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Interrupting Dissociation of Players through Real-Time Digital Tasks during Online Gambling

Ceyda Kiyak[a], Deniz Cetinkaya[b], John McAlaney[c], Sarah Hodge[c], and Raian Ali[d]

[a]School of Psychology, Faculty of Social Sciences, University of East Anglia, Norwich, UK; [b]Department of Computing and Informatics, Faculty of Science and Technology, Bournemouth University, Bournemouth, UK; [c]Department of Psychology, Faculty of Science and Technology, Bournemouth University, Bournemouth, UK; [d]College of Science and Engineering, Hamad Bin Khalifa University, Doha, Qatar

ABSTRACT

Online gambling is relatively easier to access compared to traditional one, so it can pose specific risks to individuals such as causing isolation, lack of interruption and dissociation. Intermittent interactions that require cognitive process can interrupt a task and capture the attentional focus which can help to break the dissociative state of players while playing. This study proposes an approach of using digital tasks to interrupt the dissociation of players during online gambling. We investigated the effectiveness of the approach through mixed methods where participants ($N = 50$) were invited to the computerised lab experiment and randomised to five conditions. Participants received digital tasks as an interruption while playing online slot gambling and their response time to the interruptions was measured. After the play, participants completed the Jacob's Dissociation Questionnaire, and the Acceptability Questionnaire (both Likert scale and open-ended questions). The analysis revealed that there was a significant main effect of the interruptions in terms of response times, and a significant interaction between the interruptions and the digital tasks. Five main themes were generated after Thematic Analysis of the qualitative data: (1) Distraction, (2) Awareness, (3) User experience, (4) Considerations for design and (5) Considerations for technology. Digital tasks could be potentially useful tools to interrupt players' dissociation during online gambling and support behavioural awareness and change towards more conscious and responsible gambling.

KEYWORDS

Responsible gambling; human-computer interaction; persuasive technology; digital nudge; behaviour change

1. Introduction

Online gambling provides a unique environment which can include isolation, lack of interruption, constant, and easy access which can pose specific risks to individuals (Gainsbury et al., 2020). Even though gambling is meant to be a recreational activity, problem gambling has substantial and negative personal, social, family, and financial consequences (Gainsbury, 2014). The World Health Organisation (WHO) reported that the overall prevalence of lifetime gambling disorders among adults ranging between 0.1% and 5.8% worldwide (Christopher, 2020). Particularly, online gambling may be more concerning due to its availability and accessibility (Håkansson et al., 2020). Therefore, the widespread accessibility of online gambling through smartphones and computers makes the scope and complexity of the problem even higher in comparison to traditional gambling which requires going to a betting shop (Drosatos et al., 2019). Given the role of technology in online gambling, games designed by using Human-Computer Interaction (HCI) principles hold a crucial role in affecting individuals' gambling behaviour and supporting responsible gambling.

1.1. Gambling disorder and dissociation

Dissociation has a complex and multifaceted definition and there are different nomenclatures in the literature while implying dissociation in reference to gambling such as "altered state of awareness" (McKeith et al., 2017), "immersion" (Murch et al., 2017; Murch & Clark, 2019); "dark flow" (Dixon et al., 2018); "the zone" (Murch et al., 2017); and "slot machine zone" (Oakes et al., 2020; Schüll, 2012). In this study, the term "*dissociation*" will be used to refer to all these experiences since dissociation is an umbrella term for aforementioned nomenclatures. In the field of gambling disorder (GD), dissociation relies on the General Theory of Addiction (Jacobs, 1986) that considers deficits in emotion regulation as a core feature of GD (Rogier & Velotti, 2018). Jacobs (1989) suggested that dissociation offers a way to cope with robust negative feelings. Thus, dissociative experiences represent temporary relief from an overwhelming emotional state (Wanner et al., 2006). Jacobs (1988) stated that, while indulging, individuals with addictions tend to share a common set of dissociative-like experiences that differentiate them from individuals

CONTACT Ceyda Kiyak c.kiyak@uea.ac.uk School of Psychology, Faculty of Social Sciences, University of East Anglia, Norwich, UK; Raian Ali raali2@hbku.edu.qa College of Science and Engineering, Hamad Bin Khalifa University, Doha, Qatar.

with no addictions. Moreover, qualitative research presents the subjective experience of cognitive and psychological states among gamblers, for instance, feeling "mentally detached, where space and time do not exist" (Rogier et al., 2020) or wanting to "slip in a bubble bath" (Schüll, 2012).

Gamblers experience a state of flow when they become totally focused on gambling activity (Rogier et al., 2022). This experience leads players to lose track of time and money they spend (Dixon et al., 2018). The literature shows that dissociative states experienced during gambling activities play a crucial role in developing and perpetuation of gambling disorders (Carlbring et al., 2012; Harris & Griffiths, 2017; Kuley & Jacobs, 1988; Rogier et al., 2020, Dixon et al., 2018). Individuals who gamble often report their awareness of events and time is substantially disturbed after several consecutive hours of gambling (Jacobs, 1988).

Dixon et al. (2018) found that among social (low or non-risk) slot-machine gamblers, the degree of dissociation while playing was significantly correlated with the severity of GD. These findings are supported by research on Electronic Gaming Machines (EGMs), which suggests that ambient sound, coloured lights, and even the game's rhythm seem to be the most effective ways to cause a dissociation (Finlay et al., 2007; McCormick et al., 2012; Noseworthy & Finlay, 2009). Research on flow state also demonstrated similar results. Lavoie and Main (2019) reported that flow increased the feeling of "pull to continue" which led people to lose track of time, and consequently increased the amount of time they spent on gambling.

Taken together, dissociation is suggested to be a considerable factor in the perpetuation and intensification of gambling behaviour. According to Monaghan (2009), effective harm-minimisation strategies must draw attention away from gambling. In addition to this, Bailey et al. (2001) suggested that intermittent and dynamic messages that interrupt a task can capture the attentional focus. Thus, dissociation of players must be interrupted with complex tasks to shift their attention which aim to enable responsible gambling while maintaining players' enjoyment of the gambling (Stewart & Wohl, 2013).

1.2. Responsible gambling and harm-minimisation in online gambling

The emergence, availability and accessibility of online gambling have raised worldwide concerns and all stakeholders have been encouraged about Responsible Gambling (RG) to develop science-based RG strategies that are safe and effective (Håkansson et al., 2020). RG tools are harm-minimising strategies which provides a common framework for legal and safe online gambling (Ivanova et al., 2019). The purpose of RG tools is harm prevention and reduction in gambling to keep individuals safe from developing problems. In addition to this, harm-minimisation tools intend to make gambling activity safer without decreasing the uptake of gambling per se (Auer & Griffiths, 2013; Griffiths et al., 2009). Up to now various RG strategies have been developed and put into practice to enable responsible gambling among players. The current RG strategies include various tools like self-exclusion programmes, behavioural tracking of play patterns, setting of loss and deposit limits (both player and corporate), player commitment to deposits, statistics for losses or wins, measuring gambling time, warning messages, restricted game design, gambling education and information, and support services reflecting primary, secondary, and tertiary prevention efforts (Ladouceur et al., 2017).

1.3. Technology-assisted behaviour change in online gambling

The technology has a unique potential to strengthen classical behaviour change (Drosatos et al., 2019). Since gambling products have become technologically more sophisticated because of technological advancements, the same technological innovation can be used to encourage responsible gambling and the creation of harm-minimization tools to support gamblers in maintaining self-control and making sensible and controlled decisions for their gambling behaviours (Harris & Griffiths, 2017). So far, the literature has utilised various strategies to enable responsible gambling as harm reduction techniques by using persuasive technologies (Shahrom et al., 2017) and digital nudging such as limit setting, pop-up messages, enforced breaks, peer groups, and self-exclusion (Bjørseth et al., 2021; Rodda, 2021).

While the persuasive technologies seek to elicit direct changes in behaviours, digital nudging enables users to make decisions in an online environment which can be guided beneficially by implementing design elements of the user-interface and consequently the choice environment of the users (Hummel et al., 2018). However, even though a wide range of harm reduction and prevention initiatives have been developed, only a few studies have been conducted to test their effectiveness and supported with enough quantitative empirical data (World Health Organization, 2019). Moreover, according to the literature, the existing RG tools used to minimise online gambling related harm (e.g., pop-up messages, limit setting, enforced breaks), demonstrate inconsistent effects (Auer et al., 2014; Harris & Griffiths, 2017). Therefore, little research attention has been given to minimising the gambling-related harms through more complex and innovative RG tools which are empirically supported.

1.4. Overview of the study

Taken all together, easy accessibility and persuasive design used in online gambling (e.g., more immersive and engaging) makes adversity of the online gambling problem even greater. Existing RG technologies, however, do not appear to be strong enough to breaking through players' intense focus and time disorientation while gambling. Additionally, only a small number of studies have recently presented empirical evidence on the efficacy of RG strategies. There seems to be a gap in the literature providing more effective RG tools implementing novel digital tasks with the optimal message content to interrupt the dissociative state of players. The opportunity of real-time response and interactivity with players could be used to mitigate against online problem gambling with more complex, effortful, and demanding real-

time digital tasks by using persuasive technologies and digital nudging to distract players' intense focus on gambling. Thus, in this study we designed, developed, and investigated the effectiveness of four digital tasks (cognitive, dialogue, informative and standard tasks) to interrupt dissociation of players during online gambling. Therefore, the following research questions were formulated to focus the study and determine the appropriate research design:

RQ1: How effective are the various types of digital tasks in interrupting dissociation of players during online gambling?

RQ2: What are the players' perceptions and expectations of digital tasks during online gambling?

2. Materials and methods

2.1. Design and development of the digital tasks

Digital tasks serve as a potential tool to deliver RG information to gamblers during online gambling. Breaks with accompanying RG messages show a certain level of positive efficacy according to the literature (Harris & Griffiths, 2017). Therefore, in this study, we developed four digital tasks by using persuasive technology and digital nudge elements to interrupt dissociation experienced by players while gambling.

According to HCI principles, the visual design of any interface is vital because users quickly decide whether they like or dislike an interface (in less than a second) and then seek for evidence to support their first impression (Lindgaard et al., 2006; Wohl et al., 2014). As a result, we designed the digital tasks simple and plain with clear language (e.g., *"play responsibly"*) and information (e.g., *"gambling is a psychological, social, and financial problem"*) in a non-disruptive way. In accordance with the information and results from different studies in the literature, the digital tasks were given sparingly to avoid tasks becoming an irritation. As such, the digital tasks were supposed to interrupt participants' dissociative state during online gambling sessions, but not with such frequency that the participants would become frustrated and disregard the digital tasks provided. Therefore, the participants received two different types of interruptions at two different time points.

Four types of digital tasks were designed as cognitive tasks, dialogue tasks, informative tasks, and standard tasks. *Cognitive tasks* were designed by using very well-known visual search paradigms (Neisser, 1963; Treisman & Gelade, 1980; Wolfe, 1998) to distract players' attention in which the participants are asked to count the target shapes in certain colours. *Dialogue tasks* were designed by encouraging of self-appraisal content to reflect gamblers' beliefs on their own gambling activity, increase their awareness and persuade them to play less (see Figure 1 for the illustration of cognitive and dialogue tasks). *Informative tasks* were designed to correct erroneous cognitions and consequently exert the influence over gambling behaviour where we used digital nudging to ascertain what type of information it is being delivered. *Standard tasks* were designed based on pop-up messages that were already available in the literature which used responsible gambling strategies (Harris & Parke, 2016). While some studies have shown the effect of pop-up messages in terms of RG behaviour (Kim et al., 2014; Stewart & Wohl, 2013; Wohl et al., 2013), there is still room for increasing their efficacy even though previous studies suggest that gamblers do not pay attention to such static responsible gambling messages (Monaghan & Blaszczynski, 2007). Standard tasks are self-appraisal messages that do not require any cognitive process that would shift their attention, while three experimental groups (cognitive, dialogue and informative) are complex and time-consuming intending to interrupt the dissociation of players (see Figure 2 for the illustration of informative and standard tasks). Therefore, standard tasks were used as a control group to compare the effectiveness of available pop-up messages in the literature and the digital tasks designed in this study (cognitive, dialogue and informative) to investigate whether they are robust enough to shift players' focus.

2.2. Participants

In total, 1462 participants responded to the recruitment advert and were assessed for eligibility during recruitment process. Among them, 1129 participants did not to meet eligibility criteria (being 18 years old and over, fluent in English, playing gamble online and scoring less than 8 on Problem Gambling Severity Index (PGSI), 218 participants did not complete the survey and 65 participants declined to

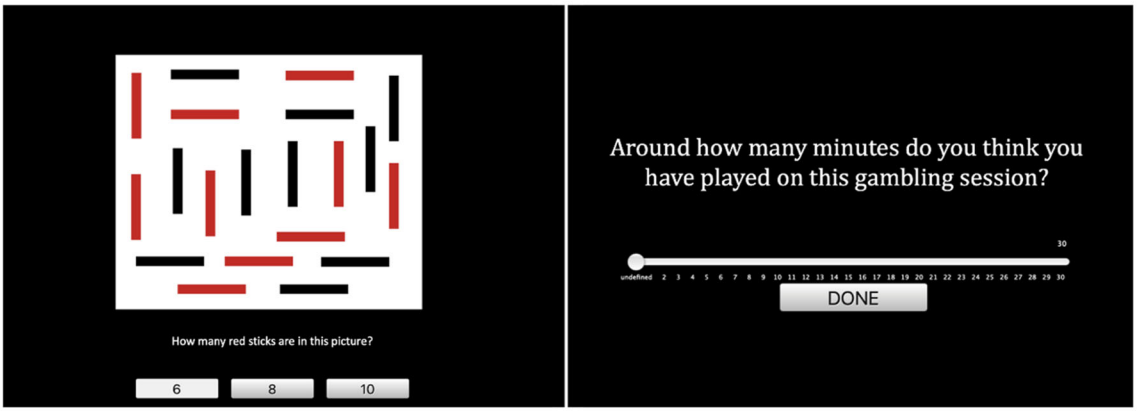

Figure 1. Cognitive and Dialogue task.

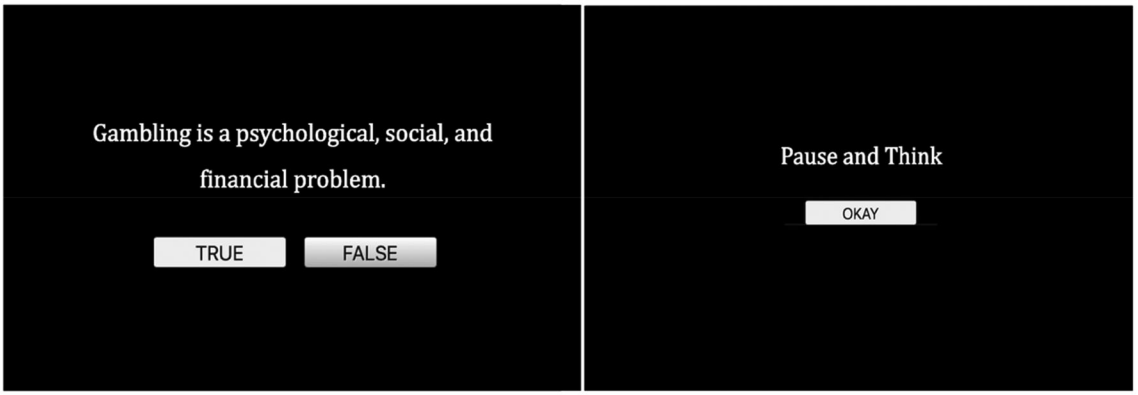

Figure 2. Informative and Standard task.

Table 1. Demographic and baseline characteristics of participants across groups ($N = 50$).

Participant's characteristics	Cognitive task ($n = 10$)	Dialogue task ($n = 10$)	Informative task ($n = 10$)	Standard task ($n = 10$)	No task ($n = 10$)
Age Mean (+/-SD)	31.8 (6.89)	33.1 (6.33)	31.2 (6.61)	27.7 (5.01)	27.4 (3.53)
Gender					
Female	3	3	6	5	7
Male	7	7	4	5	3
Ethnicity					
Asian or Asian British – Indian	1	1	0	1	0
Black or Black British – African	0	0	1	0	1
Black or Black British – Caribbean	1	0	1	0	0
Chinese	0	1	0	0	1
White	7	5	5	7	6
Other Asian background	1	0	1	0	1
Other mixed background	0	1	0	0	1
Other white background	0	0	2	2	0
Any other ethnic background	0	2	0	0	0
Education					
Compulsory school education completed	1	2	0	1	0
Bachelor's degree	5	1	2	3	3
Master's degree	2	5	7	6	5
PhD	2	2	1	6	2
Employment					
Student	3	3	3	6	7
Self-employed	0	1	1	0	0
Part time employment	3	0	2	2	1
Full time employment	4	6	4	2	2
Income					
Less than £11,999	3	1	3	3	
Between £12,000 and £24,999	4	5	3	6	5
Between £25,000 and £49,999	2	3	3	1	2
Between £50,000 and £79,999	1	1	1	0	2
Between £80,000 and £149,999	0	0	0	0	0
More than £150,000	0	0	0	0	1
PGSI Mean (+/-SD)	2.20 (2.39)	2.20 (2.3)	2.4 (2.32)	1.3 (2.26)	2.2 (2.1)

participate. 50 participants who met the eligibility criteria were recruited to take part in the study. The sample consisted of 24 females (48%) and 26 males (52%) with a minimum age of 20 and a maximum age of 48. Most participants were white (60%, $N = 30$), had a master's degree (50%, $N = 25$), and most common occupation was student (44%, $N = 22$), and the income was between £12,000 and £24,999 (40%, $N = 20$). Mean of PGSI scores of participants was 2.22 *(SD = 2.06)* with a maximum score of 7 and minimum score of 0 and all participants were individuals who gamble online. Demographic characteristics of participants across groups are explained in Table 1.

2.3. Design of the study

A mixed methods approach was employed to measure the response times to interruptions of the digital tasks, level of dissociation during online gambling, level of acceptability of the digital tasks both in a Likert scale as quantitative data and open-ended questions in the Acceptability Questionnaire about participants' perceptions and experiences with the digital tasks as qualitative data. A 5×2 mixed, double-blind, and randomised design was used with five conditions (i) cognitive, ii) dialogue, iii) informative, iv) standard, and v) no task (control group), and two response time measurements (1^{st} interruption and 2^{nd} interruption) were taken.

Randomisation was achieved by the software (https://www.testable.org) automatically. Neither participants nor the researchers knew which digital task the participant received making the study a double-blind study. The dependent variables were response times, the level of dissociation and the acceptability of the digital tasks. The independent variables were the digital tasks and the response times.

2.4. Materials and measures

2.4.1. Measures for the quantitative study

Demographics questionnaire: This questionnaire assessed basic demographic information of participants including age, gender, ethnicity, education level, profession, and annual income.

The Problem Gambling Severity Index (PGSI): It is a 9-item self-report measure of problem gambling that was developed to identify the different type of gamblers (Ferris & Wynne, 2001). Individuals are conventionally categorised into four gambling subtypes based on their PGSI scores as follows: 0 = non-problem gambler; 1–2 = low-risk gambler; 3–7 = moderate risk gambler; and 8 and over = problem gambler. Only participants who scored below 8 were recruited in this study due to ethical considerations of the study. Cronbach's Alpha for PGSI is excellent ($\alpha = 0.93$; McCormick et al., 2012). PGSI validity was calculated by computing correlations with other measures of problem gambling, such as the DSM-IV (r = .83) and clinical interviews (r =.48).

Jacob's Dissociation Questionnaire (JDQ): Jacobs's (1988) five-item dissociation scale (0 *not at all* to 5 all *the time*) was used to assess participants' experiences of dissociation during the online gambling session (e.g., "In the previous gambling session, how much did you lose track of time?"). JDQ has a high internal consistency (α = .71; Diskin & Hodgins, 2001).

Acceptability questionnaire: Acceptability of the digital tasks was assessed through both quantitative and qualitative methods by using Likert scale and open-ended questions. The questions were constructed by the first author based on similar research in the literature.

2.4.2. Materials for the qualitative study

Participants were asked three open ended questions after the experiment relating to their experiences and opinions on the digital tasks that they received during online gambling: *(i) What did you like most and least about the digital tasks?; (ii) What would you change?; (iii) Do you have any suggestions?*. This part provides a narrative of the themes that were constructed from the analysis of data to answer the research question. Responses were transcribed and analysed by using Thematic Analysis. Themes were then reviewed, refined, defined, and considered in relationship to each other in a 'theme map'.

2.5. Procedure

Step 1 – Recruitment: Participants were recruited from the general population through social media platforms (e.g., LinkedIn, Twitter), flyers posted at the university campus and online psychology research participation credit system (SONA). At the beginning of the online survey, participants were asked to give their consent for the study and data protection. Then, they responded to a demographic questionnaire and PGSI. Based on their PGSI score, we only invited those who were low and moderate in gambling severity to the experiment.

Step 2 – Experiment: Participants were invited to the Psychology lab. The computer-based experiment started with a common instruction in which the gambling session was explained (e.g., duration, type of the gambling). Then, the participants were randomised automatically by the web-based software to one of the five conditions: i) cognitive, ii) dialogue, iii) informative, iv) standard and v) no task. While the participants were gambling on online slot on the computer, they received two interruptions for each digital task (the online slot was presented on a real gambling operator with an account including credits and real chances of winning). Figure 3 illustrates the experiment flow whereas 'R'

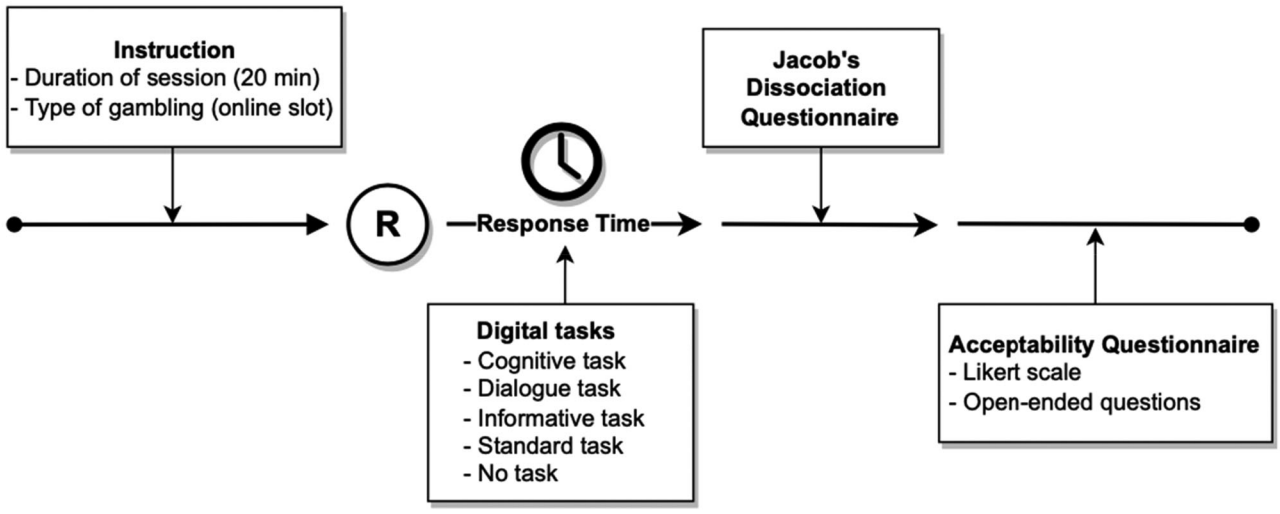

Figure 3. The experiment flow (R: Randomisation).

in the figure represents the randomisation process. We recorded the participants' response times to the interruptions to see how much time they required to notice and respond to the digital tasks (*response time* refers to the amount of time between when the interruptions were made available on the screen and when the participants responded to them). After the online gambling session, participants responded to Jacob's Dissociation Scale to measure their level of dissociation during gambling and the Acceptability Questionnaire for their level of acceptance of the digital tasks.

2.6. Ethics

Ethical approval was reviewed and approved in line with Bournemouth University's ethics committee. Only participants who scored below 8 on PGSI were recruited in the experiments as it is a threshold for at-risk gambling. The scores above 8 on PGSI indicate problem gambling with negative consequences and loss of control (Ferris & Wynne, 2001), therefore in order to prevent possible harm that the experiment might cause on this clinical sample, individuals scored above 8 on PGSI were not recruited. Participants were asked to give their written consent and were informed about our data protection policy and procedure before the study. After taking part in the experiment, participants were reimbursed for their time with £10 Amazon vouchers. All participants were treated in accordance with British Psychological Society Code of Human Research Ethics (Oates et al., 2021). Also, the study was conducted in accordance with the principles expressed in the Declaration of Helsinki (World Medical Association, 2013).

3. Results

3.1. Response times and the digital tasks during online gambling

A 4×2 double-blind and randomised design with mixed factorial ANOVA was conducted with four conditions (i) cognitive, ii) dialogue, iii) informative, and iv) standard task and two response time measurements (1st interruption and 2nd interruption). "No task group," which was a control group, was not added to this analysis as participants in "no task group" did not receive any interruptions of a digital task, therefore their response times were not measured.

The response time of each digital task was measured at two time points. 1st interruption was given on the 5th minute of online gambling, and 2nd interruption was given on the 10th minute of gambling, and the online gambling session lasted 15 minutes in total. Participant's response time to interruptions of the digital tasks was measured in milliseconds.

Normality checks (Shapiro Wilk test) and homogeneity of variances test (Levene's test) were carried out and both assumptions were violated. However, ANOVA is considered to be a robust test against the normality assumptions which means ANOVA tolerates violations to its normality assumption rather well (Field, 2013). The analysis revealed that

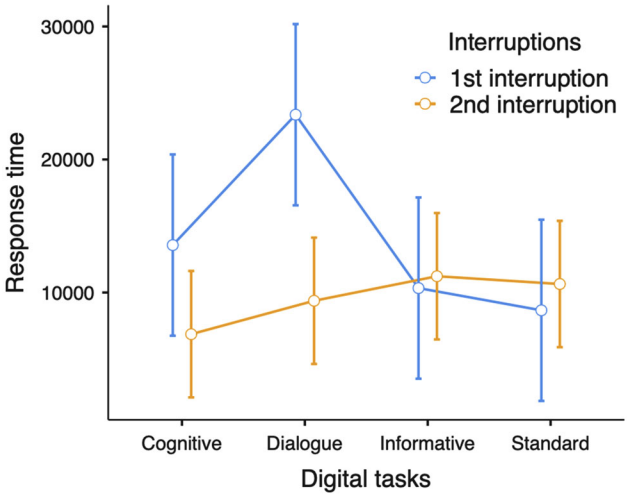

Figure 4. Response times to interruptions across the digital tasks (measurements in milliseconds).

Table 2. Descriptive for the interruptions across the digital tasks.

Interruptions	Digital tasks	*N*	Mean (milliseconds)	95% Confidence interval SD	Lower	Upper
1st interruption	Cognitive	10	13565	4499	6751	20379
	Dialogue	10	23368	4793	16554	30182
	Informative	10	10333	3492	3519	17147
	Standard	10	8662	4682	1848	15476
	All tasks	40	13982	11726		
2nd interruption	Cognitive	10	6867	1999	2116	11617
	Dialogue	10	9378	2642	4627	14129
	Informative	10	11224	8404	6474	15975
	Standard	10	10640	3016	5889	15390
	All tasks	40	9527	7316		

there was a significant main effect of interruptions (1st interruption and 2nd interruption) F (1,36) = 6.52, p = .015. Moreover, there was a significant interaction between interruptions and the digital tasks F (3, 36) = 4.54, p = .008 (see Figure 4). However, there was no statistically significant main effect of the digital tasks F (3,36) = 1.81, p =.16. Interruptions explain 15% ($\eta 2$ $p = 0.15$) of the variance of response times, while the digital tasks explain 13% ($\eta 2$ $p = 0.13$).

The participants spent more time to respond to the 1st interruption ($M = 13982$, $SD = 11726$) compared to the 2nd interruption ($M = 9527$, $SD = 7316$) (see Table 2). However, the only significant difference between the 1st interruption and the 2nd interruption was for the dialogue task F (1,36) = 6.52, p = .006.

3.2. Dissociation and digital tasks during online gambling

Shapiro-Wilk test was performed on the dissociation and the digital tasks and did not show evidence of non-normality ($W = 0.96$, $p = 0.11$). Therefore, a one-way between subjects ANOVA was conducted to compare the effect of the digital tasks on dissociation level of participants for cognitive, dialogue, informative, standard tasks, and no task as a control group during online gambling.

Table 3. Descriptive for the level of dissociation and acceptability across the digital tasks.

					95% Confidence interval	
	Digital tasks	*N*	Mean	SD	Lower	Upper
Dissociation	Cognitive	10	1.30	0.823	−0.980	3.58
	Dialogue	10	6.60	2.37	4.320	8.88
	Informative	10	9.70	4.42	7.420	11.98
	Standard	10	11.70	4.52	9.420	13.98
	No task	10	11.70	4.22	9.420	13.98
Acceptability	Cognitive	10	25.9	2.73	23.8	28.0
	Dialogue	10	22.2	3.99	20.01	24.3
	Informative	10	21.4	2.37	19.3	23.5
	Standard	10	13.0	3.86	10.9	15.1

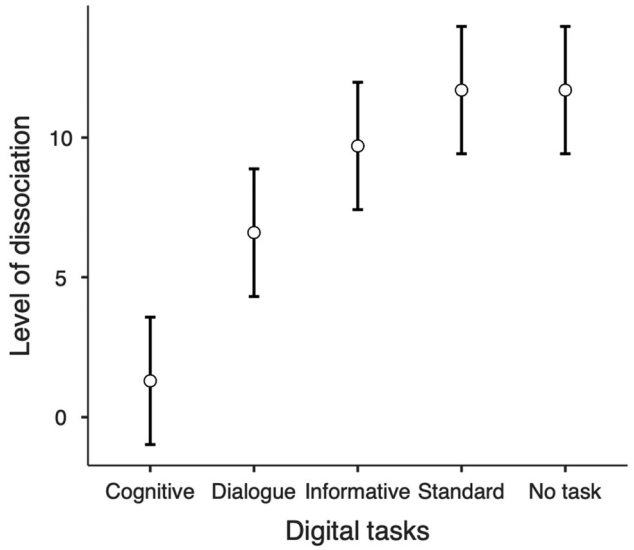

Figure 5. The level of dissociation of participants across the digital tasks.

There was a significant effect of the digital tasks on dissociation for the five groups F (4, 45) = 15, $p < .001$. Post hoc comparisons using the Tukey HSD test indicated that there was a significant difference between cognitive ($M = 1.30$, $SD = 0.82$) and dialogue task ($M = 6.60$, $SD = 2.37$), $t = -3.31$, $p = .015$; cognitive and informative task ($M = 9.70$, $SD = 4.42$), $t = -5.25$, $p < .001$; cognitive and standard task ($M = 11.70$, $SD = 4.52$), $t = -6.50$, $p < .001$; cognitive and no task ($M = 11.70$, $SD = 4.22$), $t = -6.50$, $p < .001$ (see Table 3 and Figure 5).

3.3. Acceptability of the digital tasks during online gambling

Shapiro-Wilk test was performed on the acceptability and the digital tasks and did not show evidence of non-normality ($W = 0.97$, $p = 0.58$). Therefore, a one-way between subjects ANOVA was conducted to compare the acceptability of the digital tasks by players during online gambling for cognitive, dialogue, informative, and standard tasks. There was a significant effect of the digital tasks on acceptability for the four groups F (3, 36) = 27.1, $p < .001$. Post hoc comparisons using the Tukey HSD test indicated that there was a significant difference between cognitive ($M = 25.1$, $SD = 2.73$), and informative task ($M = 29.6$, $SD = 2.37$), $t = -3.04$, $p = .022$; cognitive and standard task ($M = 38$, $SD = 3.86$), $t = -8.70$, $p < .001$, on the other. However, there was no significant difference between cognitive and dialogue task ($M = 28.8$, $SD = 2.37$), $t = -2.50$, $p = 0.07$ (see Table 3 and Figure 6).

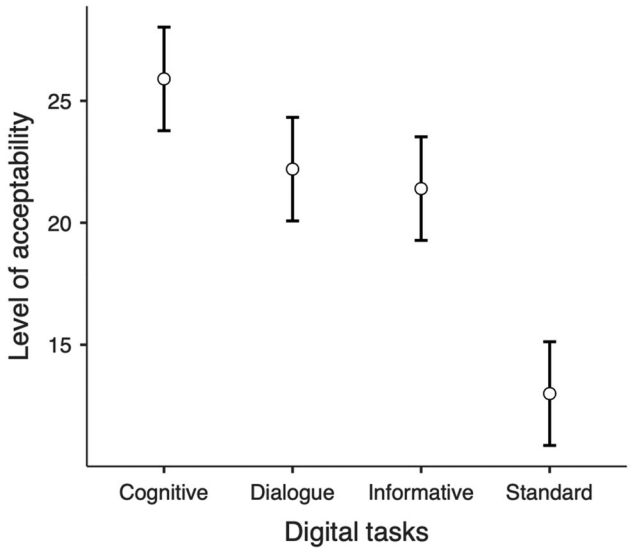

Figure 6. The level of acceptability of participants across the digital tasks.

3.4. Qualitative results

Thematic analysis of the qualitative data revealed five distinct main themes and twelve sub-themes specific to the second research question (RQ2: What are the players' perceptions and expectations of the digital tasks during online gambling activity?). Figure 7 demonstrates the thematic map. The circles represent the themes, while the rectangles indicate the sub-themes.

Theme 1. Distraction: The focal point of this theme is centred on the interruption of dissociation of participants. Three sub-themes emerged from this theme: shifting focus, break away from engagement, and break through immersion. The majority of participants gave feedback on how the digital tasks they received during online gambling distracted their focus on playing and shifted their attention to another task. Particularly participants in the "cognitive task" and "dialogue task" groups commented on how the digital tasks interfered with their immersion.

Sub-theme 1-1. Shifting focus: Participants highlighted how the digital tasks shifted their focus. A participant defined this experience as "They (digital tasks) stopped me and distracted my attention from the gambling screen for a bit during the session which is kind of relaxing" (P26, dialogue task).

Sub-theme 1-2. Break away from engagement: Participants reported that the interruption they received made them stop and disengaged from gambling. A participant stated that "It broke my engagement from gambling as I had to spend time for some other thing" (P2, informative task).

Sub-theme 1-3. Break through immersion: A participant said "I liked how it distracted me from gambling. I felt so

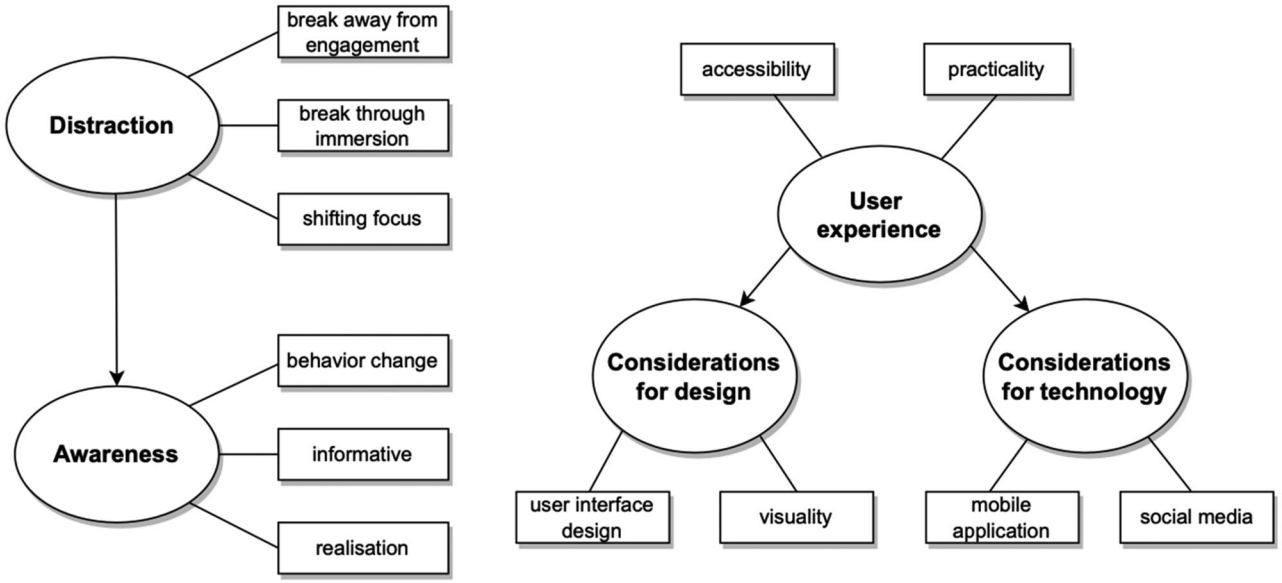

Figure 7. Thematic map for perceptions and expectations of the participants for the digital tasks.

immersed in gambling and the digital task made me stop for a while" (P13, cognitive task).

Theme 2. Awareness: This theme discusses how the digital tasks created an awareness for participants. Three sub-themes emerged from this theme: behaviour change, informative and realisation.

Sub-theme 2-1. Behaviour change: Participants expressed that the formation about the negative consequences of online gambling raised awareness and made them change their current attitude on gambling. One participant stated that "They (digital tasks) made me think and change my behaviour on playing after checking my credit balance and time" (P26, dialogue task).

Sub-theme 2-2. Informative: Participants found the digital tasks informational and insightful. One participant reported that "Interruptions were simple and easy to understand, very informative and created awareness even though I knew it already" (P14, informative task).

Sub-theme 2-3. Realisation: Participants felt the digital tasks made them realise about their current gambling behaviour. They reported that "Some apps have a time limit, I can easily ignore them by swiping, but here I had to think and realise how much money and time I spent while playing" (P3, dialogue task).

Theme 3. User experience: The focus of this theme was on user experience of participants on the digital tasks. Two sub-themes emerged from this theme: accessibility, and practicality. Participants found the digital tasks easy, accessible, ergonomic, and practical which are the necessary elements for a tool to be user friendly. This theme was particularly important as interruptions during online gambling might impact the enjoyment of gambling and lead to reactance.

Sub-theme 3-1. Accessibility: Participants identified the digital tasks as "accessible" for being easy to understand and use. They stated that "They (digital tasks) are accessible already but could be more featured" (P7, dialogue task); "I think the messages were very easy to understand for anyone" (P29, dialogue task).

Sub-theme 3-2. Practicality: Participants found the digital tasks "practical" due to their functions and feasibility. They reported that "Different buttons to select an answer were practical for me" (P1, cognitive task); "It was easy to read them as they appear on the screen in big puntos" (P33, standard task).

Theme 4. Considerations for design: Participants identified several requirements for a better design of the digital tasks such as using different colours, shapes, graphic and fonts. Two sub-themes emerged from this theme: user interface design, and visuality.

Sub-theme 4-1. User interface design: Participants gave feedback on design by saying: "Possibly using an image as an identifier as opposed to only colour-based interactions would be a good change, it could be more interesting distraction" (P1, cognitive task).

Sub-theme 4-2. Visuality: Participants gave suggestions on the visual design of the digital tasks to make them more compelling and identifiable. They commented that "I would make these notifications more engrossing" (P26, standard task).

Theme 5. Considerations for technology: Most participants recommended implementing the digital tasks to smart phone applications, and moreover they indicated that having these digital tasks in other social media platforms would be beneficial too. Two sub-themes emerged from this theme: mobile application and social media.

Sub-theme 5-1. Mobile application: Participants stated that "I would like to have it as an app on my phone instead of a desktop version. Especially while gambling or using Instagram, people would benefit a lot" (P36, informative tasks).

Sub-theme 5-2. Social media: "I think we definitely need these interruptions during gambling, also gaming and social media. Especially Instagram. I always lose track of time and I need a distraction" (P6, cognitive task).

Overall finding from the qualitative data is that the digital tasks have a high acceptance level by the participants *who scored low to moderate on The Problem Gambling Severity Index*. The participants emphasised how the digital tasks made them stop playing gambling and shifted their focus to another task which gave them more control over their playing. They also found the digital tasks informative which enabled awareness about their current gambling behaviour. Moreover, they found the digital tasks accessible and practical which made them respond the tasks easily without disturbing their enjoyment of playing gambling. However, the participants also highlighted that the digital tasks need to be improved in terms of graphical design for better visuality and design features. The participants also underlined the need for a mobile application and the presence of similar digital tasks on other social media platforms (e.g., Facebook, Instagram, YouTube, TikTok, and gaming websites) along with the gambling websites and mobile applications. In summary, based on participants' feedback the digital tasks are useful tools to shift players' attention for more responsible, informed, and conscious usage of gambling tools.

4. Discussion

The quantitative analysis revealed that although there was no significant interaction between the interruptions and the digital tasks, the participants responded to 2nd interruption significantly faster compared to 1st interruption. This result infers that the 1st interruption was able to disrupt the dissociative state of participants, so the participants were faster to respond to the 2nd interruption. More specifically, participants in the dialogue task group responded the 2nd interruption significantly faster than participants in other digital task groups. There was also a significant difference between the 1st and 2nd interruption in terms of response times for participants in the dialogue task group. It can be concluded that since the dialogue task involves questions regarding the players' gambling activity (e.g., the amount of time and money spent), the participants might have been more aware of their gambling behaviour because of the time and thought given to find out how much time and money they spent prior to the interruption they received. Therefore, the participants might have chosen to be careful about their gambling as they realised how much time and money they spent. That means that the dialogue tasks made participants to think about their gambling behaviour but also distracted their intense focus on gambling and interrupted their dissociative state, consequently participants were more attentive and thus responded the 2nd interruption faster.

These results are also supported by the analysis of the Jacob's Dissociation Questionnaire which is a self-measurement scale conducted after the online gambling session. Participants in the cognitive and dialogue task groups, whose response times to the interruptions were lower to compared to other digital task groups, rated their dissociation level significantly less compared to the informative, standard and no task groups. This indicates that the cognitive and dialogue tasks were more effective in disrupting participants' focus and interrupting dissociation compared to the other groups. This may be because both the cognitive and dialogue tasks are time consuming and demanding tasks due to their context (e.g., calculating, counting, checking time and balance). Moreover, the cognitive and dialogue tasks were rated the most positively by participants according to the results from the Acceptability Questionnaire. In addition to that, the data from the qualitative part of the Acceptability Questionnaire support this hypothesis as well.

The qualitative results identified five themes and areas to consider for future developments such as design and technology. Based on the results, while the digital tasks were accepted positively by participants and found effective to disrupt their dissociative state and create awareness about their gambling activity, however they need to be improved in terms of design and visuality. Moreover, participants suggested implementing the digital tasks into mobile applications and social media platforms.

Overall, this study shows that the cognitive and dialogue tasks designed and developed by using persuasive technologies and digital nudging are useful digital tools to use to interrupt players' dissociation to shift their focus to enable them to play less and be aware of their gambling behaviour according to both quantitative (i.e., outcome of the digital tasks) and qualitative results (i.e., thoughts about the experience).

4.1. Strengths and limitations

This study had several strengths in addressing the key overarching aim, which was to investigate the effectiveness of various digital tasks on interrupting the dissociative state of players during online gambling. Firstly, novel digital tasks were designed and developed which relied on the evidence-based techniques from Psychology and HCI disciplines. Secondly, to the best of our knowledge, this is one of the first studies to measure response times to tasks/messages during online gambling which provides empirical data. Thirdly, using mixed methods for methodology and analysis enabled us to approach the topic from different directions. Lastly, presence of the standard tasks and no task groups as control groups allowed for distinguishing between the specific effects of digitals tasks on participants' dissociation level during online gambling. In this way, we were able to see whether any task or also the content of the digital tasks was effective. In conclusion, this study demonstrates the potential for digital interactions, and it is hoped that this will stimulate discussions in the gambling and software industries to design and develop novel digital tasks for more responsible gambling.

We acknowledge some limitations to this study. Firstly, due to the lab experiment the ecological validity of this study is acknowledged to not the same as if gambling was taken place in a player's normal setting, they gamble in. Secondly, only individuals whose scores were below the threshold for problem gambling on PGSI were recruited.

Individuals with harmful gambling or gambling disorder were not recruited due to ethical considerations. Although recruitment of individuals who are not at risk might seem like a limitation at first, harm prevention and reduction strategies can also target different populations, including individuals with no known risk factors, individuals with one or several risk factors, and problem gamblers. Lastly, this study includes a small sample per each group which makes it difficult to identify statistically significant differences and generalise the results to the population. However, due to using mixed methods and collecting qualitative data, it is considered that results are still valid. Further studies with automated processes for online gambling can help to collect more data and potentially have more significant results in the future.

4.2. Implications and future directions

There are several theoretical and practical implications of this study. Even though there is an exciting potential for technology (software such as smartphone applications and websites) to be implemented into cyberspace to minimise gambling related harm, existing RG tools in the literature lack of novelty. Although technology-based approaches to address gambling harm are relatively new, there is extensive research in the literature on RG tools. The existing literature mainly focused on pop-up messages as an interruption, and the effectiveness of it is still a matter of debate, besides there is not enough empirical evidence. In addition to existing results in the literature about pop-up message tools (Ladouceur et al., 2012; Monaghan & Blaszczynski, 2007; Stewart & Wohl, 2013; Wohl et al., 2014) it was suggested that novel digital tasks through utilisation of persuasive technologies and digital nudging which provide a basis and a reference point for innovations for responsible online gambling tools. Moreover, the results proposed key design directions for digital tasks and identified more appealing ways to design them from participants' feedback through qualitative study.

The results from this study also contribute to the knowledge based on how interdisciplinary approaches and emergent technologies can be used for prevention and intervention strategies on online gambling related harm. For instance, these digital tasks can interrupt the dissociative state of players and provide a "cool down" opportunity which could enable awareness and behaviour change on players' gambling behaviour. The outcomes of this project could also benefit and support users of these applications to encourage positive engagement with these applications and reduce harm. Moreover, the results could be used for reducing harm on other type of behavioural addictions as well such as digital addiction.

Results from this study lay important groundwork for future studies as well. This study aimed to develop and design novel digital tasks to interrupt players' dissociative state during online gambling by using HCI principles. HCI principles aim to make it easier to develop interactive computer systems that try to change people's attitudes and behaviours (Lockton et al., 2010). Based on the qualitative results, future research could use fundamental HCI principles that take more aesthetic visuality and better design features into consideration. Moreover, replicating this study with the GD population instead of the general population could give insights on how gamblers would respond to those digital tasks during gambling. Furthermore, future study could replicate the experiment using smartphone applications instead of web-based software where many gamblers prefer to gamble online.

5. Conclusion

Technology based strategies can strengthen target behaviours and empower targeted groups to make positive behaviour changes. Thus, it is crucial to understand how harm minimisation techniques in gambling can support people in a cyberspace. This study explored the effectiveness of various digital tasks which are aimed to interrupt dissociation of players during online gambling and support behavioural awareness and change through persuasive technologies and digital nudging. Integrating the digital tasks with appropriate behaviour change strategies and techniques with contributions from Psychology and HCI disciplines can help to minimise the gambling related harm for more responsible gambling.

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Author contributions

CK and RA conceptualised the study. CK designed the methodology, performed data collection, conducted the analyses, and wrote the paper. DC contributed to project administration, conceptualisation, design, investigation, resources and supervised the project. JM and SH contributed to conceptualisation, design, methodology, data curation, formal analysis, and interpretation of findings and supervised the project. RA contributed to design, and interpretation of findings. All authors contributed to original draft, reviewed, and approved the final version of the paper for submission.

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The authors report there are no competing interests to declare.

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ORCID

Raian Ali http://orcid.org/0000-0002-5285-7829

Data availability statement

The data that support the findings of this study are available from the corresponding author CK upon reasonable request.

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About the authors

Ceyda Kiyak is a PhD candidate at the School of Psychology at University of East Anglia, UK. She completed MRes in Computing and Informatics at Bournemouth University, UK and MSc in Experimental Psychology at University of Milan-Bicocca, Italy. Her research involves integrating technology into psychology practice.

Deniz Cetinkaya is a Principal Academic in the Department of Computing and Informatics at Bournemouth University. She is the Programme Leader for Software Engineering and Computing courses. Deniz received her PhD from Technische Universiteit Delft (TUDelft), Netherlands. Her research interests include software engineering, human-computer interaction, machine learning and data science.

John McAlaney is a Professor at Bournemouth University, where he leads the Gambling Research Group. His work focuses on decision making and social influence in online environments, including problematic gambling, digital addiction, and participation in cybercrime.

Sarah Hodge is a Senior Lecturer at Bournemouth University. Her research explores the overlap between gaming and gambling, human computer interaction factors for gambling using technology, as well as how to psychologically support users, and supporting education and awareness of harms in children's and young people's gaming and gambling.

Raian Ali is a Professor at Hamad Bin Khalifa University in Qatar. His research has an inter-disciplinary nature, with a focus on the inter-relation between technology and human requirements and behaviour such as digital addiction, persuasive systems, and behaviour change. Raian holds a PhD from the University of Trento, Italy.