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**A Reasoned Action Approach to understand mobile gambling behavior  
among college students**

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### Abstract

University students demonstrate high rates of gambling behavior, which can have negative health consequences. Mobile gambling has rapidly expanded, and most students own a device. It is therefore important to understand the key psychological factors underlying students' mobile gambling. This information could be used to inform interventions. Psychological determinants and beliefs were identified using the Reasoned Action Approach (RAA: Fishbein & Ajzen, 2010). Study 1 identified the modal salient behavioral, normative, and control beliefs. Thirty-five participants completed a questionnaire concerning each belief category. Content analysis identified 27 modal salient beliefs; Eleven behavioral, nine normative, and seven control. Study 2 assessed the predictive utility of the RAA and key beliefs using a cross-sectional design. Participants completed questionnaires assessing RAA determinants (N = 473) and mobile gambling behavior (N = 388). Constructs accounted for 66% and 56% of the variance in intention and behavior, respectively. Attitude (affective and instrumental) and injunctive norm significantly predicted intention, and intention and autonomy significantly predicted behavior. A number of key beliefs were identified including "Bonus offers and promotions" and "Access and availability of apps". The studies provide important information regarding the psychology underlying students' mobile gambling behavior. Interventions could target the identified key beliefs to change the behavior.

Keywords: mobile phones; Theory of Planned Behavior; gambling; social psychology; students

## Introduction

University students often engage in an array of health risk behaviors such as smoking (Nasser & Zhang, 2019), binge drinking (Norman et al., 2012), and excessive consumption of high fat foods (Sprake et al., 2018). Moreover, students have shown high rates of gambling whilst at university (Petry & Gonzalez-Ibanez, 2015; Weinstock et al., 2008). Gambling is a pervasive problem with many detrimental consequences (Li et al., 2017; Petry & Weinstock, 2007). For example, gambling can lead to poor mental health in students (Petry & Weinstock, 2007). Gambling can be undertaken using many modalities such as mobile phones. The use of mobile phones offers the opportunity to gamble in various ways such as mobile applications (apps), websites, text message, or phone call, and the platform of mobile devices for gambling continues to rise (James et al., 2016). These different modes can be particularly appealing for many reasons. For example, mobile apps are easy to download, simple to use, and offer quick deposits. Despite these advantages, a significant amount of money is lost using such apps and mobile gambling (Armstrong et al., 2018) and the potential to develop a gambling problem is more prevalent in mobile gamblers when compared to the general population (Zhao et al., 2018). Mobile gamblers are also more likely to be those gambling for the first time (James et al., 2016). Pertinent to the present study, university students have demonstrated participation in gambling behavior (Petry & Gonzalez-Ibanez, 2015; Weinstock et al., 2008) and nearly all students have access to a mobile phone (Fowler & Noyes, 2015). Therefore, given the potential susceptibility of university students towards mobile gambling, especially given aspects of university lifestyle might contribute to increased risky behaviors, it is important to understand the psychological determinants underlying university students' participation in mobile gambling behavior.

### The Reasoned Action Approach

To understand, predict and change behavior, a number of social cognition models can be adopted. The Theory of Planned Behavior (TPB; Ajzen, 1991) states the proximal determinant of behavior is a behavioral intention which represents a person's motivation to engage in the behavior. Intention is determined by three antecedent determinants: attitude, subjective norm, and perceived behavioral control (PBC). The Reasoned Actioned Approach (RAA; Fishbein & Ajzen 2010), which developed from iterations of the TPB, also considers attitude, perceived norm (termed subjective norm in the TPB), and PBC as determinants of intention (see Figure 1). However, unlike the TPB, the RAA considers these constructs to comprise distinct subcomponents. These subcomponents have been found to influence intention and behavior differently (Conner et al., 2017; McEachan et al., 2016).

Attitude comprises both instrumental (cognitive) and affective (experiential) appraisals of the behavior. For example, an individual may believe gambling presents an easy opportunity to win money (instrumental) and that gambling is an exciting activity (affective). Perceived norm refers to the perceived pressure of others to participate in the behavior, known as injunctive norm, and the influence of what others are themselves doing, known as descriptive norm. PBC refers to both the capacity and autonomy of engaging in the behavior. Capacity refers to the confidence an individual has in undertaking the behavior and whether they could engage in the behavior if they wanted to. Autonomy refers to the perceived control one has over the behavior and whether participating in the behavior is up to them. As well as influencing behavior through intention, PBC can also directly affect behavior.

The three antecedents of intention are underpinned by sets of salient beliefs, which are the psychological foundations of the corresponding determinant. Attitude is influenced by behavioral beliefs, perceived norm by normative beliefs, and PBC by control beliefs. Behavioral beliefs are the perceived consequences of engaging in behavior (instrumental or affective) and people's evaluation of these consequences. Normative beliefs are the perceived expectations and influences of important referents and a person's motivation to comply with those expectations. Control beliefs are people's evaluation about the presence of factors that may facilitate or impede performance of the behavior. It is at the level of beliefs where an understanding of the behavior can be achieved, and interventions developed (Fishbein & Ajzen, 2010).

[Insert Figure 1 near here]

### ***Formative research***

When adopting the RAA to understand and change behavior, formative research is required to establish the precise psychological foundations of the behavior (Fishbein & Ajzen, 2010). More specifically, a belief elicitation study is needed to understand the salient behavioral, normative, and control beliefs. Using a representative sample of the population, this study identifies the modal salient beliefs, which are those held most commonly by the sample of interest. Following this, a second piece of research is required to understand the specific cognitions influencing the behavior. As a behavior may not be influenced by all determinants, this study is needed to ascertain whether the behavior is determined by attitudinal, normative, and/or control factors. More pertinent to the development of a behavior change intervention, this second piece of research can establish the key beliefs related to intention and behavior. As such, undertaking this formative research not only enables an explanation of behavior, but important information is revealed for intervention development. To summarize,

when adopting the RAA to understand and change behavior, it is important to first identify the modal salient beliefs, and to then identify the most important determinants and beliefs.

### *Applications of the RAA/TPB to gambling behavior*

A number of studies have used the RAA to understand different health behaviors (e.g., Conner et al., 2017; Hagger et al., 2018; McEachan et al., 2016). McEachan et al. (2016) investigated predictors of the RAA to understand health protection (e.g., dieting, condom use, physical activity) and health risk (e.g., smoking, binge drinking) behaviors. The meta-analysis showed the RAA accounted for 59% and 31% of the variance in intention and behavior, respectively. There has been a lack of studies using the RAA to understand gambling behavior. However, some studies have used other reasoned action models, such as the TPB, to understand the key predictors of gambling behavior (e.g., St-Pierre et al., 2014, 2015; Wu & Tang, 2012). In line with TPB theorizing, Wu and Tang (2012) found intention predicted behavior, and attitude, subjective norm and PBC predicted intention. St-Pierre et al. (2015) found intentions to gambling in adolescents to be influenced by attitude and PBC, but not subjective norm.

As was noted, it is at the belief level where the psychological foundation of behavior operates. Thus, it is insufficient to only identify the immediate antecedents of intention (e.g., attitude) and behavior (e.g., intention). Although studies have identified the key beliefs underlying several health risk (e.g., Epton et al., 2015; Rowe et al., 2016) and health protection (e.g., Hamilton et al., 2012; Vayro & Hamilton, 2016) behaviors using reasoned action theories, this has not been conducted in relation to gambling behavior. For example, although Wu and Tang (2012) identified attitude, subjective norm, and PBC to be influential in governing intention, the specific beliefs underlying these determinants are unclear. Thus, although research has identified some of the psychological factors underlying gambling behavior, the specific beliefs posited in the RAA remain unidentified. These beliefs are important when developing behavioral interventions as specific strategies and methods can be adopted to modify them. This can, perhaps, explain why gambling interventions using reasoned action theories have demonstrated limited success. St-Pierre et al. (2017) undertook an intervention targeting beliefs within the TPB (behavioral, normative, and control). The intervention, which included a video, did not change TPB determinants or gambling behavior. However, it is not clear whether the intervention targeted relevant beliefs, especially as the paper describes those targeted as ‘common gambling-related.... beliefs’, and not those using the formative work prescribed by Fishbein and Ajzen (2010).

In addition to this, research has not adopted the RAA which, as was highlighted, is the most contemporary model from the reasoned action tradition. The meta-analysis conducted by McEachan et al.

(2016) also showed the variance explained in intention and behavior exceeded the variance explained in studies adopting the TPB (e.g., Armitage & Conner, 2001; McEachan et al., 2011). Moreover, adopting the RAA enables differences in the predictive power of components to be understood. Research is therefore needed to identify the specific cognitions related to mobile gambling using the RAA. The identification of such cognitions could provide important information for intervention design.

### **Purpose**

The purpose of the studies was to adopt the RAA to identify the psychological determinants and beliefs underlying student participation in mobile gambling. Specifically, the studies aimed to: 1) identify the salient and key behavioral, normative, and control beliefs underlying students' mobile gambling behavior, and 2) understand the contribution of RAA determinants in predicting student participation in mobile gambling.

## **Study 1**

### **Material and methods**

#### **Participants and protocol**

Both studies were conducted in the UK where gambling is legal at the age of 18 years. In Study 1, a small convenience sample was used comprising students attending a public higher education university. Participants were recruited using a variety of methods including a university announcement, posters, and word-of-mouth. Interested participants were instructed to complete an online survey relating to the beliefs underlying their participation in mobile gambling. Before completing the survey, a welcome message was provided which included information relating to the study purpose, confidentiality, anonymity, and study contact details. Upon completing the survey, participants were provided with a thank you message, and relevant contact details were again provided. Both studies received full ethical approval from the school ethics board.

Thirty-five students (age  $M = 20.2$  years,  $SD = 1.40$ , Male  $n = 25$ , Female  $n = 10$ ) participated in Study 1. This sample size is within the typical range of previous elicitation studies and has been recommended by Fishbein and Ajzen (2010). The majority of students were Caucasian ( $n = 30$ : Asian,  $n = 5$ ), born in the UK ( $n = 33$ ), and in their first year of study ( $n = 18$ : second-year,  $n = 8$ : third-year,  $n = 6$ : postgraduate,  $n = 3$ ). They had participated in past mobile gambling behavior as follows: Never = 5; once a year = 2; 2-3 times per year = 1; every other month = 2; once a month = 7; 2-3 times per month = 6; weekly = 7; more than once per week = 2; every other day = 2; every day = 1.

#### **Measures**

Following the suggestions of Fishbein and Ajzen (2010), open-ended questions were used to identify the salient behavioral, normative, and control beliefs. Participants were given the following description of mobile gambling and were asked to adhere to the description throughout the survey: “There are many ways in which gambling can be undertaken using a mobile phone. These include using a mobile application, accessing a website, sending a text message, or making a call over the phone. When responding to the questions, please refer to this form of gambling being performed over the next month”. To identify the behavioral beliefs, participants were asked to list the advantages and disadvantages of the behavior (e.g., “What do you see as the advantages/disadvantages of you participating in mobile gambling?”). In relation to normative beliefs, participants were asked to identify those who would approve and disapprove of the behavior (e.g., “Please list the types of individuals or groups who would approve/disapprove of you participating in mobile gambling”). To identify the control beliefs, participants were required to state what would make it more easy and more difficult to participate in mobile gambling behavior (e.g., “Please list any factors or circumstances that would make it easy/difficult for you to participate in mobile gambling”).

The survey also took measures of age, gender, ethnicity, nationality, and education level. Past mobile gambling behavior was also measured using one item within the Gambling Quantity and Perceived Norms Scale (Neighbors et al., 2002). The item measures how often a person gambles (i.e., never, once a year, 2-3 times per year, every other month, once a month, 2-3 times per month, weekly, more than once per week, every other day, and every day), and participants were asked to relate this specifically to mobile gambling.

### **Analysis**

In line with Francis et al. (2004), content analysis was used to identify categories of positive and negative behavioral beliefs, of descriptive and normative influences, and of control beliefs. Two researchers independently coded frequently cited words and similar phrases into categories of beliefs. For example, the belief “Bonus offers and promotions” was created from responses such as “you usually get free bets when signing up” and “promotions happen quite frequently”. Discrepancies in categories were discussed between the two researchers and revisions made when appropriate. This resulted in a final coding frame of categories within the corresponding RAA belief-based heading. A frequency count was adopted to identify the modal salient beliefs. Specifically, to capture a wide range of underlying beliefs, the modal set was defined as those mentioned by at least 30% of participants (Vayro & Hamilton, 2016). Thus, beliefs elicited from at least 30% of participants were retained in the modal set and beliefs not mentioned by at least 30% of participants were not. Both researchers separately undertook the frequency count and inter-rater reliability was calculated using the

following: (agreed ratings/total coded) x100. Inter-rater reliability was established with 100% agreement between both researchers.

## **Results**

A total of 49 beliefs were elicited from the sample: 19 behavioral, 15 normative, and 15 control. When the 30% rule was applied, the modal set resulted in 27 beliefs (see Table 1): 11 behavioral, 9 normative, and 7 control beliefs.

[Insert Table 1 near here]

### **Behavioral beliefs**

As can be seen in Table 1, six modal salient behavioral beliefs were identified relating to the advantages of mobile gambling. These beliefs were ‘Exciting’, ‘Easily accessible’, ‘Bonus offers and promotions’, ‘Win money’, ‘Remain anonymous’, and ‘Adrenaline rush’. Five beliefs were identified as being disadvantages of mobile gambling: ‘Lose money’, ‘No cash deposit’, ‘Negative mood/depression’, ‘Requires phone on person’, and ‘Requires internet connection’.

### **Normative beliefs**

Table 1 shows the normative beliefs approving and disapproving mobile gambling. With regards to the former, these were ‘Friends at university’, ‘Friends outside university’, ‘Social club members’, ‘Sibling(s)’, and ‘Work colleagues’. In relation to those disapproving, the referents identified were ‘Parent(s)’, ‘Friends at university’, ‘Partner/Spouse’, and ‘Lecturers/Academic staff’.

### **Control beliefs**

As shown in Table 1, three control beliefs were identified within the modal set as making mobile gambling easier. These were ‘Funds in account’, ‘Free bets and promotions’, and ‘Access and availability of apps’. Four beliefs were stated as making mobile gambling more difficult: ‘No access to phone’, ‘Poor internet connectivity’, ‘Forget log in details’, and ‘Stringent age verification process’.

Following the identification of the modal salient behavioral, normative, and control beliefs, Study 2 identified the key beliefs associated with mobile gambling behavior. The study also examined the contribution of the RAA.

## **Study 2**

### **Materials and methods**

#### **Participants and procedure**

A cross-sectional design was used with a four-week follow-up. Participants were recruited from the same university used in Study 1. This was done through university announcements, posters, and word-of-mouth. Interested participants were instructed to complete an online survey at T1. The baseline questionnaire was completed by 473 participants (age  $M = 19.45$  years,  $SD = 1.95$ , Male  $n = 266$ , Female  $n = 207$ ). Participants were reminded at the end of the survey that they would be required to complete a second questionnaire four weeks later (T2) assessing their gambling behavior over the previous month. An email reminder with a link to the survey was also sent to participants, and pseudo codes were used to match data collected at both time points. This resulted in 388 participants completing both T1 and T2 assessments (82.3% retention). To check for attrition bias, a comparison was made between those completing both T1 and T2 measures and those only completing T1 assessments. There were no significant differences between responders and non-responders on RAA measures and past gambling behavior. Once the second questionnaire was completed at T2, participants were provided with debrief information and thanked for their participation.

### Measures

RAA constructs were assessed in accordance with the suggestions of Fishbein and Ajzen (2010). To achieve this, participants were provided with the same behavioral definition given in Study 1. Measures of the modal salient beliefs identified in Study 1 and the main RAA constructs were taken; attitude (instrumental and affective), perceived norm (injunctive and descriptive), PBC (capacity and autonomy), and intention. Mobile gambling behavior was also assessed. All items used 7-point Likert scales which varied in direction, unless stated otherwise. These were measured as follows.

T1: Three items measured instrumental attitude (e.g., “For me, participating in mobile gambling would be” Bad-Good, Cronbach’s  $\alpha = .90$ ), four items measured affective attitude (e.g., “For me, participating in mobile gambling would be” Unpleasant-Pleasant, Cronbach’s  $\alpha = .93$ ), three items measured injunctive norm (e.g., “People who are important to me think I should participate in mobile gambling”, Disagree-Agree, Cronbach’s  $\alpha = .95$ ), three items measured descriptive norm (e.g., “People who are like me participate in mobile gambling”, Disagree-Agree, Cronbach’s  $\alpha = .95$ ), four items measured capacity (e.g., “I am confident that I can resist participating in mobile gambling”, Disagree-Agree, Cronbach’s  $\alpha = .82$ ), three items measured autonomy (e.g., “Whether or not I participate in mobile gambling is totally up to me”, Disagree-Agree, Cronbach’s  $\alpha = .91$ ), and three items measured intention (e.g., “I intend to participate in mobile gambling”, Strongly agree-Strongly disagree, Cronbach’s  $\alpha = .95$ ).

To assess behavioral beliefs, participants were asked the extent to which they agreed with the statements provided (e.g., “For me, participating in gambling would be exciting”, Strongly disagree-Strongly agree). Normative beliefs comprised of injunctive and descriptive aspects and participants were again asked whether they agreed with the statements (e.g., “My friends outside university think that I should participate in gambling”, & “My friends outside university participate in gambling themselves”, scored Strongly disagree-Strongly agree). Control beliefs were measured by the item “How much would the following factors make you more or less likely to participate in mobile gambling...?”, followed by the specific control belief (e.g., “... when I have no access to my phone”, scored More likely-Less likely).

Similar to Study 1, one item within the Gambling Quantity and Perceived Norms Scale (Neighbors et al., 2002) was used to assess past gambling behavior. Participants also provided demographic characteristics of age, gender, ethnicity, education, and nationality.

T2: Three items were used to assess mobile gambling behavior at T2. These were adapted to fit the definition provided to students (i.e., mobile gambling over the next four weeks). Two items used 7-point Likert scales (e.g., “During the past month, how often did you participate in mobile gambling”, Never-Almost always) and one item required participants to identify the number of weeks the behavior was performed (scored 0 weeks, 1 week, 2 weeks, 3 weeks, and 4 weeks, Cronbach’s  $\alpha = .97$ ). These items were converted to z-scores, and then summed and averaged to provide one overall score for mobile gambling behavior.

### **Statistical analysis**

Item scores were reversed when required, meaning lower responses represented negative perceptions and higher scores reflected positive perceptions. The mean of each item representing the same construct was summed and averaged to give an overall score for each construct. A descriptive analysis of means, standard deviations, and Pearson’s correlations between RAA determinants, intention, and behavior was then conducted. Following this, a multiple linear regression was conducted between affective attitude, instrumental attitude, injunctive norm, descriptive norm, capacity, and autonomy in relation to intention. The same model was then performed between intention, capacity, and autonomy with regards to gambling behavior.

To identify the key beliefs, guidelines of von Haeften et al. (2001) and Hornik and Woolf (1999) were followed. First, correlations were used to identify the beliefs significantly correlating with intention and behavior. Following this, the beliefs correlating with intention and behavior were then entered into a multiple linear regression to identify the beliefs independently predicting the outcome variables. Given the usefulness of

both belief-intention (von Haeften et al., 2001) and belief-behavior (Sutton, 2002) relations, the key beliefs were identified by assessing the importance of both.

## Results

### Descriptive statistics

The means, standard deviations, and intercorrelations between study variables are shown in Table 2. Participants had a moderate level of intention ( $M = 3.64$ ,  $SD = 2.23$ ) and had participated in past gambling behavior as follows: Never = 78, once a year = 32; 2-3 times per year = 44; every other month = 42; once a month = 50; 2-3 times per month = 94; weekly = 57; more than once per week = 45; every other day = 15; every day = 16. At T2, participants had participated in gambling behavior an average of 2.22 times per week (0 weeks = 133; 1 week = 19; 2 weeks = 20; 3 weeks = 60; 4 weeks = 156). As can be seen in Table 2, all RAA constructs correlated with intention, such that strong intentions to gamble were associated with positive affective and instrumental attitudes, strong injunctive and descriptive norms, and weak capacity and autonomy. Gambling behavior at T2 was also correlated with all RAA constructs, such that gambling behavior was associated with positive affective and instrumental attitudes, strong injunctive and descriptive norms, and weak capacity and autonomy.

### Predicting intention and behavior

As can be seen in Table 3, the multiple regression showed RAA constructs accounted for 66% of the variance in intention,  $F(6, 472) = 155.47$ ,  $p < .001$ ,  $R^2 = .66$ . Affective attitude ( $\beta = .54$ ,  $p < .001$ ), instrumental attitude ( $\beta = .21$ ,  $p < .001$ ), and injunctive norm ( $\beta = .18$ ,  $p < .001$ ) all significantly predicted intention, with descriptive norm ( $\beta = -.00$ ,  $p = .96$ ), capacity ( $\beta = -.04$ ,  $p = .39$ ), and autonomy ( $\beta = -.03$ ,  $p = .49$ ) not significantly contributing to intention. With regards to behavior, the multiple regression showed capacity, autonomy, and intention accounted for 56% of the variance,  $F(387, 3) = 166.93$ ,  $p < .001$ ,  $R^2 = .56$ . Autonomy ( $\beta = -.15$ ,  $p < .05$ ) and intention ( $\beta = .70$ ,  $p < .001$ ) were significant predictors, whereas capacity was not ( $\beta = -.00$ ,  $p = .98$ ). The regression therefore showed behavior to be a product of strong intentions to gamble and weak autonomy.

[Insert Table 2 and Table 3 near here]

### Key beliefs

The means, standard deviations, and correlations of salient modal behavioral, normative (injunctive and descriptive), and control beliefs with intention and gambling behavior are shown in Table 4. The analyses found 10/11 behavioral beliefs ( $r_s(471) = .86$  to  $-.46$ ), 5/8 normative (injunctive) beliefs ( $r_s(471) = .80$  to  $.03$ ), 6/8 normative (descriptive) beliefs ( $r_s(471) = .79$  to  $-.10$ ), and all control beliefs ( $r_s(471) = .87$  to  $-.28$ ) significantly

correlated with intention. With regards to behavior, 9/11 behavioral beliefs ( $r_s(386) = .72$  to  $-.51$ ), 5/8 normative (injunctive) beliefs ( $r_s(386) = .67$  to  $.11$ ), 6/8 normative (descriptive) beliefs ( $r_s(386) = .73$  to  $-.13$ ), and all control beliefs ( $r_s(386) = .75$  to  $-.30$ ) were significantly correlated.

To identify the key beliefs, those beliefs significantly correlating with intention and behavior were then entered into a multiple regression. As is shown in Table 4, 3/10 behavioral beliefs ('Exciting' ( $\beta = .47$ ), 'Bonus offers and promotions' ( $\beta = .19$ ), and 'Adrenaline rush' ( $\beta = .11$ )), 3/5 normative (injunctive) beliefs ('Friends at university' ( $\beta = .29$ ), 'Friends outside university' ( $\beta = .28$ ), and 'Social club members' ( $\beta = .21$ )), 3/6 normative (descriptive) beliefs ('Friends at university' ( $\beta = .33$ ), 'Friends outside university' ( $\beta = .17$ ), and 'Social club members' ( $\beta = .32$ )), and 1/7 control beliefs ('Access and availability of apps' ( $\beta = .54$ )) predicted intention.

In relation to behavior, 5/9 behavioral beliefs ('Exciting' ( $\beta = .40$ ), 'Easily accessible' ( $\beta = .08$ ), 'Adrenaline rush' ( $\beta = .11$ ), 'Lose money' ( $\beta = -.15$ ), and 'Negative mood/depression' ( $\beta = -.17$ )), 3/5 normative (injunctive) beliefs ('Friends at university' ( $\beta = .23$ ), 'Friends outside university' ( $\beta = .15$ ), and 'Social club members' ( $\beta = .29$ )), 3/6 normative (descriptive) beliefs ('Friends at university' ( $\beta = .10$ ), 'Friends outside university' ( $\beta = .10$ ), and 'Social club members' ( $\beta = .51$ )), and 2/7 control beliefs ('Access and availability of apps' ( $\beta = .14$ ) and 'Stringent age verification process' ( $\beta = -.10$ )) were significant predictors.

[Insert Table 4 near here]

### Discussion

The purpose of the studies was to understand the psychological influences underlying student participation in mobile gambling using the RAA. To achieve this, Study 1 identified the modal salient behavioral, normative, and control beliefs, and Study 2 assessed the contribution of RAA constructs and identified the key beliefs underlying the behavior.

#### RAA constructs

The studies found support for the RAA to explain intention and behavior relating to mobile gambling. With regards to intention, the 66% accounted for by RAA constructs is considerably high, especially when compared to other reasoned action models such as the TPB. This variance could be due to the inclusion of all six subcomponents (McEachan et al., 2016).

It was found that affective attitude, instrumental attitude, and injunctive norm were important in governing intention. This suggests attitudes and the perceptions of significant others plays a considerable role in students' intentions towards mobile gambling. The results showed a particular importance of affective attitude.

This construct has been shown to have significant influence on many health-related intentions (Hagger et al., 2018; McEachan et al., 2011). Although not adopting the RAA, studies have also demonstrated the role of affect in gambling (e.g., Cummins et al., 2009; Simmons et al., 2016). For example, Cummins et al. (2009) found positive affect to relate to reckless betting. The specific beliefs underlying affect are discussed below within the key belief section.

In terms of behavior, RAA constructs accounted for 56% of the variance in mobile gambling. The findings suggest the role of intention and autonomy in governing students' gambling behavior. In accordance with the RAA and previous studies (McEachan et al., 2016), intention was the main predictor of, and positively associated with, behavior. Thus, the main influence on students' mobile gambling behavior was intention. However, autonomy had a negative relationship with behavior. Although not in line with the RAA and other social cognitive models which posit behavior to ensue when perceptions of autonomy are high, this is unsurprising. That is, individuals may participate in gambling when they have weak autonomy over the behavior. This is in line with other health risk behaviors. For example, Norman and Conner (2006) found a negative relationship between control and alcohol consumption, with drinking behavior more likely when participants had weak control.

### **Key beliefs**

A number of beliefs predicted intention and behavior. With regards to behavioral beliefs, the results showed feelings of excitement and adrenaline as key beliefs. Additionally, the prevalence of bonus offers and promotions was also a key belief predicting students' intention to gamble. Previous research has identified positive feelings to be associated with gambling in university students (Mond et al., 2019; Sherba & Gersper, 2017). For example, Sherba and Gersper (2017) found nearly 30% of their sample believed gambling to be exciting. It is therefore evident that these feelings are highly influential with regards to students' intentions to engage in mobile gambling. With there being many gambling companies competing to gain customers, bonus offers and promotions are often provided to entice betting (Hing et al., 2017). For example, new subscribers are often greeted with sign-up offers, free bets, and money-back guarantees. As students live off a relatively small budget (Stollak et al., 2011), these bonus offers and promotions could be particularly appealing, and therefore positively influence their intentions to participate in mobile gambling.

In relation to behavior, the ease of access to mobile gambling and the negative consequences of losing money and developing negative moods and depression were important behavioral beliefs. Gambling using a mobile phone removes a number of barriers associated with other forms of gambling and thus makes it highly

convenient (St-Pierre et al., 2014). Additionally, there are many ways a student can gamble on a mobile device including accessing a website, downloading an app, or making a phone call. With these benefits and given students often have a mobile phone on their person, the accessibility of mobile gambling is an important belief governing students' gambling behavior. Another important belief is the money that can be lost through gambling. It has been shown that almost one third of gamblers using the internet to gamble believe it is easier to lose money online (Gainsbury et al., 2012). This is a problem for students who typically have minimum income, struggle with budgeting, and often rely on loans during their time at university (Hordósy & Clark, 2019). It is therefore perhaps unsurprising that the potential to lose money was shown to weaken the prospect of engaging in mobile gambling behavior. Finally, gambling has been associated with negative mental health (Cowlshaw & Kessler, 2016). For example, gambling has been shown to correlate with depression in students (Martin et al., 2014). Thus, awareness of these outcomes appears to weaken the relationship with gambling behavior.

The key normative beliefs were friends in and outside of university and social club members. These three beliefs were the same for both injunctive and descriptive norms, and they predicted both intention and behavior. Thus, the approval of these referents and whether they themselves participated in gambling had a significant impact on the students' mobile gambling intentions and behavior. Students spend a lot of time with their peers and previous research has shown friends to be influential norms in a range of different behaviors. For example, Epton et al. (2015) found students were influenced by friends in relation to physical activity, binge drinking, fruit and vegetable consumption, and smoking. Students are also often members of different social clubs (e.g., sport, book, dancing, quiz), which may occur in or outside the university setting. For example, a student may belong to a university book club whilst competing in recreational sport outside of university. Therefore, the behaviors of these referents and whether they would approve or disapprove of mobile gambling has a significant impact on the intentions and behaviors of students. It is interesting to note that the influence of parents was not a key belief. Zhao et al. (2018) found the disapproval of parents to predict less gambling behavior. However, compared to the present studies which involved university students, their study used adolescents aged 10-19 years. Students attending university appear to be influenced by referents other than parents.

Finally, with regards to key control beliefs, the access and availability of mobile apps both predicted intention and behavior, and a stringent age verification process predicted behavior. As was previously mentioned, there are many benefits attributed to mobile betting, particularly when using apps. However, the present study suggests decreasing the access and availability of such apps would weaken mobile gambling

intentions and behavior. Finally, an age verification process that is more stringent had an impact on students' decision to participate in mobile gambling. Although university students in the UK are of legal age to gamble, they are still required to prove they meet this requirement. These checks are often quick and are of little inconvenience (Zhao et al., 2018). However, the present study suggests that a verification process which is more stringent could weaken the relation with gambling behavior.

### **Implications**

There are a number of implications from the studies. Affective attitude, instrumental attitude, and injunctive norm successfully predicted students' intention to engage in mobile gambling. Interventions could therefore focus on these three antecedents and, given intention successfully predicted behavior, doing so may decrease gambling mobile gambling behavior in university students. Affective attitude was the strongest predictor of intention which suggests interventions may have greater success targeting this construct. A focus could also be given to perceptions of autonomy. More specifically, interventions could ensure students have greater autonomy over their ability to not gamble. To address these important constructs, the studies provided information on the specific beliefs that should be targeted. For example, downplaying the experiential feelings of excitement whilst promoting the potential to develop negative moods could lead to a successful change in affective attitudes. Moreover, correcting misperceptions of the behavior of relevant referents could lead to a change in descriptive norm.

To facilitate the development of interventions, research in psychology has sought to identify relevant components that can be used to modify psychological determinants, known as behavior change techniques (Michie et al., 2013). These techniques can be used to manipulate the identified key beliefs. For example, the technique 'Information about emotional consequences', whereby the emotional consequences of the behavior are outlined, could be used to provide information relating to the potential consequences of depression and anxiety. The normative beliefs could be targeted using 'Social comparison' and 'Information about others' approval'. Autonomy over the behavior could be targeted through modifying the environment. More specifically, 'Restructuring the physical environment' through reducing the number mobile apps and making access more difficult could provide students with more autonomy over their behavior. These are only a few examples and intervention designers should visit the full list of techniques devised by Michie et al. (2013) when deciding on the specific content of an intervention.

### **Strengths**

The studies have a number of strengths. First, the studies investigated a behavior which has been neglected using insights from social cognitive theories (St-Pierre et al., 2015). Second, of the studies that have adopted social cognitive theories to understand gambling behavior, none have used the RAA, a theory which provides a greater explanation of social behavior (McEachan et al., 2016). Additionally, no study has undertaken the extensive, yet important research specified within the RAA relating to elicitation and prediction. Intervention effectiveness depends on manipulating relevant behavioral, normative, and control beliefs. The paper identified those most important and thus not only explains gambling behavior but provides relevant information for changing it.

### **Limitations**

Despite these strengths, the studies are not without limitations. One limitation is the specific form of gambling behavior studied and the subsequent lack of generalizability. However, to identify relevant psychological influences, the RAA recommends precisely defining the behavior. Second, the study relied on self-report meaning accurate appraisals of gambling behavior may not have been identified due to response bias (Furnham, 1986). Third, the study was undertaken at a single institution in the UK and students from other universities may have different psychological profiles. Finally, the cross-sectional study design means causality cannot be inferred.

### **Conclusion**

Mobile gambling is a behavior with serious detrimental consequences, especially for undergraduate students who are frequent mobile phone users. The two studies used the RAA to identify the psychological determinants and beliefs underlying the behavior. It was found that intention and autonomy contributed to gambling behavior, and intention was influenced by affective attitude, instrumental attitude, and injunctive norm. Furthermore, a number of beliefs underlying RAA constructs were found to predict intention and behavior. Future research could address students' gambling behavior by targeting the identified key beliefs. Successfully doing so may result in a decrease in the number of students participating in mobile gambling.

### **Declarations**

**Funding:** There was no funding attached to the study.

**Conflicts of interest/Competing interests:** The author declare no conflict of interest or competing interests.

**Consent to participate:** All participants provided informed consent prior to participation.

**Availability of data and material:** Data is available upon reasonable request.

**Ethics approval:** Approval was obtained from the school ethics board. The procedures used in this study adhere to the tenets of the Declaration of Helsinki.

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**Tables**

Table 1. *Modal salient behavioral, normative, and control beliefs relating to mobile gambling behavior.*

Belief	Belief category	Belief	N	%
Behavioral	Advantages	Exciting	32	91
		Easily accessible	30	85
		Bonus offers and promotions	23	65
		Win money	20	57
		Remain anonymous	15	42
	Disadvantages	Adrenaline rush	12	34
		Lose money	30	85
		No cash deposit	24	18
		Negative mood/depression	18	51
		Requires phone on person	15	42
Normative	Approve	Requires internet connection	14	40
		Friends at university	32	91
		Friends outside university	29	82
		Social club members	25	71
		Sibling(s)	18	51
	Disapprove	Work colleagues	14	40
		Parent(s)	32	91
		Friends at university	23	65
		Partner/Spouse	16	45
		Lecturers/Academic staff	13	37
Control	Easier	Funds in account	28	80
		Free bets and promotions	25	71
		Access and availability of apps	20	57
	Difficult	No access to phone	32	91
		Poor internet connectivity	26	74
		Forget log in details	17	48
		Stringent age verification process	15	42

Table 2. *Descriptive statistics and intercorrelations between RAA constructs, intention, and mobile gambling behavior.*

Variable	2.	3.	4.	5.	6.	7.	8.	<i>M</i>	<i>SD</i>
1. Affective attitude	.56**	.54**	.56**	-.12**	-.19**	.75**	.63**	3.88	1.96
2. Instrumental attitude		.75**	.73**	-.15**	-.21**	.65**	.57**	3.55	2.10
3. Injunctive norm			.72**	-.12**	-.18**	.63**	.58**	3.59	2.14
4. Descriptive norm				-.11*	-.17**	.59**	.54**	3.55	2.06
5. Capacity					.87**	-.13**	-.24**	4.22	2.00
6. Autonomy						-.18**	-.30**	3.95	2.03
7. Intention							.73**	4.19	2.22
8. T2 behavior								2.22	1.77

*Note.* \* $p < .05$ , \*\* $p < .01$ .

Intention  $N = 473$

T2 Behavior  $N = 388$

Behavior at T2 is presented using the item assessing the number of weeks participated within the previous month.

Table 3. *Predicting gambling intention and mobile gambling behavior.*

Variable	B	$\beta$	$R^2$	Adjusted $R^2$
		<i>Intention</i>	.66	.66
Affective attitude	.61	.54***		
Instrumental attitude	.22	.21***		
Injunctive norm	.19	.18***		
Descriptive norm	-.00	-.00		
Capacity	-.05	-.04		
Autonomy	-.04	-.03		
		<i>T2 behavior</i>	.56	.56
Capacity	-.00	-.00		
Autonomy	-.07	-.15*		
Intention	.32	.70***		

Note. \* $p < .05$ , \*\*\* $p < .001$

Intention N = 473

T2 Behavior N = 388

RAA GAMBLING BEHAVIOR

Table 4. Summary of the correlations and multiple regression analyses predicting intention and behavior from beliefs.

	Beliefs	Intention		T2 behavior	
		<i>r</i>	$\beta$ s	<i>r</i>	$\beta$ s
Behavioral	Remain anonymous	.81**	.07	.64**	-.05
	Exciting	.86**	.47***	.72**	.40*
	Easily accessible	.79**	-.01	.66**	.08**
	Bonus offers and promotions	.83**	.19**	.69**	.11
	Win money	.69**	.14	.54**	.03
	Adrenaline rush	.59**	.11*	.51**	.11*
	Lose money	-.34**	-.05	-.39**	-.15***
	Requires internet connection	-.38**	.07	-.44**	.05
	Negative mood/depression	-.46**	-.10	-.51**	-.17*
	No cash deposit	-.09*	.00	-.04	----
Normative (injunctive)	Requires phone on person	-.07	----	.09	----
	Friends at university	.80**	.29***	.67**	.23**
	Friends outside university	.79**	.28***	.64**	.15*
	Work colleagues	.57**	.09	.49**	.12
	Sibling(s)	.05	----	.07	----
	Social club members	.78**	.21***	.66**	.29***
	Partner/Spouse	.09	----	.11*	.10
	Parent(s)	.03*	.01	.00	----
	Lecturers/Academic staff	.03	----	-.03	----
	Friends at university	.79**	.33***	.65**	.10***

RAA GAMBLING BEHAVIOR

Normative (descriptive)	Friends outside university	.77**	.17*	.64**	.10*
	Work colleagues	.40**	.07	.40**	.10
	Sibling(s)	.20*	.04	.19*	.08
	Social club members	.75**	.32***	.73**	.51***
	Partner/Spouse	-.03	-----	-.03	-----
	Parent(s)	.02	-----	.05	-----
	Lecturers/Academic staff	-.10*	-.04	-.13**	-.08
Control	Access and availability of apps	.87**	.54***	.75**	.14*
	Free bets and promotions	.85**	-.16	.75**	.45
	Funds in account	.80**	.18	.71**	.13
	No access to phone	.15**	.11	.17**	.00
	Forget log in details	.15**	-.00	.19**	.06
	Poor internet connectivity	.18**	-.02	.21**	-.03
	Stringent age verification process	-.28**	-.04	-.30**	-.10*

*Note.* \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Intention N = 473

T2 Behavior N = 388

Figures

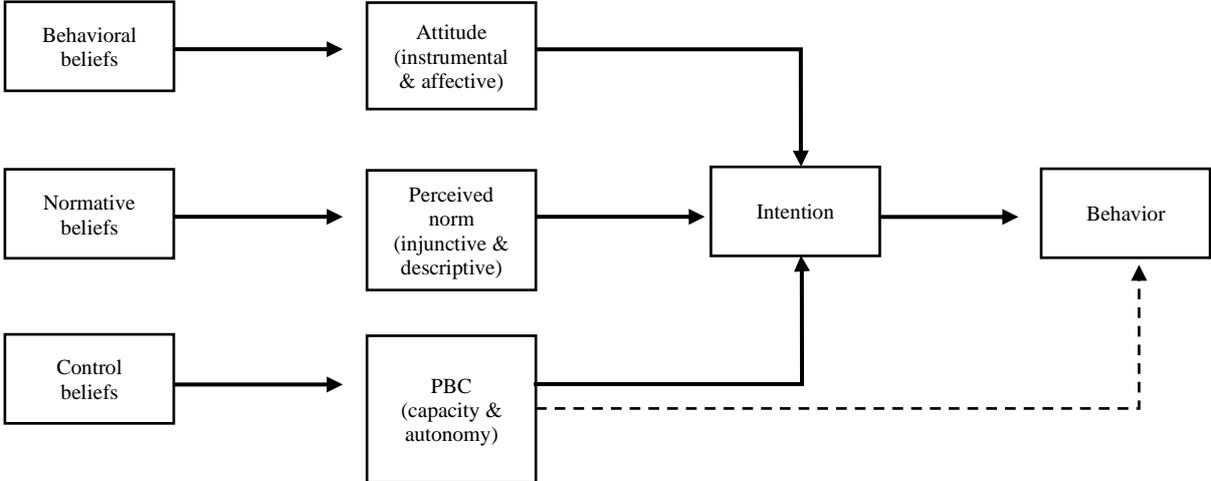


Fig. 1 The RAA (Fishbein & Ajzen, 2010).