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Attention deficit hyperactivity disorder: Potential gateway to pathological gambling

Review

Introduction: A high prevalence of gambling amongst individuals with attention deficit hyperactivity disorder (ADHD) suggests a need for specialised early intervention strategies.
Objective: This review aims to analyse the relationship between ADHD and pathological gambling, and to identify the biological, psychological, and social predictor variables.
Methods: Literature was searched from PsycINFO and PubMed in reference to individuals with a history of ADHD symptoms and current gambling problems. In total, ten studies were included.
Results: The results indicate a strong correlation with the hyperactive-impulsive subtype of ADHD and internalising disorders in the development of pathological gambling. Furthermore, persistent ADHD was found to increase gambling behaviour severity.
Conclusion: There is preliminary evidence that ADHD could lead to a specific profile of gambling behaviour, which is not merely based on impulsivity but a more cohesive biopsychosocial model. However, more research is required on neurobiological variables before a causal relationship can be concluded.
Keywords: Attention deficit hyperactivity disorder, gambling, biological, psychological, social, predictor variable

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INTRODUCTION

Attention deficit hyperactivity disorder (ADHD) is a developmental neuropsychiatric disorder characterised by inattention, hyperactivity, and impulsivity (American Psychiatric Association, 2000; 2013). The symptoms are highly persistent with a prevalence of 4.4% (Kessler et al., 2006). A review on risky decision making in individuals with ADHD found that children and adolescents with ADHD, but not adults, demonstrate riskier decision making than healthy controls (Groen, Gaastra, Lewis-Evans, & Tucha, 2013). Similarly, adolescence is generally characterised with a high prevalence of risky behaviour, including gambling behaviour (Shead, Derevensky, & Gupta, 2010). Interestingly, ADHD was found to increase the likelihood for gambling behaviour in the youth population with a significantly higher prevalence rate of gambling in adolescents with ADHD (Derevensky & Gupta, 2004; Faregh & Derevensky, 2011). This is a serious problem because adolescent gambling can have severe future consequences, especially since an earlier onset predicts more severe gambling problems (Hardoon & Derevensky, 2002; Kessler et al., 2008). For example, social gambling initiated during adolescence has a higher probability of resulting in problem gambling than social gambling initiated in adulthood (Kessler et al., 2008). Thus, young individuals with ADHD are particularly disadvantaged due to their general predisposition for risky and impulsive behaviour, which lead to gambling experiences at an earlier age (Pagani, Derevensky, & Japel, 2009).

Gambling disorders are associated with financial, legal, social, and health consequences (American Psychiatric Association, 2013). These include but are not limited to high debt, employment difficulties, substance abuse, antisocial personality disorder, and suicidal thoughts (Breyer et al., 2009; Gupta et al., 2013; Kessler et al., 2008). A national comorbidity survey conducted in the United States found the prevalence of adult pathological gambling to be 0.6%, with a majority initiating gambling behaviour by 19 years of age (Kessler et al., 2008). In the Diagnostic and Statistical Manual for Mental Disorders 4th edition (DSM-IV), pathological gambling is categorised as an impulse control disorder due to high comorbidity being reported between pathological gambling and impulsivity (American Psychiatric Association, 2000; Carlton & Manowitz, 1992; Carlton, Manowitz, & McBride, 1987; Specker, Carlson, Christenson, & Marcotte, 1995). However, the aforementioned national comorbidity survey illustrated that pathological gambling is more significantly associated with comorbid disorders, such as mood disorders (OR=2.5-4.6) and substance abuse disorders (OR=3.9-5.8), than ADHD (OR=1.8; Kessler et al., 2008). In the new version of the DSM, the DSM-V, gambling disorders are relocated under substance abuse and addictive disorders (American Psychiatric Association, 2013). Nonetheless, Canadian and French samples have reported that up to half of the youth with gambling problems reported clinical levels of ADHD (Faregh & Derevensky, 2011; Romo et al., 2014). Similarly, studies have shown pathological gamblers to report a history of ADHD before the onset of pathological gambling (Carlton &

Manowitz, 1992; Carlton et al., 1987; Kessler et al., 2008; Rugle & Melamed, 1993; Specker et al., 1995). In addition, persistent ADHD has been suggested to increase gambling symptom severity (Breyer et al., 2009). Subsequently, to unravel the role of ADHD, it is essential to determine which variables may lead to problem gambling behaviour in individuals with ADHD.

The first studies on the correlation between attention problems and pathological gambling were conducted over 20 years ago (Carlton & Manowitz, 1992; Carlton et al., 1987; Rugle & Melamed, 1993). Using retrospective data, these studies showed that pathological gamblers reported higher levels of childhood behavioural and cognitive symptoms related to ADHD, especially impulsivity (Carlton & Manowitz, 1992; Carlton et al., 1987; Rugle & Melamed, 1993). However, clinical measures for ADHD symptoms were not applied within these populations of gamblers. Nevertheless, the previous findings led ADHD to be included as a risk factor in Blaszczynski and Nower's (2002) pathways model of problem gambling. The model proposes that "impulsivist traits", such as ADHD, together with emotional vulnerability, biological vulnerability, and ecological factors predispose to gambling related cognitions and behaviours, resulting in one of the pathways towards problem gambling (Blaszczynski & Nower, 2002). Consequently, the model implies that the role of ADHD in gambling behaviour is based on impulsivity. Since then, about a dozen studies have measured the link between ADHD and problem gambling, and a high comorbidity has been established (Breyer et al., 2009; Canu & Schatz, 2011; Clark, Nower, & Walker, 2013; Dai, Harrow, Song, Rucklidge, & Grace, 2013; Davtian, Reid, & Fong, 2012; Derevensky, Pratt, Hardoon, & Gupta, 2007; Faregh & Derevensky, 2011; Fischer & Barkley 2006; Grall-Bronnec et al., 2011; Pagani et al., 2009; Rodriguez-Jimenez et al., 2006). Still, not a single study has been able to conclude why. Thus, it is important to establish if a causal relationship exists between childhood ADHD and later life gambling problems by evaluating the possible mediating factors.

On the one hand, ADHD may cause a genetic vulnerability, interfere with cognitive and emotional processes, or cultivate a social environment, resulting in a unique profile of pathological gamblers with ADHD (Gupta et al., 2013). This causal relationship may be further mediated by ADHD symptom clusters, more specifically the three subtypes: predominantly inattentive, predominantly hyperactive-impulsive, or combined type (American Psychiatric Association, 2000; 2013; Gupta et al., 2013). On the other hand, gambling problems might only correlate with the high levels of impulsivity, which is not specific to ADHD, as proposed by the pathways model (Blaszczynski, & Nower, 2002; Specker et al., 1995). Hence, ADHD may have a causal or a mediatory role in gambling problems. Determining mediating factors is important for improving early intervention strategies and psychoeducation, while support for a causal pathway would emphasise the need for specialised treatment for individuals with gambling problems and a history of ADHD. Consequently, the aim of this review is to summarise the biological, psychological, and social factors that may predispose an individual with ADHD to develop gambling problems.

METHODS

Search strategy and inclusion criteria

A systematic literature review was carried out to assess the biopsychosocial predictors of problematic gambling in populations with current or childhood ADHD symptoms. The literature was searched for in PsycINFO and PubMed. The study selection procedure is illustrated in Figure 1. The keywords 'ADHD', 'attention deficit hyperactivity disorder' or 'attention deficit disorder' were combined with 'gambling' and pathology related keywords, such as 'pathological', 'problem' or 'behaviour'. The following selection criteria were used for inclusion of studies: written in English, human participants, a clinically valid diagnostic tool for ADHD symptom assessment, analysis of gambling behaviour, and examination of biological, psychological or social aspects in relation to both ADHD symptoms and gambling behaviour. The last criterion resulted in the highest exclusion as many studies did not conduct a joint analysis of ADHD symptoms and gambling behaviour in regard to the biopsychosocial aspects. Studies focusing on other neuropsychiatric disorders, for example learning disability with comorbid ADHD, were excluded. The reason for excluding these studies is the difficulty in concluding the role of the primary disorder. Articles including the word gambling in reference to a gambling task, such as the Iowa Gambling Task, which is used to measure decision-making and not gambling pathology per se, were also excluded. The reference lists of the included articles were used to find other relevant articles. Even though one article (Clark et al., 2013) does not report administering a clinically valid diagnostic tool for ADHD, it was included because the questions administered are replications of the DSM-IV criteria (American Psychiatric Association, 2000). After completion of selection procedures (Figure 1), 10 articles published between 2006 and 2013 were included in the review (see Table 1 for an overview of these studies).

Study selection procedure

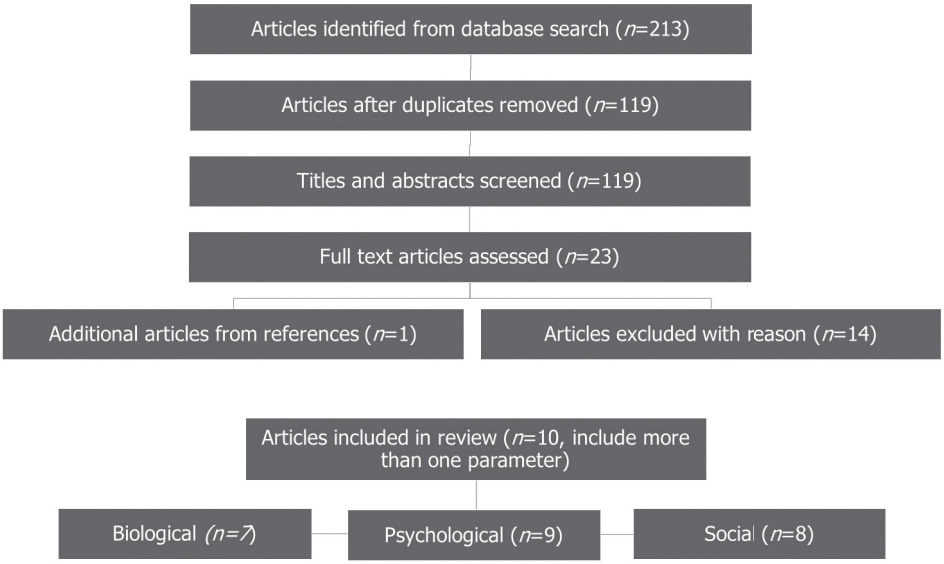

Figure 1. Flowchart illustrating the literature search procedure and articles included in the review for assessment of biological, psychological, and social predictor variables.

RESULTS

Only 1 out of 10 studies did not find a significant relationship between clinically relevant symptoms of ADHD and gambling behaviour (Canu & Schatz, 2011). Canu and Schatz (2011) found an increase in gambling behaviour amongst male, but not female, college students with high levels of ADHD impulsivity symptoms; however, significance diminished when only clinical levels of ADHD was assessed. This could be due to the subsequently small sample size (n=29), and thus ADHD subtypes could not be differentiated (Canu & Schatz, 2011). The results from another study are also questionable as a higher percentage of the ADHD group stated inability to control gambling than the control group, but the percentages were low, 6% vs. 1% respectively (Fischer & Barkley, 2006). Nevertheless, 4 out of 6 studies found that a history of ADHD increased gambling symptom severity (Breyer et al., 2009; Clark et al., 2013; Derevensky et al., 2007; Grall-Bronnec et al., 2011). In addition, one study demonstrated a higher prevalence of gambling problems in adults with persistent ADHD (since childhood) than adults with only childhood ADHD or adults without ADHD (Breyer et al., 2009). Adults with persistent ADHD also reported more severe gambling behaviour (Breyer et al., 2009). In the following sections are outlined the biological, social, and psychological aspects, which may contribute to the differences in findings.

Table 1. An overview of the studies assessed in the review.

Author (yr.)	Participants	*N*	Age (*M*)	Biological	Psychological	Social
Breyer et al. (2009)	Individuals with ADHD, Control group	235	18-24 yrs. (20.2)	Gender, IQ	ASPD, impulsivity	Education, employment, SES
Canu & Schatz (2011)	Individuals with or without symptoms of ADHD	224	18+ yrs. (20.3)	Gender	Impulsivity	Education
Clark et al. (2013)	Individuals with or without symptoms of ADHD	6145	18-27 yrs. (21.7)	ADHD subtypes	Emotional problems, gambling cognitions	Relationships
Dai et al. (2013)	Individuals with ADHD, Control group	60	17-64 yrs. (33.2)	Gender, IQ	Gambling cognitions, impulsivity	Education, SES
Davtian et al. (2012)	PGs with ADHD, PGs without ADHD	95	N/A (43.2 yrs.)	N/A	Personality (NEO-PI-R)	N/A
Derevensky et al. (2007)	Non-Gambler, Social Gambler, At-risk Gambler, Probable PG	2336	12-19 yrs. (14.8)	Age, gender, ADHD subtypes	N/A	N/A
Faregh & Derevensky (2011)	Individuals with ADHD and GP Controls with GP	1130	11-19 yrs. (N/A)	Age, ADHD subtypes	Depressive affect, emotional problems	Relationships
Fischer & Barkley (2006)	Individuals with hyperactive ADHD, Control group	239	19-25 yrs. 20.9	IQ	Inability to control gambling	Education, employment, relationships
Grall-Bronnec et al. (2011)	At-risk gamblers, PGs, Severe PGs	84	19-74 yrs. (41.8)	N/A	Comorbidities, impulsivity, gambling cognitions	Education
Rodriguez-Jimenez et al. (2006)	PGs with ADHD, PGs without ADHD, Control group	95	18-45 yrs. (32.7)	N/A	Impulsivity	Education, residence, employment

Note: ADHD=attention deficit hyperactivity disorder; ASPD=antisocial personality disorder; GP=gambling problem; NEO-PI-R=Revised NEO Personality Inventory; PGs=pathological gamblers; SES=socioeconomic status.

Biological

ADHD subtypes

Three studies measured the likelihood of ADHD subtypes in varying levels of gambling severity (Clark et al., 2013; Derevensky et al, 2007; Faregh & Derevensky, 2011). All studies concurred on probable pathological gamblers having a high prevalence of hyperactive-impulsive type. One study analysed hyperactive-impulsive type together with combined type ADHD (Faregh & Derevensky, 2011); however, combined type ADHD cannot be supported to have an effect on gambling behaviour (Clark et al., 2013). The findings on the predominantly inattentive type are controversial (Clark et al., 2013; Derevensky et al, 2007; Faregh & Derevensky, 2011). Derevensky et al. (2007) that the symptom severity of hyperactive-impulsive and inattentive type increased with gambling severity. Similarly, Faregh and Derevensky (2011) found a significantly higher prevalence of hyperactive-impulsive/combined type than inattentive type amongst at-risk and probable problem gamblers. In addition, Clarke et al. (2013) found the inattentive subtype to be a negative predictor of gambling problems.

Gender, age and IQ

Four studies analysed gender differences (Breyer et al., 2009; Canu & Schatz, 2011; Dai et al., 2013; Derevensky et al, 2007). Derevensky et al. (2007) found significantly higher scores on the hyperactive-impulsive ADHD scale for females than males as gambling severity increased. Nonetheless, individuals with pathological gambling behaviour and clinically relevant symptoms of ADHD did not differ in gender (Derevensky et al., 2007). This was the only study to come across any gender differences. Two studies measured age but neither found a confounding or mediating effect of age in the initiation of gambling, the severity of gambling behaviour or in ADHD symptomatology (Derevensky et al, 2007; Faregh & Derevensky, 2011). In addition, only one out of the three studies measuring IQ found a significantly lower IQ in the ADHD group (Breyer et al., 2009; Dai et al., 2013; Fischer & Barkley, 2006).

Psychological

Personality, impulsivity, and gambling cognitions

Davtian et al. (2012) found that adult pathological gamblers with ADHD had significantly more personality traits related with neuroticism, such as stress proneness, emotional instability and self-consciousness, compared to pathological gamblers without ADHD. They also reported higher levels of excitement-seeking and social discomfort. However, the two groups had similar levels of impulsiveness, which includes inhibition of impulses and resisting cravings (Davtian et al., 2012). Other studies are controversial about levels of impulsivity with one study supporting the previous statement (Breyer et al., 2009) and two suggesting gamblers with ADHD have higher impulsivity (Grall-Bronnec et al., 2011; Rodriguez-Jimenez et al., 2006). As aforementioned, one study found a positive relationship between impulsivity

and gambling severity in males, but could not confirm it within clinically relevant ADHD symptom levels (Canu & Schatz, 2011). Rodriguez-Jimenez et al. (2006) observed that pathological gamblers with ADHD are less able to delay gratification and they have lower inhibitory control than pathological gamblers without ADHD. Similarly, two studies found a significant correlation between a clinical diagnosis of ADHD in adulthood and gambling cognitions, such as the inability to stop gambling (Dai et al., 2013; Fischer & Barkley, 2006). This is also supported in individuals who reported childhood symptoms of ADHD (Clark et al., 2013).

Emotional problems and psychiatric comorbidities

Faregh and Derevensky (2011) found that adolescent pathological gamblers with ADHD had significantly more emotional problems than at-risk gamblers, social gamblers or non-gamblers with ADHD. In contrast, adolescent pathological gamblers without ADHD did not have a significant correlation between emotional problems and gambling problems (Faregh and Derevensky, 2011). Two studies have demonstrated that emotional problems were specific to ADHD populations, increasing the likelihood of pathological gambling (Clark et al., 2013; Faregh & Derevensky, 2011). In addition, ADHD correlated with higher negative affect amongst at-risk gamblers and pathological gamblers (Faregh & Derevensky, 2011). Likewise, Grall-Bronnec et al. (2011) found that the gambling and ADHD relationship is related to a significantly higher prevalence of comorbid mood, anxiety, alcohol abuse, and antisocial personality disorders. Another study supports the link with antisocial personality disorder (Breyer et al., 2009).

Social

Education, employment, socioeconomic status and residence

The two demographic variables that were found to be significant were education and employment, both with controversial findings. Fischer and Barkley (2006) found that the hyperactive group had a higher unemployment rate. Grall-Bronnec et al. (2011) found that gamblers with a history of ADHD were significantly less likely to have graduated from high school. This is supported by a lack of correlation between gambling and clinical ADHD symptoms in a college student population (Canu & Schatz, 2011). In contrast, Rodriguez-Jimenez et al. (2006) found no significant differences in education level or employment status.

Peer and family relationships

Three studies measured relationship problems (Clark et al., 2013; Faregh & Derevensky, 2011; Fischer & Barkley, 2006). Two studies found individuals with ADHD to report more relationship problems together with gambling behaviour than the control group (Clark et al., 2013; Faregh & Derevensky, 2011). Nevertheless, Faregh and Derevensky (2011) did not find family problems to be a significant covariate for gambling severity in individuals with ADHD.

DISCUSSION

The present review on the relationship between gambling problems and ADHD did not produce a coherent list of biological, psychological, and social variables, which would be agreed upon across the studies. This was not surprising within two as heterogeneous populations as problem gamblers and individuals with ADHD. Nevertheless, some variables received more support than others. Looking at the biological aspects, the hyperactive-impulsive ADHD subtype was most consistently associated with higher gambling problem severity, while differences in gender, age and IQ were not strongly supported as mediators in this relationship (Breyer et al., 2009; Canu & Schatz, 2011; Clark et al., 2013; Derevensky et al, 2007; Faregh & Derevensky, 2011; Fischer & Barkley, 2006). The lack of differences due to gambling initiation age was surprising as previous research on pathological gambling implied that an earlier age of onset results in higher symptoms (Hardoon & Derevensky, 2002; Kessler et al., 2008). Nonetheless, persistent ADHD was related to more severe gambling behaviour and a higher percentage of individuals with gambling problems (Breyer et al., 2009). This is an interesting combination of findings because adult (i.e. persistent) ADHD is commonly associated with inattentive symptoms and not hyperactive-impulsive symptoms (Hinshaw, Owens, Sami, & Fargeon, 2006). However, ADHD subtype was not differentiated amongst the individuals with persistent ADHD (Breyer et al., 2009). Consequently, this relationship should be further studied to unravel possible genetic predispositions.

As to psychological aspects, impulsivity was more controversial with two studies for higher impulsivity in individuals with ADHD and pathological gambling, and two studies against (Breyer et al., 2009; Davtian et al., 2012; Grall-Bronnec et al., 2011; Rodriguez-Jimenez et al., 2006). The findings suggested that the impulsive nature of individuals with ADHD and pathological gambling is caused by an inability to delay rewards and inhibit pre-potent responses (Grall-Bronnec et al., 2011; Rodriguez-Jimenez et al., 2006). This is supported by the main neurobiological dysfunctions in ADHD, which are thought to be the diminished prefrontal cognitive control and the reward related midbrain dopamine system (Groen et al., 2013). For example, children with ADHD were found to exhibit sensitivity for reward magnitude and frequency, preferring smaller rewards only when they were more frequent, while continuously disregarding punishment magnitude (Luman, Oosterlaan, Knol, & Sergeant, 2008). Furthermore, they chose smaller immediate rewards over larger future rewards (Luman, Oosterlaan, & Sergeant, 2005). Consequently, individuals with ADHD could result in a unique subgroup of problem gamblers due to their impaired reward system and developmental cognitive vulnerabilities.

A high prevalence of comorbid mood and anxiety disorders was found amongst individuals with ADHD and gambling problems (Faregh & Derevensky, 2011; Grall-Bronnec et al., 2011). This is supported by findings of emotional problems and neurotic personality traits, which increase vulnerability for mood and anxiety

disorders (Clark et al., 2013; Davtian et al., 2012). Similarly, personality traits of social discomfort explain the higher incidence of comorbid antisocial personality disorder (Breyer et al., 2009; Davtian et al., 2012; Grall-Bronnec et al., 2011). Internalising disorders are common comorbid disorders with ADHD and may be part of a causal pathway instead of mediating variables (Hardoon & Derevensky, 2002). Davtian et al. (2012) suggest that pathological gamblers with ADHD may use gambling as a way to cope with stress and negative emotions, similarly to gamblers without ADHD (Shead et al., 2010). This could be one reason as to why gamblers with ADHD were noted to experience an inability to stop gambling (Dai et al., 2013; Fischer & Barkley, 2006) – another reason being the aforementioned reward system impairments (Grall-Bronnec et al., 2011; Groen et al., 2013; Rodriguez-Jimenez et al., 2006). Hence, it is important to note that pathological gamblers with and without ADHD may differ in their reasons for gambling. Then again, the reasons are not mutually exclusive as serotonin and dopamine, associated with mood and reward respectively, are suggested to interact (Kenna et al., 2012). ADHD may therefore not only contribute to the development but also to the persistence of a gambling problem.

The only two social aspects with significant differences were education and employment (Canu & Schatz, 2011; Fischer & Barkley, 2006; Grall-Bronnec et al., 2011; Rodriguez-Jimenez et al., 2006). As Fischer and Barkley (2006) found gamblers with ADHD to have less likely graduated from high school, the non-significant relationship between ADHD and gambling behaviour in Canu and Schatz´s (2011) study could be confounded by the college student population. Moreover, obsessing about gambling has been found to cause school and work problems, which may lead to the lower education and higher unemployment rate (Breyer et al., 2009; Shead et al., 2010). Education level and employment status could therefore be mediating factors in the development of or consequences of an already existing gambling problem in individuals with ADHD.

In support of the DSM-V, in which gambling problems are no longer categorised under impulse control disorders, impulsivity is not causal to the development of gambling problems (American Psychiatric Association, 2000; 2013). Even though, the hyperactive-impulsive ADHD subtype is strongly supported as a mediator. Blaszczynski and Nower's (2002) model also located ADHD under "impulsivist traits"; however, the current findings suggest that ADHD should have its own place in the pathway towards gambling problems. Nevertheless, the other factors included in the pathway, such as the emotional vulnerability, are supported (Blaszczynski & Nower, 2002). As gambling disorders are currently categorised with substance abuse and addictive disorders, a connection could be expected (American Psychiatric Association, 2013). Conversely, a recent study in a Canadian sample found youth with ADHD to report more gambling behaviour compared to peers, but not substance abuse behaviour (Ostojic, Charach, Henderson, McAuley, & Crosbie, 2014). Then again, the gambling behaviour only trended towards significance (Ostojic et al., 2014). Nonetheless, individuals with ADHD seem noncompliant with current classifications, indicating that other domains of the hyperactive-impulsive ADHD subtype should be examined. These could include the mediating factors found in the current review, as illustrated in the biopsychosocial model below (Figure 2).

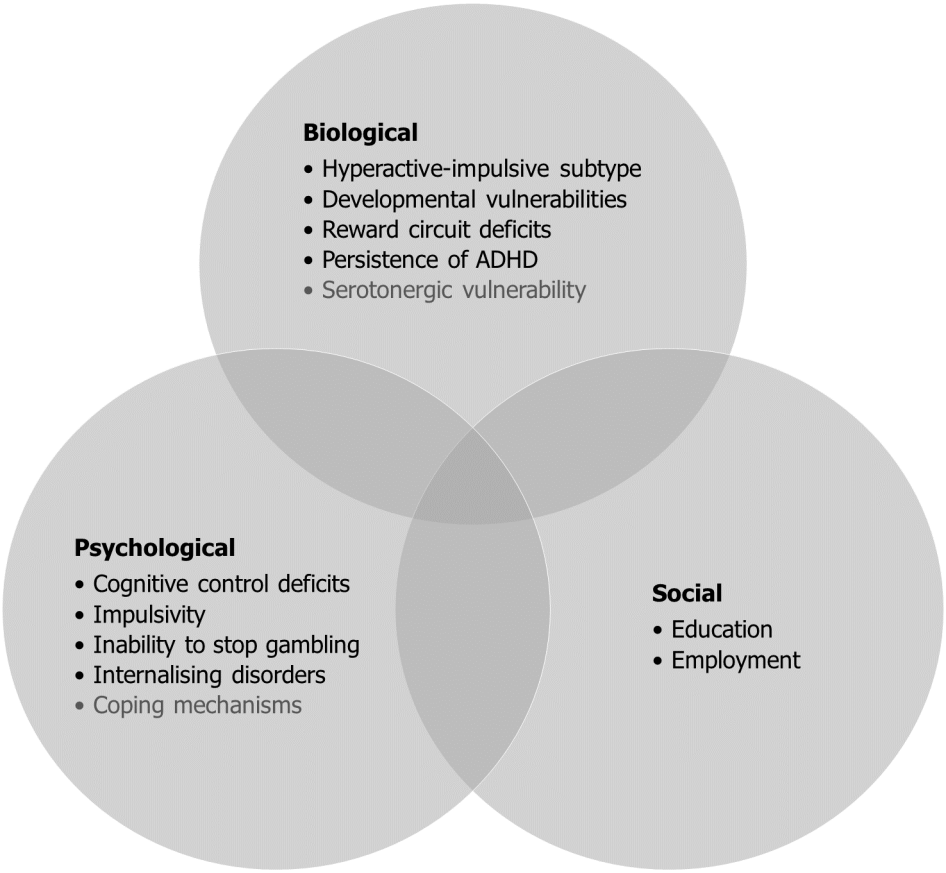

Figure 2. A biopsychosocial model of the variables that may lead an individual with ADHD to develop gambling problems, with the variables in grey proposed as future research.

CONCLUSION

The current review proposes a biopsychosocial approach to understanding the relationship between ADHD and pathological gambling. As shown in Figure 2, multiple variables have been suggested to increase the vulnerability for individuals with ADHD to develop gambling problems. However, most studies conducted on this topic, thus the majority of the studies included in this review, are cross-sectional studies. Consequently, they cannot conclude anything about causality between ADHD and gambling behaviour. Nevertheless, the two longitudinal studies imply that ADHD leads to gambling problems (Breyer et al., 2009; Fischer & Barkley, 2006). Based on the current results, the most prominent causal model for the development of gambling problems would incorporate an interaction between the hyperactive-impulsive ADHD subtype and internalising disorders, including negative affect, emotional problems and comorbid disorders (Clark et al., 2013;

Faregh & Derevensky, 2011). However, the causal relationship of this cannot be established before more longitudinal studies have been conducted. Nonetheless, a biopsychosocial approach can and should be used to establish early intervention strategies and psychoeducation of risky relationships, underlining that it is not simply impulsivity. As to treatment, the suggestion that pathological gamblers with a history of ADHD may have a different reason for persistent gambling than those without should be addressed.

Future research should focus on objective neurobiological factors, instead of only behavioural and self-report data. For example, individuals with ADHD and gambling problems may have a serotonergic vulnerability causing the impulsive behaviour, stress proneness and emotional problems (Davtian et al., 2012; Kenna et al., 2012). The promoter region of the serotonin transporter gene (5-HTTLPR) has been implicated in individuals with ADHD and comorbid internalising disorders, and could lead to a neurobiological link between ADHD and pathological gambling (Kenna et al., 2012). Especially, how it interacts with the dopaminergic system, and their joint effect on reward processing, cognitive control, and coping mechanisms (Groen et al., 2013). The findings reported in this review emphasise the need for an integrated biopsychosocial model.

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