

The Prevalence, Mental Health and Criminal Characteristics of Potential Problem Gamblers in a Substance Using Treatment Seeking Population

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Abstract Some recent evidence suggests that problem gambling presents at elevated rates among treatment samples of substance users; if so, there may be significant implications for treatment. This study utilised a retrospective clinical case file review of all clients assessed for entry into a residential substance use service in Australia over a calendar year. Fifty-seven (21.4 %) of the 266 participants were classified as potential problem gamblers. Potential problem gamblers (PPGs) were not associated with increased psychological and social vulnerability; but displayed phenomenology divergent from single substance addiction, indicative of impulsivity. PPGs were more likely to be male, have a personality disorder, and be associated with a broader pattern of criminality, particularly crimes associated with financial gain. These findings challenge the recent re-conceptualisation of problem gambling, suggesting that problem gambling within treatment populations of substance users should be treated as a disorder adjacent to substance addiction, associated with distinct and specific phenomenology.

Keywords Problem gambling · Mental health · Criminality · Impulsivity

Substance addiction commonly presents in association within a wide range of comorbid mental health problems (Marshall and Farrell 2007). This comorbidity, which refers to the simultaneous occurrence of two or more distinct disorders within an individual, is of paramount concern in treatment samples of substance users (Flynn and Brown 2008). Within this

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population prevalence estimates of comorbid mental health problems have been found to be as high as 70–80 % (Adamson et al. 2006; Chan et al. 2008; Weaver et al. 2003), leading some to make the comment that “*comorbidity is the rule not the exception*” within treatment populations (Cridland et al. 2012). Within Australia research estimates that between 64 and 71 % of substance users in treatment services meet the diagnostic criteria for at least one comorbid mental health disorder (Mortlock et al. 2011). This rate is significantly elevated compared to 8.5 % of the general Australian population reported to experience two or more comorbid mental health problems simultaneously (ABS, 2007).

This elevated comorbidity is highly complex. Not only has research identified high prevalence rates across the full spectrum of mental disorders (Marshall and Farrell 2007); high levels of social vulnerabilities (Humphreys et al. 2005) and prior criminal justice contacts (Gossop et al. 1998) are also routinely observed in treatment samples of substance users (Brunette et al. 2004). This combination of problems occurs at rates consistently higher than those observed in the general population and has been linked to increased addiction severity (Cridland et al. 2012; Morisano et al. 2014). Without having a comprehensive understanding of these potential vulnerabilities (Drake and Green 2013; Grant and Chamberlain 2013) some have argued that treatment strategies remain misinformed and consequently ineffective (Morisano et al. 2014; Mortlock et al. 2011).

One area that has received some interest in the literature is problem gambling. A recent meta-analysis found that within treatment samples of substance users, 14 % of individuals classified for a full diagnosis of pathological gambling, and 23 % demonstrating the same symptoms at a sub-clinical level (Cowlshaw et al. 2014). These findings, in combination with the recent revisions to the DSM-5, (APA, 2013) which places behavioural and substance addictions within the same diagnostic category, attest to the increased clinical overlap between substance addiction and problem gambling (Grant and Chamberlain 2013). The estimated lifetime prevalence rates of problem gambling in the general community range from 2.3 to 3.9 % (Kessler et al. 2008; Productivity Commission 2010; Volberg et al. 2001), with 12 month prevalence estimates between 0.6 and 0.8 % (Bondolfi et al. 2007; Wardle et al. 2007).

Rates of problem gambling vary according to gender, with males being significantly more likely than females to be problem gamblers (Blanco et al. 2006; Crisp et al. 2004; Delfabbro 2011; Nordmyr et al. 2014). Prevalence rates also vary according to age, with young adults (18–25 years old), particularly young males, being at the highest risk for developing problem gambling (Hayatbakhsh et al. 2012; Huang and Boyer 2007; Kristiansen and Jensen 2014). Of note, at a clinical level these associations tend to disappear, with clinical services reporting a much older age bracket for problem gamblers presenting for treatment (Delfabbro 2011). There is also some evidence that problem gambling is unequally distributed across socioeconomic status, ethnicity as well as incarcerated and psychiatric populations (Raylu and Oei 2002). While many of these factors overlap in incidence regardless of gambling behaviours (AIHW, 2013), understanding why problem gambling occurs within these populations at rates higher than those observed in the general community remains of substantial clinical and practical importance to help better inform treatment priorities and foci.

Problem Gambling and Comorbid Mental Health

In comparison to general population estimates, problem gamblers in both community (Billi et al. 2014; el-Guebaly et al. 2006; Hayatbakhsh et al. 2012; Petry et al. 2005) and treatment

samples (Hounslow et al. 2011; Quilty et al. 2011) consistently present with significantly elevated rates of mood dysfunction (including suicidal ideation and self-harm), anxiety, and substance use disorders. These rates are consistently significantly inflated (Lorains et al. 2011), for example with recent national estimates reporting that 6–15 % of Australians experience mood and affective problems, and only 5 % are affected by substance use (ABS, 2007).

In terms of temporal relationships, Kessler et al. (2008) found that while mood and anxiety disorders preceded problem gambling, the opposite was true for substance use disorders, which generally developed prior to the onset of gambling behaviours. Results from the national epidemiologic survey on alcohol and related conditions (NESARC; Giddens et al. 2012) support this, reporting that anxiety disorders mediate the presentation of additional psychopathology in problem gamblers. Similarly, personality disorders (particularly borderline and antisocial) have been found at much higher rates among problem gamblers, some as high as 40–60 % (Bagby et al. 2008; Ibanez et al. 2001; Petry et al. 2005).

Finally, the available research suggests that problem gambling is associated with the experience of trauma (Haw et al. 2013). Within both community and clinical samples, approximately 14 % to 19 % of problem gamblers meet the diagnostic criteria for post-traumatic stress disorder (Kaush et al. 2006; Kessler et al. 2008). Furthermore, research has also shown that problem gamblers with a history of trauma are more likely to experience problems with drug and alcohol use and report greater levels of psychological distress including suicidality, depression and anxiety (Ledgerwood and Milosevic 2013; Najavits et al. 2011).

Problem Gambling and Relationships

Problem gambling has been found to have adverse effects on family life, particularly intimate partnerships (Kourgiantakis et al. 2013). For example, in comparison to general population estimates, problem gamblers have been found to have elevated rates of separation, divorce and family dysfunction (Black et al. 2012; Dowling et al. 2009,). Spouses/partners of problem gamblers report high levels of personal distress and relationship dissatisfaction (Hodgins et al. 2007). These attitudes are commonly reported as a result of a high level of anger, deception, and an overall sense of mistrust of the partner, which has been shown to culminate in intimate partner violence (Kalischuk et al. 2006). Although empirical evidence in this area remains limited at this time, emerging results from both community samples of problem gamblers (Afifi et al. 2010; Korman et al. 2008) as well as from samples of male perpetrators of IPV (Brasfield et al. 2012) indicate that problem gambling is associated with both the perpetration *and* victimization of IPV. In particular, a recent Australian study of problem gamblers and their families found that 52.5 % reported some form of family violence within the past 12 months, with 70 % of these participants reporting that this violence was directly related to gambling (Suomi et al. 2013).

Problem Gambling and Crime

Problem gambling is found at increased rates in incarcerated populations, with approximately one third of people detained in correctional services reported to be problem gamblers

(Williams, Royston & Hagen, 2005). Lahn (2005) reported that this rate was some 18 times higher than general population estimates. Interestingly, between 10 and 30 % of incarcerated problem gamblers have been found to have committed criminal offences to directly support their gambling, i.e., for financial gain (Nordmyr et al. 2014). Additionally, the more severe an individual's problem gambling, the more likely they are to be repeat offenders and to have resorted to more violent crimes to obtain income (Turner & McAvoy 2011).

Aims and Hypotheses

This study aimed to examine the prevalence and presentation of potential problem gambling in a treatment sample of substance users. It was hypothesized that: (1) there would be a higher prevalence of potential problem gamblers within a treatment sample of substance users compared to general population estimates; (2) potential problem gambling would be more common among for males than females; (3) there would be a significant difference in the rates of comorbid mental health problems between potential problem and non-problem gamblers; (4) there will be significant differences in the presence of family-related discord between potential problem and non-problem gamblers in a treatment sample of substance users; and (5) there would be a significant association between potential problem gambling and criminal offending.

Methods

Design

The study involved a retrospective analysis of all clients attending a face-to-face admission assessment at a Drug and Alcohol Rehabilitation Service in New South Wales, Australia, in the calendar year of 2013 ($N=280$). Individuals were procedurally excluded from the service if they had a criminal history involving extremely violent charges such as homicide, sexually based offences, offences against children or arson-related offences, or were incarcerated at the time of referral. All other clients were considered eligible for inclusion. After screening for any repeated or incomplete assessments the final eligible sample comprised 266 completed admission assessments. The study was approved by the Human Research Ethics Committee at the host institution; all participants had provided consent for their file data to be used for research purposes.

Procedure

Client case files were examined chronologically in a secure environment, with data extracted directly onto a pre-coded de-identified data collection sheet. In addition to basic descriptive data, specific information regarding substance use and gambling history, history of police contact, family status, mental health-related information were extracted.

Participants were classified as potential problem gamblers if they self-reported being a current gambler, in addition to reporting, “yes” to screening questions “do you gamble to chase your losses?” or “do you gamble more than you can afford?” Mental health diagnoses were classified according to category diagnoses in ICD-10 (WHO, 2010), with more specific

details recorded pertaining to substances for substance-related disorders (codes F10-19). Criminal histories were classified according to the Australian standard (ANZSOC) sixteen offence divisions and grouped into three categories (offences against persons, offences against property, and offences against governments/departments/organisations) as recommended in the classification guide (ABS, 2011).

Approach to Analysis

Basic descriptive statistics were used to characterize the sample. Continuous data were compared using t-tests or non-parametric equivalents where data were skewed; Chi Squared tests of Association were used to compare categorical data, odds ratios and 95 % confidence intervals were also reported. Multivariate analyses were utilized to consider the potential for confounding, using logistic regression, plotting the AUC of the ROC and checking the robustness of the resultant model using the Hosmer-Lemeshow test. Effect sizes were calculated using Cohen's *d* (Cohen 1992), or in the case of Mann–Whitney U tests, the *z*-value was converted to *r*.

Results

Sample Characteristics

The sample included 266 participants, 177 (66.5 %) males and 89 (33.4 %) females, aged between 16 and 64 ($M=34.68$, $SD=10.21$). There was no significant difference observed in age across gender (males $M=34.65$, $SD=10.46$; females $M=34.76$, $SD=9.77$, $t=0.09$, $p=.92$).

Gambling Behaviours

Seventy-six participants (28.6 %) reported being a current gambler, a further 16 (6 %) reported a past history of gambling; a total of 57 (21.4 %) of the sample were classified as potential problem gamblers. The most commonly reported preferred method of gambling for the potential problem gamblers was electronic gaming machines ($n=38$, 66.6 %) and the most common reported expenditure per week was between AUD \$100–\$999 ($n=22$, 38.5 %). Potential problem gamblers were significantly more likely to be male, (26 % vs. 12 %, $\chi^2=6.53$, $p=.01$, $w=0.33$). They were also proportionally younger, but not significantly so ($M=32.93$, $SD=9.17$ vs. $M=35.16$, $SD=10.45$, $t=1.46$, $p=.14$). There were no significant differences between the ages of male and female potential problem gamblers ($M=33.07$, $SD=9.30$ vs. $M=32.36$, $SD=8.98$, $t=0.22$, $p=.82$).

Across the total sample, the most commonly identified primary substances of abuse were alcohol ($n=123$, 46.2 %) and stimulants ($n=63$, 23.6 %). Alcohol was significantly less common as the main substance of abuse for potential problem gamblers, ($\chi^2=4.8$, $p=.02$, $w=0.13$); no other associations were found between main substance of abuse and problem gambling.

Comorbid Mental Health

Excluding substance-related diagnoses, 207 (77.8 %) of the total sample had at least one comorbid mental health diagnosis. The most commonly reported were mood/affective

disorders ($n=160$, 60.1 %), or neurotic, stress-related and somatoform disorders ($n=106$, 39.8 %). In terms of sub-clinical mental health issues, 235 participants (87.2 %) reported a history of trauma, 88 (33 %) indicated a history of self-harm and 104 (39 %) reported a history of suicidality. The only significant difference in mental health related factors between potential problem gamblers and the remainder was the presence of personality disorders (Table 1). After adjusting for the potentially confounding factors of age and gender, this association remained statistically significant (AOR=4.76, 95 % CI 2.33–17.22).

There were no significant differences in terms of number of diagnoses between potential problem gamblers and non-problem gamblers ($M=2.37$, $SD=0.95$ vs. $M=2.26$, $SD=0.987$, $t=0.72$, $p=0.47$). There were also no significant differences in terms of sub-clinical mental health problems including trauma history, ($\chi^2=0.33$, $p=0.57$), self-harm, ($\chi^2=0.20$, $p=0.65$), and suicidal behaviours ($\chi^2=0.38$, $p=.53$).

The most common substance use disorders across the overall sample were alcohol use disorder ($n=139$, 52.3 %), cannabis use disorder ($n=86$, 32.3 %) and stimulant use disorder ($n=85$, 32.0 %). One in four ($n=66$, 24.8 %) participants were diagnosed as a poly-substance user. No significant differences were observed between potential problem gamblers and non-problem gamblers in the type or number of substance related diagnoses ($M=1.77$, $SD=1.29$ vs. $M=1.70$ $SD=1.55$, $t=0.31$, $p=0.76$).

Family Status

The majority of the sample, (248, 93 %) reported a supportive family; one in six ($n=44$, 16.5 %) indicated the presence of domestic violence victimisation within the last 12 months. There were no significant differences between potential problem gamblers and non-problem gamblers in terms of having a history of domestic violence, ($\chi^2=0.45$, $p>0.05$), or with issues related to family support, ($\chi^2=0.16$, $p=0.69$).

Table 1 Comparison of ICD-10 diagnoses according to the presence/absence of problem gambling

ICD-10 Category Diagnosis	Problem Gambler <i>N</i> (%)	Non-Problem Gambler <i>N</i> (%)	χ^2	<i>p</i>
(F00-09) Organic, including Symptomatic, Mental Disorders	0(0)	0(0)		
(F10-19) Mental and Behavioural Disorders due to Psychoactive Substance Use	54 (94.7)	195 (93.3)	0.15	.70
(F20-29) Schizophrenia, Schizotypal and Delusional Disorders	10(17.5)	35(16.7)	0.02	.90
(F30-39) Mood (affective) Disorders	33(57.9)	127(60.8)	0.15	.70
(F40-49) Neurotic, Stress Related and Somatoform Disorders	20(35.1)	86(41.1)	0.69	.41
(F50-59) Behavioural Syndromes Associated with Physiological Disturbances and Physical Factors	0(0)	5 (2.4)	1.39	.24
(F60-69) Disorders of Adult Personality and Behaviour	11(19.3)	10(4.8)	12.97	<.001***
(F70-79) Mental Retardation	0(0)	0(0)	–	–
(F80-89) Disorders of Psychological Development	0(0)	0(0)	–	–
(F90-98) Behavioural and Emotional Disorders with onset usually occurring in childhood and adolescence.	7(12.3)	15(7.2)	1.54	.22

Criminal history

The majority ($n=191$, 71.8 %) of the sample had a criminal history; more than a quarter ($n=79$, 29.6 %) reported having been previously incarcerated. While no differences were observed in age, males were found to be significantly more likely than females to have both a criminal history (80.2 % vs. 55.1 %, $\chi^2=18.53$, $p<.001$, $w=0.26$) and to have been previously incarcerated (38.1 % vs. 13.5 %, $\chi^2=17.08$, $p<.001$, $w=0.25$). The range of offences committed, both in total and when comparing across potential problem gamblers and non-problem gamblers are shown in Table 2.

Univariate analysis demonstrated that potential problem gamblers were significantly more likely to commit offences involving *robbery, extortion and related offences* ($\chi^2=4.97$, $p=.03$, $w=0.13$), *theft and related offences* ($\chi^2=6.37$, $p=.01$, $w=0.15$), and *illicit drug related offences* ($\chi^2=4.09$, $p=.04$, $w=0.12$). When examining ANZSOC offence categories, potential problem gamblers were significantly more likely than non-problem gamblers to have a greater number of charges for *offences against property* ($t=3.25$, $p=.001$, $d=0.40$). Potential problem gamblers were also more likely than non-problem gamblers to have charges for ‘*offences against organisations, government and community*,’ ($U=6966.0$, $z=2.28$, $p=.02$, $r=0.13$). After adjusting for age and gender, this association remained; the odds of having a legal charge for an ‘*offence against property*’ was 1.61 (95 % CI 1.10–2.37) times higher among potential problem gamblers than non-problem gamblers (Table 3).

When comparing the total number of convictions across all three offence categories, potential problem gamblers were more likely than non-problem gamblers to have a broader

Table 2 ANZSOC offence type according to presence/absence of problem gambling

ANZSOC Divisions	Problem Gambler <i>n</i> (%)	Non-Problem Gambler <i>n</i> (%)	Total Across Sample <i>n</i> (%)
Homicide and Related Offences	0(0)	0(0)	0(0)
Acts Intended to Cause Injury	22(38.5)	64(30.6)	86(32.3)
Sexual Assault and Related Offences	0(0)	2(0.9)	2(0.7)
Dangerous or Negligent Acts Endangering Persons	18(31.5)	68(32.5)	86(32.3)
Abduction, Harassment and other Offences Against the Person	1(1.7)	3(1.4)	4(1.5)
Robbery, Extortion and Related Offences	10(17.5)	16(7.6)	26(9.7)
Unlawful Entry with Intent/Burglary, Break and Enter	5(8.7)	10(4.7)	15(5.6)
Theft and Related Offences	12(21.0)	18(3.8)	30(11.2)
Fraud, Deception and Related Offences	1(1.7)	5(2.3)	6(3.3)
Illicit Drug Offences	16(28.0)	34(16.2)	50(18.7)
Prohibited and Regulated Weapons and Explosive Offences	3(5.2)	1(0.4)	4(1.5)
Property Damage and Environmental Pollution	12(21.0)	26(12.4)	38(14.2)
Public Order Offences	3(5.2)	10(4.7)	13(4.8)
Traffic and Vehicle Regulatory Offences	4(7.0)	14(6.6)	18(6.7)
Offence against Government Procedures, Government Security and Government Operations	10(17.5)	29(13.8)	39(14.6)
Miscellaneous Offences	0(0)	0(0)	0(0)

Table 3 Comparison of total number of convictions within Each ANZSOC category of offence according to the presence/absence of problem gambling

ANZSOC Category	Problem Gamblers		Non- Problem Gamblers		<i>t</i>	<i>P</i>	Unadjusted		Adjusted ^b	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			<i>OR</i>	95 % <i>CI</i>	<i>OR</i>	95 % <i>CI</i>
Offences Against the Person (divisions 1–6)	0.89	0.74	0.73	0.79	1.39	.17	1.29	[0.90, 1.86]	1.19	[0.81, 1.74]
Offences Against Property (divisions 6–9 and 12)	0.70	0.92	0.35	0.63	3.25	<.001***	1.79	[1.24, 2.59]	1.61	[1.10, 2.37]
Offences Against Organisations, Government and Community (divisions 10,11,13–16)	0.63	0.69	0.42	0.63	2.16 ^a	.03*	1.58	[1.04, 2.40]	1.37	[0.89, 2.13]

M mean, *SD* standard deviation, *OR* odds ratio, *CI* confidence interval

^a Non-parametric Mann–Whitney *U* test was conducted due to violation of normality

^b Statistically adjusted for age and gender

p* < .05. **p* < .001.

Table 4 Summary of multivariate model predicting problem gambling

Variable	Adjusted OR ¹	<i>p</i>	95 % CI
Number of Different Offences	1.268	.04*	[1.02, 1.58]
Age	0.453	.99	[0.96, 1.02]
Gender	0.364	.01**	[0.16, 0.81]
Disorder of Adult Personality and Behaviour	6.438	<.001***	[2.33, 17.78] ^a

¹ Statistically adjusted for other variables in the model

a Note the wide CI consistent with the low number of personality disorders in the sample overall

p*<.05. *p*<.01. ****p*<.001

range of offences ($t=2.99$, $p=.003$, $d=0.36$). After controlling for age, gender and personality disorder, a statistically significant predictive model was developed, demonstrating that the likelihood of being a potential problem gambler increases 1.27(95 % CI 1.02–1.58) times for every additional type of offence committed (Table 4). The AUC of the ROC curve was 0.70 (95 % CI 0.62–0.77), suggesting a moderately good predictive model; while the Hosmer-Lemeshow goodness of fit test indicated that the model was robust ($p>0.05$).

Discussion

The current study aimed to explore the association between problem gambling and substance addiction in a sample of individuals seeking treatment for substance use; 23 % of this sample met the classification for current potential problem gambling. This estimated prevalence is consistent with estimates of problem gambling reported by previous literature using treatment samples of substance users (Cowlshaw et al. 2014; Jamieson et al. 2011). It is also significantly elevated in comparison to estimates of problem gambling within the general Australian population (Productivity Commission 2010). Again, consistent with the available evidence in the community and in treatment samples (Blanco et al. 2006; Delfabbro 2011), the prevalence of problem gambling was higher for males than for females. As such, the extent of potential problem gambling is indicative of an additionally vulnerable population, perhaps with different, unique or additional treatment and/or support needs.

Mental Health

Consistent with the body of research regarding treatment samples of substance users, more than three quarters of this sample reported having at least one comorbid mental health diagnosis. Rates of mental disorders were significantly raised compared to general community estimates (ABS 2007; Lorains et al. 2011), and high levels of sub-clinical issues (e.g., trauma, self-harm and suicidal ideation) were also apparent. Contrary to expectation, potential problem gamblers and non-problem gamblers in this sample did not differ markedly in terms of the presence of comorbid mental disorders, with the exception of personality disorders which were more prevalent among potential problem gamblers. The latter was broadly consistent with recent reports of elevated rates of borderline (Cowlshaw et al. 2014) and anti-social personality disorder (Cunningham-Williams et al. 2000; Hall et al. 2000) in problem gamblers recruited from substance using populations.

Family Relationships

The overwhelming majority of the sample reported they had a supportive family, while one in six reported a history of domestic violence. There were no differences found between potential problem gamblers and non-problem gamblers. This finding was inconsistent with two previous studies (Afifi et al. 2010; Suomi et al. 2013), which demonstrated an increased prevalence of domestic violence and family dysfunction in families of problem gamblers. However, given that these studies did not involve comparisons to substance users, it is possible that family-related discord simply does not differentiate potential problem and non-problem gamblers within a treatment population of substance users. These findings present an uncharacteristically low rate of family-related discord, particularly domestic violence for a clinical sample of substance users (Humphreys et al. 2005). The low level of difficulties reported in this area may be attributable to the lack of sensitivity of the questions asked during clinical intake interviews, or perhaps the more limited rapport between clinician and client and the perception of the need for more socially desirable responses for the purposes of this assessment. Thus, while it is possible that family discord does not statistically separate potential problem and non-problem gamblers within clinical samples of substance users, further investigation using more objective measures of domestic violence and family support is required before this finding can be considered robust.

Criminal Histories

A significant proportion of this sample reported histories of criminality and a number of significant differences emerged that differentially characterised the problem gambling group. Compared to non-problem gamblers, potential problem gamblers were more versatile in their offending, being likely to commit offences across all three categories of crime. At an offence-specific level, potential problem gamblers were also more likely to commit offences linked to financial gain.

Overall, this versatile profile of offending was unexpected. While this study could not assess motivation for offending, the identified link between problem gambling and crimes involving financial gain appears straightforward i.e., as identified in previous literature the financial pressures associated with problem gambling lead to an increased need to commit theft etc., (Abbott and McKenna 2005; Abbott & McKenna 2005; Delfabbro 2011). However, given that potential problem gamblers in this sample were also associated with a broader range of offences, which is inconsistent with available literature in this area, additional considerations are needed. Given this study assessed offending across the lifetime, it is possible that these results reflect an overestimate of offending, which is not temporally related to current problem gambling. However, literature using incarcerated samples has suggested that as problem gambling escalates in severity, offending becomes increasingly sporadic and violent (Turner & McAvoy 2011). Hence, it is possible that problem gamblers within clinical samples of substance users actually reflect much more severe cases of problem gambling than first recognized. Overall, these findings demonstrate that potential problem gamblers are associated with a pattern of criminal offending, distinct from non-problem gamblers in a substance using treatment population.

Integration of Findings and Implications

The findings of this study did not strictly support this study's original research argument, i.e., that the presence of dual substance and gambling addiction would be associated with *increased*

rates of psychological and social vulnerability, compared to single substance addiction. Both groups were equally elevated across the majority of comorbid mental health problems, criminality in general, and equally low across family-related discord, suggesting that the presence of potential problem gambling does not globally increase the vulnerabilities already faced by this complex population. However, the key findings of this research suggest a specific picture of problem gambling, which is not necessarily *more* complex, but nonetheless potentially *different* from non-problem gamblers. This finding may have implications for client engagement, therapeutic alliance and treatment completion. A potential focus arising from this study related specifically to *impulsivity*, as gambling behaviours, personality disturbance and criminality are all known to all share components of maladaptive impulse control (APA, 2013; Petry et al. 2005; Skitch and Hodgins 2004). This finding reflects Blaszczynski and Nower's (2002) conceptualization of the *anti-social impulsive gambler*, which directly implicates impulsivity in association with criminality and substance use in the perpetuation of problem gambling. Evidently, such results potentially have significant conceptual implications, particularly in terms of the current classification of problem gambling. Foremost, the findings of this research both support and challenge the recent re-conceptualisation of gambling disorder by the DSM-5, specifically around the removal of the 'illegal acts' component from the most recent diagnostic criteria. If such findings are replicated elsewhere, this would also suggest the need for a different, more tailored intervention based on the substance use and criminal histories of the group.

Further, given the significantly elevated prevalence of potential problem gambling within this sample, it can be argued in accordance with the DSM-5, that substance and behavioural addictions do share some latent etiologic features (APA, 2013; Petry et al. 2005). However, given that this research also found distinct behavioural markers of impulsivity, which differentiated potential problem and non-problem gamblers, the extent to which substance and behavioural addiction are etiologically similar remains equivocal.

Limitations

Importantly, the results of this study need to be understood within the context of several limitations. Given the retrospective nature of this investigation, the data used in this study were not originally collected for this research and therefore were somewhat limited in terms of breadth, depth and consistency. Furthermore, given that the original purpose of this data was for the assessment of treatment suitability, the reported information could contain inherent biases. This could arise from clinician focus, i.e., greater emphasis could be placed on assessing factors perceived to impact treatment, or arising from client self-report, i.e., inaccurately reporting information they perceive to be desirable to treatment admission. Evidently, the use of a clinical sample limits the generalizability of these findings beyond the clinical sector, as treatment samples are known to reflect more severe instances of psychopathology (Knezevic and Ledgerwood 2012). Furthermore, due to the screening methods employed by the service prior to assessment, individuals with high-risk criminal offences, and/or current incarceration were excluded from this sample. Hence, the reported results may reflect an underestimate of the true extent of the association between potential problem gambling and substance abuse in treatment seeking individuals. Given the cross-sectional nature of the research, it is not possible to comment upon the temporal relationship between problem gambling, crime and mental health factors; this remains an area for further investigation.

Finally, the nature of the study did not allow for the use of a standardised assessment of problem gambling. That being said, the methodology adopted allowed for the assessment of a large sample of treatment seeking substance users across a broad range of psychological and social variables, and the estimated prevalence rate of potential problem gambling found here replicated estimates reported elsewhere, thereby adding influence to study results.

Conclusion

This study provided an innovative investigation of the prevalence and presentation of potential problem gambling within a sample of treatment seeking substance users in Australia. Contrary to expectation, individuals with dual substance and gambling addiction *did not* show *increased* levels of mental health comorbidity and social vulnerability, in comparison to substance addiction alone. However, the presentation of potential problem gambling was associated with a distinct cluster of comorbidity, indicative of underlying impulsivity. Therefore, these findings demonstrate that within clinical populations of substance users, potential problem gambling should not be considered a secondary, peripheral issue; rather it should be considered a distinct disorder, associated with unique phenomenology, and treated with specific and necessarily more targeted interventions.

Compliance with ethical standards

Conflict of interest statement On behalf of all authors, the corresponding author states that there is no conflict of interest.

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