

Predicting intention to play random and skill-based electronic gambling machines using the  
Theory of Reasoned Action

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## **Abstract**

Hybrid gambling machines (HGMs) are a new gambling activity that combine the skill element of traditional video games with the random pay-out schedule of electronic gaming machines (e.g., slots). Developed to increase gambling by younger generations that favor video games, there is currently no empirical evidence regarding consumer views of HGMs to guide policy-decision making related to this new gambling activity. We use the Theory of Reasoned Action (TRA) to investigate factors that motivate intentions to play these machines in two studies: 1) among 43 casino patrons and 2) among 184 US online participants residing in states where HGMs were available. Both samples completed surveys after exposure to actual or explanations of HGMs and slots. Analyses supported the prediction that positive attitudes towards HGMs and positively perceived subjective norms would predict intention to play HGMs and slots. The results suggest that the TRA is a useful framework for explaining intentions to gamble on traditional slot machines and new HGMs. The absence of research on HGMs makes these studies an important and necessary contribution to the empirical literature on machine gambling. Understanding individuals' intentions to engage with HGMs is important to guide development of harm-minimisation practices and evaluate impact of policy changes.

*Keywords:* Gambling intention; gambling attitudes; skill; theory of reasoned action; electronic gaming machines, skill-based gaming machines;

## **Attitudes and perceived subjective norms predict intention to play new gambling machines**

Gambling is a popular entertainment activity, legally available and regulated in most countries around the world. Participation rates remain consistently high with most adults engaging in some form of gambling (Dowling et al., 2016; Salonen, Alho, & Castrén, 2017; Wardle, 2015; Welte, Barnes, Tidwell, Hoffman, & Wieczorek, 2015a). Electronic gaming machines (EGMs) are one of the most popular gambling activities and are particularly important to government policy due to the taxation revenue they generate, related employment, and their strong association with gambling-related problems (Eadington, 1999; Vong & Wong, 2013). There continues to be high engagement with EGMs among core customer segments which are typically middle-age to older adults (Abbott, Romild, & Volberg, 2018; Dowling et al., 2016; Welte, Barnes, Tidwell, Hoffman, & Wieczorek, 2015b). Younger adults including the Millennial generation are thought to prefer more interactive and skill-based games and gambling activities that may be able to more closely compete with the complexity of video games (Suh, Alhaery, Abarbanel, & McKenna, 2017). Predicting gambling engagement is a complex task due to the many personal and environmental factors involved (Brochado, Santos, Oliveira, & Esperança, 2018; Griffiths & Delfabbro, 2010; Prentice, 2014; Wong & Prentice, 2015). Consequentially, it is useful to develop and test models that can simplify this process, and provide decision makers with useful, non-obvious, and reliable insight across population groups and game types (Manzi, 2010). Understanding the dominant motivations of behaviour is an essential step in developing successful interventions to facilitate gambling as an entertainment activity while minimising harms.

Individuals' attitudes towards gambling are shaped by many factors, including their past experiences and environments, and the anticipated excitement or enjoyment associated with the

activity (Coulter, Hermans, & Parker, 2013; Prentice, 2014; Prentice & Wong, 2015). In addition to individual attitudes, social norms are believed to exhibit another pressure on gambling intentions. Numerous factors, including public health impacts and religious beliefs (Bernhard, 2007; Coulter et al., 2013; Roehl, 1999), are believed to influence the social acceptability of gambling, and related social pressure or support may influence participation decisions (Lam, 2006; Perdue, Long, & Kang, 1999) in addition to individual motivations and preferences. In this article, we examine whether a well-tested model of behavioural intention, the Theory of Reasoned Action (TRA; Fishbein & Ajzen, 1975), explains intentions to play EGMs.

Empirically validating a theoretical framework that can be generalised across new hybrid and traditional gambling machines may enable both the development of popular gambling activities, and policies that facilitate sustainable, rather than potentially problematic, gambling. By understanding the precedents of consumer intentions, firms, policymakers, and other stakeholders can better structure public education and responsible gambling programs. We exploit the introduction of a new form of electronic machine gambling, hybrid gambling machines (HGMs), and a type of EGM that has been available for a relatively long period of time, slot machines, and test whether predictions from the TRA explain consumer intention.

### **The Theory of Reasoned Action**

The TRA (Fishbein & Ajzen, 1975; see Figure 1) is a well-established social-cognitive model used to explain and predict human behaviour. The TRA posits that the determinant of any behaviour is an individual's intention to perform that behaviour. Behavioural intentions refer to an individual's motivation, expressed as a conscious plan or decision, to exert effort to engage in that behaviour. Behavioural intentions are predicted by two factors: attitudes towards the behaviour and subjective norms concerning the given behaviour. Attitudes towards the behaviour

are determined by an interaction between salient beliefs about the consequences of the behaviour and an evaluation of the consequences of the behaviour. Subjective norms are determined by normative beliefs (an individual's perception of how salient others perceive the given behaviour) and motivation to comply with these normative beliefs. With respect to gambling, the TRA would assert that intention to gamble would be predicted by positive attitudes about the outcomes of gambling (e.g., winning money or an entertaining experience) and acceptance of gambling by significant others. Intention to gamble would predict actual gambling behaviour.

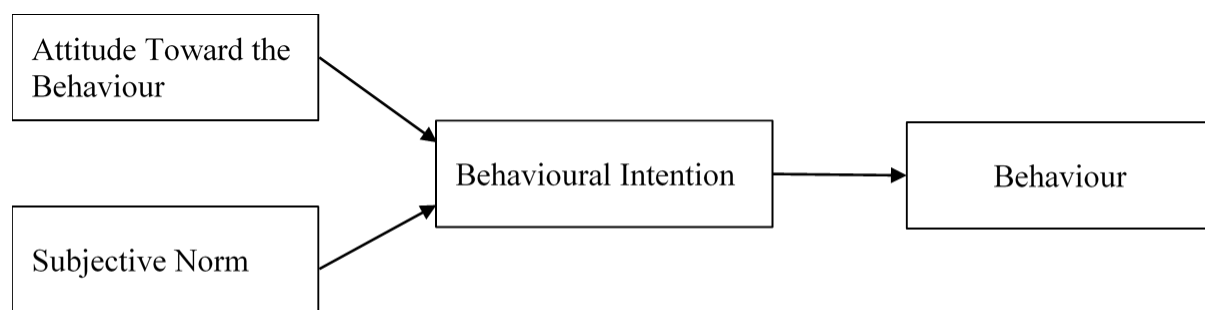


Figure 1. Fishbein and Ajzen's (1975) Theory of Reasoned Action.

The TRA was extended to a Theory of Planned Behaviour (TPB) by its original authors through the addition of perceived behavioural control as an antecedent to behavioural intention (Ajzen, 1985; Ajzen & Fishbein, 1980). Perceived behavioural control refers to one's confidence in their ability to successfully perform the target behaviour and was believed to be a useful addition to predicting intentions (Ajzen, 1991). Cummings & Corney (1987) first proposed the adaptation of Fishbein & Ajzen (1975) model to gamblers, suggesting that gambling intention could be modelled using gambling attitudes and subjective norms. They noted that this was different than predominant gambling intention research, which emphasized the role of demographic and personality variables.

Although several studies supported the role of attitudes, subjective norms, and perceived behavioural control in predicting intention to gamble, numerous applications of the TPB to

gambling failed to find support for the role of perceived behavioural control in predicting gambling intention (Flack & Morris, 2017a, 2017b; Oh & Hsu, 2001; Sheeran & Orbell, 1999; Walker, Courneya, & Deng, 2018; Wu & Tang, 2012). The TRA appears to be more suitable as a theoretical framework for examining predictors of gambling intention.

Empirical gambling research has generally validated the TRA, although the majority of related studies focus on secondary school and undergraduate university student samples (Hing, Vitartas, & Lamont, 2013; Hing, Vitartas, Lamont, & Fink, 2014; Lee, 2013; Moore & Ohtsuka, 1997; Shin & Montalto, 2015; Thrasher, Andrew, & Mahony, 2011) or samples comprised of regular gamblers considering gambling on specific games familiar to the participants, including sports (Hing et al., 2013) and lottery products (Wood & Griffiths, 2004). One study examined casino gambling intention broadly (Oh & Hsu, 2001), but this occurred in a period that preceded modern integrated casino resorts and the conversion of many mechanical machines to video machines that simulate all outcomes. There remains a gap in understanding of intention among non-gamblers, who are often the focus of innovation in technology, and intention to use EGMs as a broad category of games.

### **Electronic Gaming Machines**

EGMs in their various configurations (e.g. 'slot machines', 'poker machines', 'video lottery terminals', 'fixed-odd betting terminals', 'pachi-slots'), are a common form of gambling found in casinos and local venues internationally. EGMs usually depict a series of spinning reels where a specific sequence of pictorial icons notifies players of a win. Historically, these outcomes are entirely based on chance and although return to players are standardised at around 90%, they are designed such that most players lose or win small amounts and very few players win moderate or large jackpots (Schwartz, 2013; Turner & Horbay, 2004).

EGMs are likely the most important form of gambling from a social standpoint. They are found in a variety of tourism and hospitality environments, including integrated resorts, regional casinos, cruise ships, airports, and gaming hospitality environments. Past estimates suggest that slot machines account for roughly 80% of casino revenue (Turner & Horbay, 2004), EGMs account for approximately half of all gambling expenditure in Australia (*Australian Gambling Statistics (34th edition)*, 2018), and in Japan, the most saturated market for machine gambling, there is one EGM for every 28 people (Ziolkowski, 2016). However, since roughly the late-1990s, there has been a decline in the number of individuals who engage in EGM gambling (*Gambling (Inquiry Report No. 50)*, 2010; Welte et al., 2015a). Increasing numbers of individuals now demonstrate a preference for gambling activities that emphasise skill and experience in determining the outcome (Armstrong, Thomas, & Abbott, 2018).

In response, gaming equipment manufacturers began to develop HGMs, which appear to be developed to reach an untargeted segment of the population who are not interested in traditional EGMs. HGMs (also referred to as video game gaming machines, interactive gambling machines, and skill-based gaming machines) combine skill elements of traditional video games with EGMs, allowing the player to influence outcomes from the random number generator (Delfabbro, King, & Gainsbury, 2019). HGMs fall under the broader category of skill-based gaming and refer to the subset that are automated and resemble EGMs (Lapetina, 2017). There are many varieties of skill-based gambling machines incorporating different types of gaming elements (e.g., shooter games, sports games, or puzzles). These were developed to appeal to a young-adult cohort who have grown up with video games in addition to adults who enjoy casual mobile games and would find machines based on retro arcade-games attractive (Chen, Shoemaker, & Zemke, 2013; Hwang, 2015). At the time of our study in 2018, the only U.S.

jurisdictions allowing skill-based gambling machines were New Jersey, Connecticut, Nevada, and California. Other gambling regulators are reportedly considering whether to permit HGMs, however, the lack of empirical research on these machines limits evidence-based policy formation. Concerns about HGMs include that gamblers will over-emphasise the role of skill leading to loss chasing and attempts to ‘beat’ the machines and that targeting a new cohort of gamblers may increase rates of problem gambling in the population.

From a theoretical standpoint, the extent to which HGMs replicate EGMs in terms of how and why individuals engage with these machines is not known. It remains unclear how attitudes and subjective norms contribute to intention to gamble on HGMs, however we expect that favourable attitudes and normative beliefs will positively contribute towards intention. Our first hypothesis considers this issue,

H<sub>1</sub>: Attitudes and social norms are positively related to gamblers’ intention to gamble on HGMs.

In addition to populations of gamblers, it is also unclear whether attitudes and subjective norms predict intention in populations of both gamblers and non-gamblers, as studies have tended to focus on one group or the other. As innovation in the gambling industry is increasingly targeted towards large sectors of the population who are not active gamblers, it is helpful to consider whether prevailing understanding of gambling intention formation applies in more heterogeneous groups. This leads to our second set of hypotheses,

H<sub>2a</sub>: Attitudes and social norms are positively related to gamblers’ and non-gamblers’ intention to gamble on HGMs.

H<sub>2b</sub>: Attitudes and social norms are positively related to gamblers’ and non-gamblers’ intention to gamble on slot machines.



Although several studies support the efficacy of the TRA in explaining intentions to engage in specific forms of gambling (Hing et al., 2013, 2014; H. S. Lee, 2013; Oh & Hsu, 2001; Sheeran & Orbell, 1999; Wood & Griffiths, 2004), to our knowledge, attitudes and social norms have not been explored as antecedents to intention in the gambling category of EGMs.

Our investigation includes two studies. First, we recruited casino gamblers in a field study and explore their intentions to play a new form of gambling, HGMs. Second, we recruited an online community sample of gamblers and non-gamblers and explore whether formation of intentions is similar for a familiar form of machine gambling, slot machines, and a new form, HGMs. As the availability of HGMs is quite limited, it is anticipated that the number of people who have been exposed to skill-based gambling machines is small relative to EGMs overall. The TRA accommodates the difficulties in investigating actual gambling behaviour, instead investigating intention as the precursor to behaviour.

The primary contribution of this paper is to identify factors considered by individuals in the formation of gambling intentions. Understanding how behavioural intentions are formed is important to management practice, the design of public policy, and an effective public health strategy. For example, if social perceptions influence intentions, public health strategies can target broad population cohorts and use tactics to communicate and shape norms around acceptable behaviour related to sustainable rather than excessive gambling, as other domains have done successfully (Fell & Voas, 2006). Similarly, identification of the individual attitudes that drive behaviour can guide strategies to influence relevant cognitions. Importantly, evaluation of the success of interventions should measure impact on relevant attitudes in addition to behavioural change, which may be more difficult to measure and slower to occur. By validating the TRA using this novel form of gambling, researchers, clinicians, and policy makers will also

have support for a framework to consider how individuals may behave in response to the introduction of new gambling products, or the development of a new gambling modality altogether. This study will make an important contribution to the academic literature as the first empirical investigation of HGMs.

## **Study One**

### **Aims**

Study One aimed to investigate the utility of the TRA in explaining intentions to play HGMs amongst a sample of casino players who had received guided demonstrations of HGMs. To our knowledge, this is the first investigation of the TRA using gamblers surveyed in the field. It was hypothesised that intention to gamble on hybrid gambling machines would be related to: 1) positive attitudes towards hybrid gambling machines, and 2) positive perceived subjective norms about hybrid gambling machines.

### **Method**

#### **Participants and procedure**

The study was approved by the [redacted] Human Research Ethics Committee and all participants provided informed consent. Forty-three participants were recruited from a large resort-style casino in the US. Participants ranged in age from 31 to 74 ( $M=53.3$ ,  $SD=11.9$ ). The group was 55.8% female. Among respondents, 58.1% reported having never played HGM in the past year, while only 3.0% reported having never played slot machines in the past year. The casino held a promotional event where their loyalty card members were eligible to receive \$15 in free play and were shown how to play a new HGM that simulated a virtual basketball shot. Skill influenced outcomes through effective timing of pressing a single button, relative to on-screen events. Customers were able to retain any winnings after a series of trials guided by a product

expert from the game manufacturer. The expert discussed the game with customers, explained how it worked, and demonstrated the various features. After ending their play session, customers were intercepted by the second author or a different manufacturer employee and asked if they were willing to complete a survey related to their views of HGMs. Surveys (see supplemental materials) were then self-administered on a tablet computer. No compensation or incentive was provided for completing the survey.

### **Measures**

*Intention.* Participants indicated their agreement with two statements concerning their intentions to gamble on HGMs within the next year. Items were arranged on a five-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*). Higher scores indicate a greater intention to gamble, and the two items showed good consistency using Cronbach's alpha ( $\alpha$ ),  $\alpha = .94$ .

*Attitudes.* Three items assessed the appeal, excitement, and enjoyableness of HGMs. Items were assessed on a 5-point Likert scale (e.g., 1 = *very unappealing*, 5 = *very appealing*). Higher scores indicate a more positive attitude, and the three items showed good consistency,  $\alpha = .76$ .

*Subjective norms.* Participants indicated their agreement with three statements regarding their perceptions of how others would view their gambling on HGMs (e.g., "In general, most people I know would not have a problem with me gambling on skill-based gambling machines") on a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*). Higher scores indicate a more positive perceived subjective norm, and the three items showed good consistency,  $\alpha = .81$ .

### **Results and Discussion**

Our analysis in this study is correlational due to the limited sample size; we use a structural approach in study 2 (Kenny, 2015)(Kenny, 2015). Both the attitude scale,  $r(41) = .66$ ,

$p < .001$ , and the subjective norm scale,  $r(41) = .66$ ,  $p = .004$ , are positively correlated with the intention scale, supporting H<sub>1</sub>. Correlations of specific questions are shown in Table 1. After Bonferroni adjustments to account for multiple pairwise tests, all questions are positively correlated with other questions from their respective construct categories (intention, attitudes, and social norms). Correlations between constructs also appear reasonable. Intention is positively correlated with most measures of attitudes and subjective norms, further supporting H<sub>1</sub>. The only measure that is unrelated to at least one intention measure asks respondents whether people important in their life would gamble on HGMs, themselves.

*Table 1 - Spearman's correlation coefficients and summary statistics of field data (hybrid gambling machines)*

	1	2	3	4	5	6	7	8
1 - Intention (Feasibility)	1							
2 - Intention (Desire)	.86*	1						
3 - Attitude (Engagement)	.54*	.63*	1					
4 - Attitude (Excitement)	.62*	.61*	.54*	1				
5 - Attitude (Enjoyability)	.56*	.45	.56*	.75*	1			
6 - Subj. Norms (Problematic)	.58*	.37	.37	.45	.58*	1		
7 - Subj. Norms (Approval)	.48*	.43	.46*	.49*	.49*	.70*	1	
8 - Subj. Norms (Participation)	.41	.31	.15	.38	.36	.54*	.61*	1
Observations	43	43	43	43	43	43	43	43
Mean	3.77	3.56	3.56	3.84	3.79	3.84	3.74	3.51
Standard Deviation	1.07	1.05	1.08	0.84	0.89	0.97	0.93	1.03

\*  $p < 0.05$ ; a Bonferroni adjustment is applied to significance estimates

## Study Two

### Aims and Hypotheses

Study Two aimed to expand on Study One's findings by examining the efficacy of the TRA in predicting intentions to play both HGMs and slot machines. Participants were an online sample of US participants of both gamblers and non-gamblers.

## Method

### Participants and procedure

The study was approved by the [redacted] Human Research Ethics Committee and all participants provided informed consent. The sample in Study Two was recruited using Amazon Mechanical Turk, an online marketplace for sourcing tasks to workers. Compared to convenience samples, Mechanical Turk participants are more demographically diverse (Casler, Bickel, & Hackett, 2013) and more representative of the US population (Berinsky, Huber, & Lenz, 2012; Buhrmester, Kwang, & Gosling, 2011). To ensure high quality responses, participants were restricted to those with a Mechanical Turk approval rating of at least 95 percent, consistent with practices adopted in previous research (Goodman, Cryder, & Cheema, 2013). Participants had to meet the following inclusion criteria: a) be at least 21 years of age, b) speak fluent English, c) be North American, and d) Live in or have visited a state where skill-based gaming machines are legal (NV, NJ, CT, or CA) in the past 12 months.

A total of 232 participants agreed to take the survey. There were 48 responses that were removed due to failing one or more attention checks (Rouse, 2015) or failing to complete the survey, leaving 184 responses for analysis. While larger samples will improve power on some tests of fit, other tests such as the likelihood ratio test are almost always statistically significant if sample sizes are larger than 400 observations (Kenny, 2015; Satorra & Saris, 1985). We estimate our power using the *Computing power and minimum sample size for RMSEA* tool (Preacher & Coffman, 2006) assuming an alpha of 0.05, 174 degrees of freedom, a 'null' root mean squared error of association (RMSEA) from (Oh & Hsu, 2001) of 0.074, and an alternative 'good' RMSEA of 0.05 from (MacCallum, Browne, & Sugawara, 1996). Our estimated power in this scenario is subjectively high at 0.947.

The sample was disproportionately male (67.93%) with a mean age of 34.0 ( $SD=9.3$ ), and self-described as ‘white’ (57.30%), ‘asian’ (18.38%), ‘american indian or alaskan native’ (8.65%), ‘hispanic or latino(a) or spanish origin’ (8.11%), ‘black or african american’ (7.03%) or ‘other’ (0.54%). The sample was mostly full-time workers (78.38%). It also included part-time workers (9.19%), unemployed (4.86%), students (3.24%) and others (4.32%). The median household income range was \$50,000 to \$70,000. A total of 44 participants (23.91%) reported having not gambled at all on slot machines during the past year, and 104 (56.52%) reported having not gambler at all on HGMs in the past year.

To ensure that participants understood the nature of conventional EGMs and HGMs, they were shown separate online videos that demonstrated the features of slot machines and HGMs. They were then asked questions related to intention, attitudes, and subjective norms for both slot machines and HGMs. They were asked demographic and behavioral questions (see supplemental materials for complete questionnaire).

### **Measures**

Similar measures from Study One were included in Study Two, including HGM intention ( $\alpha = .80$ ), attitudes ( $\alpha = .90$ ), and subjective norms ( $\alpha = .75$ ). The same measures were also included for slot machine intention ( $\alpha = .88$ ), attitudes ( $\alpha = .92$ ), and subjective norms ( $\alpha = .83$ ).

*Attention check.* Three attention check items (e.g., “please select *strongly agree*”) were included throughout the survey.

### **Results and Discussion**

To test  $H_{2a}$ , we estimated a structural equation model (SEM) for HGMs using latent variables from attitude, subjective norm, and intention questions, based on the TRA. The model is displayed in Figure. Both attitudes,  $\beta=0.77$ ,  $z=7.60$ ,  $p < .001$ , and subjective norms,

$\beta=0.28$ ,  $z=2.56$ ,  $p=.01$ , significantly predict intentions to play HGMs. Overall the model fit is good. The likelihood ratio test fails to imply missing paths,  $\chi^2(17)=22.20$ ,  $p=0.18$ ; the root mean squared error of approximation is 0.04, indicating good fit (MacCallum et al., 1996); the standardized root mean squared residual is 0.039, again indicating a good fit (Hu & Bentler, 1999); and the coefficient of determination is subjectively high,  $R^2=0.98$ .

*Table 2 - Spearman's correlation coefficients and summary statistics of Mechanical Turk sample (hybrid gambling machines)*

	1	2	3	4	5	6	7	8
1 - Intention (Feasibility)	1							
2 - Intention (Desire)	.58*	1						
3 - Attitude (Engagement)	.48*	.52*	1					
4 - Attitude (Excitement)	.41*	.53*	.61*	1				
5 - Attitude (Enjoyability)	.49*	.64*	.68*	.69*	1			
6 - Subj. Norms (Problematic)	.36*	.34*	.29*	.21	.28*	1		
7 - Subj. Norms (Approval)	.29*	.38*	.23	.29*	.37*	.51*	1	
8 - Subj. Norms (Participation)	.35*	.42*	.21	.24	.37*	.43*	.51*	1
Observations	185	185	185	185	185	185	185	185
Mean	3.97	4.02	4.22	4.16	4.13	3.96	3.75	3.65
Standard Deviation	1.07	1.02	0.81	0.83	0.86	0.88	1.00	1.06

\*  $p<0.01$ ; a Bonferroni adjustment is applied to significance estimates

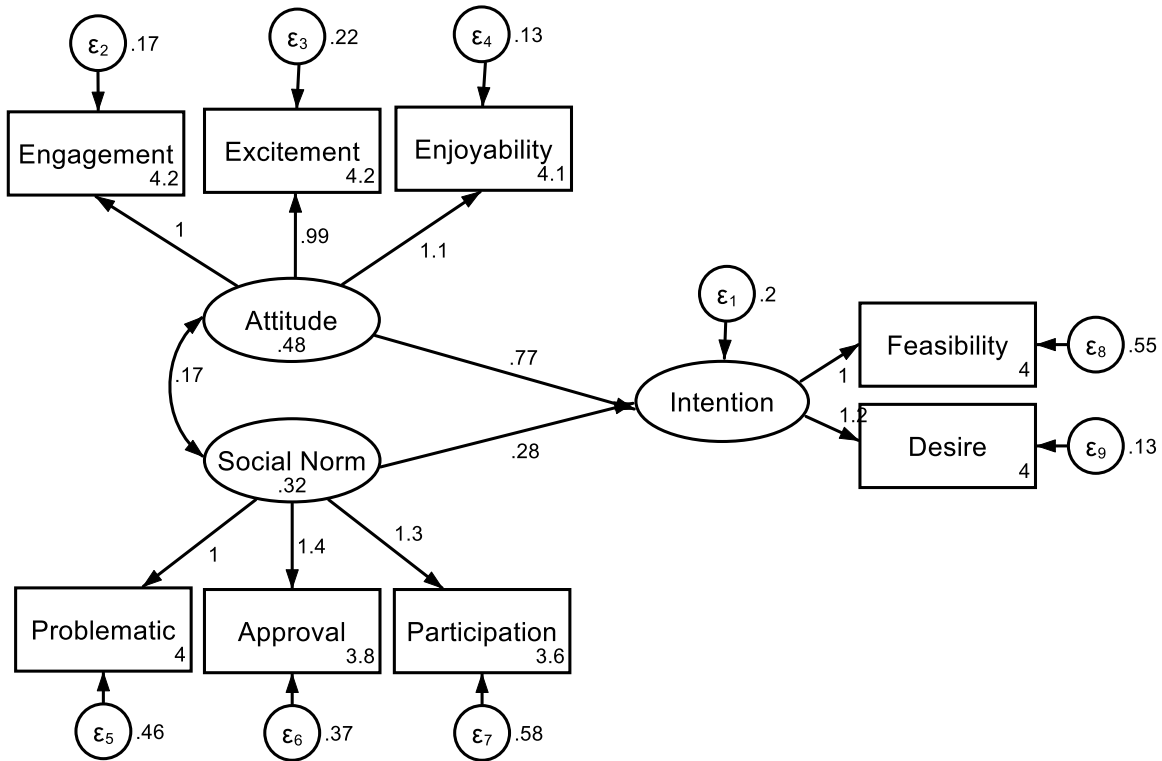


Figure 2 - SEM of latent attitude and social norm variables predicting intention to gambling on HGMs

To help understand the generalizability of the TRA in gambling and test  $H_{2b}$ , we replicated the SEM for similar slot machine related questions (Figure 3). Again, we observe that attitudes,  $\beta=0.70$ ,  $z=9.35$ ,  $p<.001$ , and subjective norms,  $\beta=0.30$ ,  $z=3.13$ ,  $p=.002$ , significantly predict intention, with similar effect sizes as in the HGM model. However, we find that the measures of model fit are mixed. The likelihood ratio test rejects the assumption of no missing paths,  $\chi^2(17)=57.16$ ,  $p<0.001$ , and the root mean squared error of approximation is 0.11, exceeding typical fit thresholds (MacCallum et al., 1996), but the standardized root mean squared residual is 0.05, indicating good fit (Hu & Bentler, 1999), and coefficient of determination is high,  $R^2=0.99$ . One potential explanation for the differences may be related to the higher correlations between attitudes and subjective norms in the slot machine model. The covariance of those latent variables is higher in the slot SEM,  $cov=.50$ ,  $z=5.99$ ,  $p<0.001$ , than in the hybrid gambling machine SEM,  $cov=.17$ ,  $z=4.23$ ,  $p<0.001$ .



Table 3 - Spearman's correlation coefficients and summary statistics of Mechanical Turk sample (Slot Machines)

	1	2	3	4	5	6	7	8
1 - Intention (Feasibility)	1							
2 - Intention (Desire)	.67*	1						
3 - Attitude (Engagement)	.62*	.69*	1					
4 - Attitude (Excitement)	.50*	.67*	.69*	1				
5 - Attitude (Enjoyability)	.54*	.65*	.76*	.75*	1			
6 – Subj. Norms (Problematic)	.46*	.43*	.39*	.28*	.41*	1		
7 – Subj. Norms (Approval)	.44*	.48*	.44*	.37*	.46*	.63*	1	
8 – Subj. Norms (Participation)	.53*	.56*	.48*	.42*	.53*	.50*	.67*	1
Observations	185	185	185	185	185	185	185	185
Mean	3.81	3.69	3.64	3.70	3.75	3.83	3.48	3.54
Standard Deviation	1.16	1.31	1.14	1.11	1.04	1.05	1.07	1.14

\* p<0.01; a Bonferoni adjustment is applied to significance estimates

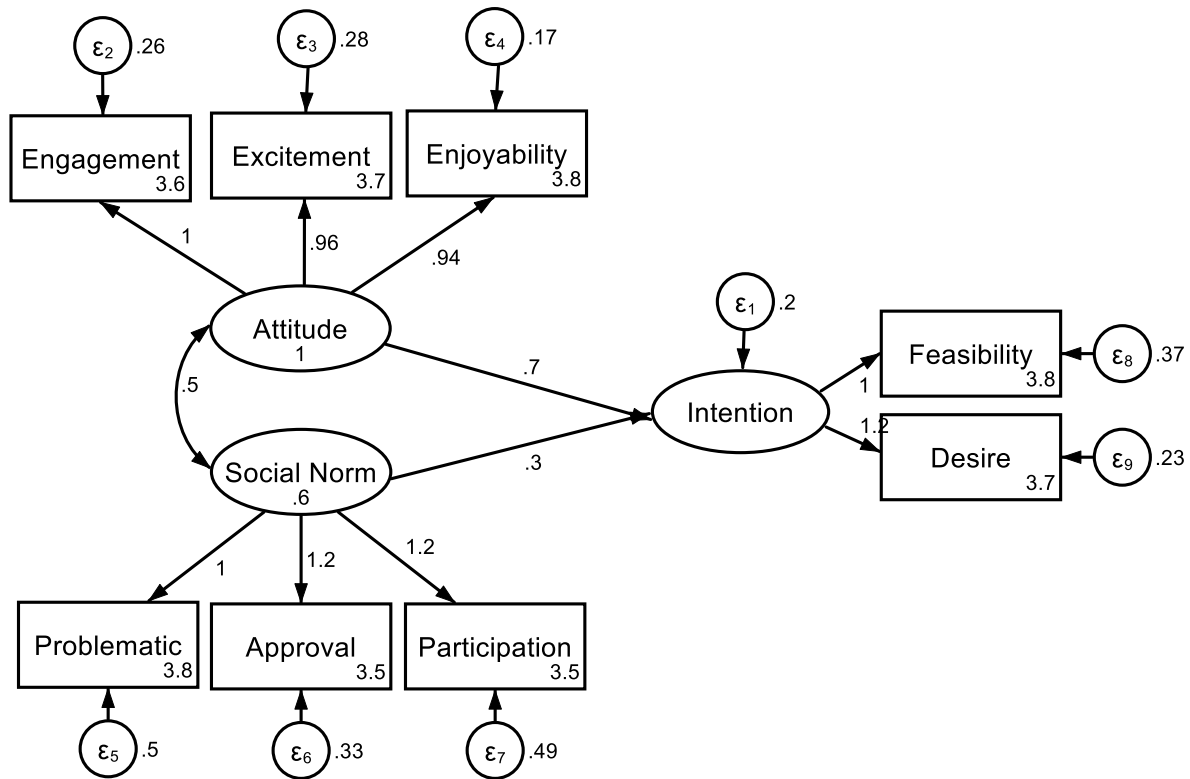


Figure 3: SEM of latent attitude and social norm variables predicting intention to gamble on slots

## General Discussion

Literature on the role of attitudes and subjective social norms in the formation of gambling intentions has shown a consistent effect but has generally been limited to student samples or a narrow range of familiar games. In this study, we exploited the recent introduction of a new form of electronic machine gambling to explore whether intentions predict engagement in a new form of gambling with a skill component. As hypothesised, Fishbein and Ajzen's (1975) TRA predicted intention to gamble on HGMs amongst a small group of gamblers in an ecologically valid environment, and in a structural model that was administered to a diverse online community sample. These studies both showed evidence that intention to gamble on slot machines and HGMs is related to personal attitudes and subjective norms. More positive attitudes and stronger subjective norms towards HGMs predicted a stronger intention to gamble on these machines within the next year. These findings suggest that intentions to play HGMs, and perhaps EGMs more generally, can be predicted by a rational decision-making model.

The HGM SEM fit the respondent data well, however, the slot machine SEM fit was mixed, showing reasonable fit on some measures but unreasonable fit on others. One explanation of the poorer performing slot machine model may be related to the higher observed correlation between attitudes and subjective norms. While HGMs only emerged across limited jurisdictions in 2017, slot machines have likely been available for the entire adult lifetime of our respondents. There may therefore have been more feedback between slot machine attitudes and social norms over time. Social norms towards slot machine gambling may have influenced attitudes, and personal preferences towards slot machine gambling may have shaped selection of social groups (Binde, 2010). This could lead to the higher correlation observed in our model, and the partly confounding results.

The absence of research on HGMs make these studies an important and necessary contribution to the empirical literature on machine gambling and an important first step in understanding participants' intentions to engage with HGMs. Overall, these results lend support to the generalisability of the TRA in early gambling exposure. The utility of the TRA in predicting intention to gamble on EGMs contributes to, and extends, previous research on intentions to gamble and gamble in specific games, including sports (Hing et al., 2013, 2014), the lottery (Sheeran & Orbell, 1999; Wood & Griffiths, 2004) and casino games (Lee, 2013; Oh & Hsu, 2001). The results add to the literature by exploring combined populations of gamblers and non-gamblers, which has previously only been done in a limited capacity with predominantly student samples. This is an important finding to previous research and supports the use of the TRA as a theoretical foundation for understanding gambling behaviours.

This study makes an important contribution as the first empirical study of HGMs, including patrons with real world experience of these machines, which are as yet unregulated and unavailable outside of the US. It provides a validated framework to guide policies for the new machines and demonstrates that this framework may be appropriate for other gambling activities, including those updated by new technology. As scholars and policymakers develop harm reduction interventions in gambling, they should consider how current and potential gamblers will form their attitudes and social norms. For example, given the importance of individual attitudes, public health campaigns or industry messaging should focus on the intrinsic entertainment value of gambling to promote sustainable gambling and to avoid misconceptions such as illusions of control (Lee, Chen, Song, & Lee, 2014). Communications aimed at a broader population cohort may focus on emphasising engaging in strategies to proactively manage gambling such as setting limits and seeing gambling as an infrequent activity, emphasising social

enjoyment aspects and taking breaks. In addition, public health strategies should encourage the perception of positive social norms related to engaging with consumer protection tools, and gambling at affordable limits. Importantly, this research provides a useful guide for the evaluation of any harm minimisation policy or practice. It is often difficult to measure behavioural change, which may take a long time to occur. The positive support for the TRA shows that evaluation of consumer attitudes is an appropriate way to determine initial effectiveness of policies, to ensure that these are having the desired impact.

### **Limitations and Future Research**

Our empirical results aligned closely with our theoretical suppositions, nonetheless, the cross-sectional design of the studies cannot determine the direction of causality underlying the relationships between gambling attitudes and subjective norms and gambling intentions. Gambling-related beliefs may simply reflect future gambling intentions and not necessarily predict future gambling intentions. Further evidence is therefore needed before firm conclusions can be drawn as to causal pathways. Future research should examine the temporal nature of the relationships between the TRA variables by including follow-up measures of gambling intention. In addition, although the present studies have improved upon past research that has utilised student samples by recruiting an ecologically valid sample and a community, they may not be representative of all potential HGM players. The present samples were of an older mean age and some HGMs are likely to target millennials who appear to be relatively uninterested in traditional EGMs (Chen et al., 2013).

As part of the casino study, only those who had self-selected to play in a live HGM demonstration were invited to participate in the survey, indicating an existing level of interest in the machines. Further, only loyalty-card members were eligible for the bonus, meaning that the

sample was likely more frequent gamblers. Thus, additional research is needed to test the TRA in the context of HGMs amongst larger, more diverse populations, including adolescent and young adult samples and those who may not be interested in playing the machines.

Future research may examine whether intentions to gamble on HGMs predict gambling frequency and problem gambling, given that past research demonstrates intentions to gamble predict actual gambling behaviour and problem gambling (Larimer & Neighbors, 2003; Moore & Ohtsuka, 1997; Oh & Hsu, 2001). Last, this study found mixed results in the fit of the TRA to slot machine gambling, which may be related to feedback between subjective norms and attitudes over time. Future researchers could consider studying similar models in populations with less exposure to machine gambling, such as certain immigrant populations or jurisdictions that recently legalized machine gambling.

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