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Examining the impact of mobile gambling harm minimisation features: a dualistic model of passion perspective

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ABSTRACT

Driven by the ubiquity of smartphones, sports gambling has intensified globally. Most mobile gambling apps are mandated to offer harm minimisation features which are IT tools designed to help prevent harmful gambling activity. Existing research on the effectiveness of gambling harm minimisation features often overlooks the fact that individuals engage with multiple IT tools to varying extents to achieve a single goal. As an initial step, and to reflect actual user engagement, we conduct an exploratory factor analysis on a range of opt-in harm minimisation features. Next, aligned with the dualistic model of passion, we theorise and empirical test how direct and indirect harm minimisation features moderate the translation of different passions for mobile gambling into the well-being outcome of subjective vitality. Our findings suggest that indirect harm minimisation features, but not direct features, are effective in protecting the well-being of obsessively passionate mobile gamblers. For harmoniously passionate mobile gamblers, the opposite situation holds – direct harm minimisation features strengthen the effect of a harmonious passion on vitality whereas indirect features have no significant effect.

1. Introduction

Mobile gambling, whereby people place bets online using their mobile devices through specifically designed applications, websites, or even text messaging, is an emerging form of gambling play that is becoming increasingly popular around the world. Smartphones have now become the dominant way of accessing online gambling, with 50% of all online gamblers doing so (Gambling Commission, 2020). While gambling can be a positive leisure pursuit for many, in some cases, gambling involvement can lead to disordered gambling, an addictive disorder. The damage caused by gambling harms is extensive, stretching further than the individual gambler to impact society through criminal activity, unemployment, abuse and neglect of family members, health and social care costs, and even suicide (Reith et al., 2019). Due to the ubiquity afforded by mobile gambling, and the consequences experienced by gamblers, a public health concern has emerged (John et al., 2020). Across the globe, policymakers, regulators, charities, treatment professionals, industry officials, and gambling researchers are engaged in the battle to mitigate the harms of gambling. With the digitisation of gambling, IS researchers have a social and moral responsibility to study how IS, which is currently part of the problem, can become part of the solution.

Many jurisdictions require online gambling operators to provide a range of harm minimisation features (HMFs) which the user can voluntarily adopt to assist in exercising control over their gambling activities (Cooney et al., 2021; Gainsbury et al., 2020). These IT features typically include deposit limits (i.e., users can set limits on the amount of money they can transfer into their gambling app account), cooling-off periods (i.e., users can exclude themselves from gambling on the operator's app for several months), and account history statements (i.e., users can view summarised data about their session history, win/loss data and spend). These features are also referred to as responsible gambling (Delfabbro & King, 2020; Wood et al., 2014) or consumer protection tools (Gainsbury et al., 2020; Heirene et al., 2021). The use of responsible gambling features and policies is predicated on the belief that engagement with gambling HMFs will promote positive outcomes for gamblers. However, research investigating the efficacy of these IT features is limited (Heirene et al., 2021; Hou et al., 2019). The few existing studies suggest some HMFs show promise in promoting sustainable gambling patterns

(Delfabbro & King, 2020; Harris & Griffiths, 2017; Mcauliffe et al., 2021), but there lacks; (1) a clear consensus on which tools are most effective in a mobile setting, (2) an appreciation of how players actually engage with HMFs, and (3) a deeper understanding of the mechanisms through which such features operate to influence user outcomes. We still have much to learn about online HMFs, particularly *when* and *how* they exert influence over gamblers' states and behaviours. Thus, the purpose of this study is to determine how voluntarily adopted HMFs moderate the relationship between mobile gambling passions and well-being. We adopt the dualistic model of passion (DMP; Vallerand, 2008, 2010, 2015) to frame our study theoretically as it provides a parsimonious and structured mechanism to explain the causal links between opposing gambling motivations and well-being outcomes.

We specifically focus on mobile gambling as an ideal environment for studying IT-driven gambling and HMFs due to its unique characteristics. Mobile gambling stands out for its convenience and accessibility, facilitated by the widespread use of smartphones and mobile Internet (R. James et al., 2019). This pervasive availability allows users to gamble at any time and from any place, potentially increasing the frequency and impulsiveness of their gambling (Hing et al., 2024) – behaviours which HMFs are designed to mitigate against (Gainsbury et al., 2020). In contrast to other forms of online gambling, such as on a PC where individuals can more easily disengage from the gambling environment, mobile gambling apps are seamlessly integrated into users' daily routines (R. J. E. James et al., 2017; McGee, 2020). This integration makes it almost effortless for individuals to engage in gambling activities spontaneously or as part of a habitual pattern. Consequently, the line between leisure time and gambling time becomes blurred, potentially contributing to problematic gambling behaviours (McGee, 2020). Additionally, mobile gambling apps are designed with specific technological features tailored to mobile platforms, such as touch interfaces, push notifications, and geolocation services. These features not only enhance the gambling experience and risks but also exert influence over user behaviour, further shaping the dynamics of online gambling engagement (R. J. E. James et al., 2017).

Our aim in this study is to overcome the limitations of prior work and provide a more nuanced perspective on whether, which, and how HMFs interact with a person's gambling passion to influence their well-being. First, existing studies tend to examine gambling HMFs either as separate artefacts (Auer et al., 2018; Heirene & Gainsbury, 2021; Ivanova et al., 2019) or as a collective whole (Hou et al., 2019). However, gamblers engage with a combination of some features and ignore others, in order to help achieve their desired gambling activity (Heirene et al., 2021). Viewing HMFs as a single entity ignores the fact that IT features are often subject to joint utilisation, aimed at a common objective, which creates new experiences for individuals (Gerlach & Cenfetelli, 2022).To reveal the joint use and interdependencies between different HMFs, we first conduct an exploratory factor analysis on a range of IT features validated by a panel of gambling experts. The results suggest gambling HMFs can be grouped into two weighted factors which we term "direct HMFs" and "indirect HMFs". Subsequently, our research model hypothesises on the moderating role of direct and indirect HMFs on the relationship between mobile gambling passions and vitality. Second, existing studies tend to base their insights on data provided by gambling operators (Heirene et al., 2021; Hou et al., 2019; Ivanova et al., 2019). While this provides advantages stemming from large sample sizes, such raw online behavioural data both reduces our understanding of the gambling phenomenon to the frequency and the amount of play, and helps little to understand player experiences and motivations. Our study incorporates self-reported measures of motivations (i.e., harmonious and obsessive passions) and well-being, which we argue add to the more rounded understanding of the efficacy of HMFs.

In the following section we review the emerging literature on mobile gambling and assess current understandings of the effectiveness of IT control features and specifically gambling HMFs. Drawing from the DMP, we then present our research model and hypotheses. After describing our various research methods, we then report the findings of the study before discussing how these findings contribute to research and practice.

2. Theory development

2.1. Study background

Betting through mobile devices not only differs from in-person gambling, but also differs from other forms of online gambling, as summarised in Table 1. Most salient is the context and environments in which mobile gambling is conducted compared to other types of gambling. Environmental cues can produce urges to engage in a behaviour or trigger the initialisation of the behaviour itself (Hogarth et al., 2013). Although often played in the home, both self-reported and behavioural data indicate that mobile gambling is used as a pastime in contexts as varied as work, commuting, and socialising (R. Gambling Commission, 2020; R. James et al., 2019). Historically, gambling has been restricted either to a specific location, such as a casino or bookmakers, or a fixed device like a personal computer. Mobile

Table 1. Comparison of mobile and online gambling.

Feature	Comparison	Source
Accessibility	Mobile > online > in person	McGee, (2020)
Visibility of gambling	Mobile > online	O'Gara, (2022)
Fewer barriers to gambling (e.g., electronic financial transactions)	Mobile > online	Hing et al., (2024)
Risk of problem gambling	Mobile > online	Gainsbury et al., (2016); Lopez-Gonzalez et al., (2019)
Integration with other activities (e.g., dual-screening)	Online = low, mobile = high	Hing et al., (2024)
Prevalence	Mobile = growing, online = static	Pallesen et al., (2021)
Interference with everyday activities	Mobile > online	Lopez-Gonzalez et al., (2019)
Overlap with existing gamblers	Online = high, mobile = low	R. J. E. James et al., (2017); McGee, (2020)
In-play betting (higher risk product)	Online = peripheral, mobile = central	Killick & Griffiths, (2019)
Personalisation and direct communication	Mobile > online	Hing et al., (2024)

Table 2. Summary of control mechanisms examined in is addiction research.

Study	Context	Control mechanisms examined	IT features examined
Xu et al. (2012)	Video game addiction	Attention switching activities.	No
Turel (2015)	Quitting the use of a habituated hedonic information system	Reflections on the gaps between one's value system and behaviour.	No
Soror et al. (2015)	Negative consequences of mobile phone use	Mobile phone use habit and self-regulation abilities.	No
Turel and Qahri-Saremi (2016)	Problematic use of SNS	Cognitive-emotional preoccupation with using SNS and weak cognitive-behavioural control over using SNS.	No
Polites et al. (2018)	Deficient self-regulation of time using SNS	Self-identification with a particular SNS and how that affects self-control over engagement time.	No
Gong et al. (2019)	Social games addiction	Controlling desire for anticipated enjoyment, group norms, and social identity.	No
X. Wang et al. (2021)	Online game addiction	Desire and behaviour to change oneself and/or the environment to gain a sense of control.	No
Hou et al. (2019)	Disrupting unwanted habits in online gambling	Use of IT features to regulate online gambling behaviour.	Yes. Self-exclusion, pop up messages, product blocking.
Wang & Lee (2020)	Compulsive use of mobile SNS	Positive and negative reinforcements, and compensatory behaviour.	No
Lee et al. (2021)	Online game addiction	Achievement, social and immersion affordances.	No
Vaghefi et al. (2023)	Hedonic IS addiction	Correcting one's IS use behaviour based on perceived cues, cognitive processes, and contingent consequences.	No

technology not only makes mobile gambling highly accessible and available, but also allows it to occur in different social contexts (M. Griffiths & Barnes, 2008). Likewise, mobile gamblers tend to be younger than the rest of the population – a finding that represents patterns of smartphone ownership and usage – and they tend to prefer sports betting over traditional forms of gambling play such as casino style games (R. J. E. James et al., 2017).

The interactions afforded by a smartphone are also different from other forms of online gambling. Research on smartphone use suggests that it is characterised by heavy overall use within many intervals of engagement. That is, people do not continuously engage with their phones, but do so in short bursts of sustained activity (R. J. E. James et al., 2017). Other forms of gambling, such as a physical casino, encourage people to continuously gamble in a single, lengthy session. Although it has been previously found that certain kinds of online engagement are habit-forming (Hou et al., 2019), the nature of smartphone use could make mobile gambling prone to the formation of habitual behaviours, especially unwanted gambling habits. As such, gambling clinicians have noted that engagement in mobile gambling is a common

endeavour for those presenting as disordered gamblers today (O'Gara, 2022). The question of how to control such problematic IT behaviour has received much attention within the IS discipline.

2.2. Controlling problematic IT use

While mobile and online gambling has received limited attention by IS scholars, the problems associated with engagement in potentially addictive digital technologies, such as social networking sites (SNS) (Polites et al., 2018; Turel, 2015, 2016), video games (Lee et al., 2021; X. Wang et al., 2021; Xu et al., 2012), and smartphones (Soror et al., 2015; C. Wang & Lee, 2020), have been studied extensively. Insights into the antecedents and consequences of IT addiction dominates this stream of research. Recognising the salience of such problems, IS scholars have also examined the efficacy of various mechanisms to control the impulsive behaviours associated with addictive IT. A summary of the attributes of key IS studies which consider self-control of potentially addictive IT is provided in Table 2. While advancing our understanding of why some people become problematic IT users over others, these studies tend to be conceptual works

(Polites & Karahanna, 2013) or heavily theoretical studies focusing on psychological constructs related to self-control, rather than assessing the impact of specific IT features designed to assist self-control. For example, in terms of online gaming, the harm reduction factors considered in IS research include primary control (i.e., bringing the environment into line with ones' own wishes) and secondary control (i.e., bringing oneself into line with environmental forces) (X. Wang et al., 2021), attention switching activities (Xu et al., 2012), perceived affordances (Lee et al., 2021), and self-regulation (Gong et al., 2019).

Engagement with IT features can potentially assist gamblers in reaching the self-control they desire. It is well documented that deficient self-control of IT promotes compulsive behaviours (Larose et al., 2003; Vaghefi et al., 2023). Gamblers may want to change their mobile gambling habits but find it difficult to do so relying on just their own self-control abilities. To the best of our knowledge, only one study published in a top basket IS journal has examined the efficacy of IT features in helping online gamblers control unwanted gambling habits. Adopting an observational field-study approach of a large cohort of online gamblers, Hou et al. (2019) consider the combined effect of three HMFs (i.e., self-exclusion, pop up messages, product blocking) in disrupting repetitive online gambling behaviour. They conclude that the combined use of these features is effective at disrupting online gambling regularity, but these may be less effective in sports gambling when compared with casino games. Effects of such HMFs on subjective user states have been also overlooked in past research. These are important for obtaining a more complete picture, as deteriorated subjective states such as reduced well-being are important and common harms of online gambling (Ma et al., 2014; McGee, 2020; Ukhov et al., 2020). As such, the effect of individual HMFs on gambling behaviours has received growing attention in the gambling and behavioural addiction literature, which we now consider.

2.3. Gambling harm minimisation features

Online gambling operators have introduced a range of opt-in HMFs to protect customers and help them gamble in a more controlled manner. We categorise these tools as direct HMFs and indirect HMFs based on the mechanisms they operate upon. Direct HMFs involve using IT app features to set limits and restrictions on gambling activity (e.g., deposit limits, cooling-off periods) as gamblers, and particularly problem gamblers, often struggle to keep to the time and money limits they have informally set (Delfabbro & King, 2020; Hopfgartner et al., 2022). As gambling is potentially an addictive activity, adhering to informally set gambling limits requires self-control, which

is a limited resource. Direct HMFs are designed to supplement the player's own self-control abilities by preventing them from gambling in an uncontrolled manner. For example, a player may be likely to "chase their losses" after a series of losing bets. Enabling the deposit limit feature on the gambling app prevents them from transferring in more funds from their bank account in such situations. Indirect HMFs encourage self-awareness of gambling patterns and limits to be set away from the gambling environment (Harris & Griffiths, 2017). Indirect HMFs provide information on the player's gambling trends (e.g., account history statements, reality check notifications) and indirectly influence activity. In theory, indirect HMFs work by enabling gamblers to track their wins, losses, deposits, withdrawals, and current balance, which results in more rational, controlled decisions (Auer & Griffiths, 2012). This information encourages gamblers to reflect on their own play, instigate behaviour change, and moderate their gambling in response to the information presented (Wohl et al., 2017). Descriptions and screenshots of commonly available HMFs are provided in Appendix 1.

While HMFs have been widely available for several years, there has been limited empirical investigations to determine the boundary conditions which influence the effectiveness of such interventions (Auer et al., 2018; Gainsbury et al., 2020; Hopfgartner et al., 2022). No clear consensus exists to suggest HMFs are effective in protecting gamblers (Delfabbro & King, 2020; Harris & Griffiths, 2017; Mcauliffe et al., 2021). For example, individuals who set deposit limits (a direct HMF) did reduce the number of bets they placed per day but did not reduce the amount they wagered per bet (Nelson et al., 2008). Therefore, it suggests that gambling behaviour is reduced, but not the level of risk taken. In contrast, a study of online poker players finds that the amounts wagered do significantly decline when a voluntary time-limit (a direct HMF) was set (Auer & Griffiths, 2012). Similarly, repetitive online gambling behaviour is weakened by the duration of exposure to HMFs (Hou et al., 2019). However, in the same study, Hou et al. (2019) also conclude that HMFs were less effective in curbing unwanted habitual gambling among frequent gamblers compared to less regular users. Individuals who received messages designed to increase limit-setting on gambling websites (an indirect HMF) were significantly more likely to do so, and as a result, significantly reduced the amounts wagered per day along with net losses (Heirene & Gainsbury, 2021). A follow-up study compared users and non-users of gambling HMFs (Heirene et al., 2021). Those who use time-out and self-exclusion features (both direct HMFs) tend to place more and larger bets and lost more money. In contrast, there were few differences between users and non-users of deposit limit features (a direct HMF).

Hopfgartner et al. (2022) conducted a real-world experiment to test the effect of different lengths of mandatory gambling breaks and personalised feedback on later gambling behaviour. Longer mandatory breaks in play (a direct HMF) were associated with disproportionately longer voluntary breaks, but personalised feedback (an indirect HMF) had no impact on subsequent gambling behaviour.

While we acknowledge the accomplishments of prior HMFs studies in the gambling literature, the insights they offer are incomplete because they do not consider the joint use of multiple IT features i.e., a multi-IS perspective (Gerlach & Cenfetelli, 2022). Extending these studies to account for multiple and parallel HMF use, as we do in this study, reflects reality and enables us to more accurately assess the impact of HMF use on gamblers. What the findings from the gambling literature do indicate is that different HMFs target different types of gambling behaviour (Gainsbury et al., 2020; M. D. Griffiths et al., 2009; Heirene et al., 2021) and raise the possibility that gambling related outcomes may be dependent on the interaction between gambling motivations and engagement with HMFs. Moreover, although prior works have found some differential impacts of direct HMFs vs. indirect HMFs on gambling behaviour, these findings are limited to comparisons of their direct impacts, and we have yet to develop a deeper understanding of whether direct HMFs and indirect HMFs might create similar or different boundary conditions by which gambling motivations translate to gambling behaviour and well-being. To develop this narrative, we now turn to the DMP.

2.4. Gambling and the dualistic model of passion

Existing studies largely ignore how the individual differences between gamblers interact with HMFs to affect outcomes. Studies that have incorporated individual differences contrast high involvement versus low involvement in gambling activities (Heirene et al., 2021). However, as noted by Billieux et al. (2019), high involvement does not automatically equate to excessive or addictive patterns of play, and low involvement does not equate to the absence of problems. A more nuanced approach to conceptualise differences between problematic and non-problematic play is provided by the DMP (Billieux et al., 2019). For this reason, we adopt the DMP to frame our study theoretically.

Vallerand (2008, 2010, 2015) introduced the notion of passion to better explain the motivational mechanisms driving engagement in activities. Passion is defined as a "... *strong inclination toward an activity that people like, that they find important, and in which they invest time and energy*" (Vallerand et al., 2003, p. 756). In the DMP, Vallerand (2008) proposes a framework for studying the factors influencing both controlled and uncontrolled behaviours, such as gambling. According to the DMP, two people can share a deep passion for an activity yet exhibit different behaviours and experience varied consequences (Vallerand, 2010, 2015). These different behaviours characterise two types of passion, harmonious and obsessive, each having different characteristics and leading to diverse outcomes respectively (Vallerand, 2010). With harmonious passion, the motivation to freely participate in an important activity occurs without it conflicting with other areas of one's life, while control over the activity is maintained. In contrast, obsessive passion is characterised by an uncontrollable urge to participate in the activity, leading to interference with other aspects of one's life (Vallerand, 2008, 2010, 2015). The two types of passion have different consequences for motivation and well-being. Harmonious passion is generally associated with intrinsic motivation, emotional well-being and a sense of satisfaction, whereas obsessive passion can sometimes lead to stress, anxiety, and a need for external validation.

The two forms of passion do have points in common. In both harmonious and obsessive passion, the person loves the activity, finds it important, and considers it with a minimum of seriousness; but the two passions differ on the fact that the behaviours are not likely to be the same, in terms of the control of behaviours, the consequences, and the place given to this activity in one's life. The DMP postulates that when a person is passionate about an activity, both passion types can be co-present are not necessarily exclusive, but one usually dominates the other (Vallerand, 2015). Although less common, the two forms of passion can both be strong in the same person. In our empirical data that we will discuss later, 2% of our sample fall into this small category of mobile gamblers who reported high levels of harmonious and obsessive passion simultaneously.

Prior research in IS has drawn on constructs related to passion such as intrinsic and extrinsic motivation (T. L. James et al., 2019), addiction (Turel et al., 2011), IT identity (Polites et al., 2018), flow (Nadj et al., 2023) and engagement (Ray et al., 2014). Passion offers a different theoretical perspective on these concepts because it: (a) manifests duality, leading to either adaptive or maladaptive consequences (other approaches all take a unidimensional perspective), (b) embodies a deep and lasting love and affection for activities related to IT (not core in other constructs), (c) arises when these activities become integral to one's sense of self and identity (similar to IT identity but this lacks a and b), and (d) is a motivational, rather than affective, construct (addiction, flow, and engagement are affective and/or cognitive constructs of one's mind). Thus, while passion

shares some similarities to constructs used in IS research, it differs from them in important ways and serves as a unique framework for understanding human motivation and well-being.

A scoping review by Morvannou, Dufour, Brunelle, et al. (2017) examined 17 studies applying passion to gambling. These studies found that the two forms of passion are associated with different behavioural and emotional outcomes (Morvannou et al., 2017, 2018). Harmonious passion has been linked to numerous adaptive outcomes, such as vitality (Ratelle et al., 2004). In contrast, obsessive passion has been linked with gambling problems (Castelda et al., 2007; Morvannou et al., 2018; Ratelle et al., 2004) and negative emotions like anxiety (Ratelle et al., 2004). The DMP has also been applied to mobile gambling with the central tenets of the framework validated. A harmonious passion for mobile gambling was found to be associated with positive outcomes (improved mood, high study engagement), with obsessive passion linked to undesired outcomes (addiction, low mood, low study engagement) (Enwereuzor et al., 2016; Whelan et al., 2021). Thus, two individuals can share very similar intense mobile gambling patterns, but obtain very different life outcomes due to how their passions are internalised. Following this logic, if gambling HMFs affect users, we should expect that effect to differ depending on the type of passion being examined.

3. Research model and hypotheses

Our research model (Figure 1) integrates the DMP with relevant technology features (i.e., HMFs) to extend theory and practice in several unique directions. Our novel contributions stem from the moderating effects of HMFs. To establish the additional insights that these moderating effects will bring to the literature, we first theorise the direct relationships between passions for mobile gambling and subjective vitality. The direct relationships essentially provide the basis to develop this study's contributions from. As we posit that the HMFs will act as valves to regulate the translation of different passions into vitality, the model highlights the independent roles that direct HMFs and indirect HMFs could play as moderators. Note, we do not hypothesise the direct effects of HMFs on vitality as direct effects of moderating variables are not meaningful in the presence of interactions (Hayes 2022). We specifically chose vitality as it is an important outcome in both gambling and IS research. Subjective vitality is a measure of personal well-being which has been conceptualised as " ... *a feeling of personal energy associated with agency*" (Ryan & Frederick, 1997). Thus, vitality is not just the absence of illness or disease. One can be of sound physical and mental health, but not be thriving in their life. Vitality incorporates the extent to which one is living life to its fullest, which is a truer reflection of personal well-being (Ryan & Frederick, 1997).

3.1. Passion for mobile gambling and vitality

A number of meta-analyses confirm less than desirable associations between an obsessive passion for a variety of activities and well-being outcomes such as anxiety, rumination, self-esteem, and vitality (Curran et al., 2015; Pollack et al., 2020). Studies
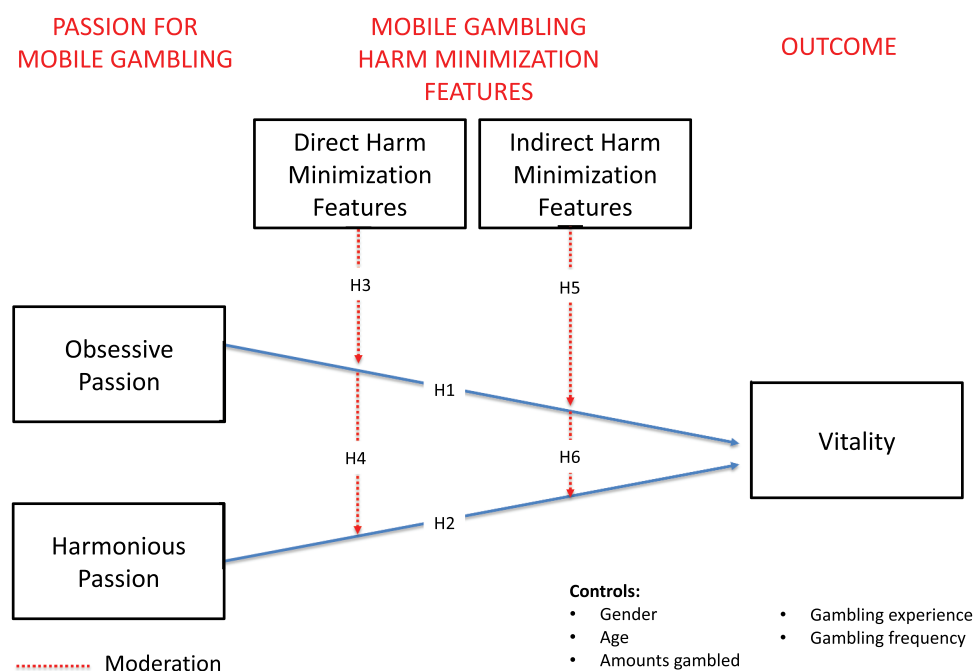

Figure 1. The research model.

focusing specifically on gambling also confirm the maladaptive effects of an obsessive passion on a person's vitality, as well as greater anxiety, rumination, and negative mood (Ratelle et al., 2004). An obsessive passion for gambling is strongly linked with uncontrolled gambling behaviour (Mageau et al., 2005) which leads to a rigid type of persistence despite the costs (Vallerand et al., 2003).

Conversely, with harmonious passion, the persistence is mindful and flexible, enabling the person to disengage if the activity becomes harmful. When a person develops a love for a potentially addictive activity, such as gambling, possessing a harmonious passion may not only protect from negative outcomes, but also lead to positive experiences (Vallerand, 2015). Prior research on gambling provides support for this view. A harmonious passion for gambling is generally positively associated with beneficial emotional experiences, such as pleasure, fun, and enjoyment (Mageau et al., 2005). Focusing specifically on mobile gamblers, Whelan et al. (2021) found that harmonious passion strongly associated with positive mood and was unrelated to problematic gambling. A similar pattern has been reported in studies of other screen-based activities, such as video games, where an obsessive passion leads to negative affect and tension whereas a harmonious passion correlates with adaptive outcomes such positive affect and greater energy (Lafrenière et al., 2009; Przybylski et al., 2009).

Hypothesis 1 (H1): Obsessive passion for mobile gambling will be negatively related to subjective vitality.

Hypothesis 2 (H2): Harmonious passion for mobile gambling will be positively related to subjective vitality.

3.2. Moderating effects of HMFs on vitality

Building on H1 and H2, we argue that the relationships between mobile gambling passions and vitality vary in strength depending on the gamblers' level of engagement with HMFs. Obsessive passion is associated with feelings of not being in control of one's gambling behaviour (Back et al., 2011; Mageau et al., 2005; Ratelle et al., 2004). Direct HMFs can boost internal reflective processes in overriding impulsive thinking and restore control by restricting the time and financial amounts gambled. Such features are likely to have a greater positive impact on vitality as obsessive passion rises from low to high. From a low-level obsessive passion perspective, direct HMFs can act as effective preventative tools for gamblers who still maintain a degree of control over their gambling activities, and thus help maintain their existing level of

vitality. As obsessively passionate gamblers are motivated more by winning money than by challenge and excitement (Back et al., 2011), we expect direct HMFs to be beneficial in preventing them from becoming absorbed by gambling, for example, by chasing their losses, and avoid the associated well-being lows as a result. Prior research has found that at-risk online gamblers change their behaviour in a positive way after they used IT features to set time and money limits on their gambling activity (Auer & Griffiths, 2012). Thus, knowing that engagement with direct HMFs can help restore control as obsessive gambling tendencies rise should dampen, and even reverse, the negative effects of obsessive passion for mobile gambling on vitality. Beyond gambling, the features of mobile apps have been found to be effective in enabling users to maintain such self-control. Engagement with the features of health apps such as, self-monitoring and tracking healthy behaviours, were positively associated with the well-being measures of physical exercise, medication adherence, and quitting smoking (Coorey et al., 2018).

In sum, similar to the way "disruptive" IT features inhibit repetitive gambling patterns (Hou et al., 2019), we expect the use of direct HMFs, which assist with the maintenance of self-control, will lead to improved vitality for mobile gamblers reporting a high obsessive passion.

Hypothesis 3 (H3): The use of direct harm minimisation features will moderate (weaken) the negative relationship between obsessive passion for mobile gambling and vitality.

While being in control of one's gambling is a characteristic of a harmonious passion, such individuals may engage with direct HMFs to ensure their passion for this potentially addictive activity remains more harmonious than obsessive. The extra layer of protection perceived to be afforded by direct HMFs may further enhance the positive relationship between harmonious passion and vitality. While we expect the use of features that support self-control to enhance subjective vitality outcomes, this effect is likely to be more prominent at higher levels of harmonious passion. When harmonious passion for mobile gambling is low, direct HMFs are likely to have only a limited effect on vitality. As hypothesised in H2, low levels of harmonious passion are associated with low levels of vitality, and engagement with direct HMFs is unlikely to alter this relationship as mobile gambling only occupies a minor place in such people's lives. In contrast, mobile gamblers high in harmonious passion gain heightened levels of vitality. For such individuals, direct HMFs can be viewed not so much as a corrective measure but as a means of preserving the players' already positive relationship with gambling, thus further enhancing the joy they gain from this

activity. While they may gamble extensively, engaging with direct HMFs creates an enriching environment for them to partake in gambling whilst also preventing the manifestation of potential problematic gambling behaviours. As harmoniously passionate gamblers are motivated by intrinsic rewards such as enjoyment (Ratelle et al., 2004), direct HMFs should provide environmental motivation and positive support, thereby enabling them to attain their goals in safety and further enhance vitality as harmonious passion rises.

Hypothesis 4 (H4): The use of direct harm minimisation features will moderate (strengthen) the positive relationship between harmonious passion for mobile gambling and vitality.

Self-awareness is a critical issue for the intentional control of thought and behaviour (Muraven, 2010; Muraven et al., 2008). In the context of gambling, uncontrolled behaviour is more likely when a player is unaware of their betting patterns, wins and losses (Harris & Griffiths, 2017; Monaghan & Blaszczynski, 2009). Lack of self-awareness during gambling may result in players behaving in ways not originally intended, such as spending more money and time gambling than they can afford (Monaghan, 2009). Indirect HMFs, such as reality checks and account history statements, are designed to enhance self-awareness by feeding objective evidence back to players. For gamblers low in obsessive passions, such features may not have much of an effect as their vitality is already likely to be relatively high. For example, receiving feedback that your gambling is controlled when you are a moderate gambler might be perceived as confirming the obvious and unlikely to provide much of a boost in positive feelings. For highly obsessive gamblers, indirect features can assist in reducing harmful play. For example, tools which provide personalised feedback on gambling activity have shown some evidence of effectiveness in triggering a return to controlled gambling behaviours for at-risk players (Wood & Wohl, 2015), which presumably would positively impact well-being. Similarly, in a lab experiment, pop-up messages encouraging self-awareness of gambling patterns had a positive influence on players' thoughts and behaviours (Monaghan & Blaszczynski, 2009). As uncontrolled play is a characteristic of an obsessive passion for mobile gambling, indirect HMFs can provide those gamblers with the self-awareness needed to reflect on their betting patterns, and gamble in a manner that does not damage their vitality. Without that awareness, the negative relationship between obsessive passion and vitality would be stronger.

Hypothesis 5 (H5): The use of indirect harm minimisation features will moderate (weaken) the negative relationship between obsessive passion for mobile gambling and vitality.

As explained by the DMP, those high in harmonious passion could still have tendencies towards obsessive passion. Even though harmoniously passionate gamblers feel they have their gambling under control, engaging with indirect HMFs provides objective feedback on their gambling activity, thus giving them the opportunity to alter their behaviour if needed, and ensure their mobile gambling remains a fun activity that enhances mental well-being. Some support for this view can be found in one study of fitness technology features (T.L. James et al., 2019). Intrinsically motivated exercisers (a similar concept to harmonious passion) reported higher subjective vitality when they engaged in the fitness apps features which provided information and feedback on their exercise activities. Prior gambling research has also suggested that indirect HMFs such as reality checks may be more effective in keeping controlled gamblers safe (Wood & Wohl, 2015). We expect that engagement with indirect HMFs will be particularly beneficial to highly passionate mobile gamblers as the purpose of these features is to correct the individual's perception about what normal level of gambling play is. If the gambler's harmonious passion begins to be dominated by a rising obsessive passion, the objective feedback provided by indirect features can alert the individual to this trajectory, and the need to recalibrate gambling activities. Similar to the way digital feedback tools nudge moderate SNS users to avoid overuse (Purohit et al., 2023), we expect indirect HMFs to enhance the vitality of harmoniously passionate mobile gamblers as such tools provide the security that they can continue in their passion knowing they have engaged a warning system that will alert them to potential trouble.

Hypothesis 6 (H6): The use of indirect harm minimisation features will moderate (strengthen) the positive relationship between harmonious passion for mobile gambling and vitality.

4. Research methods

This research was conducted in three phases. First, we developed a questionnaire for an expert panel to determine which mobile gambling app features could be classified as HMFs. Second, we conducted a factor analysis to validate the different groupings of HMFs voluntarily used by mobile sports gamblers. Third, we tested the relationships of the research model. We describe the phases below.

4.1. Expert panel

Mobile gambling apps incorporate a multitude of features designed to influence gambling activity, only some of which promote harm minimisation. To identify the range of gambling app features which can potentially promote harm minimisation, we convened a panel gambling experts, who all work full-time dealing with gambling related issues through research and/or treatment, to assess 17 commonly available mobile gambling features. A description of these features along with screenshots of how they are presented to players is provided in Appendix 1. We developed the list of 17 features by reviewing existing publications describing HMFs (Cooney et al., 2021; Wood et al., 2014) and our own review of the features offered by 22 popular mobile gambling apps (e.g., Paddy Power, Bet365, 888 Sport).

Gambling experts known to the authors were contacted by email to participate in the expert panel. A total of 13 experts were contacted with 11 agreeing to participate. As part of the participation agreement, we asked participants to classify themselves as either primarily practitioners ($n = 3$), primarily researchers ($n = 5$), or equally both ($n = 3$). Each participant completed an online questionnaire with two parts, the first of which sought their opinion on whether each specific feature promoted harm minimisation in gambling. The 11 panellists agreed fully that six features promoted harm minimisation, with four additional features receiving agreement from 10 of the 11 panellists, with one panellist stating they were unsure. There was a clear consensus that the remaining 7 features did not promote harm minimisation. Part 2 provided a semantic differential scale where the expert panel stated, on a scale from 1 to 10, the extent to which they believed each of the 17 features promoted impulsive or responsible gambling (closer to 1 means impulsive gambling, closer to 10 means responsible gambling). Panellists could only see their own responses and not those of other panel members. Of the 10 features identified in part 1 as promoting harm minimisation, one (i.e., withdrawal blocking) was negatively correlated with other features and was removed from the analysis. Cronbach's Alpha for the remaining nine was

0.95, which indicates a very high level of inter-rater agreement. Mean values ranged from 8.08 to 9.12. Standard deviations ranged from 1.14 to 1.87. These nine features were included in the factor analysis in the next phase.

4.2. Data collection

Survey data were collected over two points in time through the Prolific crowdsourcing platform. The pool of participants was pre-screened to specifically target individuals who engage in online sports gambling on a weekly basis. While online gambling operators typically offer casino games and sports gambling options, we deliberately focus on sports gambling. Previous research reports that online gamblers are more likely to become habituated to sports than casino games (Ma et al., 2014; McGee, 2020). This leads us to believe the impact of HMFs are more pronounced in mobile sports gambling over casino games.

The independent and moderating variables were gathered at t1. Two weeks later, dependent and control variables were gathered at t2. Demographic data were provided by Prolific. The two-week time lag is considered sufficient for separating the dependent from the independent variables, but still retain participants interest in the study (Turel & Qahri-Saremi, 2016). The time lagged design helped to ensure common method bias (CMB) did not influence our results (Podsakoff et al., 2003). Additionally, extremely high correlations between constructs may indicate the presence of CMB (Podsakoff et al., 2003). The highest correlation between variables is 0.73 (see Table 3), which is below the recommended threshold (Hair et al., 2019). We also conducted a full collinearity test, as recommended by Kock (2015), to test for the presence of CMB. This approach requires the calculation of the variance inflation factors (VIF) values for all constructs in the research model. All values in our model were below the 3.3 threshold, with obsessive passion for mobile gambling showing the highest VIF value (1.65).

Initial filter questions asked respondents to indicate their preferred method of gambling (i.e., smartphone,

Table 3. Correlations between latent variables (square root of AVEs bolded in the main diagonal).

	1	2	3	4	5	6	7	8	9	10
1. Obsessive passion	**.81**									
2. Harmonious passion	.28*	**.68**								
3. Direct HMF	.30*	(.03)	**1.00**							
4. Idirect HMF	.08	.05	.51*	**1.00**						
5. Vitality	(.07)	.19*	.07	.05	**.73**					
6. Gender	.06	(.02)	.04	.04	.03	**1.00**				
7. Age	.01	.04	.00	.00	.01	.00	**1.00**			
8. Experience	.07	(.13)*	(.09)*	(.05)	(.06)	.06	.56*	**1.00**		
9. Frequency	.32*	.28*	.14	.02	.03	.01	.13*	.15*	**1.00**	
10. Amount	.06	.14*	(.03)	(.07)	.02	(.02)	(.01)	.03	.05	**1.00**

n = 493; *p < 0.05; The numbers along the diagonal are the square root of the AVE (average variance extracted); off-diagonal elements are correlations between constructs.

PC, land-based) and to confirm they have used mobile gambling apps in the past week. Only those who stated that the smartphone was their preferred method of gambling, and currently use mobile gambling apps, proceeded to the next phase of the survey. Out of the initial 690 responses, 96 were discarded due to incomplete surveys. Additionally, 101 responses were removed for incorrectly answering attention check questions. Following this data cleaning process, the final sample comprised 493 participants. Most of the sample were men ($n = 281$, 57%), live in the United Kingdom ($n = 343$, 59%), and were between 18 and 72 years old ($M = 32$, SD = 9). Most of these participants had completed a bachelor's degree education ($n = 306$, 62%) and were in full-time employment ($n = 326$, 66%). Concerning their smartphone gambling habits, the majority gambled at least 3 days a week ($n = 408$; 83%). Soccer was the most preferred sport to gamble on ($n = 266$, 54%), followed by horse racing ($n = 103$, 21%). Across the sample, 22 different mobile gambling apps were used with Bet365 (42%), Paddy Power (34%), SkyBet (27%), and Betfair (25%) the most popular platforms. With the number of predictor variables in our model, a minimum sample size of 395 is needed to achieve valid predictive power at the 0.80 level with a small effect size of 0.02, as recommended for correlational research (Faul et al., 2009). Therefore, our sample size provides adequate statistical power.

4.3. Factor analysis

We next conducted factor analysis in SPSS as an initial test for convergent and discriminant validity of HMFs, as shown in the rotated component matrix and scree plot in Appendix 2. We used the principal component analysis (PCA) method to extract appropriate factors. Adhering to the multi-IS perspective (Gerlach & Cenfetelli, 2022), respondents were asked to consider their engagement across all gambling apps they use rather than one specific app. Engagement with HMFs loaded strongly onto one factor. Self-exclusion, time-out, cooling off, curfew, and deposit limits loaded onto this factor, which we termed direct HMFs, as when initiated, these features directly limit gambling activity. Components whose eigenvalues are at least 1 can be considered as factors (Matsunaga, 2010). One other factor surpasses this threshold, albeit just. Reality checks and account history statements loaded onto a second factor, which we termed indirect HMFs, as these features only provide information on gambling activity, and have an indirect influence on gambling behaviours. We also conducted a parallel analysis using the parallel analysis engine (Patil et al., 2017) to determine how many factors to retain. The parallel analysis approach suggests retaining factors whose actual eigenvalues are greater than the eigenvalues from randomly generated correlation matrices. The

eigenvalues for direct HMFs are greater than the randomly generated version (4.2 vs 1.2) but for indirect HMFs, actual values are slightly lower (1.04 vs 1.13). Even though it is not obvious whether the second factor should be retained, we do retain it for the study as the eigenvalues are just above 1, and " … *extracting too few factors might leave out valuable common variance*" (Yong & Pearce, 2013, p. 85). Hence, component 1 (i.e., direct HMF) and 2 (i.e., indirect HMF) were included in the research model analysis. Overall, both factors explained 58.2% of the total variance with direct HMFs responsible for 40.2% and indirect HMFs 18%.

The factor loading for two features (product blocking, and gambling self-awareness test) were below the recommended 0.6 threshold (Matsunaga, 2010) and were excluded from the analysis of the research model. To the best of our knowledge, all HMFs were offered as opt-in options across the gambling apps study participants used i.e., players could voluntarily decide to use each HMF.

4.4. Measures

All measurement items, other than direct and indirect HMFs, were taken from prior research and adapted to fit the context of mobile gambling. To measure engagement with direct and indirect HMFs, participants were asked to what extent they used each of the nine HMFs validated by the expert panel. Using SPSS, a single factor score was then calculated for the items which loaded onto direct HMFs and indirect HMFs. As we expected variability in the extent to which participants engaged with different direct HMFs and indirect HMFs (e.g., a mobile gambler might use the self-exclusion feature quite heavily, but use deposit limits less frequently), we used the Bartlett factor scores approach to calculate factor scores. In this approach, the factor score is weighted by regression coefficients so that the factor score would be most influenced by the highest loadings onto the factor. This procedure also generates unbiased estimates of the actual factor scores (Distefano et al., 2019).

A seven-point Likert scale was used to measure the key constructs of the research model. The ten-item gambling passion scale (Rousseau et al., 2002) was used to measure both harmonious and obsessive passion for mobile gambling. The dependent variable subjective vitality was taken from the seminal scale developed by Ryan and Frederick (1997). We specifically include age, gender, gambling experience, gambling frequency and amounts gambled as controlling variables as previous studies have established links between these variables and gambling passions (Enwereuzor et al., 2016; Morvannou et al., 2017). The mean and standard deviations for each survey item are provided in Appendix 3.

4.5. Data analysis

We started our analysis by assessing the convergent validity through item loadings, composite reliability (CR), and average variance extracted (AVE). Cronbach's coefficient alpha was used to gauge the internal consistency reliability of each item block, with values above 0.70 being considered acceptable (Nunnally, 1978). Since all items met this threshold, they were included in the analysis. Additionally, CR values exceeding 0.8 and AVE values greater than 0.5 further confirmed the satisfactory convergent validity. The validity and reliability tests were conducted using SPSS v27.

Confirming convergent and discriminant validity, all items loaded above 0.50 on their respective constructs, and within constructs loadings exceed those across different constructs (Chin, 1998). Table 3 displays the item loadings on their relevant and alternative constructs. Additional statistics provided in Appendix 3 further confirm that the validity and reliability are acceptable.

Our hypotheses were tested using hierarchical linear regression also with SPSS v27. The rationale for using this technique is to determine if the addition of the HMF moderating variables explain a statistically significant amount of variance in subjective vitality after accounting for the main effect and control variables. We estimated hierarchical regression analyses for four different models. Model 1 contained only the control variables as a predictor of the dependent variable of vitality. In model 2, we added the main effect variables of harmonious and obsessive passion for mobile gambling. Model 3 added the direct effects of indirect and direct HMFs. Model 4 added in the moderating effects for direct and indirect HMFs. The bootstrapping sampling procedure was used to test all models with bias-corrected 95% confidence intervals ($n = 5,000$).

5. Results

Model 1 with only control variables did not significantly explain vitality ($R^2 = 0.01$, Adj. $R^2 = 0.01$, $F(5, 487) = 0.73$, $p > 0.05$). Model 2 did significantly explain vitality ($R^2 = 0.06$, Adj. $R^2 = 0.05$, $F(7, 485) = 4.75$, $p < 0.001$). In this second model, obsessive passion for mobile gambling was significantly and negatively associated with vitality ($\beta = -0.14$, LL = −0.5, UL = −0.40, $p < 0.01$) while as predicted, harmonious passion was positively associated ($\beta = 0.24$, LL = 0.13, UL = 0.34, $p < 0.001$). Model 3 added in the main effects for both types of HMFs and significantly explained the dependent variable ($R^2 = 0.08$, Adj. $R^2 = 0.07$, $F(9, 483) = 4.88$, $p < 0.001$). Model 4 incorporated the moderating effects and continued to significantly explain vitality ($R^2 = 0.12$, Adj. $R^2 = 0.10$, $F(13, 479) = 5.06$, $p < 0.001$). The F-change for each

progressive model was also significant, meaning that the variables added in each step significantly improved the explanation. The results highlight that after accounting for both forms of mobile gambling passion, HMFs, and control variables, the additional inclusion of direct and indirect HMFs as moderating variables did significantly enhance the explanation of vitality. We rely on this final model to confirm our hypotheses.

Supporting H1 and H2, obsessive passion for mobile gambling was negatively associated with vitality (H1: $\beta = -0.22$, LL = −0.13, UL = −0.10, $p < 0.001$) while harmonious passion continued to be positively associated (H2: $\beta = 0.24$, LL = 0.14, UL = 0.32, $p < 0.001$). Direct HMFs did not significantly moderate the relationship between obsessive passion and vitality (H3: $\beta = -0.09$, LL = −0.02, UL = 0.12, $p > 0.05$). Thus, H3 is not supported. Supporting H4, engagement with direct HMFs did strengthen the relationship between harmonious passion and vitality (H4: $\beta = 0.12$, LL = 0.01, UL = 0.18, $p < 0.05$). The overall model also supported H5. Indirect HMFs significantly weakened the effect of an obsessive passion for mobile gambling on vitality (H5: $\beta = 0.12$, LL = 0.01, UL = 0.23, $p < 0.05$). However, indirect HMFs did not significantly moderate the effect of harmonious passion for mobile gambling on vitality (H6: $\beta = -0.03$, LL = −0.13, UL = 0.08, $p > 0.05$).

The relatively low R^2 is a reflection of the high variability in engagement levels with HMFs in our sample. Our analysis supported four hypotheses (H1, H2, H4, H5) while the remaining two hypotheses (H3, H6) were not supported. A summary of the results can be found in Table 4. We also examined the effects of five control variables (age, gender, gambling experience, gambling frequency, amounts gambled). Only gambling experience was significantly related (negatively) with subjective vitality. All other control variables were not significantly related with vitality. Overall, these results provide important insights into the linkages between mobile gambling passion, HMFs, and vitality.

The significant moderation effects (H4, H5) are plotted in Figures 2 and 3 below. To note, the moderating effect of direct HMFs on the relationship between harmonious passion for mobile gambling and vitality (Figure 3) is significant at all levels of engagement. While high engagement with direct HMFs interacts with harmonious passion to have the highest positive effect on vitality, this finding suggests that any engagement with direct HMFs will enhance the vitality of harmoniously passionate mobile gamblers. However, the moderating effect of indirect HMFs on the relationship between obsessive passion and vitality (Figure 3) only becomes significant when engagement is low i.e., when engagement with indirect HMFs is at a medium or high level, the negative relationship between obsessive passion and vitality

Table 4. Coefficient results of the hierarchical linear regression analysis.

|	Model 1	Model 2	Model 3	Model 3
Gender	0.02	0.03	0.03	0.05
Age	0.05	0.06	0.06	0.05
Experience	−0.91	−0.11*	−0.10*	−0.11*
Frequency	0.04	0.02	0.03	0.06
Amount	0.02	−0.01	0.01	0.02
Obsessive passion		−0.14**	−0.20***	−0.22***
Harmonious passion		0.24***	0.25***	0.24***
Direct HMFs			0.16**	0.13*
Indirect HMFs			−0.03	−0.01
Direct HMF x Obsessive passion				0.05
Direct HMF x Harmonious passion				0.12*
Indirect HMF x Obsessive passion				0.12**
Indirect HMF x Harmonious passion				−0.02
R^2	0.01	0.06	0.08	0.12
Adjusted R^2	−0.01	0.05	0.07	0.10
F Change	0.73	14.70***	5.05**	5.85**

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.
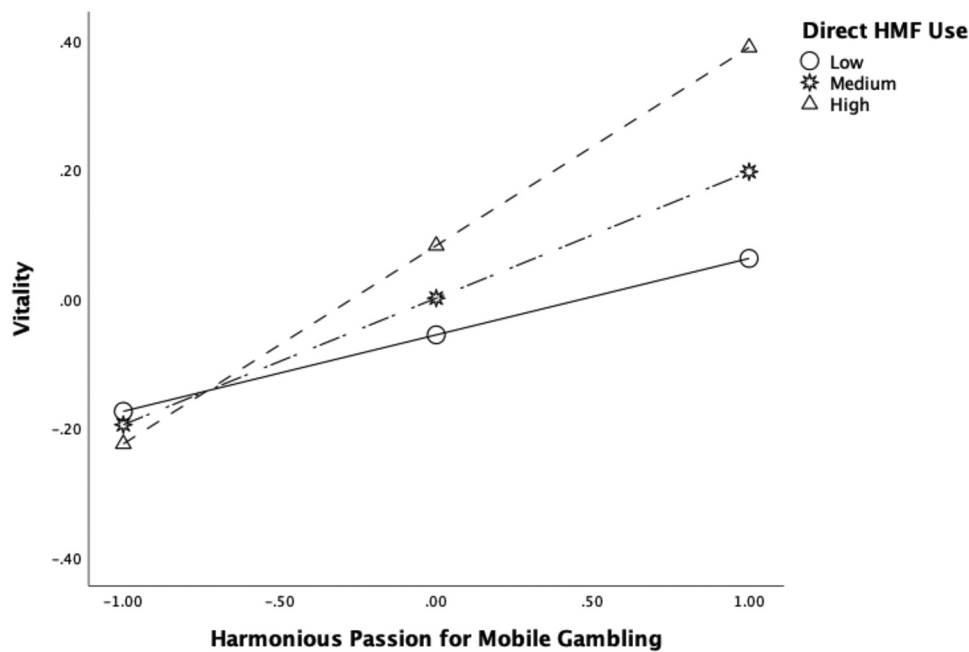
Figure 2. The moderating effect of direct HMFs on the relationship between harmonious passion for mobile gambling and vitality.

becomes non-significant. This suggests that a high level of engagement with indirect HMFs is needed to offset the negative effects of an obsessive passion for mobile gambling on vitality.

6. Discussion

Through smartphone gambling apps, people can potentially gamble anytime and anywhere. Our findings suggest that under certain conditions, HMFs can be effective in protecting the well-being of mobile gamblers. The interaction between direct HMFs (e.g., deposit limits, self-exclusion, curfew) and harmonious passion for mobile gambling predicts higher vitality. Similarly, high engagement with indirect HMFs (e.g., reality checks, account history statements) can break the negative relationship between obsessive passion for mobile gambling and vitality. We now discuss how our study contributes to research and practice.

6.1. Contributions to research

Our study paves the way for a more systematic exploration of harm reduction features. Such explorations may go beyond gambling, as harm reduction features can help IS become part of the solution (and not just part of the problem) in many other areas where excessive IS use can be harmful (e.g., SNS use, online gaming). While there is a rich conversation in the IS literature as to the causes and consequences of problematic IT use, the role of IT features in disrupting unwanted behaviours has received less attention. As detailed in Table 2 earlier, the IS discourse considering the disruption of unwanted IT behaviours has tended to be conceptual in nature (Polites & Karahanna, 2013) or focused on psychological constructs related to self-control (Polites et al., 2018; Turel, 2015; Vaghefi et al., 2023). As the IT artefact is core to the identity of the IS discipline (Benbasat & Zmud, 2003; Orlikowski & Iacono, 2001), our study
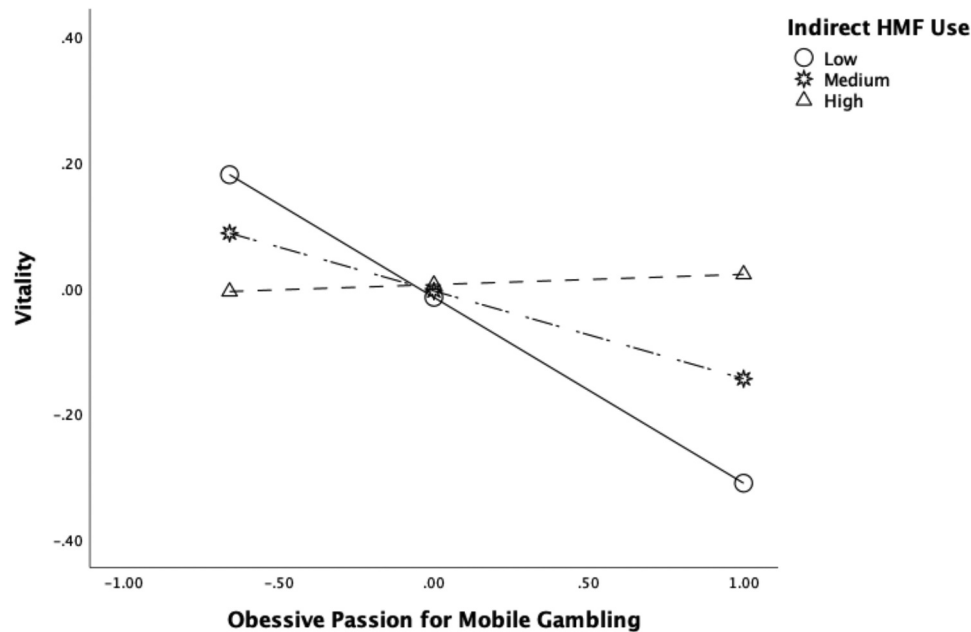
Figure 3. The moderating effect of indirect HMFs on the relationship between obsessive passion for mobile gambling and vitality.

shifts the discussion towards the efficacy of IT features in disrupting problematic behaviours and minimising harms. This perspective is important to IS becoming a provider of problematic IT use solutions as an evidenced-based understanding of how people perceive and engage with HMFs is critical to improving the design and effectiveness of existing tools, as well as in innovating new ones, with the aim of better mitigating IT-related harms. Within the online gambling IS literature specifically, we are only aware of one relevant study (Hou et al., 2019). This limited IS literature only examined the effects of how long a lump-sum group of HMFs was enabled, without discerning any potential effects HMF use intensity and type of usage. We extend this work by examining how HMF use intensity and type influence the well-being of gamblers.

Our study also helps shift the perspective of IS research from the single-IS paradigm to the multi-IS reality. People use multiple interrelated and interdependent IT tools to accomplish a goal yet this multi-IS reality has been left largely unexplored in IS research (Gerlach & Cenfetelli, 2022). Our study confirms why the multi-IS perspective needs to be considered. When the deposit limit feature is examined in isolation, our findings show it has no significant effect on the relationship between mobile gambling passions and vitality. However, the vast majority of our respondents (92%) indicated they typically use two or more different gambling apps, and also engage with multiple HMFs across those apps. When the interdependencies between deposit limits and other direct HMFs are examined, a significant effect is found (H4). To help achieve their desired level of gambling, our study suggests mobile gamblers prefer to use

a combination of features across apps which directly limits their activities (i.e., direct HMFs) or provides them with information and feedback on their activities (i.e., indirect HMFs). This multi-IS perspective can also advance the responsible gambling literature by more accurately capturing reality. It has been recognised in the gambling literature that players engage with a combination of some features and discount others (Heirene et al., 2021), but prior studies almost exclusively focus on assessing the efficacy of single HMFs. Thus, the resulting insights from prior studies focusing on a single HMFs may be limited. Future research into the efficacy of harm reduction features can follow our exploratory factor analysis approach and consider the interdependencies of such features to reflect IT use more accurately.

Our passion perspective addresses recent calls by IS scholars for a more balanced perspective on problematic IT use behaviours (Gerlach & Cenfetelli, 2020; Gong et al., 2021; Vaghefi et al., 2023). Such a balanced perspective is needed as individuals might show problematic behaviours (e.g., constant phone checking), but this does not automatically mean individuals have problems. The DMP provides an alternative and possibly a more accurate vantage point from which IS research on problematic IT use can view and conceptualise problems, and if they are real problems or not. High involvement with potentially addictive IT may not necessarily be a problem, nor does low involvement mean problems are unlikely (Billieux et al., 2019). What is more important to consider, as advocated by the DMP, is the place that activity, whether it be engagement with SNS, smartphones, online gaming, or mobile gambling, occupies in the person's life. The existing IS

literature on problematic IT behaviours have tended to draw from theories of impulse control to explain adverse outcomes (Kuem et al., 2021; Polites et al., 2018; Turel, 2015). But viewing problematic IT use through the DMP lens affords the realisation that impulsive use may only associate with problems if that behaviour conflicts with other important aspects of the individual's life. Our findings within the context of mobile gambling should encourage IS scholars with an interest in other phenomena related to problematic IT use to adopt a broader perspective and establish whether apparent adaptive or maladaptive use behaviours manifest as such.

Ultimately, our findings suggest that direct HMFs have some interaction effects with a harmonious passion for mobile gambling but not so with obsessive passion. Conversely, indirect HMFs do not have an interaction effect with harmonious passion but do to some extent with obsessive passion. Previous research suggests that obsessively passionate gamblers are more likely to engage with direct HMFs (Gainsbury et al., 2020). This is because gamblers who struggle to control their behaviours tend to rely on restrictive tools to aid self-control. However, our results (H3) suggest engagement with direct HMFs does not moderate the relationship between obsessive passion and vitality. There are a number of reasons why this may be the case. First, obsessive passion is strongly connected to problem gambling (Mageau et al., 2005; Morvannou et al., 2017; Ratelle et al., 2004) which is associated with cognitive distortions particularly amongst problem online gamblers (Mackay & Hodgins, 2012). Thus, mobile gamblers with a high obsessive passion may engage with direct HMFs as it provides an illusion of control over gambling, but which ultimately does not influence their vitality. This view aligns with recent findings which suggest online gamblers who use timeouts and self-exclusion (both types of direct HMFs) to restrict gambling play display less controlled gambling behaviours (Heirene et al., 2021). Second, players have to opt-in to engage with direct HMFs. We note from our data that reported engagement with direct HMFs is relatively low, a finding consistent with prior research (Gainsbury et al., 2020). Only 50% of our sample use the deposit limit feature and 23% use the time-out feature. In contrast, 80% of participants use the account history feature, an indirect HMF which provides players with summarised data about their session history, win/loss data and spending records. It is possible that the use of direct HMFs does interact with obsessive passion for mobile gambling to have a positive effect on vitality, but this outcome only occurs when engagement with direct HMFs is widespread and frequent.

Pointing to the effectiveness of HMFs, our data suggests that engagement with indirect HMFs does weaken the negative effect of obsessive passion on vitality. However, a deeper analysis of our data reveals that engagement with indirect HMFs has to be at a high level if vitality is to be protected. The negative relationship between obsessive passion and vitality remains significant when engagement with indirect HMFs is at a low level. In the responsible gambling literature, well-being has rarely been studied, but some modest support exists for the efficacy of different indirect HMFs, such as pop-up messages (Bjørseth et al., 2021), activity statements (Gainsbury et al., 2020), and behaviour tracking tools (Auer & Griffiths, 2012), in supporting sustainable gambling. Our study extends this existing literature by showing when these indirect HMFs are used in combination, and at a high level, they have a positive effect on the subjective vitality of obsessively passionate mobile gamblers. One possible explanation of this finding is through the process of dissociation. Like other potentially addictive behaviours, gambling often involves losing track of both time and space (Jacobs, 1988), especially among problem gamblers (Diskin & Hodgins, 2001). Prior studies have found that dissociation does not inhibit adherence to monetary limits when study participants received pop-up reminders (Stewart & Wohl, 2013). Thus, indirect HMFs may help protect vitality when obsessive passion is high by helping to inhibit feelings of dissociation.

6.2. Implications for practice and society

These findings will be of particular interest to gambling policy makers. Some national Governments are considering following the approach of Australia where online gambling sites are required to make their customers set a deposit limit or actively opt out of setting one. Yet, setting a deposit limit is just one of a number of HMFs gamblers could use to regulate their gambling behaviours. Our study shows that mobile gamblers tend to use a combination of HMFs, and for those reporting high obsessive passion, indirect tools such as reality checks and account history statements (both indirect HMF) may be more advantageous for well-being than restrictive tools like deposit limits. An alternative approach could be to include all HMFs in an opt-out system, and allow mobile gamblers select the combination of features which will best assist them in achieving their desired outcomes. When gamblers are involved in the design and delivery of the HMFs they use, they are more likely to stick to pre-set monetary limits (Wohl et al., 2014).

Mobile gambling is a potentially addictive activity. Our findings show that the relationship between harmonious passion for mobile gambling and vitality is moderated by engagement with direct HMFs (H4). The moderation effect is significant when engagement with direct HMFs is at the low, medium, and high levels. This suggests that harmonious passionate

mobile gamblers engage with direct HMFs to be proactive in ensuring they can continue to enjoy gambling, but avoid a situation where their gambling becomes unsustainable and negatively affects their well-being. This finding will be of particular interest to gambling app operators. If gambling app users can maintain a harmonious passion whilst limiting an obsessive passion, they are more likely to continue gambling in a safe manner and provide more sustainable revenue through loyalty. Nudging players to adopt multiple HMFs can help ensure gambling passions remain more harmonious than obsessive, which will ultimately benefit the gambling operator. Yet, prior studies report that the provision and promotion of HMFs by gambling operators needs improvement (Catania & Griffiths, 2023; Cooney et al., 2021). Our findings suggest that engagement with direct HMFs helps protect the well-being of harmoniously passionate gamblers, which may in turn prevent customer churn for gambling operators.

6.3. Limitations and future research

Several limitations of this study are important to note, as they highlight directions for future research. First, as with any survey-based study, the generalisability of our findings is constrained. Our sample consisted of online sports gamblers who were accessed via the data collection platform. Future research should explore the generalisability of these findings to other forms of mobile gambling, such as card games, as well as to non-English speaking populations. In addition, possible generalisability of the effects of HMFs on non-gambling uses (e.g., SNS, smartphones, online gaming) is a ripe area for future research. Such studies can build on our passion-focused framework and findings to determine if and when apps such as Freedom (a website blocking app) and Social Fever (an app which provides feedback on smartphone use) are effective in protecting user well-being.

Second, the appropriate tests indicated that it was a borderline decision whether to retain indirect HMFs as a factor or not. The relatively weakness of indirect HMFs as a factor may be a function of sports betting in a mobile environment. We suggest future studies should follow our approach and conduct a factor analysis of the different HMFs gamblers use, but for specific online gambling products (e.g., online casino, online poker, online slots etc.) through different media (e.g., smartphone app, laptop/PC). This may produce more robust factors revealing how gamblers cumulatively engage with different HMFs.

Lastly, IS research has much to contribute to minimising the harms associated with online gambling. The current study, along with prior research (Heirene & Gainsbury, 2021; Hopfgartner et al., 2022; Hou et al., 2019; Nelson et al., 2008) suggests

HMFs can be effective in preventing gambling related harms. However, the potential benefits of HMFs are being lost due to the low uptake of these features. While requiring online gamblers to opt-out of using HMFs is one option to promote use, this may have an unintended consequence of reducing HMF engagement as players may feel such policies restrict their agency. IS research has a rich tradition of documenting the factors which promote the adoption and continued use of IT systems and features. By adapting technology adoption models to the gambling context, IS can provide the gambling addiction community with a better understanding of why HMFs are, and are not, being adopted by players. Additionally, as gambling addiction is a real-world problem, IS researchers can also draw from the growing interest in design science to create new IS artefacts which inhibit gambling related harms.

Disclosure statement

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Appendices

### Appendix 1 Commonly available mobile gambling harm minimisation features

(1) **In-play betting** – players can bet on a variety of outcomes whilst the sporting event is live. The odds rapidly change based on events.

(2) **Cashing out bets** – players can cash out a bet that is currently winning for a smaller amount than the odds offered at the end of an event.

(3) **Bet editing** – players can amend their bet while the event is in play to add or remove wagers, or change the value of the bet.

(4) **Automatic betting** – players can set a casino or table game (or in some cases sports betting) to automatically wager for a specified amount of time.

(5) **Micro-betting** – players can bet on simple events that are easy to follow (e.g., if Messi's next shot at goal will result in a score).

(6) **Turbo mode** – players can speed up the play of slots and casino games to play more games in a shorter period of time.

(7) **Withdrawal cancelling** – players can cancel a withdrawal made from their gambling account to use the funds to continue playing.

(8) **Curfew** – Players can set blocks on their gambling account on specific days, dates, or hours of the day (e.g., during working hours).

(9) **Deposit limits** – players can set limits of the amount of money they can transfer into their gambling site account. Increases only occur after cooling off periods.

(10) **Cooling off period** – a tool which excludes players from gambling on the operator's website for up to 6 months.

(11) **Account history** – provides the player with summarised data about their session history, win/loss data and spend.

(12) **Product blocking** – players can seek specific blocks on their gambling activity (i.e., slots but not sports betting).

(13) **Reality check (or session time reminders)** – pop ups that inform players of the amount of time they have played. May also include session information.

(14) **Self-exclusion** – a tool which excludes players from gambling on the operator's website for more than 6 months.

(15) **Time-out** – players can take a short, self-imposed break from their gambling of up to six weeks.

(16) **Withdrawal blocking** – players can prevent themselves from cancelling the withdrawal of funds from their gambling account, to prevent them from using that money to continue gambling after they have asked for it to be transferred to their bank account.

(17) **Gambling self-assessment** – A tool which allows users to check how much of an impact gambling is having on their life.

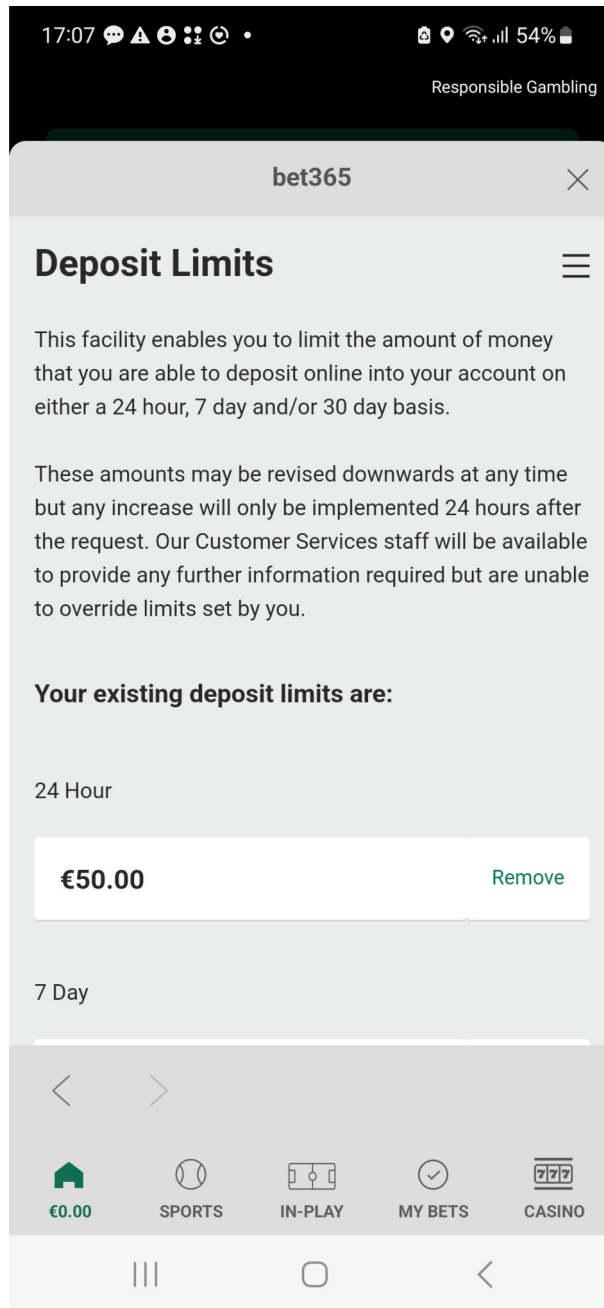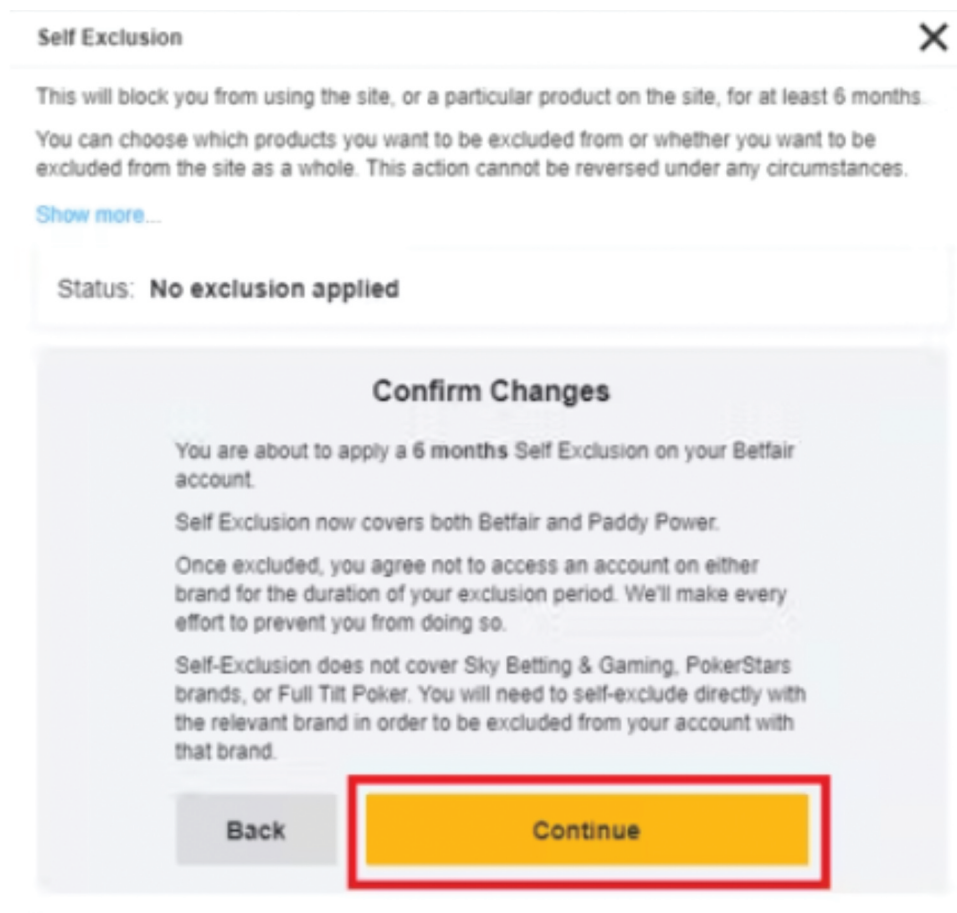**Reality check feature** *(screenshots taken from Paddy Power gambling app)*
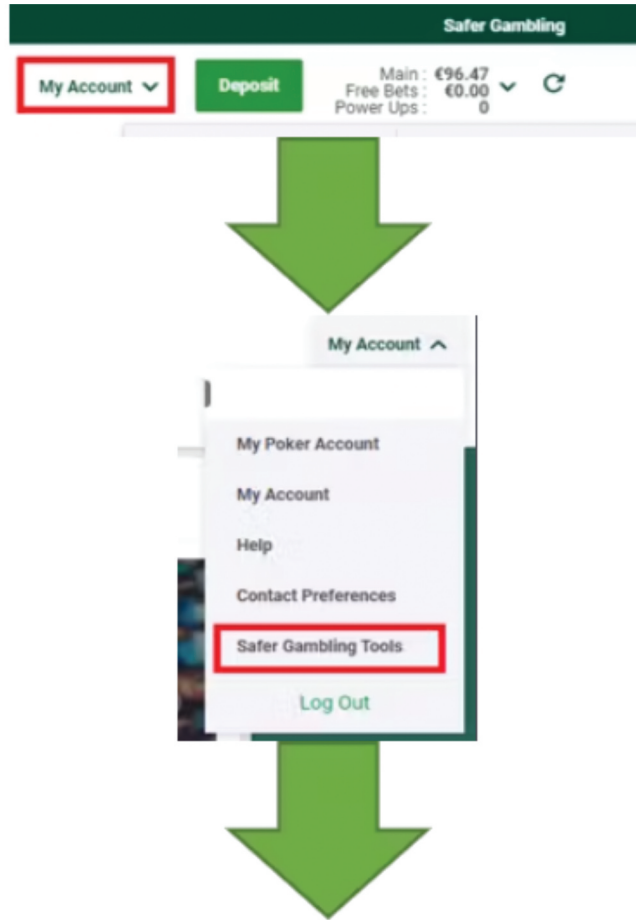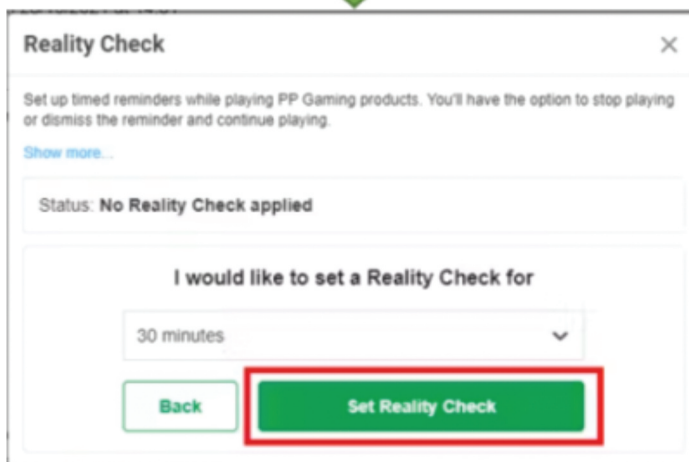
**Deposit limit feature** *(screenshot taken from the bet365 gambling app)*

Self-exclusion feature *(screenshot taken from Betfair gambling app)*

Appendix 2 Exploratory factor analysis of harm minimisation features

Rotated component matrix

	Component	
Harm minimisation features	*1*	*2*
Self-exclusion	.839	
Time-out	.755	
Cooling off period	.724	
Curfew	.713	
Deposit limits	.605	
Reality checks		.801
Account history statements		.703
Product blocking	.327*	
Gambling self-assessment		.496*

*did not load sufficiently onto any component and not used in the analysis.

Scree plot of component Eigenvalues
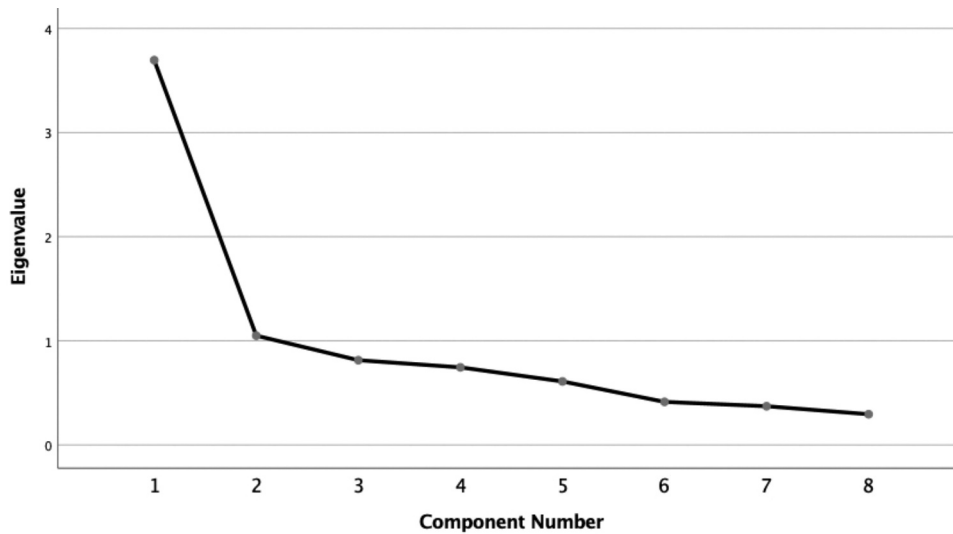
Components whose Eigenvalues are at least 1 are considered to be strong (Matsunaga, 2010). Hence, component 1 (i.e., direct HMF) and 2 (i.e., indirect HMF) were included in the research model analysis.

Appendix 3. Construct reliabilities (CR), average variance extracted (AVE), Cronbach's Alpha (CA) item means, standard deviations (S.D.), loadings

Construct	Item	Mean	S.D	Load
Harmonious Passion for Mobile Gambling Rousseau et al., (2002) CR: 0.89 AVE: 0.68 CA: 0.84	This gambling activity allows me to live memorable experiences.	2.62	1.62	.72
	This gambling activity is in harmony with the other activities in my life.	3.59	1.82	.73
	The new things that I discover with this gambling activity allow me to appreciate it even more.	2.68	1.57	.82
	This gambling activity reflects the qualities I like about myself.	2.59	1.48	.83
	This gambling activity allows me to live a variety of experiences	2.83	1.62	.90
Obsessive Passion for Mobile Gambling Rousseau et al., (2002) CR: 0.94 AVE: 0.81 CA: 0.94	I cannot live without this gambling activity.	1.83	1.25	.76
	I am emotionally dependent on this gambling activity.	1.72	1.26	.90
	I have a tough time controlling my need to play this gambling activity.	1.88	1.48	.95
	I have almost an obsessive feeling for this gambling activity.	1.88	1.46	.93
	The urge is so strong, I cannot help myself from playing this gambling activity.	1.78	1.39	.94
Subjective Vitality Ryan and Frederick, (1997) CR: 0.93 AVE: 0.73 CA: 0.92	I feel alive and vital.	4.84	1.41	.85
	Sometimes I feel so alive I just want to burst.	3.46	1.59	.74
	I have energy and spirit.	4.48	1.47	.88
	I look forward to each new day.	4.47	1.50	.88
	I nearly always feel alert and awake.	3.94	1.55	.86
	I feel energized.	4.08	1.52	.90