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Cognitive Distortions and Problem Gambling in Sports Betting

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Abstract: Sports betting is an activity that has seen tremendous growth over the past decade. The integrative nature of sports betting in marketing mediums and the advent of modern technology makes it a particularly dangerous form of gambling. This study aimed to compare the cognitions of sports bettors and non-sports gamblers. A total of 713 participants were recruited, of which 80 were sports bettors, 270 were non-sports gamblers, and 363 were non-gamblers. Cognitive distortions were measured using the Gamblers Belief's Questionnaire, which comprises two factors: Luck/Perseverance, and Illusion of Control. The results of a between-groups MANOVA showed that sports bettors recorded higher scores for Luck/Perseverance (M = 35.27, SD = 13.63) than non-gamblers (M = 17.60, SD = 8.20, $p < .001$) and non-sports gamblers (M = 27.19, SD = 11.81, $p < .001$). Sports gamblers also recorded higher Illusion of Control scores (M = 25.48, SD = 8.81) than both non-gamblers (M = 13.46, SD = 6.50, $p < .001$) and non-sports gamblers (M = 19.76, SD = 7.91, $p < .001$). Problem gambling was measured using the South Oaks Gambling Screen. One-way analysis of variance between the three groups showed sports bettors scores (M = 3.45, SD = 3.29) were higher than those of non-sports gamblers (M = 1.62, SD = 2.30), and non-gamblers (M = 0.29, SD = 0.96, $p < .001$). These findings suggest that gamblers should not be treated as a homogenous group, and that greater attention should be placed on sports bettors in prevention and treatment efforts.

Keywords: Pathological Gambling, Sports Betting, Cognitive Distortions.

Introduction

Gambling is a widespread recreational activity that is prevalent across many cultures (Richard et al., 2017). Frequent gambling can lead to the serious condition of problem gambling, which is classified as a mental disorder in the Diagnostic and Statistical Manual V (DSM-5). Under the diagnostic criteria of the DSM-5, an individual diagnosed with a gambling disorder is at risk of social, psychological, and financial issues that can damage their personal well-being.

Gambling is widely accepted in Singapore. The average Singaporean lost about US$650 gambling in 2016, ranking second in the world after Australia in gambling loss per capita (The Economist, 2017), and the average problem gambler in Singapore spends about US$900 per year on gambling activities according to government reports (National Council on Problem Gambling, 2021).

One form of gambling that has grown in popularity in recent years is sports betting, accounting for a plurality of global online gambling (Statista, 2020), and a significant proportion of all gambling revenue (Mercier et al., 2018). In the United States, sports betting generated US$1 billion in revenue in 2020 (Drape, 2021), and this has been projected to increase as much as six-fold by 2023. From a business standpoint, bookmakers have spent more than US$200 million on advertising and sponsorship to promote their gambling services (Drape, 2021). The growth and prevalence of sports betting highlights that this is an important area for researchers and policymakers to attend to. One key driver behind the growth of sports betting is it's integrative nature with the sports entertainment ecosystem (Lopez-Gonzalez et al., 2018; Lopez-Gonzalez et al., 2019). This refers to the integration of sports betting across a sport (teams, players, events, etc.) in tandem with its parallel industries such as media organizations. As part of this integration, a large volume of marketing resources are spent by bookmakers on advertisements and sponsorships during sports broadcasts (Lopez-Gonzalez et al., 2017), as well as endorsement deals with players and teams.

These marketing campaigns not only increase spectators' exposure to opportunities for sports betting, but also spread of messages that can foster cognitive distortions about gambling and the impression that such activities are fun and exciting (Lopez-Gonzalez et al., 2018). Furthermore, a striking finding by Hing et al. (2015) indicated that for pathological gamblers, the prevalence of sports betting advertisements could be a stronger predictor of gambling intention than even their personal attitudes and subjective norms towards gambling. The marketing of sports betting also inhibits one's capacity to control their gambling behaviour in the face of aggressive promotion of incentives and potential value both before and during a sporting event (Winters & Derevensky, 2019).

Another key driver for growth is the advent of modern technology that facilitates gambling activities. Sports bettors are now able to conveniently and easily bet both before and during a game, and are given a wide variety of permutations of outcomes to bet on (e.g., the number of touchdowns in an American football game, or the number of corner kicks in a soccer game; National Council on Problem Gambling, 2020). This increase in betting opportunities creates a potentially dangerous environment for pathological gamblers who are typically prone to high frequencies of gambling.

The literature has suggested that gamblers should not be treated as a homogenous group because there are different profiles of gamblers depending on the nature of their activity. These studies have shown that while all gamblers share certain demographic and psychographic characteristics, other characteristics vary between different types of gamblers. Gamblers who bet on sports are distinct from other gamblers because sports betting is perceived to be a more skill-based form of gambling (Andersson et al., 2009; Noriega & Lin, 2003). However, this is a false impression, as studies have shown that sports bettors' success rates are indistinguishable from random chance over time (Cantinotti et al., 2004; Ladouceur et al., 1998).

One factor that has been attributed to the identifying and treating of pathological gamblers is that of an individual's cognitive distortions. Cognitive distortions in gambling refer to irrational thoughts and beliefs about one's capacity to predict the outcome of a wager and diminish of the role of random chance (Philander et al., 2019). Demographic and psychographic factors, while being useful in their own right, do not yield important information about gamblers' cognitive structures that determine their affective and behavioural outcomes. Having cognitive distortions has also been found to be predictive of future gambling involvement (Yakovenko et al., 2016), and also as a mediator of the relationship between negative psychological constructs and problem gambling behaviour (Donati et al., 2018). Of particular concern to researchers is the perception that sports betting is skill-based as this can exacerbate the impact of cognitive distortions of gamblers.

The growth and prevalence of sports betting has spurred research into the characteristics of individuals who partake in it. Previous studies have examined the profile of sports bettors using both demographic and psychographic variables, but few have compared the profiles of sports bettors with those of gamblers who do not bet on sports (henceforth referred to as non-sports gamblers). Therefore, this study purports to investigate differences in cognitive distortions and pathological gambling tendencies between sports bettors and non-sports gamblers.

Literature Review

Sports betting is defined as the act of wagering money on legally approved local, national, or international human sporting activities across both analog and digital mediums (Hing et al., 2016). Recently published literature suggests a heightened interest in the characteristics of people involved in different forms of gambling (Gainsbury et al., 2012). These include the examination of popular gambling genres such as poker (Dufour et al., 2020; Moreau et al., 2016), electronic gaming machines (e.g., Delfabbro et al., 2020), and horse racing (e.g., Ladouceur et al., 1998). The findings of these studies suggest that individuals who partake in different gambling activities have distinct characteristics, especially in terms of cognitive distortions and pathological gambling tendencies (Dufour et al., 2015; Dufour et al., 2020).

Cognitive Distortions among Sports Bettors

Cognitive distortions have been shown to strongly correlate with pathological gambling symptoms and gambling frequency across a variety of measures. When used in the context of gambling, "cognitive distortions" is an umbrella term encompassing a series of errors in thinking and psychological assumptions that can lead to irrational gambling decisions. It is generally agreed upon in the literature that this is a crucial factor in the development and maintenance of pathological gambling tendencies (Fortune & Goodie, 2012; Mercier et al., 2018). These distortions are of particular concern for sports betting, because it has been identified in the literature as a key driver of problem gambling prevalence (Derevensky & Winters 2018; Hing et al., 2016). While there are arguably numerous types of errors and biases that could be considered cognitive distortions, the literature generally accepts two well known examples as their primary measures: the *gambler's fallacy* and the *illusion of control*.

The gambler's fallacy describes an irrational belief that a sequence of random events must correspond with their perception of what constitutes randomness, which leads to believing that certain outcomes are more or less likely to happen than their base probability based on what has happened so far (Goodie et al., 2019; Tversky & Kahneman, 1971). For example, this could refer to an individual who is attempting to predict the outcome of a coin flip based on previous results of the coin flip, despite every flip being independent from each other. In the context of sports betting, examples could include increased betting on a team that is on a winning streak that could have been a reflection of statistical randomness. In such scenarios, bettors perceive that persevering with their wagers based on particular trends is profitable, in spite of research that suggests otherwise (Cantinotti et al., 2004; Ladouceur et al., 1998).

The second fallacy, illusion of control, refers to a gambler's perceived ability to either influence the outcome of a wager, or to increase their probability of winning via skill or strategy (Joukhador et al., 2003;

Raylu & Oei, 2004; Steenbergh et al., 2002). In sports betting, this usually corresponds to the gambler's belief in their personal knowledge and expertise about the sport, which in truth is unlikely to outperform that of random guessing. It could also include superstitious beliefs about how their personal behaviour will affect the outcome, despite no possible causal relationship.

Profile of Sports Bettors

With regard to sports betting, recent literature reviews (Mercier et al., 2018; Winters & Derevensky, 2019) highlight both a growing prevalence of it, and a distinctiveness in the characteristics of sports bettors. For example, problem sports gamblers tend to be younger and more highly educated than problem gamblers that use casino games (Hing et al., 2016).

One worrying phenomenon indicated by these studies is that the incidence of sports betting seems to begin from a relatively young age. Several studies (Andersson et al., 2009; Cantinotti et al., 2004; Noriega & Lin, 2003) have found that sports bettors reported higher levels of cognitive distortions, especially as pathological gambling severity increased. One common finding of these studies is that sports bettors perceive themselves to have a degree of skill that gives them an edge when betting on sports. This is congruent with the findings that these gamblers have higher education levels, which could lead to a higher degree of resourcefulness and ability to research useful information (Winters & Derevensky, 2019). This perception creates a belief that they can predict an outcome of a match as a result of their pre-existing knowledge of the factors surrounding the game, teams, and/or players involved (Andersson et al., 2009; Noriega & Lin, 2003). This can create a false sense of confidence with regard to the betting task (Andersson et al., 2009), because all publicly available information is already accounted for in the betting lines set by bookies, and any given gambler is unlikely to know better than them how to adjust expectations based on that information.

These studies have typically focused solely on either the profile of sports bettors (Andersson et al., 2009; Cantinotti et al., 2004; Hing et al., 2016), risk factors underpinning such gambling behaviour (Hing et al., 2017), or comparisons of such characteristics between sports bettors and the general, non-gambling population. There is however a dearth in research directly comparing sports bettors with those who engage in different forms of gambling. Addressing this gap could provide useful insights from the perspective of diagnosis and the efficacy of potential interventions for gambling disorders.

There have been some studies comparing sports bettors to other kinds of gamblers. For example, Noriega and Lin (2003) found demographic differences sports bettors and casino gamblers, and most notably that sports bettors perceived themselves to have higher skill in gambling. In a similar vein, Gainsbury and colleagues (2017) compared sports bettors against e-sports (competitive online video gaming) bettors and found differences only in demographic variables such as age and

ethnicity. While not directly comparing sports bettors, one study compared the cognitive distortions between pathological gamblers and non-pathological gamblers that either have a preference for chance or skill games (Myrseth et al., 2010), which corresponds to the perceptions of casino gambling and sports betting. They found that those with a preference for skill games had higher illusion of control scores than those preferring chance games. Finally, another study found that sports bettors had a higher confidence in their ability to predict the outcome of the World Cup when compared to arts students with poor sports knowledge, but did not outperform them on most of the outcomes – nor did many outperform predictions simply based on the published world rankings (Andersson et al., 2009).

However, while these studies have been able to find differences between the gambler sub-groups, they have primarily focused on demographic differences, and only partially allude to potential cognitive differences. Most studies evaluating the cognitions of gamblers have tended to focus primarily on gamblers' perceived skill, which closely resembles what is defined as illusion of control in this study. While these findings are useful for understanding the cognitions of gamblers, they do not provide a holistic comparison of the cognition of sport gamblers. In addition, no study has thus far compared these differences in Asian populations. To date, one study has compared sports gamblers and non-sports gamblers using erroneous cognitions and found that associations between those cognitions and problem gambling was greater in sports gamblers and non-sports gamblers (Cooper et al., 2021). This study aims to build on those findings by directly comparing some of these variables between sports gamblers and other types of gamblers.

As such, this study aimed to investigate psychological differences between the sport gamblers and non-sport gamblers. Given that sport bettors display certain behavioural tendencies, as well as logical assumptions about their capacity to predict certain outcomes, it stands to reason that these gamblers will have higher cognitive distortion scores, as well as higher pathological gambling tendencies, as compared to non-sport gamblers.

H_1: Sports bettors have higher levels of cognitive distortions compared to non-sports bettors

H_2: Sports bettors have higher pathological gambling levels compared to non-sports bettors

Method

Participants

This study was conducted on the general population in Singapore, where both male and female respondents were recruited. While most gambling studies typically focused on males due to an assumed disparity in

prevalence, there have been recent calls to further examine gambling among female populations (Dufour et al., 2020; McCarthy et al., 2018).

713 responses were collected from the public, and subsequently used for this study. Based on their responses, the respondents were divided into three groups; respondents who had participated in sport betting (sport gamblers) in the past 12 months from the date of filling the questionnaire (n = 80), respondents who had participated in non-sport betting gambling activities (n = 270) and respondents who had not gambled (n = 363).

Procedures

Ethical approval was obtained from the university's Institutional Review Board. Participants were recruited through a convenience sampling technique from subway stations situated around Singapore. To be eligible for the study, participants had to either be a Singaporean citizen or a permanent resident. In addition, participants must be above the age of 21, which was the minimum legal age for gambling in Singapore.

The participants were first briefed on the purpose of the study. Upon obtaining consent, they were then each given an online Google Form questionnaire via a link that could be accessed on their mobile phones. No remuneration was given for participation.

Measures

The respondents were required to provide demographic information such as age and gender. Gambling activity was measured via multiple choice questions with a list of typical gambling activities that are available in Singapore (e.g., lottery, sports betting, horse racing, etc.), and the respondents were asked to indicate which profiles of gambling activities they had participated in the past 12 months.

Cognitive distortions were measured through the two-dimensional Gambler's Beliefs Questionnaire (GBQ) developed by Steenbergh and colleagues (2002). The GBQ includes 21 items rated on a 5-point Likert scale, comprising two dimensions: Luck/Perseverance (13 items) and Illusion of Control (eight items). It demonstrated strong internal consistency in the original study with a Cronbach's α of .92 (Steenbergh et al., 2002), and in this study, with α = .96.

Pathological gambling tendencies were measured via the Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987), which includes 20 items rated on a 5-point Likert scale. The SOGS has been widely used since its conceptualization to detect pathological gambling and has proven to be reliable with a Cronbach's α of .97 (Battersby et al., 2002), and .97 in this study as well.

Statistical Analyses

The data was analysed using the Statistical Package for the Social Sciences (SPSS) version 26. A series of tests were conducted to evaluate the study hypothesis, with alpha level set at .05.

To test for H_1, two separate one-way ANOVA tests were conducted. Both used the three gambling subgroups as the independent variable, with the first ANOVA using Luck/Perseverance score as the dependent variable and the second using Illusion of Control score. To test for H_2, a one-way ANOVA was conducted with gambling profile group as independent variable, and SOGS scores as the dependent variable. For each of the aforementioned tests, Games-Howell post hoc tests were run for pairwise comparisons due to unequal variances.

Results

Results of the first ANOVA showed a statistically significant difference in Luck/Perseverance scores across the three gambling profiles, F (2, 710) = 126.91, $p < .01$. The effect size was large, with an eta squared of .26. Post hoc comparisons using the Games-Howell test indicated that sports bettors had significantly higher scores than non-sports gamblers (Mean Difference = 8.08, $p < .01$), and non-gamblers (Mean Difference = 17.67, $p < .01$). Non-sports gamblers also had a significantly higher score than non-gamblers (Mean Difference = 9.59, $p < .01$).

The second ANOVA found a statistically significant difference in Illusion of Control scores across the three gambling profiles, F (2, 710) = 114.29, $p < .01$. The effect size was large, with an eta squared of .24. Post hoc comparisons with the Games-Howell test indicated that sports bettors had significantly higher illusion of control scores than non-sports gamblers (Mean Difference = 5.72, $p < .01$), and non-gamblers (Mean Difference = 12.01, $p < .01$), while non-sports gamblers also scored significantly higher than non-gamblers (Mean Difference = 6.29, $p < .01$; Table 2).

Table 1
ANOVAs Comparing Gamblers' Cognitive Distortions Across Different Gambling Profiles

	Non-gamblers (n = 363)	Non-sports gamblers (n = 270)	Sports bettors (n = 80)	ANOVA		
	Mean (*SD*)	Mean (*SD*)	Mean (*SD*)	F	p	η^2
Luck/Perseverance	17.60(8.20)	27.19(11.81)	35.27 (13.63)	126.91	< .001	.26
Illusion of Control	13.46(6.50)	19.76(7.91)	25.475 (8.809)	114.29	< .001	.24

Table 2
Pairwise Comparisons of Luck/Perseverance and Illusion of Control, with Games-Howell Post-Hoc Test

Comparison	Luck/Perseverance Mean Difference	Illusion of Control Mean Difference
Sports bettors gamblers vs. non-sports gamblers	8.08*	5.72*
Sports gamblers vs. non-gamblers	17.67*	12.01*
Non-sports gamblers vs. non-gamblers	9.59*	6.39*

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The ANOVA evaluating the second hypothesis about pathological gambling found a statistically significant difference in SOGS scores across the three profiles, F (2, 710) = 101.82, $p < .01$. The effect size was large, with an eta squared of .22 (Table 3). Post hoc comparisons with Games-Howell corrections indicated that the mean scores for sports bettors were higher than that of non-sports gamblers (Mean difference = 1.82, $p < .01$), and non-gamblers (Mean difference = 3.16, $p < .01$). Mean scores of non-sports gamblers were significantly higher than that of sports bettors (Mean difference = 1.34, $p < .01$). This is detailed in Table 4.

Table 3
One-Way ANCOVA for Comparing Gamblers' Pathological Gambling Tendencies across Different Gambling Profiles

	Non-gamblers (n = 363)	Non-sport gamblers (n = 270)	Sport gamblers (n = 80)		ANOVA	
	M (*SD*)	M (*SD*)	M (*SD*)	η^2	F (2, 710)	p
SOGS Score	3.45 (1.72)	1.47 (.96)	1.38 (1.24)	.22	101.82	< .001

Table 4
Pairwise Comparisons of SOGS Score with the Games-Howell Post Hoc Test

Comparison	SOGS Score Mean Difference
Sports bettors vs. non-sports gamblers	1.82*
Sports bettors vs. non-gamblers	3.16*
Non-sports gamblers vs. non-gamblers	1.34*

Note: * $p < .05$.

Discussion

This study investigated differences in the cognitive distortions and pathological gambling tendencies between sports bettors and other types of gamblers. To the authors' knowledge, this was the first study conducted that attempted to do this in an Asian setting. The findings suggest that there are cognitive differences between these groups.

H_1 was tested via the comparison of GBQ scores for cognitive distortions across the different gambling profiles. Sports bettors exhibited higher scores in both the Luck/Perseverance and Illusion of Control dimensions of cognitive distortions in the GBQ. This indicates that sports bettors are more likely to believe in logical fallacies regarding luck-based thinking that makes them believe that they will eventually recoup their losses or make more money should they continue to bet. This suggests that sports bettors are more vulnerable to problematic gambling when compared to non-gamblers and gamblers who engage in other forms of gambling.

In a similar vein, the differences in illusion of control scores between sports bettors and non-sports gamblers suggest that sports bettors have more distorted thinking stemming from a belief that they have some control over the outcome of their wagers. This could be due to the nature of sports betting, which is accompanied by information about the sport that is being wagered on. Previous studies have suggested that sports bettors exhibit greater confidence and perceived knowledge of a gambling task (Andersson et al., 2009; Noriega & Lin, 2003; Cooper et al., 2021), which the findings of this study lend support to. As such, the belief of sports bettors that information surrounding a sports wager can be leveraged to provide an advantage in predicting an outcome could be a contributing factor to these higher illusion of control scores.

H_2 was tested via the comparison of SOGS scores for pathological gambling tendencies across the different groups. The higher SOGS scores reported by sports bettors indicate higher pathological gambling levels compared to other profiles of gamblers. The SOGS revolves around several sub-indicators that pertain to pathological gambling tendencies, which include family and job disruption, dishonesty with regard to gambling wins and losses, and financial irresponsibility (Lesieur & Blume, 1987). The higher SOGS scores in sports bettors therefore suggest that they are more at risk to exhibit such behaviours, which can have severe personal and financial ramifications.

The findings could support the work of Cooper et al. (2021) by expanding on their work regarding the perception of sports bettors that they have stronger predictive capabilities than other gamblers, by empirically comparing the cognitive variables across the gambling subgroups. It also augments the work of Myrseth et al. (2010), who showed similar cognitive distortion differences when comparing gamblers with different game preferences. This is also congruent with the findings of the past literature (Andersson et al., 2009; Cantinotti et al., 2004; Noriega & Lin, 2003) that sports bettors displayed certain behavioural tendencies as well as assumptions that they had better predictive abilities. In that light, this study underlies that distinction by suggesting that there should be incongruences across the different profiles of gamblers in both treatment and intervention efforts.

The findings suggest that sports bettors are indeed a distinct profile of gambler in terms of their psychopathology. This would strongly suggest that that prevention and treatment protocols should be tailored for addressing the cognitive distortions of sports bettors, including the belief that they can overcome statistical odds through luck, or that they have some control over the outcome of a wager. Specifically, prevention measures might need to be considered from the perspective of not just the incidence of gambling behaviour, but also the underlying factors that influence sports bettors' cognitive distortions (e.g., beliefs on perseverance and skill). From a treatment standpoint, reformative and education efforts need to consider younger and more educated demographics that sports bettors seem to fall under.

The findings of this study could advance the knowledge in the existing literature on sports bettors by reinforcing the distinction between them and other types of of gamblers, especially from a psychological standpoint. It could also contribute to efforts to diagnose and rehabilitate pathological gamblers by identifying differences between different gambling profiles of gamblers that may require specialized intervention efforts. Specifically, given the higher levels of cognitive distortion among sports bettors, additional efforts should be made to address the dissonance between their illusion of control beliefs and their actual success rates. The inability to address these issues could potentially lead to psychological, social, and financial issues for these individuals.

Limitations and Future Research

While this study is one of few in the literature that attempts to empirically compare sports bettors with other types of gamblers, one limitation is that this comparison is based on past gambling behaviour. Future research could extend this by adopting a longitudinal approach, which would align with the call for more in-depth analyses on sports bettors made by Mercier and colleagues (2018). Another limitation is that the sports bettors recruited might not have exclusively participated in sports betting. Future research into comparisons of sub-groups could thus consider the recruitment of gamblers who only participate in sports betting. In addition, future longitudinal research may attempt to address the discrepancy between gamblers' cognitions and their betting performance (Mercier et al., 2018).

Conclusions

The present study compared sports bettors and non-sports gamblers in terms of their cognitive distortions and pathological gambling tendencies. The findings revealed that sports bettors had higher tendency towards problem gambling than both non-gamblers and gamblers who did not bet on sports. The findings also point to potential dangers of sports as a gambling medium as opposed to other forms of gambling, which in turn highlights the need for specific attention to be placed on sports bettors, in terms of both diagnosis and treatment.

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Declaration of conflict of interest
There is no conflicting interest of note form any of the authors in the conduct of this research.

Availability of data and material
The data associated with this study is available on request from the corresponding author, Y.X.P. Phua, due to privacy/ethical restrictions.

Author's contributions
All three authors were involved with the conceptualization and design of the study, the analysis and interpretation of data, and the preparation of the manuscript. In addition, the first author, Y.X.P. Phua, and the third author, H.K. Leng, were involved in the acquisition of the data used in this study.

Ethics and informed consent
Ethical approval was obtained from the corresponding author's university's institutional review board, (IRB-2018-03-039)

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