal, were resolved by discussion. Following [20], Hill and colleagues' classifications [36] described the range of views within a subtheme. *General* answers were endorsed by all the sample but one, *typical* answers included over half, *a variant* included under half, and *rare* answers three participants or fewer. This aimed to identify the continuum of reactions.

3 Results

Participants saw the proposed technology as a tool for providing information, limiting money and time spent gambling, and providing support, as shown in Figure 1.

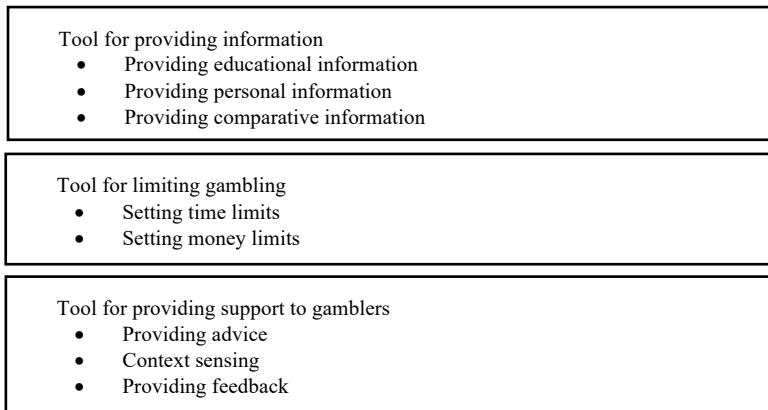


Fig. 2. Themes and subthemes identified

3.1 Tool for providing information

Participants felt the proposed technology-based solutions could provide **educational, personal and comparative information**, which would be sensitive to online gambling behaviour regarding timing and content of messages.

Providing educational information. Many ex-problem gamblers reported not realising they had a problem until they were in rehabilitation having lost large amounts of money and ruined relationships with family members. *Typical* participants felt information about the consequences of gambling would plant seeds of awareness and could be presented as educational text, audio, or real-life stories, to add a personal dimension. *Typical* ex-problem gamblers also felt information about the dangers of gambling

would be most effective for low to moderate gamblers. Earlier stages were considered a ‘teachable moment,’ to identify individuals before the addiction consumed their lives.

Providing personal information. *Typical* participants felt visual information about their online betting activity (e.g., hours played, deposits, amounts won and lost over time), would raise awareness of their financial situation and facilitate budgeting. However, it is worth noting that *a variant* of ex-problem gamblers would not have wanted to see how much they were losing, although they acknowledged the potential positive impact of this information. Also, *typical* current gamblers wanted to receive data about their betting activity, including across operators to optimise their gambling, although *rare* ex-problem gamblers felt that providing such information might have the opposite effect to that intended, encouraging gamblers to chase their losses.

Providing comparative information. *A variant* of ex-problem gamblers felt comparative information about their gambling activity relative to others would shock them. Similarly, *rare* current gamblers felt comparative information would tap into the competitive nature of gambling. However, both *a variant* of ex-problem gamblers and *rare* current gamblers felt they would not care about how their gambling compared to others.

3.2 Tool for limiting gambling

Participants felt mobile application platforms could provide the facility to set **time and money limits**, based on gambling data.

Setting time limits. All ex-problem gamblers reported gambling for up to 8 hours or more at a time, not wanting to stop until they had won. They felt time limits, particularly if set by the platform, would enable them to maintain control, and prevent loss chasing, as the longer they gambled, the less rational their choices became. However, time limits would need to be implemented with caution as *rare* participants were concerned some people would engage in more high-risk gambling if limited time remained. On the other hand, time spent gambling was not an issue for *typical* current gamblers, some of whom spent time researching the form of the sports team or horse before betting.

Setting money limits. *General* ex-problem gamblers felt setting spending limits through the platform would prevent losses of control. They said that the lack of physical notes means money seems unreal. *General* current gamblers, who reported budgeting, also highlighted how easy it was to spend online, particularly following a win. *General* ex-problem gamblers felt any limits would need to be nationwide, as many people have multiple accounts and if locked out of one online bookmaker would likely try another.

3.3 Tool for providing support to gamblers

Participants felt the proposed technology could be used to provide support to individuals, by sending messages tailored to their gambling activity. They felt it could **provide advice, sense context** and **provide feedback**.

Providing advice. *Typical* participants felt advice, e.g., around calculating disposable income, would facilitate budgeting and suggested budgeting forms should be made compulsory when signing up to gambling sites. *A variant* of ex-problem gamblers also felt that validated questionnaires (used in treatment), such as the Problem Gambling Severity Index [37] would be informative. However, *rare* problem gamblers expressed concerns that informing individuals their gambling was currently acceptable might lead to it becoming problematic.

Context sensing. *Typical* participants were positive about using emoticons or a word or point on a scale to inform the application about their emotional state on a regular basis, so over time it could identify situations when they were more vulnerable. They felt this information could enable the platform to contact them in specific situations when they gambled more (e.g., when experiencing low mood). *Typical* ex-problem gamblers favoured receiving information about their location in relation to betting shops from an app, particularly if combined with suggestions for alternative activities nearby, to maintain accountability for their actions. However, *typical* current gamblers and *rare* ex-problem gamblers felt that context sensing was too intrusive, invading on their privacy.

Providing feedback. *A variant* of ex-problem gamblers felt receiving feedback in response to pre-set gambling-related goals would provide motivation and encouragement. *A variant* of ex-problem and *typical* current gamblers thought receiving personalized warnings would be helpful if they were reaching the end of their limits or following an unusual betting pattern/placing an unusually high bet. However, *a variant* of ex-problem gamblers said they would ignore/dismiss pop-ups. To facilitate switching attention, *rare* ex-problem gamblers (all female) said they would feel supported by telephone calls inquiring after their wellbeing and encouraging them to take breaks.

Table 2. Relevant Quotes from the interviews

Theme	Sub-theme	Relevant Quotes
Tool for providing information	Providing educational information	<p><i>“Seeing other people and hearing other people could help ... anyone in their gambling career to hear someone say ... I didn’t think I had a problem, I developed a problem and this is where I am now” [P20, male, ex-problem gambler]</i></p> <p><i>“for me, if you’ve got a problem, you can’t control it doesn’t matter if ... you set yourself a limit ... you’re just</i></p>

		<i>setting yourself on a downward spiral.</i> ” [P24, male, ex-problem gambler]
	Providing personal information	<p><i>“Having a visual look of what I spent, it makes it real then, wow I didn’t realise I spent £500 a day for the past 2 weeks on [gambling operator’s] website.”</i> [P3, male, ex-problem gambler].</p> <p><i>“while I was gambling if I knew how much money I was losing, it would make me want to win that money.”</i> [P24, male, ex-problem gambler]</p> <p><i>“that [providing data across operators] would be useful because it would tell me which operator is paying out the best odds and the best money.”</i> [P10, male, current gambler].</p>
	Providing comparative information	<p><i>“I’d be like, “Wow, I’m in the top 5% [of gamblers] here in a population of quarter of a million.” That would be scary”</i> [P1, male, ex-problem gambler]</p> <p><i>“Yes, I think that’s actually a good idea, because gamblers [are]-- very competitive people”</i> [P6, male, current gambler]</p>
Tool for limiting gambling	Setting time limits	<p><i>“At the worst ... I’d normally gamble in the evening and then it end up all night.”</i> [P18, female, ex-problem gambler]</p> <p><i>“I would double or treble my stakes if you say, “You’ve only got three more spins whatever happens.”</i> [P2, male, ex-problem gambler]</p> <p><i>“I have a look at the race that’s on. I just look at the horses, and what their odds are, and the names as well... I’d say I spend more time looking at the slip, as opposed to putting a lot of money on a lot of the races.”</i> [P15, female, current gambler]</p>
	Setting money limits	<p><i>“it makes it numb because it’s not real, it’s sort of virtual money”</i> [P2, male, ex-problem gambler].</p> <p><i>“especially if you had a win, it’s quite easy just to think, “If I’d put on more money, I would have got more money back, so let’s have a look at something else maybe”</i> [P15, female, current gambler]</p> <p><i>“if you set £50 [limit] for six accounts, then you can spend £300”.</i> [P16, male, ex-problem gambler]</p>
Tool for providing support to gamblers	Providing advice	<i>“an app like that, so you put in everything, what you’ve got coming in, what you’ve got coming out, and then whatever spare money you’ve got ... if you’ve got that to gamble with that is totally spare money, ... I think that one is definitely beneficial.”</i> [P16, male, ex-problem gambler]

	Context sensing	<i>"I think I've gambled when I was really low. That was the middle stages of my addiction ... I think [reporting emotions] would be a good idea."</i> [P22, male, ex-problem gambler]
	Providing feedback	<i>"Something visual to say, "I've not gambled today." Maybe how much your limit was gambling each day. Say, it's £50 each day and you say you've not gambled for 10 days. Let's see how much money you've saved."</i> [P1, male, ex-problem gambler] <i>"[messages] would really have been helpful at the time because anything that gives you a reason to switch your whole attention from what you're doing"</i> [P2, male, ex-problem gambler] <i>"It [pop-up] was just ... a nuisance. I know better than some pop-up on a screen telling me that I've been on this long enough."</i> [P21, male, ex-problem gambler] <i>"You've been playing for quite a while, make sure you don't get headaches ... Why not take a break?" Just in a way to make it that you're doing it for the interest of my health."</i> [P13, female, ex-problem gambler].

4 Discussion

4.1 Summary of the Findings

This study built on previous research into perceptions of RG tools [17, 20] to explore individuals' views of the use of online gambling behavioural data and interactive real-time technology for managing responsible gambling. Both ex-problem and current gamblers viewed the technology positively, indicating its potential to help a range of individuals. Participants were positive about a tool that would provide information, facilitate sustainable gambling and provide support to gamblers, in line with research that gamblers view RG tools as positive features [17] with the potential to change gambling behaviour [20]. However, negative impacts of aspects of the tool were also reported (e.g., bet more if aware that less time left), in line with evidence that in certain contexts some persuasive design principles may trigger digital addiction [38]. Further, participants felt interactive real-time technology would enable low to moderate gamblers to limit their gambling whilst still controllable. Problem gamblers likely require intensive residential treatment followed by abstinence.

4.2 Discussion of findings in relation to previous research

Abraham & Michie's taxonomy of behaviour change techniques used in interventions [39] identified self-monitoring of behaviour and feedback on performance as effective behaviour change strategies. In our study, participants welcomed opportunities

provided by interactive real-time technology to track player data and provide personalized feedback [40] as they wished to see their gambling data in real time. This ties in with findings that users of a RG tool wanted more feedback on their gambling habits [20]. Our study suggests provision of real-time gambling behavioural data (which is currently collected by gambling operators) to customers would be an excellent way to enable responsible data sharing, and in turn facilitate corporate social responsibility goals of transparency and accountability, benefiting all involved. However, this should be implemented with caution as some ex-problem gamblers mentioned seeing losses would trigger loss chasing. Effective messages are needed to combat this.

In line with control theory [39], prompting goal setting and review of behavioural goals was welcomed. Goal setting is an effective behaviour change strategy [39, 41] and behavioural feedback about gambling led to reductions in deposits over 24 weeks in social and at-risk but not problem gamblers [21]. These findings suggest goal setting is a potential preventative measure rather than an intervention for problem gambling. Further research needs to identify individuals whilst their gambling is under control, to ensure they receive timely support.

Both ex-problem and current gamblers viewed money limits positively. Similarly, an RG tool led to reduced deposits, amounts bet, and time spent on gambling [20, 21]. Money limits are rarely exceeded once set [28] and could easily be implemented in practice. Participants felt limits should be across operators to reduce loss chasing, in line with evidence that problematic gamblers play multiple platforms concurrently [42].

Gamblers can enter states of dissociation leading to loss of track of time and money spent gambling [43]. Time and monetary pop-up reminders may combat dissociative states as well as addressing failures to adhere to pre-set limits. Many participants felt such reminders would switch their attention. However, others considered pop-ups a nuisance to ignore. Similarly, pop-ups were relatively ineffective in reducing gambling among gambling-intense individuals [44]. Further research is needed to determine their effectiveness for low to moderate gamblers.

Participants were positive about recording their emotions so that over time, applications could identify mood shifts associated with problem gambling - relevant because problem gambling may be a way of coping with difficult emotions [45]. Identification of mood shifts could be combined with offering appropriate support. This corroborates findings that online peer support groups may prevent digital addiction [46, 47]. However, problem gambling has been associated with alexithymia, a difficulty identifying and describing feelings [48]. Further exploration of the potential of mood sensing technology to facilitate responsible gambling might be helpful.

4.3 Individual Differences

Important differences between participants were identified. Ex-problem gamblers felt time limits would help them control their gambling. However, current gamblers spent time on sports betting websites checking the form of players/horses, which often equated to improved prediction of outcomes, not extra bets. Further, ex-problem gamblers mentioned limits could lead to gambling larger sums of money to compensate for

the shorter duration. Similarly, although some participants received context sensing positively, others considered it intrusive, in line with research on use of smartphone applications for supporting health behaviour change [49]. This highlights the importance of tailoring, to ensure potential limits and technologies are appropriate to the type of betting and gambler in facilitating RG [50, 51].

4.4 Limitations

Over 80% of participants were male, despite our efforts to recruit female gamblers. Further research is needed to explore female gamblers' experiences and views regarding real-time interactive technology for managing RG. This is particularly important given gender differences were identified - women were more likely than men to frame technology as a helper from whom they desired support, in line with recent research where women preferred digital addiction labels to include supportive content [52].

Information about gambling was self-reported. While the ex-problem gamblers had clearly experienced significant gambling-related issues (many were recruited via an organisation providing therapy to problem gamblers), current gamblers' levels of gambling were not recorded, although most reported managing budgets. A questionnaire such as the PGSI [37] would have quantified levels of gambling.

The interviews should have included more information about rights to data, how it will be used and how long it will be stored by the application, to enhance awareness of the consequences of the intervention. However, interviews informed participants that gambling operators were collecting data and using it for marketing based on terms and conditions many people accept without reading, and that according to GDPR, participants had the right to access their data. Given this context, additional concerns about the app having access to their data were not raised.

As participants had not trialled use of real-time interactive technology to manage responsible gambling, it is unclear how they would use it in practice. In particular, the concept of independent parties offering RG tools was novel. Further, most were unfamiliar with long-term support increasing personalisation of dialogue. Although we showed them a video about the concept, application and website for a more tangible experience, further exploration of the use of such technology in practice is required.

5 Conclusions

Building on previous research, participants were positive about data-driven, interactive, real-time technology. The range of strategies offered to promote responsible gambling, were particularly lauded by ex-problem gamblers, who had used a range of tools to recover from their addictions. Interactive, real-time technology, by retrieving and utilising a wider range of data than what RG tools currently provide, offers a promising opportunity to reach customers whilst their gambling is under control, facilitated by tailoring support to the gambler.

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