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### **Abstract**

Gambling as a leisure activity has now become widespread in many countries. While the majority of individuals who gamble have no negative detrimental effects, research has consistently shown that a small minority develop problems and that for an even smaller minority, the behaviour appears to be an addiction just like other more traditional psychoactive substance-based addictive behaviours. This chapter briefly overviews problematic gambling behaviour by examining the (i) demographics of gambling and problem gambling, (ii) prevalence of gambling and problem gambling, (iii) psychological theories of problem gambling, (iv) importance of structural and situational characteristics in problem gambling, (v) biological bases of problem gambling, (vi) specific comorbidities, (vii) problem gambling assessment approaches, and (viii) treatment approaches for problem gambling. Gambling addiction, like other addictions, result from an interaction and interplay between many factors including the individual's biological and/or genetic predisposition, their psychological constitution, their social environment, and structural characteristics of the gambling activity itself.

### **Introduction**

Gambling is a heterogeneous activity that cuts across barriers of culture, class and race (Griffiths, 1995). There are many different types of gambling including the playing of slot machines, betting on sports events, buying a lottery ticket, playing bingo, and gambling on the stock market. Some of these gambling activities rely purely on chance (e.g., playing roulette, buying a scratchcard) whereas other gambling activities involve some form of skill (e.g., playing poker or blackjack, sports betting). In essence, gambling is defined as the staking of money (or something of financial value) on a future event that the outcome is unknown at the time of staking the money (Griffiths, 1995). Gambling often takes place in dedicated gambling venues such as casinos, betting shops, amusement arcades, bingo halls, amusement and arcades but can now be engaged in remotely via the internet on laptops, tablets, and smartphones.

For a small minority of individuals, gambling can become a problematic. There are many terms that have been used to describe such problematic gambling including (among others) 'addictive', 'disordered', 'pathological', 'dependent', 'impulsive' and 'compulsive', (Griffiths & Delfabbro, 2001). Although there is no total agreement among scholars, 'problem gambling' is arguably the most commonly used descriptor, and is a general term used to indicate varying patterns of damaging or disrupting gambling behaviour. Some individuals can experience problems associated with their gambling that do not meet the full criteria for 'gambling disorder' as defined in diagnostic manuals such as the latest (fifth) edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013) or the latest (11<sup>th</sup>) revision of the International Classification of Diseases (ICD-11, World Health Association, 2019). Most problem gamblers do not display all the core components of genuine addictions (i.e., conflict, salience, withdrawal symptoms, relapse, tolerance, and mood modification; Griffiths, 2005). Put very simply, all gambling addicts are problem gamblers, but not all problem gamblers are gambling addicts (Griffiths, 2016).

The term 'problem gambling' is typically used to describe gambling behaviour that damages, disrupts or compromises personal and family relationships (e.g., relationship breakdowns, divorce), as well as occupational/educational activities (e.g., poor work performance, job loss)

(Griffiths, 2004, 2006). Unsurprisingly, problem gambling typically results in great financial problems such as unpaid creditors, substantial debts, insolvency, and bankruptcy (Griffiths, 2006). In the most extreme cases, legal problems will occur as a consequence of criminal behaviour (e.g., stealing, fraud, embezzlement, etc.) in attempts to obtain money to gamble or to pay off gambling debts (Dennison et al., 2020; Griffiths, 2006). This can also lead to homelessness (Nower et al., 2015). Other criminal acts are associated with problem gambling such as perpetration of intimate partner violence (IPV). A meta-analytic review of IPV in 14 studies by Dowling et al. (2016) reported that 36.5% of problem gamblers were perpetrators of physical IPV (36.5%), 38.1% reported being the victims of physical IPV (38.1%), and that among IPV perpetrators, the prevalence of problem gambling was 11.3%.

There are numerous screening instruments that have been developed to assess problematic gambling behaviour and most individuals working in the gambling studies field agree that problematic behaviour exists on a continuum from relatively minor problems at one end to extreme and pathological behaviour at the other. The behaviour can move in and out of being problematic status and for many individuals there is a natural remission as they ‘mature’ out of the behaviour (Meyer et al., 2009). This conception allies with the emphasis on general public health, which focuses on the personal, social, and physical ‘harms’ that problem gambling can create across various sectors of the general population, rather than the historically narrow focus on the problems of a minority of ‘addicted’ individuals. For example, the families and close friends of problem gamblers typically experience substantial difficulties (e.g., psychological, social and/or financial problems) (Griffiths & Delfabbro, 2001; Griffiths, 2006).

### **The demographics of gambling and problem gambling**

To further understand gambling and problem gambling, it is important to examine its demographics (Griffiths & Delfabbro, 2001). In fact, there are several groups that have been reported to be more likely to gamble and to develop gambling-related problems (Calado & Griffiths, 2016). For instance, men have been found to gamble more than women (Costes et al., 2015; Sassen et al., 2011; Spritzer et al., 2011), to spend more money on gambling (Raisamo et al., 2014), and to participate more in most gambling activities, with the exception of bingo and scratchcards, which are more played by women (Potenza et al., 2006; Wardle et al., 2011). Gender differences have been attributed to a number of factors, including variations in how men's and women's roles in society are viewed and their motivations (Hayer & Griffiths, 2015). Historically, gambling has been viewed as a male-dominated activity (Merkouris et al., 2016), with men being found to be more competitive than women (Burger et al., 2006), and more likely to report gambling for enhancement (excitement or achievement) (Wardle et al., 2011). Therefore, this motivation means more males choose more games of skill as their favourite gambling type, whereas females choose more passive games, such as bingo and scratchcards (Burger et al., 2006). With regard to other demographic characteristics, individuals from the oldest age groups (aged 60 or more years) are less likely to gamble, whereas individuals aged between 24 and 45 years are more likely to gamble (Wardle et al., 2011; Welte et al., 2015). Furthermore, individuals with lower educational qualifications are more likely to gamble than individuals with higher qualifications (Costes et al., 2015; Wardle et al., 2011).

Problem gambling is more likely to occur among males (e.g., Abbott et al., 2014; Bondolfi et al., 2000; Bonke & Borregaard, 2006; Brodbeck et al., 2009; Druine et al., 2006; Olason et al., 2015; Potenza et al., 2019; Williams et al., 2021), those with low education (Potenza et al., 2019), single or divorced individuals (Bakken et al., 2009; Çakici, 2012; Druine et al., 2006; Makarovič, 2010), black individuals (Potenza et al., 2019), as well as individuals of a younger age (Abbott et al., 2014; Kun et al., 2012; Olason et al., 2015). Youth constitutes a vulnerable

risk factor in the development of problem gambling behaviour. In addition, individuals with a lower level of education are more likely to develop problem gambling (Costes et al., 2015; Meyer et al., 2015; Olason & Gretarsson, 2009), as well as individuals that belong to an ethnic minority (Makarovič, 2010; Seabury & Wardle, 2014; Wardle et al., 2011) or who had been born in another country to where they currently reside (Abbott et al., 2014; Bakken et al., 2009; Meyer et al., 2015). Furthermore, individuals unemployed or with a low income have been reported as being more likely to be problem gamblers (Castrén et al., 2013; Costes et al., 2015; Druine et al., 2006; Ilkas & Turja, 2003; Kun et al., 2012; Meyer et al., 2015; Sassen et al., 2011; Williams et al., 2021).

As can be seen by the brief analysis of socio-demographics, problem gambling is a complex and multidimensional phenomenon. The literature shows that social, psychological and biological factors are involved in the development and maintenance of the behaviour. Therefore, several theoretical models have attempted to explain the mechanisms underlying gambling and problem gambling. Some of the major theories are outlined later in the chapter.

### **Prevalence of gambling and problem gambling**

There are far more nationally representative surveys assessing the prevalence of problem gambling than there are for other types of behavioural addiction. Most national surveys conducted worldwide have reported that most individuals have engaged in gambling at some point during their lives, and there are more individuals that gamble annually than those who do not. In a systematic review of worldwide problem gambling prevalence (from 2000-2015), Calado and Griffiths (2016) reported that the lifetime prevalence of problem and gambling disorder/pathological gambling (combined) in 69 studies ranged from 0.7% (in Denmark) to 6.5% (in Estonia) – although the latter figure was from research carried out in 2004. In the same study, the past-year problem gambling prevalence ranged from 0.12% (in Switzerland) to 5.8% (in Hong Kong). However, the problem gambling prevalence rate in more recent Hong Kong studies is now much lower. The review by Calado and Griffiths also included a detailed country-by-country analysis of problem gambling in Europe.

Despite the variations in the prevalence rates of problem gambling, Calado and Griffiths (2016) reported that the socio-demographic findings in most European countries were very similar. More specifically, problem gambling was more likely to occur among males (e.g., Belgium, Cyprus, Denmark, Finland, Germany, Great Britain, Hungary, Iceland, Norway, Switzerland, Sweden), single or divorced individuals (e.g., Belgium, Cyprus, Denmark; Great Britain; Iceland, Norway, Slovenia), individuals of a younger age (e.g., Denmark, Estonia, France, Hungary, Norway, Sweden, Switzerland, Hungary, Iceland), individuals with a lower level of education (e.g., France, Germany, Iceland, Norway, Sweden), individuals that belong to an ethnic minority (e.g., Great Britain, Netherlands, Slovenia), or who had been born abroad (e.g., Germany, Norway, Sweden), and individuals unemployed or with a low income (e.g., Belgium, Finland, France, Germany, Hungary, Netherlands). It should also be noted that research has consistently shown that there are high prevalence estimates for gambling disorder among specific clinical populations and/or those with neurological/medical conditions such as those with problematic psychoactive substance use (4.3%-6.9%) or Parkinson's disease (2.2%-7%) (Potenza et al., 2019). It has also been estimated that among those with gambling disorder, the majority of individuals have one or more psychiatric disorder (96%) and that two-thirds have three or more such disorders (64%) (Potenza et al., 2019).

The most popular types of gambling activities across European countries were lotteries, scratchcards, sports betting and slot machines (e.g., Cyprus, Finland, Great Britain, Hungary,

Iceland, Norway, Sweden). However, the types of gambling activities most associated with problem gambling were slot machines and online gambling games (e.g., Germany, Norway, Portugal). It was also noted that the prevalence rates of problem gambling remained relatively stable among those countries that have carried out more than one nationally representative survey (e.g., Germany, Great Britain, Netherlands, Germany) (Calado & Griffiths, 2016; Potenza et al., 2019). However, it should be noted that all the studies utilized self-report data, which are subject to many well-known methods biases and there were many different screening instruments used.

In a systematic review of worldwide adolescent problem gambling prevalence (from 2000-2015), Calado et al., (2017) reported that the lifetime prevalence of problem and gambling disorder/pathological gambling (combined) in 44 studies among adolescents ranged from 1.6% (in Denmark and Brazil) to 5.6% (in Albania). In the same study, the past-year problem gambling prevalence among adolescents ranged from 0.2% (in Norway and Australia) to 5.8% (in Spain) although this figure was from a regional study and has decreased in more recent Spanish studies. They also noted that one study carried out in Croatia reported a problem gambling prevalence rate of 12.3% but this was a study with a three-month timeframe and also used a screening instrument not used in any other study. The review by Calado et al. also included a detailed country-by-country analysis of problem gambling in Europe.

As with studies of problem gambling among adults, Calado et al. (2017) reported that the socio-demographic findings in most European countries were very similar. Adolescent problem gambling was more likely to occur among males (e.g., Croatia, Denmark, Finland, Great Britain, Iceland, Italy, Lithuania, Norway, Spain, Sweden, Switzerland); among ethnic minority individuals (e.g., Great Britain, Norway, Sweden); among individuals whose parents gambled (e.g., Great Britain, Iceland, Spain); among individuals who did not live with both of their parents (e.g., Norway); and among older-aged adolescents (e.g., Denmark, Lithuania, Switzerland). Adolescent problem gamblers were also more likely to gamble online (e.g., Denmark, Iceland). The review by Calado et al. (2017) also noted that the most prevalent gambling activities among adolescents were slot machines, card games, and scratch-cards (Bosnia and Herzegovina, Great Britain, Iceland, Luxembourg, Norway). It was also reported that the types of gambling most engaged in by problem gamblers were sports betting, slot machines and card games (i.e., games with high event frequencies). Most European research on adolescent gambling has reported a clear association between gambling and substance abuse (Great Britain, Italy, Lithuania, Norway, Romania, Spain, Switzerland). However, all the aforementioned adolescent gambling studies relied on self-report survey data and were typically carried out in school-based settings. Also, some of the studies did not have a nationally representative sample and there were many different screening instruments used (almost all of which were based on instruments originally developed for use among adults and then adapted by using more child-friendly wordings).

Within in each country, findings generally demonstrate that the prevalence rate of problem gambling among adolescents tends to be higher than the prevalence of problem gambling among adults (Calado et al., 2016). There are many possible reasons for this: (i) the transitional period of adolescence is typically characterized by an increase in risky behaviours more generally (e.g., smoking cigarettes, drink alcohol, and illicit drug use, as well as gambling) which then ‘mature out’ into adulthood as other life events take precedence (e.g., full-time employment, marriage, parenthood; Griffiths, 1995); and (ii) millennials have grown up in a period where gambling is socially acceptable, widely available, and widely marketed (Volberg et al., 2010).

## **Psychological theories of problem gambling**

*Psychoanalytic theories:* The first psychologists to offer an explanation for problem gambling were the psychoanalysts. However, there is no single cohesive psychodynamic or psychoanalytic theory that has been advanced in order to explain the development of problem gambling (Rickwood et al., 2010). Psychoanalytic theorists adopted the view that problem gambling was the consequence of an underlying neurosis related to a regression to pre-genital psychosexual phases (Rosenthal, 2008). Von Hattingberg (1914, cited by Moreyra, Aibanez, Saiz-Ruiz, Nissenson & Blanco, 2000), who conducted the first study of problem gambling, proposed that problem gamblers had a fixation in the anal phase of development, which explained the compulsive and masochistic traits in their personality. It was theorized that problem gamblers eroticized the tension and fear involved in gambling. The work of Von Hattingberg was further elaborated by Freud (1928) and Bergler (1957) who have largely influenced later psychoanalytic work on this topic. Freud (1928) suggests that gamblers play to lose and that it constitutes a form of punishment that secondarily becomes a pleasurable activity. For Bergler (1957), problem gambling was viewed as masochistic and related to the Oedipus complex. According to his theory, a gambler's unconscious motivations included the desire to lose and to be punished. For Bergler (1957), the problem gambler unconsciously resents parents and other childhood authority figures who forced him, as a child, to give up the pleasure principle to adopt the reality principle. Given the reliance on clinical case material and absence of empirically testable hypotheses, psychoanalytic models are generally considered to be of limited utility in explaining either the onset and maintenance of problem gambling. However, the psychoanalytic model is the only theory which acknowledges unconscious determinants in gambling.

*Cognitive theories:* Some authors emphasize the role of erroneous beliefs and irrational thinking, in the aetiology and maintenance of gambling and problem gambling behaviours (e.g., Griffiths, 1990; Petry, 2005; Toneatto, Blitz-Miller, Calderwood, Dragonetti, & Tsanos, 1997; Walker, 1992). In order to investigate gamblers' beliefs, researchers have asked gamblers to verbalize their thoughts during gambling sessions, a technique called the 'thinking aloud' method. Using this method, researchers identified many cognitive distortions and misconceptions about gambling (Griffiths, 1994). Some relevant cognitive distortions include (i) magnification of gambling in which gambling skill is overestimated, (ii) predictive control where cognitions are related to the ability to predict gambling outcomes, (iii) illusion of control where gamblers overestimate their personal abilities/skills in influencing game outcome, (iv) superstitious beliefs where gamblers carry specific objects, or perform specific actions and rituals, thinking this can influence the probability of winning; (v) selective memory where individuals recall large wins but have difficulty in recalling losses; and (vi) illusory correlations where gamblers assign false causality to salient features in the environment that they think are related to winning (Griffiths, 1994; Toneatto, 1999). Despite these strengths, cognitive theories have some limitations because they do not explain the functional interaction between arousal, conditioning, and cognitive activity, or the transition from recreational to problem gambling (Rickwood et al., 2010).

*Behavioural theories:* Behavioural theories view problem gambling as a learned behaviour acquired through a process of reinforcement operating under operant and classical conditioning paradigms (Rickwood et al., 2010; Delfabbro, 2013). Operant conditioning is established through fixed and variable ratio schedules of reinforcement (e.g., sensory stimulation, short interval between stake and payout in some gambling games), in which the behaviour is maintained by intermittent schedules of reinforcement, most likely a variable-ratio schedule (Polezzi et al., 2012). Behavioural theory also postulates that both positive and negative

reinforcement increase the probability of a gambling response being elicited and also explain persistence in gambling (Rickwood et al., 2010). The experience of winning, the excitement of winning and various concomitant stimuli act as positive reinforcers that help to maintain the behaviour over time (Coventry & Constable, 1999), whereas negative reinforcement is thought to occur when individuals use gambling as a way in which to escape from unpleasant experiences including depression, anxiety, boredom, and other adverse life-events (Petry, 2005). Early wins are particularly important at the initial stages of a gambling career, with almost half of the gamblers reporting a significant monetary gain in the initial phase of their disorder that could act as a trigger for it (Kassinove & Schare, 2001; Braverman & Shaffer, 2010). Classical conditioning takes place when individuals continue to gamble as a result of becoming conditioned to states such as the excitement or arousal associated with gambling, so that they feel bored, unstimulated, and restless when they are unable to gamble (Polezzi et al., 2012). Despite evidence supporting behavioural theories, they fail to acknowledge the importance of internal events, as they tend to underestimate the power of individual motivation, emotions, and perceptions to influence outcomes (Raylu & Oei, 2002).

*Need-state theories and addiction:* Need state theories postulate that individuals gamble to escape from unpleasant feeling states such as anxiety, depression, and boredom (Blaszczynski & Nower, 2002). Therefore, it can be assumed that principles of reinforcement derived from behaviour theory are also incorporated in addiction models. According to such theory, susceptibility to addiction arises as a result of personal vulnerability and to the extent to which the experience of gambling assists individuals in dealing with underlying psychological problems (Delfabbro, 2013). Both Walker (1992) and Jacobs (1986) proposed that problem gambling could often be described as a form of 'psychological addiction' in that engagement in the behaviour can be negatively reinforcing. In Jacobs' (1986) view, there are specific physiological and psychological characteristics or experiences that can make individuals prone to this form of vulnerability. At a physiological level, some individuals may be chronically under- or over-aroused, so that they need to engage in alternative activities in order to obtain an optimal level of arousal that is hedonistically comfortable. For some, this may mean engaging in risky activity to gain excitement and an increase in physiological arousal. For others, the activity may have a cathartic or calming effect that enables individuals to reduce their arousal. At a psychological level, problem gamblers have been found to have lower self-esteem, mood disturbances, and will report a history of negative life events, early childhood trauma and rejection and are more likely to have histories of early trauma, abuse or stressful life events that preceded the gambling problems (Scherrer et al., 2007; McCormick et al., 2012). Therefore, gambling is used to provide an escape from these problems. These models suggest that some individuals have a greater need for arousal and others have a need for relaxation. Therefore, it is assumed that it is unlikely that avoidance of negative feeling states will be common to all activities or all gamblers. However, as Griffiths and Delfabbro (2001) noted, it is unclear why some individuals have a greater need for relaxation and arousal and whether this would be sufficient to explain normal and problem gambling.

### **The importance of structural and situational characteristics in problem gambling**

Structural characteristics in gambling refer to specific characteristics that are inherent within the gambling game. Such features include win probability, stake size, sound and lighting effects of the game, event frequency (how many bets an individual can place in a given period of time), payout interval (the time between starting the game and payout), jackpot size, prize structure, near-miss opportunities (the psychological bias of interpreting losses as nearly wins or anticipatory of a winning streak), and whether the game has any element of skill (Griffiths, 1993; Griffiths & Auer, 2013; Parke & Griffiths, 2006, 2007). The gambling industry has

employed numerous game design features to entice individuals to gamble and keep them gambling.

Each gambling activity has different structural characteristics that provide insights into the ‘addictiveness’ of a specific type of gambling. For instance, slot machines are sometimes colloquially referred to as the ‘crack cocaine of gambling’ and much of this has to do with both high event frequencies (i.e., a player can typically gamble 1000 times an hour on some slot games) and high accessibility. This type of gambling has a high association with problem gambling (Williams et al., 2021). The structural characteristics of a particular gambling activity may act as reinforcers for a gambling behaviour, may satisfy gamblers’ needs, and may actually facilitate excessive gambling (Dowling et al., 2005). For instance, a gambling activity characterized by a short time between the initiation of a betting event and the result of that game means that little time are given over to financial considerations, and, winnings can be re-gambled almost immediately (Parke & Griffiths, 2006).

In fact, it has been demonstrated in numerous studies that gambling activities, such as slot machines, characterized by short-event frequencies are the gambling activities most played by problem gamblers (Lupu & Todirita, 2013; Calado et al., 2017a; Williams et al., 2021). Many slot machine players overestimate the amount of skill involved when playing such games (Griffiths, 1994). When combined with motivational factors (e.g., gambling as a way of escape; Wood & Griffiths, 2007), slot machine gamblers may become conditioned to the ‘tranquilising’ effect of engaging in the activity itself rather than the simple desire to win money. High event frequency activities such as slot machines also mean that the speed of play in such games is very fast, and a systematic review examining all studies that had empirically examined speed of play found that it was associated with problem gambling (Harris & Griffiths, 2018). Research has also indicated that continuous forms of gambling (e.g., casino games, in-play sports betting, slot machines) with rapid play-rate are more associated with gambling problems (Griffiths, 1999; Killick & Griffiths, 2019).

Moreover, other structural characteristics that have been found to promote a gambler’s desire to continue playing include near misses (Parke & Griffiths, 2004; Pisklak et al., 2020). For example, Dixon et al. (2011) demonstrated that skin conductance responses and heart rate deceleration was significantly larger for near misses than either wins or losses, and these arousal responses were not mediated by players’ problem gambling status. The authors hypothesized that these arousal patterns and responses are due to the experience of frustration in almost winning. In fact, the psychology of near misses postulates that gamblers becomes physiologically aroused when they almost win, and this stimulates further gambling (Griffiths, 1991). In short, gamblers do not constantly lose, gamblers constantly nearly win (Griffiths, 1994).

Macro-situational characteristics are primarily features of the environment, typically accessibility factors, such as the location of the gambling venue, the number of gambling venues in a specified area and possible membership requirements, free travel to and/or accommodation at the gambling venue, as well as or advertising and marketing that can stimulate individuals to gamble (Griffiths & Parke, 2003; Hayer & Griffiths, 2015). Micro-situational characteristics comprise the internal features of the gambling venue itself (e.g., decor, heating, lighting, colour, background music, floor layout, refreshment facilities) or facilitating factors that may influence gambling in the first place (e.g., free bets or gambles on particular games) or influence continued gambling (e.g., the placing of a cash dispenser on the casino floor, free food and/or alcoholic drinks while gambling). Research has shown that peripheral features such as sounds,

and “warm” lights play a key role in the development of some gambling behaviours (Stark, Saunders & Wookey, 1982; Finlay, Marmurek, Kanetkar & Londerville, 2010). For instance, Dixon et al. (2007) reported that fast tempo music (e.g., >94 beats per minute) had a significant effect on participant betting speed while gambling. Similarly, Spenwyn et al. (2010) found that the combined effects of both high tempo music and red light resulted in faster bets by participants while playing a computerized version of roulette.

### **Biological bases of problem gambling**

Psychological theories on their own cannot fully explain problematic gambling behaviour given that all human behaviour is biopsychosocial in nature. Research into the biological bases of problem gambling dates back over three decades to the 1980s with studies examining biological and genetic predispositions. More recently, large twin studies have estimated that genetic factors account for 50–60% of the vulnerability for developing problem gambling (Eisen et al., 2001; Slutske, Zhu, Meier, & Martin, 2010; Giddens et al., 2011). On the other hand, gene association studies primarily report the involvement of genes for the dopaminergic and serotonergic systems (Comings et al., 2001; Lobo et al., 2010; Wilson, Lobo, Tavares, Gentil & Vallada, 2013). In a systematic review on the genetic basis of problem gambling and gambling disorder, Gyollai et al. (2014) identified 21 studies utilizing empirical data from eight independent samples (gene association data for 13 studies mainly examining the involvement of the serotonergic and dopaminergic systems, and twin data examining the role of genetic and environmental factors for the other eight studies). They concluded that even though the number of studies was small the data clearly indicated that there was a genetic vulnerability in relation to problem gambling.

Molecular genetic studies examining problem gambling have noted that both serotonergic genes (e.g., MAOA, MAOB, SLC6A4) and dopaminergic genes (e.g., DRD1, DRD2, DRD4) may increase the vulnerability in developing gambling disorder (Potenza et al., 2019). However, Potenza et al. (2019) caution that findings from molecular genetic studies examining problem gambling should be considered preliminary given some of the methodological weaknesses (e.g. sample sizes) and the fact that other heritable traits (e.g., impulsivity) are implicated in problem gambling and it is unclear how such overlaps contribute to genetic susceptibility.

Research within the fields of neurobiology and neurochemistry has demonstrated increasing evidence that implicates multiple neurotransmitter systems (e.g., dopaminergic, serotonergic) in the pathophysiology of gambling disorders. The dopaminergic system is associated with reward mechanisms and addictive behaviours (Nestler, 2004) and it is hypothesized that changes in dopaminergic pathways might underlie the seeking of rewards (e.g., gambling), that trigger the release of dopamine and produce feelings of pleasure (Zack & Poulos, 2009). Problem gamblers have been shown to have increased dopamine transmission in the dorsal striatum (Potenza et al., 2019).

Neuroimaging studies of problem gamblers have indicated diminished ventral striatum and ventromedial prefrontal cortex and ventrolateral prefrontal cortex activity during rewarding events suggestive of a blunted neurophysiological response to rewards and losses (De Ruiter et al., 2009; Reuter et al., 2005). Neurobiological research examining problem gamblers has shown that compared to non-problem gamblers, they have differences in the limbic and frontostriatal brain regions, including the amygdala, striatum, anterior cingulate cortex, orbitofrontal cortex, hippocampus and insula (Potenza et al., 2019). These brain regions are associated with various characteristics that are central to problem gambling (e.g., stress dysregulation, maladaptive



decision-making, chasing losses, excitement and reward sensitivity, and emotional/social problems) (Potenza et al., 2019).

Traditionally, serotonin function has been considered to be of substantial importance in mediating impulse control. Human studies of problem gamblers have shown decreased concentrations of platelet monoamine oxidase B (a peripheral marker of serotonergic function) and low concentrations of serotonin metabolites in the cerebrospinal fluid (Potenza, 2001). In addition, research has suggested that problem gambling shares genetic vulnerability factors with other addictions (Slutske et al., 2000; Lang et al., 2016).

Biological models suggest that the drive toward intense is biologically prescribed, but they are unable to account for the full diversity of gambling patterns and behaviour. In addition, these theories fail to explain demographic differences in the preference for activities and variations in motivation. Neither can they explain why some activities are more 'addictive' than others and why the structural characteristics of specific activities can influence behaviour (Griffiths & Delfabbro, 2001).

### **Specific comorbidities**

It is important to note that problem gambling is often comorbid with other psychological and behavioural disorders (e.g., depression, anxiety, suicidal ideation, etc.) (Wardle et al., 2020). These comorbid disorders can also exacerbate, or be exacerbated by, problematic gambling behaviour (Griffiths, 2004). There are many studies over the past three decades demonstrating a strong association between problem gambling and psychiatric comorbidity, particularly depression and anxiety (e.g., Assanangkornchai et al., 2016; Black & Moyer, 1998; Brandt & Fischer, 2019; Ford & Håkansson, 2020). Håkansson et al., 2018; Ibáñez et al., 2001; Kerber et al., 2008; Kessler et al., 2008; Lorains, Cowlshaw & Thomas, 2011; McCormick, Delfabbro & Denson, 2012; Quigley et al., 2015). A recent national study in Sweden found that females that reported that anxiety or depression prior to gambling onset was a risk factor for developing problem gambling among females but not for males (Sundqvist & Rosendahl, 2019). Additionally, recent review by Hartmann and Blaszczynski (2018) examined the longitudinal relationships between psychiatric disorders and problem gambling among 35 studies. Based on the findings of longitudinal studies, they concluded that psychiatric disorders could be both a precursor and a consequence of problem gambling. They also noted that there can be other underlying interactive factors (with impulsivity being one such trait) that could predict and drive the relationship between problem gambling and psychiatric distress. A recent systematic review by Richard et al. (2020) examined studies that had examined the relationship between gambling, depression, and conduct disorders (e.g., aggression, anti-social behaviours, delinquency, etc.) in 47 studies. The cross-sectional studies showed that problem gambling was consistently related to both depression and conduct disorders. Longitudinal studies showed that conduct disorders were a risk factor for problem gambling.

Many problem gamblers also experience irrational cognitive distortions and misperceptions in their thinking (e.g., overconfidence, superstitions, denial) (Ciccarelli et al., 2021; Griffiths, 1994a). Research has consistently shown that problem gambling has a high association with impulsivity as demonstrated in a recent meta-analytic review of 52 studies (Ioannidis et al., 2019). The role of impulsivity may also play a role in problem gambling's relationship with psychoactive substance abuse. Among problem gamblers, studies have also reported increased rates of substance abuse or dependence attention-deficit hyperactivity disorder (ADHD), and personality disorders (e.g., narcissistic personality disorder, borderline personality disorder, antisocial personality disorder) (Jacob et al., 2018; Sussman et al., 2011; Theule et al., 2019).

A recent systematic review by Marchetti et al. (2019) examined the relationship between problem gambling and alexithymia (a personality trait in which individuals have a deficit in the cognitive processing of emotion). The review identified 20 studies (14 with community samples and six with clinical samples). Alexithymia was much more prevalent among problem gamblers (among both clinical and community samples) and the authors claimed gambling was used as a coping strategy as a way of avoiding negative emotions and increasing emotional arousal.

Depression and anxiety caused by problem gambling may result in increased use of alcohol and/or other drugs as a means of coping, and vice versa (Griffiths, Parke & Wood, 2002). Such co-morbidities can differ among different demographic cohorts and different gambling types. Moreover, for some individuals, problem gambling is simply symptomatic of a more global disturbance in their biopsychosocial functioning. More severe problem gamblers tend to be easily bored, restless, highly competitive, energetic, restless (Parke et al., 2004), as well as being prone to stress-related physical illnesses including migraines, heart disease, insomnia, peptic ulcer disease, and hypertension (Daghestani et al, 1996; Griffiths et al., 2001; Griffiths, 2004). Health-related problems can also be a consequence of withdrawal effects. Rosenthal and Lesieur (1992) reported two-thirds of problem gamblers experienced at least one physical side-effect while undergoing withdrawal including loss of appetite, headaches, muscle aches, insomnia, stomach upsets, heart palpitations, chills and/or breathing difficulties. Such symptoms have also been reported in other studies (e.g., Blaszczynski et al., 2008; Griffiths & Smeaton, 2002).

As aforementioned, gambling and problem gambling often co-occur with other potentially addictive behaviours. Among large older teen samples of heavy gamblers, co-occurrence with heavy use of alcohol or marijuana/other illicit drugs has been found to be 36% (Barnes et al., 2009) and 59% (Westphal et al., 2000). Among large samples of adult gambling addicts, 41% to 75% reported being current cigarette smokers (Becona, 1993; Desai et al., 2007; Potenza et al., 2006). In several small samples, 4% to 11.4% of adult gambling addicts reported alcoholism (Black & Moyer, 1998; Lesieur & Rosenthal, 1991; Netemeyer et al., 1998). In one large sample of gambling addicted adults that called a gambling helpline, 18% reported problems with alcohol use (Potenza et al., 2006), and in large samples of Spanish and Swiss adults, 14% and 36%, respectively, of probable gambling addicted adults reported alcohol abuse (Bondolfi et al., 2000). Sampled from large representative samples of U.S. adults, 25% and 33% of gambling addicts reported alcohol dependence (Desai et al., 2007; Welte et al., 2001). In fact, drinking alcohol is the most common substance used by people with gambling problems (Gordon, 2008).

Research has consistently shown that there is a high co-morbidity between pathological gambling and alcohol use disorders in both community and clinical samples (e.g., Bland, Newman, Orn, & Stebelsky, 1993; Daghestani, Elenz, & Crayton, 1996; Elia & Jacobs, 1993; Lesieur, Blume, & Zoppa, 1986; Smart & Ferris, 1996; see also review by Crockford & el-Guebaly, 1998). To summarise more specifically, high co-morbidity rates of gambling and drinking alcohol have been found among:

- Pathological gamblers (e.g., Lister et al., 2015; Dannon, et al, 2006; Ladd & Petry, 2005)
- Treatment-seeking pathological gamblers (e.g., Ciarrocchi & Richardson, 1989; Ibanez, et al, 2001, Kausch, 2003; Ladd & Petry 2003; Lesieur, Blume & Zoppa, 1986; Ramirez, McCormick, Russo & Taber, 1984; Rash, Weinstock & Petry, 2011; Suomi et al., 2014; Stinchfield, et al, 2005; Toneatto, Skinner & Dragonetti, 2002)

- Alcohol-dependent patients (e.g., Kovács et al., 2020; Maccallum & Blaszczyński, 2001; Romanczuk-Seiferth et al., 2015)
- Psychiatric outpatients (e.g., Zimmerman, Chelminski & Young, 2006)
- Casino employees (Shaffer, et al, 1999; Shaffer & Hall, 2002)
- Military personnel (Cowlshaw et al., 2020; Gallaway et al., 2019)
- Adolescents (Barnes, et al, 2005; 2009; Cicarelli et al., 2020; Sutherland & Griffiths, 1998; Walker, Clark & Folk, 2010; Westphal, et al, 2000)
- Young adults (e.g., Afifi et al., 2016; Edgerton et al., 2019; Emond et al., 2020; Oksanen et al., 2019; Slutske, Caspi, Moffitt & Poulton, 2005)
- Elderly gamblers (e.g., Vander Bilt, Dodge, Pandav, et al., 2004)
- Native Americans (e.g., Ella & Jacobs, 1993)
- Adults in regional populations (e.g., Momper, Delva, Grogan-Kaylor, et al., 2010)
- Adults in large national and/or epidemiological surveys (e.g., Barnes et al., 2015; Petry, et al., 2005; Wardle, et al., 2007; 2011)

Survey population research at a national level has consistently found an association between levels of self-reported gambling-related problems and at-risk levels of alcohol consumption in many countries' national including the United States (Barnes et al., 2015; Cunnigham-Williams, et al., 1998; Feigelman, et al., 1998; Gerstein, et al, 1999; Kessler, et al, 2008; Petry, et al, 2005; Welte, et al., 2001), Canada (Afifi, et al., 2010), New Zealand (Abbott & Volberg, 1992), Switzerland (Bondolfi et al., 2000; 2008), Korea (Park, Cho, Jeon, et al., 2010), United Kingdom (Griffiths, Wardle, Orford, et al., 2010), Sweden (Statens Folkalsoinstitut, 2012; Fröberg, Hallqvist & Tengstro, 2012), Finland (Oksanen et al., 2019), Australia (Dickerson, Baron, Hong & Cottrell, 1996), and Spain (Becona, 1993).

Lorains, Cowlshaw and Thomas (2011) carried out a meta-analytic review relating to the prevalence of common co-morbid disorders (including alcohol use disorder), and pathological gamblers in nationally representative population samples. Their results from across the 11 studies indicated that problem and pathological gamblers had high rates of other co-morbid disorders. The highest mean prevalence was for nicotine dependence (60.1%), followed by a substance use disorder (including alcohol use disorder) (57.5%), any type of mood disorder (37.9%) and any type of anxiety disorder (37.4%). However, they noted "*there was evidence of moderate heterogeneity across studies, suggesting that rate estimates do not necessarily converge around a single population figure, and that weighted means should be interpreted with caution*" (p.495). In a similar meta-analytic review, Cowlshaw et al. (2014) examined studies that had examined problem gambling among those undergoing treatment for substance abuse. They reported that 14% of those undergoing treatment for substance abuse were also pathological gamblers.

In another comprehensive review of 11 types of addiction, Sussman, et al. (2011) estimated that 50%, 30%, and 20% of gambling addicts also are cigarette, alcohol, and illicit drug use addicts, respectively. The alcohol and drug use co-occurrence estimates are a little lower than those suggested by Freimuth et al. (2008), and Kausch (2003), but are based on a larger pool of studies (albeit not a large pool). Yakovenko and Hodgins (2018) systematically reviewed the literature on comorbidity in gambling disorder comprising 251 studies. They noted that very few of the studies examined the mechanisms or temporal sequencing of co-morbidity and that most studies examined the comorbidity prevalence rates between gambling and other co-occurring disorders. The high co-occurrence of gambling disorder and psychoactive substance use (and vice versa) among the general population may be indicative of common vulnerability

factors, and which are consistent with the findings from genetic and neuroimaging research (Potenza et al., 2019).

### **Problem gambling assessment approaches**

Although problem gambling has been studied and researched for over a century, formal assessment did not occur into ‘pathological gambling’ was included in the DSM-III (American Psychiatric Association, 1980) as a disorder of impulse control alongside behaviours such as pyromania and kleptomania. In 1987, the criteria for pathological gambling were changed completely and modelled on the criteria for psychoactive substance use in the DSM-III-R (American Psychiatric Association, 1987). The 1987 criteria were changed, in part, because of the increasing acceptance of gambling as a potentially addictive behaviour. The criteria were slightly updated in the both the DSM-IV (American Psychiatric Association, 1994) and DSM-5 (American Psychiatric Association, 2013). However, the latest DSM-5 re-categorized ‘pathological gambling’ as ‘gambling disorder’ and as a behavioural addiction rather than a disorder of impulse control (see Appendix 1). The DSM criteria are meant to be used by qualified practitioners during diagnostic clinical interviews but have often been used in nationally representative epidemiological studies.

Since the publication of the DSM-III criteria over 20 different gambling screens have been developed to assess problem gambling (Dowling et al., 2019). The two most used (in addition to the DSM criteria) are arguably the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987) and its derivatives and the Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001). None of these screens assesses ‘gambling addiction’ and problem gambling is typically operationally defined based on the number of criteria endorsed on each of the screens. For instance, in the DSM-5, and individual endorsing four (or more) out of nine criteria in a 12-month period are classed as having gambling disorder (see Appendix 1).

Research has indicated that different problem gambling screening instruments produce different rates of problem gambling among the same populations. Some studies suggest that the SOGS produces higher rates of problem gambling due to too many false positives (e.g., Stucki & Rihs-Middel, 2007). When SOGS has been used simultaneously alongside another screen, the problem gambling rates assessed using the SOGS have been higher (e.g., Bonke & Borregaard, 2006; Orford et al., 2003). In addition, different timeframes used when assessing problem gambling (e.g., past-year vs. lifetime) also result in different rates of problem gambling (with past-year rates unsurprisingly producing a lower problem gambling rate than a lifetime timeframe). A study by Orford et al. (2010) which compared the PGSI with the DSM-IV in a largescale nationally representative British study found that some PGSI items displayed extreme men to women endorsement ratios and that the PGSI was possibly under-estimating the prevalence of problem gambling among females.

It should also be noted that there are also many short screens that have also been developed to assess and screen for problem gambling. These brief screening instruments have typically been used (a) in largescale epidemiological surveys when lots of other behaviours are studied simultaneously as a way to reduce survey fatigue, and (b) by general practitioners to screen for problem gambling in health-based settings (Potenza et al., 2019). Dowling et al. (2019) recently reviewed 20 brief screening instruments and concluded that five of them met criteria for satisfactory diagnostic accuracy in detecting both problem and at-risk gambling (i.e., NODS-CLiP [National Opinion Research Center Diagnostic Screen for Gambling Disorders – Loss of Control, Lying and Preoccupation], NODS-CLiP2, NODS-PERC [National Opinion Research Centre Diagnostic Screen for Gambling Disorders - Preoccupation, Escape, Chasing and

Risked Relationships], Brief Problem Gambling Screen (BPGS-2), and PGSI-SF [Problem Gambling Severity Index-Short Form]).

### **Treatment approaches for problem gambling**

Studies relating to the treatment of problem gambling appeared in the literature long before the formal recognition of pathological gambling and gambling disorder. Almost all forms of gambling treatment are based on specific theoretical perspectives (e.g., psychoanalytic therapy, behavioural therapy, cognitive therapy, pharmacotherapy, etc.) as well as multi-modal treatment combinations of these (Griffiths & MacDonald, 1999; Griffiths, Bellringer, Farrell-Roberts & Freestone, 2001; Hayer, et al, 2005). Cognitive-based therapies (including cognitive therapy, cognitive-behavioural therapy, and motivational interviewing) have empirical support for treatment efficacy of problem gambling (Potenza et al., 2019). Other reviews have concluded that gambling treatment efficacy is increased when pharmacotherapy is simultaneously combined with psychotherapies (Ribeiro et al., 2021).

Cognitive-based therapies for problem gambling primarily focus on the correction of the gambler's cognitive distortions has been found to reduce gambling frequency, diagnostic criteria, monetary risk, and urges to gamble (Ladouceur et al., 2001; Toneatto & Ladouceur, 2003; Sylvain, Ladouceur & Boisvert, 1997). These findings add support to the idea that erroneous perceptions play a role in the development and maintenance of problem gambling. Most randomised trials have included cognitive-based interventions in one or more of their design elements, and most found have reported some benefits for problem gamblers. There are a number of ways that cognitive-based treatments can be delivered (e.g., individual or group, via a workbook or online) (Petry et al., 2017).

In a systematic review of cognitive-based treatments of problem gambling, Petry et al. (2017) identified 21 randomized trial studies (three for cognitive therapy, three for cognitive-behavioural therapy, five for motivational interviewing, seven for a cognitive-behavioural workbook, and three for a cognitive-behavioural workbook feedback). Most of the studies reviewed reported the benefits of CB therapy, but very few of the studies reported long-term efficacy. Petry et al. also noted that some self-directed minimal interventions may benefit individuals with less severe problem gambling symptoms but that those with severe gambling pathology benefit from direct contact with therapists. They also noted that motivational interviewing on its own provides little evidence that it is effective in reducing problem gambling when not combined with other cognitive-based interventions.

A number of behavioural therapies have been developed to treat problem gambling utilizing aversive conditioning (Barker & Miller, 1968; Koller, 1972), response prevention (Symes & Nicki, 1997), and imaginary desensitization (McConaghy, Armstrong, Blaszczyński & Allcockm, 1983). Some studies have compared aversive therapy to other modalities of treatment (McConaghy et al., 1983; McConaghy, Blaszczyński & Frankova, 1991) and failed to confirm an initial enthusiasm prompted by earlier case reports (e.g., Goorney, 1968). More recently, Smith et al. (2015) reported that a behavioural (exposure-based) therapy with 21 participants who completed the treatment was very effective in reducing problem gambling at 12 weeks and at a 6-month follow-up. However, Ribeiro et al. (2021) concluded that in relation to the non-pharmacological treatment of gambling disorder, at present there was currently no 'gold standard' treatment.

In a recent review, Ribeiro et al. (2021) also systematically examined the non-pharmacological treatment of gambling disorder among studies that had utilized randomized controlled trials.

They reviewed 22 studies (1694 patients, mean age=42.94 years, 62.3% males). The results showed at least some efficacy in improving problematic gambling behaviour for cognitive behaviour therapy (n=7), cognitive therapy (n=3), exposure therapy (n=1), combined or separate motivational interviewing and imaginal desensitization (n=4), node-link mapping therapy (n=1), couples therapy (n=1), and 12-step facilitated and personalized feedback intervention (n=1). They also reported that physical exercise had promising efficacy but the results were not statistically significant. The review demonstrated the heterogeneity of the available non-pharmacological therapies and that most studies has methodological weaknesses (poor control groups, small sample sizes, etc.).

Pharmacotherapy has become increasingly used in the treatment of problem gambling including lithium, neuroleptics, glutamatergic agents, serotonergic antidepressants, opioid-receptor antagonists, and dopamine receptor antagonists (Potenza et al., 2019). Given the important role of serotonin function in problem gambling and impulse control disorders, serotonergic drugs have been utilized in the treatment of problem gambling (Brewer & Potenza, 2008). Randomised placebo-controlled trials have been employed to evaluate the efficacy of selective serotonin reuptake inhibitors (SSRIs), such as sertraline (Saiz-Ruiz et al., 2005), fluvoxamine (e.g., Hollander et al., 2000), paroxetine (e.g., Grant et al., 2003), and escitalopram (Myrseth et al. (2011)). In a 16-week double-blind, crossover study Hollander et al. (2000) reported the superior effect of fluvoxamine compared with placebo. However, in a six-month, double-blind, placebo-controlled study, Blanco and colleagues (2002) found that fluvoxamine treatment did not result in a statistically significant improvement, as measured by reduction in money and time spent gambling. In another double-blind, six-month, placebo-controlled trial using sertraline, Saiz-Ruiz et al. (2005) reported no significant differences compared to a placebo group among 60 problem gamblers. Moreover, Grant et al. (2003) in a 16-week study of paroxetine found no significant differences between active drug and placebo.

Myrseth et al. (2011) conducted a randomized controlled trial pilot study, in which one treatment group received cognitive-behavioural therapy, whereas the other group only received eight-week treatment of escitalopram, and reported both groups had significant improvements in past-week gambling urges, thoughts, and behaviours. After eight weeks of treatment, the escitalopram group also received cognitive-behavioural therapy, and at 16 weeks of treatment, the authors did not find a significant differential group effect on the outcome measures between the two groups (cognitive-behavioural therapy versus escitalopram and cognitive-behavioural therapy). While overall showing mixed success of pharmacotherapy, limitations of previous SSRI studies include high drop-out rates and variability in the magnitude of the placebo response observed in different trials.

In addition, pharmacological treatment has been developed based on the dopaminergic system (which influences reward, motivation, reinforcement of reward, and appetitive urges). Given their ability to modulate dopaminergic transmission in the mesolimbic pathway, opioid receptor antagonists (naltrexone and nalmefene) have been utilized in the treatment of problem gambling (Hodgins, Stea, & Grant, 2011). Results from double-blind, placebo-controlled studies of naltrexone and multi-centre double-blind, placebo controlled trials of nalmefene suggest the efficacy of opioid antagonists in reducing the intensity of urges to gamble, gambling thoughts, and gambling behaviour (Grant, Kim & Hartman, 2009; Grant, Odlaug, Potenza, Hollander & Kim, 2010). However, a randomized control trial with bupropion, a drug with dopaminergic properties, did not differ from placebo in the treatment of problem gambling (Black et al., 2007). In one of the few meta-analyses in the literature, Pallessen et al. (2007) reported that mood stabilizers, opioid-receptor antagonists and anti-depressants had better efficacy in treating

problem gambling compared to no treatment or a placebo. However, Potenza et al. (2019) recently concluded that no specific pharmacological medications have been approved with an expressed indication for the treatment of problem gambling. No pharmacological therapy has a formal indication for the treatment of gambling disorder but noted that some medications, (opioid receptor antagonists) may be helpful in the treatment of problem gambling.

Arguably the most popular treatment for problem gambling is Gamblers Anonymous (GA), with thousands of established groups worldwide. GA treatment utilizes the 12-step Minnesota Model Gamblers modelled after Alcoholics Anonymous, and comprises weekly meetings alongside other problem gamblers (although the GA Fellowship tends to use the term ‘compulsive gambling’) (Griffiths, 1995). Most members in treatment have an individual sponsor and the treatment programme provides social and pragmatic peer assistance (e.g., helping group members to manage their gambling-related financial problems (Potenza et al., 2019). GA views problem gambling as a disease and that total abstinence is the main goal in alleviating the problem. The efficacy of the treatment is unknown given the Fellowship is underpinned by total anonymity (Griffiths, 1995; Potenza et al., 2019). Drop-out rates are high (over 90% within the first year) but there are many problem gamblers who benefit from GA and achieve long-term abstinence (Griffiths, 1995). Furthermore, compared to individuals who do not attend GA, those who do attend GA meetings while receiving other professional treatments have higher rates of gambling abstinence (Potenza et al., 2019).

## **Conclusions**

Gambling is a highly prevalent leisure activity worldwide and problem gambling prevalence rates are relatively low and relatively stable in mature gambling markets. Gambling and problem gambling are highly complex behaviours, which cannot be explained by any single theory or perspective. In many studies that have examined problem gambling, different factors have often been studied descriptively or in isolation, without a theoretical or conceptual framework that integrates the different elements. Nonetheless, gambling addiction, like other addictions, result from an interaction and interplay between many factors including the individual’s biological and/ or genetic predisposition, their psychological constitution, their social environment, and structural characteristics of the gambling activity itself (Griffiths & Delfabbro, 2001).

Psychology plays a major role in further understanding problem gambling and gambling addiction. This chapter has highlighted the complexity of this phenomenon and provides a brief overview of some of the major theoretical models and perspectives related to problem gambling. Most theories (at least in part) are useful in order to provide a rationale for future studies. However, these theories are not completely independent from each other, and the weakness of one theory can be complemented by the strength of the other. Therefore, gambling research is best served by a biopsychosocial model (Griffiths & Delfabbro, 2001; Griffiths, 2005) that stresses the biological and cognitive factors of the individual, but at the same time emphasises the role of interpersonal variables, such as attitudes and gambling behaviour of parents, the quality of relationship with them, contextual variables, such as situational factors of the gambling environment.

Consequently, researchers should not assume that individual factors will explain the full complexity of gambling and problem gambling behaviour, and it is useful to explore how individual factors interact with other factors, such as gambling opportunities, attitudes of others, gambling behaviour of friends and family, and inherent structural characteristics of gambling activities. It should also be noted that problem gambling does not occur in a vacuum and that

problem gambling often clusters with other problematic behaviours (e.g., alcohol and drug addictions) and disorders (e.g., mood disorders) that can exacerbate and/or be exacerbated by problem gambling. Vulnerable individuals may attempt to continuously manipulate their neurobiological circuitry in order to obtain a more comfortable subjective state. Further research is needed to assess prevalence, and all possible patterns of co-occurrence, of addictive behaviours within the large samples of individuals.

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### **Appendix 1: DSM-5 Diagnostic Criteria for Gambling Disorder (American Psychiatric Association, 2013)**

- A. Persistent and recurrent problematic gambling behavior leading to clinically significant impairment or distress, as indicated by the individual exhibiting four (or more) of the following in a 12-month period:
1. Needs to gamble with increasing amounts of money in order to achieve the desired excitement.
  2. Is restless or irritable when attempting to cut down or stop gambling.
  3. Has made repeated unsuccessful efforts to control, cut back, or stop gambling.
  4. Is often preoccupied with gambling (e.g., having persistent thoughts of reliving past gambling experiences, handicapping or planning the next venture, thinking of ways to get money with which to gamble).
  5. Often gambles when feeling distressed (e.g., helpless, guilty, anxious, depressed).
  6. After losing money gambling, often returns another day to get even (“chasing” one’s losses).
  7. Lies to conceal the extent of involvement with gambling.
  8. Has jeopardized or lost a significant relationship, job, or educational or career opportunity because of gambling.
  9. Relies on others to provide money to relieve desperate financial situations caused by

gambling.

B. The gambling behavior is not better explained by a manic episode.

Specifiers for the severity are as follows:

- Mild: four or five criteria met.
- Moderate: six or seven criteria met.
- Severe: eight or nine criteria met.