



Explainable persuasion for interactive design: The case of online gambling[☆]

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ARTICLE INFO

Article history:

Received 7 April 2022

Received in revised form 23 August 2022

Accepted 20 September 2022

Available online 12 October 2022

Keywords:

Explainability
Persuasive systems
Ethical design
Informed consent
Online gambling

ABSTRACT

Persuasive technology refers to digital means that influence attitude behaviour, and decisions. While the professional design of persuasive interfaces considers user interests and freedom of choice a primary requirement, principles and methods to achieve it are yet to be introduced. In the design of persuasive interfaces, fulfilling conditions of informed consent can help establish transparency and address such ethical issues. This paper defined explainable persuasion, its potential form, and benefits and explored whether explainable persuasion is a user requirement on demand. This paper further examined explainable persuasion design from the user's perspective and reported on acceptance and rejection factors, as well as possible design tensions and solutions. In this study, we took online gambling as a case study. A total of 250 UK-based users of gambling platforms (age range 18–75, 127 female) completed our online survey based on principles of persuasion and explainability. Findings showed that players were aware of the use, persuasive intent, and potential harm of various persuasive design techniques used in online gambling platforms (e.g., the use of in-game rewards, reminders, and praise to encourage further gambling). Despite this awareness, they agreed that explainable persuasion can still help users stay in control of their online experience, increase their positive attitude towards the online system, and keep them reminded of the potential side effects of persuasive interfaces. Future research is required to enhance the design and implementation of explainable persuasion in persuasive interfaces.

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1. Introduction

Persuasive interfaces, whether designed for self-directed behaviour change or to enhance user involvement in systems, are generally aligned with user interest. However, because such interfaces persuade users by influencing and shaping their behaviour, ethical concerns may arise (Karppinen and Oinas-Kukkonen, 2013). This is more likely to be the case when persuasion is not self-directed but designed to influence the users to follow a specific action (Spahn, 2012). Examples of such practice could be seen within interactive online platforms that aim to maximise user engagement through persuasive design techniques, such as rewards or social influence. In this context, ethical concerns and considerations need to be addressed. While engaging with persuasive interfaces, the user may be unaware of being influenced. This can hinder their ability to evaluate the persuasion attempt

as well as to reflect and direct their behaviour (Timmer et al., 2015). Moreover, persuasive interfaces designed to maximise user engagement may in some cases trigger or reinforce usage that is addictive in the sense of being obsessive, hasty and associated with harm. Some elements can trigger irresistible urges and increase perceived urgency and pressure (Alrobai et al., 2014; Ali et al., 2015; Kuonanoja and Oinas-Kukkonen, 2018). For example, the use of rewards on digital platforms may encourage people to place more importance on the positive experience felt in the moment and make it hard to reflect on negative consequences that they may face in the future regarding excessive use (Cemiloglu et al., 2021b). While different approaches are taken to discuss the role of ethics in persuasive technology, transparency and user voluntariness were suggested to be important factors in building ethical persuasive interfaces (Atkinson, 2006; Smids, 2012; Barral et al., 2014; Timmer et al., 2015). This view resonates with the informed consent theory proposed in bioethics literature (Faden and Beauchamp, 1986). Informed consent is defined as an ethical requirement in which a participant needs to understand the nature of the intervention before accepting it (Faden and Beauchamp, 1986). As proposed by Cemiloglu et al. (2021a), ethical persuasive interfaces can fulfil conditions for informed

[☆] Editor: Dr. Kelly Blincoe.

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consent by informing users about system persuasion so they can consent to be subject to the activity. This approach adheres to the concept of “libertarian paternalism”, which postulates that designers may influence how users interact with the system, but freedom of choice belongs to the user (Sunstein and Thaler, 2003). To date, the concept of transparent, persuasive technology mainly remained philosophical in academia (Atkinson, 2006; Smids, 2012; Barral et al., 2014; Timmer et al., 2015). Design of ethical persuasive interfaces, e.g., in terms of graphical and informational content, delivery methods, personalisation, and timing, have not yet been discussed.

In designing ethical persuasive systems, explainable persuasion is a potential solution to address informed consent within persuasive interfaces. Explainable persuasion may address issues related to system transparency, ethics, and user-control, particularly within persuasive interfaces where emotions can bias decision-making, such as gambling platforms (Hinson et al., 2006). The existing body of research on guidelines for the design, implementation, and evaluation of explainable systems (Rosenfeld and Richardson, 2019; Samek et al., 2019; Chazette and Schneider, 2020; Rai, 2020; Sokol and Flach, 2020) and information systems transparency (Hosseini et al., 2018) could provide a foundation for designing explainable persuasive interfaces. It is important to note that standard usability guidelines may not be adequate in the context of explainable persuasive interfaces. This is because the user’s primary task while interacting with persuasive interfaces is not to regulate their behaviour. On the contrary, notices and alerts are frequently viewed as distractions from the user’s primary task (Iqbal and Horvitz, 2010; Shepherd and Renaud, 2018). Consequently, warning communication and privacy notice design guidelines (Kim and Wogalter, 2009; Schaub et al., 2015) can also contribute significantly to explainable persuasive design.

In this paper, we discussed the concept of explainable persuasion when building persuasive interfaces. We first gave an overview of persuasive design in Section 2. In Section 3, we introduced and defined explainable persuasion and highlighted the need for it. In Section 4, we took online gambling as an example domain and application and explored user awareness of persuasive design techniques and users’ attitudes towards the concept of explainable persuasion. In this section, we also examined user acceptance and rejection factors of explainable persuasion. In Section 5, we provided a general discussion and underlined threats to validity and in Section 6, we concluded the paper by presenting explainable persuasion design tensions and possible solutions. In Section 7, we provided suggestions for future work.

2. Persuasive design

To introduce the concept of explainable persuasion, it is important first to review the core factors relating to persuasive system design. This will provide a basis to discuss how these factors may impact the design of explainable persuasion. Within the digital environment, persuasive systems are defined as “computerised software or information systems designed to reinforce, change or shape attitudes or behaviours or both without using coercion or deception” (Oinas-Kukkonen and Harjumaa, 2009, p486). The design itself is suggested to be persuasive by definition as the way the designer structures the digital realm defines how the user will interact with it (Redström, 2006). Accordingly, persuasion by design could be accomplished through elements that make up the system, such as the visual and aesthetic cues or persuasive design techniques and technologies adopted in the system (Cyr et al., 2018).

2.1. Persuasion context

Within the persuasive system design (PSD) model, the persuasion context is defined as comprising of the persuasion intent, persuasion event, and strategy in use (Torning and Oinas-Kukkonen, 2009). The persuasion intent refers to who the persuader is and what the system intends as a target behaviour. The persuasion event refers to the use context (i.e., characteristics of the problem domain), user context (i.e., individual traits, interests, and goals which influence information processing), and the technology context (i.e., characteristics of the technological platform in use). The strategy refers to the message (i.e., content and delivery) and the route to persuasion. The route to persuasion can be the central route, persuasion resulting from information processing that is slow and reflective or the peripheral route, persuasion resulting from information processing that is fast and relies on mental shortcuts (Cacioppo et al., 1986).

2.2. Persuasive design techniques

Oinas-Kukkonen and Harjumaa (2009) defined four groups of design principles in the PSD model that can help build persuasive systems at an operational level: (i) primary task support, (ii) dialogue support, (iii) social support, and (iv) system credibility. For example, within dialogue support, the use of rewards in the form of likes, mentions, or earned points in interactive platforms may maximise user engagement by further reinforcing the target behaviour. Another reference model for designing persuasive techniques in interactive platforms is Cialdini’s (2001) principles of persuasion, consisting of reciprocity, scarcity, commitment, and consistency. These design techniques have been implemented in various fields such as e-commerce, health, and wellness (Langrial et al., 2012; Alhammad and Gulliver, 2014; Oyeboode et al., 2020; Adib and Orji, 2021). The most commonly used persuasive design techniques in e-commerce applications were reported as dialogue support and system credibility support (Alhammad and Gulliver, 2014). Within the e-commerce context, designers focus on elements that facilitate interaction as customers may be hesitant to carry out a financial transaction if there is no positive engagement with the website. Also, because there is an element of risk involved for buyers when using e-commerce websites, the designers of these sites place a strong emphasis on establishing credibility and trust (Alhammad and Gulliver, 2014). The most commonly used persuasive design techniques in the health domain were reported as primary task support and system credibility support (Oyeboode et al., 2020). Within the healthcare context, it is essential to assist users in performing tasks by tailoring interventions to the individual level, as each individual is unique. Additionally, because users tend to be sceptical about whether they can trust apps in the healthcare industry, the appearance of an app’s credibility is critical (Oyeboode et al., 2020).

2.3. User experience of persuasive systems

User experience design plays a significant role when building persuasive systems because persuasion requires effective communication between the system and the user. The usability of the interactive system is a defining factor determining the quality of the communication between the user and system (Cockton and Gram, 1996). While definitions of usability vary (Lewis, 2014), in ISO 9241-11 (2018), it refers to “the extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use”. In other words, for a system to provide a viable medium for persuasion, it needs to be usable. Consequently, the PSD model identified two postulates that need to be

fulfilled when designing persuasive systems with user experience in mind (Oinas-Kukkonen and Harjumaa, 2009). According to the model, persuasive systems should seek to be unobtrusive; the system needs to refrain from interfering with users while they are focused on their primary tasks. Thus, the timing of the persuasive design techniques is crucial. The second postulate states that persuasive systems should be easy to use and pleasant to interact with. Hence, persuasive systems should adhere to general software qualities such as responsiveness, ease of access, error prevention, convenience, and high information quality and attractiveness (Oinas-Kukkonen and Harjumaa, 2009). From a broader perspective, usability and persuasion reciprocally influence each other. For persuasion to occur, it is necessary to create grounds for an effective user experience. At the same time, effective user experience can be supported by persuasive design techniques such as attractiveness, personalisation, and reciprocity.

3. Explainable persuasion

In this section, we defined explainable persuasion and argued why it may be necessary for designing ethical persuasive interfaces.

Within explainable AI literature, explainability refers to helping users understand why and how an intelligent system has behaved in a certain way or made a recommendation (Naiseh et al., 2020a). Studies of human-agent systems showed that providing explanations on algorithmic decisions, outputs or their properties, e.g., confidence level, sample size, and training period, help users better understand the workings of the system, which in turn facilitates informed user decisions (Eslami et al., 2018; Chazette and Schneider, 2020). Also, explaining persuasion may be similar to Explainable Artificial Intelligence (XAI), as Artificial Intelligence (AI) and persuasion share similarities, e.g., in personalising recommendations and tailoring steps for users based on data reflecting their personal, physical, or social context (Naiseh et al., 2020b). However, persuasive interfaces are based on other elements that primarily come from other disciplines rather than AI, including linguistics, games, and interaction design. For example, utilising the concept of tunnelling (i.e., guiding the user through a predetermined course of action in a step-by-step format) by exploiting humans' desire to complete tasks may lead to loss of control in online spaces and entering into the flow state (i.e., causing full immersion with the activity) (Chou and Ting, 2003). Thus, suggesting that the design of explainable persuasion needs to also include information regarding interactive design.

3.1. What is explainable persuasion?

Explainable persuasion aims to disclose information about the use of persuasive design techniques to help establish necessary conditions for informed consent when interacting with persuasive interfaces. From a business and usability perspective, explainable persuasive interfaces should preserve the legitimate purpose of persuasion. This poses challenges to the design of both persuasive interfaces and their explanatory counterparts. We define the concept of *explainable persuasion* as:

The system's transparency about its persuasion attempts so that users can choose to be conscious of how the design may alter their attention or behaviour towards certain content or actions and can consent to be subject to it.

3.2. Content of explainable persuasion

In determining the content of explainable persuasion, the informed consent theory defined in bioethics literature (Faden and

Table 1

Explainable persuasion based on informed consent theory: Auto-spin online gambling feature example.

Components of explanation	Content of explanation
Persuasion technique used by the system	The content will explain that the game uses the persuasive design technique of reduction (i.e., reducing user effort to act) through the auto-spin function.
Persuasion intention of the system	The content will explain that the intent of using the auto-spin function is to ease play for the user.
The consequence of interacting with persuasion techniques used by the system	The content will explain that auto-spin may impair a person's ability to control their urges and make it difficult to stop playing when they want to.

Beauchamp, 1986) and the persuasion knowledge model defined in the consumer research literature (Friestad and Wright, 1994) could be used as reference models.

In the bioethics literature, informed consent is defined as a process in which a patient accepts to receive a medical intervention following a thorough explanation by the doctor of the intervention, its intent, benefits and associated risks, along with alternative interventions and their possible effects (Jonsen et al., 1982). Informed consent is regarded as an ethical requirement since it protects the patient's right to make autonomous choices about their life (Faden and Beauchamp, 1986). Accordingly, in the context of persuasive systems, the content of explainable persuasion could inform users about the persuasive design techniques used by the system, the persuasion intentions of the system and the potential consequences of interacting with such persuasion techniques so that the users can consent to be subject to it. The example given in Table 1 demonstrates the potential content of explainable persuasion in the context of online gambling with reference to informed consent theory. Here the persuasive design technique to be explained is the gambling feature of an auto-spin function at an online slot game. Auto-spin is a feature that enables repetitive play by spinning the reels consecutively and automatically without requiring the player to press any buttons. A variant of that can also be the option for an auto-refresh of social media pages and the auto-play feature on sites like YouTube and Netflix.

Another reference model for determining the content of explainable persuasion could be the persuasion knowledge model (Friestad and Wright, 1994). According to the persuasion knowledge model, when faced with a persuasion attempt, people utilise their persuasion knowledge (Friestad and Wright, 1994). Persuasion knowledge is suggested to consist of information relating to both the persuasion agent and target. Table 2. defines the persuasion knowledge components. The model postulates that individuals can assess the persuasion attempt better when they have information on both the persuasion agent and the target. While people typically have some knowledge about traditional forms of persuasion, such as those used in advertising and marketing, their knowledge of digital persuasive design techniques could be limited, which may affect their response to the persuasion attempts (de Pelsmacker and Neijens, 2012). In the context of persuasive interfaces, information relating to persuasion knowledge could be used as a guide to establish the necessary conditions for informed consent. The example in Table 2 demonstrates potential explainable persuasion content in the context of online gambling with reference to the persuasion knowledge model.

Table 2

Explainable persuasion based on persuasion knowledge model: Auto-spin online gambling feature example.

Components of Explanation	Content of Explanation
Persuasion agent's intention	The content will explain that the intent of using the auto-spin function is to ease play for the user.
Persuasion agent's tactic	The content will explain that the auto-spin function persuades users to have continuous interaction with the game by reducing the effort to gamble, as players are not required to press any buttons when they play in auto-spin mode.
Psychological mediator that the persuasion agent uses	The content will explain that the auto-spin function is persuasive because it makes people act on impulses and make quick decisions regarding play.
Persuasion's target coping goal	The content on the target coping goal will be on having more control over the gambling time and amount.
Persuasion's target coping tactics	The content will explain that users can disable the auto-spin function or limit the time they play with it.

3.3. Useful transparency

Before exploring user acceptance of explainable persuasion, it is important to underline why system persuasion transparency is needed. Our main goal with explainable persuasion is to empower users who choose to regulate their digital usage through improved user consent and choice. This objective is similar to the useful transparency objective defined within the information systems transparency. According to [Hosseini et al. \(2018\)](#), useful transparency is achieved when quality information is made accessible to the audience in a meaningful and useful manner. It is stated that transparency is only useful when it allows users to make decisions and take actions using the available information. [Hosseini et al. \(2018\)](#) defined certain steps that needed to be taken between information availability to information actionability to achieve useful transparency. These steps, which are listed in [Table 3](#), could be utilised as a model for designing useful explainable persuasion.

3.4. The importance of explainable persuasion

In this section, we discussed the need for explainable persuasion through both ethical and business lenses.

From an ethical perspective, explainable persuasion can facilitate designers in taking responsibility for protecting users' rights to know that they are being exposed to persuasion, especially when such persuasion is tailored to the user based on their profile and behaviour data. Such an approach is congruent with the European Union's General Data Protection Regulations ([Parliament and Council, 2016](#)), which argued for the right to an explanation of algorithmic decisions made about the user ([Goodman and Flaxman, 2017](#)). A similar approach is also evident within the advertising industry. The guidelines proposed by the United States Federal Trade Commission state that native advertisements on online platforms should be labelled as sponsored content to inform users that they are interacting with adverts ([Federal Trade Commission, 2015](#)).

From a business perspective, explainable persuasion may contribute to businesses in two ways. First, system explainability studies showed that explainability is an important factor in building trust between the user and the system and increasing user

Table 3

Steps to be taken for useful transparency.

1. Information availability	Operators must give relevant information while maintaining the attributes of correctness, completeness, and timeliness.
2. Information interpretation	Operators must present information in a specific way so that users can interpret it.
3. Information accessibility	The information must be visible and easily accessible.
4. Information perception	In order to achieve usable transparency, there must be congruence between users' and information providers' perceptions of what constitutes transparency.
5. Information understandability	All users must be able to comprehend the information provided, which can only be accomplished through controlling for potential language, cultural, and cognitive challenges.
6. Information acceptance	The user has to be prepared to process the information, which might either confirm their ideas or challenge them.
7. Information actionability	It is necessary for information to prompt appropriate user action.

satisfaction ([Eslami et al., 2018](#); [Chazette and Schneider, 2020](#)). Providing information about the use of persuasive design techniques can increase user perception of fairness with respect to persuasive systems, lessen the feeling of being "tricked" by the system and give the user a sense of control. Second, employing explainable persuasion, especially within technology that has the potential to be highly immersive, can work as a proactive strategy by helping users reflect on their behaviour while interacting with persuasive interfaces. For example, explainable persuasion could inform the user which persuasive design technique makes the greatest contribution to their excessive usage. This could, in turn, help business sustainability, as users would not need to take extreme measures such as self-exclusion from websites ([Cemiloglu et al., 2020](#)). We propose that all operators should provide explainable persuasion, which must be compelled by law in the same way that GDPR or native ad disclaimers are. However, research at this level must initially show that explainable persuasion is a user requirement on demand and is effective in helping users regulate their digital usage.

4. User perspective of explainable persuasion

In this section, we explored the concept of explainable persuasion from the user's perspective. The first step in any innovation is user acceptance, which is users' willingness to use the tool for the purpose it was designed for ([Dillon, 2001](#)). There is little use in proceeding with the design process if users refuse to use it. Thus, we aimed to explore whether explainable persuasion is a user requirement on demand. Moreover, explainable persuasion is not only about assisting the user behaviour, but from a commercial point of view, it is also about being transparent. In addition to the user's actions, the system providers' conduct is also important.

A distinct domain for persuasive technology, online gambling, was selected as a case study for our research. Online gambling can be addictive, and hence the distinct nature of persuasion harm. While no consensus exists on the addictive nature of social media or online streaming platforms, The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) ([American Psychiatric Association, 2013](#)) recognised gambling as a disorder. Accordingly, an online survey was conducted to understand

player awareness of persuasive design techniques used in online gambling platforms and player attitudes towards the concept of explainable persuasion. While the survey was extensive and included parts on each of the persuasion techniques used, this paper concentrated on five research questions to stay within a reasonable size limit. As this is an exploratory study, no research hypotheses were presented. We aim to explore the concept of explainable persuasion from the user's perspective and examine any relationship between demographic factors.

4.1. Research questions

Based on the theoretical considerations outlined in Sections 1, 2 and 3, the following exploratory research questions were developed to address the study objective:

RQ1: Are players aware of the use and impact of persuasive design techniques used in online gambling platforms?

RQ1.a: Are players aware of the use of persuasive design techniques in online gambling platforms?

RQ1.b: Do players believe that persuasive design techniques can trigger addictive usage?

RQ2: Do players believe that explainable persuasion can help them stay in control of their gambling?

RQ3: What are the user acceptance and rejection factors of explainable persuasion?

RQ4: What information do players require when receiving explainable persuasion?

RQ5: What will players' attitudes be towards gambling operators that provide explainable persuasion within online gambling platforms?

4.2. Method

4.2.1. Participants

In total, 250 participants (age range 18–75, 123 male and 127 female) were recruited through Prolific™ (www.prolific.co), an established platform for online recruitment for research studies. Gender was considered a significant factor as previous studies reported gender differences with respect to gambling duration, gambling motive (McCormack et al., 2014) and attitudes towards responsible gambling measures (Gainsbury et al., 2013; Engebø et al., 2019). The distribution and recruiting of male and female participants in the present study occurred by chance. This might be owing to the fact that the distribution of female and male gamblers is close in online gambling as opposed to land-based gambling, where male gamblers are more prevalent. Statista (2022) reported that in 2021 approximately 27.7% of male respondents and 23.1% of female respondents engaged in at least one kind of online gambling during the previous four weeks. Participants who regularly bet online on slot or roulette games in the past 12 months were considered. We wanted to limit the study to persuasive design techniques used in pure chance games and eliminate games where players can use some analysis, e.g., poker and horse racing. Additional inclusion criteria included being 18 years or older, fluent English speakers and UK-based. The screening ensured that participants were familiar with the persuasive design techniques presented in the study and minimised the confounding effect of skill and experience in player engagement, which can be observed in online poker and sports betting (Bjerg, 2010).

4.2.2. Questionnaire design

The questionnaire was designed with Qualtrics™ (<https://www.qualtrics.com>), a web-based survey platform, and consisted of closed-ended and open-ended questions. There were three main parts to the questionnaire:

First, participants were asked about their gambling experience (e.g., number of online gambling accounts, time spent gambling per week). The 9-item Problem Gambling Severity Index (PGSI) was used to assess problem gambling severity (Ferris and Wynne, 2001a,b). The scale includes items related to gambling behaviour (e.g., How often have you bet more than you could really afford to lose?) and experienced adverse consequences due to gambling (e.g., How often has your gambling caused any financial problems for you or your household?). Each item is rated on a 4-point scale: 0 never; 1 = sometimes; 2 = most of the time; 3 = almost always. The standard cut-points are 0 = non-problem gambler; 1–2 = low-risk gambler; 3–7 = moderate-risk gambler; and 8 and more = problem gambler. In this paper, we refer to the four-standard cut-points of the PGSI as “problem gambling severity groups”. PGSI has been shown to have a high rate of internal consistency and test reliability and is commonly used in gambling research (Holtgraves, 2009; Currie et al., 2013; Calado and Griffiths, 2016). For our sample, the Cronbach's Alpha was 0.93, indicating acceptable internal consistency. The first part of the questionnaire defined persuasive design techniques in the context of online gambling and informed participants that online gambling platforms use persuasive design techniques to increase player engagement. Participants were asked whether they were aware of the use of persuasive design techniques in online gambling platforms (Yes/No response). Participants were also asked to list any persuasive design techniques they knew about in a free recall setting. Participants indicated whether they agreed with the claim that persuasive design techniques could contribute to problem gambling using a 5-point scale (1 = strongly disagree, and 5 = strongly agree). This question was repeated after Part 2.

The second part introduced participants to 13 persuasive design techniques used in online gambling platforms, using explanation cards. To design the content of the explanation cards, first, we reviewed the literature to identify persuasive design techniques used in online gambling platforms. Second, seven websites from six different operators with the largest market share in the UK online gambling and betting market (Mintel Report, 2019) were examined to identify the main persuasive design techniques used in online gambling platforms, and we used them to design the illustrative material. The analysis was guided by criteria set by the PSD model (Oinas-Kukkonen and Harjumaa, 2009) and also informed by Cialdini's (2001) work on principles of persuasion and McCormack and Griffiths's (2013) work on structural and situational characteristics of internet gambling. Publicly available content located on the website's homepage, casino page, slot page, roulette page, game information sections and promotion page were analysed. Due to membership restrictions, the gaming interface of just one of the seven online gambling sites was examined. Being a registered client allowed examining persuasive design techniques utilised in the game interface, deposit page and also helped explore personalisation features (e.g., promotion emails, in-game customised bonus offers). Ultimately, these gambling operators utilise the same provider, Playtech, which is the leading provider of online gaming and sports betting software.

Initially, 19 persuasive design techniques were identified. Of these, 13 persuasive design techniques were selected for the questionnaire. Persuasive design techniques that could be experienced differently according to individual factors were excluded. For example, the personalisation experience (i.e., providing content adapted to user characteristics or online behaviour) would differ from one person to another; hence exemplifying such a

Table 4
Persuasive design techniques presented in the study.

Persuasive design technique	Definition in the context of online gambling
Primary task support	
Reduction	Persuades players to have continuous/uninterrupted interaction with the game by reducing the effort to gamble.
Self-monitoring	Persuades players to interact with the game by providing the ability to track and evaluate gambling performance.
Rehearsal	Persuades players to interact with games by providing the ability to gamble without having to experience it in a real-world setting (i.e., without betting real money).
Dialogue support	
Praise	Persuades players to interact with games by expressing approval or admiration via words, images, symbols, and sounds.
In-game rewards	Persuades players to gamble by giving something in return when the players perform a target behaviour set by the gambling platform.
Reminders	Persuades players to interact with the gambling platform by reminding them about gambling.
Social support	
Social norms	Persuades players to interact with the gambling platform by showing how the majority acts.
Social facilitation	Persuades players to interact with the gambling platform by showing how other players are engaging in the same activity simultaneously.
Competition	Persuades players to gamble by stimulating players to compete against themselves or each other.
System credibility support	
Authority	Persuades players to interact with the gambling platform by promoting statements or norms of authority figures.
Other	
Scarcity	Persuades players to interact with the gambling platform by emphasising rarity and exclusivity or by underlining possible losses of missing such an advantage.
In-game control elements	Persuade players to gamble by stimulating their perceived control over betting outcomes.
Near misses	Persuade people to gamble by implying that the win is missed marginally by just a symbol and is around the corner.

technique in the explanation card would not be possible. Other excluded persuasive design techniques were tailoring, liking, suggestion, and social learning. Persuasive design techniques that were rarely used were also excluded from the final list of explanation cards. For example, only one gambling website used the tunnelling technique (i.e., leading the user through a predetermined sequence of steps one by one). The final list of the 13 persuasive design techniques included in the study is organised according to the PSD model and shown in Table 4.

As the second step, explanation cards were designed for each of the 13 persuasive design techniques. The persuasion knowledge model (Friestad and Wright, 1994) was the main reference model to determine the content of the explanation cards. As the study focused on persuasion awareness, only information relating to the persuasion agent (i.e., about intention, tactic and psychological mediators underlying it) was provided in the explanation

cards. The cards also provided information on the risks of interacting with the persuasion technique, which was adopted from the informed consent theory (Faden and Beauchamp, 1986). The information on how the persuasive design technique could facilitate problem gambling was based on the findings of previous research (Cemiloglu et al., 2021b). One example of a persuasive design technique explanation card is shown in Fig. 1.

The survey participants were instructed to read each explanation card carefully and answer questions for each technique. With Yes/No questions, participants were asked whether they had seen examples of each technique in their gambling experience, whether they knew about the persuasive intent of each technique, and whether they knew that each technique could potentially trigger addictive usage. Participants indicated whether or not they agreed with how each technique impacts addictive usage using a 5-point Likert scale (1 = strongly disagree, and 5 = strongly agree). In the context of online gambling, addictive usage was defined as problem gambling, characterised as an excessive amount of time and money spent on gambling which can cause severe distress and harm to one's life (Neal et al., 2005).

The third part of the questionnaire examined participants' attitudes towards receiving explainable persuasion within online gambling platforms. Participants were asked whether they agreed with the claim that explainable persuasion can help players stay more in control of their gambling using a 5-point scale (1 = strongly disagree, and 5 = strongly agree). Using the persuasion knowledge model (Friestad and Wright, 1994) and informed consent theory (Faden and Beauchamp, 1986) as reference models, participants were also asked to state what information they required when receiving explainable persuasion. Moreover, participants were asked how their attitude would change towards gambling operators that provide explainable persuasion in their platforms using a 5-point scale (1 = become more negative, and 5 = become more positive). The questionnaire concluded with demographic information about gender, age, education level, employment status and country of origin.

4.2.3. Pilot test

A pilot test was conducted before actual data collection, and it was active for two weeks. 12 participants completed the pilot questionnaire. Following the pilot test, several changes were made to improve the questionnaire. A scenario-based question was eliminated from the questionnaire as it was found redundant by the participants. To reduce the impact of fatigue and habituation (Porter et al., 2004), the sequence in which the 13 persuasive design technique explanation cards were presented was randomised. One dummy graphic resembling those used in online gambling platforms was re-designed to have a more realistic look, and the content of one of the explanation cards was re-phrased to be more comprehensible.

4.2.4. Procedure

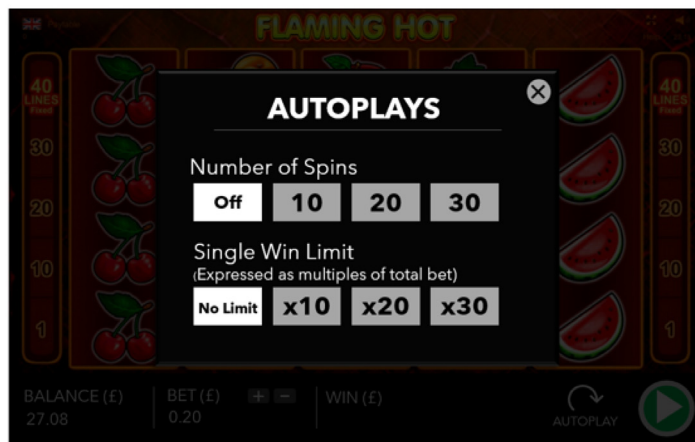
Bournemouth University Research Ethics Committee approved the ethics. Data collection took place in the first two weeks of December 2021. Participants were recruited through Prolific™ (www.prolific.co). Participants were invited to participate in an online survey that explored the impact of persuasive design techniques used in online gambling platforms on player engagement. Individuals who met the inclusion criteria were given the link to the anonymous questionnaire. Before starting the questionnaire, the participants were asked to read the participant information sheet and consent to participate. Participants were informed that they were free to stop at any time. The mean duration participants took to complete the questionnaire was 30.4 min (SD = 14.8). There were three attention checks within the questionnaire. The survey included seven open-ended questions, and all

REDUCTION

People are naturally wired to choose the path of least "effort". The reduction technique persuades players to have continuous /uninterrupted interaction with the game by reducing the effort to gamble. Therefore, requiring less behaviour affordances by the player.

EXAMPLE

Auto-play enables a repetitive play by spinning the reels consecutively and automatically without requiring the player to press any buttons.



POTENTIAL IMPACT ON PROBLEM GAMBLING

Reducing steps to gamble, in certain cases may,

- **speed up the decision-making process making it hard to reflect on behavior.**
- **make it difficult to resist impulses.**

Fig. 1. Example persuasive design technique explanation card.

participants were required to write a minimum of 100 characters. Participants who did not provide sensible answers were excluded from the analysis. Eligible participants received £5 for their participation.

4.2.5. Data analysis

The study included both continuous and ordinal data, which was analysed using SPSS version 28. Non-parametric tests were used as the data was not normally distributed. We used a chi-squared test to analyse group differences. Mann-Whitney's U and Wilcoxon signed-rank tests were used on ordinal data to analyse group differences. We used Spearman correlation to analyse the association between continuous and ordinal variables and the Mantel-Haenszel test of trend to analyse the association

between ordinal variables (Sheskin, 2003). Data from the open-ended questions was analysed using thematic analysis (Braun and Clarke, 2006).

4.3. Results

4.3.1. Participant demographics

In total, 250 participants completed the online survey. Four participants reported that they work or have worked in the gambling industry. Table 5 summarises demographics.

4.3.2. RQ1: Are players aware of the use and impact of persuasive design techniques used in online gambling platforms?

4.3.2.1. RQ1.a: Are players aware of the use of persuasive design techniques in online gambling platforms? In the first phase of

Table 5
Participant demographics.

N	250
Age: M(SD)	36 (10.4)
Age: Range	18–75
Gender: Males (%)	123 (49.2)
Females (%)	125 (50)
Gambling activity days per week: M(SD)	2.8 (1.9)
Number of online gambling accounts (%)	
1 account	9.6
2 accounts	23.6
3 accounts	23.2
4 accounts	7.2
5 accounts	5.6
6 or more accounts	30.8
Problem gambling severity index (%)	
Non-problem gambler	17.6
Low-risk gambler	25.6
Moderate-risk gambler	29.2
Problem gambler	27.6
Education (%)	
Compulsory school education completed	14.8
Vocational training	6.0
College	23.6
University degree	40.4
Postgraduate qualification (e.g., MSc, PhD)	15.2
Employment (%)	
Full-time employment	62.4
Part-time employment	14.4
Self-employed	6.0
Unemployed	2.8
On sick leave	1.6
Student	5.6
Retired	0.4
Homemaker	6.0
Other	0.8

the questionnaire, participants were informed about the use of persuasive design techniques in online gambling platforms and were asked whether they were aware of the utilisation of such techniques with a Yes/No response. The majority of participants (88.4%) stated that they were aware that online gambling platforms use persuasive design techniques. There was no significant difference in awareness based on gender ($p = 0.08$) and PGSI groups ($p = 0.18$). In a free recall setting, participants were also asked to list persuasive design techniques they were familiar with. As shown in Table 6, in-game rewards (74.4%) was the most recalled persuasive design technique, followed by game mechanics (12%) and personalisation (11.6%). Of all the participants, 2.4% reported other persuasive design techniques such as “the lack of time trackers, clocks”, “the ability to bet with sums as low as 1p”, and “the launch of new games”. In total, 6.8% of the participants stated that they did not know any examples of persuasive design techniques that are used in online gambling platforms.

“I was not aware of the use of persuasive techniques by online gambling websites. Although, I do receive free spin offers in my inbox very regularly, but I have always considered this as the websites gesture of goodwill rather than any persuasive technique to lure me in” [Moderate-risk problem gambler, Male, 41]

A chi-squared goodness-of-fit test was conducted to determine whether an equal number of participants from each of the PGSI groups recalled persuasive design techniques. The minimum expected frequency was 101. The chi-squared goodness-of-fit test indicated that the proportion of participants in each PGSI group that recalled persuasive design techniques was statistically significantly different, $\chi^2(3) = 17.1, p < 0.001$, with the non-problem gambler group having the lowest frequency and moderate-risk gamblers group having the highest frequency of participants. The

chi-squared goodness-of-fit test for gender showed that the proportion of participants who recalled persuasive design techniques was not significantly different between males and females, $\chi^2(1) = 3.4, p < 0.06$.

The second phase of the questionnaire introduced participants to 13 persuasive design techniques used in online gambling platforms and, for each technique, asked whether they had seen examples, realised the persuasive intent, and knew that it might trigger addictive usage with a Yes/No response. Each technique's reported awareness of use, awareness of intent and potential harm were taken as a total and treated as three continuous variables ranging from 0 to 13. Participants reported having seen an average of 10.7 ($SD = 1.8$) of the thirteen persuasive design techniques in their gambling experience (range six to thirteen). Participants were aware of the persuasive intent of an average of 8.4 ($SD = 3.1$) persuasive design techniques and were aware of the potential harm of an average of 8.1 ($SD = 3.2$) persuasive design techniques. Awareness of persuasive intent and potential harm for the persuasive design techniques ranged from zero to thirteen. While 2 participants (0.8%) were not aware of the persuasive intent of any of the persuasive design techniques, 20 participants (8%) were aware of the persuasive intent of all the techniques. Similarly, while four participants (1.6%) were not aware of the potential harm of any of the presented persuasive design techniques, 25 (10%) were aware of the potential harm of all the persuasive design techniques. No significant difference was observed in awareness of use, persuasive intent and potential harm of persuasive design techniques based on gender ($p = 0.31, p = 0.65, p = 0.97$, respectively) and PGSI groups ($p = 0.39, p = 0.89, p = 0.98$, respectively).

A Spearman's rank-order correlation analysis revealed a significant positive correlation between awareness of the use of persuasive design techniques presented in the study and the number of gambling accounts, $r_s(248) = 0.27, p < 0.05$, and gambling activity per week $r_s(248) = 0.27, p < 0.05$. Participants who had more gambling accounts and more gambling activity per week were more likely to also be participants who were aware of the use of persuasive design techniques presented in the study and vice-versa. There was also a significant positive correlation between weekly gambling activity and awareness of persuasive intent of persuasive design techniques presented in the study, $r_s(248) = 0.15, p < 0.05$, and awareness of potential harm of persuasive design techniques presented in the study, $r_s(248) = 0.15, p < 0.05$. Participants who gambled more per week were more likely to also be participants who were aware of the persuasive intent and potential harm of persuasive design techniques presented in the study and vice-versa. The correlation matrix for the study variables is shown in Appendix.

As shown in Table 7, out of the thirteen persuasive design techniques presented in the study, participants were mainly aware of the use of in-game rewards (98.8%), reminders (96.4%) and praise (92.4%). In contrast, authority (58.8%), near misses (64.8%) and competition (69.6%) were known by the lowest percentage of participants. Participants mainly reported being aware of the persuasive intent of in-game rewards (96.4%), reminders (90.4%) and social facilitation (72.8%). However, far less participants were aware of the persuasive intent of self-monitoring (26.8%), social norms (53.2%) and rehearsal (53.6%). Lastly, participants mainly reported being aware of the potential harm of in-game rewards (92%), reminders (86.8%) and social facilitation (70%). However, fewer participants were aware of the potential harm of self-monitoring (28.8%), social norms (48.8%) and authority (49.6%).

Table 6

Free recall of persuasive design techniques used in online gambling platforms by gender and problem gambling severity groups (%).

	Overall (%)	PGSI (%)				Gender (%)	
		Non-problem gambler	Low-risk gambler	Moderate-risk gambler	Problem gambler	Female	Male
In-game rewards	74.4	12	19.6	22	20.8	35.2	38.4
Game mechanics	12	2	3.6	4.4	2	6	5.6
Personalisation	11.6	1.2	2.8	3.6	4	4.8	6.8
Scarcity (i.e., exclusivity and temporality)	10.4	2.4	1.2	4	2.8	4.4	6
Aesthetics	8.8	2.4	1.6	2.4	2.4	3.2	5.2
Reminders	8.4	0.4	3.2	2	2.8	4.4	4
Loyalty schemes	6.8	2	2.8	0.4	1.6	2	4.8
Self-monitoring	4.8	0	1.6	1.6	1.6	2	2.8
Advertising	4.8	0.4	1.2	1.6	1.6	0.8	3.6
Simulation	2.8	0.8	0	1.2	0.8	1.6	1.2
Competition	2.8	0	0.8	0.8	1.2	1.2	1.6
Social Learning	2.4	0.4	0.4	1.2	0.4	1.2	1.2
Near Miss	2	0.4	0.4	0.8	0.4	1.2	0.8
Social facilitation (i.e., progressive jackpots)	1.6	0.8	0	0	0.8	0	1.6
Authority	1.6	0	0	0.4	1.2	0.4	1.2
Suggestion	1.2	0	0.8	0	0.4	0.4	0.8
Normative influence (i.e., refer to a friend)	1.2	0.4	0.4	0.4	0	0.8	0.4
Chat room	1.2	0	0.8	0	0.4	1.2	0
Other	2.4	0.8	0.8	0.4	0.4	1.2	1.2
Not familiar with any	6.8	2	2.4	1.2	1.2	4.8	2

Table 7

Awareness of use, intent and potential harm of each persuasive design technique presented in the study (%).

	Awareness of use	Awareness of persuasive intent	Awareness of potential harm
Reduction	86	62	64
Self-monitoring	84.8	26.8	28.8
Rehearsal	80	53.6	51.2
Praise	92.4	62.4	58.0
In-game rewards	98.8	96.4	92
Reminders	96.4	90.4	86.8
Social norms	88.8	53.2	48.8
Social facilitation	86.8	72.8	70
Competition	69.6	68.4	67.6
Authority	58.8	57.6	49.6
Scarcity	83.2	68.4	68.4
In-game control elements	81.6	64.4	66
Near misses	64.8	70	68
Average (%)	82.4	65.1	63

4.3.2.2. RQ1.b: Do players agree that persuasive design techniques can trigger addictive usage? In the context of online gambling, addictive usage was defined as problem gambling. Participants were asked whether they agreed with the claim that persuasive design techniques may contribute to problem gambling before and after viewing persuasive design technique explanation cards. Participants indicated their attitude towards the claim (from 1 = strongly disagree, to 5 = strongly agree) before and after viewing the explanation cards. As shown in Fig. 2, 91.6% of the participants agreed or strongly agreed that persuasive design techniques may contribute to problem gambling before viewing the explanation cards. There was no significant difference in agreement scores based on gender ($p = 0.42$) and PGSI groups ($p = 0.55$). Fig. 3 shows participants' attitudes towards the claim after viewing explanation cards.

A Wilcoxon signed-rank test was conducted to determine whether viewing persuasive design technique explanation cards had an impact on player attitudes towards the claim that persuasive design techniques may contribute to problem gambling. There was a statistically significant difference in agreement scores (5), $z = -8.04$, $p < 0.001$. Viewing explanation cards elicited

an increase in 93 participants' agreement scores, whereas six participants' agreement scores decreased after viewing explanation cards. A total of 151 participants did not change their agreement scores. When asked to explain their scores for time two, participants who agreed or strongly agreed that persuasive design techniques can contribute to problem gambling stated that persuasive design techniques can trigger excitement, create false hope that a big win is near and impair decision-making and self-control. The six participants who gave lower scores at time two stated that they did not find most of the shown persuasive design techniques persuasive and that only a small number of vulnerable individuals may be persuaded by them. Moreover, they mentioned that persuasive design techniques present customer value by offering the opportunity to earn money or to play new games, and everyone should be responsible for how to play and how much to gamble. As shown in Table 8, the largest proportion of participants whose agreement scores decreased were females and non-problem gamblers. After viewing explanation cards, problem gamblers were the only PGSI group to exhibit no negative change in agreement scores, and this group had the highest number of participants with a positive change.

4.3.3. RQ2: Do players agree that explainable persuasion can help players stay more in control of their gambling?

As shown in Fig. 4, 70% of participants agreed or strongly agreed that explainable persuasion can help players stay more in control of their gambling. There was no significant difference in agreement scores based on gender ($p = 0.86$) and PGSI groups ($p = 0.60$).

A Spearman's rank-order correlation analysis revealed a statistically significant negative correlation between participant agreement with the claim that explainable persuasion helps players and age, $r_s(248) = -0.18$, $p < 0.05$. Older participants were less likely to also be participants who agree that explainable persuasion can help players stay more in control of their gambling and vice-versa.

4.3.4. RQ3: What are the user acceptance and rejection factors of explainable persuasion?

This question explored user acceptance and rejection factors of explainable persuasion. This is because once we understand the acceptance and rejection factors, we can improve the design

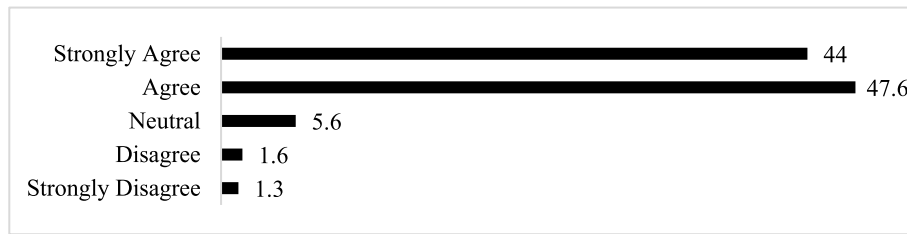


Fig. 2. Time 1: Agreement that persuasive design techniques contribute to problem gambling (%).

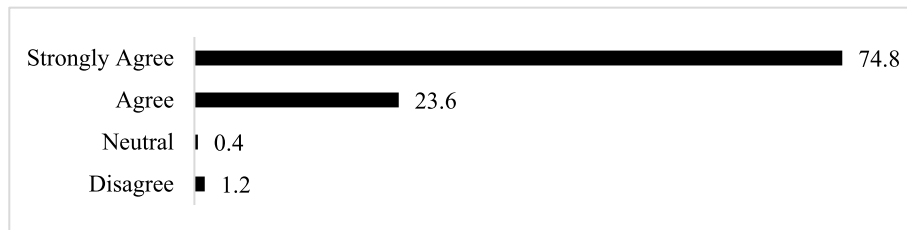


Fig. 3. Time 2: Agreement that persuasive design techniques contribute to problem gambling (%).

Table 8
Change in agreement scores by gender and problem gambling severity groups.

Agreement with claim	N	Mean ranks	Sum of ranks	Z	Asymp. Sig. (2-tailed)
All participants (n = 250)					
Negative ranks	6 ^a	58.7	352	-8.0	<0.001
Positive ranks	93 ^b	49.4	4598		
Ties	151 ^c				
Gender					
<i>Female (n = 125)</i>					
Negative ranks	4 ^a	32.7	131	-5	<0.001
Positive ranks	44 ^b	23.7	1045		
Ties	77 ^c				
<i>Male (n = 123)</i>					
Negative ranks	2 ^a	22	44	-6.2	<0.001
Positive ranks	49 ^b	26.1	1282		
Ties	72 ^c				
PGSI					
<i>Non-problem gambler (n = 44)</i>					
Negative ranks	4 ^a	10.2	41	-2.1	<0.03
Positive ranks	14 ^b	9.2	130		
Ties	26 ^c				
<i>Low-risk gambler (n = 64)</i>					
Negative ranks	0 ^a	0	0	-4.4	<0.001
Positive ranks	22 ^b	11.5	253		
Ties	42 ^c				
<i>Moderate-risk gambler (n = 73)</i>					
Negative ranks	2 ^a	19.5	39	-4.1	<0.001
Positive ranks	27 ^b	14.6	396		
Ties	44 ^c				
<i>Problem gambler (n = 69)</i>					
Negative ranks	0 ^a	0	0		<0.001
Positive ranks	30 ^b	15.5	465		
Ties	39 ^c				

^aT2 Agreement with Claim < T1 Agreement with Claim.

^bT2 Agreement with Claim > T1 Agreement with Claim.

^cT2 Agreement with Claim = T1 Agreement with Claim.

of explainable persuasion for a better user experience and higher user retention. The theoretical underpinning for the analysis is based on the Unified Theory of Acceptance and Use of Technology (UTAUT2) (Venkatesh et al., 2012).

The Unified Theory of Acceptance and Use of Technology (UTAUT) model was proposed by Venkatesh et al. (2003) to predict and assess user acceptance of information technology. UTAUT is based on the synthesis of prior technology acceptance

research on the Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1977), Technology acceptance model (TAM) (Davis, 1989), Motivational model (MM) (Davis et al., 1992), Theory of planned behaviour (TPB) (Ajzen, 1991), combined TAM and TPB (C-TAM-TPB) (Taylor and Todd, 1995), Model of PC Utilisation (MPCU) (Thompson et al., 1991), Innovation Diffusion Theory (IDT) (Roger, 1995), and Social Cognitive Theory (SCT) (Bandura, 1986). Four main variables were identified in the UTAUT model: performance



Fig. 4. Agreement with explainable persuasion helping players stay more in control of their gambling (%).

Table 9

UTAUT2 model variables.

UTAUT2 model variables	Definition
Performance expectancy	The extent to which employing a technology will give customers advantages when doing specific tasks.
Effort expectancy	The level of ease people have using technology.
Social influence	How strongly consumers believe that significant others think they should adopt a certain technology.
Facilitating conditions	Customer perceptions of the assistance and support available to complete a behaviour.
Hedonic motivation	The enjoyment and pleasure arising from the use of a technology.
Price value	Cognitive trade-offs consumers make when weighing the benefits of certain applications against the costs of using them.
Experience and habit	Experience is defined as the amount of time that has passed since the first use of a technology, while habit is defined as the degree to which people do learnt behaviours automatically.

expectation, social influence, facilitating environment, and technology support. According to the model, the acceptance and behavioural intention to use the technology is greater if the values of the four variables are greater. UTAUT has been empirically tested, and the findings indicate that it is a viable model for explaining IS/IT acceptance and use (Khechine et al., 2016). UTAUT was concentrated on organisational settings in which the use of technology is mandated (Venkatesh et al., 2012). Later, Venkatesh et al. (2012) revised their earlier model to accommodate the context of the consumer. The UTAUT2 included three new important variables: hedonic motivation, price value and experience and habit to predict consumer use. Moreover, demographics (e.g., age, gender) and experience were proposed to be moderator variables.

In the present study, the UTAUT2 model was employed to analyse and categorise participant responses of acceptance and rejection factors instead of the UTAUT model since the former focuses on customer usage context. The list and definition of UTAUT2 variables are shown in Table 9.

4.3.4.1. *Acceptance factors.* A total of 181 people mentioned acceptance factors, and in total, there were 309 statements. The distribution of gender and PGSI groups are shown in Figs. 5 and 6, respectively.

A summary of the acceptance factors of explainable persuasion is shown in Table 10.

4.3.4.1.1. *A. Performance expectancy*

4.3.4.1.1.1 *Raises awareness*

The first theme was related to raising awareness. Participants mentioned that explainable persuasion could be helpful as being aware of persuasion will make players less susceptible to influence. They felt that explainable persuasion might help players recognise the persuasive intent used in online gambling platforms:

Table 10

Acceptance factors of explainable persuasion.

Main Themes	Frequency
A. Performance expectancy	306
1. Raises awareness	257
(a) of persuasive intent	
(b) of the commercial nature of gambling	
(c) of unknown persuasive design techniques	
(d) of self-awareness	
(e) of potential negative impacts	
(f) of characteristics and operation of games	
2. Facilitates informed decision making	43
B. Demographics	3

“If people are aware about the persuasive techniques that are used to incentivise players to come back and gamble more, they would be able to spot them more in action and acknowledge that they’re there”. [Problem gambler, Male, 24]

Participants stated that explainable persuasion could raise awareness of the commercial nature of gambling. Some participants mentioned that even though they knew about the persuasive design techniques used in online gambling platforms, they did not realise the business motivation behind them:

“You are not even aware that these techniques are being carried out until pointed out to you in such cards. As a gambler, you just think it’s to make the game more enjoyable, not a technique to make you play and gamble more”. [Low-risk gambler, Female, 43]

Many participants found explainable persuasion helpful in controlling their gambling as it increased their awareness of previously unknown persuasive design techniques:

“I think of myself as fairly alert to the way gambling sites operate but had no idea about many of these techniques”. [Low-risk gambler, Female, 49]

“It has certainly opened my eyes to some of the techniques which I hadn’t thought about”. [Problem gambler, Male, 30]

Some participants stated that explainable persuasion could also increase self-awareness, which was related to recognising feelings and gambling actions in relation to persuasive design techniques:

“Explanations can help you rationalise feelings of craving or excitement, and giving a name to things helps identify the cause of feelings”. [Problem gambler, Female, 27]

“While viewing the cards, they would identify when such an instance has happened to them before. I think this would help prevent them from making the same mistakes and gain control”. [Moderate-risk gambler, Male, 20]

Some participants stated that explainable persuasion can raise awareness of the potential negative impact of interacting with persuasive design techniques and reinforce the risks:

“If you know that the website is trying to influence you to keep playing, and you know that it could lead to problem gambling, you’re more likely to try to stay in control of your gambling as you know the outcome could become a problem if you allow the persuasive techniques to persuade you”. [Non-problem gambler, Female, 26]



Fig. 5. Gender distribution among acceptance factor statements.



Fig. 6. Distribution of problem gambling severity among acceptance factor statements.



Fig. 7. Gender distribution among reception factor statements.

A few participants suggested that explainable persuasion can raise awareness of the characteristics and operation of gambling and games. They stated that explainable persuasion can remind players that they are not in control of the gambling outcomes and that the house is more likely to win:

“...(when) hitting a nudge or hold button on a spin game, if a pop-up appeared the first time you pressed one that said something like, “pressing these buttons has no influence on your chances or winning or losing”, you might think twice about how much your chances of winning are” [Moderate-risk gambler, Male, 31]

4.3.4.1.2 Facilitates informed decision making

The second theme was related to facilitating informed decision-making. Participants mentioned that explainable persuasion could help players feel more in control of their gambling by facilitating informed decision-making. They felt that explainable persuasion could help players stop and reflect on their behaviour before interacting with persuasive design techniques:

“If people understand that there’s a degree of manipulation going on, and there’s transparency on that, they may have a more sceptical or critical eye over the choices they’re making on gambling sites”. [Non-problem gambler, Female, 29]

4.3.4.1.2. B. Demographics

Some participants emphasised that explainable persuasion would be more useful to players who have control over their gambling or players who just started gambling:

“I think that ‘normal’ steady gamblers betting with funds they can afford to lose and not tempted into chasing losses, these example cards would be beneficial”. [Moderate-risk gambler, Male, 43]

4.3.4.2. Rejection factors. 96 people mentioned rejection factors, and in total, there were 139 statements. The distribution of gender and PGSI groups are shown in Figs. 7 and 8, respectively.

A summary of the rejection factors of explainable persuasion is shown in Table 11.

Table 11

Rejection factors of explainable persuasion.

Main themes	Frequency
A. Performance expectancy	69
1. The disparity between knowledge and behaviour	32
2. Explanations considered irrelevant	28
(a) Perceived familiarity	13
(b) Denial (i.e., of the problem and negative impact)	7
(c) Perceived immunity to persuasion	6
3. Immersion effect	7
B. Demographics	40
1. Problem gamblers	33
2. Susceptibility to persuasion	5
C. Hedonistic motivation	12
1. Hinders player experience	4
2. Patronising statements	4
D. Habit	12
1. Desensitisation to website warnings	12
E. Effort expectancy	6
1. Prominence issue	2
2. Comprehension	4

4.3.4.2.1. A. Performance expectancy

4.3.4.2.1.1 The disparity between knowledge and behaviour

The first theme of performance expectancy was related to the disparity between knowledge and behaviour. Participants believed that players already know about persuasive design techniques used in online gambling platforms but interact with such techniques despite the potential risks. Participants stated that even if players did not know about the persuasive design techniques, knowing about them would not help. Some participants made a comparison with anti-smoking disclaimers on cigarette



Fig. 8. Distribution of problem gambling severity among acceptance factor statements.

packaging and mentioned that knowing something is bad for you doesn't necessarily mean you will stop doing it:

"I think, for the most part, gamblers know what they're getting themselves into. It's like putting all of the anti-smoking stuff on cigarette packaging. At the end of the day, if people want to smoke, they will smoke, and the same applies to gamblers". [Moderate-risk gambler, Male, 31]

Participants also mentioned that knowing about persuasive design techniques would not help players gain more control over gambling, as gambling is based on intuitive rather than rational reasoning:

"I believe the temptation to gamble cannot be solved by education since the personal reasons players want to continue impact their biases and heuristics more powerfully". [Low-risk gambler, Male, 19]

4.3.4.2.1.2 Explanations considered irrelevant

The second theme of performance expectancy related to explanations being considered irrelevant. Some participants deemed explainable persuasion irrelevant due to the *perceived familiarity* of its content. They indicated that they were already aware of persuasive design techniques and their negative effects:

"I believe most players know exactly what persuasive techniques are being used on them by gambling websites, but it would still make no difference to them having that knowledge. This would not change the desire or the habit of gambling on these websites". [Low-risk gambler, Female, 51]

A number of participants reported that players would skip or ignore explainable persuasion because they believe such explanations do not apply to them. Participants stated that players might ignore explainable persuasion because they *deny having gambling problems, the negative impact* or think they are immune to persuasion:

"I think if you are a problem gambler, you will ignore these warnings and kid yourself that you are different to other people and that it is they who have a problem, not you". [Non-problem gambler, Male, 52]

"I'm not sure that explaining the techniques to people will help them. I think that those most likely to have gambling problems will think that they are 'immune' to being persuaded". [Low-risk gambler, Female, 37]

4.3.4.2.1.3 Immersion effect

A few participants claimed that players might not engage with explainable persuasion as they are fully immersed in gambling:

"I think that you can clearly explain how these techniques work; however, in the excitement of the moment, such clarity can be difficult for many people to think of as they are living in the moment". [Problem gambler, Male, 55]

4.3.4.2.2. B. Demographics

4.3.4.2.2.1 Problem gamblers

Participants felt that explainable persuasion might be helpful for regular players; however, they found it to be a naïve approach to those who had already developed gambling disorder. They stated that problem gambling is related to neurotransmitter dysregulation, loss of control and irrational thinking and that explainable persuasion cannot convince problem gamblers by logical argument:

Table 12

Problem gambling severity difference between the argument for naivety.

PGSI type	Naïve approach to problem gamblers
Problem gambler	29 (65.9%)
Moderate-risk gambler	16 (25%)
Low-risk gambler	13 (17.8%)
Non-problem gambler	6 (8.9%)

"I believe just being aware of something does not mean they will be in more control of their addiction. For example, everyone knows objectively that smoking kills, but people are chemically addicted to nicotine. similarly, with gambling, people are addicted to the adrenaline rush, the dopamine hits etc". [Problem gambler, Male 22]

When further examined, it was found that the argument "naïve approach for problem gamblers" was stated more by problem gamblers. As shown in Table 12, there seems to be a pattern in which problem gamblers stated the argument more compared to other groups.

A few participants' naivety concerns related to the textual presentation of explainable persuasion.

"...I think that if somebody is going to gamble or has an issue than they probably wouldn't take a great deal of notice to the text". [Problem gambler, Male, 37]

4.3.4.2.2.2 Susceptibility to persuasion

The second theme of demographics is related to difficulty in resisting persuasion. Participants stated that it might be challenging for some players to resist persuasion. They argued that resistance to persuasion requires self-control as certain offers can be highly enticing:

"These tools entice you to spend spend spend. It is down to the mental strength of the individual to resist and keep resisting the allure of more wins, more spins, more stuff". [Non-problem gambler, Male, 48]

4.3.4.2.3. C. Hedonistic motivation

4.3.4.2.3.1 Hinders player experience

The first theme of hedonistic motivation is related to hindering the player experience. Participants expressed worry about explainable persuasion hindering the player experience. They believed that explanations and notifications might cause information overload, and as a result, players might leave the gambling platform:

"I think if you have to start explaining things, it will just clog up the website with information that the people who need to read it won't. People don't care about stuff like that when they're a gambler, and if it starts annoying them, they'll just move sites". [Moderate-risk gambler, Male, 34]

4.3.4.2.3.2 Irritation by patronising statements

The second theme of hedonistic motivation was related to players feeling patronised by the statements. Some participants stated that players would not engage with explainable persuasion because they may regard such explanations as patronising and paternalistic, thus irritating:

"It depends upon how much the player believes that the explanation is true, and not just 'nannying' from health authorities". [Non-problem gambler, Male, 31]

4.3.4.2.4. D. Habit

Participants reported that some players wouldn't pay attention to any notice as they are eager to gamble and want to get started immediately:

For some players, explanations will be useful and will encourage them to take the messages with a pinch of salt. For others, however, any explanations will be quickly minimised/skim read, etc [Moderate-risk gambler, Male, 41]

4.3.4.2.5. E. Effort expectancy

4.3.4.2.5.1 Lack of visibility concern

Two participants were concerned that gambling operators will display explainable persuasion in small print and hide it in the platform, and thus it would not assist players in regulating their gaming.

They will probably find a way to put the explanation in such a place or explain in such a way which renders it useless. [Moderate-risk gambler, Male, 36]

4.3.4.2.5.2 Poor comprehension concern

A few participants believed that explanations would be hard to understand for players:

"I think that the explanations are usually longwinded - or they are complicated - because the persuasive techniques are complicated". [Non-problem gambler, Male, 61]

4.3.4.3. Suggestions for improving user acceptance.

4.3.4.3.1. A. Performance expectancy

4.3.4.3.1.1 User control

Participants had conflicting views about user control regarding explainable persuasion. Some participants suggested that explainable persuasion should be mandated to players before gambling, and their comprehension should be assessed by attention checks throughout. Others argued that interaction with explainable persuasion should be voluntary as they might be distracting or overlooked at the time of gambling. They suggested that explainable persuasion could be presented on a separate webpage for those who are interested.

4.3.4.3.1.2 Self-monitoring

Four participants suggested that players should be able to monitor how much they have interacted with persuasive design techniques throughout their gambling session and also have the option to limit interaction with persuasive design techniques such as auto spin.

4.3.4.3.2. B. Effort expectancy

4.3.4.3.2.1 Reminders

Some participants suggested that, for explainable persuasion to be effective, players must be frequently reminded of the persuasive design techniques they are exposed to throughout the gambling session. It was also suggested that just-in-time reminders might be more useful as it would be easier for players to recognise and consent to the techniques at the point of interaction.

4.3.4.3.2.2 Clear and straightforward information

According to a few participants, the content and delivery of explainable persuasion are crucial variables in capturing attention and easing comprehension. Participants indicated that explanations must be brief and straightforward and delivered in a bullet point format to be effective.

4.3.4.3.2.3 Option-out choice from persuasive design techniques

While most participants agreed that explainable persuasion can assist responsible gambling, several proposed that gambling platforms should give the choice of opting out of persuasive design techniques altogether if they so desire.

4.3.4.3.3. C. Hedonistic motivation

4.3.4.3.3.1 Use of persuasive design techniques

One of the participants proposed that the experience of interacting with explainable persuasion may be made more enjoyable by utilising persuasive design techniques, such as providing rewards and prizes for those players who engage with them.

4.3.5. RQ4: What information do players require when receiving explainable persuasion?

As shown in Table 13, participants required information about the potential negative impact (70%), use (67.6%), and coping tactics (66.8%) from explainable persuasion. In contrast, information about coping goals (54.4%) and persuasive psychological mediators (57.2%) was requested by the lowest percentage of participants. Of all the participants, only 2.8% requested other information not covered by the provided information categories.

Seven participants suggested other information could be part of the explainable persuasion content. Participants stated that details about players' betting history (i.e., wins and losses) and information about time spent on gambling could also be provided to raise self-awareness of gambling behaviour and help players reflect on their interaction with the persuasive design techniques. Participants also requested information about gambling addiction helplines, showing players where they can get help if they struggle to control their gambling. Moreover, participants stated that explainable persuasion content could include information about how to disable the persuasive design technique.

The total number of content participants requested from explainable persuasion was treated as a continuous variable ranging from 0 – 8 (use, intent, tactic, psychological mediator, negative impact, coping goal, coping tactic, other). Total number of contents requested from explainable persuasion did not vary by gender ($p = 0.87$) or PGSI group ($p = 0.50$). A Spearman's rank-order correlation analysis revealed a statistically significant positive correlation between the number of content requested from explainable persuasion and participant awareness of the intent of the persuasive design techniques presented in the study, $r_s(248) = 0.15, p < 0.05$. Moreover, there was a statistically significant positive correlation between the number of content requested from explainable persuasion and awareness of the potential harm of persuasive design techniques presented in the study, $r_s(248) = 0.15, p < 0.05$. That is, participants who were aware of the persuasive intent and potential harm of more persuasive design techniques presented in the study were more likely to also be participants who requested more content from explainable persuasion and vice-versa. A statistically significant negative correlation was also observed between the number of requested content from explainable persuasion and age, $r_s(248) = -0.14, p < 0.05$. Older participants were more likely to also be participants who requested less content from explainable persuasion and vice-versa.

4.3.6. RQ5: What will players' attitudes be towards gambling operators that provide explainable persuasion within online gambling platforms?

As shown in Fig. 9, 58.8% of participants stated that their attitude towards gambling operators would become positive or more positive if they provided explainable persuasion within online gambling platforms. There was no significant difference in attitudes based on gender ($p = 0.93$) and PGSI groups ($p = 0.29$).

A Mantel-Haenszel test of trend analysis revealed a statistically significant linear association between attitude towards gambling operators and agreement with explainable persuasion being helpful to players, $\chi^2(16) = 15.54, p < 0.05, r = 0.3$. Participants who agreed that explainable persuasion could help players control their gambling were more likely to have a positive attitude towards gambling operators that provided explainable persuasion and vice-versa. A statistically significant negative correlation was observed between attitude towards gambling operators and age, $r_s(248) = -0.13, p < 0.05$. Older participants were less likely to also be participants who have a positive attitude towards gambling operators that provided explainable persuasion and vice-versa.

Table 13
Overall and gender differences in perception of information required from explainable persuasion by gender and problem gambling severity groups (%).

	Overall (%)	PGSI (%)				Gender (%)	
		Non-problem gambler	Low-risk gambler	Moderate-risk gambler	Problem gambler	Female	Male
Information about use	67.6	56.8	71.9	64.4	73.9	69.6	65
Information about persuasive intent	65.2	72.7	56.3	64.4	69.6	60	69.9
Information about persuasive tactic	64.4	68.2	65.6	57.5	68.1	64	65
Information about persuasive psychological mediator	57.2	68.2	56.3	50.7	58.0	52.8	61.7
Information about potential negative impact	70	77.3	65.6	68.5	71.0	68.8	70.7
Information about coping goal	54.4	56.8	51.6	52.1	58.0	58.4	49.5
Information about coping tactic	66.8	68.2	68.8	67.1	63.8	69.6	64.2
Other information	2.8	28.6	0.0	28.6	42.9	2.4	3.2

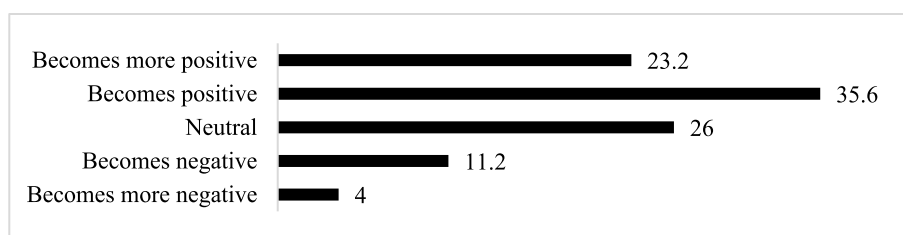


Fig. 9. Players' attitude towards gambling operators if they provide explainable persuasion (%).

Regarding participants' qualitative comments on their attitude towards gambling operators, if they provide explainable persuasion, some participants stated that providing explainable persuasion on online gambling platforms is the responsible action to take and demonstrates integrity on the part of gambling operators.

"It provides integrity and an honest approach and can be really thought-provoking for the user so can make them think about their actions and learn about their movements and how things can happen". [Low-risk gambler, Female, 29]

However, other participants were critical about the conflict between the duty of care and business motive. They believed that triggering player engagement with persuasive design techniques and then providing explanations of the negative impact is contradictory.

"...to promote a caring side from gambling companies but then to load the screen full of techniques to spend more, I believe is very irresponsible". [Problem gambler, Male, 38]

Some participants were sceptical that gambling operators would provide explainable persuasion with the players' best interests in mind.

"They will probably find a way to put the explanation in such a place or explain in such a way which renders it useless". [Moderate-risk gambler, Male, 36]

5. Discussion

The current paper introduced the concept of explainable persuasion in interactive systems, discussed the need for it and explored user attitudes towards the explainability of persuasive design techniques in the context of online gambling. With an analogy to XAI, we defined the concept of explainable persuasion and proposed that it could be a solution to support informed consent for more ethical persuasive interfaces. We discussed the need for professional and business perspectives, stating that it could help designers take responsibility in protecting users, help

build a trusting relationship between the user and the system and work as a proactive strategy for more responsible usage of technology, especially for addictive technology. In determining the content of explainable persuasion, we utilised the informed consent theory (Faden and Beauchamp, 1986) and the persuasion knowledge model (Friestad and Wright, 1994) as reference models.

We explored the concept of explainable persuasion from the users' perspective. The user study showed that most players are aware that online gambling platforms use persuasive design techniques. In a free recall setting, the most recalled persuasive design technique was in-game rewards (74.4%), followed by game mechanics (12%). This finding suggested that persuasive design techniques are not as well recognised given the significant percentage difference between the most and second most recalled persuasive design technique. Non-problem gambler group had the lowest frequency of recalling persuasive design techniques. Players tended to be less aware of the persuasive intent and potential harm such techniques could cause, and further analysis showed that players with more gambling accounts and more weekly gambling activity were more likely to be aware of the use, persuasive intent, and potential harm of persuasive design techniques. These findings suggest that explainable persuasion might be particularly useful for new and regular players who may not be as familiar with online gambling mechanics as heavy players. This ties in with research suggesting that persuasive design techniques to manage responsible online gambling would be more effective for low to moderate gamblers (Arden-Close et al., 2022). The results also showed that most of the players already agreed that persuasive design techniques may contribute to problem gambling. Their level of agreement increased after viewing the explanation cards. The rise in agreement scores might be attributed to psychological inoculation (McGuire, 1961, 1964), in which players' responsible gambling attitudes were reinforced after they were triggered to re-think the potential influence and harm. Inoculation has shown to be helpful as a preventative

strategy for other addictive behaviours such as smoking and drinking (Pfau et al., 1992; Godbold and Pfau, 2000). While much of the early research views inoculation as a prophylactic approach (i.e., preventive approach) (McGuire, 1964; Pfau et al., 2004), it has been argued that inoculation intervention can also provide a “therapeutic” effect (Compton, 2020; Van der Linden and Roozenbeek, 2020). That is, inoculation also has the potential to create resistance in people with somewhat indifferent or opposing attitudes and views (Compton and Ivanov, 2013). Our findings supported this claim; after viewing the explanation cards, problem gamblers were the PGSI group with the highest number of participants who increased their agreement scores on the claim that persuasive design techniques may contribute to problem gambling. Thus, future research should investigate whether explainable persuasion is more effective as a preventive approach or a corrective approach.

Although most players were aware that gambling sites use persuasive design techniques, the majority found the concept of explainable persuasion helpful and agreed that it could assist players in maintaining greater control over their gambling. Players stated that explainable persuasion could raise awareness of less familiar persuasive design techniques, the persuasive intent, the commercial nature of gambling, self-awareness, potential negative impacts and characteristics and operations of games. Players considered information regarding the usage, potential negative impact, and coping tactics to be the most important components of explainable persuasion. Players who were aware of the persuasive intent and potential harm of more persuasive design techniques presented in the study were more likely to request more informational content from explainable persuasion. One plausible explanation for this could be related to individual differences in the need for cognition (i.e., the tendency to enjoy effortful cognitive activities) (Cacioppo and Petty, 1982). Players with a high need for cognition may have been more motivated to seek out and process more information. Studies conducted in the field of XAI and intelligent recommender systems show that people with a high level of need for cognition pay more attention to explanations (Conati et al., 2021) and are more willing to understand the provided attributes (Millicamp et al., 2019). Future research could examine whether a correlation exists between the need for cognition and the request for in-depth informational content from explainable persuasion.

In discussing why explainable persuasion might not be helpful, players emphasised the disparity between knowledge and behaviour. Research suggests that knowledge does not always translate to intent, followed by behaviour/action and that there could be mediating factors in play. For example, according to protection motivation theory (Rogers, 1975), an individual's self-protective behaviours in the face of a threat are shaped by their threat appraisal (i.e., the perceived severity of the threat, the perceived probability of the threat harming the individual, the perceived reward linked to threat, whether extrinsic or intrinsic) and their coping appraisal (i.e., response efficacy, the belief that counter behaviour will reduce the threat, self-efficacy (Bandura et al., 1999), the belief that one will be successful in performing the counter behaviour, and the response costs; the costs assigned to counter behaviour) Thus, these cognitive constructs may mediate the relationship between knowledge and behaviour. For example, studies on smoking cessation show that self-efficacy plays an important role between the intention to quit smoking and maintaining abstinence (Ockene et al., 2000). Regarding the effect of self-efficacy, some players in the study emphasised the perceived difficulty of resisting to persuasion. Studies on metacognition research suggest that self-beliefs about one's susceptibility to persuasion can affect responses to persuasion (Rucker et al., 2004; Chang, 2017). Similarly, future research can

investigate the role of self-efficacy in understanding the disparity between knowledge and behaviour regarding explainable persuasion.

Players also stated that people might find explainable persuasion content irrelevant due to denying their gambling problems or thinking they are immune to persuasion. This finding could be explained by the absolute denial pattern (i.e., being convinced that there is no problem to be addressed) (Gorski, 2000), the stigma associated with problem gambling (Hing et al., 2014) and illusory superiority cognitive bias (i.e., overestimating own abilities in comparison to others) (Hoorens, 1995). Players in the study stated that explanations would be ignored due to the immersion effect of gambling. Flow experience (Csikszentmihalyi, 2013), a mental state of intense concentration on a specific task, devoid of distractions, can induce this immersion. Research suggests that when players are overly immersed in the game, they may lose their ability to perceive external stimuli beyond it (Schüll, 2012; Murch et al., 2020). Future research could explore how to design the delivery of explainable persuasion to disrupt the flow state and attract focused attention.

Players have expressed concern that long-worded explanations and notifications might affect their gameplay and take the fun out of the experience. From a user experience standpoint, Chazette and Schneider (2020) reported similar findings regarding system explanations and user concerns over impairment, interruption, distraction, and time consumption. Additionally, some players stated that explanations appeared patronising and could have a negative impact on their enjoyment.

Furthermore, players, especially those in the problem gambling group, stated that explainable persuasion may be a naïve approach for problem gamblers. Given that problem gamblers somewhat agree that explainable persuasion can help players stay more in control of their gambling (M:3.8 SD:1.18), the argument “naïve approach for problem gamblers” might arise not due to dismissive attitude towards explainability but other factors may be in play. For example, problem gamblers' concern about naivety could be a sign of cognitive dissonance (Festinger, 1957). Such cognitive dissonance may be manifested through the conflicted user cognition of “wanting to control behaviour” versus “wanting to perform addictive behaviour”, in which dissonance is eliminated by dismissing the help of responsible gambling features. Another reason for the naivety concern could be due to this group believing that problem gamblers' main objective is to continue gambling regardless of the consequences (Nower and Blaszczynski, 2010). Given that problem gamblers gamble for reasons other than entertainment, explainable persuasion will have little influence on encouraging responsible gambling. Moreover, the naivety concern could be related rather to the presentation of explainable persuasion. Players believed that people would not take a great deal of notice of the text as they are eager to get to gambling. In the design of explainable persuasion, it is crucial to address the conflict that exists between the desire to satisfy hedonistic motivation and the need for logical reflection. Future research can investigate explainable persuasion with respect to dual processing (Petty and Cacioppo, 1986; Evans, 2008) and test whether explainable persuasion that targets the peripheral route to information processing is more effective than explainable persuasion that targets the central route for specific groups such as problem gamblers.

More than half of the players stated that their attitude towards gambling operators would become positive if the operators provided explainable persuasion, as such a practice would reflect the operators' integrity and duty of care. This finding relates to the trustworthiness dimensions of integrity and benevolence defined by Bolat et al. (2019) for the gambling industry. The finding is also consistent with Gainsbury et al. (2013), who showed that

the use of responsible gambling tools could lead to more positive views about a gambling operator among players. Participants who agreed that explainable persuasion could help players control their gambling were more likely to have a positive attitude towards gambling operators that provided explainable persuasion. However, some players were concerned that gambling operators would not provide explainable persuasion in a legible and accessible format. Player mistrust in online gambling sites and operators regarding responsible gambling practices has been reported in previous studies (Yani-de Soriano et al., 2012; Gainsbury et al., 2013). According to Bolat et al. (2019), gambling industry personnel acknowledge that transparency is an important strategy to build trust in the gambling industry and win customers.

There is limited evidence in the current study that gender and problem gambling severity differences affected study variables. While previous studies show that females have a more positive attitude towards responsible gambling measures than males (Gainsbury et al., 2013; Engebø et al., 2019), in the current study, both females and males had a similar view and agreed that explainable persuasion can assist players in exercising greater control over their gambling. Similarly, while studies show that problem gamblers have the least positive attitudes to responsible gambling initiatives (Nower and Blaszczynski, 2010; Ivanova et al., 2019), all PGSI groups somewhat agreed that explainable persuasion can help players stay in control. One plausible explanation for such difference in the findings may be attributed to players perceiving explainable persuasion as a non-restrictive intervention aimed at fulfilling conditions for informed consent. Future research can investigate player attitudes towards explainable persuasion when it is designed as a mandatory or voluntary interaction.

While gender and problem gambling severity did not influence user attitudes towards the concept of explainable persuasion, age was found to be a determining factor. Older participants were less likely to agree that explainable persuasion can help players stay more in control of their gambling, less likely to request more content from explainable persuasion and less likely to have a positive attitude towards gambling operators that provided explainable persuasion. The negative correlation between age and dismissive attitude towards explainability could result from the decrease in the need for cognition due to age-related declines in cognitive ability. According to studies, elderly respondents' need for cognition is more likely to decrease than that of middle-aged respondents over time (Spotts, 1994; Bruinsma and Crutzen, 2018). The age impact may also be related to usability, as information overload can overwhelm older users (Lee and Coughlin, 2015). Moreover, the age impact may also be related to older gamblers having less favourable attitudes towards responsible gambling initiatives than younger adults (Gainsbury et al., 2013; Engebø et al., 2019). In general, older people tend to be less open to new technologies than younger people, citing concerns about the complexity and scepticism as barriers (Vaportzis et al., 2017).

5.1. Threats to validity

The study needs to be interpreted with considerations to validity that may have impacted the findings.

In terms of construct validity, one consideration is the completeness of the persuasive design techniques presented in the study. While the authors do not claim that the list of persuasive design techniques is complete, the purpose of the list is to gain insight into commonly used persuasive design techniques in online gambling platforms in order to guide the conceptualisation and design of explainable persuasion. The analysis was mainly guided by the Persuasive Systems Design (PSD) framework (Oinas-Kukkonen and Harjumaa, 2009), which is a theoretically valid framework for building and analysing persuasive

systems. PSD model is used in research to detect the various persuasive features used in e-commerce websites or apps and how persuasive techniques can increase persuasiveness (Langrial et al., 2012; Alhammad and Gulliver, 2014; Adib and Orji, 2021). To address the concern with completeness, the analysis was also informed by Cialdini's (2001) work on principles of persuasion and McCormack and Griffiths's (2013)'s work on structural and situational characteristics of internet gambling. Relevant persuasive design principles were extracted from these models and exemplified for the study. The list of persuasive design techniques can be expanded in future research, for example, by utilising persuasive techniques defined in advertising and marketing (O'Shaughnessy and O'Shaughnessy, 2003).

Considering internal validity, one consideration is behaviour bias. The majority of the participants were biased against persuasive design techniques, as 91.6% of the participants agreed or strongly agreed that persuasive design techniques may contribute to problem gambling before viewing the explanation cards. This bias could be related to the negative perception of gambling. Studying explainable persuasion in other persuasive domains, such as e-commerce, could help minimise this bias. Another internal validity consideration could relate to the maturation effect due to the length of the study. Since the survey took approximately 30 min to complete, some participants may have become bored, and this may have impacted their responses. The order in which the 13 persuasive design technique explanation cards were presented was randomised to reduce this impact.

Participant selection could have been an external validity consideration. The majority of the participants were recruited from the United Kingdom, and this can pose a threat to validity in terms of the generalisability of the findings internationally. It has been suggested that cultural attitudes can influence gambling and help-seeking behaviours and that cultures that value gambling are more susceptible to gambling problems than cultures that do not have favourable cultural attitudes towards gambling (Raylu and Oei, 2004; McMillen et al., 2007). Thus, cross-cultural research is needed to understand the concept of explainable persuasion from the standpoint of gamblers in different cultural contexts. In exploring explainable persuasion from users' perspectives, a distinct domain for persuasive technology, online gambling, was selected as a case study. This selection may also be an external validity consideration as the gambler profile may not represent the general user attitude towards system persuasion in other domains such as social media or online streaming platforms. Also, persuasive design techniques employed in online gambling platforms may differ from persuasive design techniques employed in other domains. Future research should examine the concept of explainable persuasion in other domains that utilise persuasive interfaces.

Lastly, the reliability of the findings may have been affected as participants were compensated for their participation. Given that gamblers have a higher demand for money, providing compensation could have threatened the validity of their participation as participants could have rushed through the survey to get paid. To reduce this potential impact, three attention checks were added to the survey. Moreover, seven open-ended questions were included in the survey, and participants who did not provide sensible answers were excluded from the analysis.

6. Design tensions and possible solutions

This paper aimed to serve as an introductory reading to user acceptance of explainable persuasion in the field of persuasive interfaces. The findings point to a number of design tensions that could prohibit players from interacting with explainable persuasion. Addressing these tensions in the explainable persuasion

Table 14
Explainable persuasion design tensions.

1. User autonomy versus mandatory interaction
2. Concise explanations versus fostering comprehension
3. Interrupting primary task versus not hindering user experience
4. Constant exposure versus desensitisation
5. Caring versus patronising

design process can fulfil users' needs and help increase user engagement.

As shown in Table 14, five design tensions have been proposed to support the design of explainable persuasion within persuasive interfaces. Before we elaborate on the design tensions, it is important to clarify what it is that we are working towards achieving. Our primary focus is not to disrupt the user experience in order to raise awareness of each persuasive design technique. This would not be feasible as it will interrupt the primary task and hinder the user experience. Our focus is to address the unintended consequences of addictive technology caused by the use of persuasive design techniques. By providing explainable persuasion that promotes consent and choice, we can empower users who desire control over their digital usage. It is important to note that the proposed design tensions are not a comprehensive list; rather, they serve as a beginning point for the design of explainable persuasion. Furthermore, it is critical to emphasise that focusing solely on user demands when designing explainable persuasion would not be the optimal strategy, given the intention-behaviour gap in addictive behaviours. This is because the user's perception of what needs to be done may contradict what is done in the heat of the moment. To overcome this challenge, future research should include not only users but also other essential players within the larger system (e.g., gambling operators, designers, and responsible gambling organisations).

6.1. User autonomy versus mandatory interaction

Some users suggested that explainable persuasion should be mandatory and that users' knowledge and awareness should be assessed throughout their interaction with persuasive platforms, while others advocated for user autonomy in their decision to interact with explainable persuasion. Since explainable persuasion is proposed as an initiative against addictive usage, it is important that all users interact with such content at least once while engaging with persuasive platforms. One way to approach this design tension could be by providing explainable persuasion at the sign-up stage to such platforms so that users could consent to the use of such persuasive design techniques. Interaction with explanations could also be encouraged by nudging (Caraban et al., 2019). Users can be automatically enrolled to the explainable persuasion feature over which they can exercise control by opting out via the control panel. Also, the presentation and delivery of explainable persuasion can be delivered in a way that adapts to the user's needs and preferences in order to respect user autonomy (Van Welie et al., 1999). Users could be allowed to customise the explainable persuasive interface by selecting the persuasive design techniques for which they wish to receive explanations, the depth of information they would like to receive, and when they would like to receive explanations.

6.2. Concise explanations versus fostering comprehension

Disclosing too much information about persuasion mechanics may lead to information overload, frustrate users, and hinder user experiences. According to the usability principle of aesthetic and minimalist design, interactive interfaces should avoid using redundant information and be straightforward to be effective

(Nielsen, 2005). However, it might be difficult to promote comprehension with brief explanations due to the complexity of the psychological dynamics related to persuasive design principles. One possible solution to this design tension could be utilising secondary channels, channels where notifications are given outside of the usage context and are accessible to the user at a specific location within the system (Schaub et al., 2015). Users could simply be informed about the use of persuasive design techniques at the point of interaction, similar to cookie disclaimers, rather than being given all the information. Detailed information on persuasive design techniques can be delivered in an accessible secondary channel within the platform (e.g., the responsible gambling page), and players who want to learn more can be directed to it via a link. Additionally, because different user profiles could have varying demands for comprehension, explainability requirements could be elicited using personas, as such a method will help identify various user groups' needs for explanation (Anvari et al., 2017). Also, through public channels such as marketing campaigns, users can be educated about the use and impact of persuasive design techniques.

6.3. Interrupting primary task versus not hindering user experience

A significant challenge is designing explainable persuasion that is usable and contextual enough to not impair user experience but also disruptive enough to catch user attention and foster critical thinking. Therefore, the main challenge is designing engaging explainable persuasive interfaces that assist both informed consent and positive user experiences and which are neutral in the sense of affecting the user's decision. Explainable persuasion may be designed to be adaptive to the context of use in order to minimise disruptions to the primary task and be relevant to the user. This can be explained by reference to the auto-spin example in the online gambling context. In this situation, providing real-time explanations about the persuasive nature of the auto-spin when the user exceeds a certain amount of time playing or amount of money using this function may lead to the user seeing such explanations as relevant and acceptable. Information can also be provided after the behaviour has occurred to help the user reflect more on the link between their behaviour and the persuasive element. Moreover, as suggested by one of the users, providing information about time spent interacting with the persuasive design technique, similar to "screen time" features under iOS and Android, could be used as a passive notification that will not interfere with the primary tasks while also being useful to track one's own gambling behaviour. Another solution to this design tension could be gamifying the interaction with explainable persuasion. For example, learning and a positive user experience could be attained through digital badges (Ibanez et al., 2014). In this manner, explainable persuasion can become a part of the user experience rather than interfering with it.

6.4. Constant exposure versus desensitisation

While users requested constant exposure to explainable persuasion for it to be effective, they also raised concerns about users simply ignoring explainable persuasion or losing interest due to immersion in the primary task or repeated exposure. One approach to address this design tension could be presenting explainable persuasion in different formats over time, such as changing the layout or wording, as this can facilitate attention switch and maintenance (Kim and Wogalter, 2009). Another solution could be having users actively interact with the explanation instead of utilising checkboxes in obtaining user consent. For example, it was shown that drag-and-drop or swiping actions are more engaging in obtaining informed consent than checkboxes were (Lindgren et al., 2021).

Table A.1
Correlation matrix for study variables.

	Gambling days per week	Number of accounts	Age	Gender	Aware of use	Aware of intent	Aware of harm	Explanations can help	Number of content requested from explainable persuasion	Attitude towards operators
Gambling days per week	–									
Number of accounts	0.36***	–								
Age	0.25***	0.06	–							
Gender	0.17**	0.02	0.15**	–						
Aware of use	0.22***	0.27***	0.08	0.07	–					
Aware of intent	0.151*	0.06	0.04	0.02	0.36***	–				
Aware of harm	0.15*	0.01	0.02	0.001	0.29***	0.90***	–			
Explanations can help	0.02	0.02	–0.19**	0.01	–0.01	0.02	0.06	–		
Number of content requested from explainable persuasion	–0.05	–0.04	–0.14*	0.01	–0.02	0.15*	0.14*	0.1	–	
Attitude towards operators	–0.04	0.08	–0.13*	–0.01	0.01	0	–0.01	0.29***	0.08	–

Note.

*p < .05.

**p < .01.

***p < .001.

6.5. Caring versus patronising

Users stated that providing explainable persuasion demonstrates integrity on the part of gambling operators and shows that they care for their users. However, users also raised concerns about feeling patronised by such explanations and saw it as a 'nanny state' (i.e., overprotective and interfering with individual freedom). According to reactance theory (Brehm, 1966), persuasive health communication may fail if individuals perceive the message as a threat to their freedom to choose (Dillard and Shen, 2005). One possible approach to this design tension could be related to explanation framing. Positive framing (i.e., emphasising the benefits of reducing interaction with persuasive interfaces), as opposed to negative framing (i.e., emphasising the negative consequences of interacting with persuasive interfaces, as presented in the explanation cards), could help address this negative perception.

7. Future work

Future research is required to realise the potential of utilising explainable persuasion in persuasive platforms and in other domains and investigate if it is effective as a preventive and a corrective approach for protecting users. The relation between explainable persuasion and ethical design requirements is also to explore. Although transparency typically has positive connotations, its implementation may not lead to leveraging the potential, for example, due to information overload and lack of personalisation in the content and its delivery method. Our results showed different reactions to explainable persuasion, and that necessitates the identification of the various user groups' requirements and designing explainable persuasion accordingly. Future research can examine how to deliver explanations based on mode, depth of information processing, timing, and frequency, as these factors are important for attention switch, maintenance, and communication processing. Future research can also look into the role of personal variables (e.g., demographics and psychometric factors) and user intentions, attitudes, and beliefs in engaging with explainable persuasion. The explanation may also need to go against user preferences when necessary, especially when they are implemented as interventions and behaviour change mechanics. The research shall identify those cases and balance between ethical requirements of technology providers and the user experience.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Deniz Cemiloglu reports financial support was provided by Kindred Group.

Data availability

Data will be made available on request.

Acknowledgment

This work has been partly supported by Kindred Group – Division of Responsible Gaming and Research, through a match-funded PhD project titled "Responsibility by Design: the Case of Online Gambling".

Appendix

See Table A.1

References

- Ahib, A., Orji, R., 2021. A systematic review of persuasive strategies in mobile E-commerce applications and their implementations. In: International Conference on Persuasive Technology. Springer, pp. 217–230.
- Ajzen, I., 1991. The theory of planned behaviour. *Organ. Behav. Hum. Decis. Process.* 50 (2), 179–211.
- Alhammad, M.M., Gulliver, S.R., 2014. Online persuasion for E-commerce websites. In: Proceedings of the 28th International BCS Human Computer Interaction Conference on HCI 2014-Sand. Sea and Sky-Holiday HCI, pp. 264–269.
- Ali, R., Jiang, N., Phalp, K., Muir, S., McAlaney, J., 2015. The Emerging Requirement for Digital Addiction Labels. Springer International Publishing, Cham, pp. 198–213.
- Alrobai, A., Phalp, K., Ali, R., 2014. Digital addiction: A requirements engineering perspective. In: Salinesi, C., van de Weerd, I. (Eds.), Requirements Engineering: Foundation for Software Quality. Springer International Publishing, Cham, pp. 112–118.
- American Psychiatric Association, 2013. Diagnostic and Statistical Manual of Mental Disorders (DSM-5®). American Psychiatric Pub.
- Anvari, F., Richards, D., Hitchens, M., Babar, M.A., Tran, H.M.T., Busch, P., 2017. An empirical investigation of the influence of persona with personality traits on conceptual design. *J. Syst. Softw.* 134, 324–339.
- Arden-Close, E., Bolat, E., Vuillier, L., Ali, R., 2022. Perceptions of interactive, real-time persuasive technology for managing online gambling. pp. 28–42.

- Atkinson, B.M.C., 2006. Captology: A critical review. In: Ijsselstein, W.A., de Kort, Y.A.W., Midden, C., Eggen, B., van den Hoven, E. (Eds.), *Persuasive Technology*. Springer Berlin Heidelberg, Berlin, Heidelberg, pp. 171–182.
- Bandura, A., 1986. *Social Foundations of Thought and Action: A Social Cognitive Theory*. Prentice-Hall, Inc, Englewood Cliffs, NJ, US.
- Bandura, A., Freeman, W.H., Lightsey, R., 1999. *Self-Efficacy: The Exercise of Control*. Springer.
- Barral, O., Aranyi, G., Kouider, S., Lindsay, A., Prins, H., Ahmed, I., Jacucci, G., Negri, P., Gamberini, L., Pizzi, D., Cavazza, M., 2014. Covert persuasive technologies: Bringing subliminal cues to human-computer interaction. In: Spagnoli, A., Chittaro, L., Gamberini, L. (Eds.), *Persuasive Technology*. Springer International Publishing, Cham, pp. 1–12.
- Bjerg, O., 2010. Problem gambling in poker: Money, rationality and control in a skill-based social game. *Int. Gambl. Stud.* 10 (3), 239–254.
- Bolat, E., Arden-Close, E., Ali, R., 2019. Building a Responsible Ecosystem: Examining Trust and Responsibility in the Gambling Industry: Bournemouth. Bournemouth University Publication.
- Braun, V., Clarke, V., 2006. Using thematic analysis in psychology. *Qual. Res. Psychol.* 3 (2), 77–101.
- Brehm, J.W., 1966. *A Theory of Psychological Reactance*. Academic Press, New York.
- Bruinsma, J., Crutzen, R., 2018. A longitudinal study on the stability of the need for cognition. *Pers. Individ. Differ.* 127, 151–161.
- Cacioppo, J.T., Petty, R.E., 1982. The need for cognition. *J. Personal. Soc. Psychol.* 42 (1), 116–131.
- Cacioppo, J.T., Petty, R.E., Kao, C.F., Rodriguez, R., 1986. Central and peripheral routes to persuasion: An individual difference perspective. *J. Personal. Soc. Psychol.* 51 (5), 1032.
- Calado, F., Griffiths, M.D., 2016. Problem gambling worldwide: An update and systematic review of empirical research (2000–2015). *J. Behav. Addict.* 5 (4), 592–613.
- Caraban, A., Karapanos, E., Gonçalves, D., Campos, P., 2019. 23 Ways to nudge: A review of technology-mediated nudging in human-computer interaction. In: *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. pp. 1–15.
- Cemiloglu, D., Arden-Close, E., Hodge, S., Kostoulas, T., Ali, R., Catania, M., 2020. Towards ethical requirements for addictive technology: The case of online gambling. In: *2020 1st Workshop on Ethics in Requirements Engineering Research and Practice (REthics)*. IEEE, pp. 1–10.
- Cemiloglu, D., Catania, M., Ali, R., 2021a. Explainable persuasion in interactive design. In: *2021 IEEE 29th International Requirements Engineering Conference Workshops. REW, IEEE*, pp. 377–382.
- Cemiloglu, D., Naiseh, M., Catania, M., Oinas-Kukkonen, H., Ali, R., 2021b. The Fine Line Between Persuasion and Digital Addiction. Springer, pp. 289–307.
- Chang, C., 2017. A metacognitive model of the effects of susceptibility to persuasion self-beliefs on advertising effects. *J. Advert.* 46 (4), 487–502.
- Chazette, L., Schneider, K., 2020. Explainability as a non-functional requirement: challenges and recommendations. *Requir. Eng.* 25 (4), 493–514.
- Chou, T.-J., Ting, C.-C., 2003. The role of flow experience in cyber-game addiction. *CyberPsychol. Behav.* 6 (6), 663–675.
- Cialdini, R.B., 2001. Harnessing the science of persuasion. *Harv. Bus. Rev.* 79 (9), 72–81.
- Cockton, G., Gram, C., 1996. *Design Principles for Interactive Software*. Springer Science & Business Media.
- Compton, J., 2020. Prophylactic versus therapeutic inoculation treatments for resistance to influence. *Commun. Theory* 30 (3), 330–343.
- Compton, J., Ivanov, B., 2013. Vaccinating voters: Surveying political campaign inoculation scholarship. *Ann. Int. Commun. Assoc.* 37 (1), 251–283.
- Conati, C., Barral, O., Putnam, V., Rieger, L., 2021. Toward personalized XAI: A case study in intelligent tutoring systems. *Artificial Intelligence* 298, 103503.
- Csikszentmihalyi, M., 2013. *Flow: The Psychology of Happiness*. Random House.
- Currie, S.R., Hodgins, D.C., Casey, D.M., 2013. Validity of the problem gambling severity index interpretive categories. *J. Gambl. Stud.* 29 (2), 311–327.
- Cyr, D., Head, M., Lim, E., Stibe, A., 2018. Using the elaboration likelihood model to examine online persuasion through website design. *Inf. Manage.* 55 (7), 807–821.
- Davis, F.D., 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Q.* 319–340.
- Davis, F.D., Bagozzi, R.P., Warshaw, P.R., 1992. Extrinsic and intrinsic motivation to use computers in the workplace 1. *J. Appl. Soc. Psychol.* 22 (14), 1111–1132.
- de Pelsmacker, P., Neijens, P.C., 2012. New advertising formats: How persuasion knowledge affects consumer responses. *J. Mark. Commun.* 18 (1), 1–4.
- Dillard, J.P., Shen, L., 2005. On the nature of reactance and its role in persuasive health communication. *Commun. Monogr.* 72 (2), 144–168.
- Dillon, A., 2001. User acceptance of information technology. *Encycl. Hum. Factors Ergon.* 1, 1105–1109.
- Engelbø, J., Torsheim, T., Mentzoni, R.A., Molde, H., Pallesen, S., 2019. Predictors of gamblers beliefs about responsible gambling measures. *J. Gambl. Stud.* 35 (4), 1375–1396.
- Eslami, M., Kumaran, S.R.K., Sandvig, C., Karahalios, K., 2018. Communicating algorithmic process in online behavioral advertising. In: *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*. Montreal QC, Canada, pp. 1–13.
- Evans, J.S.B.T., 2008. Dual-processing accounts of reasoning, judgment, and social cognition. *Annu. Rev. Psychol.* 59, 255–278.
- Faden, R.R., Beauchamp, T.L., 1986. *A History and Theory of Informed Consent*. Oxford University Press.
- Federal Trade Commission, 2015. Enforcement policy statement on deceptively formatted advertisements.
- Ferris, J.A., Wynne, H.J., 2001a. The Canadian Problem Gambling Index. Canadian Centre on Substance Abuse, Ottawa, ON.
- Ferris, J.A., Wynne, H.J., 2001b. The Canadian Problem Gambling Index: User Manual. Canadian Centre on Substance Abuse.
- Festinger, L., 1957. *A Theory of Cognitive Dissonance*. Vol. 2. Stanford University Press.
- Fishbein, M., Ajzen, I., 1977. Belief, attitude, intention, and behavior: An introduction to theory and research. *Philos. Rhetor.* 10 (2).
- Friestad, M., Wright, P., 1994. The persuasion knowledge model: How people cope with persuasion attempts. *J. Consum. Res.* 21 (1), 1–31.
- Gainsbury, S., Parke, J., Suhonen, N., 2013. Consumer attitudes towards internet gambling: Perceptions of responsible gambling policies, consumer protection, and regulation of online gambling sites. *Comput. Hum. Behav.* 29 (1), 235–245.
- Godbold, L.C., Pfau, M., 2000. Conferring resistance to peer pressure among adolescents: Using inoculation theory to discourage alcohol use. *Commun. Res.* 27 (4), 411–437.
- Goodman, B., Flaxman, S.J.A.m., 2017. European union regulations on algorithmic decision-making and a right to explanation. *AI Mag.* 38 (3), 50–57.
- Gorski, T.T., 2000. *Denial Management Counseling Professional Guide: Advanced Clinical Skills for Motivating Substance Abusers to Recover*. Herald House/Independence Press.
- Hing, N., Holdsworth, L., Tiyce, M., Breen, H., 2014. Stigma and problem gambling: Current knowledge and future research directions. *Int. Gambl. Stud.* 14 (1), 64–81.
- Hinson, J.M., Whitney, P., Holben, H., Wirick, A.K., 2006. Affective biasing of choices in gambling task decision making. *Cogn. Affect. Behav. Neurosci.* 6 (3), 190–200.
- Holtgraves, T., 2009. Evaluating the problem gambling severity index. *J. Gambl. Stud.* 25 (1), 105–120.
- Hoorens, V., 1995. Self-favoring biases. Self-Presentation, and the Self-Other Asymmetry in Social Comparison. *Journal of Personality* 63 (4), 793–817.
- Hosseini, M., Shahri, A., Halpal, K., Ali, R., 2018. Four reference models for transparency requirements in information systems. *Requir. Eng.* 23 (2), 251–275.
- Ibanez, M.-B., Di-Serio, A., Delgado-Kloos, C., 2014. Gamification for engaging computer science students in learning activities: A case study. *IEEE Trans. Learn. Technol.* 7 (3), 291–301.
- Iqbal, S.T., Horvitz, E., 2010. Notifications and awareness: a field study of alert usage and preferences. In: *Proceedings of the 2010 ACM Conference on Computer Supported Cooperative Work*. pp. 27–30.
- ISO 9241-11, 2018. *Ergonomics of human-system interaction - part 11: Usability: Definitions and concepts*. doi:{https://www.iso.org/obp/ui/#iso:std:iso:9241:-11:ed2:v1:en}.
- Ivanova, E., Rafi, J., Lindner, P., Carlbring, P., 2019. Experiences of responsible gambling tools among non-problem gamblers: A survey of active customers of an online gambling platform. *Addict. Behav. Rep.* 9, 100161.
- Jonsen, A.R., Siegler, M., Winslade, W.J., 1982. *Clinical Ethics a Practical Approach to Ethical Decisions in Clinical Medicine*. McGraw-Hill Education.
- Karppinen, P., Oinas-Kukkonen, H., 2013. Three Approaches to Ethical Considerations in the Design of Behavior Change Support Systems. Springer Berlin Heidelberg, Berlin, Heidelberg, pp. 87–98.
- Khechine, H., Lakhali, S., Ndjambou, P., 2016. A meta-analysis of the UTAUT model: Eleven years later. *Can. J. Admin. Sci./Revue Can. Des Sci. L'Admin.* 33 (2), 138–152.
- Kim, S., Wogalter, M.S., 2009. Habituation, dishabituation, and recovery effects in visual warnings. In: *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, Vol. 53. SAGE Publications Sage CA, Los Angeles, CA, pp. 1612–1616.
- Kuonanoja, L., Oinas-Kukkonen, H., 2018. Recognizing and mitigating the negative effects of information technology use: A systematic review of persuasive characteristics in information systems. In: Müller, S.D., Nielsen, J.A. (Eds.), *Nordic Contributions in IS Research*. Springer International Publishing, Cham, pp. 14–25.
- Langrial, S., Lehto, T., Oinas-Kukkonen, H., Harjumaa, M., Karppinen, P., 2012. Native mobile applications for personal well-being: a persuasive systems design evaluation.
- Lee, C., Coughlin, J.F., 2015. PERSPECTIVE: Older adults' adoption of technology: an integrated approach to identifying determinants and barriers. *J. Prod. Innov. Manage.* 32 (5), 747–759.

- Lewis, J.R., 2014. Usability: Lessons learned ... and yet to be learned. *Int. J. Hum.-Comput. Interact.* 30 (9), 663–684.
- Lindgren, D., Karegar, F., Kane, B., Pettersson, J.S., 2021. An evaluation of three designs to engage users when providing their consent on smartphones. *Behav. Inf. Technol.* 40 (4), 398–414.
- Van der Linden, S., Roozenbeek, J., 2020. Psychological inoculation against fake news. In: *The Psychology of Fake News: Accepting, Sharing, and Correcting Misinformation*. pp. 147–169.
- McCormack, A., Griffiths, M.D., 2013. A scoping study of the structural and situational characteristics of internet gambling. *Int. J. Cyber Behav. Psychol. Learn. (IJCBPL)* 3 (1), 29–49.
- McCormack, A., Shorter, G.W., Griffiths, M.D., 2014. An empirical study of gender differences in online gambling. *J. Gambl. Stud.* 30 (1), 71–88.
- McGuire, W.J., 1961. Resistance to persuasion conferred by active and passive prior refutation of the same and alternative counterarguments. *J. Abnorm. Soc. Psychol.* 63 (2), 326.
- McGuire, W.J., 1964. Inducing resistance to persuasion. Some contemporary approaches. In: Haaland, C.C., Kaelber, W.O. (Eds.), *Self and Society. an Anthology of Readings*, Lexington, Mass. Ginn Custom Publishing, pp. 192–230, 1981.
- McMillen, J., Marshall, D., Murphy, L., Lorenzen, S., Waugh, B., 2007. Help-Seeking By Problem Gamblers, Friends and Families: A Focus on Gender and Cultural Groups. Centre for Gambling Research (CGR) ANU.
- Millecamp, M., Htun, N.N., Conati, C., Verbert, K., 2019. To explain or not to explain: the effects of personal characteristics when explaining music recommendations. pp. 397–407.
- Mintel Report, 2019. Online Gambling and Betting-UK-2019. Mintel Group Ltd.
- Murch, W.S., Limbrick-Oldfield, E.H., Ferrari, M.A., MacDonald, K.I., Fookien, J., Cherkasova, M.V., Spering, M., Clark, L., 2020. Zoned in or zoned out? Investigating immersion in slot machine gambling using mobile eye-tracking. *Addiction* 115 (6), 1127–1138.
- Naiseh, M., Jiang, N., Ma, J., Ali, R., 2020a. Explainable Recommendations in Intelligent Systems: Delivery Methods, Modalities and Risks. Springer International Publishing, Cham, pp. 212–228.
- Naiseh, M., Jiang, N., Ma, J., Ali, R., 2020b. Personalising Explainable Recommendations: Literature and Conceptualisation. Springer International Publishing, Cham, pp. 518–533.
- Neal, P.N., Delfabbro, P.H., O'Neil, M.G., 2005. Problem gambling and harm: Towards a national definition.
- Nielsen, J., 2005. Ten usability heuristics [online]. Available from: Accessed20March.
- Nower, L., Blaszczynski, A., 2010. Gambling motivations, money-limiting strategies, and precommitment preferences of problem versus non-problem gamblers. *J. Gambl. Stud.* 26 (3), 361–372.
- Ockene, J.K., Mermelstein, R.J., Bonollo, D.S., Emmons, K.M., Perkins, K.A., Voorhees, C.C., Hollis, J.F., 2000. Relapse and maintenance issues for smoking cessation. *Health Psychol.* 19 (1S), 17.
- Oinas-Kukkonen, H., Harjumaa, M., 2009. Persuasive systems design: Key issues, process model, and system features. *Commun. Assoc. Inf. Syst.* 24 (1), 28.
- O'Shaughnessy, J., O'Shaughnessy, N., 2003. *Persuasion in Advertising*. Routledge.
- Oyebode, O., Ndulue, C., Alhasani, M., Orji, R., 2020. Persuasive mobile apps for health and wellness: A comparative systematic review. In: *International Conference on Persuasive Technology*. Springer, pp. 163–181.
- Parliament, European, Council, 2016. Regulation (EU) 2016/679 of the European parliament and of the council of 27 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing directive 95/46/EC (general data protection regulation) (text with EEA relevance) may 2016. [Online]. Available: <http://data.europa.eu/eli/reg/2016/679/oj/eng>.
- Petty, R.E., Cacioppo, J.T., 1986. The elaboration likelihood model of persuasion. In: *Communication and Persuasion: Central and Peripheral Routes To Attitude Change*. Springer New York, New York, NY, pp. 1–24.
- Pfau, M., Bockern, S.V., Kang, J.G., 1992. Use of inoculation to promote resistance to smoking initiation among adolescents. *Commun. Monogr.* 59 (3), 213–230.
- Pfau, M., Compton, J., Parker, K., Wittenberg, E., An, C., Ferguson, M., Malyshev, Y., 2004. The traditional explanation for resistance based on the core elements of threat and counterarguing and an alternative rationale based on attitude accessibility: Do these mechanisms trigger distinct or overlapping process of resistance. *Hum. Commun. Res.* 30, 329–360.
- Porter, S.R., Whitcomb, M.E., Weitzer, W.H., 2004. Multiple surveys of students and survey fatigue. *New Dir. Inst. Res.* 2004 (121), 63–73.
- Rai, A., 2020. Explainable AI: from black box to glass box. *J. Acad. Mark. Sci.* 48 (1), 137–141.
- Raylu, N., Oei, T.P., 2004. Role of culture in gambling and problem gambling. *Clin. Psychol. Rev.* 23 (8), 1087–1114.
- Redström, J., 2006. *Persuasive Design: Fringes and Foundations*. Springer Berlin Heidelberg, Berlin, Heidelberg, pp. 112–122.
- Roger, E.M., 1995. *Diffusion of Innovations*, third ed. The free Press, Macmillan.
- Rogers, R.W., 1975. A protection motivation theory of fear appeals and attitude change.1. *J. Psychol.* 91 (1), 93–114.
- Rosenfeld, A., Richardson, A., 2019. Explainability in human-agent systems. *Auton. Agents Multi-Agent Syst.* 33 (6), 673–705.
- Rucker, D.D., Tormala, Z.L., Petty, R.E., 2004. Individual differences in resistance to persuasion: The role of beliefs and meta-beliefs. *Resist. Persuas.* (83).
- Samek, W., Montavon, G., Vedaldi, A., Hansen, L.K., Müller, K.-R., 2019. *Explainable AI: Interpreting, Explaining and Visualizing Deep Learning*. Vol. 11700. Springer Nature.
- Schaub, F., Balebako, R., Durity, A.L., Cranor, L.F., 2015. A design space for effective privacy notices, eleventh symposium on usable privacy and security (SOUPS 2015). pp. 1–17.
- Schüll, N.D., 2012. *Addiction By Design*. Princeton University Press.
- Shepherd, L.A., Renaud, K., 2018. How to design browser security and privacy alerts. In: *2018 AISB Convention: Symposium on Digital Behaviour Intervention for Cyber Security*. Society for the Study of Artificial Intelligence and Simulation for ..., pp. 21–28.
- Sheskin, D.J., 2003. *Handbook of Parametric and Nonparametric Statistical Procedures*. Chapman and Hall/CRC.
- Smids, J., 2012. *The Voluntariness of Persuasive Technology*. Springer Berlin Heidelberg, Berlin, Heidelberg, pp. 123–132.
- Sokol, K., Flach, P., 2020. Explainability fact sheets: a framework for systematic assessment of explainable approaches. In: *Proceedings of the 2020 Conference on Fairness, Accountability, and Transparency*. Association for Computing Machinery, Barcelona, Spain, pp. 56–67.
- Yani-de Soriano, M., Javed, U., Yousafzai, S., 2012. Can an industry be socially responsible if its products harm consumers? The case of online gambling. *J. Bus. Ethics* 110 (4), 481–497.
- Spahn, A., 2012. And lead us (not) into persuasion...? Persuasive technology and the ethics of communication. *Sci. Eng. Ethics* 18 (4), 633–650.
- Spotts, H., 1994. Evidence of a Relationship Between Need for Cognition and Chronological Age: Implications for Persuasion in Consumer Research. *ACR North American Advances*.
- Statista, 2022. Online gambling participation by gender great britain 2021 [online]. Available from: Accessed21June.
- Sunstein, C.R., Thaler, R.H., 2003. Libertarian paternalism is not an oxymoron. *Univ. Chicago Law Rev.* 70 (4), 1159–1202.
- Taylor, S., Todd, P., 1995. Assessing IT usage: The role of prior experience. *MIS Q.* 56, 1–570.
- Thompson, R.L., Higgins, C.A., Howell, J.M., 1991. Personal computing: Toward a conceptual model of utilization. *MIS Q.* 12, 5–143.
- Timmer, J., Kool, L., van Est, R., 2015. Ethical Challenges in Emerging Applications of Persuasive Technology. Springer International Publishing, Cham, pp. 196–201.
- Torning, K., Oinas-Kukkonen, H., 2009. Persuasive system design: state of the art and future directions. In: *Proceedings of the 4th International Conference on Persuasive Technology*. pp. 1–8.
- Van Welie, M., Van Der Veer, G.C., Eliëns, A., 1999. Breaking down usability. In: *Interact*. pp. 613–620.
- Vaportzis, E., Clausen, M.Giatsi., Gow, A.J., 2017. Older adults perceptions of technology and barriers to interacting with tablet computers: a focus group study. *Front. Psychol.* 8 (1687).
- Venkatesh, V., Morris, M.G., Davis, G.B., Davis, F.D., 2003. User acceptance of information technology: Toward a unified view. *MIS Q.* 425–478.
- Venkatesh, V., Thong, J.Y., Xu, X., 2012. Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. *MIS Q.* 157–178.



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Sarah E. Hodge is a senior lecturer at Bournemouth University. She has a background in psychology, and she completed her Ph.D. at Bournemouth University exploring the role of moral development and decision making in video games. Since her Ph.D., Sarah has continued to explore morality in video games, including the application of the Moral Foundations Theory in gaming research. Sarah has also developed her research to explore the overlap between gaming and gambling, the role of gender and gaming, and how to psychologically support users.



Raian Ali is a Professor at the College of Science and Engineering, Hamad Bin Khalifa University, Qatar. His research focuses on the design process of digital motivation solutions, such as Gamification and Persuasive Technology, to aid people change or maintain their attitude and behaviour in areas like health and enterprise productivity. Raian has a keen interest in technology designs and digital literacy to combat 'digital addiction' and increase digital wellness. He studies transparency and explainability in persuasive and intelligent systems to increase their responsible nature.