

Gambling Cognition and Subjective Well-Being as Mediators Between Perceived Stress and Problem Gambling: A Cross-Cultural Study on White and Chinese Problem Gamblers

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This study aimed to delineate various pathways whereby cognitive and emotional vulnerabilities triggered by stress would lead to disruptive gambling. A multiple mediation framework was proposed to specify that gambling cognition and subjective well-being would mediate the influence of perceived stress on problem gambling. The cross-cultural validity of the proposed framework was examined with 132 White gamblers in Australia and 154 Chinese gamblers in China. They completed psychological scales on perceived stress, gambling expectancy bias, gambling refusal efficacy, negative affect, life satisfaction, and problem gambling. Compared to Chinese gamblers, White gamblers reported higher levels of perceived stress, gambling expectancy bias, and problem gambling as well as more pervasive negative affect and lower levels of life satisfaction. Results showed that the proposed multiple mediation framework fit the data better than two alternative plausible models. Life satisfaction and gambling refusal efficacy were two consistent mediators across White and Chinese gamblers.

Keywords: gambling cognition & subjective well-being, perceived stress and problem gambling, cross-cultural problem gambling

In the past two decades, the Asia-Pacific region has seen the widespread introduction of varying forms of gambling. Recent research in Korea (Lee, LaBrie, Grant, Kim, & Shaffer, 2008), Hong Kong (Tang, Wu, & Tang, 2007), Macau (Vong, 2007), Singapore (Teo, Mythily, Anantha, & Winslow, 2007), and Australia and New Zealand (Oei, Lin & Raylu, 2008; Storer, Abbott, & Stubbs, 2009) indicates that with greater access to new forms of gambling, there are more people who have problem gambling and who are seeking help. Excessive gambling hampers people's physical, psychological, social, and financial well-being. Problem gamblers often report poorer mental health than nongamblers, with frequent depressed and anxious mood (Oei et al., 2008; Petry, 2005; Scherrer et al., 2009). However, a majority of the gambling research has been conducted with White samples in Northern America, Europe, and Australia (Petry, 2005; Raylu & Oei, 2002; Shaffer, Hall, & Bilt, 1997). There is an urgent need for a greater understanding of psychosocial factors that can explain the development and maintenance of problem gambling in Asian countries so that effective prevention and intervention programs can be put together.

The present study attempted to delineate various pathways whereby cognitive and emotional vulnerabilities triggered by stress would lead to disruptive gambling. It also aimed to examine whether these

pathways would be applicable to different countries with distinct cultural background. A multiple mediation framework was proposed to illustrate that gambling cognition and subjective well-being would mediate the influence of stress on problem gambling. Cross-cultural validity of the proposed mediation framework was examined with adult treatment-seeking White problem gamblers in Australia and Chinese problem gamblers in China.

Perceived Stress and Problem Gambling

Stress, according to Lazarus (1993), refers to the negative cognitive and emotional states when people realize that environmental demands strain their resources and threaten their well-being. What determines an event or a series of event is stressful is people's appraisal of the event in relation to their resources and coping skills. Stress as a precipitating and perpetuating factor is implicated in major psychological models of problem gambling (Blaszczynski & Nower, 2002; Sharpe, 2002; Sharpe & Tarrier, 1993). These models suggest that stress may comprise people's executive function and impair cognitive appraisal, with distorted general cognition surrounding self, own function, and immediate environment as well as erroneous gambling cognition, leading to the onset and persistence in disruptive gambling. Indeed, experimental studies have found that stressed people were susceptible to illusion of control and preferred gambling activities that heightened their perception of control (Friedland, Keinan, & Regev, 1992). When people were exposed to anticipatory stress, they manifested poor explicit knowledge about contingencies of choices and poor performance in a gambling task (Preston, Buchannan, Stansfield, & Bechara, 2007). Neurotransmitter dysfunction such as serotonergic, nonrepinephrine, and dopaminergic abnormalities was also found among problem gamblers (Raylu & Oei, 2002; Toneatto & Millar, 2004).

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Review studies have consistently documented that stress, either measured by stressful life events or subjective perception of stress, was related to gambling in both White (Coman, Burrows, & Evans, 1997; Raylu & Oei, 2002) and Chinese gamblers (Loo, Raylu, & Oei, 2008; Tang et al., 2007). Stress has also been found to precipitate relapse and impede recovery from problem gambling (Coman et al., 1997; Friedland et al., 1992). More severe gamblers were found to report a greater number of stressors than social gamblers, who in turn reported a greater number of stressful events than nongamblers (Bergevin, Gupta, Derevensky, & Kaufman, 2006). However, there are also many people with life stress and traumatic experience who do not develop problem gambling. More recent gambling research has thus focused on identifying psychosocial factors that would mediate the association between stress and disruptive gambling.

The role of gambling cognition in the onset and maintenance of problem gambling has received much attention from clinicians and psychologists (Ladouceur, 2004; Petry, 2005; Raylu & Oei, 2002; Toneatto, 1999). Interventions that target at dysfunctional gambling cognition through cognitive behavior therapies has also been shown to be effective in reducing problem gambling (Lopez Viets & Miller, 1997; Oei, Raylu, & Casey, 2010; Toneatto & Ladouceur, 2003; Toneatto & Millar, 2004). However, review studies also found that rates of relapse and treatment nonresponse to these therapies remained high (Daughters, Lejuez, Lesieur, Strong, & Zvolensky, 2003; Toneatto & Millar, 2004). Thus, it is important to also consider other aspects of cognition to enhance the understanding of the underlying cognitive processes in problem gambling. Despite gamblers often reported low levels of life satisfaction, few studies have examined associations among stress, cognition about life in general, and gambling behavior (Grant & Kim, 2005; Lai, 2005).

Gambling Cognition as a Mediator

According to the social-cognitive theory (Bandura, 1997), behavior is maintained by action-outcome expectancy and efficacy specific to the context. Cognition surrounding gambling expectancy includes belief that gambling will lead to many positive outcomes; belief that outcome of gambling activities can be influenced, controlled, or predicted by salient cues, luck, and past wins and losses; and belief that continued gambling will eventually recoup lost money (Ladouceur, 2004; Raylu & Oei, 2002, 2004a; Steenbergh, Meyers, May, & Whelan, 2002; Toneatto, 1999). Positive biases in gambling expectancy have been found to associate with the motivation and persistence in gambling among White (Oei et al., 2008; Raylu & Oei, 2002, 2004a; Steenbergh et al., 2002) and Chinese gamblers (Loo et al., 2008; Oei et al., 2008; Tang & Wu, 2010). Furthermore, problem gamblers as compared to social gamblers showed a greater tendency to become attached and obsessive with erroneous gambling expectancy, leading to persistence in gambling despite repeated losses (Ladouceur, 2004; Rousseau, Vallerand, Ratelle, Mageau, & Provencher, 2002).

Gambling refusal efficacy is an action-outcome belief regarding whether or not people perceive they have the ability to resist an opportunity to gamble in given situations (Casey, Oei, Melville, Bourke, & Newcombe, 2008). It influences gambling behavior through its effect on behavioral choice, effort expenditure, and persistence in the face of difficulty. When under stress, people may

interpret high levels of arousal as a sign of incapacity, leading to negative emotional state such as depression through the process of negative self-evaluation (Bandura, 1997). Gambling thus represents an attempt to cope with this negative emotional state. Gambling refusal efficacy was found to associate with the acquisition, maintenance, and treatment of problem gambling among White (Casey et al., 2008; May, Whelan, Steenbergh, & Meyers, 2003; Oei et al., 2008; Sylvain, Ladouceur, & Boisvert, 1997; Symes & Nicki, 1997) and Chinese samples (Oei et al., 2008; Tang & Wu, 2010). Compared to nonproblem gamblers, problem gamblers showed lower gambling refusal efficacy, which in turn was associated with greater distorted gambling cognition and pervasive negative mood (Casey et al., 2008). For people who had a history of gambling, low levels of gambling refusal efficacy was associated with more gambling-related problems (May et al., 2003). Furthermore, gambling refusal efficacy was shown to be sensitive to change in the treatment of problem gambling, and has been used by researchers to predict the maintenance of treatment gains (Casey et al., 2008; Sylvain et al., 1997; Symes & Nicki, 1997).

Subjective Well-Being as a Mediator

Subjective well-being refers to people's emotional and cognitive evaluations of their lives in general, including what lay people call happiness, peace, fulfillment, and life satisfaction (Diener, Oishi, & Lucas, 2003). It comprises affective dimensions of positive affect and absence of negative affect, as well as a cognitive dimension of satisfaction with important life domains such as marriage, work, and leisure (Diener, 2000). Researchers typically use either a single or a combination of these dimensions to assess subjective well-being (Diener et al., 2003). Beyond the fulfillment of basic needs, subjective well-being is also affected by people's self-evaluation, life goals, life circumstances, and cultural values (Diener & Lucas, 2000). Studies have shown that stress stemming from significant life events and life changes has important implication for subjective well-being (Diener et al., 2003; Grant & Kim, 2005; Ng, Diener, Aurora, & Harter, 2009). A recent survey on 125,077 respondents from 121 countries found that people who experienced more stress tended to report lower scores on measures of subjective well-being as in lower life satisfaction and happiness (Ng et al., 2009).

Compared to gambling cognition, there is relatively less research on how general cognition or subjective well-being influences the impact of stress on problem gambling. Sharpe (2002) has suggested that people tend to have negative perception of the high arousal state that accompanies stress. They may engage in high arousal activities such as gambling to give a positive interpretation of the stress-related arousal in the form of excitement associated with winning and losing. This positive interpretation in turn becomes reinforcing through a negative reinforcement paradigm. Although the direction of causality has not been established, research has consistently found associations between problem gambling and the affective dimension of subjective well-being as in depression and anxiety among White (see review by Raylu & Oei, 2002) and Chinese samples (see review by Loo et al., 2008).

Regarding other aspects of subjective well-being, Grant and Kim (2005) found that compared to nongamblers, problem gamblers reported poorer life satisfaction and quality of life. Rousseau et al. (2002) also noted that gamblers who showed an obsessive

passion toward gambling tended to report low life satisfaction and pervasive negative mood. In a multisite study on large samples of older Chinese immigrants in Canada, Lai (2005) found that the odds of gambling were lower with increases in life satisfaction. He suggested that when older Chinese felt happy and fulfilled, they did not need to use gambling as a way to meet their emotional needs. Grant and Kim (2005) also argued that problem gamblers' poor life satisfaction may be related to their feelings of shame and guilt triggered by their distorted views of themselves and life in general as well as their problematic gambling behavior.

Cultural Variation in Gambling, Gambling Cognition, and Subjective Well-Being

People from different cultural background are exposed to different life circumstances and environmental stressors, espouse unique cultural value and belief systems, and adopt distinct norms that dictate appropriate feelings, self-appraisal, and coping responses (Diener & Lucas, 2000; Diener et al., 2003). Significant psychobiological differences that have been evidenced in early development such as temperament and excitability versus imperiturbability have been found between Asians and Whites (Chun, Eastman, Wang, & Sue, 1998). Therefore, it can be argued that these differences may lead to people in various cultures exhibit distinct cognition, psychological states, and gambling behavior. As such, it is important that conceptual frameworks and treatment programs about problem gambling should be validated with samples from different cultures.

Available gambling literature has suggested that certain cultural groups, ethnic minorities, and indigenous groups may be more vulnerable to begin gambling and to develop disruptive gambling (Blaszczynski, Huynh, Dumlao, & Farrell, 1998; Loo et al., 2008; Raylu & Oei, 2004b). Some studies found casino and numbers gambling more popular among Chinese samples (Tang & Wu, 2010; Tang et al., 2007; Victorian Casino Gambling Authority, 2000), while gaming machines were preferred by White samples (Oei et al., 2008). Among adult recreational gamblers in Australia, Chinese as compared to Whites demonstrated a higher illusion of control and a more elevated perceived inability to stop gambling (Oei et al., 2008; Papineau, 2005). Another study conducted with White gamblers in the United Kingdom indicated that Chinese gamblers in Hong Kong exhibited less probabilistic thinking and made riskier gambling decisions (Lau & Ranyard, 2005). It has also been suggested that Chinese relative to Whites may have greater difficulty in admitting their gambling problems and in seeking professional help for fear of losing face (Loo et al., 2008; Raylu & Oei, 2004b).

Cross-cultural research has also revealed that most people reported a positive level of subjective well-being, but there are also cultural differences (Diener & Lucas, 2000; Diener et al., 2003; Oishi, 2006). For example, life satisfaction scores of Chinese were found to be substantially lower than that of American people (Oishi, 2006). Cultural differences parallel to international differences in life satisfaction were also observed across different ethnic groups in the United States (Oishi, 2006).

Purposes of the Present Study

The overall objective of the study was to unravel cognitive and affective processes underlying problem gambling in clinical

samples of problem gamblers. A multiple mediation framework was proposed to specify that gambling cognition and subjective well-being would mediate the influence of perceived stress on problem gambling. This study was one of the few studies in the literature that recruited clinical samples to test the mediation framework of problem gambling and to compare similarities and/or differences of this framework with White gamblers in Australia and Chinese gamblers in Hong Kong, China. It should be noted that gambling opportunities and treatment services for problem gambling differed in these two regions. In Australia, casino and poker machine gambling is legal and there are plenty of opportunities for these two types of gambling. Both government and nongovernment treatment centers for problem gambling are also widely available. In Hong Kong, there is easy access to multiple forms of gambling such as casino gambling, horse racing, and soccer game betting. At the time of this study, only two government-subsidized treatment centers were available to provide free, nonresidential, and voluntary treatment services to problem gamblers. Despite regional differences in gambling opportunities and treatment options, results of this study would provide pertinent information on problem gambling across cultural groups to facilitate the design of effective prevention and treatment programs.

The present study first determined whether there were cultural differences in components of the proposed framework between White and Chinese gamblers. Based on the prevailing literature, it was hypothesized that compared to White gamblers, Chinese gamblers would report higher levels of gambling expectancy bias and problem gambling, but lower levels of gambling refusal efficacy, negative affect, and life satisfaction. Despite the above hypothesized cultural variations in individual components of the proposed framework, the present study argued that the proposed pathways to problem gambling would be robust and applicable to both White and Chinese gamblers.

Specific pathways of the proposed mediation models were hypothesized as follows:

1. Perceived stress would correlate positively with problem gambling, gambling expectancy bias, and negative affect, but negatively with gambling refusal efficacy and life satisfaction.
2. Problem gambling would correlate positively with gambling expectancy bias and negative affect, but negatively with gambling refusal efficacy and life satisfaction.
3. Influence of perceived stress on problem gambling would be positively mediated by gambling expectancy bias and negative affect, but negatively mediated by gambling refusal efficacy and life satisfaction.

In addition, two alternative plausible models were also tested and compared with the proposed model. For the first alternative model, negative affect was interchanged with perceived stress. For the second alternative model, life satisfaction was interchanged with perceived stress. All other hypothesized pathways of these two alternative models were identical to the proposed model.

Method

Recruitment and Characteristics of Participants

White problem gamblers were recruited from the State of Queensland, Australia, whereas Chinese problem gamblers were recruited from Hong Kong, China. Recruitment procedures were similar for both clinical samples. Invitation to participate in gambling research and treatment programs was disseminated via media announcements on radio, newspaper articles, and advertisements, as well as flyers and posters distributed to various service providers in the two regions. Participants were either self-referred or referred by family members and other professionals such as psychiatrists, psychologists, counselors, and social workers. Before the start of treatment programs at local gambling treatment centers, trained research assistants or psychologists approached participants to invite them to take part in a gambling research. Participants were assured of the confidentiality of their personal information and responses provided for the study. After obtaining their written consents, participants completed the English (White gamblers) or Chinese versions (Chinese gamblers) of the questionnaire packages. Participation in the study was voluntary and no monetary reward was provided to participants. The major reason for not participating in the study was not having enough time and interest. Approval to conduct this study was obtained from respective research ethics committees of the participating universities in Australia and Hong Kong.

The White sample included 132 adult White gamblers in Australia (70 men, 62 women), with a response rate of 75%. Among them, 67% aged between 30 and 49 years old, 62% completed high schools, 78% were currently nonmarried (i.e., never-married, divorced, and widowed), and 65% were currently employed. About 63% of White gamblers reported alcohol use, and 37.7% had a history of depression or anxiety. Major gambling activities included gambling on machine games (86.1%), sports games (83%), animals (42%), and table card games (24%).

The Chinese sample included 154 Chinese adult gamblers in China (134 men, 20 women), with a response rate of 60%. Among them, 59% aged between 30 and 49 years old, 63% completed high schools, about half of them were currently nonmarried, and 77% were currently employed. About 10% of this sample reported alcohol use and 27% had a history of depression or anxiety. Major gambling activities included betting on horse races (78%), casino games (62%), soccer games (56%), and mahjong games (45%).

Instruments

Perceived stress. Perceived stress was measured by the 7-item Stress subscale of the Depression Anxiety Stress Scale (DASS; Lovibond & Lovibond, 1995). The DASS scale has shown to have high internal consistency for both Australian and Chinese samples (Oei, Lin, & Raylu, 2007; Tang & Wu, 2010). Participants were asked to rate the level of stress in the previous 1 week. A 4-point Likert response scale was used, ranging from 0 as "never," 1 as "sometimes," 2 as "often," to 3 as "almost all the time." High scores represent high levels of perceived stress.

Gambling expectancy bias. The 23-item Gambling Related Cognitions Scale (GRCS) was used to assess gambling-related belief of participants (Raylu & Oei, 2004a). It included items on a

range of gambling expectancy biases, such as expecting gambling could lead to many positive outcomes, believing gambling outcomes could be influenced or predicted by personal skill/ability or environmental cues, and reframing gambling outcomes that would encourage continued gambling despite losses. The GRCS showed satisfactory internal reliability and convergent validity, and was able to distinguish between gamblers and nongamblers in both Australian and Chinese samples (Oei et al., 2007). Participants responded with a 7-point Likert scale to indicate the extent to which they agreed with each item, with 1 as "strongly disagree" to 7 "strongly agree." High scores indicate high levels of gambling expectancy bias.

Gambling refusal efficacy. For White gamblers, the 31-item Gambling Refusal Self-Efficacy Questionnaire was used to evaluate participants' perceived ability to resist gambling in a range of situations (Casey et al., 2008). This scale was validated with community adults and problem gamblers in Australia, and demonstrated satisfactory internal consistency. It was also found to correlate with gambling-related cognition and behavior, and was sensitive to change after treatment of problem gambling (Oei et al., 2008). Participants responded to each item by indicating how confident they were to refuse gambling on a scale from 0 as "No confidence, cannot refuse" to 100 as "Extreme Confidence, Certain can refuse" in increments of 10.

For Chinese gamblers, the modified 10-item Self-Efficacy Scale (Schwarzer & Jerusalem, 1993) was used. The scale was modified such that it assessed participants' belief in their own ability to resist opportunities to gamble and to deal with any associated obstacles or setbacks. The Chinese version of this scale had satisfactory internal consistency and was found to correlate with mental health symptoms and problem gambling (Tang & Wu, 2010). Participants rated each item with a 4-point scale, ranging from 1 as "strongly disagree" to 4 as "strongly agree." High scores indicate a strong belief of own ability to resist gambling.

Negative affect. Negative affect was assessed by 14 items from the Depression and Anxiety subscales of the DASS (Lovibond & Lovibond, 1995). The DASS scale has shown to have high internal consistency for both Australian and Chinese samples (Oei et al., 2007; Tang & Wu, 2010). Participants were asked to rate the level of negative affect in the previous 1 week. A 4-point Likert response scale was used, ranging from 0 as "never," 1 as "sometimes," 2 as "often," to 3 as "almost all the time." High scores represent high levels of negative affect.

Life satisfaction. Life satisfaction is one of the central constructs of subjective well-being and was assessed by the 5-item Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985). This scale assesses people's satisfaction with life as a whole and has been widely used in both Western and Asian countries. It was found to be internally consistent for both White and Chinese samples (Oishi, 2006). The scale demonstrated good convergent validity with other assessment of subjective well-being as well as good discriminant validity from emotional well-being (Pavot & Diener, 1993). Participants responded with a 7-point Likert scale to indicate their agreement with the items, using 1 as "strongly disagree" and 7 as "strongly agree." High scores indicate high levels of satisfaction with life.

Problem gambling. The South Oaks Gambling Screen (Lesieur & Blume, 1987) was used to assess participants' gambling behavior and problem. This instrument is widely used for the

screening of problem gambling. It contains an unscored gambling behavior frequency section and a scored measure of gambling problems. For this study, only the latter section was used, which includes 20 items on gambling problems commonly reported by gamblers. These 20 items demonstrated good reliability and validity when used with Western (Lesieur & Blume, 1987; Stinchfield, 2002) and Chinese community and gambler samples (Tang et al., 2007; Tang, Wu, Tang, & Yan, 2010). Participants were asked to give “yes” or “no” response to each item, and affirmative responses were summed to form a total score. A high score represents a problematic gambling behavior pattern. A total SOGS score of 5 or higher is typically used to classify probable pathological gambling (Lesieur & Blume, 1987; Shaffer et al., 1997; Stinchfield, 2002), although some researchers have suggested using higher cut scores of 8 or above for Chinese samples (Blaszczynski et al., 1998; Tang et al., 2010).

Demographics. Participants provided information on their age, sex, marital and employment status, educational attainment, and types of gambling activities.

Results

Preliminary Analyses

Table 1 summarizes demographics and descriptive statistics for White and Chinese gamblers. All psychological measures showed satisfactory internal consistency for both samples, with alpha values ranging between .79 and .94 (see Table 2). Results of chi-square analyses indicated that compared to Chinese gamblers, the White sample had more female gamblers, was younger, had higher educational attainment, was more likely to be nonmarried and without full-time employment, and admitted to alcohol use ($p < .05$). Results from independent t tests indicated that White relative to Chinese gamblers reported more problem gambling behavior, more gambling expectancy bias, higher levels of perceived stress and negative affect, and lower levels of life satisfaction ($p < .05$).

Bivariate correlation analyses between variables were conducted separately for the two samples, and results were presented in Table 3. For both samples, psychological variables were associated with each other in the expected directions ($p < .05$). In particular, problem gambling was related to high levels of perceived stress, gambling expectancy bias, and negative affect; but low levels of gambling refusal efficacy and life satisfaction. Regarding demographic characteristics, female relative to male sex was associated with greater disruptive gambling among White gamblers, and younger relative to older age was associated with higher levels of negative affect and life dissatisfaction among Chinese gamblers ($p < .05$). As such, age and sex effects were controlled in subsequent mediational analyses.

Determining the Model fit of the Proposed and Alternative Models

Using AMOS 18.0, a path model was evaluated separately for White and Chinese gamblers to examine the model fit of the proposed multiple mediation model (Figures 1 and 2). This proposed model specified that the influence of perceived stress on problem gambling would be positively mediated by gambling expectancy bias and negative affect, but negatively mediated by

Table 1
Demographics Background of Participants

	White gamblers ($N = 132$)		Chinese gamblers ($N = 154$)		χ^2
	N	%	N	%	
Sex					
Male	70	53.0	134	86.4	39.72**
Female	62	47.0	20	13.0	
Age (years)					
18–29	26	19.7	34	21.4	20.83**
30–39	65	49.2	47	30.6	
40–49	23	17.5	44	28.6	
50 or above	18	13.6	29	18.8	
Education attainment					
Primary school	3	2.3	29	18.8	27.35**
High school	82	62.1	97	63.0	
University or above	46	34.8	25	16.2	
Missing data	1	0.8	3	2.0	
Marital status					
Nonmarried	103	78.0	70	45.5	32.65**
Married	28	22.0	84	54.5	
Employment status					
Employed	86	65.2	119	77.3	5.15*
Nonemployed	46	34.8	35	22.7	
Health problems					
Alcohol use	84	63.6	16	10.4	86.29***
Depression or anxiety	50	37.7	42	27.3	3.19
Gambling activities					
Animal/horse racing	55	41.7	120	78.0	37.83***
Betting sports games	109	82.6	86	55.8	22.20***
Cards	32	24.2	—	—	—
Gaming machines	114	86.1	—	—	—
Casino gambling	—	—	95	61.7	—
Mahjong	—	—	69	44.8	—

* $p < .05$. ** $p < .01$. *** $p < .005$.

gambling refusal efficacy and life satisfaction. Covarying paths were also specified between gambling expectancy bias and gambling refusal efficacy, as well as between negative affect and life satisfaction. Results showed a good fit with the data, with $\chi^2(5, N = 132) = 3.9, p = .60, CFI = 1.00$, and $RMSEA = .00$ for White gamblers, and $\chi^2(5, N = 154) = 9.7, p = .10, CFI = .98$, and $RMSEA = .08$ for Chinese gamblers (see Table 4).

Two alternative plausible models were also tested with Amos version 18. The first alternative model interchanged perceived stress with negative affect, whereas the second alternative model interchanged perceived stress with life satisfaction. The model fit indices of these two alternative non-nested models were then compared with the proposed model. As shown in Table 4, the AIC, BCC, BIC, and other model fit indices indicated that the proposed model fit the data better than the two alternative models for both White and Chinese gamblers.

Determining Indirect Effects of the Proposed Multiple Mediation Model

Two separate bootstrapping procedures were conducted to determine the indirect effect (i.e., the amount of mediation) of perceived stress on problem gambling via the four mediators for White and Chinese gamblers. The bootstrapping procedure has

Table 2
Descriptive Statistics of Major Variables

	White gamblers (N = 132)			Chinese gamblers (N = 154)			t-test
	Mean	SD	α	Mean	SD	α	
Gambling problem	9.73	3.66	.79	8.70	5.04	.89	2.01*
Life satisfaction	3.25	1.59	.90	3.94	1.22	.88	-4.10***
Negative affect	1.15	.82	.94	.55	.56	.94	7.38***
Gambling refusal efficacy ^a	34.57	22.57	.94	2.80	.53	.91	—
Gambling expectancy bias	3.64	1.15	.91	3.29	1.13	.93	2.61**
Perceived stress	1.50	.84	.91	.74	.61	.86	8.84***

^a White gamblers completed the Gambling Refusal Self-Efficacy Questionnaire (Casey et al., 2008), whereas Chinese gamblers completed the modified Self-Efficacy Scale (Schwarzer & Jerusalem, 1993).

* $p < .05$. ** $p < .01$. *** $p < .005$.

advantages over the traditional Baron and Kenny’s (1986) approach and the Sobel’s (1982) test, as it does not assume normality of the sampling distribution of the indirect effects and has higher power while maintains adequate control over Type I error rate (MacKinnon, Lockwood, Hoffman, West, & Shets, 2002; Preacher & Hayes, 2008). The present multiple mediation hypotheses were evaluated with the SPSS macros for bootstrapping as provided by Preacher and Hayes (2008). These macros have advantages over the AMOS software as they also provide estimates and standard errors of the indirect effects of individual mediators within a multiple mediation framework. The indirect effects (i.e., effects via the mediators), direct effects (i.e., effects after controlling for the mediators), and total effects (indirect + direct effects) of perceived stress on problem gambling were calculated while controlling for sex and age effects. The bootstrap estimates were based on 1,000 bootstrap samples. An indirect effect was considered to be significant if its 95% Bias Corrected and Accelerated (BCa) bootstrap CIs from 1,000 bootstrap samples exclude zero.

For White gamblers, the hypothesized multiple mediation framework accounted for a total of 26.9% of the variances in problem gambling. Results taken as a set indicated that gambling expectancy bias, refusal efficacy, negative affect, and life satisfac-

tion fully mediated the effect of perceived stress on problem gambling. In particular, the total effect estimate of perceived stress on problem gambling was significant ($\beta = 1.48, SE = .36, t = 4.12, p < .001$), but the direct effect estimate of perceived stress after controlling for the four mediators was insignificant ($\beta = -.77, SE = .74, t = -1.05, p = .30$). In other words, the indirect effect estimate of perceived stress through the four indicators was significant ($\beta = 2.24, SE = .61, 95\% \text{ BCa CI} = 1.10 \text{ to } 3.56$). Among the four mediators, refusal efficacy, negative affect, and life satisfaction were significant mediators. Indirect effect estimates of perceived stress on problem gambling were .51 via refusal efficacy ($SE = .21, 95\% \text{ BCa CI} = .16 \text{ to } 1.00$), 1.40 via negative affect ($SE = .54, 95\% \text{ BCa CI} = .34 \text{ to } 2.45$), and .40 via life satisfaction ($SE = .19, 95\% \text{ BCa CI} = .08 \text{ to } .75$). Figure 1 shows that the hypothesized paths of the proposed mediation framework were significant and in the expected directions ($p < .05$), with the exception of gambling expectancy bias ($p > .05$).

For Chinese gamblers, the hypothesized multiple mediation framework accounted for a total of 16.74% of the variances in problem gambling. Results taken as a set also indicated that the four hypothesized mediators fully mediated the effect of perceived stress on problem gambling. The total effect estimate of perceived

Table 3
Correlation Matrices of Major Variables

Chinese gamblers										
White gamblers	1	2	3	4	5	6	7	8	9	10
1. Sex ^a		.08	-.08	.25**	.07	-.05	.16	.07	-.02	-.13
2. Age	.16		-.43***	-.12	-.15	-.04	.09	-.20**	.27**	-.01
3. Marital status ^b	-.10	-.18*		.16	-.01	-.04	-.05	.07	-.13	-.16
4. Employment status ^c	.11	.24**	.07		.02	-.15	.07	.03	.01	-.15
5. Perceived stress	.01	-.04	.17	.05		.36**	-.29**	.85***	-.35**	.22**
6. Gambling expectancy bias	.06	-.09	.06	.09	.48***		-.21**	.29**	-.16**	.17**
7. Gambling refusal efficacy ^d	-.16	-.14	.08	-.12	-.44***	-.56**		-.28**	.31**	-.27**
8. Negative affect	.10	.02	-.01	.10	.87***	.47***	-.42***		-.39***	.19**
9. Life satisfaction	-.03	-.16	-.13	-.01	-.47***	-.21**	.30**	-.44***		-.31**
10. Problem gambling	-.17**	-.12	-.02	-.04	.34**	.40***	-.36**	.40***	-.29**	

^a Male as “1” and female as “2.” ^b Married as “1” and nonmarried as “2.” ^c Employed as “1” and nonemployed as “2.” ^d White gamblers completed the Gambling Refusal Self-Efficacy Questionnaire (Casey et al., 2008), whereas Chinese gamblers completed the modified Self-Efficacy Scale (Schwarzer & Jerusalem, 1993).

* $p < .05$. ** $p < .01$. *** $p < .005$.

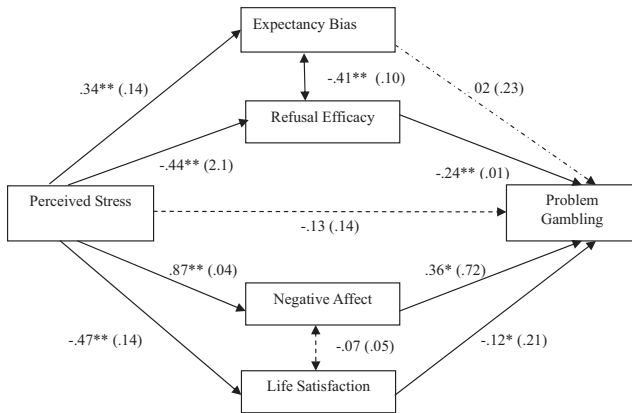


Figure 1. Results of multiple mediation framework for White gamblers ($N = 132$). Note: Values presented are standardized coefficients and standard errors controlling for sex and age effects, solid arrows represent significant pathways (* $p < .05$. ** $p < .01$).

stress on problem gambling was significant ($\beta = 1.91$, $SE = .65$, $t = 2.92$, $p = .004$), but the direct effect estimate after controlling for the four mediators was insignificant ($\beta = 1.22$, $SE = 1.22$, $t = 1.00$, $p = .32$). In other words, the indirect effect estimate of perceived stress on problem gambling through the four mediators was significant ($\beta = .69$, $SE = 1.15$, 95% BCa CI = .12 to 2.31). The significant mediators were refusal efficacy ($\beta = .37$, $SE = .27$, 95% BCa CI = .02 to 1.03) and life satisfaction ($\beta = .72$, $SE = .33$, 95% BCa CI = .22 to 1.53). As shown in Figure 2, the hypothesized paths from perceived stress to the four mediators were all significant ($p < .05$). However, only paths from refusal efficacy and life satisfaction to problem gambling were significant ($p < .05$).

Finally, the four mediators were evaluated with four separate single mediation models. Sobel tests were conducted to determine whether these mediators would mediate the influence of perceived stress on problem gambling when they were evaluated individually. For White gamblers, all four mediators were significant mediators in their respective single mediation models ($Z = .30$ for expectancy bias, .69 for refusal efficacy, 1.52 for negative affect, and .59 for life satisfaction, $p < .01$). For Chinese gamblers, three out of the four hypothesized mediators were significant mediators when evaluated individually ($Z = .64$ for refusal efficacy, 1.35 for negative affect, and .88 for life satisfaction, $p < .01$).

Discussion

Data collected from White gamblers in Australia and Chinese gamblers in China supported the proposed multiple mediation framework. This study also provided empirical evidence that the proposed model fit the data better than two alternative plausible models. For both samples, results indicated that gambling-related cognition and subjective well-being as a set fully mediated the influence of perceived stress on problem gambling. In particular, perceived stress did not directly influence problem gambling when other psychosocial factors were also taken into consideration. Instead, it exerted an indirect influence via various mediators, mainly through low levels of refusal efficacy and life satisfaction. Other studies have also noted indirect, but not direct, link between

stress and excessive gambling via different coping style among young recreational gamblers (Bergevin et al., 2006; Lightsey & Hulse, 2002). These findings were generally in line with the basic diathesis-stress perspective (Lazarus, 1993) and psychological models of gambling (Blaszczynski & Nower, 2006; Sharpe, 2001; Sharpe & Tarrier, 1993). These models typically suggest that stress may trigger cognitive and emotional vulnerabilities, which may in turn relate to the onset and maintenance of problem gambling.

Current conceptual models often include a number of psychosocial factors to account for problem gambling (Blaszczynski & Nower, 2002; Sharpe, 2002; Sharpe & Tarrier, 1993). However, gambling research seldom considers these factors as a set and compares their relative magnitude. The present study showed that the hypothesized mediators were significant mediators when they were evaluated individually in their respective single mediation models, with the exception of gambling expectancy bias in Chinese gamblers. However, when these mediators were considered as a set, only refusal efficacy and life satisfaction emerged as consistent mediators for both White and Chinese gamblers, negative affect was a significant mediator for White gamblers only, and gambling expectancy bias was not a significant mediator for both White and Chinese gamblers. These findings have implications for gambling treatment programs. It may also explain why some gamblers failed to respond to treatment or had early relapse after completing therapies that targeted at modifying dysfunctional gambling cognition (Daughters et al., 2003; Toneatto & Millar, 2004). The present findings suggested that current cognitive therapies for problem gambling may also need to attend to participants' subjective well-being. Components that address the enhancement of life satisfaction and distress tolerance may be included in these programs in addition to focusing on correcting erroneous gambling cognition and fostering refusal efficacy (Daughters et al., 2003). Future research should also examine whether the inclusion of these additional components would improve treatment response and outcome.

Regarding individual paths of the proposed multiple mediation framework, paths from perceived stress to the four mediators were all significant and in the expected directions for both samples.

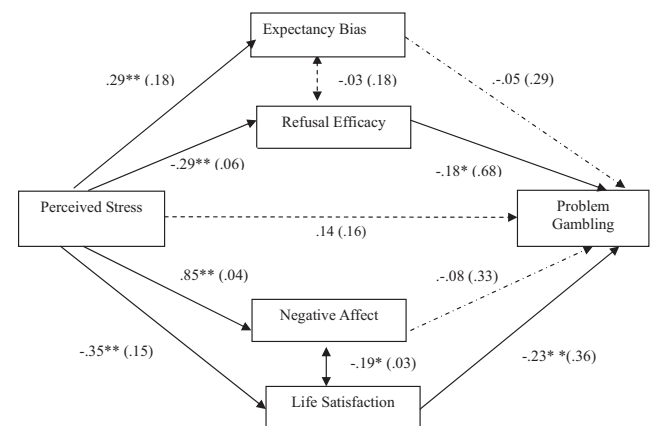


Figure 2. Results of multiple mediation framework for Chinese gamblers ($N = 154$). Note: Values presented are standardized coefficients and standard errors controlling for sex and age effects, solid arrows represent significant pathways (* $p < .05$. ** $p < .01$).

Table 4
Summary of Model Fit Indices in Predicting Problem Gambling

	CFI	RMSEA	C	C-df	AIC	BCC	BIC	C/df	<i>p</i> value
White gamblers									
Proposed model-perceived stress as IV	1.00	.00	3.9	-1.1	47.9	50.4	111.3	.8	.60
Alternative model 1: Negative affect as IV	1.00	.10	10.1	5.1	54.1	56.5	117.5	2.0	.10
Alternative model 2: Life satisfaction as IV	.90	.20	23.7	18.7	67.8	70.2	131.2	4.8	.00
White gamblers									
Proposed model-perceived stress as IV	.98	.08	9.7	4.7	53.7	55.8	120.5	1.9	.10
Alternative model 1: Negative affect as IV	.90	.10	12.9	7.9	56.9	59.0	123.7	2.6	.00
Alternative model 2: Life satisfaction as IV	.90	.20	24.8	19.8	68.8	70.9	135.6	5.0	.00

Note. Variables in the models include perceived stress, negative affect, life satisfaction, expectancy bias, refusal efficacy, and problem gambling. Parameters = 22, df = 5 for all models.

These findings were consistent with the stress literature that indicates stress being associated with erroneous gambling cognition (Friedland et al., 1992; Preston et al., 2007), negative affect (Bandura, 1997), and low levels of life satisfaction (Diener et al., 2003; Grant & Kim, 2005; Ng et al., 2009). For both samples, significant paths from mediators to problem gambling included paths from refusal efficacy and life satisfaction. Previous research also found that gambling refusal efficacy was associated with the onset and maintenance of disruptive gambling (Casey et al., 2008; May et al., 2003; Oei et al., 2008; Tang & Wu, 2010) and that problem gamblers often reported poor life satisfaction and quality of life (Grant & Kim, 2005; Lai, 2005; Rousseau et al., 2002). However, it should also be noted that there were insignificant paths from some mediators to problem gambling. In particular, the path from gambling expectancy bias to problem gambling was insignificant in Chinese gamblers. This should be interpreted in light of the findings that gambling expectancy bias was not a significant mediator in Chinese gamblers when it was evaluated individually and as a part of the multiple mediation framework. For other insignificant paths, namely paths from gambling expectancy bias to problem gambling in White gamblers and from negative affect to problem gambling in Chinese gamblers, it may be related to multicollinearity among variables. It is plausible that perceived stress may have already explained most of the variances in these two mediators, thus left the latter few unique variances to explain problem gambling. Researchers have argued that multicollinearity is to be expected in a mediational analysis and it cannot be avoided (Preacher & Hayes, 2008). They also suggest to increase the sample size rather than to delete the insignificant paths in dealing with multicollinearity. As such, it is deemed necessary to retain these insignificant paths in the proposed multiple mediation framework.

The present study also found that compared to Chinese gamblers in China, White gamblers in Australia reported higher levels of problem gambling, perceived stress, gambling expectancy bias, and negative affect as well as lower levels of life satisfaction. These results were contrary to hypotheses and available cross-cultural literature on gambling (Blaszczynski et al., 1998; Loo et al., 2008; Oei et al., 2008; Papineau, 2005) and subjective well being (Oishi, 2006). It should be noted that studies that found Chinese relative to White gamblers showed more severe problem gambling and related risk factors were primarily based on data collected from Chinese immigrants or Chinese college students

residing in foreign countries such as Australia (Blaszczynski et al., 1998; Oei et al., 2008) and Canada (Papineau, 2005). Compared to White gamblers residing in their own countries, Chinese gamblers as immigrants and as an ethnic minority group in new countries may be vulnerable to adjustment challenges, cultural shocks, social isolation, discrimination, and service barriers. The latter may feel unhappy about life in general and engage in gambling, an acceptable pastime and social activity in their home countries, as a way to meet their emotional needs and to build social network (Blaszczynski et al., 1998; Lai, 2005; Raylu & Oei, 2004b). As issues surrounding the acculturation process were not applicable in the present sample of Chinese gamblers who resided in their home country, the pattern of cultural differences documented in previous studies was thus not supported. In a comprehensive review of gambling among Chinese, Loo et al. (2008) also concluded that there is inconsistent evidence regarding cultural differences in gambling when comparing Chinese and Western samples. One plausible reason is the lack of clarity of the classification of individuals as being "Chinese," who may be people raised in Chinese countries, Chinese immigrants residing in non-Chinese countries, as well as Chinese diaspora who grew up in Western countries. It is deemed important that future studies should explore whether there are differences in disruptive gambling behavior and related risk factors among these groups of "Chinese gamblers."

It is interesting to note that in psychological literature, there are abundant theories in almost all areas of psychological phenomena. However, there is a lack of research testing the validity of these theories, in particular in a clinical population. The present study contributes significantly to the gambling literature in that it is not only testing a conceptual framework of problem gambling in clinical populations but also compares the generalizability of this framework when it is extended to two distinct cultures (White and Chinese problem gamblers). However, caution should also be taken when interpreting results of the present study as it has various methodological weaknesses. These included gamblers being recruited conveniently from local gambling treatment centers. It remained unclear the extent to which they represented the populations of gamblers in the two regions, especially whether results would be generalized to nontreatment seeking problem gamblers. The cross-sectional design of the study did not allow for causal inference among variables, although the proposed mediation framework implicated the direction of various pathways leading to problem gambling. It should be noted that preexisting

cognitive and emotional vulnerabilities may make individuals more prone to stress, or individuals report poor subjective well-being as a result of disruptive gambling and its related financial, interpersonal, and work problems. Future studies with a longitudinal design should aim to determine the temporal relationships among stress, mediators, and problem gambling, and whether the mediation effect would be changed after treatment of problem gambling. There were also too few female Chinese gamblers to enable a detail examination of the gender effect, despite studies have found considerable differences in gambling activities and related risk factors between male and female treatment-seeking gamblers (Grant & Kim, 2003; Oei et al., 2008; Tang et al., 2007). Lastly, methodology concerns similar to other gambling research, such as reliance on self-reports without external validation, were also applicable to the present study. However, issues surrounding the reliability and validity of gambling-related measurement scales for Chinese have already been attended to, as all scales used in the present study had been validated with Chinese samples. It should also be noted that direct comparison on gambling refusal efficacy between White and Chinese gamblers was not made as the two samples were assessed with two different measurement scales on this aspect.

To conclude, the present study empirically validated a multiple mediation framework that specifies gambling cognition and subjective well-being would mediate the influence of perceived stress on problem gambling. This framework was applicable to both White and Chinese problem gamblers. Among the four hypothesized mediators, gambling refusal efficacy and life satisfaction emerged as salient and consistent mediators for both samples.

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