

**Co-morbidity in Individuals with Disordered Gambling: What
Research Has Been Done and What Does It Mean**

Final Report to Gambling Research Exchange Ontario (GREO)

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Table of Contents

Executive Summary	4
Introduction.....	7
Methodology.....	10
Data sources and searches.....	10
Study selection	11
Data abstraction and synthesis of literature	12
Figure 1: PRISMA Flow Diagram.....	14
Quality assessment.....	15
Results and Implications	15
Prevalence of co-morbidity in disordered gambling.....	16
Prospective cohort studies.....	19
Efforts to address etiology of gambling and co-morbid disorders.....	20
Implication of co-morbid disorders on disordered gambling outcomes	21
How does the literature compare to other addictive behaviours?	23
Summary of Literature Gaps and Recommendations	25
Conclusions.....	29
References.....	31
Table 1 – Systematic Reviews	65
Table 2 – Chapters or Narrative Reviews	68
Table 3 – Prevalence Studies of Clinical Populations	73
Table 4 – Prevalence Studies of General Populations	83
Table 5 – Prevalence Studies of Special Populations	90
Table 6 – Randomized Controlled Trials.....	94
Table 7 – Uncontrolled Interventions	100
Table 8 – Case Studies.....	105
Table 9 – Prospective Studies.....	109
Table 10 – Cross-Sectional Studies	113
Appendix A - Search Strategies by Database	129

CENTRAL	129
EMBASE	129
MEDLINE	129
PsycINFO	130
Appendix B – Web Search Sources	131

Executive Summary

Individuals with disordered gambling often report at least one other lifetime psychiatric diagnosis. Although prevalence rates vary, there is substantial evidence for co-morbidity being the rule rather than the exception in disordered gamblers. The goal of this study was to broadly summarize and review the current literature on the extent, range and nature of disordered gambling co-morbidity. Following an initial search and screening of six databases and a number of grey literature sources, 218 articles were included in the final synthesis and evaluation.

The extracted articles appeared to generally cover four areas: prevalence of co-morbidity in disordered gambling, efforts to integrate treatment of disordered gambling and co-morbid disorders, efforts to address etiology of gambling and co-morbid disorders, and implication of co-morbid disorders on disordered gambling outcomes. We also compared the results to literature trends in other addictive behaviours.

A large proportion of the surveyed studies reported prevalence rates of disordered gambling and related co-morbidities. The most commonly reported co-occurring disorders were substance and alcohol use disorders, personality disorders (particularly cluster B), mood disorders, anxiety disorders, and impulse control disorders.

Efforts to integrate treatment of disordered gambling and co-morbid disorders have been minimal. Most treatment studies consisted of single-case reports, with only a handful of controlled interventions. Results of such studies suggest that integrated treatment tailored for specific combinations of co-morbid disorders improve symptoms of all assessed disorders. Notably, very few studies have been published observing co-morbidity over time.

Across all studies, the presence of co-morbidity appears to exacerbate symptoms of problem gambling, reduce quality of life, and increase functional impairment. There is general

consensus that amount of co-morbid disorders is positively correlated with severity of psychopathology.

While there has been some attempt to address the etiology of disordered gambling and co-morbidity, such studies are limited to twin registry designs generally outlining environmental and genetic contributions. Results from such studies appear to indicate shared contributions of genes and environment to the development of co-morbidity and gambling problems.

When compared to literature trends for other addictive disorders, gambling research appears to mimic their development, but is also several steps behind. Substance abuse researchers have taken co-morbidity research further by evaluating a variety of specific combinations of presenting co-morbidities, and attempting to disentangle temporal effects of co-occurring disorders with regard to onset and remission. There have also been a much greater number of controlled treatment evaluations specifically tailored for co-morbidity.

The following recommendations are made based on the observed literature gaps:

1. Authors of cross-sectional and prevalence designs are encouraged to go beyond reporting rates by recommending potential mechanisms of action that could be investigated.
2. Given how few studies report on temporal sequencing, future research should focus on understanding how co-occurring disorders interact over time.
3. Effects of co-morbidity on treatment outcomes must move toward a more nuanced direction by examining specific combinations of disorders and their differential outcomes.
4. There is a need for more controlled treatment studies evaluating programs designed specifically for individuals with disordered gambling and co-morbid disorders.
5. System level initiatives to address co-morbidity should be documented and evaluated.

6. The substance use literature may be used as an effective model for guiding future research given its more mature level of development in the area of co-morbidity.

Introduction

Within the field of disordered gambling, much attention is devoted to the study of negative consequences of gambling with the goal of applying findings to improve screening, assessment, and treatment of disordered gambling. An understudied area of this research is co-morbidity. Extensive research over the last two decades has demonstrated that gambling problems are associated with a number of other mental health disorders including anxiety and mood disorders, substance use, personality disorders, as well as psychotic spectrum disorders (Lorains, Cowlishaw, & Thomas, 2011). For example, a recent systematic review of treatment-seeking problem gamblers estimated that 75% of this population met criteria for a current co-morbid Axis I disorder (Dowling et al., 2015). In Canada, Pelletier, Ladouceur, and Rheaume (2008) reported that 64% of disordered gamblers in their sample met criteria for at least one personality disorder, with clusters B and C being most common. Conversely, if one examines other psychiatric populations, they also endorse high rates of disordered gambling. Himelhoch and colleagues (2016) reported that 46% of their sample of opioid dependent patients seeking methadone treatment met criteria for past-year disordered gambling. Correspondingly, Fernandez-Montalvo, Lopez-Goni, and Arteaga (2012) examined individuals with substance use disorders and showed that compared to individuals addicted to substances without disordered gambling, those with gambling problems showed significantly higher levels of alcohol addiction and general psychopathological symptoms including personality variables.

These substantial co-morbidity occurrences introduce complexity to both clinical work and research. Treatment and assessment can no longer afford to be focused on disordered gambling alone. Clinicians must be aware of the possible co-occurring disorders with gambling and understand how this may impact the onset, course, and outcome of interventions. Similarly,

if co-morbidity is the rule rather than the exception, research studies that examine disordered gambling in isolation may not be ecologically valid as real-world patients have convoluted and complex histories of overlapping disorders rather than carefully selected disordered gambling without other co-morbidities.

Despite this known association, there has not been a comprehensive review of co-morbidity studies other than prevalence surveys in disordered gambling literature since the 1990s. The majority of published reviews focus on prevalence of comorbid disorders alone without reviewing the scope of integrated interventions for co-occurring disorders and disordered gambling. The need for a scoping review of co-morbidity in the gambling literature is further highlighted by increasing evidence that co-morbidity is rarely addressed in an integrated form in the treatment of addiction (Center for Substance Abuse Treatment, 2005). Rather, addictive disorders are either treated first followed by specialized treatment for co-morbid mental disorders or vice versa. Failure to integrate treatment of co-morbid conditions leads to a “ping pong” phenomenon, where consumers of treatments often bounce back and forth between addiction and psychiatric treatment programs and back again, benefitting very little from either.

Treatments that have been evaluated in the extant addiction literature support the efficacy and relative benefits of treating co-morbid disorders together with the primary addictive disorder (e.g., McGovern et al., 2011). To facilitate similar work in the area of disordered gambling, a comprehensive scoping review of co-morbidity literature must be conducted first to highlight existing findings on the co-occurrence of disordered gambling and other mental disorders. Subsequently, integrated treatments may be developed and evaluated to improve care delivery models for disordered gambling much like the aforementioned trend in other addictive behaviours.

The goal of this study was to inform the gambling research and clinical communities about what has been accomplished in the area of co-morbidity and provide recommendations for where to go in the future. Specifically, the report answers the following questions:

- What is the extent, range and nature of research activity relating to disordered gambling and co-morbidity?
- To what extent have treatments been developed and/or evaluated for the care of individuals with disordered gambling who have co-morbid mental health disorders?
- How does the research compare to co-morbidity initiatives for other addictive behaviors?

An overview is provided of not just the prevalence literature and the types of disorders that are co-morbid with disordered gambling, but also how prevalence knowledge has been applied to develop integrated treatments and address the ping pong treatment phenomenon described above. The results are descriptively compared to the trends found in co-morbidity literature for substance use in order to illustrate how comparable the advances are in disordered gambling, another type of addictive behavior. Knowledge gaps are identified and recommendations are provided for specific directions for co-morbidity research as it relates to gambling. The recommendations aim to provide gambling researchers and practitioners with a better understanding of common co-morbidities of disordered gambling, how to potentially integrate them into treatment, and how to build on the existing body of literature. Scoping review methodology is ideal for the chosen topic given the paucity of randomized controlled trials in the field, which makes it difficult for researchers to undertake full systematic reviews and meta-analyses. Thus, the findings clarify a complex concept in disordered gambling (i.e., co-

morbidity) and complement results of existing clinical trials for disordered gambling interventions.

Methodology

The project employed a scoping review methodology to examine the breadth of literature in the area, as opposed to a more restricted focus on specific aspects of co-morbidity. As detailed in Levac, Colquhoun, and O'Brien (2010), the functional elements of a scoping review include an overview of the literature, summary of the findings, dissemination of outcomes, and identification of gaps in the research. The review followed their five stage model of conducting a rigorous scoping review, which included identifying the research question, identifying relevant studies, study selection, charting the data, and collating, summarizing, and reporting the results. Although a scoping review differs from a systematic review, the study roughly employed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA statement; Moher et al., 2009) to report the findings including a PRISMA flow diagram.

Data sources and searches

The following databases were searched for eligible studies up to and including July, 2016: PsycINFO, Medline, EMBASE (Excerpta Medica Database), CENTRAL (Cochrane Central Registry of Controlled Trials), Current Controlled Trials, and the Campbell Collaboration. Search terms included articles in all languages. The first search used the Boolean term "or" to explode (search by subject heading) and map (search by keyword) variations on the following MeSH headings: "gambling", "disordered gambling" and "pathological gambling". The second search was done using the Boolean term "or" to explode and map variations on the terms "comorbidity", "combined treatment", "psychiatric comorbidity", "integrated" and

“concurrent”. The two Boolean searches were combined using the Boolean term “and”. Given that the scoping review did not focus on a specific study design, the terms were kept intentionally broad to capture as much relevant literature as possible. For detailed steps of database search strategy, see Appendix A.

After the initial database search, duplicates were removed and narrowed. The researchers then systematically reviewed the remaining articles to determine whether they address co-morbidity in the area of gambling. A random sample of 50 articles was extracted from the initial search results to establish inter-rater reliability for study inclusion. Disagreements were clarified by consensus and another random sample was drawn until the researchers reached .95 Kappa inter-rater reliability on their study selection. Subsequently, all studies chosen by either researcher were included in the review. A grey literature search was also conducted of 33 websites, using a similar set of keywords as described above, that primarily belong to organizations involved in research and/or practice relating to problem gambling. In addition, the included articles’ reference lists were searched. These grey literature sources were reviewed by the research team and included in the final report. For a list of the grey literature sources, see Appendix B.

Study selection

The authors included studies involving individuals with disordered gambling who had an additional co-morbid mental health disorder. Treatment or cross-sectional design studies must have included an assessment of severity for disordered gambling as well as the co-morbid disorder to be considered eligible. For example, a study that assessed disordered gambling symptoms, but only reported frequency of drinking without any diagnostic or severity assessment was excluded. The goal was to focus the review on studies that confirmed co-

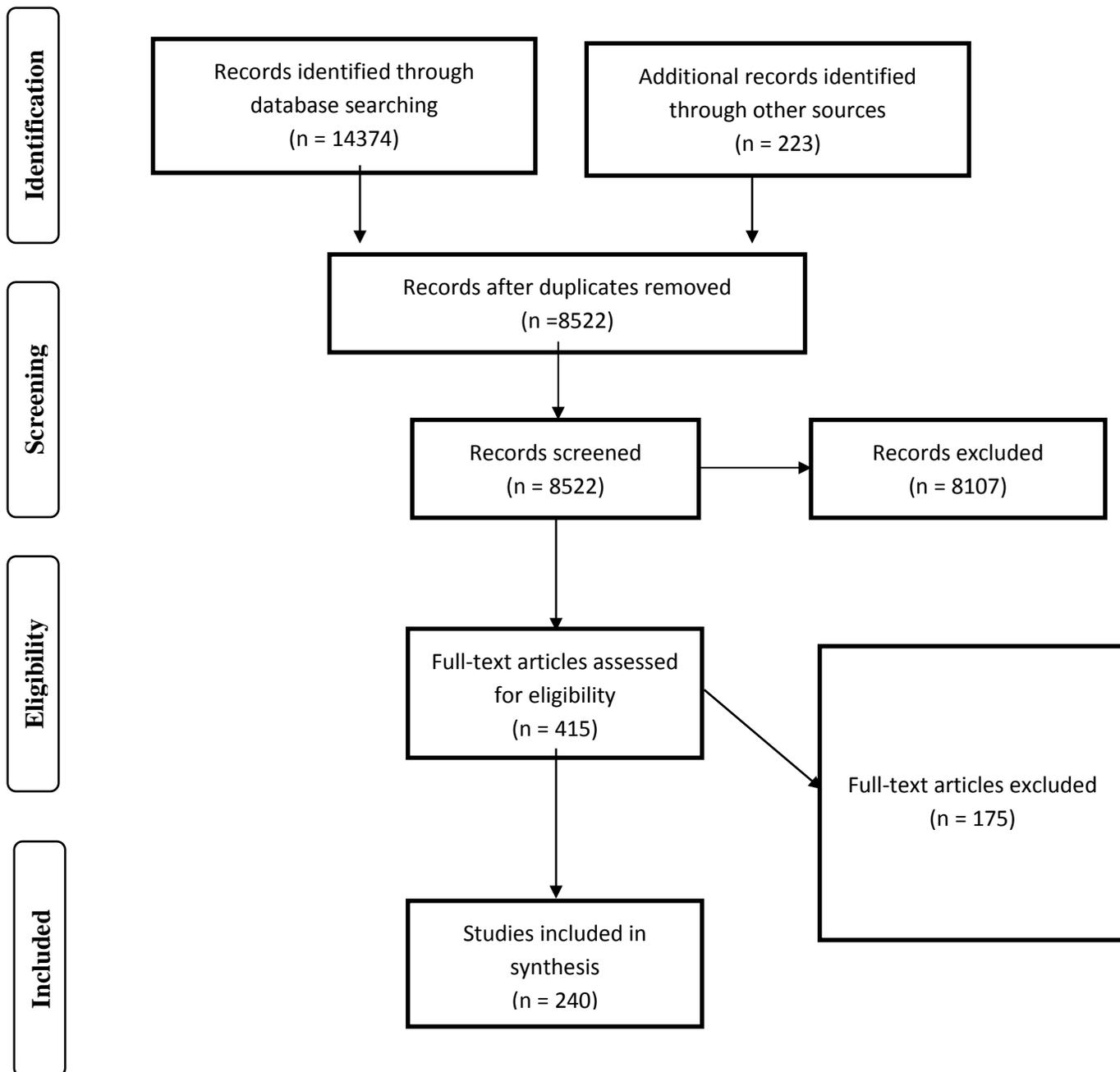
morbidity rather than measured proxy indicators of potential problem such as frequency of substance consumption, which by itself is not a diagnostic criterion for substance use disorder.

All types of mental health comorbidities were included. The following study types were included in the final review: systematic reviews, book chapters and narrative review articles, randomized controlled trials (RCTs), uncontrolled treatment studies, cross-sectional non-treatment studies, prevalence surveys of the general population, clinical populations, as well as special populations of interest (e.g., Gamblers Anonymous members, high school students), prospective studies, and case studies. Included studies were limited to peerreviewed articles and book sections only. All other literature was excluded to keep the size of the study manageable as well as ensure a minimum standard of quality via peer review. This included articles that were not available in English translation, as well as unpublished dissertations. Furthermore, case studies were limited to designs that employed a clinical assessment of severity (e.g., a report of a treatment case without assessment would not be included). As such, the results presented in this report do not represent all possible studies in the literature – only those that met the specific inclusion criteria.

Data abstraction and synthesis of literature

A coding template was developed to categorize the literature into themes and areas of interest, which varied by study type. Examples of areas that were identified included journal details, type of research, type of co-morbid disorder (e.g., anxiety, substance use), sample size, population, country in which the research was carried out, outcome measures, results, and conclusions drawn by the study authors. The two authors coded the literature independently for relevant data to extract and added/rejected additional articles as needed (e.g., finding new articles

in reference lists or deciding that an article does not meet inclusion criteria). The initial search of the combined search terms yielded 8522 results after duplicates were removed. Following the screening process, 240 articles were included in the final synthesis and evaluation. See *Figure 1* for the PRISMA flow diagram outlining the search process. Tables 1-10 provide a list of all included articles as well as relevant extracted data including summaries of individual study results and conclusions.

Figure 1: PRISMA Flow Diagram

Quality assessment

Unlike systematic reviews, which typically address a specific type of study with a narrower scope, scoping review methodology includes a broad range of study designs and a wide scope of review within a given topic (Levac et al., 2010). As such, it becomes difficult to apply a unified quality assessment process that will be appropriate for all of the included studies and the larger number of studies surveyed. Although criteria have been offered for assessing the value and utility of a commissioned scoping study in health policy contexts (Anderson et al., 2008), no agreed upon criteria currently exist for other areas of health research nor is there a critical appraisal tool to employ the criteria toward evaluating scoping study quality. Consequently, the studies chosen for inclusion in the report were not assessed systematically for quality other than ensuring that they were from peer-reviewed sources. In an effort to provide a commentary on the quality of the studies in the examined field, we provide examples of studies we consider to have employed rigorous methodology and a higher quality of reporting standards in reporting on disordered gambling and co-morbidity. See annotations in the reference list for highlights of rigorous articles.

Results and Implications

The 240 identified studies were sorted into broad categories: systematic reviews, book chapters and narrative review articles, randomized controlled trials (RCTs), uncontrolled treatment studies, cross-sectional non-treatment studies, prevalence surveys of the general population, clinical populations, as well as special populations of interest (e.g., Gamblers Anonymous members, high school students), prospective studies, and case studies. As shown in Table 1, only five systematic reviews were identified, four of which were conducted within the

last three years. Book chapters and narrative reviews have been published more frequently (14% of the retrieved articles), and have been published at regular intervals since 1998, but with increasing frequency. Table 2 outlines these publications.

Prevalence of co-morbidity in disordered gambling

For the purposes of this study, any articles that focused primarily on reporting prevalence rates of co-morbidity between disordered gambling and another disorder were categorized as prevalence studies. Results revealed that a large proportion of the scoped studies reported solely prevalence rates with no or minimal analyses beyond these statistics. 15% of the included studies were classified as examining co-morbidity prevalence in clinical populations (e.g., treatment-seeking disordered gamblers; Table 3); 13% were classified as examining general populations (e.g., national surveys; Table 4); and 7% examining special populations of interest (e.g., high-school students, older adults; Table 5).

A substantial majority of the studies focused on substance and alcohol use disorder co-morbidities. Other identified disorders of interest were mood and anxiety disorders, personality disorders, and attention-deficit hyperactivity disorder (ADHD). A minority of studies examined co-morbidity with impulse control disorders (e.g., compulsive buying), behavioral addictions (e.g., internet gaming), and psychotic spectrum disorders.

Prevalence estimates were conducted in a wide range of geographic locations including the United States, Canada, Hong Kong, Australia, France, Germany, Norway, Spain, and Sweden. Sample sizes ranged from 50 to over 40,000 participants, providing generally reliable and robust statistical estimates. Surveyed populations were relatively narrow with the majority consisting of either general population communities or treatment seeking disordered gamblers or

substance-users. As reported by Lorains et al. (2011) in their earlier systematic review, results from such studies converge on agreement that disordered gambling co-occurs frequently with substance use disorders, various personality disorders, mood disorders and anxiety disorders. Specifically, alcohol use disorder, major depressive disorder, generalized anxiety disorder, and obsessive-compulsive disorder were heavily represented in the results. Co-morbidity rates ranged from 6% to 94% of the sample, with clinical populations reporting typical co-morbidity rates in the 30-60% range. Some authors attempted to identify prevalence variations by demographic characteristics such as gender and ethnicity. However, these results were inconsistent and did not provide any clear consensus on co-morbidity fluctuations across sub-populations (see Tables 3 and 4).

Of interest, a limited number of studies examined older adults and high school students, noting that both populations experienced higher than previously thought rates of gambling co-morbidities. For example, McCready and colleagues (2008) reported that 6.8% of adults over the age of 55 in their Canadian sample experienced gambling related problems. Having a co-morbid substance use disorder increased the odds of a disordered gambling diagnosis by almost four times. Similarly, Cook and colleagues (2015) concluded that high school students in Ontario, Canada who report problem gambling behaviours show increased rates of substance addiction and other mental health problems, on par with those of adults. They concluded that the association between these problems suggests a more unified treatment approach may be beneficial.

Upon examination of the prevalence literature in Tables 3, 4 and 5, it is clear that a significant proportion of all studies conducted in the area of disordered gambling co-morbidity does not go beyond reporting statistical associations between disorders. In addition, there is a

relatively small number of studies that provide nuanced examinations of unique populations of interest. This is particularly unfortunate given that results from such studies agree that there is understudied vulnerability in populations such as older adults, adolescents, and ethnic minorities.

Efforts to integrate treatment of disordered gambling and co-morbid disorders

Efforts to treat disordered gambling concurrently with other presenting psychiatric disorders have been minimal, with only 18% of the scoped studies reporting on any kind of treatments (see Table 6 for Controlled, Table 7 for Uncontrolled Clinical Trials and Table 8 for Case Reports). A review of the treatment studies shows that the vast majority simply include one or more co-morbidity variables as a moderator or a predictor of outcome. Dowling et al (2016) also recently reviewed the data addressing this issue and identified 21 relevant studies. Tables 6 and 7 only identify a few additional studies. Given the large and increasing number of efficacy trials of gambling treatment (Yakovenko & Hodgins, 2016) and the fact that co-morbidity rates are very high, it is surprising that the number of studies reporting this type of analyses is so small.

Even more surprising, however, is that of the studies examining the effect of comorbidity on outcome, the vast majority have found that individuals with a co-morbid problem have outcomes similar to those without co-morbidity. In the Dowling review for example, of the 12 studies that examined depression as a predictor of outcome, only 2 found that it was associated with poorer gambling outcome. Of the 12 studies examining anxiety, only 1 found poorer outcomes. Of 11 studies that examined alcohol use disorder, only 3 found it associated with poorer outcome. Given that co-morbidity is associated with more severe gambling problems in community samples, one possible explanation for these surprising findings is that there is self-selection in these treatment samples. Perhaps people who choose gambling treatment are

handling the co-morbid problems (e.g., alcohol problem) reasonably well. Those needing more attention for the co-morbid issues may not be seeking treatment in those sectors.

Another surprising finding is that so few of the identified studies did not focus on co-morbidity as explicit targets for treatment. In fact, only five of the studies included in this review, excluding case reports, tailored treatment specifically for co-morbid disorders together with gambling. These included cognitive-behavioural therapy (CBT) group treatment, CBT for individuals with co-occurring disordered gambling and schizophrenia, a naltrexone trial for alcohol using gamblers and treatment of disordered gambling in cocaine users.

The majority of treatment literature on disordered gambling co-morbidity consists of single case studies, which inherently carry limited generalizability of results and require additional research with larger samples to ascertain findings. However, as shown in Table 8, the published case study literature does survey a wide variety of attempted treatments including psychopharmacological interventions for co-morbid mood and anxiety disorders, mindfulness-based cognitive therapy, and cognitive behavioral therapy. Reported outcomes are generally favourable with substantial improvement in both gambling symptoms and other psychopathology up to a year follow-up.

Prospective cohort studies

Another important observed pattern is the small to moderate number of prospective design studies for disordered gamblers (4% of the scoped studies; Table 9). Although only a handful of them specifically focused on observing co-morbidity over time, all of the identified studies measured co-morbid psychiatric disorders in some form as they related to gambling symptoms over time. The limited findings agree that gambling symptomatology is exacerbated

over time by co-morbid conditions and vice versa. Furthermore, treatment outcomes such as drop-out rates are negatively compounded with the development of co-morbidities over time.

In general, the results of the review suggest that intervention research on integrated treatment of co-morbid disorders and disordered gambling is lacking. Few controlled studies have been published and no clinical guidelines for concurrent evidence-based treatment are provided. Despite the observed dearth of treatment literature, findings from case reports and limited prospective studies warrant continued research in treatments tailored for specific combinations of disorders with gambling as improvements in both disorders have been reported with appropriate clinical delivery.

Efforts to address etiology of gambling and co-morbid disorders

In addition to minimal intervention research, the scoping review revealed a significant lack of studies attempting to understand the mechanisms underlying co-morbidity in disordered gambling and common etiological pathways. Examples include a study that reported that lithium and selective serotonin reuptake inhibitors (SSRIs), while both similarly effective at alleviating mood symptoms in disordered gamblers, have opposite effects on prefrontal cortex basal metabolic rates (Hollander et al., 2008). Lithium appeared to lower the metabolic rates while SSRIs normalized them. The authors concluded that further research is needed to better understand the different pathophysiology underlying these treatments, despite similar behavioral results. Another study examined 7869 individuals in the Vietnam Twin Registry in order to ascertain the relative environment and genetic contributions to co-occurrence of disordered gambling and co-morbidities. Results revealed that potentially half of the risk for major depression in disordered gamblers may be attributable to the presence of other psychiatric

disorders. However, there was also substantial genetic overlap between disordered gambling and major depression. No clear pattern emerged from such studies, but early findings appear to indicate shared contribution of genes and environment to the development of co-morbidity and gambling problems.

The above studies represent important examples of the next logical steps in the progression of research beyond prevalence estimates of co-morbidity. Identifying specific genes or environmental contributions to risk for co-occurring disorders could help guide treatment development that encompasses the full clinical presentations of real-world patients.

Unfortunately, only a handful of studies in all of the scoped literature went the extra step of addressing etiology and mechanisms of disorder overlap. Yet, existing findings are fruitful and provide robust methodology for how to carry out etiological examinations of disordered gambling co-morbidities. The published research on etiology also offers an emerging lesson in the potentially vastly differing mechanisms of action despite similar observed effects.

Specifically, it is vital to understand pharmacological agents' pathophysiology since there may be unobservable iatrogenic effects in the brain despite short-term relief of symptoms. Similarly, uncovering common underlying pathways between co-morbid addictive behaviors may lend support to the addiction syndrome model and increase efficiency in treatment delivery by targeting common etiological variables across multiple disorders with a single, unified treatment.

Implication of co-morbid disorders on disordered gambling outcomes

A major proportion of the surveyed literature (20%) was classified as cross-sectional studies, which were defined as studies that examined disordered gambling co-morbidity using some form of cross-sectional analysis, typically as a control factor or outcome variable (Table 9).

The studies included analysis of secondary data from community surveys, examinations of disordered and non-disordered gamblers in the general population, as well as analysis of outcomes from disordered gamblers and substance users in community clinics. The chief product of this body of work was robust documentation of the effects of disordered gambling on co-morbid disorders and vice versa in cross-sectional clinical and community samples. The results also allowed for commentary on the bi-directional influence between gambling and the co-morbid disorder.

The primary pattern of results supports the conclusion that co-morbidity, regardless of disorder type, exacerbates disordered gambling symptomatology and associated functional outcomes. This includes proxy behaviors of problem gambling severity such as gambling expenditure and frequency, as well as quality of life and activities of daily living. Compared to disordered gamblers without co-morbidity, those with co-morbid disorders tend to start out at lower baselines and do worse in community treatment, as measured by functional impairment at the end of treatment as well as measures of treatment success such as drop-out rates. For example, Fatseas and colleagues (2016) concluded that disordered gamblers with co-morbid Attention Deficit Hyperactivity Disorder (ADHD) had greater gambling severity and unemployment rates compared to those without ADHD. Cunningham-Williams (2000) and colleagues demonstrated a similar relationship in the opposite direction of effect. In their sample of street drug users, those with disordered gambling had greater levels of functional and mental health problems than those without co-morbid disordered gambling. Interestingly, the adverse effects of co-morbidity appear to be compounded with multiple co-occurring disorders. Potenza and colleagues (2005) demonstrated that in disordered gamblers, when other co-morbidities are controlled for, risk for Major Depressive Disorder (MDD) is halved. In other word, having

additional co-morbidities increased risk for depression given the presence of disordered gambling compared to having depression and gambling problems only. The results suggest a positive correlation between number of co-morbidities and severity of existing gambling symptoms and general impairment. Furthermore, the influence between disorders does not differ significantly with regard to direction of effect: gambling exacerbates other existing mental health symptoms and co-morbid mental health disorders exacerbate existing gambling problems.

Research surveying mental health providers appears to support the conclusion that those who are delivering services are aware of these co-morbidities and tend to be relatively accurate with regard to which co-morbid disorders are frequent (Haw, Holdsworth, & Nisbet, 2012). There was general agreement that the most commonly occurring disorders were depression, anxiety disorders, substance disorders (nicotine dependence, alcohol and other drug abuse/dependence) and personality disorders. While some participants gave definite opinions as to the temporal sequencing of disorders, the overall consensus was that it was largely dependent upon the individual. These conclusions reflect a similar pattern to previously discussed results, where identification of disorders is present, but little consensus or understanding exists of the mechanisms of co-morbidity or attempts to modify treatment to account for them.

How does the literature compare to other addictive behaviours?

An important consideration when drawing conclusions from this scoping review is how the disordered gambling co-morbidity research compares to co-morbidity research for other addictive disorders. Since disordered gambling is the newest addictive behavior to be researched, one would expect that the substance use literature can provide a reference point for how to move forward co-morbidity research on gambling. A survey of the alcohol and drug abuse literature

reveals many of the same patterns as those found in this review. Epidemiology of co-occurrence appears to be a common form of study: co-morbidity of substance use disorders and other psychiatric disorders is common in both general and clinical populations across multiple geographic locations around the world (Kessler et al., 2005; SAMHSA, 2013). Much like in disordered gambling, individuals with co-morbid disorders also tend have worse functioning and treatment outcomes (Cleary et al., 2008). However, while gambling researchers continue focusing on prevalence estimates, substance use literature has taken this type of research design further by identifying the effects of epidemiology of co-morbid disorders on course of illness, including effects of early onset of co-occurring disorders. This is in part facilitated by longitudinal research examining the sequence of development and remission of each disorder.

With regard to research on etiology and mechanisms, the substance use literature also goes a step further. A much greater variety of studies have been published examining the underlying causal mechanisms between the co-occurrence of substance use and other disorders including genetic overlap, neurobiology, prospective designs examining temporal change and qualitative research looking at behavioral change (Tomasson & Vaglum, 1996, Szerman et al., 2013, Whitley & Crawford, 2005). In addition, treatment studies in this area have attempted to look at whether treatment of one disorder results in remission of the other, concluding that this is not necessarily the case and may vary depending on specific disorders and individual presentation (Kalina, 2013; Rigg, 2003). By contrast, disordered gambling studies have yet to differentiate effects of co-morbidity on course of illness by type of disorder.

A similar nuanced approach has also been taken with regard to examining compounding effects of multiple co-morbidities. Gambling disorder researchers have ventured into this realm (see previous section). Yet, within substance use, researchers have attempted to

disentangle whether the effects of controlling for co-morbid disorders vary depending on which co-morbidity is present. For example, Hasin and colleagues (2007) found that when other disorders are controlled for, the association between depression and substance use is reduced, but association between bipolar disorder and substance use remains significant.

When it comes to treatment, substance use researchers have taken similar strides to gambling disorder researchers, but to a greater degree. It is generally recognized within the United States and portions of Europe that co-morbid disorders may require integrated care approaches (Carra et al., 2016). Although this type of treatment approach is still fragmented and nowhere near universal acceptance, significant efforts are underway to evaluate integrated treatment as it compares to traditional treatment models for substance abuse (Cleary et al., 2008). This includes multisite trials and assessments of the feasibility, availability, and effectiveness of dual-diagnosis programs (Baldacchino et al., 2011). Comparably, gambling research is behind when it comes to integrated treatment. Not only are there only a handful of studies evaluating treatment designed specifically for co-morbidity, but there is also little buy-in from large funding agencies to fund the rigorous multisite evaluations necessary to establish the relative effectiveness of such programs compared to existing ones.

Summary of Literature Gaps and Recommendations

Based on the results of the scoping review, we identified the following literature gaps in the area of disordered gambling co-morbidity. Each gap is complemented by summary recommendations on how to improve the research in these areas.

1. Few studies examine the mechanisms or etiology of co-morbidity in gambling.

A substantial proportion of the surveyed literature does not go beyond measures of association and prevalence statistics related to disordered gambling and co-morbidity. Literature that was published provides a clear consensus on relatively high rates of occurrence of co-morbid disorders, as well as confirming substance use, personality, mood, and anxiety disorders as being the most common co-morbidities. Given the large body of literature replicating these results across multiple geographic locations, cultures, and populations, it is important to move beyond prevalence. Authors of cross-sectional and prevalence studies are encouraged to measure potential mechanisms of action. A good example of this is a meta-analysis conducted by Meng and colleagues (2014) of functional brain response to cognitive tasks in gambling disorder. This review identified 13 relevant whole-brain studies of gambling disorder that point to frontostriatal cortical pathway dysfunction. Furthermore, a welcome addition would be clearly stated, testable suggestions based on cross-sectional findings for how to modify existing interventions. Very few studies offered such recommendations. Subsequently, the clinical utility of the studies was limited to associated variables only.

2. Few studies report on temporal sequencing.

A significant gap in the surveyed literature is longitudinal studies and temporal sequencing examinations. Despite showing a robust association between disordered gambling and a variety of co-morbid conditions, a very limited number of studies attempted to establish whether disordered gambling preceded the onset of the co-morbid condition or vice versa. Understanding how the co-occurring disorders interact over time is vital to treatment delivery. Models for hypothesizing likely treatment course and outcome with regard to onset or remission of various implicated disorders would be integral to improving the effectiveness of existing treatments for disordered gambling as well as new ones. For example, having some confidence

that disordered gambling symptoms are typically secondary when presenting with major depressive disorder may allow for a more focused approach by dealing with depressive symptomatology as the primary treatment target. Retrospective reports of the timing of onset of disorders are, of course, of limited reliability, but are still valuable. There are currently a growing number of longitudinal and prospective studies in the gambling field that will allow more definitive conclusions if onset is measured.

3. A more nuanced approach to examination of bi-directional effects of co-morbidity is required.

Although a significant body of literature exists evaluating the effects of disordered gambling on other psychiatric disorders and vice versa, an important next step is to begin disentangling such effects by type of disorder. This involves comparing and contrasting treatment outcomes, levels of functioning, temporal onset, and symptom severity across disorders with the goal of understanding whether certain disorder combinations require unique considerations. In other words, an important question to begin asking is whether multiple co-morbidities worsen outcomes regardless of disorder or whether trajectories are unique. Understanding pathways of development, and course of illness based on specific co-morbid presentations would add to the clinical utility of current longitudinal and cross-sectional studies by providing a foundation for tailored treatment approaches for dual-diagnosis programs.

4. There is a lack of treatment evaluation for dual diagnosis individuals.

. The existing literature reviewed here provides ample support for the conclusion that co-morbidity exacerbates symptom severity. However, its impact on treatment progress and functional outcomes is less clear-cut. Examining co-morbidity as a moderator or mediator of outcome should be routine in all controlled and uncontrolled gambling treatment trials.

In addition, a clear take-away from the review is the lack of studies focusing on evaluating and designing treatment specifically for individuals with disordered gambling and co-morbid psychiatric disorders. In the absence of effective treatment addressing both problems, individuals need to tackle each problem in a separate treatment stream, likely sequentially.

5. System level initiatives to address co-morbidity should be documented and evaluated.

One recent paper that was found did not fit into any of the broad categories we created for this review as it focused on evaluating the impact of a system-level initiative to address co-morbidity by promoting cross-sector collaboration (Martyres & Townsend, 2016). In many jurisdictions, treatment for gambling disorders is isolated from mental health, substance abuse and social services. This initiative involved using a variety of strategies to engage services in these other sectors to address gambling problems by providing support from gambling specialty services. The report describes the successes and failures based upon qualitative interviews with the providers involved. Many jurisdictions are, of course, involved with similarly creative initiatives, many of which are evaluated. However, what is unique is the publication of this project in a peer-reviewed journal. Publication allows knowledge to be shared and transferred and will move the field ahead much more quickly.

6. The substance use and alcohol use disorder literature may act as a model for guiding future research.

A qualitative comparison between the disordered gambling and substance use co-morbidity literatures suggests that gambling researchers are engaging in effective early efforts at addressing co-morbidity. The latter also provides a model for the types of research designs that could be carried out in the near future to bring gambling research in line with the more mature substance use field. Examples include examining combinations of different disorders to look for

nuanced differences between clinical presentations; going beyond prevalence estimates to evaluate the impact of epidemiological data on course of illness, such as impacts of early onset on future remission; and establishing new clinical trials of treatment protocols that are specifically designed for dual-diagnosis disordered gamblers. Lastly, a necessary condition for the above strides is additional funding. Major funders of gambling research need to invest in research that develops the understanding of co-morbidity in disordered gambling beyond prevalence statistics and as control factors. Evidence for the feasibility and success of this investment approach is present in the substance use literature.

Conclusions

The evidence from this scoping review suggests that disordered gambling research on co-morbidity is moderately available and is slowly progressing along a similar trajectory to that of substance use research. Co-morbidity rates have been established as significant, with substance use, personality, mood, and anxiety disorders being the most common co-occurring disorders with gambling. Cross-sectional examinations of the effects of gambling symptoms on other psychiatric conditions and vice versa are also ample, concluding that in both cases, the co-morbidity effects exacerbate any existing pathology, worsen treatment outcomes, derail treatment course, and impair general functioning. This effect appears to positively correlate with number of co-morbid disorders.

Despite the above progress, disordered gambling research is also plateauing in many regards by saturating studies on prevalence rates and cross-sectional measures of association. There is a severe lack of testable, practical hypotheses based on existing findings with most authors relegating individual study conclusions to acknowledgements of high co-occurrence

between disorders. This pattern has resulted in a stagnation of sorts, whereby few treatment studies exist of programs tailored for dual-diagnosis and mechanisms of action and etiology of disordered gambling co-morbidity are few and far between.

Yet, one merely has to look to the substance use literature to see a model of fruitful examples of research designs and future studies to complement existing research and push forward our understanding of disordered gambling co-morbidity to be in line with more mature areas of addictive behaviours research. A comparison of both literatures provides several conclusions for current gambling researchers: co-morbidity in disordered gambling is common, and outcomes may be improved when separate treatment modalities for these disorders are offered in combination; it is not clear how well this integration may work for all clients, but in most jurisdictions, current research evidence warrants trials of integrated services and additional funding for their implementation.

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Table 1 – Systematic Reviews

Article	Co-morbidity	Sample Size (number of studies)	Population	Design of Studies	Outcome Constructs	Intervention	Control	Results	Conclusion
Cowlshaw, S., Merkouris, S., Chapman, A., and Radermacher, H. (2014).	Problem Gambling is a substance use disorder	128	Substance Use Disorder Treatment	Prevalence in clinical or population samples	PG	N/A	N/A	14% of patients that demonstrate comorbid pathological gambling. Around 23% suffer conditions along the broader spectrum of problem gambling.	Despite the limitations of existing evidence, the current findings suggest a strong need for management of gambling disorders in substance use treatment.
Dowling, N., Merkouris, S., & Lorains, F. (2016). I	Mental health and substance use disorder comorbidity	27	Problem gamblers in treatment	RCTs, prospective studies	2 systematic reviews: 1) intervention studies treating comorbidity in problem gambling,) 2) studies assessing impact of comorbidity or gambling typology on treatment outcome.	Six intervention studies included naltrexone added to CTB for comorbid alcohol; N-act for comorbid tobacco.	N/A	N/A	The problem gambling treatment outcome literature has, however, generally ignored psychiatric comorbidities, excluded individuals with comorbidities, or employed small samples that preclude the detection of comorbidity subgroup differences in treatment responses. Future research evaluating interventions sequenced according to disorder severity or the functional relationship between the gambling behavior and comorbid symptomatology, identifying psychiatric disorders as moderators of the efficacy of problem gambling interventions, and evaluating interventions matched to client comorbidity could advance this immature field of study.

Karaca, S., Saleh, A., Canan, F., & Potenza, M. N. (2016).	ADHD comorbidity with behavioural addictions including Gambling Disorder	14	Behavioural addictions	Prevalence in clinical or population samples.	ADHD and gambling disorder assesses with diagnostic criteria.	N/A	N/A	The prevalence of ADHD in gambling disorder was notably high, ranging from 5.8 % to 20 %; no studies of gambling disorder in ADHD samples.	Dysregulation of reward system may be linked.
Lorains, F. K., Cowlshaw, S., and Thomas, S. A. (2011).	Psychiatric comorbidity in Problem Gambling	11	General population	Prevalence of Problem Gambling and comorbidity	Comorbidity	N/A	N/A	Results from across the studies indicated that problem and pathological gamblers had high rates of other comorbid disorders. The highest mean prevalence was for nicotine dependence (60.1%), followed by a substance use disorder (57.5%), any type of mood disorder (37.9%) and any type of anxiety disorder (37.4%). However, 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	Problem and pathological gamblers experience high levels of other comorbid mental health disorders and screening for comorbid disorders upon entering treatment for gambling problems is recommended. Further research is required to explore the underlying causes of variability observed in the prevalence estimates.
Meng, Y.-j., Deng, W., Wang, H.-y., Guo, W.-j., Li, T., Lam, C., & Lin, X. (2014).	Substance use disorder	13	Problem Gamblers in treatment	Neuroimaging studies	Whole-brain studies investigating the functional brain response to cognitive tasks.	Gambling disorder with and without substance use disorder	Healthy controls	Both Gambling Disorder (GD) subgroups that had, or had not, excluded any kind of substance use disorder comorbidity showed hyperactivity in the right lentiform nucleus. The GD group that had not exclude the substance (mostly nicotine and/or marijuana) use disorder comorbidity showed increased activity in the right lentiform nucleus and left percuneus	Provide support for the proposed reclassification of Gambling Disorder as a behavioral addiction in the DSM-V.

compared to the Healthy Control (HC) group (“Substance Use Disorder (SUD)-not-excluded pairs” subgroup analysis), while the subgroup of GD that had excluded any kind of substance use disorder comorbidity showed hyperactivity in right anterior cingulate gyrus and middle frontal gyrus, and left middle occipital gyrus, in addition to the right lentiform nucleus (“SUD-excluded pairs” subgroup analysis); Both the “SUD-not-excluded pairs” and “SUD-excluded pairs” subgroups showed increased activities in the lentiform nucleus in patients with GD compared to HCs.

Table 2 – Chapters or Narrative Reviews

Article	Co-morbid Disorder	Results	Conclusions
Black, D. W., & Shaw, M. (2008)	Comorbid mental health disorders including personality disorder	The literature suggests a clear connection between pathological gambling; addictive, mood, and anxiety disorders; ADHD; and Axis II disorders (particularly antisocial disorder and BPDs). Other ICDs are also frequently comorbid.	Future investigations should consider the role of comorbid disorders on course and outcome, illness progression, and treatment.
Blanco, C., Cohen, O., Lujan, J. J., & Wulfert, E. (2010).	Mood, anxiety, impulse control, and personality disorders	Reviews rates of comorbidity for each type of disorder and points out that alcohol and substance comorbidity is higher in young males with gambling problems. Women appear to be more likely to have a comorbidity of depression and anxiety. The most common comorbid disorders across all groups are mood disorders and substance abuse.	The authors highlight the high rates of comorbidity across a variety of disorders, suggesting a need for careful screening and interventions designed to incorporate comorbidity in treatment.
Blanco, P., Guglielmo, R., & Righino, E. (2014).	Generalized anxiety disorder	As part of a chapter on comorbidity of anxiety with other disorders, the literature on generalized anxiety disorder/gambling disorder is reviewed including genetic and environmental overlap.	Data are sparse so few conclusions beyond the need to better understand the association to improve treatment.
Brown, M., Allen, J., & Dowling, N. A. (2015).	Personality disorder	Reviews comorbidity with problem gambling (PG) (high), characteristics (more complications, higher impulsivity) and applies etiological theoretically-driven model of borderline personality disorder to gambling (Lineman's biosocial developmental model). Discusses application of DBT to PG	Concludes that given similarities and high comorbidity, that the model and DBT treatment are clinically useful for treating PG
Cottler, L. (2003).	No specific one	Editorial urging for an increased need and understanding of comorbidity in disordered gambling; author reviews results from studies from a specific journal issue. Many discussed studies do not appear to focus specifically on comorbidity.	Current research pertaining to the interaction of comorbidity and disordered gambling is inadequate and there are many ways to advance the field.
Crockford, D. N., & el-Guebaly, N. (1998).	Psychiatric comorbidity	Evidence for high rates of substance use disorder, antisocial personality disorder, and likely mood disorders.	Relatively few studies of comorbidity with strong research design to date.
Erbas, B., & Buchner, U. G. (2012).	No specific one	Review briefly summaries prevalence of comorbid disorders noting that more than 90% of disordered gambling patients have at least one other mental disorder. 40% appear to have five or more psychiatric diagnoses.	Patients with substance use, affective, anxiety, and personality disorders should be interviewed about their gambling behaviour given the high rates of comorbidity reviewed across all these domains.
Erbas, B., & Buchner, U. G. (2012).	Substance use disorder, personality	Treatment for first 2 in addiction system and latter two in specialized gambling treatment.	Commentary on funding of treatment for PG with comorbidity in Germany.

	disorder, depression, other mental health		
Fiori, F., Corbo, M., Sarchione, F., Martinotti, G., & di Giannantonio, M. (2015).	Comorbid disorders as link to suicide in Gambling disorder	Chapter explores comorbid mental health disorders, among other social cultural factors, as they relate to suicide in gambling disorder (GD).	Impulsivity related to GD and comorbid disorders may relate to high rates of suicide.
Freimuth, M., Waddell, M., Stannard, J., Kelley, S., Kipper, A., Richardson, A., & Szuromi, I. (2008).	Mental health and Substance use disorder	Reviews comorbidity of behavioural addictions and substance use disorders, including gambling disorder- prevalence, age of onset, clinical implications.	For this treatment literature to develop, those who treat dually diagnosed and co-addicted clients must become more attuned to the behavioral addictions.
Gonzalez-Ortega, I., Echeburua, E., de Corral, P., & Polo-Lopez, R. (2015).	Depression, anxiety disorder, substance use disorder	Reviews gender differences in PG including comorbidity.	Concludes that women suffer more comorbid depression and anxiety and men substance use disorder.
Grant, J. E., & Chamberlain, S. R. (2013).	Substance use	Reviews the literature on co-occurrence of disordered gambling and substance use. Authors point out that not only are the prevalence rates high for this comorbidity, but the underlying neurocognitive features and potential phenomenology is also quite similar.	There is evidence for a significant overlap between gambling disorder and substance use disorders including onset and course, comorbid expression, common etiological pathways and familial contributions.
Griffiths, M., Parke, J. & Wood, R. (2002).	Substance use disorder	Reviews literature on co-occurrence.	Involvement in one potentially addictive behaviour almost certainly increases the likelihood of involvement in the other, although the direction of the relationship is not clear at this time.
Iancu, I., Lowengrub, K., Dembinsky, Y., Kotler, M., & Dannon, P. N. (2008).	Dannon subtype model	Reviews pharmacotherapy for gambling disorder as well as a proposed subtypes model, based on comorbidity.	Subtypes may be linked to optimal choice of pharmacotherapy agent.
Johansson, A., Grant, J. E., Kim, S. W., Odlaug, B. L., & Gotestam, K. (2009).	Depression, anxiety, OCD, alcohol and substance use, personality disorders	Review briefly summarizes prevalence rates of comorbidities or each disorder with gambling disorder, noting that severity of gambling problems appears to positively correlate with extent of comorbidity.	There is a clear relationship between disordered gambling and a number of other mental disorders. However, the exact nature of the relationship requires further study and is not well developed.

Kim, S. W., Grant, J. E., Eckert, E. D., Faris, P. L., & Hartman, B. K. (2006).	Mood disorder	Reviews literature from a clinical perspective.	A high prevalence rate of manic and depressive disorders has been recorded among pathological gambling disorder patients. A rational treatment approach to each defined subset of complicated gambling disorder is discussed.
Langhinrichsen-Rohling, J. (2005)	Depression	Reviews literature on depression and gambling disorder and proposes a developmental model for adolescents.	There is a need for prospective, longitudinal studies of the development of gambling disorders, depression, and suicidal behavior in adolescents. Understanding the co-occurrence and time course of these behaviors in their developmental context will be essential for prevention and intervention efforts.
O'Brien, C. (2011).	Depression	Reviews the prevalence of co-occurrence of disordered gambling and depression as well as causal links between the two disorders. Authors note that the disorders are highly comorbid but no clear link has been established to ascertain a direction of influence between the two disorders.	Evidence is supportive of the fact that depression could be both a cause and a consequences of disordered gambling.
Odlaug, B. L., Schreiber, L. R. N., & Grant, J. E. (2012).	Personality disorders	Reviews the prevalence of personality disorders co-occurring with gambling problems as well as Axis I disorders, noting that co-occurrence is high for both Axes. Authors note that the clinical presentations of those with personality disorder comorbidities is more severe.	Current research on the impact of personality disorders on disordered gambling is limited, but it is clear that there need to be special clinical considerations for this population.
Odlaug, B. L., Schreiber, L. R. N., & Grant, J. E. (2012).	Personality disorders	Review literature on personality dimensions and disorders in pathological gambling. Research suggests that pathological gamblers with a personality disorder present with more clinically severe symptoms of gambling (i.e. gambling behaviors and thoughts have greater negative impact on functioning) .Overall, little research has investigated the impact of personality variables on treatment outcome, highlighting an area in need of future research.	Although no recent treatment studies have been completed based on gambling subtype, categorizing pathological gambling based on personality dimensions, specifically impulsivity and comorbid psychopathology, may help clinicians provide more individualized, efficacious treatments for pathological gambling. Future personality subtypes research may lead to a greater understanding of how and to what extent these variables affect pathological gambling treatment outcome.
Petry, N. M. (2005).	No specific one	The chapter focuses on surveying prevalence rates for a variety of Axis I and Axis II disorders, noting the highest prevalence rates among substance and mood/anxiety disorders. The limited research reviewed on the interaction between the disorders suggests that it is unclear whether problem gambling causes comorbid disorder development or vice versa - it is likely that it is both.	The area of comorbidity research in disordered gambling is quite young and requires additional studies beyond prevalence rates to ascertain the relationship between these disorders.
Petry, N. M., & Champine, R. (2012)	Substance use and other Axis I disorders	Review summarizes the high prevalence rates of comorbid disorders in problem gambling. Authors note that those with comorbidities tend to have more severe symptoms and greater overall impairment. Few treatments have been developed specifically for comorbidities, but brief	An integrated treatment approach focusing on both substance use and gambling problems may assist in treating comorbid populations.

		advice appears to be a good treatment modality for engaging substance users with comorbid gambling problems.	
Petry, N. M., Andrade, L. F., Alessi, S. M., & Rash, C. J. (2016).	Mental health disorders	Reviews comorbidity literature as part of general overview of gambling disorder and other impulse control disorders.	Greater understanding of course of gambling disorder and comorbid disorders is required.
Potenza, M. N. (2005).	Alcohol use disorder	Part of the review briefly notes the high co-occurrence of alcohol/substance use disorders and gambling and describes a proposed trial for investigating psychopharmacological treatment of this comorbidity.	Treatment for individuals with alcohol use and gambling problems are limited, but may require an integrated approach that warrants further research.
Potenza, M. N. (2007).	Mental health disorders	Reviews epidemiology and other research investigating the nature of the relationships between impulse control disorders and other psychiatric disorders, including impulsivity as a link.	Efficacy of treatments for mental disorders need to be assessed in dual diagnosis patients.
Potenza, M. N., & Wilber, M. K. (2001)	Substance use disorder (SUD)	Reviews comorbidity as rationale for neuroimaging studies in gambling disorder (GD).	Call for more neurobiological research comparing SUD and GD.
Rigbye, J., & Griffiths, M. D. (2011).	No specific one	Reviews the extent of disordered gambling treatment availability in Great Britain. Co-morbidity is identified as one of the few ways through which a person with a gambling disorder could get access to specialized treatment. However, in such cases, gambling would be classified as a secondary problem to the co-morbid disorder.	The co-morbidity result suggests that disordered gambling may not be seen as a bona fide mental health issue, with some mental health professionals stating that it should not even be classed as a mental health issue. This highlights a need for more awareness and education for health professionals about this issue.
Shaffer, H. J., & Korn, D. A. (2002).	No specific one	Co-morbidity is addressed as part of a general overview of gambling disorder with the majority of the discussion centering on prevalence rates. Substance use, anxiety, mood, suicidality, impulse control, and personality disorders are noted as the most common comorbidities for disordered gambling. The authors briefly pose a question of whether gambling disorder causes or is caused by co-morbidities.	The co-occurrence of disorders with gambling may reflect an underlying syndrome mode, whereby the shared symptoms with other disorders account for the comorbidity evidence, and the unique component distinguishes gambling itself.
Stewart, S. H., & Kushner, M. G. (2003).	Alcohol use disorder	Reviews research presented at symposium.	Treatment studies are badly needed to determine the very practical clinical issues relating to comorbidity and treatment outcome. Prospective studies should examine behavioral-level (event-level) and diagnostic-level relationships between gambling and drinking over time. Finally, laboratory studies, reasonably well represented here, remain critical to a better understanding of the behavioral and pharmacological dynamics in comorbidity.
Tedeschi, D., Martinotti, G., Andreoli, S., & Janiri, L. (2008).	No specific one	Review focuses on general overview of disordered gambling, specifying only comorbidity prevalence rates as part of the discussion.	A substantial proportion of problem gamblers endorsed comorbid disorders, which may reflect shared genetic vulnerability or negative experiences.

		Most common comorbid disorders identified are substance use, mood, and anxiety.	
Westphal, J. R. (2007).	No specific one	Review briefly mentions co-morbidity prevalence rates, citing alcohol and drug use, personality, mood, and anxiety as the most commonly observed co-occurring disorders with gambling.	Comorbidity occurs commonly, if not in the majority of cases of problem gambling.
Winters, K. C., & Anderson, N. (2000).	Alcohol use disorder	Reviews literature on co-occurrence in adolescents.	The overlap of psychosocial risk factors suggest that the two behaviours share underlying commonalities, but it is unclear why some youth develop problems and others do not.
Yip, S. W., & Potenza, M. N. (2014).	No specific one	Review describes a variety of pharmacotherapies for gambling disorder, noting which specific agents are most effective for combinations of co-occurring disorders with gambling.	Although there is no currently approved medication with an indication for gambling disorder, a variety of pharmaceutical agents have efficacy evidence supporting their use in treating comorbid disorders together with gambling, often resulting in improvement in both conditions.

Table 3 – Prevalence Studies of Clinical Populations

Article	Co-morbid Disorder	Sample Size	Population	Country	Outcome Constructs	Results	Conclusions
Alexandre, J. M., Fatseas, M., Bouju, G., Legauffre, C., Valleur, M., Magalon, D., Chereau-Boudet, I., Gorsane, M., Auriacombe, M., Hardouin, J., Venisse, J., and Grall-Bronnec, M. (2015)	ADHD	599	Addiction outpatients	France	Not reported	Disordered gambling significantly associated with greater ADHD, with 21% of sample endorsing lifetime or current ADHD.	ADHD is prevalent and associated with more severe disordered gambling.
Aragay, N., Roca, A., Garcia, B., Marqueta, C., Guijarro, S., Delgado, L. . . . Vallès, V. (2012).	Disordered gambling	100 psychiatric inpatients, 100 non-psychiatric inpatients	Psychiatric inpatients	Spain	NODS PG; clinical diagnosis of psychiatric disorders	PG 9% vs 3% ns; higher in psychotic vs non-psychotic disorders	higher prevalence of PG in psychiatric versus non-psychiatric inpatients
Aymami, N., Jimenez-Murcia, S., Granero, R., Ramos-Quiroga, J. A., Fernandez-Aranda, F., Claes, L. . . . Menchon, J. M. (2015).	ADHD	391	Gambling disorder outpatients	Spain	ADHD and disordered gambling symptom severity	Participants aged 18-35 had higher ADHD scores; higher ADHD scores were associated with greater disordered gambling severity and more psychopathology.	ADHD symptoms in both male and female disordered gamblers may act as an indicator of severity of gambling and general psychopathology.
Black, D. W., Black, D. W., & Moyer, T. (1998)	DSM 1 and 2	30	Gambling disorder	USA	DIS, PDQ, and Minnesota Impulsive Disorders Interview	According to DIS results, 18 subjects (60 percent) had a lifetime mood disorder, 19 (64 percent) a lifetime substance use disorder, and 12 (40 percent) a lifetime anxiety disorder. Based on the PDQ-IV, 26 sub- jects	The results confirm that individuals with pathological gambling suffer substantial psychiatric comorbidity. They support continued inclusion of pathological gambling in the

						(87 percent) had a personality disorder, the most common being obsessive-compulsive, avoidant, schizotypal, and paranoid personality disorders. The sample also had a relatively high rate of antisocial personality disorder. Impulse control disorders were common, especially compulsive buying and compulsive sexual behavior.	diagnostic category of impulse control disorders
Blaszczynski, A., & Steel, Z. (1998).	DSM-III-R Axis 2	82	Treatment patients	USA	Personality Disorder Questionnaire - Revised	93% meet criteria with a mean of 4.6 per patient, in particular Cluster B.	High rates of impulsivity and affective instability characterize gambling problems and may affect treatment response.
Blaszczynski, A., & Steel, Z. and McConaghy, N. (1997).	DSM-III Antisocial Personality Disorder	115	Treatment and gamblers anonymous members	Australia	ASP, impulsivity	15.5% met ASP, and those with ASP had higher scores on a variety of impulsivity measures.	Research supports a model of pathological gambling in which the severity of associated behavioural and psychological disturbance in those seeking treatment is mediated by an impulsivity-psychopathy construct.
Brown, M., Oldenhof, E., Allen, J. S., & Dowling, N. A. (2016).	Personality disorders divided by cluster symptomatology; alcohol use disorder, substance use disorder; general psychological distress	168	Gambling disorder outpatients	Australia	Self-report severity measures for all disorders	44% of sample met criteria for a personality disorder. Cluster B personality disorder symptoms but not Clusters A or C, were associated with problem gambling severity. With exception of alcohol and drug use, all psychological distress variables were higher among problem gamblers with personality disorders compared to those without.	Personality disorders co-occur frequently with disordered gambling. The psychological profiles of treatment-seeking disordered gamblers with personality disorders are more complex than those without personality disorders.
De Carvalho, S. V., Collakis, S. T., de Oliveira, M. P., & da Silveira, D. X. (2005).	Substance and alcohol use disorders	74	Outpatients from three different substance use treatment services	Brazil	DSM-IV criteria for alcohol use, disordered gambling, and depression.	19% of sample were classified as pathological gamblers. These patients showed significantly more depressive symptoms than non-pathological gambling patients.	Individuals with substance use disorders endorse a high frequency of disordered gambling.

Del Pino-Gutierrez, A., Fernandez-Aranda, F., Granero, R., Tarrega, S., Valdeperez, A., Aguera, Z. . . . Jimenez-Murcia, S. (2016).	Alcohol use disorder	951	Gambling disorder outpatients	Spain	DSM-IV criteria for disordered gambling and symptom checklist for alcohol use	Increased alcohol use and problems were significantly related to increased problem gambling.	Results corroborate high comorbidity between disordered gambling and substance use, suggesting the existence of shared vulnerabilities.
Echeburua, E., & Fernandez-Montalvo, J. (2008).	Personality disorders	150	Outpatient treatment-seeking disordered gamblers compared with general clinical sample and non-psychiatric normative sample.	Spain	SOGS for gambling symptoms, International Personality Disorders Examination and the Millon Clinical Multiaxial Inventory for personality disorder symptoms	32% of disordered gamblers, 16% of the general psychiatric control group and 8% of the normative group showed at least one personality disorder. Most prevalent ones were borderline personality disorder followed by antisocial, narcissistic, and non-specified personality disorders.	Results support disordered gambling having higher comorbidity with personality disorders than both non-psychiatric sample as well as individuals with other Axis I mental disorders such as mood and anxiety. However, results are also suggesting a much lower prevalence of PDS than other similar studies, which may be attributed to lack of rigorous assessment tools used across different studies.
Elia, C., & Jacobs, D. F. (1993).	Alcohol use disorder	85	Caucasian (n = 53) and Native American (n = 32) male inpatients with a primary diagnosis of alcohol use disorder.	USA	SOGS for gambling symptoms	22% of Native Americans and 7.3% of Caucasians scored in the probable pathological gambling addiction range. 41% of Native Americans and 21.3% of Caucasians admitted some difficulty with gambling.	A disproportionately high number of Native Americans with alcohol misuse also had additional difficulties with gambling, suggesting routing screening for gambling problems with substance misusers.
Elman, I., Borodovsky, J., Howard, M., Scoglio, A., Steinkamp, J., Sobieszczyk, A. . . .	Substance use disorder	183	Outpatients seeking treatment for drug and alcohol use disorders	USA	SOGS for gambling symptoms, DSM-IV TR symptoms for substance use disorders	18.6% of participants met criteria for problem gambling and 10.9% for pathological gambling.	Prevalence of problematic gambling in patients with substance use disorders is strikingly higher than those found in the general population. Results call for creation and adjustment of clinical addiction services to meet emerging

Albanese, M. (2016).							preventive and therapeutic needs.
Fernandez-Montalvo, J., Lopez-Goni, J. J., & Arteaga, A. (2012).	Substance use disorder	112	Treatment-seeking outpatients (men) with substance use disorders		DSM-IV criteria and SOGS for disordered gambling, Addiction Severity Index, MCMI-II and Symptom Checklist-90-Revised for substance use and other psychopathology	33.9% of the sample reported clinically significant gambling-related symptoms. Compared to substance-addicted patients without disordered gambling, those with showed significantly higher levels of alcohol severity, psychopathological symptoms and personality variables.	Results show a need for disordered gambling assessment among patients with substance use disorders as a well as a combined treatment approach for both disorders.
Grant, J., & Kim, S. (2003).	Impulse control disorders, including sexual behaviour and compulsive buying	96	Gambling disorder outpatients	USA	DSM-IV Criteria, modified PG-YBOCS, G-SAS, and GAF for disordered gambling; DSM-IV criteria for comorbid disorders	22.9% reported a comorbid impulse control disorder, most commonly compulsive sexual behaviour and compulsive buying. Those with comorbidity reported greater urges and thoughts related to gambling as well as greater functional impairment	Impulse control disorders are common among disordered gamblers and are associated with more severe gambling symptoms.
Grant, J. E., & Steinberg, M. A. (2005).	Compulsive sexual behaviour (CSB).	225	Outpatient pathological gamblers	USA	Compulsive sexual behaviour in Problem Gamblers	Forty-four (19.6%) subjects met criteria for co- occurring CSB. The symptoms of CSB preceded the onset of pathological gambling symptoms in 31 (70.5%) subjects. Men were more likely to have CSB (X ² D 4.74; df = 1; p D 0.029).	The high rate of CSB and the potential for worsening of pathological gambling symptoms in these patients, however, suggests that clinicians should carefully screen pathological gambling patients for CSB, as the presence of CSB may have treatment implications
Haydock, M., Cowlshaw, S., Harvey, C., & Castle, D. (2014).	Psychotic spectrum disorders	151	Adults attending mental health services	Australia	DSM-IV criteria and Diagnostic Interview for Psychosis for psychotic disorders, AUDIT for alcohol dependence, MSIF for functional impairment, and PGSI for gambling symptoms	4.1% of sample was classified as low risk gamblers, 6.4% as moderate, and 5.8% as problem. Moderate/problem gamblers were more likely to be male, left school and sought financial assistance. They were also more likely to have a substance use disorder (excluding cannabis).	Individuals with psychotic spectrum disorders are four times more likely to have a gambling problem than the general population. Clinicians should screen for comorbid gambling problems in people with psychosis.

Himmelhoch, S., Miles-McLean, H., Medoff, D., Kreyenbuhl, J., Rugle, L., Brownley, J., . . . Himmelhoch, S. S. (2016).	Opioid dependence	185	Methadone Patients	USA	Gambling Disorder	46.2% met criteria for past year gambling disorder. No differences in demographic profile.	efforts to screen and treat gambling disorder in the context of methadone maintenance treatment are clearly warranted.
Ibáñez, A., Blanco, C., Donahue, E., Lesieur, H. R., Castro, I. P. d., Fernández-Piqueras, J., & Sáiz-Ruiz, J. (2001).	Axis 1 and 2	69	Outpatient Problem Gamblers	Spain	Axis 1 and 2, Dopamine D2 receptor gene	A comorbid psychiatric disorder was present in 43 (62.3%) of the gamblers. The most frequent diagnoses were personality disorders (N=29 [42.0%]), alcohol abuse or dependence (N=23 [33.3%]), and adjustment disorders (N=12 [17.4%]). Gamblers with comorbid psychiatric disorders had gambling scores and psychological scale scores indicating greater severity of gambling and psychopathology. Significant differences in DRD2 allele distribution were found in gamblers with and without co- morbid disorders.	Psychiatric comorbidity is common among pathological gamblers and is associated with greater severity of clinical problems. The DRD2 gene could be a liability genetic factor for psychiatric comorbidity in pathological gambling.
Ibanez, A., Blanco, C., Moreryra, P. & Saiz, J. (2003)	DSM-III-R Axis 1 and 2	69	Gambling disorder outpatients	Spain	SCID-1 and 2	Although the overall rates of 12- month psychiatric comorbidities were similar for both groups (Men 60%, women 68%), women were more likely to have a concurrent diagnosis of a mood disorder, whereas men were more likely to suffer from comorbid alcohol abuse or dependence. In addition, lifetime comorbidity for major depressive disorder was 40.9% in women, compared with 4.3% in men, whereas that of alcohol dependence was 9.1% versus 46.8% (22/47). Men met a greater mean number of criteria for antisocial personality disorder than women.	The clinical picture of male pathological gamblers suggests that they are more impulsive than female pathological gamblers. Future research should include both men and women.

Jiménez-Murcia, S., Fernández-Aranda, F., Granero, R., Chóliz, M., La Verde, M., Aguglia, E. . . . Menchón, J. M. (2014).	video game addiction	193	GD treatment sample	Spain	video game addiction	prevalence of video game addiction was 15%; related to younger age, but not GD severity; Video game users and addicts had higher psychological distress and dysfunctional personality traits.	Intervention strategies that focus on the training of these personality features and systematic screening for potential VGU/VGA are recommended.
Kennedy, S. H., Welsh, B. R., Fulton, K., Soczynska, J. K., McIntyre, R. S., O'Donovan, C., . . . Martin, N. (2010).	Major depressive disorder (MDD), Bipolar disorder (BD)	579	Adults attending mental health services	Canada and USA	DSM-IV criteria for comorbidity and PGSI for gambling symptoms	Prevalence of problem gambling did not differ between MDD and BD groups. Among problem gamblers, mood disorder was the primary onset condition in 71% of cases. Individuals with mood disorder and anxiety or substance use disorders had significantly increased odds of problem gambling.	Results reaffirm a higher prevalence of gambling both in BD and MDD populations. Multiple comorbidities also appear to be risk factors for gambling behaviours in these populations.
Kroeber, H. L. (1992).	Personality disorders	46	Adults attending outpatient or inpatient services or consulting for a forensic expert report	Germany	DSM-III-R criteria for gambling and comorbid disorders	Roulette gamblers compared to other forms of gambling showed signs of personality disorders, especially narcissistic and cyclothymic patterns significantly more often. Anti-social behavior and delinquency before the onset of excessive gambling were frequent in all types of gamblers.	Roulette and game machine gamblers have different patterns of psychiatric presentation. Excessive casino gamblers have more personality disorders.
Kruedelbach, N., Walker, H., Chapman, H., Haro, G., Mateu, C., & Leal, C. (2006).	Personality disorders, substance use disorder	162	Disordered gamblers in residential treatment	Spain	DSM-IV criteria for substance and personality disorders. Gambling severity symptoms.	61% of the sample endorsed at least one personality disorder, mostly cluster B. 63% of the sample endorsed a lifetime substance use disorder. Presence of a personality disorder was related to being addicted to more than one substance.	Personality disorders and substance use disorders are frequent comorbidities of disordered gambling.
Maccallum, F., & Blaszczynski, A. (2002).	Substance use disorder	75	Outpatient treatment poker players	Australia	DSM-IV SUD	Nicotine dependence was the most common substance- related disorder. Thirty-seven per cent of participants (41.67% males and 29.63% females) met criteria for this disorder. Alcohol abuse was the next most common disorder, with 16.00% of the sample meeting criteria for this disorder during the 12 months prior to	Screening for gambling problems should be included in standard approaches in the assessment of substance users and appropriate interventions offered to identified cases of problem gambling.

						assessment. Males (22.92%) were significantly more likely to meet criteria for alcohol abuse than females (3.70%; Fisher's exact $p < 0.03$). Rates of alcohol dependence were somewhat lower (10.42% males, 3.70% females) and there was no sex differences on this variable. Comparatively few subjects met diagnostic criteria for substances other than alcohol and tobacco (1.3%–5.3%), and no subject met criteria for a 12-month opiate disorder. With the exception of opiate disorders, the rates of substance disorders were higher for all substances in this sample than in the general Australian population.	
McCormick, R. A. (1993).	Substance use disorder	2171	Outpatient substance abuse treatment sample	France	Problem Gamblers (SOGS)	Users were assessed for their gambling behavior, and divided into three groups: those with no significant gambling problem (87%); those with a probable problem (7.2%); and those with a severe problem (5.8%). Substance abusers with a gambling problem scored significantly higher on measures of: impulsivity; disinhibition of aggressive/hostile responses; and negative affectivity. They also abused more substances than the non-gamblers.	The results underscore the importance of assessing a wide range of impulsive behaviors in substance abusers and the potential for subtyping substance abusers based on psychological traits.
Nehlin, C., Grönbladh, L., Fredriksson, A., & Jansson, L. (2013).	Gambling disorder	2160	Psychiatric outpatients	Sweden	Problematic gambling	Problematic gambling was more frequent among males, 10.2% compared with females 3.1%. No differences in age could be identified among male gamblers reporting gambling problems. Females reporting gambling problems were older than females who reported no gambling problems. Alcohol abuse	Gambling and substance use disorders are prevalent among psychiatric outpatients. Clinicians need to screen; and evidence-based treatments are required.

						was associated with PG in males but not females.	
Pelletier, O., Ladouceur, R., & Rheume, J. (2008).	Personality disorders (PD)	121	French-speaking disordered gamblers seeking cognitive behavioral therapy treatment	Canada	DSM-IV criteria for both gambling and comorbid disorders	64% of gamblers had at least one comorbid PD. The most common disorders were in clusters B and C. Presence of cluster B comorbidity was a significant predictor of treatment dropout.	Many disordered gamblers seeking treatment suffer from a comorbid PD. It is important to assess problems on Axis I and II at the beginning of treatment to manage complications and reduce dropouts.
Pino-Gutierrez, A., Fernandez-Aranda, F., Granero, R., Tarrega, S., Valdeperez, A., Aguera, Z., . . . Jimenez-Murcia, S. (2016).	Alcohol abuse, other psychiatric disorders	951	Gambling disorder (GD) outpatient treatment sample	Spain	AUDIT	Overall alcohol abuse, 15.8%, dependence 3.3% ; results showed a high prevalence of risk of alcohol dependence in GD patients who were immigrants, unemployed, and had a low level of education. A positive linear trend was also found between alcohol consumption level and the prevalence of other current and lifetime comorbid mental disorders, and for the presence of drug abuse.	The results showed an association between increased alcohol consumption and greater dysfunction, but overall prevalence was not high relatively to other studies with smaller samples, and less well validated measures.
Preston, D. L., McAvoy, S., Saunders, C., Gillam, L., Saied, A., & Turner, N. E. (2012).	Social anxiety, depression, substance use, ADHD	254	Incarcerated male federal offenders	Canada	DSM-IV criteria for all assessed disorders.	9.4% of the sample were disordered gamblers. Gambling problems were significantly associated with social anxiety, depression, substance abuse, impulsiveness, and current and childhood ADHD symptoms. When compared to nonoffenders, these correlates appeared to be similar.	Any intervention for this population needs to be comprehensive and take into considerations all comorbid disorders.
Rudd, C., & Thomas, S. D. (2015).	Gambling disorder	266	Substance abuse residential treatment	Australia	Probable gambling disorder	21.4 % were 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	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

						pattern of criminality, particularly crimes associated with financial gain.	with distinct and specific phenomenology.
Rupcich, N., Frisch, G. R., & Govoni, R. (1997)	Substance use	328	Substance use disorder outpatients	Canada	Self-report severity measure for gambling symptoms	11% of the sample met criteria for disordered gambling with 14% being probable problem gamblers	Treatment professionals should screen for disordered gambling when treating other addictions.
Shek, D., Chan, E., & Wong, R. (2012a).	Mood and adjustment disorder	201	Disordered gamblers seeking treatment.	Hong Kong	Self-report severity measures for all disorders	64% of participants endorsed at least one comorbid disorder. Most common comorbidities were mood (29%) and adjustment disorders (21%). Individuals with these comorbidities endorsed greater levels of impairment and gambling problems than those without.	Mood and adjustment disorders may be common among disordered gamblers in Hong Kong.
Shek, D., Chan, E., & Wong, R. (2012b).	Variety of axis I disorders	201	Disordered gamblers seeking treatment.	Hong Kong	Self-report severity measures for all disorders	64% of participants met criteria for a lifetime comorbid disorder. The most common disorders were mood disorder, adjustment disorder, and substance use disorder. Gamblers with comorbidities were more likely to have severe psychopathology, greater impairment, and more gambling problems than those without comorbidities.	Disordered gambling comorbidity is highly prevalent and compounds existing impairment and symptom severity across multiple disorders.
Thon, N., Preuss, U., Polzleitner, A., Quantschnig, B., Scholz, H., Kuhberger, A. . . . Wurst, F. (2014).	Suicide attempt history and substance use disorders	862	Disordered gambling outpatients	Austria	ICD-10 criteria for all assessed disorders.	10% of the sample had a history of a suicide attempt. Those with a history of suicide attempt were significantly more likely to have a comorbid disorder.	1 in 10 disordered gamblers have a history of suicide attempts, which is exacerbated by co-morbidity of any kind, most commonly substance use and alcohol use. This relationship between suicidality and comorbidity must be considered in treatment.
Zimmerman, M., Chelminski, I., and Young, D. (2006)	Variety of DSM-IV Axis I disorders	1709	Psychiatric outpatients	United States	DSM-IV criteria for all assessed disorders.	2.3% of patients met criteria for lifetime disordered gambling. These patients were significantly more likely to have at least one Axis I disorder than those without gambling	Disordered gambling is highly comorbid with a variety of Axis I disorders even when compared to other non-gambling psychiatric patients.

Zorland, J., Kuperminc, G. P., Mooss, A. D., Gilmore, D., & Emshoff, J. G. (2013)..	Substance use disorder	602	Drug court participants	United States	Self-report severity measures for all disorders	problems. Significantly higher rates of bipolar disorder, social phobia, panic disorder, alcohol use, and other impulsive control disorders were observed in disordered gamblers. 10% of the sample met cut-offs for disordered gambling with 20% meeting probable gambling problems cut-offs.	Disordered gambling is a salient issue among substance-abusing offenders.
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Table 4 – Prevalence Studies of General Populations

Article	Co-morbid Disorder	Sample Size	Population	Country	Outcome Constructs	Results	Conclusions
Alegria, A. A., Petry, N. M., Hasin, D. S., Liu, S.-M., Grant, B. F., & Blanco, C. (2009).	Alcohol use disorder (AUD), nicotine dependence, mood, generalized anxiety disorder, and personality disorder	43093	National general survey	USA	DSM-IV Symptoms severity for all assessed disorders	All assessed disorders endorsed by 40-74% of disordered gamblers with White disordered gamblers more likely to endorse AUD than Black. No differences on any other disorders. Highest comorbidity was alcohol; lowest was mood disorder.	Prevalence of co-morbid disordered gambling varies by racial and ethnic group.
Bakken, I. J., Gotestam, K., Grawe, R. W., Wenzel, H. G., & Oren, A. (2009).	Sleep disorders, depression, generalized anxiety disorder, OCD, alcohol use disorder and substance use disorder.	3482	National general survey	Norway	Multiple choice asking if participant experience the disorder; DSM-IV disorder gambling criteria	Disordered gamblers endorsed more psychological impairments across all disorders, ranging from 11% (OCD) to 63% (Sleep disorders).	Problematic gambling is associated with multiple negative mental health conditions.
Barnes, G. M., Welte, J. W., Hoffman, J. H., & Tidwell, M. C. O. (2011).	Alcohol use disorder and substance use disorder, Conduct Disorder	2274	National general survey ages 14-21	USA	Disordered gambling symptom severity and DSM-IV symptoms for other disorders	Alcohol, tobacco, and marijuana dependence and conduct disorder significantly predicted disordered gambling with strongest association for alcohol use.	Given that the assessed disorders appear to be co-occur together frequently, interventions for any of the specific behaviors in youth should consider assessing for the other problem behaviors as well.
Barnes, G. M., Welte, J. W., Hoffman, J. H., & Tidwell, M.-C. O. (2009).	Alcohol use disorder and substance use disorder	2274	National general survey ages 14-21	USA	Disordered gambling symptom severity and DSM-IV symptoms for other disorders	Significant association between gambling and alcohol/drug problems, with males showing a greater correlation than females.	Substance use and gambling co-occur because they may have shared antecedent factors.
Barnes, G. M., Welte, J. W., Tidwell, M.-C. O.,	Alcohol use disorder and	2963	National general survey	USA	DSM-IV Symptoms	Alcohol dependence, tobacco dependence, and marijuana dependence are all highly	Substance use and gambling co-occur because they may have shared antecedent factors.

& Hoffman, J. H. (2015).	substance use disorder				severity for all assessed disorders	predicting of disordered gambling. The effect is stronger for males than females.	
Barnes, G. M., Welte, J. W., Tidwell, M.-C. O., & Hoffman, J. H. (2015).	Substance use disorder and gambling disorder	2963	Adults 18+	USA	Substance use and gambling disorders	Dependence OR tobacco 2.77, marijuana 5.01, alcohol 2.80.	Problem gambler and substance use disorder are linked.
Barry, D. T., Stefanovics, E. A., Desai, R. A., and Potenza, M. N. (2010).	DSM mental health and substance use disorder	32316	NSEARC General population sample	USA	Compare comorbidity by race and level of Problem Gambling	Black respondents in comparison to white respondents had higher rates of PPG, Rates of psychiatric disorder were associated with past-year gambling problem severity in both black and white respondents. Although patterns of co-occurrence appear largely similar across racial groups, the relationship between past-year gambling severity and several forms of psychopathology appears stronger in black respondents as compared to white ones, specifically in the relationship between subsyndromal gambling and mood disorders (particularly hypomania) and substance use disorders.	Study findings highlight the importance of developing treatments for problem or pathological gamblers with co-occurring psychiatric disorders: currently there is a dearth of evidence-based treatments for individuals with co-occurring gambling and other psychiatric disorders.
Barry, D. T., Stefanovics, E. A., Desai, R. A., and Potenza, M. N. (2011).	DSM mental health and substance use disorder	31839	NSEARC General population sample	USA	Compare comorbidity by race and level of Problem Gambling	Hispanic respondents in comparison to white respondents were more likely to exhibit PPG. Problem gambling severity was associated with past-year Axis I and lifetime Axis II psychiatric disorders in both Hispanic and white respondents, with the largest odds typically observed in association with the most severe gambling pathology. A stronger relationship between subsyndromal gambling and a broad range of Axis I disorders (mood, anxiety and substance use disorders) and Axis II disorders (particularly cluster B) was observed in Hispanic respondents as compared to white ones.	Differences in the patterns of co-occurring disorders between subsyndromal levels of gambling in Hispanic and white respondents indicate the importance of considering ethnicity/race-related factors related to subthreshold levels of gambling in developing improved mental health prevention and treatment strategies.

Bischof, A., Meyer, C., Bischof, G., Kastirke, N., John, U., & Rumpf, H.-J. (2013).	CIDI Axis I mental health diagnosis	164	At risk, and Problem Gamblers from general population sample	Germany	Axis I disorders	Psychiatric disorder rates 93.6% in pathological, 83.5% in problem, 81.0% in at risk vs 35.7% in general population reference group. Types of disorders consistent with previous research. No differences found between at risk and problem gamblers or problem and pathological gamblers. compared to at risk, pathological gamblers showed elevated rates of substance use disorders.	Individuals with even one or two PG symptoms have increases rates of psychiatric disorders.
Bland, R., Newman, S., Orn, H., & Stebelsky, G. (1993).	Variety of Axis I disorders and antisocial personality disorder	30	National general survey	Canada	DSM-III criteria for all disorders	Disordered gamblers compared to nongamblers had significantly higher risk for all assessed disorders. 40% of the sample also met criteria for antisocial personality disorder.	Disordered gambling is highly comorbid with a variety of Axis I disorders and antisocial personality.
Bland, R., Newman, S., Orn, H., & Stebelsky, G. (1993).	DSM-III	7214	General population, age 18+	Canada	DSM Mental health	Lifetime prevalence of PG was 0.42%, and PG had high rates of other disorders (RR = 2.5), including mood, anxiety, eating, substance use and antisocial personality disorder.	Study found lower prevalence than pathological gambling than other early studies but relatively high rates of comorbidity.
Bonnaire, C., Kovess-Masfety, V., Guignard, R., Richard, J. B., du Roscoat, E., & Beck, F. (2016).	Alcohol use disorder and substance use disorder	25647	National general survey	France	Self-report measures of problem severity for all outcomes	Disordered gamblers endorsed more significant problems with alcohol, cocaine, cannabis, heroin and tobacco than non-disordered gamblers. Females endorsed a more severe tobacco dependence than males.	Substance use may potentially be used as a way of coping with psychological distress caused by gambling problems or substance use may trigger gambling desire.
Brewer, J. A., Potenza, M. N., and Desai, R. A.	DSM mental health and substance use disorder	43093	NSEARC General population sample	USA	Contrasted alcohol use disorder (AUD) and non-AUD populations in terms of the association between Problem Gambling and mental health comorbidity	Among those without AUD, significant associations were noted between gambling severity and nearly all of the Axis I and Axis II disorders. Among respondents with AUD, there were few significant associations between gambling severity and Axis I disorders. Rates of at-risk or problem/pathological gambling were 2.3% among those without AUD and 8.3% among those with AUD.	Strong associations emerged between gambling and Axis I disorders such as major depressive disorder (MDD), panic disorder (PD) and generalized anxiety disorder (GAD) in individuals without AUD. One hypothesis as to why these patterns would not be observed in AUD respondents is that these diagnoses are characterized by a common "internalizing pattern" of behavior, where maladjustment is expressed primarily inwardly as anxiety/misery/fear as compared to

							“externalizing” patterns of behavior which manifest through alcohol consumption and other outwardly directed expressions.
Chou, K.-L., & Afifi, T. O. (2011).	NSEARC DSM diagnoses	33,231	US community sample	USA	Prevalence of Gambling Disorders	Past-year disordered gambling at baseline was associated with the subsequent occurrence of any Axis I psychiatric disorder, any mood disorder, bipolar disorder, generalized anxiety disorder, posttraumatic stress disorder, any substance use disorder, alcohol use disorders, and alcohol dependence disorder after adjustment for sociodemographic variables. After simultaneous adjustment for medical conditions, health-related quality of life, and recent stressful life events, disordered gambling remained significantly related to any mood disorder, generalized anxiety disorder, posttraumatic stress disorder, alcohol use disorders, and alcohol dependence.	Co-morbid mental disorders may have a significant impact on disordered gambling and should be screened for consistently.
Cunningham-Williams, R. M., Cottler, L. B., Compton, I. W. M., & Spitznagel, E. L. (1998).	DSM-III	3004	General population, age 18+	USA	DSM Mental Health	Lifetime prevalence of problem gambling (PG) was 0.9%, and PG had high rates of other disorders, including tobacco, major depression, phobias, substance use and antisocial personality disorder.	Clinicians need to screen for comorbid disorders
Cunningham-Williams, R. M., Cottler, L. B., Compton, W. M., III, & Spitznagel, E. L. (1998).	Antisocial personality disorder, alcohol and tobacco dependence, mood disorders, schizophrenia, OCD, anxiety disorders	3004	National general survey	USA	DSM-III criteria for all disorders	Problem gamblers had higher rates of most psychiatric disorders than non-gamblers. Association was strongest for antisocial personality disorder and substance use.	Clinicians treating alcoholism and tobacco dependence may need to screen for disordered gambling.

Cunningham-Williams, R. M., Cottler, L. B., Compton, W. M., III, & Spitznagel, E. L. (1998).	DSM mental health and substance use disorder	3004	Community adults	USA	DSM mental health	Recreational gamblers and problem gamblers had higher rates of most psychiatric disorders than non-gamblers after adjustment for race, sex, and age effects, especially antisocial personality disorder, alcohol, and tobacco disorder. Age of onset for phobias, depression, tobacco, and asp before problem gambling, alcohol within 2 years.	Clinicians need to screen for comorbid disorders.
Cunningham-Williams, R. M., Grucza, R. A., Cottler, L. B., Womack, S. B., Books, S. J., Przybeck, T. R., Spitznagel, E. L., & Cloninger, C. R. (2005).	DSM-IV	918	General population, age 18+	USA	Select mental health disorders	The psychiatric and substance use problems associated at the bivariate level with gambling status, (depression, anxiety) only alcohol abuse/dependence and tobacco dependence remained significant in the final model.	Targeted prevention messages are warranted specifically for gamblers of varying risk for PGD.
el-Guebaly, N., Patten, S. B., Currie, S., Williams, J. V., Beck, C. A., Maxwell, C. J., & Li Wang, J. (2006).	Mood disorders, anxiety disorders, substance use disorders	14934	National general survey	Canada	PGSI for gambling symptoms, DSM-IV criteria for comorbid disorders	2.9% of sample fell in the moderate/high severity of gambling problems category. In persons with mood or anxiety disorder, compared to persons without a disorder, the risk of having a gambling problem was 1.7 times higher. For those with substance use disorder, the risk was 2.9 times higher. Those with both mood/anxiety and substance use disorders were 5 times more likely to be problem gamblers.	Presence of a psychiatric comorbidity increases the risk for higher severity gambling compared to persons without a mental disorder.
el-Guebaly, N., Patten, S. B., Currie, S., Williams, J. V., Beck, C. A., Maxwell, C. J., & Li Wang, J. (2006).	Mood disorder and substance use disorder (SUD)	14934	General population, age 18+	Canada	Prevalence of pathological gambling in general population who gamble, in those with current mood disorder, and those with current SUD	The risk of moderate/high severity gambling was 1.7 times higher in persons with mood or anxiety disorder compared to persons with no selected disorder. For persons with substance dependence or harmful alcohol use, the risk of moderate/high severity gambling was 2.9 times higher. Persons with both mood/anxiety and substance/ alcohol	Targeted prevention messages are warranted specifically for gamblers of varying risk for pathological gambling disorder.

						disorders were five times more likely to be moderate/high severity gamblers.	
Feigelman, W., Wallisch, L. S., & Lesieur, H. R. (1998).	DSM-III-R Substance use disorder	6308	Community sample	USA	Compared no problem, substance problem, gambling problem, dual problem.	Compared to having only gambling or substance disorder, dual persons were younger, more likely to be male, and without religion. They showed greater levels of dysfunction as evidenced by treatment-seeking and legal problems.	Confirms the results of studies completed with clinical populations, demonstrating the increased psychosocial dysfunctionality associated with having a combined gambling and substance use problem.
Kessler, R., Hwang, I., LaBrie, R., Petukhova, M., Sampson, N., Winters, K., & Schaffer, H. (2008a).	Mood disorders anxiety disorders, substance use disorders, impulse control disorders	9282	National general survey	USA	ICD-10 criteria for both gambling and comorbid disorders	0.6% of sample met criteria for disordered gambling. Disordered gambling onset and persistence were predicted by prior anxiety, mood, impulse-control and substance use disorders. Disordered gambling predicted subsequent onset of generalized anxiety disorder, PTSD, and substance use disorder.	Although disordered gambling is comparatively rare, it is frequently secondary to other mental and substance disordered that are associated with both disordered gambling onset and persistence.
Kessler, R., Hwang, I., LaBrie, R., Petukhova, M., Sampson, N., Winters, K., & Schaffer, H. (2008b).	DSM-IV	3435	National Comorbidity Study-Replication	USA	Pathological gambling (PG) comorbidity	96.3 % of respondents with lifetime PG also meet lifetime criteria for one or more other CIDI/DSM-IV disorders. Onset and persistence of PG were predicted by a variety of prior DSM-IV anxiety, mood, impulse-control and substance use disorders. PG also predicted the subsequent onset of generalized anxiety disorder, post-traumatic stress disorder (PTSD) and substance dependence. Although none of the NCS-R respondents with PG ever received treatment for gambling problems, 49.0 % were treated at some time for other mental disorders.	Given that three quarters of PG cases occur only subsequent to the onset of other DSM-IV disorders, it seems likely that onset of PG could be prevented if clinicians increased their monitoring for emerging gambling problems. However, as PG is such a rare disorder, it is difficult to argue that prevention should become a focus of clinical attention, other than perhaps among patients with BP-I disorder, where risk of PG is relatively high.
McIntyre, R. S., McElroy, S. L., Konarski, J. Z., Soczynska, J. K., Wilkins, K., & Kennedy, S. H. (2007).	Bipolar disorder	36984	National general survey	Canada	DSM-IV criteria for all disorders except gambling. Self-report severity for gambling symptoms.	The odds of having disordered gambling were twice as high for those with bipolar disorder compared to those without. Increased risk for gambling problems was associated with comorbid alcohol dependence and drug dependence.	Bipolar disorder is differentially affected by problem gambling. Screening for gambling problems is warranted in this population, especially for those with comorbid alcohol and substance use.

Momper, S. L., Delva, J., Grogan-Kaylor, A., Sanchez, N., & Volberg, R. A. (2010).	Major depressive disorder (MDD)	3596	Community telephone survey	USA	NODS for problem gambling symptoms and two questions based on DSM-IV criteria for MDD	1.2% of sample were disordered gamblers; greater gambling problems were associated with greater depressive symptoms and arrest history.	Interventions for problem and at-risk gamblers needs to include screening for major depressive disorder.
Park, S., Cho, M. J., Jeon, H. J., Lee, H. W., Bae, J. N., Park, J. I., Sohn, J. H., Lee, Y. R., Lee, J. Y., & Hong, J. P. (2010).	Alcohol use disorder, nicotine dependence, suicidality, mood and anxiety disorders.	6510	National general survey	South Korea	DSM-IV criteria for all assessed disorders.	Of those who met criteria for disordered gambling, 79% had at least one psychiatric illness in comparison to controls of 28%. Associations were significant for alcohol use, nicotine dependence, mood disorder, anxiety disorder, and suicidality.	Disordered gambling is highly associated with a number of other disorders, suggesting that clinicians should evaluate and treat such disorders in gamblers.
Rush, B. R., Bassani, D. G., Urbanoski, K. A., & Castel, S. (2008).	Substance use	36885	National general survey	Canada	DSM-IV criteria for all disorders except gambling. Self-report severity for gambling symptoms.	Those with disordered gambling endorsed high prevalence rates of substance use. Gambling severity was related to substance use problem severity but not to the co-occurrence of other mental disorders.	Prevalence of disordered gambling is increased with substance use severity, but the pattern does not appear to be affected by other disorder co-occurrence.
Welte, J. W., Barnes, G. M., Tidwell, M. O., & Hoffman, J. H. (2009).	Conduct disorder	2274	National general survey	USA	DSM-IV criteria for conduct disorder; self-report severity measure for gambling	There was a strong association between current problem gambling and current conduct disorder. This comorbidity was stronger in younger participants and declined in strength with age. Early-onset problem gamblers had a higher risk for conduct disorder than late-onset gamblers.	Gambling problems that emerge early are likely to be a part of a general pattern of problem behaviour, while gambling problems that emerge later may have an etiology unique to gambling.
Welte, J., Barnes, G., Wieczorek, W., Tidwell, M.-C., & Parker, J. (2001).	Alcohol use disorder (AUD) in pathological gambling (PG)	2638	National general population	USA	DIS and SOGS	OR of PG and AUD was 23.1 and was relatively higher in high SES (where prevalence of PG is lower).	Disordered gambling in lower SES appears less deviant; in higher SES it is closely linked to another deviant behaviour.

Table 5 – Prevalence Studies of Special Populations

Article	Co-morbid Disorder	Sample Size	Population	Country	Outcome Constructs	Results	Conclusions
Barnes, G. M., Welte, J. W., Hoffman, J. H., & Tidwell, M.-C. O. (2009).	Alcohol disorder, cannabis use disorder, tobacco use disorder		General population adolescents ages 14-21	USA	Alcohol, cannabis, tobacco use and disorder comorbidity with Gambling Disorder	Alcohol and gambling problems show high co-occurrence, especially among male youth and black youth.	Results consistent with problem behaviour theory and generality of deviance, and provide direction for targeted prevention and intervention efforts.
Blanco, C., Myers, J., & Kendler, K. (2012).	Major depressive disorder, alcohol use disorder and substance use disorder	43799	Web-based sample from website allowing two people to compare their personalities and behaviors	USA	DSM-IV symptoms of gambling, DSM-III-R symptoms of major depression, substance and alcohol use severity based on frequency cut-offs	There was a low genetic correlation between symptoms of disordered gambling and major depression and a high genetic correlation with symptoms of alcohol, caffeine, and nicotine dependence; results were invariant across genders.	Disordered gambling is largely genetically determined and more closely related to externalizing than internalizing behaviors.
Cheung, N. W. (2012).	Substance use disorders	4734	High school students 12-23 years	Hong Kong	DSM-IV symptoms of gambling and severity measure of tobacco and alcohol use using frequency cut-offs	Gambling severity was significantly correlated with more problematic drinking and tobacco use.	Gambling problems are likely to a part of a general problem behavior syndrome among young people in a Chinese context.
Chou, K. L., & Cheung, K. C. (2013).	Major depression	8205	Older adults age 65+	USA	DSM-IV criteria for all assessed disorders.	1.4% of those with major depression also met criteria for disordered gambling.	Gambling problems are significantly associated with depression in older adults.
Cook, S., Turner, N., Ballon, B.,	Substance use disorder and	4851	High school students	Canada	Substance abuse and mental	In a multivariate analysis, substance-use problems, mental health problems, and the participation in a variety of	

Paglia-Boak, A., Murray, R., Adlaf, E. . . . Mann, R. E. (2015).	mental disorders				disorders comorbidity	delinquent behaviors remained significantly associated with youth problem gambling behavior. Students who report problem gambling behaviors show increased substance abuse, mental health, and delinquency/criminal problems that are similar to those seen among adult problem gamblers.	
Fu, W., & Yu, C. K.-C. (2015).	Internet gaming disorder	700	Chinese Hong Kong students (14-23)	Hong Kong	Internet Gaming Disorder	OR 8.0.	Most distorted thoughts were not correlated with Internet gaming addiction, it appears that despite their similar diagnostic criteria, disordered gambling and Internet gaming addiction are two related but different conditions. These findings lend support to the DSM-5's (American Psychiatric Association 2013) proposal of Internet gaming disorder as a psychopathological condition distinct from gambling disorder. In addition, they advance the previous evidence for the association between gambling pathology and Internet use.
Getty, H. A., Watson, J., & Frisch, G. (2000).	Major depressive disorder	60	Gamblers anonymous (GA) members and non-problem gambling controls	Canada	SOGS for gambling symptoms, and BDI for depressive symptoms	GA members reported significantly higher levels of depression than controls. Females reported greater levels of depression than males.	Therapies designed to increase ability to examine negative inner states will be helpful to disordered gamblers.
Gill, K., Heath, L., Derevensky, J., & Torrie, J. (2016).	DSM mental health and substance use disorders	506	Northern Cree communities	Canada	DSM depression, anxiety and substance use disorders	Compared to the no/low risk gamblers, a greater proportion of moderate/high risk gamblers were cigarette smokers (44.8 vs. 56.3 %), they were more likely to meet DSM-IV diagnostic criteria for alcohol dependence (21.2 vs. 46.2 %), and they were more likely to report moderate to severe depressive symptoms in the past month.	The high rates of comorbidity between problem gambling, tobacco dependence, substance abuse and other psychological problems demonstrate that gambling among some Cree adults is part of a pattern of high-risk factors for negative long-term health consequences.

Glenn, M. K., Diaz, S., & Moore, L. C. (2006).	Substance use disorder (SUD)	227	Gambling Helpline callers	USA	Self-reported SUD history	23% of callers reported SUD history.	SUD are one of numerous management issues clinicians working with gambling disorder must address.
Haw, J., & Holdsworth, L. (2015).	Generalized anxiety disorder, depression, alcohol use disorder, drugs, nicotine use disorder	276	Problem gamblers in treatment	Australia	Self-reported prevalence and age of onset	Women tended to experience other disorders before the first onset of problem gambling, whereas men tended to experience other disorders after the first onset of problem gambling. Women developed PG on average 11 years later than men but age of onset for other disorders was similar for men and women.	Later onset of problem gambling in women may allow greater time for other disorders to occur, Alternatively, problem gambling in women may be more likely to be related to coping with negative affect than in men.
Lehmann, S., Akre, C., Berchtold, A., Flatz, A., & Suris, J. C. (2016).	Substance use, internet use	3134	Post-secondary students	Switzerland	Self-report severity measures for all disorders.	Compared to non-gamblers, disordered gamblers were more likely to be problematic internet users and have problematic alcohol use.	Adolescent disordered gambling is associated with other health risk behaviours. Health practitioners should include gambling in psychosocial screening and counselling for adolescents.
Lynch, W. J., Maciejewski, P. K., & Potenza, M. N. (2004).	Depression, substance use disorder	872	Gambling Behavior and Impact Study, Participants were categorized by age (16-17 vs 18-29 years), past-year gambling status (yes vs no), and age at gambling on- set (≤ 18 years vs > 18 years) to form 5 groups: adolescent gamblers (n=235), adolescent non-gamblers (n=299), early-onset adult gamblers (n=151), adult-onset gamblers (n=204), and adult non-gamblers (n=187).	USA	Psychiatric correlates by age of onset of Problem Gambling	Adolescent gamblers were more likely than adolescent non-gamblers to report alcohol and drug use and abuse/dependence and depression. Elevated rates of alcohol and drug use and abuse/dependence were observed in early-onset adult gamblers vs adult non-gamblers, and only elevated rates of alcohol use were observed in adult-onset gamblers vs adult non-gamblers. Substantial differences in reasons for and patterns of gambling were observed among the 3 groups of gamblers.	Adolescent-onset gambling is associated with more severe psychiatric problems, particularly substance use disorders, in adolescents and young adults. More research is needed to investigate the relationships and inform prevention and treatment strategies.
McCready, J., Mann, R. E.,	Substance use disorders	4526	Older adults age 55+	Canada	PGSI for gambling symptoms, DSM-IV criteria	6.9% of sample reported experiencing problems related to gambling. Those with a substance use disorder were 3.88	Association of gambling problems with substance dependence point to

Zhao, J., & Eves, R. (2008).					for comorbid disorders	times more likely to experience gambling problems than those without.	the need for additional research on gambling problems among seniors.
Shek, D. T., Chan, E. M., & Wong, R. H. (2013).	DSM mental health and substance use disorders	201	Pathological gamblers (PG) in treatment	Hong Kong	SCID Axis 1	64% lifetime and 45% current Axis 1, which were related to greater gambling problem severity, functional impairment, living alone, and nicotine dependence. Most common were mood, adjustment, nicotine and alcohol disorders. Alcohol and mood disorder tended to precede PG, whereas adjustment disorder followed PG.	The high prevalence of comorbidity suggests that integrated treatment is required.
Walther, B., Morgenstern, M., & Hanewinkel, R. (2012).	Substance use and problematic computer gaming	2553	Students age 12-25	Germany	Self-report severity measures for all disorders.	Problematic gambling was positively associated with problematic computer gaming, but less so than problem substance use.	Although disordered gambling may be associated with both problem gaming and substance use, disordered gamblers appear to be more similar to substance users than problematic computer gamers.
Wong, P. W. C., Chan, W. S. C., Conwell, Y., Conner, K. R., & Yip, P. S. F. (2010).	Major depression and suicide.	17	Cases of individuals who completed suicide with evidence of disordered gambling prior to death.	Hong Kong	Interviews with proxy respondents.	83% of the suicide cases had other associated psychiatric disorders in addition to problem gambling, most often major depression and substance use.	A high proportion of suicide cases with disordered gambling also experience other psychiatric illness. Clinicians treating depression should explore the presence of problem gambling behavior and unmanageable debt.

Table 6 – Randomized Controlled Trials

Article	Co-morbid Disorders	Sample Size	Population	Outcome Constructs	Intervention	Control	Length of Follow up	Results	Conclusions
Black, D. W., Arndt, S., Coryell, W. H., Argo, T., Forbush, K. T., Shaw, M. C., . . . Allen, J. (2007).	ADHD, depression	39	Community-recruited disordered gamblers and healthy controls	DSM-IV criteria for gambling; self-report severity measures for all other disorders	12 weeks of bupropion	Placebo pill	12 weeks	Although there were general decreases across all symptoms, there were no statistically significant differences between groups on any co-morbidity measures.	Evidence does not support the use of bupropion to treat co-morbid conditions in disordered gamblers.
Dowling, N. (2009).	Alcohol/substance use, depression, anxiety	77	Female disordered gamblers	Self-report measures of severity for all disorders	12 weeks of group or individual CBT	12 weeks waiting list	6 months	There were no significant differences between treatment groups that achieved abstinence/controlled gambling and uncontrolled gambling on any of the co-morbid disorder measures.	Co-morbidity may not differentially affect individuals who are abstinent from gambling versus those who continue to gambling uncontrollably.
Echeburúa, E., Gómez, M., & Freixa, M. (2011).	Schizophrenia	44	Disordered gamblers with schizophrenia	DSM-IV criteria for all disorders; abstinence or controlled gambling at follow-up	20 sessions of CBT + standard psychopharmacological treatment	Psychopharmacology standard treatment	12 months	74% of the CBT group compared to only 19% of the control group gave up gambling at 3 months follow-up. Improvement in the experimental group weakened at 6 and 12 months follow-up.	Findings support the beneficial effects of CBT as adjunctive therapy for patients with dual diagnoses of schizophrenia and disordered gambling.
Grant, J. E., Donahue, C. B., Odlaug, B. L., & Kim, S. W. (2011).	Anxiety, depression	68	Disordered gamblers	Self-report measures of severity for all disorders	Imaginal desensitization plus motivational interviewing	8 weeks	Levels of anxiety and depression reduced over the course of treatment for both groups and there were no significant differences	A variety of treatments may be effective at reducing both disordered gambling and co-	

								between the groups at post treatment. At 6 months follow-up, psychiatric comorbidity did not predict abstinence from gambling.	morbidity symptoms. Comorbidity may not have an impact on disordered gambling recovery in the long term.
Grant, J. E., Kim, S. W., Hollander, E., & Potenza, M. N. (2008).	Depression, anxiety	284	Disordered gamblers	DSM-IV criteria for all disorders	16 weeks of nalmefene or 18 weeks of naltrexone	Placebo pill	18 weeks	Co-occurring disorders were not associated with treatment response. No comorbidity variable significantly changed.	Evidence from this study does not support the use of nalmefene and naltrexone in the treatment of disordered gambling comorbidity.
Grant, J. E., Odlaug, B. L., Chamberlain, S. R., Potenza, M. N., Schreiber, L. R., Donahue, C. B., & Kim, S. W. (2014).	Nicotine use disorder	28	Disordered gamblers with nicotine use disorder	Self-report measures of severity for gambling and nicotine use disorders	12 weeks of N-acetylcysteine	Placebo pill	3 months	N-acetylcysteine significantly reduced nicotine problems compared to the placebo in the first six weeks of treatment, but the effect did not persist. There was no effect on gambling severity during treatment, but during 3 months follow-up, there was a significant effect on gambling severity.	N-acetylcysteine treatment during therapy facilitates long-term application of behavioral therapy once patients are in the community after therapy has been completed.
Hollander, E., Buchsbaum, M. S., Haznedar, M., Berenguer, J., Berlin, H. A., Chaplin, W. . . Pallanti, S. (2008).	Bipolar II and cyclothymia	16	Patients with disordered gambling and a comorbid diagnosis of bipolar II or cyclothymia	Relative glucose metabolic rates (rGMR)	N/A	32 age- and sex-matched patients from another psychopharmacological project studying effect of normal aging on memory	10 weeks	Patients with disordered gambling showed increased baseline rGMR rates in the orbitofrontal cortex and medial frontal cortex. Lithium further increased these rates, heightening group differences, but also increased rates in posterior cingulate and	Lithium and selective serotonin reuptake inhibitors show similar alleviation of symptoms, but lithium further increases rGMRs in the prefrontal cortex, whereas SSRIs normalize the rates. Further

								the dorsolateral frontal cortex.	studies of the limbic system will be important to understand the pathophysiology of disordered gambling in relationship to both bipolar and obsessive-compulsive spectrum disorders.
Hollander, E., Pallanti, S., Allen, A., Sood, E., & Rossi, N. B. (2005).	Bipolar spectrum disorders	40	Disordered gamblers with bipolar disorder	Self-report measures of severity for problem gambling, depression, impulsivity, and affective stability	10 weeks of sustained-release lithium carbonate	Placebo pill	10 weeks	Compared to placebo, the intervention group significantly improved with regard to problem gambling severity, affective stability, and gambling thoughts/urges. Improvement in gambling severity was correlated with improvement in mania ratings.	Sustained-release lithium may be an effective treatment in reducing both gambling and affective instability in disordered gamblers with bipolar spectrum disorders.
Korman, L., Collins, J., Littman-Sharp, N., Skinner, W., McMain, S., & Mercado, V. (2008).	Anger, alcohol/substance use	42	Disordered gamblers with comorbid anger and substance use	Self-report measures of severity for all disorders	14 week integrated treatment targeting anger and addictions	14 week specialized treatment as usual for gambling and substance use	12 weeks post treatment	Participants in the intervention group reported significantly less gambling, less trait anger and substance use at follow-up than the control group.	Findings suggest that addressing anger, gambling and substance use problems in an integrated way may optimize treatment outcomes compared to treatment as usual.
Ledgerwood, D. M., Ledgerwood, D. M., and	Pathways model	229	Treatment-seeking pathological gamblers	Self-report measures of severity for all disorders.	Secondary analyses of cognitive behavioral therapy trial	None	12 Months	Compared with behaviorally conditioned (BC) gamblers, emotionally vulnerable (EV) gamblers had	The three Pathways subtypes differ on some baseline characteristics, but subtyping did not

Petry, N. M. (2010).								higherpsychiatric and gambling severity, and were more likely to have a parent with a psychiatric history. Antisocial impulsive (AI) gamblers also had elevated gambling and psychiatric severity relative to BC gamblers. They were more likely to have antisocial personality disorder and had the highest legal and family/social severity scores. They were also most likely to have a history of substance abuse treatment, history of inpatient psychiatric treatment, and a parent with a substance use or gambling problem. AI and EV gamblers experienced greater gambling severity throughout treatment than BC gamblers, but all three subtypes demonstrated similar patterns of treatment response.	predict treatment outcomes beyond a simple association with problem gambling severity.
Milton, S., Crino, R., Hunt, C., & Prosser, E. (2002).	Depression, anxiety, alcohol/substance use	40	Disordered gamblers	DSM-IV criteria for disordered gambling; self-report severity measures for all other disorders	8 sessions of CBT + elements of compliance intervention	8 sessions of CBT	9 months	Levels of problem gambling and co-morbid symptoms reduced at 9 months follow-up. There were no differences between the groups on these variables. Co-morbid problem drinking, drug use, and problem gambling duration	CBT may be an effective treatment for managing both disordered gambling symptoms and co-morbid symptoms. Substance and alcohol use may contribute to treatment

								predicted poor compliance. Poor outcome with regard to gambling was predicted by comorbid problem drinking.	compliance and success.
Pallanti, S., Quercioli, L., Sood, E., & Hollander, E. (2002).	Substance use disorder	42	Disordered gamblers	Self-report measures of severity for all disorders	14 weeks of lithium	14 weeks of valproate	14 weeks	There were no significant differences between the groups nor a significant decrease in depression scores over the course of treatment.	Results do not support the use of lithium or valproate in the treatment of disordered gamblers with comorbid mood disorders.
Toneatto, T., Brands, B., & Selby, P. (2006).	Alcohol use disorder	52	Treatment-seeking pathological gamblers with alcohol use disorder	DSM-IV criteria for gambling and alcohol use disorders; time-line follow back for frequency and quantity of gambling and drinking	11 weeks of combined naltrexone + CBT	11 weeks of placebo + CBT	1 year	No significant group differences were found on any alcohol or gambling outcome measures at post-treatment or follow-up. However, all participants reduced their drinking and gambling significantly over one year, suggesting that treatment in general did have an effect on both disorders.	Results do not support the use of naltrexone to treat concurrent alcohol use and gambling disorders.
Wong, D. F., Chung, C. L., Wu, J., Tang, J., Lau, P., & Wan, J. P. (2015).	Depression	38	Treatment-seeking pathological gamblers	SOGS for gambling, DASS for depression	10 sessions of group CBT + individual counselling	10 sessions of individual counselling	10 weeks	Gambling severity was associated with a significant reduction in depressive symptoms post-treatment across both groups, but there were no group differences between co-	Random confounding (e.g., baseline differences) may have influenced the trial thus obscuring differences

morbid disorder
outcomes.

between groups at
post-treatment.

Table 7 – Uncontrolled Interventions

Authors	Co-morbid Disorders	Sample Size	Population	Outcome Constructs	Intervention	Length of Follow up	Results	Conclusions
Blaszczynski, A., McConaghy, N., & Frankova, A. (1991a).	Anxiety, depression	63	Disordered gamblers	Self-report measures of severity for all disorders	1 week behavioural intervention	5 years retrospective	All participants regardless of abstinence, controlled gambling, or uncontrolled gambling experienced a reduction in anxiety and depression. There were no differences between the groups on measures of co-morbidity.	Abstinence is not the only possible therapeutic outcome of behavioral intervention for disordered gambling. All outcomes of CBT appear to be associated with reduction of co-morbid symptoms.
Blaszczynski, A., McConaghy, N., & Frankova, A. (1991b).	Anxiety, depression	63	Disordered gamblers	Self-report measures of severity for all disorders	1 week behavioural intervention	5 years retrospective	There were no significant differences between completely abstinent and intermittently relapsing disordered gamblers on measures of anxiety or depression.	Complete abstinence may be too stringent of a criterion for treatment; possibility of brief episodes of relapse may not significantly impact co-morbidity outcomes.
Breen, R. B., Kruedelbach, N. G., & Walker, H. I. (2001).	Depression	66	Inpatient disordered gamblers	Self-report severity measures of gambling cognitions and depressive symptoms	28 days of group and individual CBT	28 days	Depressive scores were the only pre-treatment variable to significantly contribute to change in cognitions post-treatment.	Depressive symptoms may contribute to irrational beliefs about gambling in disordered gamblers.
Carlbring, P., Degerman, N., Jonsson, J., & Andersson, G. (2012)	Anxiety, depression	284	Disordered gamblers	Self-report severity measures for all disorders	8 weeks of internet-based cognitive behavioural therapy	36 months	The treatment resulted in significant reductions in disordered gambling symptoms, anxiety and depression, sustained at full length follow-up.	Internet-based CBT for disordered gamblers with depression or anxiety can be effective.
Grant, J. E., & Potenza, M. N. (2006).	Anxiety disorders	13	Disordered gamblers with co-occurring anxiety	Self-report measures of severity for all disorders	Open-label trial of escitalopram	12 weeks	All measures of anxiety, problem gambling and quality of life improved over the course of treatment.	Open-label escitalopram may be an effective treatment for disordered gamblers with co-morbid anxiety.

Grant, J. E., Chamberlain, S. R., Odlaug, B. L., Potenza, M. N., & Kim, S. W. (2010).	Anxiety, depression	29	Disordered gamblers	Self-report measures of severity for all disorders	12-week open label trial of memantine	12 weeks	Anxiety and depression scores significantly decreased for the group over the course of treatment.	Pharmacological manipulation of the glutamate system may help both gambling and co-morbid disorders in disordered gamblers.
Grant, J. E., Kim, S. W., & Odlaug, B. L. (2007).	Anxiety, depression	27	Disordered gamblers	Self-report measures of severity for all disorders	Open label trial of n-acetyl cysteine (NAC)	8 weeks	None of the co-morbidity symptoms improved significantly over the course of the trial.	Evidence does not support the use of NAC for treatment of co-morbidity symptoms in disordered gamblers.
Guo, S., Manning, V., Thane, K. K., Ng, A., Abdin, E., & Wong, K. E. (2014).	Anxiety, depression	80	Disordered gamblers	Self-report severity measure for all disorders	Disordered gambling outpatients	1 year	Levels of depression and gambling severity went down at each follow-up and remained significantly lower at 12 months follow-up. However, levels of co-morbid symptoms did not predict reduction in gambling severity at follow-up.	Although treatment as usual at an outpatient clinic may have an impact on both gambling and co-morbid disorder pathology, co-morbidity symptoms may not predict gambling symptom response to treatment.
Hall, G. W., Carriero, N. J., Takushi, R. Y., Montoya, I. D., Preston, K. L., & Gorelick, D. A. (2000).	Cocaine dependence	313	Cocaine dependent outpatients	Attendance, drug-free urines	Various drug trials for cocaine dependence	12 Weeks	Pathological gamblers had a life-time occurrence rate of 8.0% and a current (past month) occurrence of 3.8%. Onset preceded the onset of cocaine dependence in 72.0% of the patients (and pre-ceded onset of opiate dependence in 44.4%). Patients with pathological gambling (lifetime or current) did not differ significantly from other patients in length of treatment or proportion of cocaine-positive urine samples. Those with lifetime pathological gambling were significantly more likely to have tobacco dependence (84.0% versus 61.1%) and antisocial personality disorder (56.0% versus 19.8%), to be unemployed (84.0% versus 49.3%), to have recently engaged in illegal activity for profit (64.0% versus 38.5%), and to have been incarcerated (62.5% versus 33.9%).	Pathological gambling is substantially more prevalent among cocaine-dependent outpatients than in the general population. Patients with pathological gambling differ from other cocaine-dependent outpatients in some sociodemographic characteristics, but not in short-term outcome of treatment for cocaine dependence.

Jimenez-Murcia, S., Alvarez-Moya, E. M., Granero, R., Aymami, M. N., Gomez-Pena, M., Jaurrieta, N., . . . Vallejo, J. (2007).	Variety of Axis I and Axis II disorders	290	Disordered gamblers	DSM-IV criteria for disordered gambling; self-report severity measures for all other disorders	16 weekly sessions of group CBT	6 months	Levels of all co-morbid disorder symptoms as well as gambling symptom severity decreased following treatment. However, only symptoms of OCD were predictive of relapse or treatment dropout for gambling disorder.	CBT may be an effective intervention to target both disordered gambling and co-morbid disorders. OCD may be a unique contributor to relapse or dropout in treatment.
Kim, H. S., Hodgins, D. C., Bellringer, M., & Abbott, M. (2016).	Alcohol use disorder, depression	150	Gambling helpline callers		Referral to treatment plus support	12 Months	Although women had greater problem gambling severity and psychiatric distress compared with men, rates of depression, alcohol problems and smoking did not differ. Men and women has similar gambling and psychosocial outcomes, role of comorbidity not examined specifically	Results suggest that after calling the helpline, women reduced their problematic gambling and improved psychosocial functioning without further treatment.
Ladouceur, R., Lachance, S., & Fournier, P.M. (2009).	Depression, anxiety	89	Disordered gamblers	DSM-IV criteria for disordered gambling; self-report severity measures for all other disorders	12 weekly CBT sessions	12 months	Levels of anxiety and depression significantly decreased post-treatment and were maintained at 12 months follow-up. Lower levels of anxiety and depression were also predictive of gamblers who no longer met DSM-IV criteria for disordered gambling at 12 months.	CBT may be an effective intervention at reducing both disordered gambling and co-morbid disorder symptoms. Anxiety and depression may contribute to treatment success for disordered gamblers.
Moghaddam, J., Campos, M., Myo, C., Reid, R., Fong, T., Moghaddam, J. F. . . . Fong, T. W. (2015).	Depression	44	Inpatient gambling treatment		Multimodal but mainly Cognitive Behavioral Therapy	8 Weeks	At baseline, 16 non-depressed, 19-mild to moderate depression and 9 severe. Latter two groups showed significant decline in depression over the 8 week treatment	The course of depression in Gambling Disorder treatment requires further study.
Morefield, K., Walker, C., Smith, D., Harvey, P., Dunn, K., & Battersby, M. (2014).	Variety of Axis I disorders, including mood, substance	53	Treatment-seeking PGs	Suicidal ideation, depression, and non-specific psychological distress, functional	Inpatient treatment of 6-12 sessions of CBT over two weeks + exposure therapy for	12 months	Both gambling symptom severity and psychological distress, including depression significantly decreased over 12 months follow-up.	Intensive inpatient gambling treatment described in the study offers a useful treatment option for participants with gambling and complex co-morbid disorders.

	use and psychosis			impairment, problem gambling severity	gambling urges			
Pelletier, O., Ladouceur, R., & Rheume, J. (2008).	Axis 2 disorders		Outpatient Cognitive Behavioral Therapy Problem Gamblers	Treatment dropout	Cognitive Behavioral Therapy	N/A	Sixty-four per cent had at least one comorbid personality disorder. The most common personality disorders were represented in clusters B and C. The presence of a comorbid cluster B was a significant predictor of treatment dropout.	Since dropouts create negative consequences, it is essential to assess problems on axis I and II at the beginning of treatment and to develop new treatment strategies to manage complications associated with personality disorders and reduce the number of treatment dropouts among pathological gamblers seeking treatment. Such interventions will have to be empirically tested and implemented.
Smith, D. P., Battersby, M. W., Harvey, P. W., Pols, R. G., Baigent, M. F., & Oakes, J. E. (2011).	Alcohol use disorder, anxiety, depression	127	Disordered gamblers	Self-report measures of severity for all disorders	Weekly CBT individual sessions	12 weeks	Although alcohol use and anxiety did not appear to be contributing to gambling severity at follow up, participants with higher depression levels had a greater likelihood of problem gambling during treatment and at follow-up.	Addressing depression together with problem gambling may improve treatment outcomes in disordered gamblers.
Toneatto, T., Skinner, W., & Dragonetti, R. (2002).	Substance use disorder	169	Disordered gamblers	DSM-IV criteria for disordered gambling; one item self-report for lifetime and past month substance use	One of four conditions across multiple geographic sites: group CBT, individual MI, 12-step therapy, and individual solution-focused therapy	12 months	Drug use decreased for all groups over the course of treatment. However, substance or medication use was not related to problem gambling severity at posttreatment or follow-up.	Regardless of treatment modality, problematic substance use may not be related to long-term success in treatment for disordered gambling.

Zimmerman, M., Breen, R. B., & Posternak, M. A. (2002).	Depression	15	Disordered gamblers	Self-report measures of severity for all disorders	Open-label trial of citalopram	12 weeks	All participants reported a significant improvement on measures of gambling severity and depressive symptoms, as well as overall quality of life.	Citalopram appears to be an effective treatment for disordered gambling and may benefit as an adjunct antidepressant for gamblers with symptoms of depression.
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Table 8 – Case Studies

Author	Co-morbid Disorder	Participant Characteristics	Design	Outcome Constructs	Intervention	Control	Results	Conclusion
Ballon, B. (2006).		28 yr old Asian male with history of disordered gambling and major depression who is initially treated with anti-depressants and told that gambling symptoms will resolve on their own.	N/A	N/A	N/A	None	Authors review the presenting case, but develop discussion into a review of possible pathways toward treatment, depending on whether the assumptions are that major depressive disorder (MDD) preceded gambling or gambling preceded MDD. Cognitive behavioral therapy is recommended to treat both conditions concurrently regardless of order of onset.	Concurrent disorders require concurrent treatment. Clinicians need to be aware of the presentation and manifestation of pathological gambling and mood disorders to provide proper assessment and treatment plans.
Chaim, C. H., Nazar, B. P., Hollander, E., & Lessa, J. L. (2014)	Bipolar Disorder	42 year old male with 20 year history of disordered gambling and bipolar treated with, lithium, fluoxetine and clonazepam over 18 months; abstinent from drugs and alcohol	7 follow ups over 18 months following medication start	Mood symptoms and disordered gambling symptoms	Lithium	None	Mood substantially improved along with gambling symptoms over 18 months	Assessment of temperament and comorbidities in disordered gambling may guide better treatment choices. Lithium may be an efficacious treatment for patients with disordered gambling and comorbid bipolar spectrum conditions
de Lisle, S. M., Dowling, N. A., & Allen, J. (2011).	Generalized anxiety disorder and major	61 year old female with history of disordered gambling, generalized anxiety and dysphoric affect	8 weekly Mindfulness based cognitive therapy (MBCT) sessions followed by 10-week	Gambling frequency, duration and expenditure; self-report symptom	Mindfulness-based cognitive therapy for disordered gambling	None	Intervention significantly improved both gambling symptoms and anxiety/depression symptoms; at 10 weeks,	Disordered gamblers with comorbid disorders may benefit from MBCT for disordered gambling. However, benefits may only be sustainable if

	depressive disorder		follow-up period to assess symptoms	checklists for other disorders			participant was abstinent and had subclinical levels of anxiety and depression	commitment to daily practice is sustained.
el-Guebaly, N. (2005).	Generalized anxiety disorder and alcohol use disorder	39 year old male with history of disordered gambling on VLTs, anxiety and alcohol use referred by his family physician for treatment after accruing a debt of \$50,000	Combination of prescribed treatments with regiment changes following relapses	N/A; general functioning described following treatment	Antidepressant medication treatment + 10 weekly CBT sessions; following relapse, a residential program which included both AA and GA groups + couple therapy	None	Client was back to work for the last 6 months and reports functioning well	A cumulative series of interventions was required to address all co-morbidities. Authors advocate for the importance of outcome monitoring of "real world" patients in non-randomized designs as useful clinical designs for understanding complex co-morbid cases of disordered gambling.
Grall-Bronnec, M., Sauvaget, A., Boutin, C., Bulteau, S., Jimenez-Murcia, S., Fernandez-Aranda, F. . . . Caillon, J. (2015).	DSM-IV axis 1 disorders	8 cases of men seeking treatment for excessive trading	Identified in larger cohort (JRU cohort)	N/A	N/A	None	Three quarters of the patients reported suffering from a major depression, current or past, more than a third reported another addiction and a quarter, an anxiety disorder.	Article concludes that excessive traders show profiles similar to gambling disorder.
Hollander, E., & Dell'Osso, B. (2006).	Cyclothymic disorder, alcohol and nicotine use disorder	30 year old female bank teller presenting for treatment complaining of feeling anxious, depressed and guilty after having been arrested for shoplifting in attempt	10 week treatment with lithium as part of a blind treatment study assessing effectiveness of lithium versus placebo for disordered gambling and bipolar spectrum disorders	Thoughts and urges to gambling, gambling frequency, affective instability and depressive symptomatology	10 weeks of lithium	None	Substantial reduction in thoughts and urges to gamble, increased capacity to delay or inhibit acting on gambling impulses, reduction in impulsive gambling and improvement in mood stability.	Although lithium was an effective agent for treating this particular patient, disordered gamblers with co-morbidities may benefit from combined treatment with psychosocial interventions. Any treatment should be oriented to several factors for modification

		to settle gambling debt.						including conditioned stimuli for gambling, cognitive distortions and negative internal states.
Miura, J., Kikuchi, A., Fujii, A., Tateishi, T., & Kaneko, S. (2009).	Major depression	36 year old Japanese male presenting with third episode of depression. Symptoms responded minimally to fluvoxamine.	Combination of medication with dose adjustment based on symptoms.	DSM-IV criteria for disordered gambling; self-reported mood symptoms	200 mg fluvoxamine + 2 mg cabergoline to treat depression.	None	Remission of depressive symptoms followed by onset of problem gambling symptoms after increase in cabergoline. Gambling symptoms did not go away until one week after discontinuation of cabergoline.	Clinicians should be aware of the potential for disordered gambling when prescribing cabergoline for patients with depressive symptoms.
Nicolato, R., Romano-Silva, M. A., Correa, H., Salgado, J. V., & Teixeira, A. (2007).	Bipolar Disorder	57 year old female with 5 year history of problem gambling and two hypomanic episodes	Combination of medication over two months treatment.	Mood symptoms and disordered gambling symptoms	900 mg of lithium + 200 mg of topiramate	None	After 2 months of treatment, gambling behavior stopped. On long term follow-up (unspecified period), patient reportedly remained asymptomatic.	Topiramate may be considered an add-on therapy for cases of comorbid bipolar disorder and gambling disorder where lithium is only partially effective.
O'Dwyer, A. M., & Sheppard, N. P. (1993).	Major depression	40 year old married female with two year hx of depression	Unspecified length of treatment + 6 months follow up	DSM-III-R criteria for major depressive disorder and pathological gambling	Combination of tricyclic anti-depressant, supportive psychotherapy and marital counselling.	None	Recovery from depression was associated with remission of gambling symptoms. At 6 months follow-up, symptoms did not recur.	Clinicians should be alert to the possible association between major depression and disordered gambling.
Potenza, M. N., & Chambers, R. (2001).	Schizophrenia	31 year old divorced female with diagnosis of schizophrenia, nicotine dependence, and disordered gambling.	Hospitalization for psychotic symptoms with psychopharmacological treatment combined with psychosocial support.	Disordered gambling symptoms	10 mg oral olanzapine at bedtime	None	Patient has not gambled since hospital discharge at the time of the report.	Screening individuals with schizophrenia regarding their gambling behaviours is warranted. It is of interest that both the psychotic and the gambling symptoms appeared to be controlled with the

								serotonin/dopamine antagonist treatment.
Sauvaget, A., Jimenez-Murcia, S., Fernandez-Aranda, F., Fagundo, A. B., Moragas, L., Wolz, I. . . Menchon, J. M. (2015).	Adjustment disorder	83 year old male with no evidence of neurodegenerative disease or cognitive impairment with significant symptoms of disordered gambling.	Ambulatory care on an outpatient basis (weekly + 2 year follow up)	Disordered gambling symptoms	16 weekly outpatient CBT sessions with 2-year follow up.	None	Not reported. Case focused on describing history and relevant considerations for screening and treatment.	Disordered gambling rates may be underestimated among the elderly and may increase among individuals with increased levels of stress, adjustment disorder difficulties, and movement difficulties.
Yoon, G., & Kim, S. W. (2013).	Major depression, alcohol use disorder	58 yr old male with 4-year history of disordered gambling, alcohol dependence in remission, and depression as well as previous unsuccessful attempts at treating gambling problems.	Psychopharmacological treatment with 12 months follow-up.	Gambling symptoms	Intramuscular naltrexone	None	Patient abstained from gambling during the next 12 months as well as abstaining from alcohol and stabilizing depression with citalopram.	Injectable naltrexone may successfully control gambling cravings and comorbid alcohol use problems.

Table 9 – Prospective Studies

Article	Co-morbid Disorder	Sample Size	Population (Age Range)	Number of Follow-Ups	Length of Follow-Up Period	Outcome Constructs	Results	Conclusions
Bruneau, M., Grall-Bronnec, M., Venisse, J. L., Romo, L., Valleur, M., Magalon, D. . . . Hardouin, J. B. (2016).	ADHD	320	Disordered gamblers (18+)	5	1 year	DSM-IV symptoms of disordered gambling and ADHD	Having symptoms consistent with current ADHD was a significant risk factor for remaining a disordered gambler over time	Having current ADHD may encourage the persistence of gambling problems
Bruneau, M., Grall-Bronnec, M., Venisse, J. L., Romo, L., Valleur, M., Magalon, D. . . . Hardouin, J. B. (2016).	Generalized anxiety disorder, depression, alcohol use disorder, ASP, psychotic disorder (all current)	304	Adults	3	2 years	Transitions in and out of Gambling Disorder	Anxiety disorder and ADHD associated with development of Gambling Disorder; ADHD associated with maintenance of Gambling Disorder over 2 years	Anxiety and ADHD may be contributing risk factors to the onset and maintenance of disordered gambling and should be screened for and potentially treated in combination with any existing gambling problems.
Chou, K.-L., & Afifi, T. O. (2011).	NSEARC DSM diagnoses	33,231	US community sample	2	3 years	Current Gambling Disorder as predictor of subsequent mental health disorders three years later.	Past-year disordered gambling at baseline was associated with the subsequent occurrence of any Axis I psychiatric disorder, any mood disorder, bipolar disorder, generalized anxiety disorder, posttraumatic stress disorder, any substance use disorder, alcohol use disorders, and alcohol dependence disorder after adjustment for sociodemographic variables. After simultaneous adjustment for medical conditions, health-related quality of life, and recent stressful life events, disordered gambling remained significantly related to any mood	The clinical implications of these findings are that treatment providers need to screen gambling patients for mood, anxiety, and substance use problems and monitor the possible development of later comorbid conditions.

							disorder, generalized anxiety disorder, posttraumatic stress disorder, alcohol use disorders, and alcohol dependence.	
Chou, K.-L., & Afifi, T. O. (2011).	DSM-IV Disorders	33,321	NSEARC follow-up sample	1	3 years	Incidence of psychiatric disorders over three years in Problem Gamblers versus non-Problem Gamblers	In the final models simultaneously adjusting for sociodemographic variables, the presence of 11 medical conditions, SF-12 physical and mental health component summary scores, and the 12 stressful life events, disordered gambling remained significantly associated with any mood disorder, generalized anxiety disorder, PTSD, alcohol use disorders, and alcohol dependence.	Intervention efforts to manage gambling behavior alone without addressing related affective symptoms, anxiety symptoms, or drinking tendencies may result in limited treatment effectiveness.
Dussault, F., Brendgen, M., Vitaro, F., Carbonneau, R., Boivin, M., & Tremblay, R. (2016).	Depression	878	Males from Kindergarten cohort, assessed at age 14	5	11 years	Course of Problem Gambling as influenced by depressive symptoms, impulsivity and family functioning.	Most young males with high levels of gambling problems follow a joint trajectory of high depressive symptoms. Subsequent logistic regression revealed that impulsivity predicted membership in all pathogenic trajectories, and quality of the relationship with parents predicted membership in depressogenic trajectories. In addition, membership in the comorbid trajectory can be predicted by an interaction between friendship quality and socio-family risk.	These findings support the notion that 'pure' gamblers without comorbid internalizing problems are an exception rather than the rule, at least during the late adolescence-early adulthood period.
Edgerton, J., Melnyk, T., Roberts, L., Edgerton, J. D., Melnyk, T. S., & Roberts, L. W. (2015).	Alcohol use disorder, substance use disorder, major depressive disorder, generalized anxiety disorder	679	18-20 year olds, community	4	5 years	Course of Problem Gambling	The problem gambling treatment outcome literature has, however, generally ignored psychiatric comorbidities, excluded individuals with comorbidities, or employed small samples that preclude the detection of comorbidity subgroup differences in treatment responses.	In the present study, we used time 1 measures of anxiety, depression, and alcohol and drug dependence as time-invariant predictors of level of problem gambling severity and rate of change in severity across repeated measures. However, this does not take into account how change over time in these co-occurring conditions might affect problem gambling, nor how changes in problem gambling may affect these comorbid disorders. Possible

Gomes, K. (2015).	Major depressive disorder	50	Disordered gamblers (18+) seeking treatment	4	4 months	BDI-II for depressive symptoms, PGSI for gambling symptoms	Depressive symptoms measured at beginning of treatment were able to predict gambling severity scores at every follow-up point.	future approaches to addressing these questions could include incorporating co-occurring disorders as time-varying predictors and/or some form of parallel process modelling.
Hodgins, D. C., Peden, N. and Cassidy E. (2005).	ADHD	101	Community recruited Problem Gamblers	3	1 year	Gambling outcomes	Lifetime mood disorders were identified in 61% of participants and 73% and 48% had lifetime alcohol use and drug use disorders, respectively. Current prevalence rates, however, were much lower. Current mood disorders were found for 20% and 7% had a current alcohol disorder and 7% a current drug use disorder. Age of onset for substance use disorders was earlier than gambling disorders but mood disorders were equally likely to predate or follow gambling disorders. Lifetime mood disorder was associated with a longer time to achieve 3 months of stable abstinence. Participants who were currently in treatment or attending Gamblers Anonymous and the small number of participants with current alcohol disorders were also more likely to achieve abstinence earlier.	Results point to a significant role for lifetime mood disorders in outcome from gambling disorders regardless of whether a current mood disorder is present. In contrast, lifetime substance abuse was not associated with outcome. However, the role of current alcohol abuse is less clear, given the unexpected (and possibly unreliable) finding of a more positive outcome for those with a current alcohol use disorder.
Slutske, W. S., Caspi, A., Moffitt, T. E., and Poulton, R. (2005).	Personality variables and substance use	939	A complete birth cohort of non-treatment seeking disordered gamblers.	2	3 (first assessment at 18 years and then 21 years)	Self-report severity measure for gambling; DSM-III criteria	Disordered gambling was significantly associated with alcohol and substance use. The relationship between disordered gambling and substance use was reduced after controlling for individual differences in personality.	From the perspective of personality, disordered gambling has a lot in common with addictive disorders.

for all other
disorders.

Table 10 – Cross-Sectional Studies

Article	Co-morbid Disorder	Sample Size	Population (Age Range)	Outcome Constructs	Results	Conclusions
Abdollahnejad, R., Delfabbro, P., & Denson, L. (2014).	Clustering of DSM Axis 1 and 2	140	Community regular gamblers (73 identified as Problem Gamblers)	Clustering of disorders	Axis I and Axis II psychiatric disorders and personality disturbances were found to be more prevalent amongst pathological gamblers than other gamblers with the strongest differences observed for mood and anxiety-related disorders. Almost two-thirds of pathological gamblers reported both an anxiety and/or mood disorder in conjunction with another type of disorder. These differences between the gambling groups existed even after controlling for gender.	Results highlight the significant challenges facing treatment services in the treatment of Problem Gambling and the extent to which this should be treated as the primary disorder.
Abdollahnejad, R., Delfabbro, P., & Denson, L. (2014).	Alcohol use disorder	140	Regular gamblers	Cognitive distortions	In regression models, two-way interaction between delusion proneness and Pathological Gambling was significant at high levels of alcohol misuse but not at low levels of alcohol misuse.	If pathological gamblers also experience problems associated with alcohol then this may be an additional factor that may increase their vulnerability for developing erroneous beliefs related to gambling.
Abdollahnejad, R., Delfabbro, P., & Denson, L. (2014).	Rates of Axis 1 and 2 disorders in Alcohol use disorder and Problem Gambler and Dual Disorder	140	Community regular gamblers (73 identified as Problem Gamblers)	Alcohol Use Disorder/Pathological Gambler dual diagnosis	Comparisons showed that most psychiatric conditions (and in particular personality disorders) were significantly more prevalent in those with a dual diagnosis, followed by problem gamblers and then by those with neither disorder.	These findings suggest that substance use disorder, in this case Alcohol Use Disorder, may play an important role in explaining why psychiatric disorders are so prevalent in problem gambler populations.
Abouzari, M., Oberg, S., Gruber, A., & Tata, M. (2015).	ADHD	63	Young adults	Reinforcement-driven choice adaptation (IGT)	Problem Gamblers performed worse on decision-making task than controls and medicated ADHD but better than unmedicated ADHD gamblers.	ADHD may exacerbate poor decision making in Problem Gamblers but does not cause it independently.

Andronicos, M., Beauchamp, G., DiMambro, M., Robert, M., Besson, J., & Seguin, M. (2015).	DSM IV Axis 1 and 2	86	Community sample of at risk gamblers	Adversity over the lifespan, including comorbidity	Over the course of their lives, 80% of participants, most of whom had a diagnosis of pathological gambling, had another mental health disorder. Disorders most frequently identified were mood disorders (70%) and alcohol and substance abuse (49%). When comparing men and women, the results indicated that women have significantly more anxiety disorders and co-morbid disorders involving anxiety disorders than men.	Professionals may have more difficulty detecting female gamblers because gambling problems may be masked by other co- morbid disorders.
Andronicos, M., Beauchamp, G., Robert, M., Besson, J., & Seguin, M. (2016).	DSM IV Axis 1 and 2	90	49 male suicide victims with Gambling Disorder, 41 living controls with at risk gambling	Mental health and other adversity over lifetime	Over the life span, suicide victims met more diagnostic criteria for pathological gambling and mood disorders than living gamblers. No difference was found in alcohol and substance misuse or psychotic disorders. No significant results regarding the number of suicide attempts between suicide victims and living gamblers. However, our results highlighted a significant emergence of mental health disorders during the last six months of life among suicide victims compared to the living controls: 94% were diagnosed as pathological gamblers, 65% had mood disorders, and 47% experienced alcohol misuse and/or substance disorders ($p < 0.01$). Only 16% of suicide victims had one mental health disorder and 82% had two mental health disorders. Within this group of co-morbid disorders, 33% of suicide victims presented with mood disorders and alcohol misuse and/or substance abuse.	Results from this study clearly indicated that six months before death, suicide victims had a significantly higher number of mental health disorders, especially co- morbid mental health disorders and anxiety, compared to the living controls. But during this same last six months, we did not observe any increase in life adversity. Authors suggest that the accumulation of mental health disorders can reveal the presence of a suicidal crisis process.
Bagby, R. M., Vachon D. D., Bulmash, E., & Quilty, L. C. (2008).	Personality disorder (PD)	204	Community recruited Pathological Gamblers (PG) and Non-	SCID-II self-report vs interview	Compared to the SCID-II, the SCID- II/PQ produced significantly higher PD prevalence rate estimates and symptom endorsements. Although the pattern of specific PD prevalence and symptom endorsement varied somewhat across the instruments, PGs consistently displayed	What remains unclear is the causal and temporal relationship between borderline PD and pathological gambling. The presumption would be that this personality disturbance, or at least some features

			Pathological Gamblers (NPG)		significantly higher levels of borderline PD than NPGs; this pattern endured even after controlling for Axis I disorders and overlap among Axis II PDs.	associated with it, preceded the onset of pathological gambling.
Barnes, B., & Parwani, S. (1987).	Depression	40	Disordered gamblers (25-50)	Self-report symptoms of depression and gambling	Compared to non-gamblers, disordered gamblers endorsed significantly higher levels of depression and neuroticism.	Comorbidity with depression may suggest that problem gamblers use gambling as a way to cope with depression.
Battersby, M., Tolchard, B., Scurrah, M., & Thomas, L. (2006).	Depression and alcohol use disorder	79	Pathological gamblers in treatment	Suicidal ideation and behaviour	81.4% showed some suicidal ideation and 30.2% reported one or more suicide attempts in the preceding 12 months. Suicidal ideation and behaviours were positively correlated with the gambling severity, the presence of debt attributed to gambling, alcohol dependence and depression. Suicidal ideation/behaviour was not significantly associated with gender and living arrangements, nor a history of receiving treatment for depression during the preceding 12 months.	Counselling services, general practitioners and mental health services should screen for gambling problems when assessing risk after suicide and suicide risk when assessing gambling.
Bischof, A., Meyer, C., Bischof, G., John, U., Wurst, F. M., Thon, N. . . . Rumpf, H.-J. (2015).	Mood disorder, generalized anxiety disorder, substance use and personality disorders.	442	Adult pathological gamblers from a variety of recruitment channels	Suicidal ideation	Suicidal ideation linked with mood and substance use disorder; attempt linked to mood disorder, cluster B disorder.	Early detection and intervention is warranted.
Black, D. W., Coryell, W. C., Crowe, R. R., McCormick, B., Shaw, M., & Allen, M. (2014).	Rates of Axis I and ASP disorders in pathological gamblers, relatives and controls	1263	Community recruited pathological gamblers, relatives, and healthy controls.	SCID DSM-IV	Pathological gambling probands were more likely than control probands to have a co-occurring psychiatric disorder. First-degree relatives of pathological gambling probands met criteria for pathological gambling-related phenotypes significantly more often than control relatives. Pathological gambling relatives had significantly higher rates than control relatives for major depression, bipolar disorder, alcohol use disorders, drug use	Pathological gambling is familial. Mood and substance use disorders may emerge as a consequence of the pathological gambling or as a more complex syndrome. In contrast, antisocial personality disorder, social anxiety disorder, and posttraumatic stress disorder may share a common familial etiology with pathological gambling. The phenotype may extend beyond pathological gambling to include subclinical forms of the disorder.

					disorders, social anxiety disorder, and antisocial personality disorder.	
Black, D., Coryell, W., Crowe, R., Shaw, M., McCormick, B., Allen, J. . . . Crowe, R. R. (2015).	Personality disorder	579	Adults, 18+	Personality disorder diagnosis	Pathological gamblers (PG) with personality disorder (PD) were younger, had earlier age of onset, more likely to be in minority group, and had greater problem severity. OR for PD in probands versus controls, 9.0 (all clusters elevated); OR in relatives of PG versus controls, 3.2; Rates of psychiatric disorder higher in PG versus controls, and in PG with PD versus PG.	Presences of personality disorder seems to be a marker for severity of problem gamblers and other psychiatric disorders.
Blanco, C., García-Anaya, M., Wall, M., de Los Cobos, J. C. P., Swierad, E., Wang, S., & Petry, N. M. (2015).	Tobacco, alcohol, other drug disorder and obesity	43,093	US adults - representative sample	Addiction syndrome	Bivariate analyses indicated that pathological gambling (PG) was significantly and positively associated to nicotine, alcohol and drug dependence, with ORs ranging from 2.82 for drug dependence to 8.17 for nicotine dependence. Factor analyses shows that gambling disorder but not obesity loads on an addiction factor.	Data strongly support the inclusion of pathological gambling in a latent factor with substance use disorders and its consideration as an addictive disorder. By contrast, data are less supportive of the consideration of obesity, as defined by BMI, as an addictive disorder.
Brown, M., Oldenhof, E., Allen, J. S., & Dowling, N. A. (2016).	Personality disorders	168	Treatment seeking disordered gamblers	Self-report symptoms of personality disorders	43% of the sample met criteria for at least one personality disorder. Cluster B disorders, but not A or C, were associated with problem gambling severity. All psychological symptoms, except alcohol and drug use, were higher in those with personality comorbidity than those without.	High rates of comorbid personality disorders in problem gamblers, particularly cluster B, suggest that routine screening for personality disorders in gambling treatment services is warranted.
Challet-Bouju, G., Hardouin, J.-B., Renard, N., Legauffre, C., Valleur, M., Magalon, D. . . . Grall-Bronnec, M. (2015)..	Axis 1 and ASP	600	French gamblers	Clustering used to examine profiles according to preferred gambling activity	Some comorbid variables included- clustered did differ significantly in frequency of various disorders EGM - depression; games with deferred outcome, addictions, less social phobia and panic; roulette- manic, OCD; scratch- panic, eating disorders.	The preference for one particular gambling activity may concern different profiles of gamblers. This study highlights the importance of considering the pair gambler- game rather than one or the other separately, and may provide support for future research on gambling and preventive actions directed toward a particular game.

Chamberlain, S. R., Derbyshire, K., Leppink, E. & Grant, J. E. (2015).	ADHD	126	Non-treatment-seeking young adult PG (18-29)	Clinical and cognitive variables, including alcohol use.	Probable current ADHD was identified in 21.4% of the sample, and was associated with earlier age at onset of gambling behaviors, higher Barratt impulsivity scores (all three subscales), greater caffeine intake, worse response inhibition (Stop-Signal Test), and impaired decision-making (greater proportion of points gambled, Cambridge Gamble Test). Problem gamblers with and without ADHD did not differ on demographic characteristics or the rate of other psychiatric disorders, depression scores, nicotine and alcohol consumption, and body mass index. No significant group differences were found for general response speed, working memory, or executive planning.	ADHD is common in young adults with dysfunctional gambling behaviors and is associated with elevated questionnaire and cognitive based measures of impulsivity, along with heightened caffeine use. Future work should study the causal nature between these factors and the treatment implications of these findings.
Cunningham-Williams, R. M., Cottler, L. B., Compton, W. M., Spitznagel, E. L. & Ben-Abdallah, A. (2000).	Substance use disorder	990	IV drug abusers recruited from treatment or community	Compare Problem Gambling (PG) rates in two samples	Prevalence of PG was 11%, no difference between samples. PGs had higher rates of psychiatric disorders, in particular ASPD and substance use disorders. Age of onset of ADPD was earlier than PG.	Screening of drug abuse samples for PG is warranted.
Fatseas, M., Alexandre, J. M., Vennis, J. L., Romo, L., Valleur, M., Magalon, D. . . . Grall-Bronnec, M. (2016).	ADHD	599	Treatment seeking disordered gamblers	Self-report symptom severity scales for all assessed disorders.	21% of gamblers met criteria for lifetime or current ADHD. ADHD was associated with greater problem gambling severity and more psychiatric comorbidity.	Results support a link between disordered gambling and ADHD, which may necessitate consideration of these disorders together in treatment and prevention.
Fatseas, M., Alexandre, J. M., Vennis, J. L., Romo, L., Valleur, M., Magalon, D. . . . Grall-Bronnec, M. (2016).	ADHD	628	Diverse convenience sample of problem and non-problem gamblers (French JEU cohort)	ADHD	Results from the multivariate analysis showed that ADHD was associated with a higher severity of gambling-related problems and with more psychiatric comorbidity. Among problem gamblers, subjects with history of ADHD were also at higher risk for unemployment,	

					psychiatric comorbidity and specific dysfunctional personality traits.	
Fernández, J., Montalvo & Echeburúa, O. E. (2008).	Personality disorder	150	Disordered gamblers	MCI-II and International Personality Disorders Examination	32% of pathological gamblers and 16% of the general clinical sample (versus 8% of the normative sample) showed at least one personality disorder. The most prevalent ones were the borderline personality disorder (16%), followed by the antisocial, narcissistic, and non-specified personality disorders (8% each).	Personality processes must be integrated to forward our understanding of pathological gambling. This information could be helpful in alerting the clinician to potential obstacles and difficulties early in therapy, thereby guiding treatment decisions based on the patient's personality pattern. Further research is needed to develop tailor-made treatment for this kind of patients.
Giddens, J.L., Stefanovics, E., Pilver, C. E., Desai, R., & Potenza, M. N. (2012).	Generalized anxiety disorder	43093	NESEARC Data	AUDADIS-IV)	This study investigated the relationships between pathological gambling (PG) severity, anxiety disorders (AD), and other psychopathology in a nationally representative sample. Initial hypotheses were largely supported. First, higher prevalence estimates of psychopathologies in the AD group as compared to the non-AD group were observed for most Axes I and II disorders. Second, although respondents with ADs typically demonstrated higher prevalence estimates for psychiatric disorders, significant gambling-by-anxiety suggested a weaker relationship between PG severity and psychopathology in the group with ADs, as compared to the group without ADs. Third, amongst the Axis I disorders showing significant gambling-by-anxiety group interactions, the majority were mood disorders, although nicotine dependence and multiple Axis II disorders were also implicated. These findings suggest that ADs may be accounting for some of the variance in the relationships between PG severity and psychiatric disorders, and specifically for internalizing disorders,	Half of all lifetime psychiatric disorders were current, strongly suggesting that psychiatric disorders need to be addressed in gambling treatment."

					tobacco smoking and multiple personality disorders.	
Grall-Bronnec, M., Wainstein, L., Augy, J., Bouju, G., Feuillet, F., Venisse, J.-L., & Sebillé-Rivain, V. (2011).	ADHD	84	Treatment seeking disordered gamblers	Self-report severity measures for all assessed disorders.	25% of the sample reported a history of ADHD. Those with both problem gambling and ADHD endorsed more severe gambling problems, more frequent comorbidity, greater gambling-related cognitions and higher risk of suicide.	The association between disordered gambling and ADHD is frequent and worsens prognosis compared to gambling alone.
Hagen, B., Kalishuk, R. G., Currie, C., Solowoniuk, J., & Nixon, G. (2013).	Trauma	34	Aboriginal women meeting criteria for moderate risk problem gambling	Self-report of qualitative experience	Participants all endorsed experience social trauma and using gambling to cope with those experience. Gambling was described as a coping strategy that helped "block out the past" and deal with negative mood.	Aboriginal women with gambling problems may need support to heal from social trauma.
Haw, J., Holdsworth, L., & Nisbet, S. (2012).	Co-morbidity	24	Mental health experts	Co-morbidity rates, temporal sequencing	There was general agreement that the most commonly occurring disorders were depression, anxiety disorders, substance disorders (nicotine dependence, alcohol and other drug abuse/dependence) and personality disorders. While some participants gave definite opinions as to the temporal sequencing of disorders, the overall consensus was that it was largely dependent upon the individual.	These results concur with other findings in the literature and also the Blaszczynski and Nower (2002) pathways model of problem gambling.
Hendriks, V. M., Meerkerk, G. J., Van Oers, H. A., & Garretsen, H. F. (1997).	Alcohol, tobacco, and marijuana use disorders	4497	Dutch scratch tickets players. (ages 14-83)	Self-report measures of severity for all disorders	Excessive drinking more prevalent in at risk versus recreational instant lottery players. No difference in tobacco use; at risk more likely to have used cannabis.	This study indicates that there are several background factors that enhance the likelihood of at-risk playing in the instant lottery, including alcohol use.
Holdsworth, L., Nuske, E., & Breen, H. (2013).	Substance use disorder	20	Recreational and disordered female gamblers	Responses to qualitative interview questions	Compared to women who were recreational gamblers, problem gamblers endorsed a range of comorbid issues and various complex needs associated with problem gambling such as relationship breakdown work issues and crime.	Comorbidity creates a range of complex issues for female disordered gamblers.

Holdsworth, L., Nuske, E., & Hing, N. (2015).	Mental health disorders	40	Volunteer community members (29-72)	Etiological model	Qualitative interviews on social support, comorbidity, and life events as influencing gambling; Participants in both groups discussed experiencing various mental health problems, both diagnosed and self-reported (19 problem gamblers, 8 recreational gamblers). Nine problem gambling participants described multiple co-morbidities, and many made connections between episodes of mental illness and increased gambling activity. Participants in the problem gambling group tended to recall early exposure to gambling, then encountered peer pressure to gamble, and later tended to increase their gambling in times of adversity, thus adopting avoidance focused ways of coping. While participants with gambling problems tended to increase their gambling when experiencing adverse events, those who gambled recreationally did not. The ameliorating factors emerged as personal resilience and social support networks, which both appeared to be major protective factors.	The findings of this study emphasise the importance of having strong external social support and internal resilience when faced with adverse life events and mental health issues to enhance the likelihood of positive outcomes from adversity.
Hounslow, V., Smith, D., Battersby, M., & Morefield, K. (2011).	Depression	127	Treatment seeking disordered gamblers	Self-report measures of severity.	Depression was a significant predictor of problem gambling severity. High levels of anxiety and stress were also found.	Depression and anxiety need to be considered as part of treatment planning and assessment for disordered gamblers.
Jamieson, J., Mazmanian, D., Penney, A., Black, N., & Nguyen, A. (2011).	Alcohol and substance use disorder	2596	Addiction clients with comorbid gambling	Self-report severity measures for all assessed disorders.	Participants with both substance use and secondary disordered gambling had different patterns of recent mental health diagnoses and problematic substance use compared to those who had a primary gambling problem. These clients were similar to substance use only clients.	Individuals with comorbid substance use and problem gambling appear to be closer with regard to clinical characteristics to primary substance abusers rather than disordered gamblers.

Korman, L. M., Collins, J., Dutton, D., Dhayanathan, B., Littman-Sharp, N., & Skinner, W. (2008).	Substance use disorder and intimate partner violence	248	Community recruited problem gamblers.	Intimate partner violence and anger	Intimate partner violence was higher among problem gamblers with comorbid substance abuse.	Recent research suggests that gambling and substance use outcomes are significantly better when comorbid anger problems are addressed in treatment.
Kwak, H., Zinkhan, G. M., & Roushanzamir, E. P. (2004).	Substance use and compulsive buying	443	Undergraduate students	Self-report severity measures for all assessed disorders.	Patterns of comorbidity between problem gambling, compulsive buying and substance use appeared to be similar in both the USA and South Korea.	Coexistence of problem gambling and other compulsive disorders is a cross-cultural phenomenon.
Ledgerwood, D. M., & Petry, N. M. (2006).	PTSD	149	Treatment seeking disordered gamblers	Self-report severity measures for all assessed disorders.	34% of participants reported a high occurrence of PTSD symptoms. Those with higher scores on PTSD measures tended to have greater impairment and symptom severity in both gambling and other psychiatric problems.	There appears to be an association between PTSD and disordered gambling that warrants further research.
Lee, K. M., Guo, S., Manning, V., Thane, K., & Wong, K. E. (2011).	Alcohol use disorder	300	Two cohorts of treatment seeking disordered gamblers	DSM-IV criteria	Compared to the beginning of the decade, the cohort at the end of the decade endorsed the same comorbidities except alcohol use disorders, which increased three-fold.	In Singapore, alcohol use disorders should be routinely screened for in disordered gamblers.
Maniaci, G., Picone, F., Dimarco, T., Lipari, A., Brancato, A., & Cannizzaro, C. (2015).	Personality and clinical disorders (DSM)	70		MCCI-III	Pathological gamblers displayed significantly higher scores for Axis I disorders, such as anxiety, somatoform symptoms, bipolar disease, dysthymia and major depression, with respect to controls; moreover, they showed higher levels of Axis II personality disorders like depressive, antisocial, sadistic, negativistic, self-defeating, borderline and paranoid disorders. Alexithymia was associated with gambling disorder after controlling for comorbid disorders	The alexithymia construct stands out as an important and independent predictor of gambling behaviour, thus orienting the therapeutic strategy also towards the treatment of this clinical feature.
Mansueto, G., Pennelli, M., De Palo, V., Monacis, L., Sinatra, M., &	Variety of Axis I disorders	127	Treatment seeking disordered gamblers	Self-report measures of severity.	Compared to the general population controls, disordered gamblers endorsed higher levels of comorbid symptomatology across a range of Axis I disorders. This symptomatology was	Disordered gamblers should be routinely screened for other psychiatric disorders.

De Caro, M. F. (2016)					significantly correlated with problem gambling severity. Mediation analyses showed that dysfunctional metacognitive strategies may be mediated by comorbid disorders with regard to disordered gambling.	
Martinez-Pina, A., de Parga, J. L., Vallverdu, R. F., Planas, X. S., Mateo, M. M., & Aguado, V. M. (1991).	Alcohol use disorder	172	Treatment seeking disordered gamblers compared to controls	Self-report measures of severity	A significantly greater amount of disordered gamblers endorsed at least one comorbid disorder. Disordered gambling correlated with alcohol use disorder.	Disordered gambling may be associated with alcohol use disorder and should be assessed for routinely in this population.
Mathias, A. C. R., Vargens, R. W., Kessler, F. H., & Cruz, M. S. (2009).	Substance use disorder	147	Treatment seeking substance abusers	Self-report severity measures	Compared to substance and alcohol abusers without gambling problems, disordered gamblers had greater severity of problems across all symptom domains, greater impairment, more suicidal ideas, and parents with gambling problems.	Alcohol and substance abusers in treatment need to be routinely screened for disordered gambling.
McCormick, R. A., Russo, A. M., Ramirez, L. E., & Taber, J. I. (1984)..	Major depression and hypomania	50	Disordered gambling outpatients	Clinical interview and assessment	76% of the participants met criteria for major depressive disorder and 38% endorsed hypomanic disorder.	There is an association between mood disorders and disordered gambling.
Odlaug, B. L., Stinchfield, R., Golberstein, E., & Grant, J. E. (2013).	Tobacco use disorder	420	Disordered gamblers	DSM-IV criteria for gambling disorders; self-report measures of severity for other outcomes	Although daily tobacco users began treatment with more severe symptoms of gambling disorder, tobacco use did not significantly affect treatment completion or gambling severity at 6 months follow up.	Although tobacco use may be associated with greater gambling problem severity, results from this study do not support its impact on disordered gambling treatment outcomes.
Patterson, I. J. C., Holland, J., & Middleton, R. (2006).	Depression, anxiety, mood, and substance use	41	Disordered gamblers in inpatient treatment and healthy controls	DSM-IV criteria	94% of the disordered gamblers met criteria for an anxiety disorder, 83% mood disorder, and 22% substance use disorder.	Inpatient disordered gamblers appear to endorse comorbidity the majority of the time, which requires consideration in treatment.
Peles, E., Weinstein, A., Sason, A., Adelson,	OCD	101	Methadone maintenance treatment patients	Stroop task reaction times	Compared to individuals with only disordered gambling, those with both OCD and gambling disorder had longer reaction times. They also endorsed	The generally poorer performance on the task by the comorbidity group indicates an attention deficit in this population. Clinical approaches should take into

M., & Schreiber, S. (2013).					abusing more drugs, being older, and having worse cognitive status.	consideration the increased impairment of comorbidity.
Petry, N. M. (2001).	Substance use	86	Disordered gamblers	Performance on delay discounting task	Disordered gamblers with substance use disorder discounted delayed rewards at higher rates than non-substance-abusing gamblers.	Data provide evidence that increased delayed discounting may be a feature central to disordered gambling, compounded by comorbidity with other addictive disorders.
Pietrzak, R. H., & Petry, N. M. (2005).	Antisocial personality disorder	237	Disordered gamblers seeking treatment	Self-report measures of addiction severity, general psychopathology, and gambling behaviors	17% of the sample met criteria for ASPD. Compared to those without ASPD, gamblers with ASPD had an earlier onset of gambling in life, increased severity of gambling problems, medical and drug problems, and higher levels of anxiety features.	The results underscore the importance of assessing for a wide range of disorders among treatment seeking gamblers, including antisocial personality disorder.
Potenza, M. N., Xian, H., Shah, K., Scherrer, J. F., & Eisen, S. A. (2005).	Major depressive disorder	7869	Vietnam Twin Registry men	Genetic/environmental contribution to comorbidity	High rates of lifetime co-occurrence were observed between pathological gambling (PG) and major depressive disorder (MDD). In individuals with PG as compared with those without PG, the unadjusted OR for MDD was 4.06 (95% CI, 2.68-6.13). 34% of the genetic variance for each disorder also contributed to that for the other. All of the overlap between PG and MDD was accounted for by genetic factors.	The finding that, when controlling for other psychiatric disorders, the OR for MDD in PG is reduced from 4.13 to 1.98 suggests that some of the risk for MDD in individuals with PG is attributable to psychiatric disorders that frequently co-occur with PG. The most significant finding from the present study was the identification of substantial genetic overlap between PG and MDD. Future investigation is needed not only to identify specific genetic factors that PG and MDD have in common, but also to translate these findings into advances in prevention and treatment of the disorders. The identification of specific genes could facilitate the development of improved treatments, such as those targeting specific gene products.
Quilty, L. C., Mehra, P., Toneatto, T., & Bagby, M. (2010).	Depression and bipolar disorders	275	Outpatients with lifetime diagnoses of depression or bipolar disorder	Self-report measures of gambling problems and behavior, as well as impulsivity	Urgency was associated with problem gambling across all disorders. Lack of perseverance was associated with problem gambling only in depression. Reckless action during negative mood was associated with gambling pathology	Impulsivity and affective comorbidity may inform current understanding of disordered gambling as patterns of impulsivity vary by comorbidity type.

					across all disorders. Difficulty remaining focused was associated with gambling pathology only in depression.	
Quilty, L. C., Watson, C., Robinson, J. J., Toneatto, T., & Bagby, R. (2011).	Depression and bipolar disorders	275	Outpatients with lifetime diagnoses of depression or bipolar disorder	Self-report and semi- structured interviews assessing mood stability and gambling symptom severity	Prevalence of comorbidity in the sample ranged from 4% to 11% depending on how conservative the criteria were. Although there was a positive correlation between gambling severity and mood symptoms, any direct association between the comorbid disorders disappeared when analyzed longitudinally.	Results do not support a temporally causal relationship between mood disorders and gambling disorder. The study results underscore the need for prospective designs in advancing the understanding of comorbid etiology.
Redden, S. A., Leppink, E. W., & Grant, J. E. (2015).	Depression	215	Non-treatment- seeking young adult PG (18-29)	Variety of self-reports and tasks assessing gambling severity, general psychopathology, quality of life, impulsivity, and cognition	Participants with both depression and disordered gambling reported higher rates of anxiety, suicidality, alcohol and substance use problems, compulsive buying and a lower quality of life. They also performed worse on cognitive tasks evaluating spatial working memory.	Results suggest that individuals with both gambling problems and depression may differ clinically from those with gambling only and may require additional treatment considerations.
Sacco, P., Cunningham- Williams, R. M., Ostmann, E., & Spitznagel Jr, E. L. (2008).	Personality disorders	153	Adult gamblers	DSM-IV criteria for all disorders.	Individuals who met full criteria for a gambling disorder compared to those who only met partial criteria endorsed greater symptoms of borderline personality disorder. After adjusting for depressive symptoms, this association became nonsignificant.	Results suggest that the relationship between personality pathology, depression and gambling is complex and further research is required to understand it.
Sacco, P., Cunningham- Williams, R. M., Ostmann, E., & Spitznagel Jr, E. L. (2008).	Personality disorder	153	Community gamblers	SCID-II personality disorder diagnosis	Multivariate models that adjusted for socio-demo- graphics and substance abuse pathology, showed increased Borderline Personality Disorder symptoms that were associated with higher odds of pathological gambling disorder (PGD), but not with problem gambling. When current depressive symptoms were included in a multivariate model, associations between Borderline Personality Disorder and PGD were nonsignificant.	Treatment of individuals with personality disorders should include assessment and monitoring of gambling behavior, irrespective of a sub- stance abuse/dependence diagnosis. Given the associations found between personality disorders, depressive symptoms, and gambling, testing of causal models such as the Pathways Model (Blaszczynski & Nower, 2002; Clarke, 2006) is indicated.

Sáez-Abad, C., & Bertolín-Guillén, J. M. (2008).	Personality disorders	100	Disordered gambling outpatients	Self-report for gambling severity; DSM-IV criteria for other disorders.	Compared to non-patient and non-disordered gamblers, disordered gamblers report a higher prevalence of personality disorders, mostly cluster B.	Personality disorders are common among problem gamblers, which may need to be taken into account in assessment and treatment.
Scherrer, J. F., Xian, H., Shah, K. R., Volberg, R., Slutske, W., & Eisen, S. A. (2005).	Variety of Axis I disorders	1669	Male twin registry members	Self-report data on quality of life and comorbid diagnoses.	Disordered gamblers had lower quality of life than problem or non-problem gamblers. This effect persisted on a number of quality of life subscales after controlling for co-morbid disorders such as substance abuse.	Disordered gambling is associated with decreased quality of life above and beyond the effect of comorbidity.
Seguin, M., Robert, M., DiMambro, M., Lesage, A., Reidi, G., Roy, M. . . . Dutrisac, S. (2013).	Variety of Axis I disorders	86	Treatment seeking disordered gamblers	Self-report gambling severity; DSM-IV criteria for all disorders	98% of the sample reported a lifetime diagnosis of at least one other mental disorder; 62% reported at least one disorder comorbidity in the last six months.	A substantial proportion of problem gamblers present with comorbidity, which requires particular dedication toward treatment engagement for this population.
Sellman, J., Adamson, S., Robertson, P., Sullivan, S., & Coverdale, J. (2002).	Alcohol use disorder	124	Alcohol-dependent outpatients	Self-report measures for gambling severity; DSM-IV criteria for all disorders	4% of the sample met full criteria for gambling disorder; 19% met partial criteria. Compared to those with alcohol use disorder only, those with both gambling problems and alcohol problems were more likely to be involved in all modes of gambling. The authors propose a two-arm treatment model, where those with mild gambling problems and alcohol use are treated in the setting to which they are initially referred; those with severe problem gambling should be referred to specialized gambling treatment despite the comorbidity.	Individuals with both alcohol use and gambling disorders may require special treatment considerations depending on the severity of the gambling problem.
Shaffer, H. J., Freed, C. R., & Healea, D. (2002).	Substance use disorder	171	Homeless individuals with substance use disorder seeking treatment	DSM-IV criteria for all disorders.	5% to 13% of the sample met criteria for problem gambling depending on severity cut-offs used. The rates of problem gambling among substance users were higher than the general population but comparable to other psychiatric patients. Individuals with more severe gambling problems endorsed greater periods of homelessness and more severe	The findings should encourage clinicians working with homeless people to screen for gambling problems and related disorders.

					psychopathology and functional impairment.	
Shorey, R. C., Anderson, S., & Stuart, G. L. (2012).	Alcohol use disorder	628	Treatment seeking disordered gamblers	Early maladaptive schema measure	Compared to individuals with only alcohol use disorder, those with both problem gambling and alcohol use disorder endorsed significantly more early maladaptive schemas out of the 18 schemas that were assessed. These included self-sacrifice, unrelenting standards, and punitiveness.	If future research replicates the results, treatment providers may need to target early maladaptive schemas more specifically in individuals with comorbid disordered gambling.
Slutske, W. S., Slutske, W. S., Eisen, S. Xian, H., & True, W. R. (2001).	Antisocial personality disorder	7869	Male twin registry members	Clinical interviews assessing a range of antisocial behaviors	Disordered gambling was significantly associated with antisocial personality disorder, childhood conduct disorder, and adult antisocial behavior. The association with all three disorders was mostly explained by genetic factors.	The antisocial behavior observed in many problem gamblers is partially due to their sharing a common genetic vulnerability and cannot be simply a consequence of the problematic gambling itself.
Soberay, A., Faragher, J., Barbash, M., Brookover, A., & Grimsley, P. (2014).	Mood, anxiety, and PTSD	77	Disordered gamblers seeking treatment	DSM-IV criteria for all disorders and general psychosocial functioning	86% of the sample met criteria for at least one comorbid disorder. Comorbidity was positively correlated with severity of gambling problems and lower psychosocial functioning, but was not related to improvement in treatment and satisfaction with the therapeutic relationship.	Co-occurring disorders play a central role in the clinical presentation of disordered gamblers, but their effects may not necessarily impact improvement in treatment.
Specker, S. M., Carlson, G. A., Christenson, G. A., & Marcotte, M. (1995).	ADHD, impulse control disorders (ICD)	104	Pathological gamblers in treatment	SCID-II, Minnesota Impulse Behaviors Interview	High rates of ICDs (other than gambling) were found in pathological gamblers (Table 2). Thirty-five percent (14/40) met the criteria for an ICD, with 20% (8/40) having one impulse disorder and 15% (6/40) having two. The most frequent ICD was compulsive buying, found in 25% (10/40) of the pathological gamblers, followed by compulsive sexual behaviors in 10% (4/40), intermittent explosive disorder in 7.5% (3/40), kleptomania in 5% (2/40), and compulsive exercising in 2.5% (1/40). Attention deficit disorder was also common, seen in 20% (8/40) of the pathological gamblers with an	ICDs appear to be a diverse diagnostic category. Our research suggests that pathological gambling may be clustered with attention deficit disorder, compulsive buying, and compulsive sexual behaviors. Pathological gambling also shares several characteristics with substance use disorders. Future research on pathological gamblers should focus on primary vs. secondary ICD, comorbidity by gender, and predisposing or protecting factors.

					additional 18% (7140) missing threshold criteria by one item.	
Specker, S. M., Carlson, G. A., Edmonson, K. M., Johnson, P. E., & Marcotte, M. (1996).	DSM Axis 1 and 2	104	Pathological gamblers in treatment	SCID- ! And II	High lifetime rates of Axis I (92%) but not Axis II (25%) psychopathology were found in pathological gamblers as compared to controls. No differences between male and female gamblers were found in rates of affective, substance use or personality disorders. Females had higher rates of anxiety disorders and histories of physical/sexual abuse.	PGs have significant rates of current and lifetime psychopathology. Persons with psychiatric and substance use disorders may be at higher risk to develop a gambling disorder.
Stein, G. N., Pretorius, A., Stein, D. J., & Sinclair, H. (2016).	Suicidality and major depression	92	Disordered gamblers seeking treatment	DSM-IV criteria and clinical assessment of suicide risk	Individuals with comorbidity endorsed greater levels of suicidality than those with disordered gambling only. This effect occurred for those with any lifetime history of psychiatric disorders and was stronger for those with a current diagnosis of major depression.	The results provide additional evidence that treatment of disordered gambling should focus on comorbid psychiatric illnesses, particularly suicidality.
Steinberg, L., Tremblay, A.-M., Zack, M., Busto, U. E., & Zawertailo, L. A. (2011).	Alcohol use disorder	52	Adults from the community	Self-report severity measures of alcohol and gambling problems; performance on cognitive and motivational tasks.	There were no significant differences in performance between the comorbid and disordered gambling alone groups.	Noise stress has similar motivational and physiological effects in men with gambling disorder or both gambling and alcohol use disorders.
Thomsen, K. R., Callesen, M. B., Linnet, J., Kringelbach, M. L., & Moller, A. (2009).	Depression	40	Adults from the community	Self-reported gambling severity symptoms; behaviors observed during slot machine play	Disordered gamblers with greater levels of depression reported greater gambling urges, played more games and played for longer.	The presence of depression as a comorbidity in pathological gambling may exacerbate symptoms of severity.
Vachon, D. D., & Bagby, R. M. (2009).	DSM IV Axis 1 and 2	228	SCID 1 and II	SCID- ! And II	Simple subtype did not have elevated Axis 1 and 2 disorders relative to controls. Hedonic moderate and demoralized high.	The differential relations between specific forms of psychopathology with pathological gambling (PG) severity level in anxiety disorder (AD) and non-AD groups may provide insight into motivations to gamble in specific psychiatric groups. Clinically, the extent to which low-risk, at-risk, and problem gambling might contribute to the

Waluk, O. R., Youssef, G. J., & Dowling, N. A. (2016).	ADHD	214	Treatment seeking disordered gamblers	Self-report severity measures for all assessed disorders.	25% of the sample screened positively for ADHD. ADHD was significantly positively correlated with gambling severity, impulsivity and cluster B personality disorders. ADHD was not associated with alcohol or substance use.	development or maintenance of multiple psychopathologies warrants additional investigation. These findings also have clinical relevance in considering how best to identify and treat individuals with co-occurring psychopathologies.
Westphal, J. R., & Johnson, L. J. (2007).	Substance use disorder, anxiety and depression	78	Treatment seeking disordered gamblers	Self-report measures of problem gambling severity	77% of the participants reported at least one comorbidity; 56% reported multiple comorbidities. The most common comorbidities were substance use, depression, anxiety, personality disorders, and impulse control disorders. Presence of comorbidity significantly exacerbated gambling symptoms.	Co-morbid disorders can interact with and exacerbate problem gambling symptoms.
Xian, H., Giddens, J. L., Scherrer, J., Eisen, S., & Potenza, M. N. (2010).	Anxiety disorders	7869	Male twin registry members	DSM-III diagnoses for all assessed disorders	The relationship between disordered gambling and generalized anxiety disorder was mostly attributable to shared genetic contributions. The relationship between disordered gambling and panic disorder was attributable to both genetic and unique environmental contributions.	Common environmental contributions may impact panic and gambling disorders, whereas distinct environmental factors may contribute to problem gambling and generalized anxiety disorder. All assessed disorders seemed to be impact by share genetic contributions.
Yakovenko, I., Clark, C. M., Hodgins, D. C., & Goghari, V. M. (2014).	Schizophrenia	8	Community recruited disordered gamblers with schizophrenia	Qualitative interview responses	Gambling as a need for activity, and gambling as a means of connecting with society/world were reported as notable reasons for engaging in problematic gambling. A substantial proportion of participants reported bi-directional exacerbation of symptoms of schizophrenia and gambling disorder.	Individuals with both gambling disorder and schizophrenia endorse unique patterns of reasons for gambling and gambling behavior that are not present in those with disordered gambling only. This may require additional treatment consideration for population with the comorbidity.

Appendix A - Search Strategies by Database

CENTRAL

1. exp Gambling (keyword)
2. Gambl*.tw.
3. 1 or 2
4. exp Comorbidity/
5. Comorbid*.tw.
6. Co-morbid*.tw.
7. Concurrent.tw.
8. integrat*.tw.
9. (combin* and treat*).tw.
10. Depress*.tw.
11. Anxiety*.tw.
12. Substance*.tw.
13. Personality*.tw.
14. Mood*.tw.
15. Nicotine*.tw.
16. Tobacco*.tw.
17. 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16
18. 3 and 17

EMBASE

1. exp pathological gambling (keyword)
2. Gambl*.tw.
3. 1 or 2
4. exp comorbidity/
5. (combin* and treat*).tw.
6. Co-morbid*.tw.
7. (psyc* and comorbid*).tw.
8. Integrat*.tw.
9. Concurrent.tw.
10. Depress*.tw.
11. Anxiety*.tw.
12. Substance*.tw.
13. Personality*.tw.
14. Mood*.tw.
15. Nicotine*.tw.
16. Tobacco*.tw.
17. 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16
18. 3 and 17

MEDLINE

1. exp Gambling/

2. Gambl*.tw.
3. 1 or 2
4. exp Comorbidity/
5. exp “Delivery of Health Care, Integrated”/
6. (combin* and treat*).tw.
7. (psyc* and comorbid*).tw.
8. Integrat*.tw.
9. concurrent.tw.
10. Depress*.tw.
11. Anxiety*.tw.
12. Substance*.tw.
13. Personality*.tw.
14. Mood*.tw.
15. Nicotine*.tw.
16. Tobacco*.tw.
17. 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13
18. 3 and 14

PsycINFO

1. exp Gambling/
2. exp Pathological Gambling/
3. Gambl*.tw.
4. 1 or 2 or 3
5. exp Comorbidity/
6. Comorbid*.tw.
7. Co-morbid*.tw.
8. exp INTEGRATED SERVICES/
9. Concurrent.tw.
10. (combin* and treat*).tw.
11. integrat*.tw.
12. depress*.tw.
13. anxiety*.tw.
14. substance*.tw.
15. personality*.tw.
16. mood*.tw.
17. nicotine*.tw.
18. tobacco*.tw.
17. 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18
18. 4 and 17

Appendix B – Web Search Sources

- Addictive Behaviours Laboratory | University of Calgary:
<http://www.addiction.ucalgary.ca/>
- Alberta Alcohol and Drug Abuse Commission (part of AHS)
<http://albertahealthservices.ca>
- Alberta Gambling Research Institute Bibliographies:
<http://www.abgamblinginstitute.ualberta.ca/LibraryResources/Bibliographies.aspx>
- Alberta Gambling Research Institute: Research Repository @ the University of Calgary
<http://dspace.ucalgary.ca/handle/1880/79>
- Australasian Gaming Council Research library:
<https://www.austgamingcouncil.org.au/content/library-information>
- Australian Productivity Commission <http://pc.gov.au/>
- CADTH: <http://www.cadth.ca/>
- Canadian Partnership for Responsible Gambling e-Library <http://www.cprg.ca/>
- Canadian Responsible Gambling Council; <http://www.responsiblegambling.org/>
- Center for Gaming Research, UNLV, <http://gaming.unlv.edu/>
- Centre for Evidence-based mental health (UK):
<http://cebmh.warne.ox.ac.uk/cebmh/cebmh.htm>
- Gambling Research Australia Website and Clearinghouse
<http://www.gamblingresearch.org.au/>
- GambLIB – Gambling Research Database <http://www.gamblib.org/>
- Gemini Research <http://www.geminiresearch.com/>

- International Centre for Youth Gambling Problems and High-Risk Behaviours, McGill
<http://youthgambling.com/>
- KT + <http://plus.mcmaster.ca/kt/Default.aspx>
- Massachusetts Council on Compulsive Gambling
<http://www.masscompulsivegambling.org/>
- National Bureau of Economic Research <http://nber.org/>
- National Center for Responsible Gambling Research Library:
<http://www.ncrg.org/research-center/research-library>
- National Collaborating Centre for Methods and Tools:
<http://www.nccmt.ca/search/registry-eng.html>
- New York Academy of Medicine Grey Literature Report: <http://www.greylit.org/home>
- North American Association of State and Provincial Lotteries <http://naspl.org/>
- Ontario Problem Gambling Research Centre: <http://www.gamblingresearch.org>
- Oregon Council on Problem Gambling: <http://www.oregoncpg.com/>
- PHAC Canadian Best Practices Portal: <http://cbpp-pcpe.phac-aspc.gc.ca/interventions/browse-categories-by-icon/>
- Problem Gambling Institute of Ontario
<http://www.problemgambling.ca/Pages/Home.aspx>
- Problem Gambling Foundation of New Zealand – Library <http://pgfnz.org.nz/library/>
- Project Cork <http://www.projectcork.org/>
- Research and Development Research Base <http://rdrb.utoronto.ca/>
- Responsible Gambling Fund http://www.olgr.nsw.gov.au/rgf_home.asp

- Responsible Gambling Information Hub <http://rgtinfohub.org.uk/>
- Substance Abuse and Mental Health Services Administration (US):
<http://store.samhsa.gov/home>
- UCLA Gambling Studies Program
<http://uclagamblingprogram.org/research/publications.php>