



**Mind the Gap:  
Interrupting Dissociation of Players  
Through Real-Time Digital Tasks  
During Online Gambling**

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**Master by Research (MRes) Thesis**

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## **Declaration**

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## Abstract

*Background:* When people engage in online gambling, they often lose track of time and money spent which is called a “dissociation state”. Literature suggests that intermittent and dynamic messages that interrupt a task can capture the attentional focus. As interactions increase awareness of the here and now, they may be effective in breaking the players’ dissociation state during online gambling and consequently minimise the potential of gambling related harm. To this respect, in this study we investigated the effectiveness of four types of digital tasks (cognitive, dialogue, informative, and standard tasks) in interrupting the dissociation of players during online gambling.

*Methods:* 50 participants were recruited from the general population who were 18 years old and over, fluent in English and scored no more than 8 (which is the cut-off for high-risk gambling) on the Problem Gambling Severity Index (PGSI). Participants responded to an online survey with demographic questions and PGSI. Eligible participants were invited to the computer based online experiment at the lab where they were randomised to five different digital task groups (experimental groups: cognitive, dialogue, informative, standard; and control group: no task) and they received the digital tasks as an interruption while they were playing online slot gambling on a dummy account on the computer. Participants’ response times to the interruptions were recorded during online gambling. After the gambling session their level of dissociation and their acceptance of the digital tasks were measured by using Jacob’s Dissociation Questionnaire (JDQ) and the Acceptability Questionnaire (both Likert scale and open-ended questions) respectively.

*Results:* The analysis revealed that there was a significant main effect of interruptions in terms of response times  $F(1, 36) = 6.52, p = .015$ , and a significant interaction between the two interruptions and the digital tasks  $F(3, 36) = 4.54, p = .008$ . However, there was no statistically significant difference between the digital tasks in terms of total response times to two interruptions  $F(3, 36) = 1.81, p = .16$ . On the other hand, there was a significant effect of the digital tasks on the dissociation level of participants for the five groups  $F(4, 45) = 15, p < .001$ . Cognitive tasks ( $M = 1.30, SD = 0.82$ ) interrupted the dissociation of players more compared to the other digital tasks. Additionally, there was a significant effect of digital tasks on acceptability for the four groups  $F(3, 36) = 27.1, p < .001$ . According to the results of acceptability questionnaires, while players accepted the cognitive tasks the most ( $M = 25.1, SD = 2.73$ ), standard tasks were accepted the least by the participants ( $M = 38, SD = 3.86$ ). The

qualitative data from the open-ended questions in the Acceptability Questionnaire was analysed using Thematic Analysis. Five main themes were generated: 1. distraction, 2. awareness, 3. user experience, 4. considerations for design and 5. considerations for technology.

*Implications:* Cognitive and dialogue digital tasks could be potentially useful digital tools to interrupt players' dissociation during online gambling and to minimise gambling related harm. These novel digital tasks might be used in online gambling related prevention and intervention strategies in the field.

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*“Life is not a matter of holding good cards, but of playing a poor hand well.”*

Robert Louis Stevenson

Life is essentially a gamble, because we cannot possibly know the millions of variables that lead up to the choices we make, the situations in which we find ourselves, the ways in which we act every day and so on. We take the chances, play the odds, and try to set them in our favour. While I was writing this thesis, I had so many philosophical questions on chances, opportunities, and risks that people would have and take throughout their life. Herewith, I would like to take this opportunity and thank all those people who gave me the opportunities to succeed over the last year in the world of gambling, particularly to my academic supervisors at Bournemouth University, I am entirely humbled by the sheer genius of them. Thank you very much for giving me the chance to work in such an excellent interdisciplinary research environment.

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## **Dedication**

In this thesis, we aimed to develop novel digital tasks to minimise online gambling related harm. Therefore, I would like to dedicate this thesis to those who lost not only their money and time but also their family, friends, job, and joy in life because of the adverse consequences of problem gambling. As a researcher and psychotherapist, I hope that this research will result in new technological innovations to design real-time digital tasks for responsible gambling.

**Ceyda Kiyak**

**Bournemouth, 2022**

*“Gamblers know how a man can sit for almost twenty-four hours...without looking to the right, or to the left.”*

*Dostoyevsky, “The Gambler”, 1867*

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## List of Abbreviations

<b>Abbreviation</b>	<b>Meaning</b>
AI	Artificial Intelligence
ANOVA	Analysis of Variance
APA	American Psychological Association
BCTs	Behaviour Change Techniques
BRS	Brain Reward System
COVID-19	Coronavirus Disease 2019
DRD2 gene	Dopamine Receptor 2 gene
DSM	Diagnostic and Statistical Manual for Mental Disorders
EGMs	Electronic Gambling Machines
<i>F</i>	F value (variance of the group)
GD	Gambling Disorder
HCI	Human Computer Interaction
ICD	International Classification of Diseases
ICT	Information and Communication Technology
IT	Information Technology
IoT	Internet of Things
<i>M</i>	Mean
JDQ	Jacob's Dissociation Questionnaire



<i>N</i>	Population size
<i>p</i>	P value (probability)
PGSI	Problem Gambling Severity Index
PPG	Potential Problem Gambler
PT	Persuasive Technologies
SD	Standard Deviation
RG	Responsible Gambling
SNS	Social Network Sites
Tukey HSD	Tukey Honestly Significant Difference
UK	United Kingdom
USA	United States of America
WHO	World Health Organisation

# CHAPTER I. INTRODUCTION

## 1.1. Background of Gambling Disorder

Gambling has a long history in many cultures and its existence pre-dates the written word (Abbott, 2017). In today's world, problem gambling is pervading many cultures and societies at different levels such as economical, labour, health, and social costs (WHO, 2017). Even though most individuals engage in gambling as an enjoyable social activity, a small percentage of people become excessively involved in terms of time invested and money wagered, and they maintain to gamble despite its substantial and negative personal, social, family, and financial consequences (Gainsbury et al., 2014). Particularly online gambling may be more concerning due to its availability and velocity (Håkansson et al., 2020). The rapid and widespread increase in use of the Internet and smartphones has changed the gambling activity (Wardle et al., 2021). The ubiquitous accessibility of online gambling through smartphones and computers makes the scale and complexity of the problem even higher compared to traditional gambling which requires going to a betting shop (Drosatos et al., 2018).

Moreover, the widespread and easy accessibility of online gambling has increased after COVID-19 pandemic response worldwide with lockdowns and restrictions. According to Emond et al. (2021) gambling soared during lockdown, especially among regular gamblers. COVID-19 pandemic lockdowns have changed the gambling habits of individuals. As a consequence, while gambling was affected in many ways during COVID-19 pandemic (e.g., closing of casinos and cessation of sports may limit certain forms of gambling), online gambling remained available, and COVID-19-related stress might cause increase engagement in online gambling (Håkansson et al., 2020). For instance, even though the lockdown response to the COVID-19 pandemic has significantly reduced access to commercial gambling around the world (Biddle, 2020), the results from a meta-analysis published in 2021 reported that there is a subgroup of individuals who increased their gambling activity by starting or increasing online gambling and among gamblers who were not involved in online gambling

before COVID-19, 15% of them shifted to online gambling during lockdown (Hodgins & Stevens, 2021). Additionally, while gambling frequency among social gamblers decreased, Potential Problem Gamblers (PPG) remained the same in their online gambling activity; and individuals who were negatively affected by COVID-19 pandemic financially reported an increase in their gambling frequency (Sharman et al., 2021). Therefore, the emergence, availability and accessibility of online gambling have raised worldwide concerns and all stakeholders have been encouraged about concern on Responsible Gambling (RG) to develop science-based RG programs that are safe and effective.

RG tools are harm-minimising strategies particularly among at-risk and problem gamblers and provide a common framework for legal and safe online (Ivanova et al., 2019). Up to now various RG harm-minimisation strategies have been developed and put into practice to enable responsible gambling among players such as pop-up messages, limit setting, breaks in play, and behavioural tracking. In their critical review on the harm-minimisation tools for electronic gambling, Harris & Griffiths (2017) reported that evidence shows an inconsistent effect for informative style message, and often significant results but with small effect sizes for the use of self-appraisal messaging, normative feedback, and the use of time and monetary reminders on gambling behaviour.

As gambling products become increasingly technologically sophisticated and involved, the same technical innovation may be leveraged to enable the development of harm-minimization tools to make more controlled decisions about individuals' gambling behaviours (Harris & Griffiths, 2017). However, the literature mainly focused on pop-up messages and monetary reminders according to the most recent available evidence and neglected designing more complex digital tasks with Persuasive Technologies (PT) and digital nudging which can interrupt players' attention to gambling and dissociation which may have occurred from the gambling activity. Several studies in the literature reported that deficits in aspects of attention, working-memory, planning and time-estimation are more common among problem gamblers (Hodgins et al., 2011; Potenza, 2014).

Jacobs (1988) suggests that when people engage in addictive behaviour, they often lose track of time and space. Such a mental state is called *dissociation* and occurs readily among people who play online gambling, particularly common among problem gamblers (Diskin & Hodgins, 2001) who become unaware of their surroundings. In their paper, Rogier, Capone & Velotti (2021, p.4) stated that “*Individuals suffering from gambling disorder (GD) would be likely to dissociate in response to excessive arousal activated by traumatic memories. From this perspective, dissociative experiences while gambling would be conditioned responses to emotional triggers aiming to escape from negative internal states but would invalidate healthy emotion information processing as well*”. This point of view has been indirectly supported by pieces of research many times in the literature and theoretically, it has been argued that pathological dissociation is involved in the onset and maintenance of GD (Poole et al., 2017; Cartmill et al., 2014; Oathes & Ray, 2008; Schore, 2009).

Gamblers are described as totally focused on gambling activity when they are experiencing a state of flow (Rogier, Capone & Velotti, 2021). This experience leads players to a loss of track of time and money they spend (Dixon et al., 2019). Therefore, this experience can create a considerable gap between players’ perception and reality in terms of the amount of money and time they spend. The intense focus and time disorientation experienced by players during online gambling might lead them to spend more time and money than they initially planned. In fact, the progression and maintenance of problem gambling is associated with dissociation in which players enter and remain during gambling activity (Jacobs, 1988). According to Monaghan (2009) effective harm-minimisation strategies must draw/interrupt attention away from gambling. In addition to this, Bailey, Konstan & Carlis (2001) suggested that intermittent, dynamic messages that interrupt a task can capture the attentional focus. Therefore, dissociation of players must be interrupted to shift their attention to the interactions which aim to enable responsible gambling while maintaining players’ enjoyment of the gambling (Stewart & Whole, 2014) with more complex tasks.

Johnston and Dark (1990) suggested that warning signs with warning messages are capable of capturing attention in the presence of competing visual stimuli. One strategy to capture players' attention is the use of interruptions, which shifts players' attention focus from a primary task to a notification (McCrickard et al., 2003). Along with this Speir et al. (1997) found that interruptions with simple and non-challenging contexts actually increases human performance. This effect is useful for players to refocus their attention on their gambling behaviour to assess the amount of time and money they spend. Therefore, while interruptions should be complex enough to distract players' focus on gambling, they should also be simple enough for players to use their unused cognitive capacity on a task. As interactions given during online gambling increase awareness of the here and now, they may be effective in breaking the dissociation of gamblers experience (Monaghan, 2009) and consequently minimise the online gambling related harm and aid responsible, informed, and conscious usage.

In summary, easy accessibility and persuasive design used in online gambling (e.g., more immersive and engaging) makes the scale and complexity of the online gambling problem even higher in comparison to traditional gambling. Although there are already diverse RG tools to minimise the online gambling related harm (e.g., pop-up messages, limit setting, enforced breaks), the literature demonstrates an inconsistent effect for these tools (Harris & Griffiths, 2017; Auer, Malischnig & Griffiths, 2014). These tools seem insufficient in breaking through the intense focus and time disorientation experienced by players during online gambling. Since the online space offers a unique chance to enable behaviour change, 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. However, to date, relatively few studies have reported empirical data related to the effectiveness of responsible gambling 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 dissociation state of players.

Therefore, in this study we designed and developed four different digital tasks (cognitive, dialogue, informative and standard tasks) to interrupt dissociation of players during online gambling. The cognitive tasks were developed based on visual search paradigm which is a perceptual task requiring attention because of scanning a target object among other distractors. Therefore, the cognitive tasks are demanding, and time consuming as the participants need to calculate and count target objects which could potentially divert participants' attention from gambling. The dialogue tasks were developed based on self-appraisal feedback. In this task, participants are asked to answer questions about their current gambling activity (e.g., the time and money they spent). Therefore, participants are required to have a thought process about their gambling behaviour which could potentially take some for them and consequently disturb their immersion in successive betting. However, the informative and standard tasks were developed based on basic digital nudging where the participants read an informative message about gambling and select a button to remove the content from the screen. Therefore, these tasks do not require any thinking process unlike the cognitive and dialogue tasks.

## **1.2. Thesis Aim**

Taken all together, the aim of this thesis is to investigate the effectiveness of different digital tasks during online gambling sessions to interrupt the dissociation of players. This could minimise the gap between their perception and reality in terms of money and time spent. To achieve this aim, we took Responsible Gambling (RG) as an exemplar domain. Therefore, this thesis focused on how to design and develop digital tasks by using technology assisted behaviour change (e.g., persuasive technologies and digital nudging). Consequently, this study is interdisciplinary research using both psychology and computing disciplines' methods and principles. Figure 1 shows the research topic and context of this study.



*Figure 1. Research focus and context*

### **1.3. Thesis Questions**

Based on the thesis aim, the following research questions were formulated to focus the study and determine the appropriate research design:

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

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

#### **1.4. Thesis Hypotheses**

The following hypotheses were formulated:

##### **Hypothesis 1:**

**H1a:** The response times to interruptions among participants who are in “cognitive task” and “dialogue task” groups are lower than participants who are in “informative task” and “standard task” groups.

**H1b:** The response times to 2<sup>nd</sup> interruption among participants who are in “cognitive task” and “dialogue task” groups are lower than participants who are in “informative task” and “standard task” groups.

##### **Hypothesis 2:**

**H2a:** The level of dissociation is lower among participants who are in experimental groups (cognitive, dialogue, informative and standard tasks) than participants who are in the control group (no task).

**H2b:** The level of dissociation is lower among participants who are in the “cognitive task” and “dialogue task” groups than participants who are in “informative task” and “standard task” groups.

##### **Hypothesis 3:**

**H3:** The level of acceptability is higher among participants who are in “cognitive task” and “dialogue task” groups than participants who are in “informative task” and “standard task” groups.



## CHAPTER II. LITERATURE REVIEW

### 2.1. Terminology and classification of Gambling Disorder

The Diagnostic and Statistical Manual of Mental Disorders (DSM-3) included serious problem gambling for the first time in 1980 and it was referred to as pathological gambling placed in the “Impulse-Control Disorders” category (Abbott, 2017). Pathological gambling has also been referred to as harmful gambling, problem gambling, compulsive gambling, irresponsible gambling, or gambling disorder. The differences among these terms are, in part, a matter of severity as well as frequency of gambling (Abbott et al., 2015). In the latest edition of the DSM-5, there has been a change and pathological gambling was renamed as “Gambling Disorder (GD)” and moved to the new category of ‘Addictions and Related Disorders’, becoming the first and only formal behavioural addiction in the manual. Similarly, the World Health Organisation (WHO) has reclassified GD as an addictive disorder in the ICD-11 as well (WHO, 2019).

The DSM-5 defines the following criteria for Gambling Disorder (DSM-5; American Psychiatric Association, 2013): Persistent and recurrent problematic gambling behaviour leading to clinically significant impairment or distress, as indicated by the individual exhibiting four (or more) of the following in a 12-month period:

1. Needs to gamble with increasing amounts of money in order to achieve the desired excitement.
2. Is restless or irritable when attempting to cut down or stop gambling.
3. Has made repeated unsuccessful efforts to control, cut back, or stop gambling.
4. Is often preoccupied with gambling (e.g., having persistent thoughts of reliving past gambling experiences, handicapping, or planning the next venture, thinking of ways to get money with which to gamble).
5. Often gambles when feeling distressed (e.g., helpless, guilty, anxious, depressed).

6. After losing money gambling, often returns another day to get even (“chasing” one’s losses).
7. Lies to conceal the extent of involvement with gambling.
8. Has jeopardised or lost a significant relationship, job, or educational or career opportunity because of gambling.
9. Relies on others to provide money to relieve desperate financial situations caused by gambling.

There is a disagreement in the literature proposing that gambling disorder is heterogenous and attempts to identify subtypes of gambling disorder have been generally unsuccessful (Grant & Potenza, 2022). According to Szerman et al. (2020), gambling disorder, and problem gambling lie on a continuum, with the former located at the end of the scale, while problem gambling is a less problematic behaviour that may not result in severe difficulties in the individual’s life. The differences between these terms are in-part a matter of severity as well as frequency of gambling.

While the gambling disorder is the most extreme form of gambling activity as currently outlined in the Diagnostic and Statistical Manual of Mental Disorders - Fifth Edition (DSM-5), social gambling places the low or non-risk gambling on the continuum (Hilbrecht & Mockk, 2019). Therefore, in this study, we identify four subtypes of gambling behaviour based on Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001) which assess the problem gambling behaviours and adverse consequences of gambling behaviour by asking individuals gambling behaviour over the past 12 months by scoring themselves against nine questions. The PGSI includes two domains of enquiry: gambling behaviours (four questions) and gambling harms (five questions). Participants are classified into gambling subtypes based on their PGSI scores as follows: 0 = non-problem gambler; 1–2 = low-risk gambler, 3–7 = moderate risk gambler, 8 and over = gambling disorder/problem gambler.

***Gambling disorder (high risk, problem or pathological):*** As stated earlier, *gambling disorder* is characterised by a persistent, recurrent pattern of gambling that causes negative consequences such as substantial distress or impairment in individuals' life (Potenza et al., 2019).

***At-risk (moderate risk or harmful) gambling:*** *At-risk gambling* refers to an experience resulting in one or two negative consequences in the last 12 months (Mazar et al., 2018). Longitudinal studies have demonstrated that at-risk gambling is one of the strongest predictors of future problem gambling (Billi et al., 2012; Williams et al., 2015).

***Social (low risk) gambling:*** *Social gambling* is referred as gambling for recreation or entertainment purposes and sustains, enhances, or has little to no impact on a gambler's state of well-being (Abbott et al., 2013). Moreover, gambling is considered to make positive contributions to quality of life (Hilbrecht & Mock, 2019). For instance, it was found that gambling among older adults was associated to social support and interaction (Bilt et al., 2004). Furthermore, some types of gambling are found to be helpful for adults for memory, concentration, math skills, and hand-eye coordination (Shaffer & Korn, 2002).

***Non-problem (non-risk) gambling:*** *Non-problem gambling* refers to individuals who do not have any gambling-related problems in the last year (Ferris & Wynne, 2001).

## **2.2. Clinical characteristics of GD**

Gambling disorder is a health-harming addictive behaviour, recently recognised in the International Classification of Diseases 11th Revision (ICD-11) and Diagnostic and Statistical Manual of Mental Disorders 5th Edition (DSM-5). GD is a clinically heterogeneous disorder and demonstrates high chronicity and relapse rates (Medeiros et al., 2017). There is a growing body of literature on the importance of GD, and it is a greatly worrying issue. According to the literature, the multiple biological, psychological, and socio-ecological variables contribute to the development of GD. Moreover, GD is highly comorbid with a large number of other psychiatric disorders (Rash, Weinstock, & Patten, 2016) such as substance use disorder, attention deficit hyperactivity disorder, depression, bipolar disorder, social anxiety,

schizophrenia, antisocial personality disorder; and dimensional symptoms including higher impulsivity, poorer emotional wellbeing, cognitive distortion, psychosis, deficient self-regulation, suicide, poorer family environment, and greater mental distress (Szerman et al., 2020). Therefore, understanding the multi-layered mechanism of GD provides valuable insight into its aetiology and risk factors (Mihara & Higuchi, 2017) to develop novel prevention and intervention approaches for problem gamblers.

### ***2.2.1. Neurocognitive mechanism of GD***

A substantial body of empirical work indicates that multiple neurotransmitter systems (e.g., dopaminergic, serotonergic, noradrenergic, opioidergic) play a role in the pathophysiology of gambling disorder (Hodgins, Stea & Grant, 2011). Dysfunction in ventral prefrontal cortices (including the medial and lateral orbitofrontal cortices, medial prefrontal cortex and adjacent anterior cingulate cortex, striatum, amygdala, hippocampus, and insula) has been suggested to be associated with disruptions or differences in several processes and functions, such as sensitivity to reward and excitement, loss-chasing behaviour, stress dysregulation and social-emotional problems (See Figure 2; Potenza et al., 2019).

Moreover, multiple cognitive processes have been linked to the tendency to gamble and to the severity of gambling problems (Potenza, 2013). For instance, individuals with GD demonstrate a clinical symptomatology that is associated with a broad range of executive functioning deficits such as poorer working memory and decision-making capacity, reduced cognitive control, reduction in visual and auditory function, along with the deficiency of the brain reward system (BRS) (Szerman et al., 2020; Goudriaan et al., 2005; Kertzman et al., 2006).

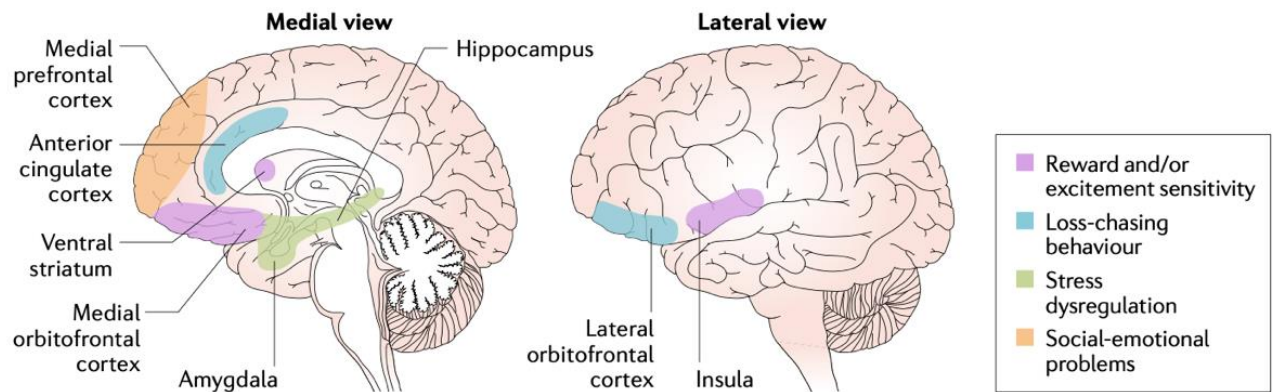


Figure 2. Neurobiology of gambling disorder (retrieved from Potenza et al., 2019)

### 2.2.2. Primary manifestations of GD

**Behavioural manifestations:** Psycho-behavioural manifestations might include a wide range of mental health signs and symptoms such as depression, anxiety (Schluter et al., 2019), cognitive distortions (e.g., denial, a sense of power and control over the outcome of chance events, overconfidence), isolation, feeling helpless, guilty, and suicidal ideation (DSM-5; American Psychiatric Association, 2013), anxiety, alcohol, and substance misuse (Browne et al., 2017). Other symptoms might include poor judgement, feeling nervous, impatience, defensiveness, agitation, mood swings, increased irritability (Neal, Delfabbro, & O’Neil, 2005), inability to track the passage of time during gambling, decreased performance at work and/or school, and becoming withdrawn from social and/or family events (Clayton, 2021).

**Physical manifestations:** Although it might be difficult to identify physical symptoms of gambling disorder as it does not manifest physical cues as in alcohol or substance use disorders (Dell, Ruzicka & Palisi, 1981), there are still several physical symptoms that might affect individual’s life such as headaches, lack of appetite which leads to weight loss, and sleeping problems including insomnia.

**Financial manifestations:** There are some common financial warnings that problem gamblers or at-risk gamblers demonstrate such as relying on others to provide money to solve financial difficulties (DSM-5; American Psychiatric Association, 2013), being secretive about financial records and pay slips, unpaid bills, and having many loans at the one time (“Gambling Help”, 2022).

### **2.2.3. Motivators, causes and risk factors of GD**

Although gambling activity is recreational for many people which is performed periodically without negative consequences, it can lead to significant harm and interfere with life functioning in a minority. Researchers have established many predictive risk factors and processes associated with the development of gambling disorders (Hodgins, Stea & Grant, 2011). Although it is commonly assumed that gambling is primarily driven by financial motives, the literature has demonstrated that gambling serves a variety of other goals. People get involved in gambling activity for various reasons such as to have fun, get thrills, share time, or compete with others, enhance their abilities, escape boredom, alleviate negative repeated or intrusive thoughts, curb cravings, or relieve poor moods (Barrada et al, 2019). Therefore, the aetiology of gambling disorder is complex, with implicated biological, psychological, social, cultural, and environmental factors.

**Biological factors:** Genetic studies indicate a substantial heritable contribution to problem gambling. For instance, data from adoptee and twin studies suggest a genetic contribution and demonstrate that 40-50% of the tendency to develop or resist the gambling problem often implied to as heritability can be predicted by genetic factors (Abbott et al., 2013). Even though problem gambling is polygenetic, the evidence from the literature consistently refers to dopamine receptor genes (particularly the Taq A1 variant of the DRD2 gene) as being key contributors of developing gambling disorder (Lim, Ha, Choi, Kang, & Shin, 2012; Lobo et al., 2010; Grant et al., 2006; Ibáñez et al., 2001).

**Psychological factors:** Antisocial traits, antisocial personality disorder (Blaszczynski & Nower, 2002); impulsivity (Toneatto & Nguyen, 2007); sensation-seeking (Johansson et al., 2009); dissociation (Diskin & Hodgins, 2001); novelty seeking, emotional vulnerability (Bagby et al., 2008); low trait self-control, and maladaptive coping strategies (Rogier, Picci & Velotti, 2019) have been reported to be underlying reasons for gambling disorder. Moreover, problem gamblers are considered to be prone to cognitive distortions (WHO, 2017), such as *illusion of control* which occurs when a person believes that they control an outcome that is uncontrollable, and *gambler's fallacy* which is a bias that the expectancy of a certain event (e.g., heads in a coin flip) becomes less likely after a long series of the same event (e.g., three successive tails) (Clark et al., 2013).

**Socio-environmental factors:** It is recognised by the literature that broader social influences (e.g., family and peer gambling involvement, neighbourhoods with low social capital and greater social disadvantage, and lower socioeconomic status) and the structural and situational characteristics of gambling activities (e.g., accessibility to gambling, location and type of gambling business, size and number of prizes, and near-miss opportunities) play a crucial role in individuals' exposure to and acceptance of gambling, their vulnerability to harm and the maintenance of gambling behaviour (Delfrabbo & King, 2017; Hodgins, Stea & Grant, 2011).

**Age and sex:** There are sex differences in terms of gambling engagement and gambling disorder. The lifetime prevalence rate of gambling disorders for females is about 0.2%, and for males it is about 0.6% (DSM-5; American Psychiatric Association, 2013). In one study, males and young adults are almost universally found to be at elevated risk (Abbott, 2017). This gap between genders is explained by the findings that males tend to have higher levels of sensation seeking and risk-taking than females (Clarke et al. 2005; Harris and Jenkins 2006). Moreover, Buth et al. (2017) reported that individuals who are up to 26 years old are at a higher risk for gambling disorder.

**Technological factors:** Technology has drastically changed the way individuals gamble and even made gambling more accessible. The impact of new technological developments

(e.g., smartphones, advanced graphics, more features) on online gambling is so massive that they generate higher levels of excitement. For instance, Yücel et al. (2018) reported that design features and structural characteristics of Electronic Gambling Machines (EGMs), such as high event frequencies (enabling continuous play), random ratio reinforcement schedules, near misses, losses appearing as wins, multiline betting, and exaggerated audible and visual reinforcements, are intentionally developed to alter fundamental aspects of human decision-making and behaviours (e.g., classical and operant conditioning, cognitive biases, and dopamine signals). Moreover, social networking sites (SNS) might serve as triggers for reinforcement of continuous use (Young & de Abreu, 2011) and consequently have the potential to increase the prevalence rates of gambling disorder (“How is Technology Innovation Impacting Gambling Addiction?”, 2022). Therefore, human-computer interaction designs hold a crucial role in affecting individuals’ gambling behaviour since they could become a persistent feature on shifting conditions from habit to disorder or addiction.

#### ***2.2.4. Adverse consequences of GD***

Problem gambling has adverse negative impacts on the health and wellbeing of individuals, families, communities, and society. The conceptual framework of gambling-related harm was classified by Longham et al. (2016) in an illustration as shown in Figure 3. In terms of health, individuals with gambling disorders have a higher probability of dying from any cause each time in comparison to the general population. For instance, the odd ratio for suicidal ideation was 4.2 while it was 5.5 for suicide attempts among high-risk gamblers in health care settings (Livingstone & Rintoul, 2021). Maccallum and Blaszczyński (2006) identified risk factors for suicide attempts such as major depression, substance abuse, marital breakdown, unemployment, financial crises, and legal difficulties. Moreover, in 2017, the gambling-related burden of harm was 2.5 times more than diabetes and 3.0 times more than drug use disorder (Abbott, 2017).



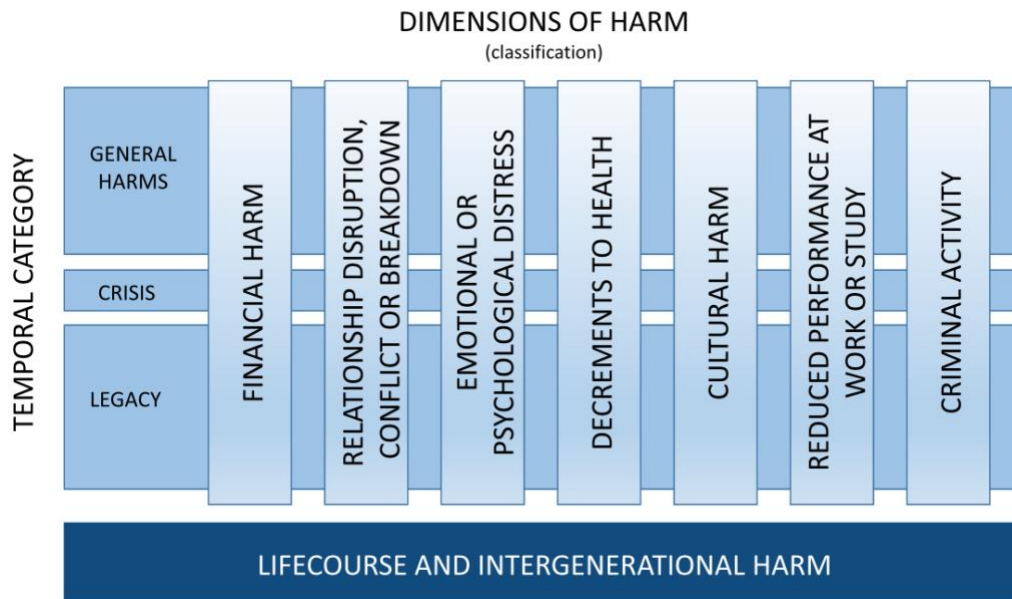


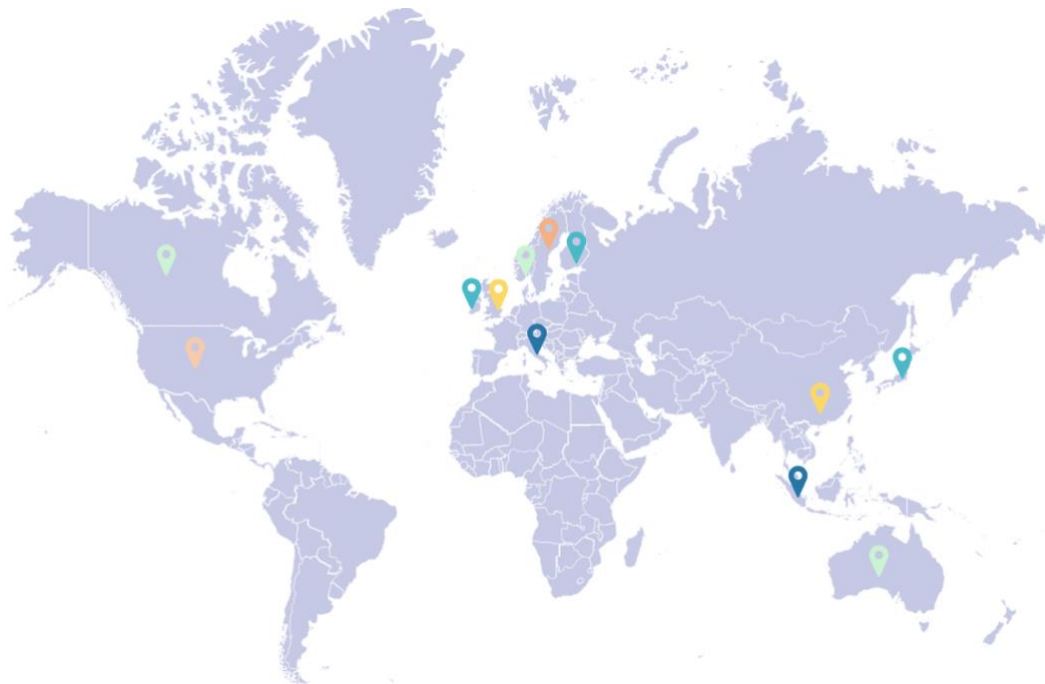
Figure 3. Conceptual framework of gambling related harm (Retrieved from Langham et al., 2016)

Shame and stigma were also suggested as the most pervasive types of emotional and psychological distress (Langham et al., 2015). Gambling was linked to poor sleep practices, non-compliance with medication, and reduced personal hygiene (Browne et al., 2016). Gambling occurs beyond the person who gambles, and it may affect both at relationship and community level. For instance, gambling-related financial difficulties were correlated with crimes including theft and selling drugs, bankruptcy and housing problems including homelessness ("Gambling-related harms evidence review", 2022). Absenteeism and the costs of job turnover, relationship breakdowns, particularly marriages and the associated costs to the family law courts, drug trafficking or prostitution to repay debts, and crimes of opportunity, including acts from petty theft from family members are some major consequences of GD (Langham et al., 2016).

### 2.3. Global overview of the prevalence of problem gambling

Gambling is a source of potentially substantial and wide-ranging harms which affect individuals' health, wealth, and relationships. The WHO reported that the overall prevalence of lifetime gambling disorders among adults ranging between 0.1% and 5.8% worldwide

(Cristopher, 2020). Prevalence rates for gambling disorders from national surveys vary worldwide. For instance, problem gambling prevalence in North America ranges from 2% to 5%, in Asia 0.5% to 5.8%, in Oceania 0.4% to 0.7%, and in Europe 0.1% to 3.4% in 2016 (Calado & Griffiths, 2016). Also, there has been an increase in online gambling from 1.5% in October 2019 to 2.3% in May 2020 in the UK (Hodgins & Stevens, 2021). Also, 4.2% of adults are classified as 'at-risk' for developing a gambling problem (Wardle et al. 2014), equating to around 2.5 million people in Great Britain (Harris & Griffiths, 2017).



*Figure 4. Countries with the highest prevalence of gambling disorder (Canada, USA, Ireland, the UK, Italy, Norway, Sweden, Finland, Japan, China, Indonesia, Australia)*

In more detail, gambling disorder prevalence in Western countries ranges from 0.3% in Sweden (Binde, 2014), 0.7% in Britain (Wardle et al., 2011) to 0.8% in Denmark (Ekholm et al., 2014), while in Oceania countries it ranges from 0.5% in New Zealand (Devlin & Walton, 2012) to 2.1% in Australia (Productivity Commission, 2010). The prevalence is in Asian countries ranging from 0.5% in Singapore (National Council on Problem Gambling, 2014), 2.5% in Macau (Fong & Ozorio, 2005; Wu, Lai, & Tong, 2014), 4% in Hong Kong (Wong & So,

2003) to 4.4% in Malaysia (Loo & Ang, 2013). Figure 4 illustrates the countries with the highest prevalence of gambling disorder.

## **2.4. Dissociation and gambling disorder**

### ***2.4.1. Operational definition of dissociation in GD***

Dissociation has a complex and multifaceted definition and there is no generally accepted definition for gambling disorder in the literature. The DSM-5 defines dissociation as *“the disruption of and/or discontinuity in the normal integration of consciousness, memory, identity, emotion, perception, body representation, motor control, and behaviour”* (APA, 2013, p. 291). There are different nomenclatures in the literature while implying dissociation in reference to gambling such as an “altered state of awareness” (McKeith, Rock & Clark, 2017), “immersion” (Murch, Chu & Clark, 2017; Murch & Clark, 2019); “dark flow” (Dixon et al., 2018); “the zone” (Murch, Chu & Clark, 2017); and “slot machine zone” (Oakes, Pols, Lawn, & Battersby, 2018; Schüll, 2012). In this thesis, the term dissociation will be used to refer to all these experiences since dissociation is an umbrella term for aforementioned nomenclatures. Even though these dissociative experiences on a pathological continuum is still a subject of ongoing debate, researchers agreed upon the necessity to differentiate them from the so-called pathological manifestations of dissociation (Rogier et al., 2021; Butler, 2006).

In the field of 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 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 & Caputo, 2020) or wanting to “slip in a bubble bath” (Schüll, 2012).

#### ***2.4.2. Gambling disorder and dissociation***

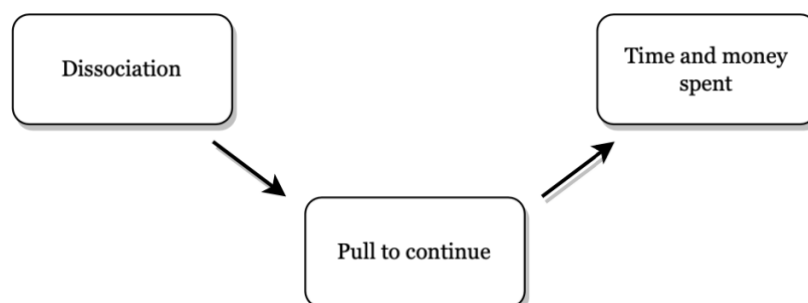
A growing body of literature shows that dissociative states experienced during gambling activities play a crucial role in developing and/or perpetuation of gambling disorders. Kuley and Jacobs (1982) stated that among problem gamblers, the symptoms of increasing anxiety before gambling are followed by derealization and depersonalisation (a sense of separation from oneself and/or from the external world). Additionally, those individuals often report their awareness of events and time is substantially disturbed during what may be several consecutive hours of gambling (Jacobs, 1988).

According to the General Theory of Addiction (Jacobs, 1986), addiction is the result of the convergence of the perception of one's physiological arousal as under or overactive, as well as the proclivity to escape from negative emotional states through fantasising. In this respect, people with problem gambling would be likely to dissociate in response to excessive arousal activated by traumatic memories (Rogier, Capone & Velotti, 2021).

In one study, it was reported that individuals with pathological engagement in various types of gambling activities reported higher scores on the dissociative scale compared to control groups (Kofoed et al., 1997). Moreover, Dixon et al. (2019) found that among social (low or non-risk) slot-machine gamblers involved in a slot-machine task, intensity of dissociation was significantly correlated with the severity of the GD. Additionally, Oakes et al. (2012) reported that the strength of dissociative states experienced during gambling activities may predict the relapse rate. Similarly, Carlbring et al. (2012) reported that individuals with higher dissociative gambling scores were less likely to report no gambling activity after their treatment in the following 30 days.

Moreover, the literature suggests that there is a significant difference between problem gamblers and social gamblers in terms of experiencing dissociation. For instance, one of the earliest types of research done by Kuley and Jacobs (1988) reported that 60% to 76% of the problem gamblers experienced a dissociative-like relationship, whereas only 3% to 24% of the social gamblers reported dissociative experiences during gambling activity. Diskin and Hodgins (1999) supported these results in an experiment where they measured the response times and Dissociative Experiences Scale (Bernstein & Putnam, 1986) to irrelevant external light stimuli while playing on a demonstration video lottery terminal. They found that problem gamblers had significantly higher scores than the occasional gamblers on the Dissociative Experiences Scale and problem gamblers had significantly higher response times compared to occasional gamblers.

Studies on EGMs support these results by suggesting that ambient sound, coloured lights and even the rhythm of the game appear most capable of inducing a dissociative experience (McCormick et al. 2012; Finlay et al. 2009; Noseworthy & Finlay 2009). Research on flow state also reported similar results. For instance, Lavoie and Main (2019) reported that flow increased the feeling of “pull to continue” which led people to lose track of time, increased the amount of time and consequently increased the amount of time they spent on gambling. Deriving from this, we can suggest that the feeling “pull to continue” mediates the relationship between dissociation and time and money spent on gambling (see Figure 5).



*Figure 5. Dissociation mediation model*

Even though some studies showed that problem gamblers experienced higher levels of dissociation than social or non-gamblers, some research also reported that problem gamblers experienced to some, although limited, extent dissociation as well (Diskin & Hodgins, 1999; Jacobs, 1988). The more individuals experience dissociative feelings the more they get pulled to continue gambling activity which results in spending more time and money on gambling.

Taken together, these studies highlight the large, positive association between the severity of GD symptoms and dissociative experiences while engaging in gambling activity. Consequently, dissociation is a considerable factor in the perpetuation and intensification of gambling behaviour. Therefore, digital tasks during online gambling activity targeting interrupting dissociation could decrease the amount of time and money spent and consequently minimise the gambling related harm. Therefore, while designing Responsible Gambling tools, it is crucial to design, develop and implement digital tasks for smart devices (e.g., smartphones and tablets) and websites that interrupt this dissociative state of players to prevent excessive gambling activity.

## **2.5. Responsible Gambling and harm minimisation**

There has been a significant growth and interest in online gambling following technological and internet developments over the last two decades. Therefore, alongside with this increased interest in online gambling, there has been an increasing awareness of the social responsibilities placed on gambling organisations and especially their responsibilities to vulnerable groups and those who are susceptible to develop problem gambling (Griffiths et al., 2012; Gambling Commission 2012; Schellinck & Schrans 2007). Even though the gambling industry has existed for a long time, it is only recently that responsible gambling practices are being developed and implemented. Apart from the rules and regulations that are implemented by the governments where gambling is legal, the role of the gambling industry and companies is very important in communication with the players to protect them by enabling RG supported technologies. In addition to this, the purpose of harm prevention and reduction in

gambling is to keep individuals who already gamble, and individuals who are non-gamblers, from developing problems. Therefore, harm prevention and reduction strategies can target different populations, including individuals with no known risk factors, individuals with one or several risk factors, and problem gamblers (Williams, West, & Simpson, 2012). Blaszczynski et al. (2004) stated that *“responsible gambling strategies should primarily target high-risk gamblers, with the aim of preventing migration to the gambling-related harm”* (p. 310).

The theory of RG is associated with the psychological factors of preventing addiction through various methods and it can be described as the *“policies and practices designed to prevent and reduce potential harms associated with gambling”* (Blaszczynski, Ladouceur & Shaffer, 2004, p.308). RG tools are interventions that were designed to reduce gambling related harm particularly among individuals who are at-risk gambling and potentially enable effective preventive strategy as well. RG strategies strive to impose a duty of care to protect the public from gambling-related adverse consequences by educating individuals about the nature of gambling, encouraging players to wager within affordable limits; and providing adequate information about the game to allow players to make informed decisions about their gambling activity (Blaszczynski et al., 2011). The existing RG strategies as of now include, but not limited to, different strategies such as self-exclusion programmes, behavioural tracking of play patterns, loss and deposit limit setting (both player and corporate), player pre-commitment to deposits, losses, wins, or gambling time, warning messages, restricted game design, gambling education and information, and support services reflecting primary, secondary, and tertiary prevention efforts (Ladouceur, Shaffer, Blaszczynski & Shaffer, 2017).

Since the increasingly advanced technological developments made the gambling products more technologically sophisticated, the same technological innovation can be used to promote responsible gambling and the development of harm-minimisation tools to help gamblers in maintaining self-control and make rational and controlled gambling-related decisions (Harris & Griffiths, 2017). Harm-minimisation tools intend to make gambling

activity safer without decreasing the uptake of gambling per se (Auer & Griffiths, 2013; Griffiths et al., 2009).

However, even though a wide range of harm reduction and prevention initiatives have been developed over the last years, those strategies and programmes are not supported with enough quantitative empirical data and most of them have not been widely implemented and the effectiveness studies are rare (WHO, 2017). Therefore, little research attention has been given to minimising the gambling-related harms through more complex and innovative responsible gambling tools which are empirically supported.

## **2.6. Technology-assisted behaviour change in online gambling**

Technology has always been a part of our lives and over the last decade digital technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), big data, cloud computing, smartphone applications, wearable devices, and many more have transformed each aspect of people's daily lives significantly (Kannan, 2017). Advances in computer science and Information Technology (IT) have enabled a new range of more intelligent, context-aware, continuous, and social online interactions for users.

### ***2.6.1. The adoption of technology in online gambling***

Technology can increase the potential of behaviour change techniques and technological solutions are the heart of online gambling services (Drosatos et al., 2019). Technology offers diverse opportunities to minimise online gambling related harm through the implementation of digital interactions and focused interventions (Paterson, Whitty & Boyer, 2019). Unlike offline forms of gambling and any other addictive behaviours such as alcohol and tobacco, the online modality of gambling provides significant opportunities for real-time monitoring and understanding of players' behaviour, as well as the ability to tailor persuasive messages and interactions (Drosatos et al., 2019). Even small improvements in the effectiveness of communicating these messages may result in significant downstream consequences on gambling related harm (Gainsbury et al., 2018). This opens a whole new avenue for research on the utilisation of digital tasks for online gambling. Therefore,



Information and Communication Technology (ICT) based strategies such as persuasive technologies and digital nudging, and Human Computer Interaction (HCI) research play a substantial role while tackling online problem gambling.

### **2.6.2. Persuasive technologies in online gambling**

One of the defining characteristics in human progress is the fact how humans have integrated technology into their daily life (Potapova, Cetinkaya & Liebcen, 2020). Digital technologies can be utilised to facilitate and improve behaviour change techniques as it offers interactivity and real-time response (Drosatos et al., 2019). Only recently have these technologies emerged that are actively persuasive which primarily aim to change attitudes and behaviours of players in the online gambling field. The study of computers as digital persuasive technologies is called *captology* (Shahrom et al., 2017) (see Figure 6) and it seeks to elicit direct changes in behaviours. The features such as persuasive techniques that make online gambling more attractive for players can be evenly utilised to combat problem online gambling (Drosatos et al., 2019).

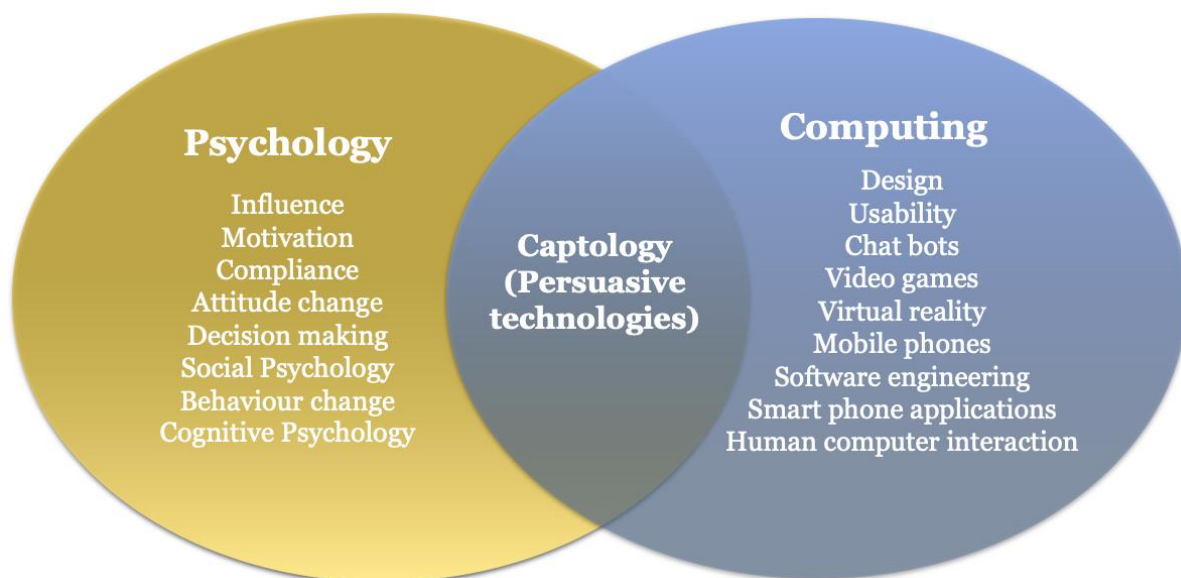


Figure 6. Captology

The online medium of cyberspace offers a unique opportunity to empower classical behaviour change since it provides real-time tasks, interactivity, traceability of usage data, intelligence, personalization, and the ability to be context aware (Drosatos et al., 2019). So far, the literature utilised various strategies to enable responsible gambling as harm reduction techniques such as limit setting, pop-up messages, enforced breaks, peer groups, and self-exclusion.

**Limit settings:** Limit setting involves setting money, time and access limits that may be specific to a single gambling episode or over a period of time (e.g., year) (Ivanova, Magnusson & Carlbring, 2019). Although limit settings are suggested as good responsible gambling strategies for online gambling to help players keep better control of their gambling activity, there are inconsistent results in terms of effectiveness of limit settings in the literature. For instance, Auer, Hopfgartner & Griffiths (2020) reported that the most gambling-intense players spent significantly decreased amounts of money over a one-year period. In another study, 80% of gamblers spent more money than their pre-set monetary limit even though they received a standard monetary limit pop-up (Broda et al., 2008). These results clearly show that there is a need for further research focused on methods of increasing the effectiveness of digital tools used for online problem gambling.

**Pop-up messages:** Pop-up messages, also called dynamic messages, refer to informative messages presented to players on the screen during online gambling activity to prevent excessive gambling (Bjørseth et al., 2021). While some pop-up messages involve descriptive or normative information regarding the players' activity in terms of time and/or monetary expenditure (Tanner et al., 2017), others are utilised to correct players' irrational or distorted beliefs about gambling (e.g., *"Winning is not due to luck. It's random"* or *"The next spin has nothing to do with your previous spin"*) (Bjørseth et al., p.3, 2021).). Furthermore, pop-up messages may include self-appraisal messages as well in which messages are designed to encourage players to focus on their own gambling behaviour (Auer & Griffiths 2015). There is cumulative empirical evidence in the literature suggesting that effectively communicated

information does not consistently correct irrational beliefs or erroneous estimations about the chances of winning (William & Connolly, 2006; Benhsain, Taillefer & Ladouceur, 2004). In a study done by Auer, Malischnig & Griffiths (2014), nine times more players quit their gambling session following receiving a pop-up message after 1000 consecutive gambles than those who did not receive the pop-up message. In another qualitative study, only 25% of the players who were exposed to the pop-up messages reported that pop-up reminders would have a positive effect on their control over gambling in terms of money and time (Schellink & Schrans, 2002). Nevertheless, the question still remains on whether pop-up messages have a substantial effect on gambling activity and help players control their gambling behaviours (Auer, Malischnig & Griffiths, 2014).

**Personalised feedback:** Personalised feedback is an intervention to provide feedback on gambling behaviours (Rodda, 2021). Auer & Griffiths (2014) discussed that providing personalised feedback about the amount of money that gamblers had actually spent may result in cognitive dissonance because of the discrepancy between what gamblers actually spent and what they thought they had spent. According to Ranney et al. (2014) when intervention and feedback are individually tailored based on personal data, they are more likely to be positively received and trusted than general statements.

**Enforced breaks:** Enforced breaks is one of the responsible gambling strategies in which players' dissociation states are disrupted to enhance the likelihood of drawing their attention to time and money they spent (Blaszczynski et al., 2016). While there is no evidence in the literature for the use of enforced breaks during gambling as a way to combat dissociation states of players, there was a significant and positive correlation between dissociation state and cravings to continue play, which supports the theoretical position for the role of dissociation in continuation of gambling within a session (Harris & Griffith, 2017).

**Online self-exclusion:** Online self-exclusion is a well-known harm reduction strategy which involves a request to a gambling operator to prevent the player from accessing specified gambling activities for a specific period (Rodda, 2021). Although there is still little research investigating the effectiveness of online self-exclusion, in a narrative review by Gainsbury

(2014) the results indicate that online self-exclusion programs have positive effects on players such as improving financial problems, reducing their gambling frequency, and increasing the quality of life of players.

### ***2.6.3. Digital nudging in online gambling***

Nudging, a concept within the field of behavioural science, usually takes the form of a subtle and seemingly insignificant change to the decision-making process (Hansen & Jespersen, 2013) and shape judgments through unforced recommendations when decisions take place (Légal, Chappé & Coiffard, 2014). 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). Nudges are very useful when attention and cognitive processes are limited (Camerer et al., 2003) like in dissociation state during online gambling. However, Naiseh et al. (2021) emphasised that although nudge is based on reactive thinking (i.e., automatic response to follow certain behaviour), for behaviours that requires more cognitive involvement a follow-up persuasion may be necessary. Fortunately, software as a medium can be used to implement a behaviour change and prevention strategy (Alrobai et al., 2016). Given these advantages, technology-assisted systems allow rapid content modification and visualisation to achieve the desired nudging effect (Mele et al., 2021).

### ***2.6.4. Human-Computer Interaction in online gambling***

Human-Computer Interaction aims to examine how human beings engage with computational devices and interactive technology to increase technology's usability and uptake (Yampolskiy, 2017; Wohl et al., 2014). The implementation of HCI principles could strengthen the effectiveness of digital tasks (e.g., persuasive technologies and digital nudging) received by players. While these digital tasks can interrupt dissociative state of players and provide "cool down" opportunity which could enable behaviour change, they could also include better layout, use of colours, icons and additional plain language which is appealing to

players, thus they could potentially be more persuasive. Evidence from the literature indicates that HCI principles alone are not sufficient to encourage end-users to comply to a pre-set monetary limit (Wohl et al., 2014), however adding interactive and persuasive techniques to HCI elements for RG tools would be received positively by players (Arden-Close et al., 2022). In their experimental study, Wohl et al. (2014) developed and tested a new monetary-limit tool by using HCI and persuasive system design (PSD) elements and concluded that HCI supported tools were more engaging and facilitated greater adherence to pre-set limits.

### ***2.6.5. Real-time digital tasks for online gambling problem***

Digital technologies allow new methods for behaviour change and prevention strategies. Real time digital tasks offer a considerable opportunity to interact with players during online gambling with appropriate communications, timed and constructed to fit individuals and their circumstances (Shih et al., 2008). Up to now, responsible gambling strategies have provided various measures (e.g., pop-up messages, enforced breaks, limit setting) for the prevention of harm associated with control over gambling features and contents. While these strategies increased the number of pop-up messages developed for online gambling problems, the existing solutions mainly targeted setting up time limits. They are mostly at a basic level and not focused on disrupting the dissociative state of players, therefore there is room for improvement. Moreover, scientific evidence demonstrating the effectiveness of these RG measures to prevent or reduce the gambling-related harm is limited (Drosatos et al., 2019). Therefore, novel strategies are needed urgently to minimise the online gambling related harm. Integrating the digital tasks with appropriate persuasive technologies, digital nudging techniques and cognitive tasks can help to effectively deploy these solutions to reduce the time and money that the problem gamblers spend during gambling activity.

## **2.7. Summary**

Innovative interactive gambling technology and the technological strategies offer opportunities to support players by helping them to control the amount of time and money

they spend during gambling activity (Auer & Griffiths, 2013; Griffiths, 2012; Griffiths, Wood, & Parke, 2009). These strategies are called responsible gambling and have been in use for over a decade now. While some studies have shown some effectiveness of these strategies up to a certain point, these applications are limited in their reach due to their inability to intervene at precise times in which players would benefit (Auer, Malischnig, & Griffiths, 2014). The characteristics that make online gambling more immersive and engaging, might also offer a great potential to combat problem online gambling (Drosatos et al., 2019).

In this thesis, we propose four different digital tasks using persuasive technologies, and digital nudging which could potentially interrupt players' dissociative state during online gambling. It is hypothesised that if a digital task (cognitive, dialogue, informative and standard tasks) is delivered at the right time, right place and in a pleasant way, it might interrupt gamblers' dissociative state and reduce the amount of money and time spent in the long term. It is also hypothesised that cognitive, dialogue, informative and standard tasks might increase the efficacy of persuasion and nudging to promote behaviour change.

# CHAPTER III. RESEARCH METHODOLOGY

## 3.1. Introduction

The central role of dissociation has been studied in the GD literature with both quantitative and qualitative research. Qualitative research demonstrated the subjective experience of dissociation among problem gamblers such as feeling “mentally detached, [where] space and time do not exist” (Rogier et al., p.164, 2020) or wanting to “slip in a bubble bath” (Schüll, p.196, 2012). In a systematic review done by Rogier et al. (2021) where they analysed 20 quantitative research studies, they reported that there is a statistically significant relationship between GD and dissociation with moderate intensity. That means high levels of dissociation seem to exacerbate problem gambling. While high dissociation levels can contribute to increasing problem gambling across all gambling activities, studies have also focused on electronic gambling machines which are considered to induce a dissociative-like experience, because of its ambient sound, coloured lights, and even the rhythm of the game (McCormick et al., 2012; Noseworthy & Finlay, 2009; Finlay et al., 2007). Similarly, since individuals apparently experience intense focus and time disorientation during online gambling, online gambling tools might cause spending more time and money than previously intended. Therefore, effective harm-minimisation strategies must be able to shift players’ attention away from the gambling (Monaghan, 2009). The results from the literature suggest that by briefly interrupting play on Internet gambling sites with a forced break and responsible gambling message, individuals may be able to refocus their attention on their gambling behaviour, which may allow them to assess whether the amount of time and money invested in the activity is appropriate based on their original intentions (McCrickard, Catrambone, Chewar, & Stasko, 2003).

Even though literature emphasised the importance of interrupting dissociation of players during gambling activities, to the knowledge of the researcher there is no empirical studies measuring response times of players to those interruptions with such cognitive tasks

which require more time, and effort; and attention to respond or dialogue task which aims to increase players' awareness on their gambling activity; or informative task where players are nudged about the nature of gambling.

### **3.2. 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, 2016). Therefore, in this study, we developed four digital tasks by using persuasive technology and digital nudge elements with the base of human-computer interaction to interrupt players' dissociation experienced during online gambling. While the first three digital tasks (cognitive, dialogue and informative) are novel, the fourth digital task, which is the standard task, was adapted from "*pop-up messages*" used in the literature.

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 1 second) and then seek for evidence to support their first impression (Wohl et al., 2014; Lindgaard, Fernandes, Dudek, & Brown, 2006). As a result, we designed the digital tasks as minimalist with clear language (e.g., "*play responsibly*") and information (e.g., "*gambling is a psychological, social, and financial problem*") in a way which would appeal to users. 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 for each digital task group: 1<sup>st</sup> interruption was given on the 5<sup>th</sup> minute of online gambling and 2<sup>nd</sup> interruption was given on the 10<sup>th</sup> minute of gambling which lasted 15 minutes in total.



When the participant pressed any button on the right screen the digital task immediately disappeared. The size of the digital tasks is approximately one-eighth that of the full screen (see Figure 7 for the illustration of the experiment from the participant's view). The digital tasks were designed using online diagram software (<https://app.diagrams.net>).

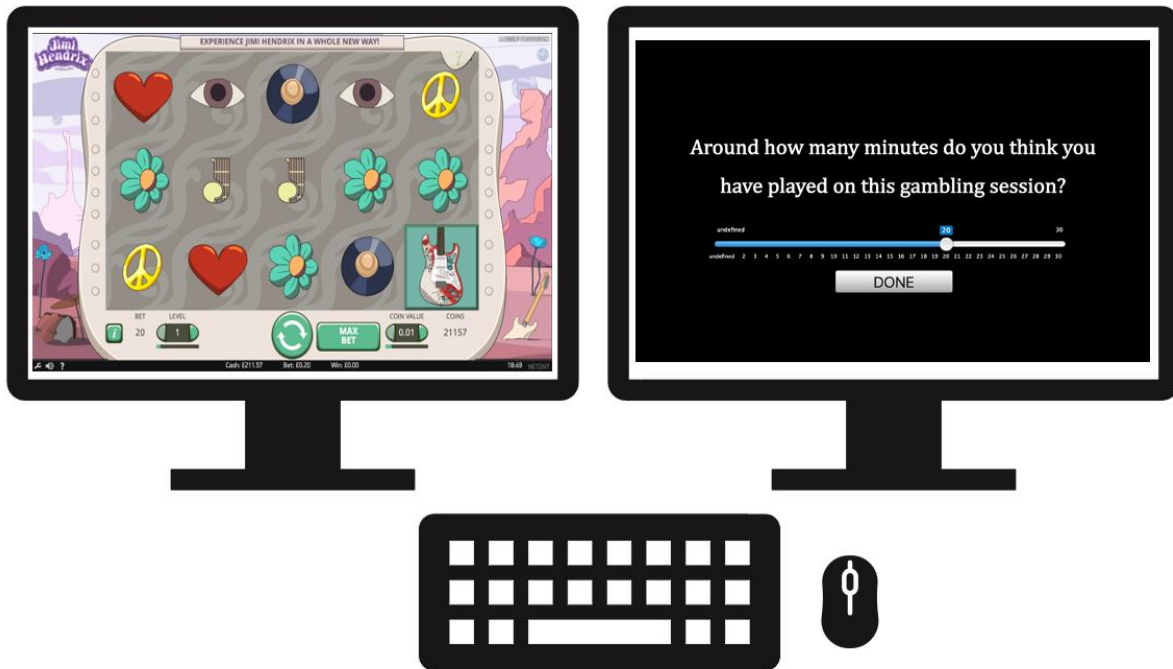


Figure 7. The illustration of the experiment from the participant's view

### 3.2.1. Cognitive tasks

Cognitive digital tasks were designed based on the well-known visual search paradigm which impacted many aspects of science enormously. The paradigm was designed to assess the function of visual attention (Neisser, 1963; Treisman & Gelade, 1980; Wolfe, 1998). Many visual search studies assess the performance by typically measuring response times of participants in a task where it is required to determine whether a target is present or absent. In this study, we designed two different visual search tasks to distract players' attention and shift their focus to a cognitive task which could potentially interrupt their dissociative state. These cognitive tasks involve different shapes and colours where the participants are asked to count the target shapes, sometimes in certain colours (see Figure 8). While doing that, we

applied usability principles where tasks are easy to comprehend and follow, comply with humans' cognitive needs, and are user friendly in terms of design and selection of answers. The participants used only a computer mouse during the experiment to play online gambling on one screen and respond to tasks on another screen.

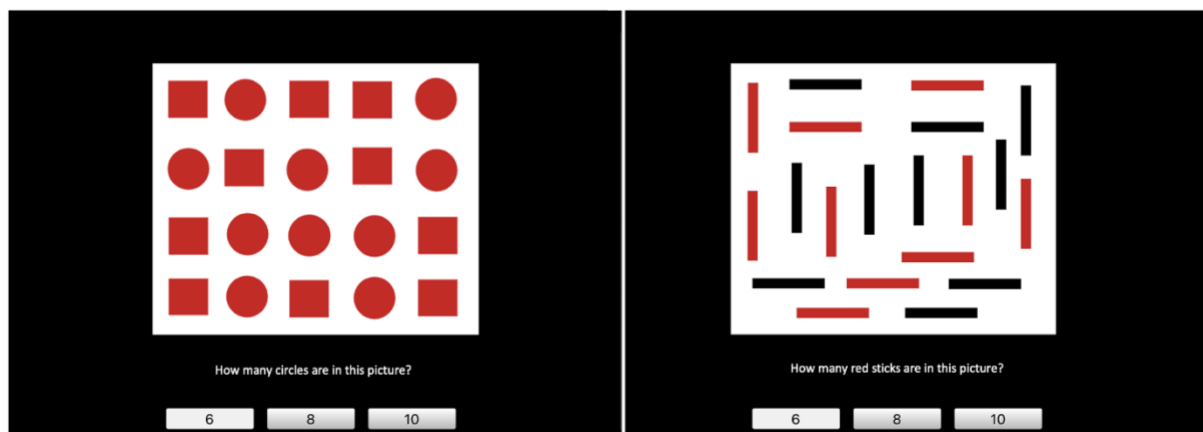


Figure 8. Cognitive tasks

### 3.2.2. Dialogue tasks

Dialogue digital tasks in this context can be considered as self-appraisal feedback as there is information which helps an individual reflect on their own gambling behaviour (Auer & Griffiths, 2015). According to some studies, in comparison to informative messages, self-appraisal interactions had a significantly greater self-reported effect on participants' thoughts, behaviour, and awareness of the amount of time spent gambling (Monaghan & Blaszczynski, 2010). Thus, dialogue digital 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. In this present study, two different dialogue tasks were used as an interruption in which users are presented with information that is adapted to their needs and raise awareness on their gambling activity: "Around how many minutes do you think you have played on this gambling session" and "Around how many credits do you think you have spent on this gambling session?". While designing dialogue tasks, a slider was used to minimise the amount of time and effort while participants responded to the digital task (See Figure 9).

Responding on a slider is a better solution for enabling users to quickly select a value along a subjective range (Colley, Mayer & Henze, 2019) than typing or selecting a choice among multiple options. While the digital tasks intend to interrupt participants' dissociation, responding to those tasks aim to not to disrupt players' enjoyment of the gambling activity.

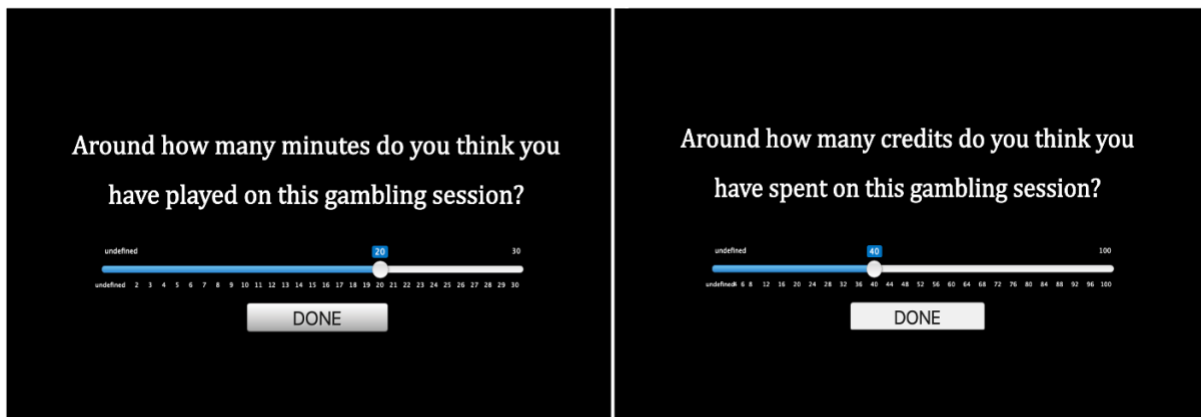


Figure 9. Dialogue tasks

### 3.2.3. Informative tasks

Informative digital tasks aim to correct erroneous cognitions and consequently exert the influence over gambling behaviour. Informative tasks can be considered as cognitive belief messages in which factual information is given to the individual about false gambling beliefs. The information is typically presented in the form of an indication of potential risks of specific behaviours (Monaghan & Blaszczynski, 2010). Digital nudges have previously been shown to hold enormous potential to change behaviour (Puroit, Holzer & Barclay, 2020). While designing informative tasks for this study we used digital nudging to ascertain what type of information it is being delivered. Informative tasks for this study involved two different tasks where participants were asked to select either “True” or “False” options for the given information: “Gambling is a psychological, social and financial problem” and “Obsessive gambling leads to various dysfunctions in the human brain” (See Figure 10).



Figure 10. Informative tasks

### 3.2.4. Standard tasks

Standard digital tasks were designed based on pop-up messages that were already available in the literature which used a responsible gambling strategy. While some studies have shown the effect of pop-up messages in terms of RG behaviour (Stewart & Wohl, 2013; Kim et al., 2014; Wohl, Gainsbury, Stewart, & Sztainert, 2013), there is still room for increasing their efficacy. Although previous studies suggest that gamblers do not pay attention to such static responsible gambling messages (Monaghan & Blaszczynski, 2007). In this study, for standard tasks a clear persuasive message on responsible gambling was included. This was accomplished by placing phrases “*Play responsibly*” and “*Pause and think*” in the middle of the screen (See Figure 11).

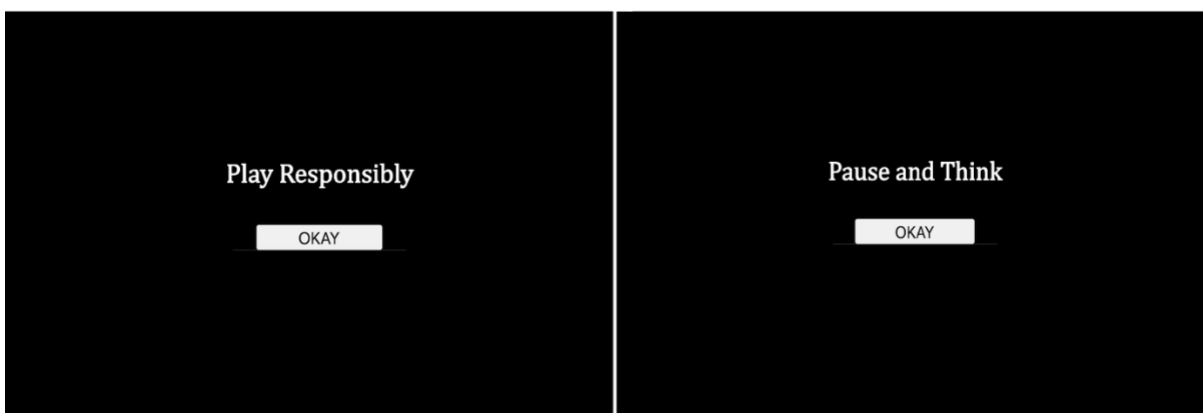


Figure 11. Standard tasks

### **3.3. Methods**

A mixed methods approach, including measurement of response times to digital tasks, dissociation level of participants and Likert scales as a quantitative data collection and open-ended questions as a qualitative data collection, was employed.

#### **3.3.1. Design**

A  $5 \times 2$  crossed, double-blind and randomised design was used with five conditions (5; cognitive, dialogue, informative, standard, and no task), and two response time measurements (2; 1<sup>st</sup> interruption and 2<sup>nd</sup> interruption). Outcome (dependent) variables are level of dissociation, response times and level of acceptability of the digital tasks. The independent variables are the digital tasks and the response times.

#### **3.3.2. Participants**

##### **3.3.2.1. Participants for quantitative study**

Eligibility requirements for participation included being between 18 years old and over, fluent in English, scoring no more than 8 (which is the cut-off for high-risk gambling) on The Problem Gambling Severity Index (PGSI) and providing consent form. Demographic characteristics of participants are explained more in detail in the Results section (see Table 1). Demographic data were collected through Qualtrics online survey and distributed on social media. 1462 participants attended the online survey. Among them 1412 participants were excluded based on three reasons; i. declined to participate; ii. did not meet inclusion criteria; iii. did not complete the survey (see Figure 12). Consequently, we recruited a total of  $N = 50$  participants online from the general population, allocated symmetrically between conditions: cognitive task: 10, dialogue task: 10, informative task: 10, standard task: 10 and no task: 10.

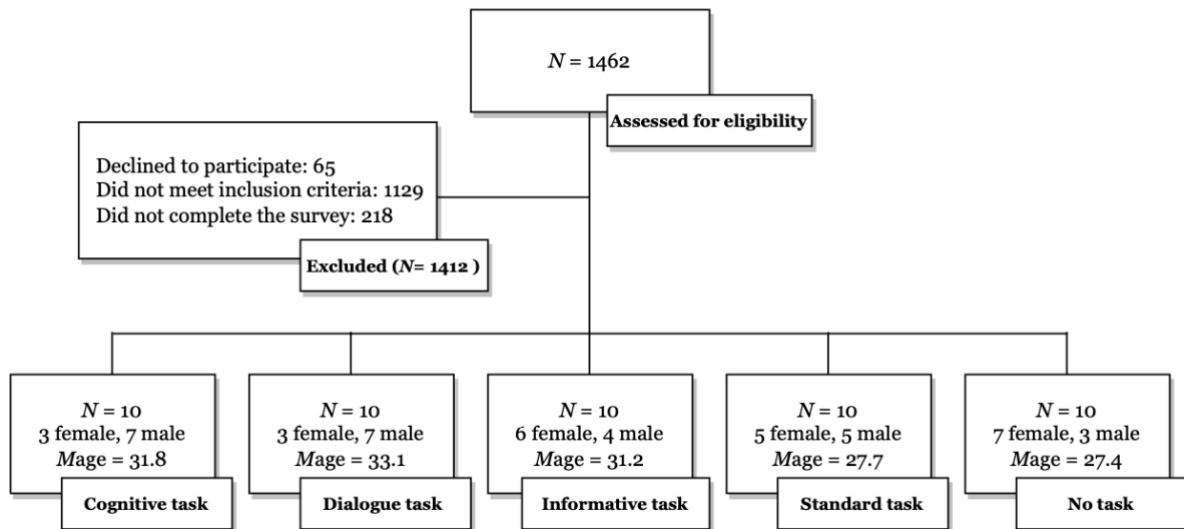


Figure 12. Consort flowchart of participants for quantitative study

### 3.3.2.2. Participants for qualitative study

The qualitative study comprised a sample of 35 participants (16 females, 19 males) aged 25–38 ( $Mage = 31.2$ ,  $SD = 6.99$ ) who responded to an open-ended question on online survey after the experiment (see Figure 13). They were asked to share their perceptions and expectations of digital tasks during online gambling activity and answering to the open-ended questions were optional. All participants attended this survey had previous online gambling experiences. Due to the methods of data collection, qualitative responses were automatically compiled in text form. During coding all responses were anonymised, and participants' responses were assigned to a participant code. Then the data was processed into a word document for analysis to take place.

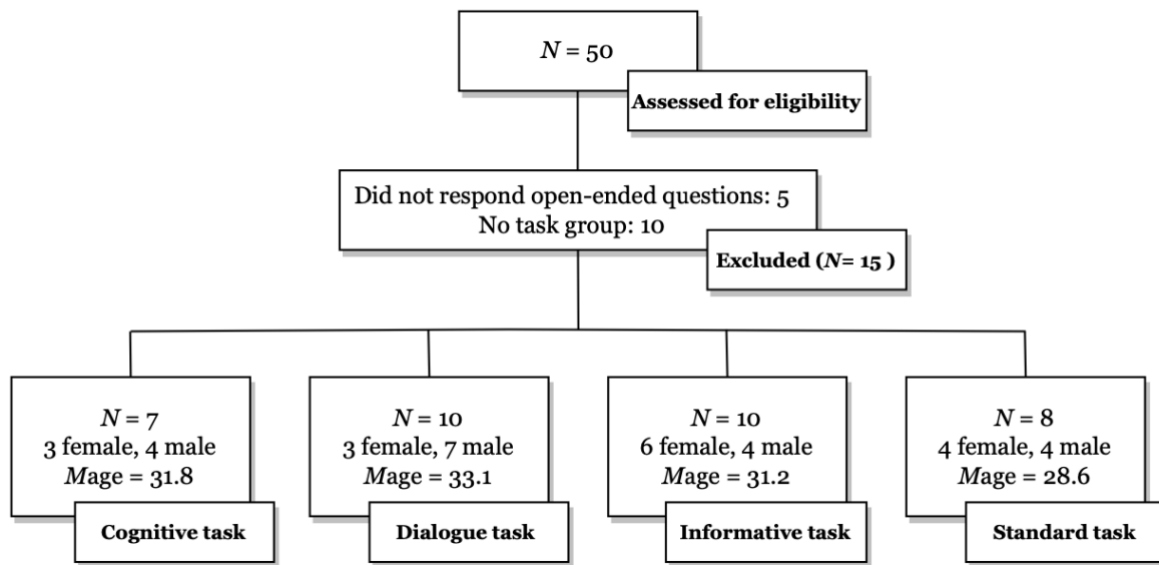


Figure 13. Consort flowchart of participants for qualitative study

### 3.3.3. Materials and measures

All questionnaires and scales are reported in full in Appendix B.

#### 3.3.3.1. Measures for quantitative study

**Demographics questionnaire:** A background questionnaire was administered at Phase 1 of the study. 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 which was used to identify the type of gamblers (Stinchfield, Govoni & Frisch, 2007). The PGSI is divided into two domains of enquiry: gambling behaviours (four questions) and gambling harms (five questions). By convention, participants were classified into gambling subtypes based on their PGSI scores as follows: 0 = non-problem gambler; 1–2 = low-risk gambler, 3–7 = moderate risk gambler, 8 and over = problem gambler. Cronbach's Alpha for this scale is excellent ( $\alpha = 0.93$ ; McCormick, Delfabbro & Denson, 2011). PGSI validity was estimated by computing correlations with concurrent measures of problem

gambling, including the DSM-IV ( $r = .83$ ) and clinical interviews ( $r = .48$ ). In this study, those with a score of below 8 were invited to take part in the experiment. In this study, those with a score of below 8 were invited to take part in the experiment who are low-risk and moderate risk gambler due to ethical considerations (for detailed information please see section 3.4. Ethics).

**Jacob's Dissociation Questionnaire (JDQ):** Jacobs's (1988) five-item dissociation scale (anchored at 0 *not at all* and 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 ( $\alpha = .71$ ; Diskin & Hodgins, 2001).

**Acceptability questionnaire:** Acceptability has been defined as "*the perception among users that a given treatment, service, practice, or innovation is agreeable, palatable, or satisfactory*" (Proctor et al., p.67, 2011). For this study, participant acceptability was assessed through quantitative and qualitative methods by using Likert scale and open-ended questions constructing a new questionnaire by the researcher which was based on similar research in the literature (see Appendix B for the Acceptability Questionnaire). Participants were asked to rate their acceptance of the digital tasks on a 5-point Likert scale for ten questions and provide feedback for the digital task they got during the online gambling session on three open-ended questions.

### **3.3.3.2. Materials for qualitative study**

Participants were asked 3 open questions 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?*.



### 3.3.4. Procedure

#### 3.3.4.1. Procedure for quantitative study

**Phase 1 - Recruitment:** Participants were recruited from the general population through social media platforms (e.g., LinkedIn, Facebook, Instagram), flyers posted in the University's Talbot 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; if they agreed, they continued to complete the survey; if not, they were redirected to the end of the survey. Participants responded to a demographic questionnaire and The Problem Gambling Severity Index (PGSI). Based on their score they were either invited to the experiment or thanked for their participation in the survey and the recruitment process was terminated for those participants (See Figure 14 for the flow of the online survey for the recruitment).

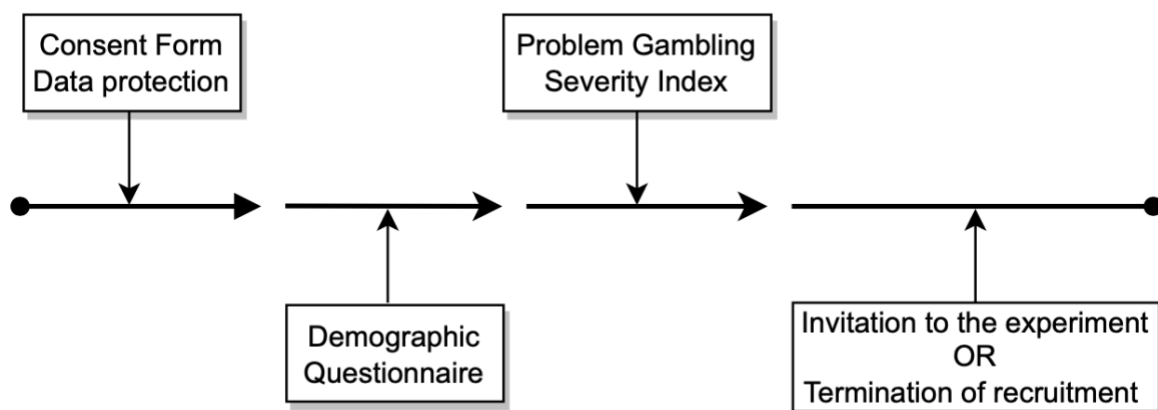


Figure 14. Phase 1 - The recruitment

**Phase 2 - Experiment:** Participants were invited to the psychology lab experiment at Poole House in Talbot Campus, Bournemouth. The experiment was started with the common instructions on a computer monitor in which the gambling session was explained (e.g., duration, type of the gambling). Then, the participants were randomised to one of five different digital tasks: i) cognitive, ii) dialogue, iii) informative, iv) standard tasks and v) no

task. The digital tasks were provided, and response times were measured on Testable (<https://www.testable.org>) which is a web-based software for behavioural measurement and data collection. Randomisation was also achieved by the software automatically. Neither participant nor the researcher knew which digital task the participant received.

While cognitive, dialogue and informative tasks were experimental groups, standard tasks and no task groups were used to explore if the content of those three tasks are effective or if any digital task causes interruption regardless of the content of the digital tasks. While they were gambling online on the computer, they received the digital task and their response times to the tasks were recorded to see how much time they required to notice and respond to the digital tasks (i.e., *response time* refers to the amount of time between when the digital tasks were made available on screen and when the participants responded to them). After the gambling session, they responded to Jacob's Dissociation Scale to measure their dissociation level during gambling and the Acceptability Questionnaire for their acceptance of the tasks (see Figure 15 for the experiment flow). After the experiment, the participants were given a debrief information sheet including links to resources they could use for further information and relevant support services (please see Appendix 3).

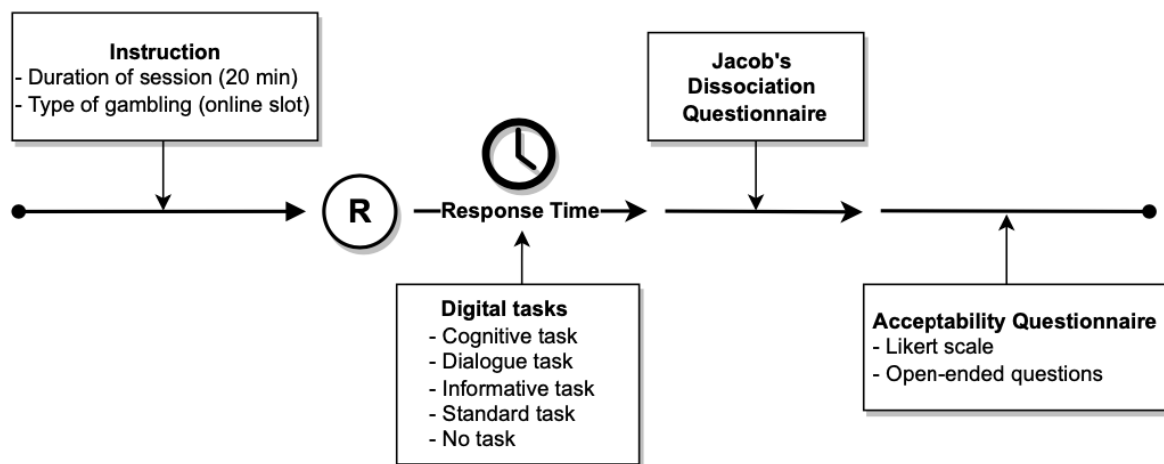


Figure 15. Phase 2 - The experiment (R: Randomisation)

### ***3.3.4.2. Procedure for qualitative study***

Qualitative inquiry and specifically thematic analysis were used to examine the acceptability and experience of participants on digital tasks in this study. Qualitative responses to the open-ended questions in the online survey which was conducted after the experiment were analysed through identifying themes and determining the number of times each theme was mentioned by using Thematic Analysis. Thematic analysis is a method for identifying, analysing, and reporting on thematic patterns within data (Braun & Clarke, 2006). It is one of the most commonly used methods of analysis in qualitative research analysis due to its flexibility (Thomas & Harden, 2008). An inductive thematic analysis of semantic information from responses to open-questions on the experiment was used in order to develop 'bottom-up' themes. An advantage of an inductive approach is that it is open to participants' experiences, rather than seeking views on topics informed by the evidence base. This helps to avoid assumptions and biases in the literature being perpetuated (Braun & Clarke, 2006) and limits the influence of the researcher's pre-existing expectations. Thematic analysis takes place over the course of six phases in accordance with the process set out by Braun and Clarke (2006). The first phase was focused on data familiarisation, including getting a thorough overview of all the data that was collected before starting to analyse individual items. In the second phase initial codes were generated by tagging items of interest that represent the meanings and patterns you saw in the data. In the third phase these initial codes were collated, categorised, and grouped into potential themes with supporting data and organised into a thematic framework. In the fourth phase themes were restructured and arranged into further potential sub-themes. In the fifth phase themes and subthemes were reviewed and revised to ensure each theme has enough data to support them and is distinct. In the six-phase final analysis and description of findings were written to accurately summarise the content of each thematic category and propose empirical findings against these categories.

### **3.4. Ethics**

Participating in this study was voluntary. Due to ethical considerations only participants who scored below 8 on PGSI were recruited 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. In the recruitment phase of the study participants were asked to give their consent for the experiment and data treatment in "Participant Agreement Form" after reading the "Participant Information Sheet". Moreover, participants were provided with a "Participant Debriefing Sheet" (See Appendix B for all forms and sheets) and encouraged to contact relevant support services for free and confidential help if they feel any discomfort during or after the study, or they think they may have any support in terms of their gambling behaviours. All participants were treated in accordance with APA ethical guidelines (American Psychological Association, 2017). Also, the study was conducted in accordance with the principles expressed in the Declaration of Helsinki (World Medical Association, 2013). Moreover, as the research involved human participation, the Research Ethics Code of Practice was followed. Since this research did not involve any aspects above minimal risk, the ethical risk was low (due to ethical considerations only participants who scored below 8 on PGSI were recruited as it is a threshold for at-risk gambling). Ethical approval was reviewed and approved in line with Bournemouth University's Research Ethics Code of Practice without any additional comments on 21<sup>st</sup> of November 2021. Finally, the participants were reimbursed with £10 Amazon vouchers after taking part in the experiment phase of the study.

# CHAPTER IV. RESULTS

## 4.1. Quantitative results

### 4.1.1. Demographic characteristics

The sample consisted of 24 (48%) females and 26 (52%) males (see Figure 17 for gender distributions across the groups) ( $Mage = 30.2$ ,  $SD = 6.03$ ) with a minimum age of 20 and a maximum age of 48. Most participants were white (60%,  $N = 30$ ), have a master's degree (50%,  $N = 25$ ), and most common occupation was students (44%,  $N = 22$ ), and income was between £12,000 and £24,999 (40%,  $N = 20$ ). Participants' PGSI scores' mean was 2.22 with a maximum score of 7 and minimum score of 0 ( $SD = 2.06$ ). Demographic characteristics of participants are explained in Table 1 (Demographic characteristics of participants across groups are given in detail in Appendix A).

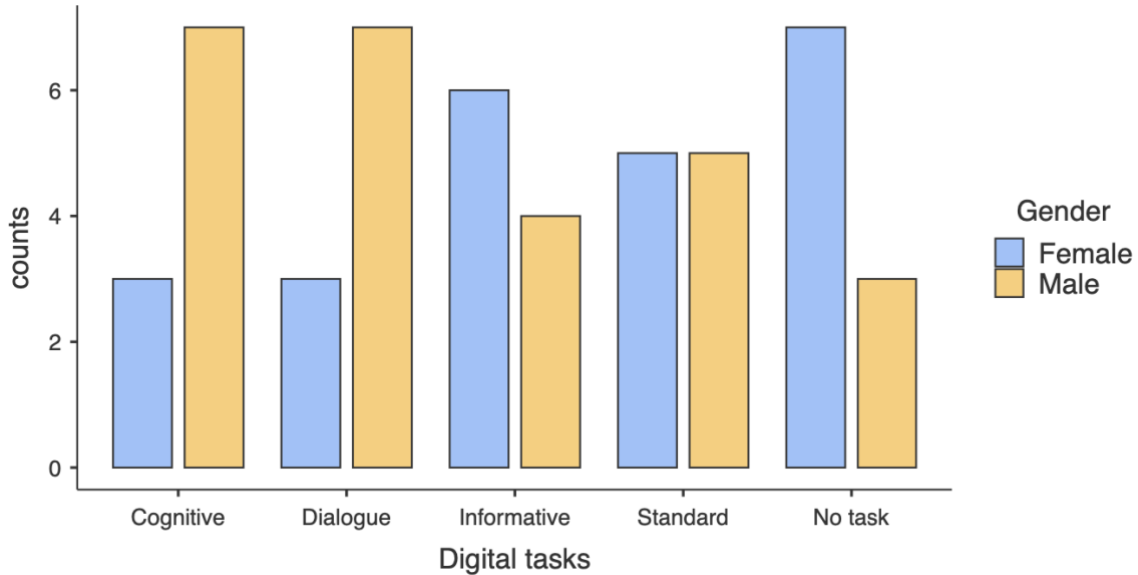


Figure 16. Gender distributions across the digital tasks

**Table 1. Demographic and baseline characteristics of participants (N = 50)**

<b>Characteristics</b>	<b>N (%) or M (SD)</b>
<b>Age (years)</b>	30.2 (6.03)
<b>Gender</b>	
Male	24 (48%)
Female	26 (52%)
<b>Ethnicity</b>	
Asian or Asian British – Indian	3 (6%)
Black or Black British – African	2 (4%)
Black or Black British – Caribbean	2 (4%)
Chinese	2 (4%)
White	30 (60%)
Other Asian background	3 (6%)
Other mixed background	2 (4%)
Other white background	4 (8%)
Any other ethnic background	2 (4%)
<b>Education</b>	
Compulsory school education completed	4 (8%)
Bachelor's degree	14 (28%)
Master's degree	25 (50%)
PhD	7 (14%)
<b>Income</b>	
Less than £11,999	15 (30%)
Between £12,000 and £24,000	20 (40%)
Between £25,000 and £49,000	11 (22%)
Between £50,000 and £79,000	3 (6%)
Between £80,000 and £149,000	1 (2%)
<b>PGSI Mean (+/-SD)</b>	2.22 (2.06)

#### **4.1.2. Response time and the digital tasks during online gambling**

**H1a:** The response times to interruptions among participants who are in “cognitive task” and “dialogue task” groups are lower than participants who are in “informative task” and “standard task” groups.

**H1b:** The response times to 2<sup>nd</sup> interruption among participants who are in “cognitive task” and “dialogue task” groups are lower than participants who are in “informative task” and “standard task” groups. If the participant’s level of dissociation is low, then it is expected that the participant will respond to the interruption faster as they will shift their attention faster. Cognitive tasks and dialogue tasks are expected to interrupt the participants’ dissociation state more strongly compared to informative and standard tasks as they require more time to respond due to the content of the task (e.g., calculation and counting).

A 4 × 2 crossed, double-blind and randomised design with Mixed factorial ANOVA was conducted with four conditions (4; cognitive, dialogue, informative, and standard task) and two response time measurements (2; 1<sup>st</sup> interruption and 2<sup>nd</sup> 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 digital task, therefore their response times were not measured.

The independent variables were the digital tasks (between-subjects factor) and interruptions (1<sup>st</sup> and 2<sup>nd</sup> interruptions; within-subjects factor). Each digital task had two response time measurements measured for two interruptions (5<sup>th</sup> and 10<sup>th</sup> minute). Therefore, participant’s response time to interruptions of the digital tasks were measured in milliseconds.

Finally, the response times of participants ( $N = 4 \times 10$ ) to two different interruptions of the digital tasks (cognitive, dialogue, informative, and standard tasks) were measured. Normality checks and Levene’s test were carried out and the 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).

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

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

The analysis revealed that there was a significant main effect of interruptions (1<sup>st</sup> interruption and 2<sup>nd</sup> interruption)  $F(1,36) = 6.52, p = .015$  (See Table 2 for descriptive of interruptions across digital tasks). Moreover, there was a significant interaction between the interruptions and the digital tasks  $F(3, 36) = 4.54, p = .008$  (see Figure 17). 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% ( $\eta^2 p = 0.13$ ).



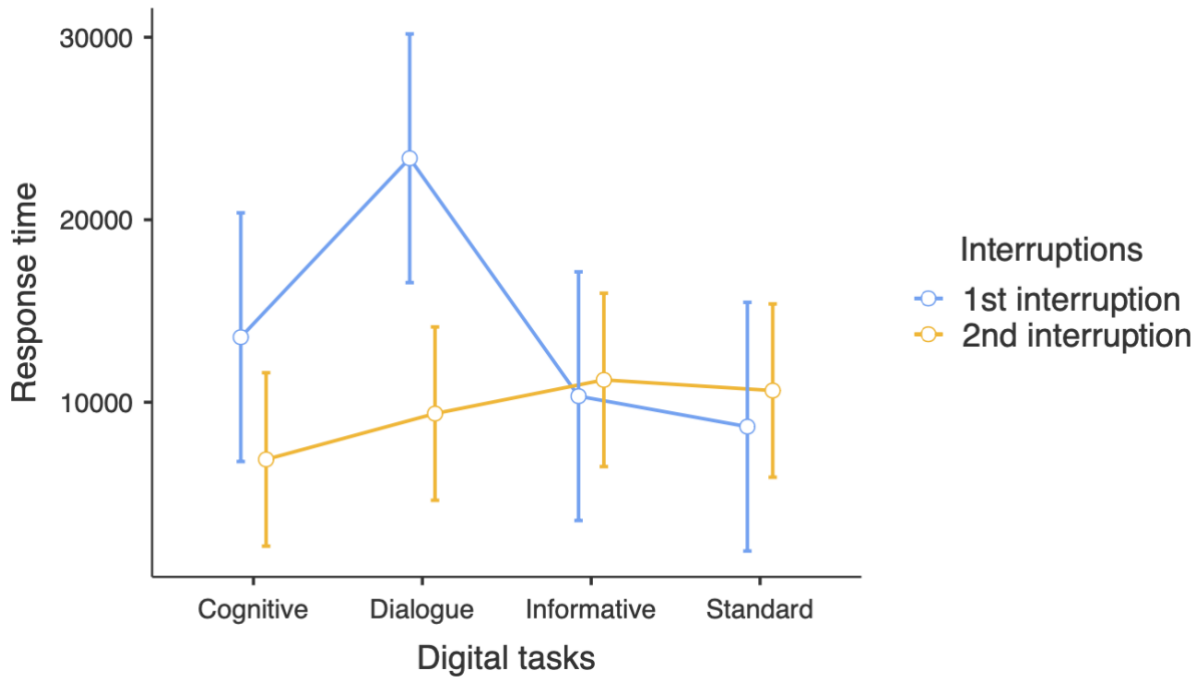


Figure 17. Response times to interruptions across digital tasks (measurements in milliseconds)

Figure 18 represents the difference between the mean of two interruptions for the digital tasks. The participants spent more time while responding to the 1<sup>st</sup> interruption ( $M=13982$ ,  $SD=11726$ ) compared to the 2<sup>nd</sup> interruption ( $M=9527$ ,  $SD=7316$ ). However, the only significant difference between the 1<sup>st</sup> interruption and 2<sup>nd</sup> interruption was for the dialogue task  $F(1,36) = 6.52$ ,  $p = .006$ . Therefore, it can be concluded that the dialogue task interrupted the participants' dissociation after the 1<sup>st</sup> interruption and distracted them, therefore they were faster to respond to the 2<sup>nd</sup> interruption compared to other digital tasks. It can be assumed 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.

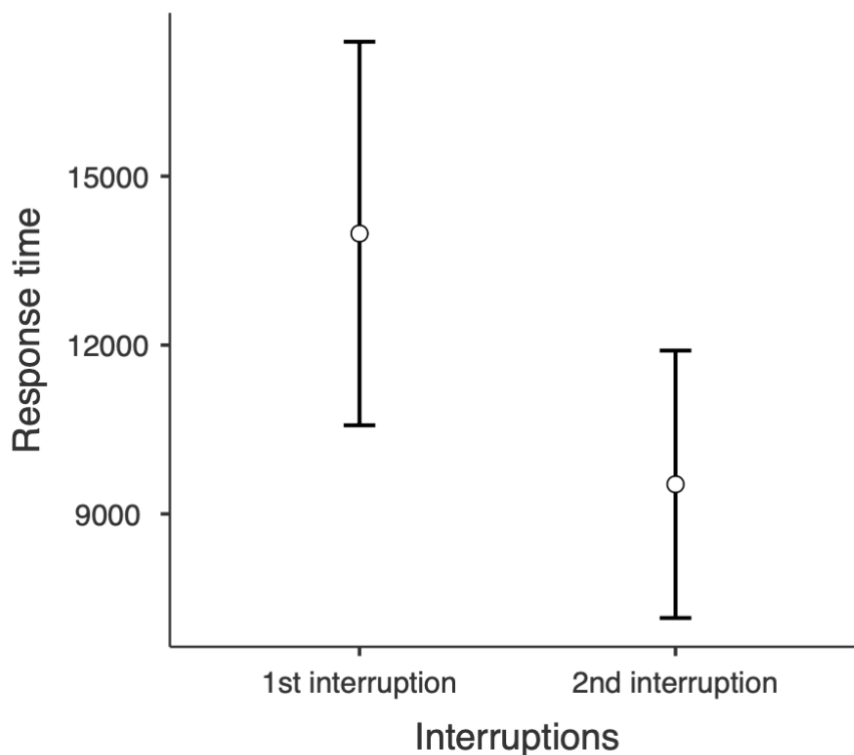


Figure 18. Response times to interruptions

#### 4.1.3. Dissociation and the digital tasks during online gambling

The following hypotheses were formulated for dissociation and digital tasks:

**H2a:** The level of dissociation is lower among participants who are in experimental groups (cognitive, dialogue, informative, and standard tasks) than participants who are in the control group (no task).

**H2b:** The level of dissociation is lower among participants who are in the “cognitive task” and “dialogue task” groups than participants who are in “informative task” and “standard task” groups.

Shapiro-Wilk test was performed 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 digital tasks on dissociation level of participants for cognitive, dialogue, informative, and standard tasks, and no task as a control group during online gambling.

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

Digital tasks	N	Mean	SD	95% Confidence interval	
				Lower	Upper
<b>Cognitive</b>	10	1.30	0.823	-0.980	3.58
<b>Dialogue</b>	10	6.60	2.37	4.320	8.88
<b>Informative</b>	10	9.70	4.42	7.420	11.98
<b>Standard</b>	10	11.70	4.52	9.420	13.98
<b>No task</b>	10	11.70	4.22	9.420	13.98

There was a significant effect of 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 ( $M = 6.60, SD = 2.37$ ),  $t = -3.31, p = .015$ ; cognitive and informative ( $M = 9.70, SD = 4.42$ ),  $t = -5.25, p < .001$ ; cognitive and standard digital tasks ( $M = 11.70, SD = 4.52$ ),  $t = -6.50, p < .001$ ; cognitive and no task ( $M = 11.70, SD = 4.22$ ),  $t = -6.50, p < .001$  (see Figure 19). Therefore, those results demonstrate that participants in the cognitive task group experienced less dissociation compared to the other digital tasks. In other words, cognitive tasks interrupted the dissociation of participants more strongly than the other digital tasks. It can be assumed that since the cognitive tasks require more attention for the given task (e.g., visual search), the thinking process might have distracted the participants more than the other digital tasks which require less attention.

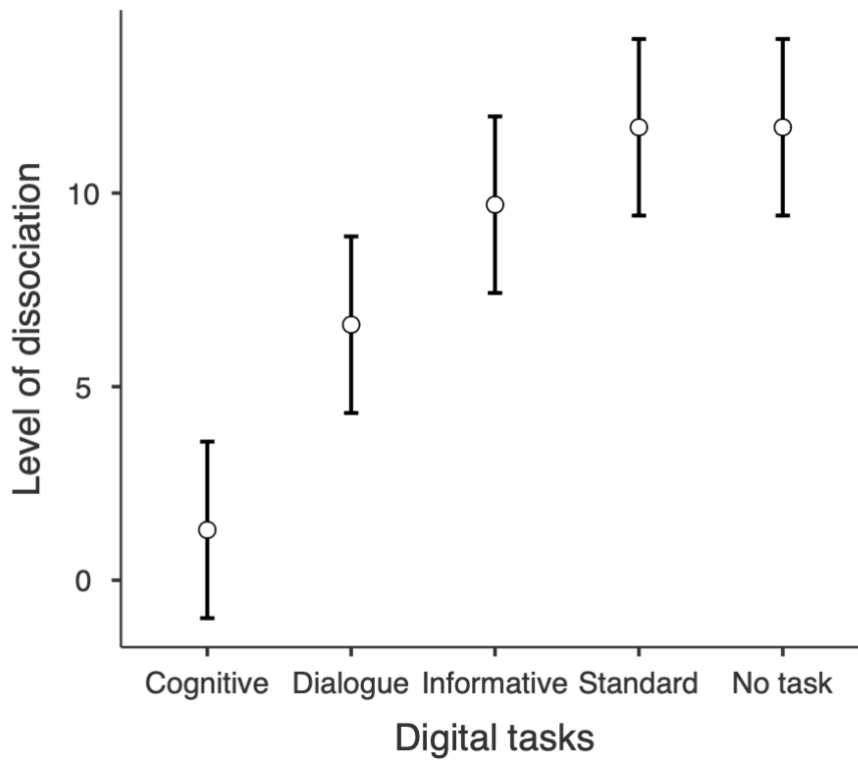


Figure 19. Level of dissociation level across groups

#### 4.1.4. Acceptability of the digital tasks during online gambling

The following hypotheses were formulated for acceptability of digital tasks:

**H3:** The level of acceptability is higher among participants who are in “cognitive task” and “dialogue task” groups than participants who are in “informative task” and “standard task” groups.

Shapiro-Wilk test was performed 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 digital tasks by players during online gambling for cognitive, dialogue, informative, and standard tasks.

**Table 4. Descriptive for the level of acceptability across the digital tasks**

Digital tasks	N	Mean	SD	95% Confidence interval	
				Lower	Upper
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

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 ( $M = 29.6, SD = 2.37$ ),  $t = -3.04, p = .022$ ; cognitive and standard digital tasks ( $M = 38, SD = 3.86$ ),  $t = -8.70, p < .001$ . However, there was no significant difference between cognitive and dialogue tasks ( $M = 28.8, SD = 2.37$ ),  $t = -2.50, p = 0.07$  (see Figure 20). Therefore, those results demonstrate that while the players accepted the cognitive tasks the most, the standard tasks were accepted the least by players. In other words, this analysis revealed that participants who received the cognitive tasks like it more compared to those who received the dialogue, informative and standard tasks.

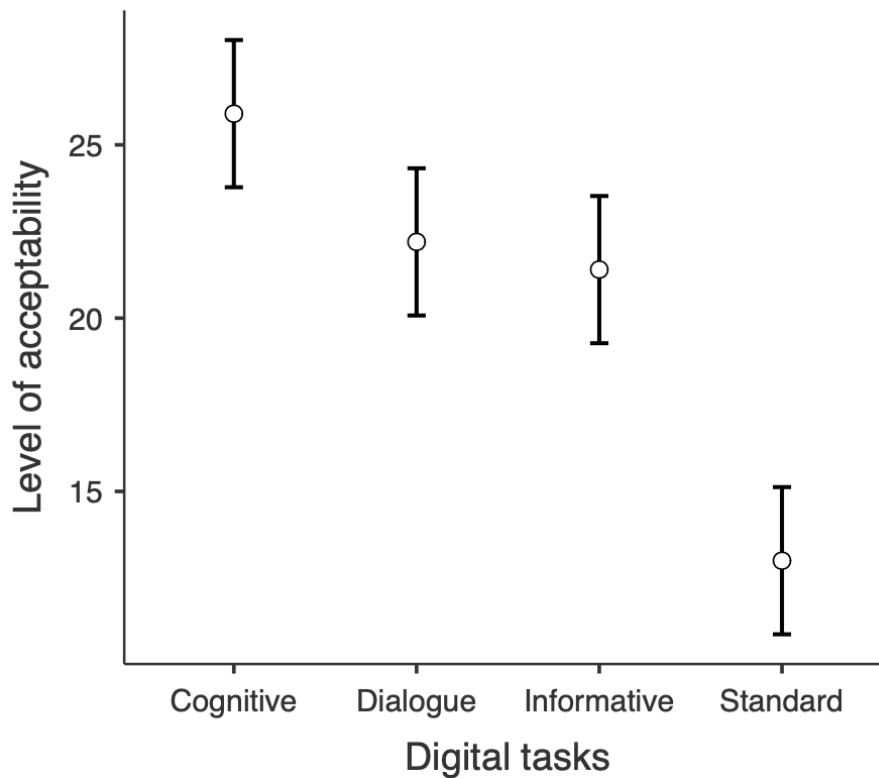


Figure 20. Level of acceptability level across groups

## 4.2. Qualitative results

### 4.2.1. Thematic analysis

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'. Thematic analysis of the data revealed five distinct main themes and eighteen sub-themes specific to the research question:

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

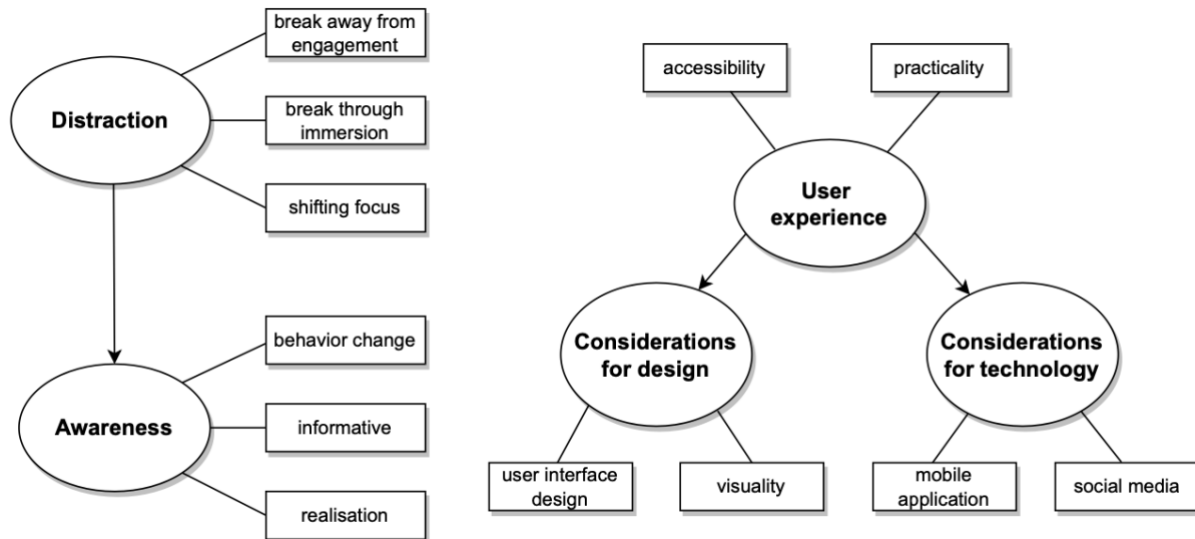


Figure 21. Thematic map for perception and expectations of participants for digital tasks

Figure 21 demonstrates the thematic map of 5 themes and 12 sub-themes which emerged from the data. The big circles represent the themes, while the small rectangles indicate the sub-themes.

**Theme 1 - Distraction:** The focal point of this theme is centred on interruption of dissociation of participants. Three sub-themes emerged from this theme: break away from engagement, break through immersion and shifting focus. The majority of participants gave feedback on how the digital tasks they received during online gambling distracted their focus on gambling and shifted their attention to another task. Particularly participants in “cognitive task” and “dialogue task” groups commented on how the digital tasks interfered with their immersion. Based on the participants’ experiences during online gambling it can be concluded that the digital tasks managed to interrupt the dissociation state of participants as originally intended.

*Break away from engagement:* Participants reported that the interruption they received made them stop gambling and disengaged from gambling. One participant stated that “It broke my engagement from gambling as I had to spend time for some other thing” (P2, informative task).

*Break through immersion:* Participants described their feeling during gambling as they were so immersed and lost in gambling, the digital task broke up this state and took them out of gambling for a while and gave them control about their behaviours. One participant said “I liked how it distracted me from gambling. I felt so immersed in gambling and the digital task made me stop for a while” (P13, cognitive task). Another participant stated that “I really feel that the interactions gave me more control over my gambling. It sorts of broke my trance” (P8, cognitive task).

*Shifting focus:* Participants reported that how the digital tasks distracted them from gambling while they were immersed in gambling as they had to count and calculate the shapes in the tasks they received. Participants defined their experiences as “They stopped me and distracted my attention from the gambling screen for a bit during the session which is kind of relaxing” (P26, dialogue task); “It takes your mind out of the game for a second” (P45, dialogue task).

**Theme 2 - Awareness:** This theme discusses how the digital tasks created an awareness of participants. Three sub-themes emerged from this theme: behaviour change, informative, and realisation. Deriving from participants’ comments, the digital tasks are useful tools which can be used as a nudge about players’ gambling behaviour.

*Behaviour change:* Participants expressed that the formation about the negative consequences of online gambling raised awareness and made them change their current behaviour on gambling. One participant stated that “They made me think about my gambling and made me change my behaviour on gambling after checking my credit balance and time” (P26, dialogue task).

*Informative:* Participants found the digital tasks informational and insightful. One participant reported that “Digital tasks were simple and easy to understand, very informative and created awareness even though I knew it already” (P14, informative task).

*Realisation:* Participants felt the digital tasks made them realise about their current gambling. 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); “I found it very insightful, I would not change anything” (P50, standard task).

**Theme 3 - User experience:** The focus of this theme was on user experience of participants on 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 any sort of interruptions during online gambling might be annoying and impact the enjoyment of gambling. Therefore, it is crucial to design digital tasks with a proper duration, content and visuality so that they still let players enjoy gambling activity while still interrupting the dissociation state and minimise the harm on the other one hand.

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

*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:** Many participants identified several requirements for the digital tasks for a better design such as using different colours, shapes, graphic and fonts. Two sub-themes emerged from this theme: user interface and visuality. While some participants found it useful using red sticks for cognitive tasks, many others recommended using different graphics.

*User interface design:* While participants found the digital tasks easy to access and understand and they also suggested several functions regarding interaction and information design. For instance, participants reported that “Possibly using an image as an identifier as

opposed to only colour-based interactions would be a good change, it could be more interesting and may be an interesting distraction” (P1, cognitive task); “I won’t mind if they stayed a bit longer and with a more colourful design” (P6, cognitive task).

*Visuality:* Participants gave suggestions on the visual design of the digital tasks to make them more compelling and identifiable. They comment that “I would make these notifications more engrossing” (P26, standard task); “Liked most - the use of the colour red, which could subtly be saying stop. Easily identifiable prompts i.e., shapes/lines/counting” (P2, cognitive 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: social media and app version.

*Mobile application:* Participants stated that “I would like to have it as an app on my phone instead of the desktop version. Especially while gambling or using Instagram, people would benefit a lot” (P36, informative tasks). “App version can be designed with more complex tasks” (P50, standard task).

*Social media:* Participants suggested that the use of the digital tasks in social media platforms such as Facebook, Instagram, and YouTube would be also beneficial for them because of addictive design of those platforms. One participant stated that “I think we definitely need these interactions during gambling' also gaming and social media. Especially Instagram. I always lose track of time and I need a distraction” (P6, cognitive task).

#### **4.2.2. Summary of the thematic analysis results**

Overall finding from the qualitative data is that the digital tasks have a high acceptance level by the participants. The participants emphasised how the digital tasks made them stop gambling and shifted their focus to another task which gave them more control over their gambling behaviour. 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 gambling. However, the participants also highlighted that the digital tasks need to be improved in terms of graphical design for better visibility and design features. Moreover, the participants 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, the participants felt that the digital tasks are useful tools to shift players' attention for more responsible, informed, and conscious usage of gambling tools.

# CHAPTER V. DISCUSSION

## 5.1. Chapter overview

Online gambling provides a unique environment with isolation, lack of interruption, constant, and easy access which can pose specific risks to individuals (Gainsbury et al., 2020). People who play gambling might experience erroneous perceptions of their immediate situation and become dissociated from their immediate actions (Griffiths, Wood, J. Parke, & A. Parke, 2006; Jacobs, 1988). Lavoie & Main (2019) stated that the flow state that the players experienced during online gambling increased the feeling of “pull to continue” which led them to lose track of time and money, and consequently increased the amount of time and money they spent on gambling. That means the more individuals experience dissociative feelings (e.g., flow state) the more they get pulled to continue gambling activity which results in spending more time and money on gambling. In the meantime, the increased availability of online gambling platforms also changed the way of constructing online gambling related harm reduction interventions. For instance, interactive and persuasive techniques could be designed to nudge players towards their online gambling behaviour through digital tasks and technology can increase the potential of behaviour change techniques. The digital tasks might serve as an interference to interrupt intense focus of players and increase awareness of the here and now to allow them to make more informed and conscious usage of gambling tools. Therefore, this study aimed to combine knowledge from the psychological literature on online gambling and knowledge accrued from the HCI discipline to develop and test novel digital tasks to interrupt players’ dissociation during online gambling.

## 5.2. Summary and interpretation of findings

In this study, we aimed to investigate the effectiveness of various digital tasks in interrupting the dissociation of players during online gambling. For this reason, we measured the response times of participants to interruptions during gambling and we measured their level of disassociation and acceptability of the digital tasks after the gambling session.

Therefore, we hypothesized that the response times to interruptions among participants who are in “cognitive task” and “dialogue task” groups are lower than participants who are in “informative task” and “standard task” groups due to the complexity of cognitive and dialogue tasks. More specifically we expected that the response times to 2<sup>nd</sup> interruption among participants who are in “cognitive task” and “dialogue task” groups are lower than participants who are in “informative task” and “standard task” groups. Along with this we hypothesised that the level of dissociation is lower among participants who are in experimental groups (cognitive, dialogue, informative and standard tasks) than participants who are in the control group (no task). We particularly expected to see that the level of dissociation is lower among participants who are in the “cognitive task” and “dialogue task” groups than participants who are in “informative task” and “standard task” groups. Finally, we hypothesised that the level of acceptability is higher among participants who are in “cognitive task” and “dialogue task” groups than participants who are in “informative task” and “standard task” groups.

The quantitative analysis revealed that although there was not a significant interaction between the interruptions and the digital tasks, the participants responded to 2<sup>nd</sup> interruption significantly faster compared to 1<sup>st</sup> interruption. More specifically, participants in the dialogue task group responded to the 2<sup>nd</sup> interruption significantly faster than participants in other digital task groups. More interestingly, there was a significant difference between the 1<sup>st</sup> and 2<sup>nd</sup> interruption in terms of response times for participants in the dialogue task group. It might be because the dialogue task requires a thinking process where participants need to find out how much time and money they spend. This process where participants need to think about their gambling behaviour might have potentially created realisation about the time and money they spent. Therefore, the participants might have chosen to be careful about their gambling as they were informed about the how much time and money they spent. That means 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 to the 2<sup>nd</sup> interruption faster.

Overall, the quantitative results clearly show that the 1<sup>st</sup> interruption distracted participants' focus on online gambling and interrupted their dissociation state, therefore they responded to the 2<sup>nd</sup> interruption faster which enabled them to shift their focus from gambling to another task. This result is 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 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 informative, standard and no task groups. This indicates that cognitive and dialogue tasks were more effective in disrupting participants' focus and interrupting dissociation compared to other groups. This might be because both cognitive and dialogue tasks are time confusing and demanding tasks due to their context (e.g., calculating, counting, checking time and balance). Moreover, both digital tasks, cognitive and dialogue tasks, were accepted the most by participants according to the results from the Acceptability Questionnaire. In addition, the data from the qualitative study support this hypothesis.

The qualitative results identified five themes and identified 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 dissociation state and create awareness about their gambling activity, 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.

Taken altogether, this study shows that cognitive and dialogue tasks 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 and qualitative results.

### **5.3. Limitations and strengths**

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. First, novel digital tasks were designed and developed which relied on the evidence-based techniques from psychology and HCI disciplines. Second, this is the first study measuring “response times” to tasks/messages during online gambling which provides empirical data. Third, using mixed methods for methodology and analysis strengthened the reliability of the results as qualitative results supported the quantitative results. Lastly, presence of the standard tasks and no task groups as control groups allowed us to distinguish specific effects of digital 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 is effective.

We acknowledge several limitations of the present study as well, which imply directions for future research. First, due to the lab experiments the ecological validity of this study is low. Second, individuals whose scores were below the threshold 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. Third, only individuals over 18 years old were recruited. Conducting this experiment on children and adolescents would contribute valuable results to the literature. Lastly, this study includes a small sample per group which makes it difficult to identify statistically significant differences and generalise the results to the wider population.

Despite these limitations, the findings show that digital tasks are indeed effective to interrupt the dissociative state of players during online gambling compared to pop-up messages used in the literature, particularly cognitive tasks, and dialogue tasks.

#### **5.4. Implications for design and RG practices**

There are several theoretical and practical implications of this study. There is an exciting potential for technology (software such as smartphone applications and websites) to

be incorporated into online settings to reduce gambling harm, however, this is another area largely lacking from the literature in terms of novelty. Although technology-based approaches to address gambling harm are relatively new, there is extensive research in the literature on responsible gambling tools. The existing literature mainly focused on pop-up messages as an interruption, the effectiveness of it is still a matter of debate and there is not enough empirical evidence. In addition to existing knowledge about pop-up message tools (Ladouceur et al., 2012; Monaghan & Blaszczynski, 2007; Stewart & Wohl, 2013; Wohl et al., 2013), we were able to suggest 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, we were able to determine the 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 might 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 their 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.

In fact, as part of this research, another project has been completed to analyse, design, and develop a prototype solution which can act as a proof of concept for the interruption of problematic states of dissociation during mobile phone use. A final year project student in Software Engineering course at Bournemouth University has successfully developed a mobile application to set up, interrupt and monitor mobile phone usage (Lyons et al., 2022). In that project, research was conducted about the digital addiction in reference to the problem domain and prevention techniques. Similar applications from the Android marketplace were



analysed and involved in the decisions made during the requirements gathering and design process. A mobile application has been designed and developed for an android device which incorporates the prior research and provides features relevant to the prevention of the problem area. An evaluation has been made through useful and constructive feedback received from the user testing. The prototype allows to set up interruption time period and to select the applications to monitor. It is developed for not only online gambling yet but for general use, however gambling applications can easily be selected from the applications list in the setup menu.

Results from this study also contribute to the knowledge in the fields of Computing, Psychology (Cyberpsychology), Behavioural Addiction, Digital Resilience, and Human Computer Interaction. It might provide gambling operators advice on how to design interactive websites to facilitate responsible gambling and this may lead to a policy change.

### **5.5. Future research directions**

Results from this study lay important groundwork for future studies. In this study we aimed to develop and design digital tasks to interrupt players' dissociation state during online gambling by using HCI principles. HCI principles aim to facilitate the creation of interactive computer systems aimed at changing people's attitudes and behaviours (Lockton et al., 2010). Based on qualitative results, future research could use fundamental HCI principles that take more aesthetic visuality and better design features into consideration. Moreover, replicating this experiment 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.

### **5.6. Conclusion**

ICT-based strategies can empower and encourage targeted groups to make positive behaviour changes. It is therefore critical to understand how gambling harm minimisation can

support people in an online environment (Paterson, Whitty & Boyer, 2020). This study is meant to shed light on the effectiveness of various digital tasks which are aimed to interrupt dissociation of players during online gambling and support behavioural awareness and behavioural change through persuasive technologies and digital nudging. Integrating the digital tasks with appropriate behaviour change strategies and techniques with contributions from psychology and computing disciplines can enable more responsible gambling. In conclusion, we believe this study will stimulate discussions in the gambling and software industries to design and develop novel digital tasks for more responsible gambling.

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# Appendix A

## Additional tables

### i. 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)
<b>Age Mean (+/-SD)</b>	31.8 (6.89)	33.1 (6.33)	31.2 (6.61)	27.7 (5.01)	27.4 (3.53)
<b>Gender</b>					
Female	3	3	6	5	7
Male	7	7	4	5	3
<b>Ethnicity</b>					
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
<b>Education</b>					
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
<b>Employment</b>					
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
<b>Income</b>					
Less than £11,999					
Between £12,000 and £24,000	3	1	3	3	5
Between £25,000 and £49,000	4	5	3	6	2
Between £50,000 and £79,000	2	3	3	1	2
Between £80,000 and £149,000	1	1	1	0	0
More than £150,000	0	0	0	0	1
	0	0	0	0	0
<b>PGSI Mean (+/-SD)</b>	2.20 (2.39)	2.20 (2.3)	2.4 (2.32)	1.3 (2.26)	2.2 (2.1)

**ii. Qualitative data**

<b>Themes</b>	<b>Subthemes</b>	<b>Quotes</b>
<b>Distraction</b>	Break away from engagement	<p>“It broke my engagement from gambling as I had to spend time for some other thing”</p> <p>“It broke up the gambling to look at something different.”</p> <p>“They take you out of the game for a second and make you think about how much time or money you have spent.”</p> <p>“It takes your mind out the game for a second.”</p>
	Break through immersion	<p>“I really feel that the interactions gave me more control over my gambling. It sorts of broke my trance”.</p> <p>“I liked how it distracted me from playing. I felt so immersed in playing and the interaction made me stop for a while. Some apps have time limit, but I can easily ignore them by swiping. But here I had to think and calculate, also I had to be careful while calculating. The colours got me confused and I had to count twice.”</p> <p>“They helped me to break away to focus on something else in case I was deeply invested in gambling and could be losing myself to the devilish charm that gambling has on those with an addictive personality.”</p> <p>“I think these kinds of interactions are very useful and necessary even. We need to be distracted and get out of that focused state during gambling or gaming.”</p> <p>“They provided me a break from the gambling "trance".</p>
	Shifting focus	<p>“They stopped me and distracted my attention from the gambling screen for a bit during the session which is kind of relaxing”.</p> <p>“It takes your mind out of the game for a second”.</p> <p>“Most – they made me check my balance/coin and brought me back into the room. Least – they frustrated me because I was focused on the gambling.”</p> <p>“How open ended they were, and how it made you think.”</p>
<b>Awareness</b>	Behaviour change	<p>“They made me think about my playing and made me change my behaviour on playing gambling after checking my credit balance and time”.</p> <p>“It made me think about my playing”.</p>

		<p>“Simple easy to understand, gives information kind of reminded actually and create awareness even though we know it already”.</p>
	Informative	<p>“Digital tasks were simple and easy to understand, very informative and created awareness even though I knew it already”.</p> <p>“They were informative”.</p> <p>“It was a bit distractive during the game, but it was also a bit enlightening about what I am doing right now”.</p> <p>“When I was losing money from my big win, it reminded me to play cautiously. So, I liked that it reminded me not to lose the money. Gambling about taking risk, if I have to be careful or someone reminds me to be safe, it is not fun at all. Interactions can be more descriptive, like why should I think and play?”.</p>
	Realisation	<p>“Some apps have a time limit, but I can easily ignore them by swiping. but here I had to think and realise how much money and time I spent while playing”.</p> <p>“I found it very insightful, would not change anything”.</p> <p>“For a minute I got lost in gambling, I think. When I saw the interaction, I realised my money was less. I had a chance to check my credits. I think calculating the circles and sticks took some time and it was useful”.</p> <p>“Made me gain awareness of my gambling money and time”.</p> <p>“Clear. Until I get the first interaction, I didn’t realise the time. I had to go back and check. I was lost completely. I like how they gave feedback about my gambling. If it was a real gambling it would have been very useful for me if I am losing or winning’ so I could change my behaviour”.</p> <p>“Some apps have a time limit, but I can easily ignore them by swiping. but here I had to think and realise how much money and time I spent while playing”.</p> <p>“It was good to check my balance and time”.</p> <p>“Pause and think” interaction didn't make me think about how much I gamble, it made me think about the game and patterns. I thought that I’m playing wrong”.</p>
<b>User experience</b>	Accessibility	<p>“They are accessible already but could be more featured”.</p> <p>“I found the slider very ergonomic; it was easy to answer”.</p> <p>“I think the messages very easy to understand for anyone”.</p>
	Practicality	<p>“It was easy to read them as they appear on the screen in big puntos”.</p>

		<p>“I found the slider very ergonomic; it was easy to answer”.</p> <p>“Different buttons to select an answer was practical for me”.</p> <p>“It was quite simple sentences, easy to read”.</p> <p>“I like that they are clear and short and easy to follow. However, they do not tell anything to me. "Pause and think"- what am I supposed to think? and why a notification tells me what to do. I'm in the middle of an enjoying moment but then I get a mysterious message. I like responsible gambling notification more. Although it is cliché and I know already that I should play responsibly at least it reminds me something (the responsibility that I have).”</p> <p>“They were short and understandable. It was easy to read them as they appear on the screen in big puntos.”</p> <p>“I found it very insightful, would not change anything.”</p>
<b>Considerations for design</b>	User interface design	<p>“Possibly using an image as an identifier as opposed to only colour- based interactions would be a good change, it could be more interesting and may be an interesting distraction”.</p> <p>“I won't mind if they stayed a bit longer and with a more colourful design”.</p>
	Visuality	<p>“I would make these notifications more engrossing”.</p> <p>“Liked most - the use of the colour red, which could subtly be saying stop. Easily identifiable prompts i.e., shapes, lines, counting”.</p> <p>“Music was a bit distractive. I do not know maybe it is a stimulation, but it was too much for me”.</p> <p>“Maybe make them more visual in order to prioritise their attention. More colourful, better design. More content More complex tasks. Longer duration for interactions I won't mind if they stayed a bit longer and with a more colourful design.”</p> <p>“Font of the interaction. More interesting interactions, more words with information. More visual”.</p> <p>“Interactions with some statistics”.</p>
<b>Considerations for technology</b>	Mobile application	<p>“I would like to have it as an app on my phone instead of the desktop version. Especially while gambling or using Instagram, people would benefit a lot”.</p> <p>“App version can be designed with more complex tasks, complicated would be better so people can think on it more.”.</p>

		<p>“App version would be better. I would like to use it on my phone.”</p> <p>“I would like to have it as an app on my phone instead of desktop version. Especially while gambling or using Instagram people would benefit a lot.”</p>
	<p>Social media</p>	<p>“I think we definitely need these interactions during gambling' also gaming and social media. Especially Instagram. I always lose track of time and I need a distraction”.</p> <p>“I think we definitely need these interactions during gambling' also gaming and social media. Especially Instagram. I always lose track of time and I need a distraction.”</p> <p>“App version should be available on social media as well.”</p>

# Appendix B

## Appendix 1. Participant information sheet



### Participant Information Sheet

#### **The title of the research project**

The use of persuasive technologies for online gambling

#### **Invitation to take part**

You are being invited to take part in a research project conducted by Ceyda Kiyak, a postgraduate researcher in the Department of Computing and Informatics, Faculty of Science and Technology, Bournemouth University, UK. This study is part of her MRes thesis and is supervised by Dr Deniz Çetinkaya, Raian Ali, John McAlaney, and Sarah Hodge. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether you wish to take part.

#### **Who is organising/funding the research?**

The research is funded by Bournemouth University and MT Securetrade Limited.

#### **What is the purpose of the project?**

We will ask you some questions about the notifications you will receive during the online gambling session. We are interested in understanding how notifications affect online

gambling. We are also trying to understand how different types of notifications are acceptable by users. To do so we are comparing different types of notifications to see if they reduce dissociation experienced by users during gambling sessions. The study will take approximately 30 minutes.

### **Why have I been chosen?**

You have been invited to the study because you are familiar with online gambling platforms or you are interested in helping the researcher explore the role of persuasive design techniques on gambling activity, you are over 18 years old, and you are a fluent English Speaker. In total 50 participants will be recruited for this study.

### **Do I have to take part?**

It is up to you to decide whether to take part. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a participant agreement form. We want you to understand what participation involves before you decide on whether to participate.

If you or any family member have an on-going relationship with BU or the research team, e.g., as a member of staff, as student or other service user, your decision on whether to take part (or continue to take part) will not affect this relationship in any way.

### **Can I change my mind about taking part?**

Yes, you can stop participating in study activities at any time and without giving a reason.

### **If I change my mind, what happens to my information?**

After you decide to withdraw from the study, we will not collect any further information from or about you. As regards information we have already collected before this point, your rights to access, change or move that information are limited. This is because we need to manage your information in specific ways in order for the research to be reliable and accurate. Further explanation about this is in the Personal Information section below.

### **What would taking part involve?**

Prior to the study you will be asked to complete a short pre-selection survey about your demographic data (e.g., age, gender) and your online gambling experience (if relevant). If you are selected to take part based on your responses, you will be invited to take part in the study in the lab. In the lab study, you will be asked to gamble for 20 minutes while you tell us about your experience at that moment out loud and fill out several online questionnaires after the gambling session. The questionnaire will also ask about how you like the notifications and your experience during gambling session.

You can choose to skip past questions or decide not to complete the questionnaire once you have started. There are no right or wrong answers. The questionnaire is confidential, and your answers will not be passed on to your parents/carers or doctors. You can complete it on your own or ask for support from a member of the research team if something is not clear to you.

### **Will I be reimbursed for taking part?**

You will be reimbursed £10 Amazon voucher for your time.

### **What are the advantages and possible disadvantages or risks of taking part?**

Whilst there are no immediate benefits to you participating in the project, it is hoped that this work will help us to understand how we can design a smartphone app to minimise online gambling related harm.

### **What type of information will be sought from me and why is the collection of this information relevant for achieving the research project's objectives?**

You will be asked demographic information, your experience during gambling sessions and your gambling habits. The project will provide important information on what kind of notifications are acceptable by users. The research will be published in academic journals and presented at conferences. You will not be identified in anything written about the project. Two types of information will be sought from you. First, your demographic information (e.g., age,



gender, education level), and information about your online gambling experience (if relevant). This information will help the researcher make sure that the recruited participants are fit to the study. Demographic data will be anonymised and held securely separate from the project data. Second, think-aloud data and answers for the questionnaires will be collected after the gambling session in the lab study. The recording will help the research team to capture the information that will be sought from you during the gambling session. Your feedback will help with developing and refining the structure and content of this research from the players' perspective.

### **Will I be recorded, and how will the recorded media be used?**

If you decide to participate, recordings will be made during the gambling session. The audio recordings of your activities made during this research will be used only for analysis and the transcription of the recording(s) for illustration in conference presentations and lectures. No other use will be made of them without your written permission, and no one outside the project will be allowed access to the original recordings. The audio recordings made during this research will be deleted once transcribed and anonymised. The transcription will not include your name or any identifiable information. Instead, each person will be identified by a unique code (i.e., #P345, #P346, etc.).

### **How will my information be managed?**

Bournemouth University (BU) is the organisation with overall responsibility for this study and the Data Controller of your personal information, which means that we are responsible for looking after your information and using it appropriately. Research is a task that we perform in the public interest, as part of our core function as a university.

Undertaking this research study involves collecting and/or generating information about you. We manage research data strictly in accordance with:

- Ethical requirements; and
- Current data protection laws. These control use of information about identifiable individuals, but do not apply to anonymous research data: “anonymous” means that we have either removed or not collected any pieces of data or links to other data which identify a specific person as the subject or source of a research result.

BU’s [Research Participant Privacy Notice](#) sets out more information about how we fulfil our responsibilities as a data controller and about your rights as an individual under the data protection legislation. We ask you to read this Notice so that you can fully understand the basis on which we will process your personal information.

Research data will be used only for the purposes of the study or related uses identified in the Privacy Notice or this Information Sheet. To safeguard your rights in relation to your personal information, we will use the minimum personally identifiable information possible and control access to that data as described below.

#### *Publication*

You will not be able to be identified in any external reports or publications about the research without your specific consent\*. Otherwise, your information will only be included in these materials in an anonymous form, i.e., you will not be identifiable. Research results will be published in academic journals and presented at conferences.

#### *Security and access controls*

BU will hold the information we collect about you in hard copy in a secure location and on a BU, password protected secure network were held electronically.

Personal information which has not been anonymised will be accessed and used only by appropriate, authorised individuals and when this is necessary for the purposes of the

research, or another purpose identified in the Privacy Notice. This may include giving access to BU staff or others responsible for monitoring and/or audit of the study, who need to ensure that the research is complying with applicable regulations.

#### *Sharing your personal information with third parties*

As well as BU staff [and the BU student(s)] working on the research project, we may also need to share personal information in non-anonymised form with MT Securetrade Limited.

#### *Further use of your information*

The information collected about you may be used in an anonymous form to support other research projects in the future and access to it in this form will not be restricted. It will not be possible for you to be identified from this data. To enable this use, anonymised data will be added to BU's online Research [Data Repository](#): this is a central location where data is stored, which is accessible to the public.

#### *Keeping your information if you withdraw from the study*

If you withdraw from active participation in the study, we will keep information which we have already collected from or about you, if this has on-going relevance or value to the study. This may include your personal identifiable information. As explained above, your legal rights to access, change, delete or move this information are limited as we need to manage your information in specific ways in order for the research to be reliable and accurate. However, if you have concerns about how this will affect you personally, you can raise these with the research team when you withdraw from the study.

You can find out more about your rights in relation to your data and how to raise queries or complaints in our Privacy Notice.

### *Retention of research data*

**Project governance documentation**, including copies of signed **participant agreements**: we keep this documentation for a long period after completion of the research, so that we have records of how we conducted the research and who took part. The only personal information in this documentation will be your name and signature, and we will not be able to link this to any anonymised research results.

### Research results:

As described above, during the study we will anonymise the information we have collected about you as an individual. This means that we will not hold your personal information in identifiable form after we have completed the research activities. You can find more specific information about retention periods for personal information in our Privacy Notice.

We keep anonymised research data indefinitely, so that it can be used for another research as described above.

### **Contact for further information**

If you have any questions or would like further information, please contact us.

Ceyda Kiyak: [ckiyak@bournemouth.ac.uk](mailto:ckiyak@bournemouth.ac.uk)

### *In case of complaints*

- Any concerns about the study should be directed to Ceyda Kiyak by email to:  
[ckiyak@bournemouth.ac.uk](mailto:ckiyak@bournemouth.ac.uk)

If your concerns are not answered by Ceyda Kiyak please contact [Professor Tiantian Zhang](#), The Faculty of Science and Technology, Bournemouth University by email to [researchgovernance@bournemouth.ac.uk](mailto:researchgovernance@bournemouth.ac.uk)

### **Finally**

If you decide to take part, you will be given a copy of the information sheet and a signed participant agreement form to keep.

Thank you for considering taking part in this research project.

## Appendix 2. Participant agreement form



Ethics ID number: 39696

Date: 9/11/2021

### Participant Agreement Form

Full title of project: The Use of Persuasive Technologies for Online Gambling

Researcher: Ceyda Kiyak, MRes Postgraduate Researcher,

Department of Computing and Informatics,

Faculty of Science & Technology,

Bournemouth University.

Email: ckiyak@bournemouth.ac.uk

Supervisor: Dr. Deniz Çetinkaya,

Department of Computing and Informatics,

Faculty of Science & Technology.

Email: dcetinkaya@bournemouth.ac.uk

You should only agree to participate in the study if you agree with all of the statements in this table and accept that participating will involve the listed activities

I have read and understood the Participant Information Sheet (Version 1) and have been given access to the BU Research Participant <a href="#">Privacy Notice</a> which sets out how we collect			
and	use	personal	information

<https://www1.bournemouth.ac.uk/about/governance/access-information/data-protection-privacy>).

I have had an opportunity to ask questions.

I understand that my participation is voluntary. I can stop participating in research activities at any time without giving a reason and I am free to decline to answer any particular question(s).

I understand that taking part in the research will include the following activity/activities as part of the research:

- being audio recorded during the project
- my words will be quoted in publications, reports, web pages and other research outputs without using my real name.

I understand that, if I withdraw from the study, I will also be able to withdraw my data from further use in the study **except** where my data has been anonymised (as I cannot be identified) or it will be harmful to the project to have my data removed.

I understand that my data may be used in an anonymised form by the research team to support other research projects in the future, including future publications, reports, or presentations.

	<b>Initial box to agree</b>
<b>I consent to take part in the project on the basis set out above</b>	

**I confirm my agreement to take part in the project on the basis set out above.**

\_\_\_\_\_

\_\_\_\_\_  
Signature

\_\_\_\_\_

\_\_\_\_\_

Name of participant  
(BLOCK CAPITALS)

\_\_\_\_\_

Date  
(dd/mm/yyyy)

\_\_\_\_\_

Name of researcher  
(BLOCK CAPITALS)

\_\_\_\_\_

Date  
(dd/mm/yyyy)

Once a Participant has signed, **please sign 1 copy**, and take 2 photocopies:

- Original kept in the local investigator’s file
- 1 copy to be kept by the participant (including a copy of PI Sheet)



## Appendix 3. Participants debrief sheet



### Participant Debrief Sheet

#### The title of the research project

The use of persuasive technologies for online gambling

#### What was the purpose of the project?

We will ask you some questions about the notifications you will receive during online gambling session. We are interested in understanding how notifications affect online gambling activity.

We are also trying to understand how different types of notifications are acceptable by users.

The study will take approximately 20 minutes.

We understand that your time is valuable and appreciate your participation. You can stop participating in study activities at any time and without giving a reason. After you decide to withdraw from the study, we will not collect any further information from or about you.

If you feel any discomfort during or after the study, or you think you may have any support in terms of your gambling behaviours, we encourage you to contact with relevant support services for free and confidential help.

BeGambleAware: <https://www.begambleaware.org>

GamCare: <https://www.gamcare.org.uk>

#### Contact for further information about the study

If you have any questions or would like further information, please contact:

Researcher: Ceyda Kiyak

ckiyak@bournemouth.ac.uk

## Appendix 4. Questionnaires and scales

### 3.1. Demographic Questionnaire

- a. Please indicate your age
  - .....
  
- b. What gender do you identify as?
  - .....
  
- c. Please indicate the highest level of education you completed (or equivalent).
  - Compulsory school education not completed
  - Compulsory school education completed
  - Bachelor's degree
  - Master's degree
  - PhD
  
- d. Please indicate your current employment status.
  - Full time employment
  - Part time employment
  - Self-employed
  - Unemployed
  - Homemaker
  - Student
  - Retired
  - Other

e. Please choose the option that best represents your ethnicity.

- White
- Gpsy or traveller
- Other white background
- Black or black British Caribbean
- Black or Black British-African
- Other Black Background
- Asian or Asian British – Indian
- Asian or Asian British – Pakistani
- Asian or Asian British – Bangladeshi
- Chinese
- Other Asian background
- Mixed-White and lack Caribbean
- Mixed – White and Black African
- Mixed – White and Asian
- Other mixed background
- Arab
- Any other ethnic background
- Prefer not to say

f. What is your total household income before tax per year?

- Less than £ 11,999
- Between £ 12,000 and 24,999
- Between £ 25,000 and 19999
- Between £ 50,000 and 79,999
- Between £ 80,000 and 149,999
- More than £150,000

### 3.2. Problem Gambling Severity Index (PGSI)

When you think of the past 12 months, how often...

	Never	Sometimes	Most of the time	Almost always	Don't know
Have you bet more than you could really afford to lose?	0	1	2	3	0
Have you needed to gamble with larger amounts of money to get the same feeling of excitement?	0	1	2	3	0
Have you gone back another day to try to win back the money you lost?	0	1	2	3	0
Have you borrowed money or sold anything to get money to gamble?	0	1	2	3	0
Have you felt that you might have a problem with gambling?	0	1	2	3	0
Have you felt people criticized your betting or told you that you had a gambling problem, regardless of whether or not you thought it was true?	0	1	2	3	0

Have you felt guilty about the way you gamble, or what happens when you gamble?      0            1            2            3            0

Has your gambling caused you any health problems, including a feeling of stress or anxiety?      0            1            2            3            0

Has your gambling caused any financial problems for you or your household?      0            1            2            3            0

### 3.2. Jacob's Dissociation Questionnaire (JDQ)

During your gambling session just now, how much did you.....

	Never	Rarely	Occasionally	Frequently	All the time
.....lose track of time?	0	1	2	3	4
....feel like you were a different person?	0	1	2	3	4
.....feel like you were outside of yourself, watching yourself gamble?	0	1	2	3	4
....feel like you were in a trance?	0	1	2	3	4
....experience a memory blackout for things that happened while you were gambling?	0	1	2	3	4

### 3.3. Acceptability Questionnaire

During your gambling session you have received a notification on the right computer screen.

Based on your experience please fill out the questions below.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Overall, I liked the interactions.	1	2	3	4	5
The interaction was clear.	1	2	3	4	5
I feel that the interaction gave me more control over my gambling.	1	2	3	4	5
I find the interaction easily understood by different level of gamblers.	1	2	3	4	5
I find the interaction easily understood by different ages.	1	2	3	4	5
The interaction was annoying.	1	2	3	4	5
The interaction was too frequent.	1	2	3	4	5
The interaction was too long.	1	2	3	4	5
The interaction was too fast.					
I would like to receive these types of interactions regularly during gambling.	1	2	3	4	5

### Open Questions

- What did you like most and least about the interactions?
- What would you change?
- Do you have any suggestions?

## Appendix 5. Recruitment Message



# Research Participants Needed

to investigate how persuasive technology interactions during online gambling may play a role on gambling activity.

## Eligibility Criteria

- ✓ 18+ years old
- ✓ Fluent English speaker
- ✓ People who gamble online (e.g., slot machine, poker, betting, chance games)

Location: Talbot Campus, Bournemouth  
Duration: 20 min

**£10  
Amazon  
voucher**



To participate, please fill out the online survey

[Click here](#)

Or scan the QR code



For more information please contact: Ceyda Kiyak

✉ [ckiyak@bournemouth.ac.uk](mailto:ckiyak@bournemouth.ac.uk)