

Risk Propensity, Gambling Cognition and Gambling Behavior: The Role of Family and Peer Influences

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Abstract

Drawing on learning style theory (Curry, 1983), the present study examines the influence of risk propensity on gambling behavior by focusing on the mediating role of gambling cognition and the moderating role of both familial monitoring and peer gambling. Applying a survey of 207 local residents and tourists in Macau, we found that risk propensity positively related to gambling behavior through its influences on facilitating gambling cognition controlled by familial monitoring; and gambling cognition also positively linked to gambling behavior moderated by peer gambling. Moreover, the moderated path analysis suggests that familial monitoring weakened risk propensity's direct influence on gambling cognition, and peer gambling strengthened the relationship between gambling cognition and gambling behavior. Theoretical and practical implications of the results are discussed.

Keywords: risk propensity, gambling cognition, gambling behavior, family influence, peer influence

1. Introduction

Gambling behavior has received considerable research attention from academicians and therapists. Gambling behavior refers to betting on specific games, such as cards, dice, lotteries, roulette, races and sport events. Numerous studies have presented the prevalence rates of gambling in various areas and pointed out the severity of problem gambling (Shaffer et al., 1999; Ladouceur, 1991; Dickerson et al., 1996; Wong & So, 2003). In Macau, gambling has always been one of the most conspicuous issues. On one hand, Macau is the only place where casino gambling is legalized in China. The administration decided to open up the casino sector in order to promote economic growth. Since then, gambling has been serving as the main contributor to Macau's economy. Owing to the large quantity of tourists from mainland China, Macau has overtaken Las Vegas as the world's No. 1 gambling market. Tax revenue from gaming sector in year 2013 is over 134 million MOPs, accounting for 86.4% of total government revenue (Macau Statistics and Census Service). On the other hand, gambling can become a form of addiction for some individuals, which may induce serious gambling problems for many people. Pathological gambling can lead to a range of severe familial and social problems.

Many countries are recognizing the harm from gambling behavior (e.g., Storer et al., 2009; Delvin & Walton, 2012; Lobsinger & Beckett, 1996; Dowling et al., 2014). A study of Macau's people participation in gambling activities conducted by Macau University (2014) revealed that Macao residents' gambling participation rate in 2013 was 49.5%. Additionally, the survey found that personal background is associated with gambling behavior. To deeper understand the problem of gambling, researchers have completed a large amount of reviews and analyses.

A substantial body of research has been conducted on risk propensity personality and risk taking behavior. The results suggested that various forms of risky behavior tend to correlate with higher risk-taking personality trait score (e.g., Samuals et al., 2004; Zuckerman, 2007; White et al., 1994). If such personality traits are associated with real-world risk-taking in various domains, high levels of these traits should be significantly associated with a behavioral preference for risk. Maclaren et al. (2015) found that gambling motive and distorted belief mediate the personality trait and gambling behavior among electronic gaming machine. Drawing on learning style theory

(Curry, 1983) which illuminates the connection of personality, cognition, and behavior, we developed a model that incorporates gambling cognition as mediator in order to gain a more complete understanding the relationship between risk propensity and gambling behavior.

Previous gambling research has explored the interaction effects among internal components of gamblers such as emotions, stress or impulsivity (Tang, Chua, & Wu, 2011). We are interested in testing the interplay among external components, namely familial monitoring and peer gambling. Low and Espelage (2014) found that parental monitoring protects adolescents from deviant behavior, thus buffered the effects of community violence exposure on perpetration and victimization. As for peer influence, Allen et al. (2006) figured out that individual with a lower resistance to peer influence is prone to engage in risk-taking or antisocial behavior. Maxwell (2002) analyzed peer influence across five risky behavior-smoking, alcohol consuming, marijuana use, tobacco chewing, and sex debut. He found that a random same sex peer predicts a teen's risky behavior initiation.

In this study, we offer a theoretical framework presented in Figure 1 that is designed to enhance our understanding of the way in which gambling cognition mediates relationship between risk propensity and gambling behavior. We then empirically examined this framework to evaluate the mediating role. In the process, our analyses serve to respectively examine the moderating effects of familial monitoring and peer gambling in different context. The present study explains and synthesizes conclusions obtained in extant literature and provides new insights regarding the theoretical connection between risk propensity and gambling behavior.

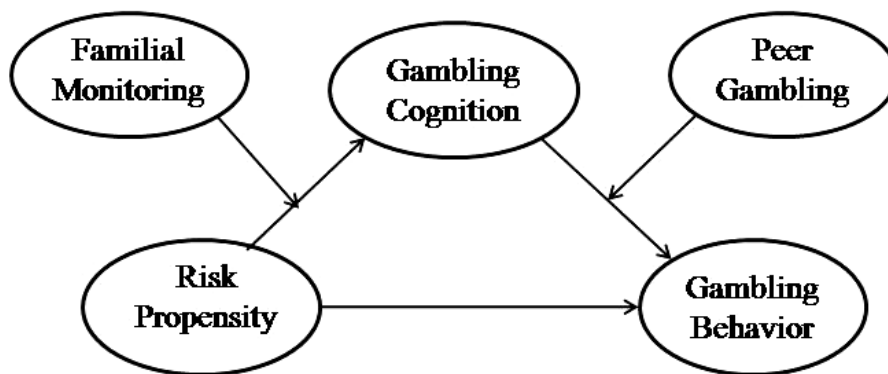


Figure 1. Theoretical model of study prediction

Finally, the sample of our study deserved mentioned. Dominant studies on gambling have been conducted from Western samples. As one of the largest gambling market in the world, Macau has rarely been subject to sophisticated empirical studies. Ozorio and Fong (2004) estimated the prevalence rates of gambling in Macau and analyzed the ratio of different groups of gamblers. Tao et al. (2011) collected data from Macau to develop an indigenous inventory GMAB (Gambling Motives, Attitudes and Behaviors) for Chinese gamblers. In our study, we tested some critical components related to gambling behavior using the data collected from Macau.

2. Theory and Hypotheses

2.1 Risk Propensity and Gambling Behaviors

A key feature of gambling is that it involves risky choice, in that outcomes are typically both uncertain, and potentially harmful. Evidence from risk and health behavior research suggests that when faced with risky choices, agents' perceptions of risk play a significant role in determining intention, and subsequent behavior (Ajzen, 2011; Breakwell, 2007; Morgan et al., 2002; Oei & Jardim, 2007; Siegrist et al., 2005). Knowles et al. (1973) found that subjects who had a greater preference for gambling were viewed by peers as risk-takers, were less likely to avoid research sessions dealing with risk, more likely to report risky driving behavior, and were more likely to smoke cigarettes.

Theoretically, risk propensity positively relates to gambling behaviors for several reasons. First, gambling behaviors can be regarded as a situation-specific risk taking domain. MacCrimmon and Wehrung (1988, 1990) suggested that risk taking tended to be situation-specific. These situations with which respondents had demonstrated different degrees of risk taking included games of chance/gambling, financial investment, business decisions, and personal decisions. Ozorio and Fong (2004) concluded that gambling and investment were two situation-specific risk taking domains. Furthermore, on the basis of Zaleskiewicz's (1999, 2001) stimulating-instrumental risk taking behavior, individuals were found to exhibit what they labeled Stimulating Risk Taking (SRT) behavior in stimulating situations of high excitatory value like gambling. While in instrumental economic situations like investing in the stock market or in one's own education, individuals were found to behave in what was labeled as Instrumental Risk Taking (IRT) way. Weber, Blais and Betz (2002) suggested that both SRT and IRT were found related contributing significantly and positively to gambling.

Second, gambling may be seen as not only a form of risk-taking but also sensation-seeking. Extant literature has found that high sensation seekers choose riskier strategies (e.g., gambling, dangerous driving) compared to low sensation seekers (Mishra & Lalumière, 2009; Waters & Kirk, 1968). Sensation-seeking describes a preference for varied, stimulating experiences and a willingness to engage in risk-taking in order to obtain such experiences (Zuckerman, 2007). Wong and Carducci (1991) reported that the risks related to gambling involvement have a tendency to increase levels of enjoyment/arousal preferred by individuals who are high in sensation-seeking. Furthermore, Powell et al. (1999) attempted to determine whether risk-taking and sensation-seeking differentiated pathological from problem gamblers. Drawing support from Lesieur and Blume's (1987) South Oaks Gambling Screen (SOGS), which is widely used measure in the assessment of pathological gambling, they indicated that pathological gambling was strongly related to risk-taking and sensation seeking behavior. Thus, higher levels of risk propensity are more likely lead to stronger sensation-seeking, resulting in choices of riskier strategies such of gambling (Cloninger, 1987). In other words, as gambling may bring high levels of sensation as a risk-taking domain, higher risk takers may be more willing to engage in gambling to obtain or absorb this enjoyment/arousal.

Third, support for the relationship between risk approach motivation and the choice to approach a risky situation (e.g., gambling), has been provided in the previous research. With assessments via Risk Taking Questionnaire (RTQ), Knowles (1976a, 1976b) indicated that the RTQ was positively correlated with the decision to participate in a gamble as high risk subjects had a greater likelihood of wagering a dollar in the hypothetical situation than low risk approach subjects. Furthermore, Knowles (1976c) found that high-risk takers viewed the risk as more appealing and significantly less risky compared to low-risk takers. In other words, individuals with high-risk taking may be more willing to enter a risk situation because they do not perceive it as risky as do low-risk approach ones. Therefore, as discussed above, we hypothesize the following:

Hypothesis 1: Risk propensity is positively related to gambling behavior.

2.2 Gambling Cognition and Gambling Behavior

On the basis of the three-layered "Onion Model" theory designed by Curry (1983, 2000), individual's cognition is related to his behavior. The "Onion Model" theory situates existing style theories in an integrated model that distinguishes three levels, organizing as the layers of an onion: an inner "cognitive personality style" layer, a middle "information-processing style" layer, and an outer "instructional preference" layer. The outermost layer labeled as "instructional preferences" refers to "the individual's choice of environment in which to learn" (Curry, 1983, p. 8). As the layer interacts most directly with external features, it is regarded as the most observable layer, linking individual's internal features such as cognition and personality with behavior (Cools & Bellens, 2012). In this study, based on the "instructional preferences" theory, we hypothesize that gamblers' cognitive distortions are related to gambling behaviors.

Support for the role of cognitive variables in gambling behavior has been reviewed by various literature (Ladouceur & Walker, 1996; Toneatto, 1999). They suggested that problem gamblers hold cognitive distortions, leading to their inability to adequately control their gambling. Identifications of gambling-related cognitive distortions include two major aspects: the gambler's fallacy, which is the belief that future outcomes can be predicted on the basis of previous outcomes (e.g., if heads has come up on 10 consecutive tosses of a coin, then tails is more likely to come up on the next toss), and an illusion of control, referring to the belief that one can influence the outcome of a chance-determined event (Langer, 1975). Furthermore, Steenbergh et al. (2002) designed the Gamblers' Beliefs Questionnaire (GBQ) to assess this two-factor conceptualization of gambling-related cognitive distortions (Spurrier & Blaszczynski, 2014; Ladouceur & Walker, 1996; Walker,

1992), including the “Luck/Perseverance” and “Illusion of Control” factors. Therefore, in this study, we develop this two-factor model of gamblers’ cognitive distortions linking with gambling behaviors.

Theoretically, two perspectives can be explained into the reasons for the positive relationships between gamblers’ cognitive distortions and gambling behaviors. First, higher level of gambler’s fallacy on “Luck/Perseverance” has been supported to be a significantly factor in increasing risk-taking behaviors, with more positive expectations on future outcomes based on past outcomes (Spurrier & Blaszczynski, 2014; Gillespie, Derevensky, & Gupta, 2007b; Wickwire, Whelan, & Meyers, 2010). Walker (1992), for example, explained that gambler’s fallacy on “Luck/Perseverance” leads gamblers to overestimate their chances of winning. Furthermore, Gillespie, Derevensky, and Gupta (2007a, 2007b) found that Probable Pathological Gamblers (PPGs) and at-risk gamblers more strongly anticipated positive outcomes (winning; enjoyment; self-enhancement) than social gamblers, who in turn anticipated positive outcomes more than non-gamblers. Wong and Tsang (2012) and Wickwire, Whelan and Meyers, (2010) also suggested that Chinese adolescents with greater gambling involvement reported higher expectations of positive outcomes (social benefit and material gain) and some negative outcomes (being out of control). Thus, with higher levels of fallacy on “Luck/Perseverance”, gamblers may overestimate their chances and exhibit more positive expectations on outcomes, which in turn increase their gambling behaviors.

Second, “Illusion of Control” factor, as a skill orientation toward gambling, has been linked to gambling behavior (Dixon, 2000; Griffiths, 1994; Ladouceur & Walker, 1996; Langer, 1975; Walker, 1992). For example, Langer (1975) found that individuals placed higher wagers on games that fostered an illusion of control. Delfabro and Winefield (2000) found that players who staked more money also exhibited more thoughts, which in turn would suggest they erroneously assessed their ability/skills to control the game. Similarly, Davis, Sundahl and Lesbo (2000) suggested that gamblers placed higher bets on their own dice rolls relative to when others rolled the dice, with beliefs that they obtained more skills/controls to influence outcomes. More recently, Martinez et al. (2011) also validated a causal model where the knowledge of another person’s win increased gamblers’ illusion of control with the belief that the other person had some control over the outcomes, which in turn encourages risk taking. Therefore, a direct causal link between gamblers’ cognitive distortions and gambling behaviors remains to be empirically established in this study.

Hypothesis 2: Gambling cognition is positively related to gambling behaviors.

2.3 The Mediating Role of Gambling Cognition

The “Onion Model” theory provides a theoretical basis for understanding how gambling cognitive distortions may mediate the relationship between risk taking and gambling behaviors. In Curry’s onion model (1983), the innermost layer is defined as “cognitive personality style”, which is an approach to adapting and assimilating information. He further explained “this adaptation does not interact directly with the environment; rather this is an underlying and relatively permanent personality dimension. As Farley (1991) described the personality dimension of sensation seeking, arousal seeking, and risk taking as “Type T Personality”, risk taking can be regarded as a dimension of personality.

The second layer is named “information-processing style” and refers to the individual’s approach to assimilate information (i.e., orientation, sensory loading, short-term memory, enhanced association, coding system, long-term storage), creating their own cognitions (Cools & Bellens, 2012). Thus, the link between these two layers-“cognitive personality style” and “information-processing style” can be explained that specific personality will result in the seeking for this matching information. On the basis of Curry’s model, people with higher level of risk-taking as a specific personality domain, are more willing to collect and adapt information, which related to risk-taking behaviors such as gambling. When gamblers with higher risk-taking are exposed to the gambling-related distorted and deceptive information (e.g., “the knowledge and skill in gambling contribute to the likelihood that it will make money”), they are more likely to generate cognitive distortions, which in turn lead to more risk-taking behaviors in gambling. Caron and Ladouceur (2003), for example, showed that gamblers exposed to an accomplice’s deceptive verbalizations (e.g., “now, I played really badly!”) took more risks. Given that they assemble more information about luck or chances in their experience, they are easier to foster any gambling-related cognition such as “gambling is challenging” and “gambling is more than just luck”.

“Instructional preferences”, the outermost layer, is most observable and most influenced layer, referring to “the individual’s choice of environment in which to learn” (Curry, 1983, p. 8). In this layer, individuals may have specific behaviors in the matching environment which provides them correlating information to learn. Thus, the link between the second layer-“information-processing style” and the outermost layer-“instructional preferences”,

can be describe that specific information collection and processing will create corresponding cognition, which in turn lead to its observable behaviors. On the basis of Curry's theory, gamblers with greater cognitive distortions are more likely to take risky behaviors such as gambling. For example, gamblers with higher level of fallacy on cognitive distortions are more likely to expect more positively on future outcomes, leading to increasing risky behaviors (Spurrier & Blaszczynski, 2014; Wickwire, Whelan, & Meyers, 2010). Gamblers may also behave with overestimation of their skills and abilities on expecting the outcomes, and then they are more willing to take risk in the gambling (Davis, Sundahl, & Lesbo, 2000).

According to Curry's model, these three layers—"cognitive personality style", "information-processing style" and "information-processing style" can be linked into a integrated mechanism explaining the relationship between risk taking, gambling cognitive distortions and gambling behaviors. In the gambling scenario, individuals with higher level of risk-taking personality may be more willing to seek and obtain information related to risk taking such as gambling, influencing the creation of cognitions about gambling, which in turn lead to the effects on gambling behaviors. Thus, according to the above logic, we expect gambling cognitive distortions to play a mediating role in the risk propensity-gambling behavior relationship. That is, risk taking, through their positive impact on gambling cognitive distortions, increases gambling behaviors.

Hypothesis 3: Gambling cognition mediates the relationship between risk propensity and gambling behaviors.

2.4 The Moderating Role of Familial Monitoring

Prior research has noted the boundary effects of familial monitoring on individual's responses (Hartos et al., 2000; Stice, Barrera, & Chassin, 1993). As proposed at the outset, the process of cognitions generation can be moderated by the extent of familial monitoring—monitoring from family members. Familial monitoring refers to the "familial awareness of the other family members' activities and (communication) to the other family members that the family is concerned about, and aware of, the other family members' activities" (Dishion & McMahon, 1998, p. 65). Effective monitoring is based on clearly communicating to the other family members' aspects of both structure (i.e., guidance, support, and limit-setting) and tracking (supervision of whereabouts and activities) (Vitaro et al., 2008; Hartos et al., 2000). In the context of high familial monitoring, family provides both instrumental (e.g., financial supports and skill-related advice) (Vitaro et al., 2008) and socio-emotional (e.g., involvement, trust, warmth, and nurturance) (Darbyshire, Oster, & Carrig, 2001; Jacob et al., 2000; Jacobson & Crockett, 2000; McGee et al., 2000) support.

Familial monitoring is negatively associated with a wide range of individuals' problem cognitive outcomes, such as antisocial personality, tendency to gambling and risky driving (Hartos et al., 2000; Vachon et al., 2004). In terms of adolescents, low familial monitoring could play a role with regard to adolescents' adjustment problems because adolescents with family members who are not aware of how and with whom their children spend their free time have more opportunities to engage in antisocial activities. Furthermore, poor familial monitoring has been shown to predict affiliation with deviant peers (Dishion et al., 1991) which in turn results in both antisocial behavior and depressive feelings. Consistent familial monitoring has also been long implicated in shaping peer-group selection, in part due to fewer opportunities to have negative peer relationships, which in turn lead to fewer externalizing behaviors (e.g., Low & Espelage, 2014; Li, Fiegelman, & Stanton, 2000; Mason et al., 1996; Patterson, De-Baryshe, & Ramsey, 1989).

On the basis of Curry's model (1983), personalities affect the creation of cognitions through the link between "cognitive personality style" and "information-processing style", which suggests the process of information seeking, collection and processing. During this period, familial monitoring may serve as an important mechanism "information filtering" (Low & Espelage, 2014). Individuals with high risk propensity are more willing to collect risk-taking related information such as gambling knowledge and skills. With effective familial monitoring which regarded as a "peer-group selecting shaper", they are less likely to be exposed to their accomplices' gambling-related distorted and deceptive verbalizations, which, in turn lead to less cognitive distortions generations. Therefore, according to Curry's theory, we hypothesize that familial monitoring can be regarded as a moderator, affecting the relationship between risk propensity and gambling cognitive distortions during the period of gamble-related information processing. We proposed the following:

Hypothesis 4: Familial monitoring moderates the relationship between risk propensity and gambling cognition such that the positive relationship is weaker when familial monitoring is high as opposed to low.

2.5 The Moderating Role of Peer Gambling

Scholars commonly refer to peer influence as being direct peer behaviors, peer pressure and other social processes with peers, which involve an influence from the peers to individuals (Smorti, Guarnieri, & Ingoglia, 2014; Arnett, 2007). As individuals move into adults they develop greater independence from their parents and their peer group become more relevant. The increased importance of peers leads individuals to conform within their peer group and to adopt the styles, values, and interests of their friends (Brown, 2004).

Similar with gambling cognitive distortions, which tend to facilitate gambling behaviors, peer gambling which regarded as peer groups with gambling behaviors, also leads to the increasing of gambling as a form of risky behaviors (e.g., Martinez et al., 2011; Browne & Brown, 1994; Hardoon & Derevensky, 2001). On the basis of social learning theory (Bandura, 1977), susceptibility to peer modeling is thought to encourage individuals' tendency to engage in risky behaviors (Gardner & Steinberg, 2005; Jaccard, Blanton, & Dodge, 2005). Peer modeling may include direct encouragement of risky behaviors, by instigating individuals to engage in risky activities, or may also be indirect, by encouraging individuals to become involved in risky behaviors because they perceive that the peer group would regard such behaviors as desirable and expected, and then adopt their styles, values and behaviors to match that peer group.

According to Curry's model, the outset layer is most influenced, referring to "the individual's choice of environment in which to learn" (Curry, 1983, p. 8). Individuals with high gambling cognitive distortions are more willing to behave learning process in gamble-related environments. On the basis of social learning theory, in the gamble-related circumstances, peer group with heavy gambling behaviors may directly encourage more risky gambling behavior, through affecting the others with gambling cognitive distortions by positive gambling outcomes, or deceptive verbalizations (Smorti, Guarnieri, & Ingoglia, 2014; Caron & Ladouceur, 2003). For example, Mushquash (2004) reported that about half of 182 respondents from the general public felt the urge to gamble after learning that someone else had won. Thus, we propose the compensatory role played by peer gambling and suggest that peer gambling will facilitate the positive impacts of gambling cognitive distortions on gambling behaviors. We hypothesized the following:

Hypothesis 5: Peer gambling moderates the relationship between gambling cognition and gambling behavior such that the positive relationship is stronger when peer gambling is high as opposed to low.

3. Method

3.1 Procedures and Respondents

Respondents were 250 local residents and tourists in Macau. Questionnaires were administered to local residents and tour group members who were around the casinos. Respondents who were around the casinos were expected to be more frequently involved in gambling than other places. Feedbacks from them should better reflect the features of gamblers. Respondents were informed that the purpose of the survey was to assess gambling behavior and the influencing factors and the responses were anonymous and confidential.

A total of 207 valid responses were collected, representing a response rate of 82.8%. Of the 207 respondents, 56.5% were male and 43.5% were female, 49.3% were unmarried or divorce and 50.7% were married. Age of the respondents ranged from 18 to 59. With the consideration of the huge amount of tourists from mainland China, we measure the income of respondents by two types of currencies (MOP and RMB) in the questionnaires. The details of the sample characteristics were summarized in Table 1.

Table 1 Summary of the sample characteristics

	Total (N=207)	Percentage of Total %
Gender		
Male	117	56.5
Female	90	43.5
Age		
Below 20	2	1.0
20-29	100	48.3
30-39	65	31.4
40-49	28	13.5

50-59	12	5.8
Marital Status		
Single or divorced	102	49.3
Married	105	50.7
Income		
Below 3,750 MOP (or 3,000 RMB)	46	22.2
3,750-10,000 MOP (or 3,000-8,000 RMB)	98	47.3
10,000-18,750 MOP (or 8,000-15,000 RMB)	48	23.2
18,750-37,500 MOP (or 15,000-30,000 RMB)	14	6.8
Above 37,500 MOP (or 30,000 RMB)	1	0.5

3.2 Measures

3.2.1 Gambling Behavior

The South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987) includes a measure of severity of gambling behavior. SOGS is an internationally and frequently used instrument to assess pathological gambling (e.g., Battersby et al., 2002; Wies & Manos, 2007; Vitaro et al., 2008) and even further revised for adolescents (SOGS-RA) by Winters, Stinchfield and Fulkerson (1993). In our study, six items are selected to assess the frequency with which respondents have engaged in gambling behaviors and experienced gambling consequence over the past 12 months (1-never, 2-rarely, 3-sometimes, 4-usually, 5-always). Sample items include “How often have you participate in games of chance in the past 12 months”, “Have you ever hidden betting slips, lottery tickets, gambling money, or other signs of gambling from your family members”. Reliability of the scale has been validated and used in many studies (e.g., Shaffer, Hall, & Vander Bilt, 1999; Volberg & Abbott, 1994). Cronbach’s alpha for current study is 0.92.

3.2.2 Gambling Cognition

Steenbergh et al. (2002) developed the Gambling Belief Questionnaire (GBQ) which is a systematic way of assessing gambling-related irrational beliefs. The GBQ has been extensively used in western cultural context (Wohl & Enzle, 2003; Wohl et al., 2007) while the Chinese version of GBQ was validated by Wong and Tsang (2012). They regarded that GBQ showed adequate psychometric properties with satisfactory high reliabilities and significant correlations with gambling variables. It is a two-factor scale and each item is rated on a Likert 1 (strongly disagree) to 5 (strongly agree) scale. Respondents were asked to 5 items, with higher scores reflecting more cognitive errors. Sample items include “I have more skills and knowledge related to gambling than most people who gamble.”, “I should keep track of previous winning bets so that I can figure out how I should bet in the future.”. Internal consistency reliability of the scale has been tested by various investigators (e.g., Steenbergh et al., 2002; Wong & Tsang, 2012). Cronbach’s alpha for current study is 0.83.

3.2.3 Risk Propensity

Multidimensional Personality Questionnaire (MPQ) which was developed by Tellegen (1982) is used in this study. Tellegen et al. (2002) regarded that “the MPQ provides for a fine-grained analysis of personality by measuring a range of discrete trait dispositions at the lower order level. Additionally, it has a higher order dimensional structure that maps onto constructs of emotion and temperament, which have direct psychobiological referents”. The MPQ is widely used to measure personality in various fields and has been validated and standardized on normal populations (e.g., Seligson et al., 2002; Hwang et al., 2012). Risk propensity for current study is consisted of four items which are drawn from negatively keyed items in harm avoidance section of the MPQ (1-strongly disagree, 2-disagree, 3-cannot say, 4-agree, 5-strongly agree). Sample items include “It would be fun to explore an old abandoned house at night.” and “I would enjoy trying to cross the ocean in a small but seaworthy sailboat.”. Cronbach’s alpha for current study is 0.87.

3.2.4 Peer Gambling

Five items were used to assess perception of peer gambling behavior (1-never, 2-rarely, 3-sometimes, 4-usually, 5-always). The items assessed respondents’ perception of the frequency and sample items include “Do any of your close friends have gambled in the past 12 months?” and “I have advised my peers on their gambling problems in the past 12 months.”. Cronbach’s alpha for current study is 0.89.

3.2.5 Familial Monitoring

We referred to the Pittsburgh Youth Study (Loeber et al., 1998) when assessing familial monitoring. Initially the scale was designed to evaluate ineffective parental practices and it is composed of two subscales: coercive disciplinary practices and monitoring. Four items were drawn from the monitoring scale and revised for adults in current study. Sample items are “Do your family members know the friends with whom you hang out during your free time?” and “Do your family members know where you are when you are not home?”. Cronbach’s alpha for current study is 0.88.

3.2.6 Control Variables

The study reviews previous research focusing on the relationship between gambling behavior and some demographic variables. Shaffer, Hall and Vander Bilt (1999) reported that prevalence rates of problem gambling were higher among adolescents than among older adults. They further provided breakdowns of prevalence rates of disordered gambling by gender and demonstrated that male gender can be a risk factor for gambling problems. Volberg (1994) reported that pathological gamblers were less likely to be married than non-gamblers and Ladouceur (1991) noted that percentage of married problem gamblers were lower than average. In terms of income, Ladouceur (1991) presented that two lowest income groups had disproportionately high rates of disordered gamblers in his survey and Volberg (1988) reached a similar conclusion that low-income respondents accounted for larger proportion of disordered gamblers.

Regarding the unique circumstance in Macau, we employed four demographic factors in current study (e.g., age, gender, marital status, monthly income). Age was self-reported in years. Gender and marital status were dummy coded, with male coded as “0” and female coded as “1”; while unmarried or divorce coded as “0” and married coded as “1”. Monthly income was coded as “1” for less than 3,000 RMB (or 3,750 MOP), “2” for 3,000-8,000 RMB (or 3,750-10,000MOP), “3” for 8,000-15,000 RMB (or 10,000-18,750 MOP), “4” for 15,000-30,000 RMB (or 18,750-37,500 MOP) and “5” for more than 30,000 RMB (or 37,500 MOP).

Confirmatory Factor Analysis (CFA) was performed to evaluate the validity of the key variables in current study. Firstly, we examined the baseline model including five variables, namely gambling behavior, gambling cognition, risk propensity, familial monitoring and peer gambling. As shown in Table 2, the hypothesized five-factor model shows good fit indices (chi-squared=187, df=80; root mean square error of approximation [RMSEA]=0.08; normed fit index [NFI]=0.91; comparative fit index [CFI]=0.95; Tucker-Lewis index [TLI]=0.93). All factor loadings were statistically significant and ranged from 0.55 to 0.83 for gambling behavior, 0.60 to 0.77 for gambling cognition, 0.71 to 0.88 for risk propensity, 0.43 to 0.86 for familial monitoring, and 0.65 to 0.79 for peer gambling.

Table 2. Results of confirmatory factor analysis of studied variables

Model	χ^2	df	$\Delta\chi^2/df$	RMSEA	NFI	CFI	TLI
5-factor model	187.23	80	---	.08	.91	.95	.93
4-factor model 1 (combined gambling behavior and gambling cognition)	229.93	84	10.68**	.09	.89	.93	.91
4-factor model 2 (combined gambling behavior and familial monitoring)	466.83	84	69.90**	.15	.78	.81	.76
4-factor model 3 (combined gambling behavior and peer gambling)	246.96	84	14.93**	.10	.88	.92	.90
4-factor model 4 (combined gambling behavior and risk propensity)	474.39	84	71.79**	.15	.77	.80	.76
4-factor model 5 (combined gambling cognition and familial monitoring)	551.34	84	91.03**	.16	.74	.77	.71
4-factor model 6 (combined gambling cognition and peer gambling)	246.72	84	14.87**	.10	.88	.92	.90
4-factor model 7 (combined gambling cognition and risk propensity)	458.05	84	67.71**	.15	.78	.81	.77
4-factor model 8 (combined familial monitoring and peer gambling)	474.85	84	71.91**	.15	.77	.80	.76
4-factor model 9 (combined risk propensity and peer gambling)	482.72	84	73.87**	.15	.77	.80	.75
4-factor model 10 (combined risk propensity and familial monitoring)	511.51	84	81.07**	.16	.76	.79	.73
1-factor model	849.82	90	66.26**	.20	.60	.62	.56

Note. RMSEA=root mean square error of approximation; CFI=Comparative Fit Index; TLI=Tucker-Lewis Index.

*p<0.05. ** p<0.01.

We further tested the discriminant validity of the five constructs by comparing the baseline model with alternative models. The results show that the five-factor model fit the data better than any of the alternative models. The final construct measurement was the average of the items for that construct. Thus, we concluded that gambling behavior, gambling cognition, risk propensity, familial monitoring, and peer gambling in our samples were distinct construct.

Table 3 shows the means, standard deviations and zero-order correlation of the variables. As can be seen in the table, gambling cognition is significantly and positively related to risk propensity while gambling behavior is significantly and positively related to gambling cognition and to risk propensity. **Hypothesis 1 and 2 are supported.**

Table 3. Descriptive statistics and zero-order correlation of variables (N=207)

	Mean	S.D.	Alpha	1	2	3	4	5	6	7	8	9
1. Gender	0.43	0.50										
2. Age	31.59	8.71		-0.20**								
3. Marital Status	0.52	0.51		-0.03	0.64**							
4. Income	2.04	0.84		-0.10	0.36**	0.17*						
5. Risk propensity	2.44	0.94	0.87	0.03	-0.09	-0.10	0.18*					
6. Familial Monitoring	3.13	0.75	0.88	0.08	-0.05	-0.06	0.01	-0.04				
7. Gambling Cognition	2.77	0.93	0.83	-0.10	0.05	0.08	0.14	0.40**	-0.09			
8. Peer Gambling	2.23	0.92	0.89	-0.23**	0.11	0.20**	-0.05	0.26**	-0.20**	0.60**		
9. Gambling Behavior	1.98	0.88	0.92	-0.12	0.19**	0.24**	0.04	0.32**	-0.25**	0.66**	0.74**	

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

Table 4 presents the results for tests of the hypothesized model. The control variables, independent variable (risk propensity), mediator (gambling cognition), moderators (familial monitoring and peer gambling) and the interaction terms were entered on separate steps. In model 1, tests of the effects of risk propensity on gambling cognition and the results reveal the positive relation between them ($\beta = 0.41$, $p < 0.001$). In model 2, the effects of risk propensity, and the interactive effects of risk propensity and familial monitoring were examined. The results show that risk propensity is positively related to gambling cognition ($\beta = 0.38$, $p < 0.001$) while its interaction is negatively related to gambling cognition ($\beta = -0.17$, $p < 0.01$). **Hypothesis 4 is supported.** In model 3, risk propensity is associated with a higher level of gambling behavior ($\beta = 0.37$, $p < 0.001$), suggesting that people with greater level of risk propensity are more likely to gamble. In model 4, after entering the gambling cognition (the mediator), peer gambling (the moderator) as well as the interaction term of gambling cognition and peer gambling, risk propensity is not significantly related to gambling behavior any more ($\beta = 0.08$, $p > 0.05$). While gambling cognition, peer gambling and the interaction term are significantly related to gambling behavior ($\beta = 0.36$, $p < 0.001$; $\beta = 0.45$, $p < 0.001$; $\beta = 0.10$, $p < 0.05$). **Hypothesis 3 and 5 are supported.**

Table 4. Result of regression analysis

Independent Variables	Gambling Cognition		Gambling Behavior	
	Model 1	Model 2	Model 3	Model 4
Control Variables				
Gender	-0.11	-0.09	-0.12	0.06
Age	-0.01	-0.00	-0.08	0.12*
Marital Status	0.10	0.09	0.25**	0.04
Income	0.04	0.05	-0.10	-0.03
Risk propensity	0.41***	0.38***	0.37***	0.08

Familial Monitoring		-0.08		
Risk propensity × Familial Monitoring		-0.17**		
Gambling Cognition				0.36***
Peer Gambling				0.45***
Gambling Cognition × Peer Gambling				0.10*
R ²	0.18	0.21	0.20	0.65
ΔR ²		0.03*		0.45***
F	8.95***	7.69***	10.08***	45.84***
df	206	206	206	206

*p<0.05. **p<0.01. ***p<0.001.

We created the interaction graphs applying two-way unstandardized equation and unstandardized predicted scores for the Y-axis. Figure 2 plotted the interaction at one standard deviation above and below the mean on risk propensity and gambling cognition. As shown in the figure, risk propensity is positively related to gambling cognition, this relationship is stronger under low familial monitoring than under high familial monitoring.

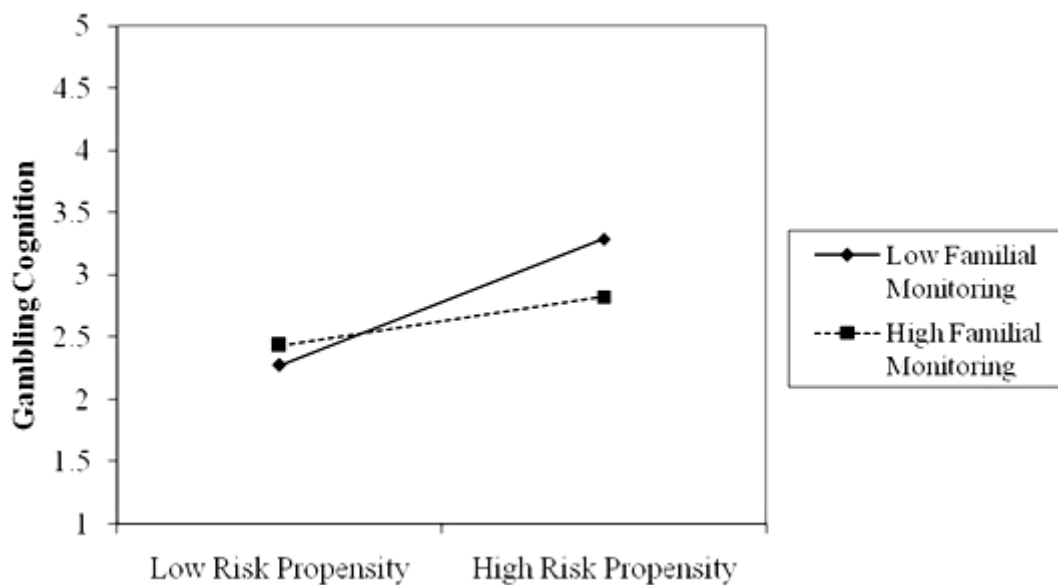


Figure 2. Interaction effects of risk propensity and familial monitoring on gambling cognition

Figure 3 illustrated the positive relationship between gambling cognition and gambling behavior. Partially owing to the significant moderating effect, the direct relationship between risk propensity and gambling behavior is not statistically significant. The slope is much steeper when the level of peer gambling is high rather than low, indicating that the positive relation between gambling cognition and gambling behavior is stronger under high level of peer gambling, which is consistent with our prediction.

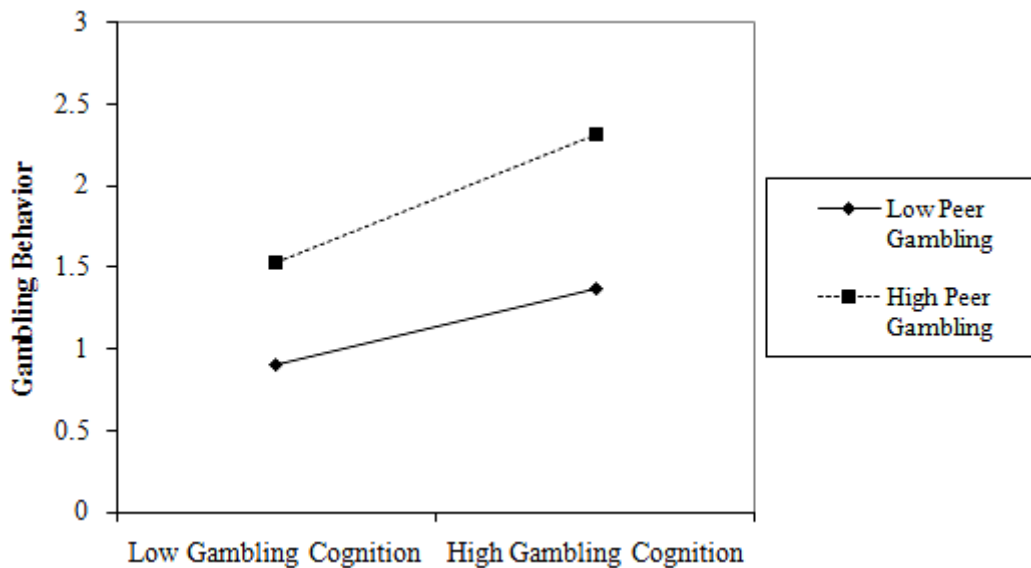


Figure 3. Interaction effects of gambling cognition and peer gambling on gambling behavior

4. Discussion

Several major findings resulted from this study. First, the results suggest that risk propensity impacts gambling behavior indirectly through developing gambling cognition. Second, familial monitoring moderated the positive relationship between risk propensity and gambling cognition in such a way that the relationship is stronger under low familial monitoring than under high familial monitoring. Third, Peer gambling moderated the positive relationship between gambling cognition and gambling behavior in such a way that the relationship is stronger when peer gambling is higher. Below, we discuss the theoretical implications, practical implications, and limitation and future direction of our study.

4.1 Theoretical Implications

Although some studies have examined the relationship between risk propensity and gambling behavior (e.g., Knowles, 1976; Eadington & Schwartz, 2012), our understanding of the transmission mechanism was limited. In present study, we contributed to the gambling literature by demonstrating the cognition mediates the relationship between risk propensity and gambling behavior. An explanation for why gambling cognition mediates this relationship can be found in “Onion model” proposed by Curry (1983). He argued that personality dimensions fundamentally control learning behavior, transmitting through information-processing dimension, and intertwined by interaction with environmental factors. Thus, focusing on the aspect of risk taking would be inadequate in explaining the outcomes.

Familial monitoring and peer gambling moderated two distinct paths in the context respectively. Dishion and McMahon (1998) presented that parental monitoring may serve as a prime protective factor relating to adolescent problem behavior. Hartos et al. (2000) found that parental behaviors such as setting limits, having expectations, and demanding responsible behavior were associated with a reduction in adolescent participation in risky driving. Our findings are consistent with the research implemented by Magoon and Ingersoll (2006). They presented that increased monitoring and supervision resulted in lower levels of adolescent gambling. Because our sample was composed of adult respondents, we accordingly investigated the moderating role of supervision from all family members rather than just from parents. The empirical results revealed that people are prone to develop gambling cognition when familial monitoring is insufficient.

Prior empirical research indicated that pathological and at-risk gamblers reported perceiving significantly more family members and peers as having a gambling problem than did non-gamblers and social gamblers (e.g., Hardoon et al., 2004; Langhinrichsen-Rohling et al., 2004). According to Onion Model (Curry, 1983), the outermost layer is most observable and is labeled “instructional preferences”, referring to “the individual’s choice of environment in which to learn”. And this layer interacts most with the external features of the learning environment. From a gambler’s perspective, he or she would be influenced by external environment such as peer’s behavior. We built on the previous research and broadened the understanding of impact of peer gambling

on gambling behavior by examining the moderating effects of peer gambling in this study. Our findings highlighted a fact that it is not just peer gambling arouses gambling problems, but the complex interaction of internal cognition and peer's contagion does.

4.2 Practical Implications

The increasing popularity of gambling has raised questions about its consequences. This study suggests different ways to help mitigate the severity of gambling behavior. First, the study lends support for the positive relationship between risk propensity and gambling behavior. Gamblers should develop a habit of spending money prudently and rationally. In addition, policy makers need to advocate "responsible gambling" as the proper attitude towards gambling.

Second, family members' supervision may hinder the procedure of shaping gambling cognition. The findings are especially instructive for parents who educate their offspring. Youths and adolescents should be alerted to the harm of gambling-related cognitive distortion. Sylvain and Ladouceur (1992) applied a cognitive therapy with the assistance of education components, stimulus control, self-monitoring and family intervention. Family members play crucial roles in some treatment for pathological gambler.

Furthermore, the study empirically confirms the association between exposure to peer gambling and higher level of gambling behavior. Because gambling behavior can be influenced by both internal and external factors, social context such as peer gambling should be integrated in the treatments of disordered gamblers. People whose friends are frequently involved in gambling are more likely to suffer from gambling problems.

4.3 Limitations and Further Research Direction

Several limitations should be noted in the present investigation. First, the gambling scales were designed for pathological gamblers who represent relatively minor proportion of the population. Pathological gambling may be expected to be infrequent, if not nonexistent, during our time sampling. The generalizability of our findings to pathological gamblers may be restricted.

Second, another limitation may be found in the current study is the relatively small number of items used to operationalize the constructs. Considering the limited time for each interview, we employed no more than six items for every construct. Nevertheless, the items were validated in previous research (e.g., Steenbergh et al., 2002; Wong & Tsang, 2012; Tellegen et al., 2002) and the re-test results of factor analyses in present study justified our items elimination.

Despite these limitations, the study provided new insight into the phenomenon of gambling by exploring its mechanism. Future research directions can stem from our study. First, longitudinal research is required to ascertain the causal sequence about how risk propensity would drive gambling cognition. Indeed, a number of studies suggest that gambling cognition may inversely generate risk taking propensity (e.g., Toneatto, 1999; Martinez et al., 2011). Longitudinal data would enhance our understanding the motive for gambling behavior and the relationship between risk propensity and gambling cognition.

Another interesting research direction is to categorize the sample according to severity of gambling behavior. Extant literature (e.g., Wiebe & Cox, 2005; Goldstein et al., 2013) contrasted problem gambler with non-gambler and low risk gambler to distinguish the influencing factors of different types of gamblers.

It is also worthwhile to continue the investigation of contextual and intermediate variables linking the relationship between gambling behavior and gambling cognition. Aside from peer gambling, numerous research has confirmed that emotions would significantly affect gambling behavior (e.g., Tang & Oei, 2011; Tang et al., 2011). Prior studies found that demographic features such as religion and ethnics were associated with gambling in Western culture (e.g., Oei et al., 2008). For these reasons, the study can be re-conducted in other regions other than Macau.

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