

Disordered Gambling Across the Lifespan:
An Examination of Comorbidity and Diagnosis From DSM-IV to DSM-5
by
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Abstract

First introduced in the third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM), pathological gambling was traditionally viewed as an 'impulse control disorder'. The publication of the DSM's fifth edition reclassified gambling (now disordered gambling) as a 'substance-related and addictive disorder' and reduced the minimum criteria required for a diagnosis. To examine the impact of these changes, and to better understand gambling disorder across the adult lifespan, this dissertation examined psychiatric comorbidity and other gambling-related features associated with DSM gambling and other substance-use disorders across younger (18-34 years old), middle-aged (35-54 years old), and older (55 years and above) adults using secondary analyses of data from the National Epidemiologic Survey of Alcohol and Related Conditions (NESARC). Study 1 examined whether changes from DSM-IV to DSM-5 affected the severity of those diagnosed with a gambling disorder with respect to mental disorder comorbidity across age groups. Results indicated that the prevalence of comorbid disorders did not change in the overall sample, although older adults were more likely to exhibit a comorbid anxiety disorder and any comorbid mental health/substance-use disorder using DSM-5 criteria. Study 2 examined whether changes in diagnostic criteria from DSM-IV to DSM-5 correspond to shifts in comorbid psychiatric disorder prevalence that are more similar to those observed in alcohol and cannabis use disorders. Findings suggested that moving from DSM-IV to DSM-5 gambling criteria resulted in a slight decrease in comorbidity rates, although substantial differences remained between comorbid rates of disordered gambling and substance use disorders. Study 3 examined mental and physical functioning, comorbid psychological disorders, and other gambling-related features in gamblers meeting at least one DSM-5 diagnostic criterion across age groups. The three age groups differed on a variety of measures. Notably, older adults had lower physical functioning, reduced help-seeking behaviour, and lower

prevalence of comorbid psychiatric conditions compared to other age groups. In sum, changes from DSM-IV to DSM-5 were not uniform, with older adults appearing to differ most between the two sets of DSM criteria. Older adults meeting a DSM gambling diagnosis (four or more criteria) were found to have higher comorbid disorder prevalence than young and middle age groups while older adults meeting one or more DSM gambling criterion had a lower comorbid disorder prevalence than other age groups. I discuss these age-related findings within the context of Charles' (2010) strength and vulnerability integration' theory, noting that meeting minimal gambling criteria does not appear to be a severe stressor that decreases overall well-being in older adults due to strengths afforded through aging. With the increased availability of gambling, the differences in disordered gambling across the lifespan and accompanying comorbid psychiatric conditions, as observed in this research, will need to be taken into account in order to achieve the best possible treatment outcomes.

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Chapter 1: General Introduction

Despite its longstanding existence, disordered gambling can be considered a relatively understudied form of addiction relative to other addictions like alcohol, cannabis, or nicotine. While these other forms of addiction are rightfully portrayed as dangerous and harmful, gambling is often sensationalized through movies and television coverage as a positive activity with minimal focus on the potential harms. The inclusion of gambling alongside substance-use disorders in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM; American Psychiatric Association [APA], 2013) was considered by some as an opportunity for gambling to attain increased research focus as a disorder associated with substantial harm (Petry & Blanco, 2013).

Previous literature on gambling has suggested that the prevalence of gambling participation and gambling disorder varies across the lifespan (National Opinion Research Center, 1999; Welte, Barnes, Tidwell, & Hoffman, 2008). With substantial changes occurring related to the diagnostic criteria of gambling, questions remain as to how disordered gamblers present as an overall group and by age. This dissertation, generally speaking, aims to examine how changes in DSM diagnostic criteria impacted disordered gambling prevalence, comorbid disorders, and other gambling-related features across three distinct age groups.

Gambling History and Categorization

Pathological gambling first appeared in the third edition of the Diagnostic and Statistical Manual as an impulse control disorder (APA, 1980). Since that time, a variety of criteria have been utilized in an attempt to define pathological gambling. The specific criteria utilized by each DSM publication can be found in Table 1. At the time of its first DSM appearance, the diagnostic criteria were suggested by Dr. Robert Custer based solely on his clinical experience (National

History of gambling diagnostic criteria across editions of the Diagnostic and Statistical Manual

Gambling Criteria	DSM-III (3 of 7)	DSM-III-R (4 of 9)	DSM-IV (5 of 10)	DSM-5 (4 of 9)
Defaulting on debts or other finances	X			
Borrowing money from an illegal source	X			
Inability to account for losses or provide evidence of claimed gambling earnings	X			
Loss of employment	X			
Illegal acts committed	X		X	
Reliance on others for financial purposes	X		X	X
Disrupted familial relationships/Lying to family	X		X	X
Preoccupation with gambling		X	X	X
Needing to increase the size or frequency of bets to reach desired excitement		X	X	X
Irritability due to restricted gambling		X	X	X
Chasing losses		X	X	X
Repeated efforts to reduce gambling behaviors		X	X	X
Giving up another important activity to gamble		X	X	X
Gambling in spite of other obligations		X		
Continuing to gamble despite inability to pay for losses		X		
Gambling larger amounts or over a longer period of time than intended		X		
Gambling to escape problems or relieve a dysphoric mood			X	X

Research Council, 1999). The DSM-III noted that, in addition to being 'chronically and progressively unable to resist impulses to gamble' and the gambling behaviors not being due to antisocial personality disorder, the individual must meet at least three of seven listed criteria related to the negative impact of gambling on 'family, personal, and vocational pursuits' (APA, 1980, p. 292-3).

The diagnostic criteria for pathological gambling changed significantly in the DSM-III-R (APA, 1987). Four of nine criteria were required for a pathological gambling diagnosis with none of the criteria retained from the original DSM-III criteria. The new criteria were intended to better reflect the conceptualized close relationship between gambling and substance dependence (Slutske, Zhu, Meier, & Martin, 2011).

Further changes were introduced in the DSM-IV (APA, 1994). Conceptualizations of pathological gambling remained strongly associated with substance-use disorders. The diagnostic

criteria changed again, changing from requiring at least 4 of 9 symptoms to needing at least 5 of 10 symptoms. Of the 10 symptoms, six were retained from the DSM-III-R, three were re-introduced from the DSM-III, and one new criterion was added: gambling to escape problems or relieve a dysphoric mood (APA, 2000).

Since the publication of the DSM-IV in 1994, advances in gambling related research have led to substantial changes in the way that pathological gambling, referred to as a 'gambling disorder' in the DSM-5, is viewed (APA, 2013). Along with the reclassification of disordered gambling as a form of 'substance-related and addictive disorder', two significant changes to the diagnostic criteria of a gambling disorder were made in the DSM-5: (a) the elimination of one of the ten diagnostic criteria, '[h]as committed illegal acts such as forgery, fraud, theft or embezzlement to finance gambling', resulting in nine total criteria, and (b) the reduction of the minimum threshold for the diagnosis from five to four (APA, 2013). The DSM workgroup on gambling also noted the change was intended to provide greater diagnostic accuracy via reduction of false negatives (Reilly & Smith, 2013; Stinchfield, 2003; Stinchfield, Govoni, & Frisch, 2005) though only modest improvements in classification accuracy have been observed (Stinchfield et al., 2015).

Gambling was the sole behavioral addiction to be included in the new DSM-5 'substance-related and addictive disorder' category. Internet gaming disorder was included as a condition requiring further investigation while other behavioral addictions, such as shopping, exercise, work, and sex, were left out primarily due to the lack of research, despite similarities found between behavioural addictions or impulse control disorders and substance addictions (e.g., genetics, epidemiology, neurobiology, age of onset, withdrawal patterns, and treatment; Pinna et al., 2015; Yau & Potenza, 2015).

Gambling as an impulse control versus substance-related disorder. The DSM-5 reclassified gambling disorder as a form of 'substance-related and addictive disorder' rather than an 'impulse control disorder' (APA, 2013). As an 'impulse control disorder' in the DSM-IV, pathological gambling was grouped in with other non-substance or behavioral addictions such as eating, video-game playing, shopping, and sex (Potenza, 2006). However, pathological gambling began to be increasingly recognized as a 'behavioral addiction', with sensations similar to those experienced by alcoholics and drug addicts (Clark & Limbrick-Oldfield, 2013; Coman, Burrows, & Evans, 1997; Frascella, Potenza, Brown, & Childress, 2010) including strong motivations to gamble and the experience of withdrawal and cravings for gambling-based activities when forced to go without for a period of time (Brezing, Derevensky, & Potenza, 2010). While the criteria for gambling in the DSM-IV reflected the view of it as purely a behavioral addiction as it relates to the external characteristics presented, the decision to alter the categorization to include gambling specifically as a substance use disorder was primarily driven by biological findings (Holden, 2010; Potenza, 2014). The DSM addictions workgroup responsible for the reclassification decision has noted "[gambling] activates the reward system in much the same way that a drug does" (p. 935; Holden, 2010). In addition, though gambling lacks the same active consequence of actively damaging the brain as a traditional substance, the cognitive distortions involved in gambling may impact addictive vulnerabilities in much the same way (Clark, 2014).

Disordered gambling, as well as other behavioral addictions, shares a number of characteristics related to the course of the disorder that are similar to substance use disorders, including the typical onset of the addiction occurring in adolescence, withdrawal when going without use or engagement, urges, cravings, and chronic patterns of use and relapse (Brewer & Potenza, 2008). Other similarities between gambling and substance use disorders have been noted, including comorbidity between the disorders (Grant & Chamberlain, 2015; Kessler et al.,

2008; Rennert et al., 2014), shared genetic variance (Leeman & Potenza, 2013; Slutske, Ellingson, Richmond-Rakerd, Zhu, & Martin, 2013), impulsivity (Di Nicola et al., 2015), and poor decision making (Bottesi, Ghisi, Ouimet, Tira, & Sanavio, 2014). Treatment options for behavioral addictions are also often similar to those available for substance use disorders, with 12-step groups, self-help approaches, and cognitive-behavioral therapy commonly used (Grant, Schreiber, & Odlaug, 2013).

Threshold reduction in criteria required for diagnosis. In a report published by the National Center for Responsible Gaming, the illegal acts criteria was dropped because "no studies have found that assessing criminal behavior helps distinguish between people with a gambling disorder and those without one" (p.4; Reilly & Smith, 2013). A number of studies have found the illegal acts criteria to be the least prevalent of the ten DSM-IV diagnostic criteria (e.g., Strong & Kahler, 2007; Toce-Gerstein, Gerstein, & Volberg, 2003) or among the least prevalent (e.g., Temcheff, Paskus, Potenza, & Derevensky, 2016). When individuals did exhibit this symptom, it was unlikely to impact the diagnosis as few individuals met this particular criteria without meeting enough of the other nine criteria to receive a pathological gambling diagnosis (Zimmerman, Chelminski, & Young, 2006).

Previous research suggests that the reduction from five to four criteria is likely to have more pronounced increases in past-year prevalence rates of disordered gambling in epidemiological samples rather than gambling-focused samples (Petry, Blanco, Auriacombe, et al., 2014). The proposed differentiation between epidemiological and gambling-focused samples suggests that the previous DSM-IV system under-reported disordered gambling in the general population and that the new criteria provide a more accurate representation of those experiencing impairment or distress due to a gambling addiction (Stinchfield, 2003; Stinchfield et al., 2005). Others have gone even farther to suggest that endorsing as few as one gambling related symptom

may be indicative of difficulties related to disordered gambling (Blanco, Hasin, Petry, Stinson, & Grant, 2006; Toce-Gerstein et al., 2003).

DSM-5 gambling diagnostic changes were met largely with positive feedback (e.g., Clark, 2014; Potenza, 2014; Romanczuk-Seiferth, van den Brink, & Goudriaan, 2014). However, support for removing the illegal acts criterion was not universal, as Temcheff and colleagues (2016) stated that the illegal acts criteria can be a key indicator of disordered gambling in college-aged groups. Others suggested that the assessment of committing illegal acts accurately reflects the desperation felt by those experiencing disordered gambling (Mitzner, Whelan, & Meyers, 2011) though opponents believe the 'lying to others' criterion captures a similar aspect (Stinchfield et al., 2015). Another argument in favor of retaining the illegal acts criterion is its potential impact on understanding those seeking treatment for disordered gambling, as one study found that approximately 40% of disordered gamblers in treatment admitted to committing an illegal act to support their gambling (Petry, Blanco, Stinchfield, & Volberg, 2013).

As stated previously, the illegal acts criterion has the lowest endorsement rate of the 10 DSM-IV diagnostic criteria, with few individuals being excluded from a diagnosis based on the removal of this single criterion (Petry, Blanco, Auriacombe, et al., 2014; Petry et al., 2013; Zimmerman et al., 2006). Research has suggested the reduction in minimum threshold has resulted in prevalence rates of disordered gambling increasing approximately 18 to 25 percent (Denis, Fatséas, & Auriacombe, 2012; Rennert et al., 2014; Temcheff et al., 2016), though smaller increases have been observed in samples of gamblers in treatment (Petry et al., 2013; Stinchfield et al., 2015). The decrease in threshold from the DSM-IV (five of ten) to DSM-5 (four of nine), and subsequent increase in prevalence, has hypothetically allowed for less severe, or milder, gamblers to now be included under the umbrella of 'gambling disorder'.

Research suggests few sociodemographic differences in the makeup of disordered gamblers with the new DSM-5 criteria (Petry, Blanco, Jin, & Grant, 2014; Stinchfield et al., 2015). However, these newly included gamblers may differ from those already captured by previous DSM criteria standards in terms of their gambling behaviors. More severe gamblers, or those meeting a higher number of criteria, are more likely to report jeopardizing important matters, more likely to conceal the extent of their gambling, and less likely to be preoccupied with gambling and to chase losses than less severe gamblers, or gamblers meeting fewer DSM criteria (Sleczka, Braun, Piontek, Bühringer, & Kraus, 2015). This suggests that DSM-IV pathological gamblers and newly included DSM-5 disordered gamblers who did not previously meet criteria are dissimilar to some degree.

Gambling Across the Lifespan

Canadian data suggests that approximately 76% of Canadians aged 15 and above gambled within the past year with most doing so in a non-problematic manner (Marshall & Wynne, 2004). For those that gamble and meet disorder criteria, the prevalence of disordered gambling does not remain consistent over the course of the lifespan. Past-year gambling participation has been found to peak between 22 and 30 years of age, while problem gambling behaviors peaked later, between the ages 31 and 40 (Welte, Barnes, Tidwell, & Hoffman, 2011). However, even the progression from early adulthood to peak gambling in the 30s is not linear, as a study using longitudinal data from Manitoba showed a general pattern of decreased prevalence of problem gambling in young adults aged 18 to 22 years over a four year time period (Edgerton, Melnyk, & Roberts, 2014). Despite a comparatively lower prevalence of disordered gambling in older adults, gambling is still a common activity with general prevalence estimates suggesting that approximately 10 to 13 percent of individuals over the age of 60 gamble frequently (Nower & Blaszczynski, 2008). Disordered gambling tends to be somewhat transient over time with

individuals often remitting without any treatment (Abbott, Williams, & Volberg, 2004; Sartor et al., 2007; Shaffer & Hall, 2002). Conversely, many disordered gamblers maintain their problematic behaviors over the course of time (Hodgins & el-Guebaly, 2004).

With gambling participation and disorder prevalence changing over the course of the lifespan (Welte et al., 2011), it stands to reason that other gambling-related features would also vary with age. In recent years, online gambling, video lottery machines, and other increasingly technological forms of gambling have seen an increase in availability and popularity, which may change the overall presentation of disordered gamblers. Though online gambling has not resulted in changes to the prevalence of disordered gambling itself (Welte, Barnes, Tidwell, Hoffman, & Wieczorek, 2015), other characteristics may have been altered, further emphasizing the importance of understanding age-related differences in gambling.

Research suggests that gamblers are also more likely to meet certain diagnostic criteria depending on their age. For instance, a previous study utilizing the NESARC found that age groups endorsed criteria differently, with younger adults (defined as under 25 years old in that study) being less likely to endorse gambling as a means of escaping negative affect and more likely to endorse chasing losses than middle-aged adults (25-59 years old; Sacco, Torres, Cunningham-Williams, Woods, & Unick, 2011). Alternatively, older adults (60 years and over) were less likely to endorse chasing losses than the middle-aged group, suggesting younger adults are more driven by sensation seeking (Stinchfield & Winters, 1998). Of those qualifying for a DSM-IV gambling diagnosis, older adults met fewer diagnostic criteria than other age groups, indicating a greater proportion of gamblers with 'mild' severity for the oldest age group in relation to other age groups (Sacco et al., 2011). However, previous research has suggested that older adults may not have the same opportunities to qualify for certain substance disorder criteria

as younger or middle-aged adults given age-related changes in familial relationships and occupational and financial responsibilities (Benyon, 2011).

Theoretical approach to understanding age differences in problem gambling. Under ideal conditions, socioemotional selectivity theory (SST; Carstensen, Isaacowitz, & Charles, 1999; Reed & Carstensen, 2012) speculates that as the perceived time left in life decreases, older adults prioritize emotional goals (e.g., well-being, meaning, and regulation) over goals related to knowledge acquisition and exploration. Older adults are, therefore, more likely to attend to positive material compared to negative material in an effort to improve their immediate emotional state (Reed & Carstensen, 2012). Alternatively, younger adults may sacrifice short-term emotional well-being in favor of knowledge and exploration that may benefit future oriented, long-term goals.

Some older adults, however, do not exhibit the cognitive and behavioral strategies that are hypothesized to accompany increased age and result in increase emotional well-being. Strength and vulnerability integration (SAVI; Charles, 2010) theory posits that older adults generally experience an increase in emotional well-being unless particular chronically stressful circumstances exist that can nullify or reverse typical age-related improvements in well-being. Factors including social isolation, neurological dysregulation, and caregiving can lead to older adults being unable to utilize cognitive and behavioral strategies, resulting in lower levels of emotional well-being and greater negative physical outcomes than younger adults (Charles & Luong, 2013). The current study proposes that disordered gambling is likely to act as a chronic, inescapable stressor in many older adults. In accordance with the SAVI theory, older adults meeting disordered gambling criteria are likely to exhibit reduced emotional well-being compared to younger adults.

Current Research

This dissertation focuses on exploring three aspects of the shift in gambling from DSM-IV to DSM-5: (1) the notion that inclusion of less severe gamblers using the most recent DSM criteria may change the overall composition of disordered gamblers as a group; (2) that diagnostic changes may result in gambling becoming increasingly similar to other forms of substance use disorder in terms of comorbid psychiatric conditions; and (3) that overall composition of disordered gamblers and comorbid psychiatric condition prevalence may present differently over the course of the adult lifespan. This research examines gambling in the lifespan across three distinct age groups: younger adults (18 to 34 years old), middle age adults (35 to 54 years old), and older adults (55 to 98 years old).

I examine these objectives with three studies using data from the National Epidemiological Survey for Alcohol and Related Conditions (NESARC). The first wave of the NESARC includes the largest participant sample qualifying for a pathological gambling diagnosis within a nationally representative dataset (Nelson, Gebauer, LaBrie, & Shaffer, 2009). Study 1 examines whether the diagnostic change in disordered gambling from DSM-IV to DSM-5 is associated with the hypothesis that the more inclusive DSM-5 group will have the same or reduced comorbidity prevalence than the DSM-IV group. Furthermore, we expect less comorbidity in the older adult age group. Study 2 examines whether changes in gambling diagnostic criteria resulted in changes to the prevalence of comorbid psychiatric disorders among disordered gamblers. My hypothesis is such that gambling comorbidity prevalence rates would be more similar to those observed in substance use disorders given DSM changes. Study 3 investigates the role of age in health and functioning among gamblers by looking at mental and physical functioning, comorbid psychological disorders, and other gambling-related features among gamblers meeting at least one disordered gambling criterion. I hypothesize that older

adults will have a stronger negative relationship between overall well-being and gambling severity than other age groups.

References

- Abbott, M. W., Williams, M. M., & Volberg, R. A. (2004). A prospective study of problem and regular nonproblem gamblers living in the community. *Substance Use & Misuse*, 39(6), 855–84.
- American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). Washington, DC.
- American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental disorders* (3rd ed., r). Washington, DC: American Psychiatric Association.
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: American Psychiatric Association.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th, Text ed.). Washington, DC: American Psychiatric Association.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Benyon, C. (2011). Diagnosing the use of illegal drugs by older people - Comments on the proposed changes to DSM-V. *Addiction*, 106(5), 884–885. <http://doi.org/10.1111/j.1360-0443.2010.03283.x>
- Blanco, C., Hasin, D. S., Petry, N., Stinson, F. S., & Grant, B. F. (2006). Sex differences in subclinical and DSM-IV pathological gambling: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Psychological Medicine*, 36(7), 943–953. <http://doi.org/10.1017/S0033291706007410>
- Bottesi, G., Ghisi, M., Ouimet, A. J., Tira, M. D., & Sanavio, E. (2014). Compulsivity and impulsivity in pathological gambling: Does a dimensional-transdiagnostic approach add clinical utility to DSM-5 classification? *Journal of Gambling Studies*, 31(3), 825–847.

<http://doi.org/10.1007/s10899-014-9470-5>

Brewer, J. A., & Potenza, M. N. (2008). The neurobiology and genetics of impulse control disorders: relationships to drug addictions. *Biochemical Pharmacology*, 75(1), 63–75.

<http://doi.org/10.1016/j.bcp.2007.06.043>

Brezing, C., Derevensky, J. L., & Potenza, M. N. (2010). Non-substance-addictive behaviors in youth: pathological gambling and problematic Internet use. *Child and Adolescent Psychiatric Clinics of North America*, 19(3), 625–41.

<http://doi.org/10.1016/j.chc.2010.03.012>

Carstensen, L. L., Isaacowitz, D. M., & Charles, S. T. (1999). Taking time seriously. A theory of socioemotional selectivity. *The American Psychologist*, 54(3), 165–81.

Charles, S. T. (2010). Strength and vulnerability integration: a model of emotional well-being across adulthood. *Psychological Bulletin*, 136(6), 1068–91. <http://doi.org/10.1037/a0021232>

Charles, S. T., & Luong, G. (2013). Emotional Experience Across Adulthood. *Current Directions in Psychological Science*, 22(6), 443–448. <http://doi.org/10.1177/0963721413497013>

Clark, L. (2014). Disordered gambling: the evolving concept of behavioral addiction. *Annals of the New York Academy of Sciences*, 1327, 46–61. <http://doi.org/10.1111/nyas.12558>

Clark, L., & Limbrick-Oldfield, E. H. (2013). Disordered gambling: a behavioral addiction. *Current Opinion in Neurobiology*, 23(4), 655–659.

<http://doi.org/10.1016/j.conb.2013.01.004>

Coman, G. J., Burrows, G. D., & Evans, B. J. (1997). Stress and anxiety as factors in the onset of problem gambling: Implications for treatment. *Stress Medicine*, 13(4), 235–244.

[http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1002/\(SICI\)1099-1700\(199710\)13:4 3.0.CO;2-4](http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1002/(SICI)1099-1700(199710)13:4<3.0.CO;2-4)

Denis, C., Fatséas, M., & Auriacombe, M. (2012). Analyses related to the development of DSM-

5 criteria for substance use related disorders: 3. An assessment of Pathological Gambling criteria. *Drug and Alcohol Dependence*, 122(1–2), 22–7.

<http://doi.org/10.1016/j.drugalcdep.2011.09.006>

Di Nicola, M., Tedeschi, D., De Risio, L., Pettorruso, M., Martinotti, G., Ruggeri, F., ... Janiri, L. (2015). Co-occurrence of alcohol use disorder and behavioral addictions: relevance of impulsivity and craving. *Drug and Alcohol Dependence*, 148, 118–25.

<http://doi.org/10.1016/j.drugalcdep.2014.12.028>

Edgerton, J. D., Melnyk, T. S., & Roberts, L. W. (2014). Problem gambling and the youth-to-adulthood transition: Assessing problem gambling severity trajectories in a sample of young adults. *Journal of Gambling Studies*, 31(4), 1463–1485. <http://doi.org/10.1007/s10899-014-9501-2>

Frascella, J., Potenza, M. N., Brown, L. L., & Childress, A. R. (2010). Shared brain vulnerabilities open the way for nonsubstance addictions: carving addiction at a new joint? *Annals of the New York Academy of Sciences*, 1187, 294–315. <http://doi.org/10.1111/j.1749-6632.2009.05420.x>

Grant, J. E., & Chamberlain, S. R. (2013). Gambling disorder and its relationship with substance use disorders: Implications for nosological revisions and treatment. *The American Journal on Addictions*. <http://doi.org/10.1111/j.1521-0391.2013.12112.x>

Grant, J. E., Schreiber, L. R. N., & Odlaug, B. L. (2013). Phenomenology and treatment of behavioural addictions. *Canadian Journal of Psychiatry*, 58(5), 252–9.

Hodgins, D. C., & el-Guebaly, N. (2004). Retrospective and prospective reports of precipitants to relapse in pathological gambling. *Journal of Consulting and Clinical Psychology*, 72(1), 72–80. <http://doi.org/10.1037/0022-006X.72.1.72>

Holden, C. (2010). Psychiatry. Behavioral addictions debut in proposed DSM-V. *Science (New*

- York, N.Y.*), 327(5968), 935. <http://doi.org/10.1126/science.327.5968.935>
- Kessler, R. C., Hwang, I., LaBrie, R., Petukhova, M., Sampson, N. A., Winters, K. C., & Shaffer, H. J. (2008). DSM-IV pathological gambling in the National Comorbidity Survey Replication. *Psychological Medicine*, 38(9), 1351–1360.
<http://doi.org/10.1017/S0033291708002900>
- Leeman, R. F., & Potenza, M. N. (2013). A targeted review of the neurobiology and genetics of behavioural addictions: an emerging area of research. *Canadian Journal of Psychiatry*, 58(5), 260–73.
- Marshall, K., & Wynne, H. (2004). Against the odds: A profile of at-risk and problem gamblers. *Canadian Social Trends*, (73), 25–29.
- Mitzner, G. B., Whelan, J. P., & Meyers, A. W. (2011). Comments from the trenches: Proposed changes to the DSM-V classification of pathological gambling. *Journal of Gambling Studies*, 27(3), 517–21. <http://doi.org/10.1007/s10899-010-9225-x>
- National Opinion Research Center. (1999). *Gambling impact behavior study*. Chicago, IL: NORC.
- National Research Council. (1999). *Pathological Gambling: A Critical Review*. Washington, DC: National Academy Press.
- Nelson, S. E., Gebauer, L., LaBrie, R. A., & Shaffer, H. J. (2009). Gambling problem symptom patterns and stability across individual and timeframe. *Psychology of Addictive Behaviors*, 23(3), 523–533. <http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1037/a0016053>
- Nower, L., & Blaszczynski, A. (2008). Characteristics of problem gamblers 56 years of age or older: a statewide study of casino self-excluders. *Psychology and Aging*, 23(3), 577–84.
<http://doi.org/10.1037/a0013233>
- Petry, N. M., & Blanco, C. (2013). National gambling experiences in the United States: will

history repeat itself? *Addiction (Abingdon, England)*, 108(6), 1032–7.

<http://doi.org/10.1111/j.1360-0443.2012.03894.x>

Petry, N. M., Blanco, C., Auriacombe, M., Borges, G., Bucholz, K., Crowley, T. J., ... O'Brien, C. (2014). An overview of and rationale for changes proposed for pathological gambling in DSM-5. *Journal of Gambling Studies*, 30(2), 493–502. <http://doi.org/10.1007/s10899-013-9370-0>

Petry, N. M., Blanco, C., Jin, C., & Grant, B. F. (2014). Concordance between gambling disorder diagnoses in the DSM-IV and DSM-5: Results from the National Epidemiological Survey of Alcohol and Related Disorders. *Psychology of Addictive Behaviors : Journal of the Society of Psychologists in Addictive Behaviors*, 28(2), 586–91.
<http://doi.org/10.1037/a0034661>

Petry, N. M., Blanco, C., Stinchfield, R., & Volberg, R. (2013). An empirical evaluation of proposed changes for gambling diagnosis in the DSM-5. *Addiction (Abingdon, England)*, 108(3), 575–81. <http://doi.org/10.1111/j.1360-0443.2012.04087.x>

Pinna, F., Dell 'osso, B., Di Nicola, M., Janiri, L., Altamura, A. C., Carpiniello, B., ... Dell 'osso, B. (2015). Behavioural addictions and the transition from DSM-IV-TR to DSM-5. *Psychopathology of Addictions Journal of Psychopathology*, 21, 380–389.

Potenza, M. N. (2006). Should addictive disorders include non-substance-related conditions? *Addiction (Abingdon, England)*, 101 Suppl, 142–51. <http://doi.org/10.1111/j.1360-0443.2006.01591.x>

Potenza, M. N. (2014). The neural bases of cognitive processes in gambling disorder. *Trends in Cognitive Sciences*, 18(8), 429–38. <http://doi.org/10.1016/j.tics.2014.03.007>

Reed, A. E., & Carstensen, L. L. (2012). The Theory Behind the Age-Related Positivity Effect. *Frontiers in Psychology*, 3, 339. <http://doi.org/10.3389/fpsyg.2012.00339>

Reilly, C., & Smith, N. (2013). *The evolving definition of pathological gambling in the DSM-5*.

Beverly, MA.

Rennert, L., Denis, C., Peer, K., Lynch, K. G., Gelernter, J., & Kranzler, H. R. (2014). DSM-5 gambling disorder: prevalence and characteristics in a substance use disorder sample.

Experimental and Clinical Psychopharmacology, 22(1), 50–6.

<http://doi.org/10.1037/a0034518>

Romanczuk-Seiferth, N., van den Brink, W., & Goudriaan, A. E. (2014). From symptoms to neurobiology: Pathological gambling in the light of the new classification in DSM-5.

Neuropsychobiology, 70(2), 95–102. <http://doi.org/10.1159/000362839>

Sacco, P., Torres, L. R., Cunningham-Williams, R. M., Woods, C., & Unick, G. J. (2011).

Differential item functioning of pathological gambling criteria: An examination of gender, race/ethnicity, and age. *Journal of Gambling Studies*, 27(2), 317–330.

<http://doi.org/10.1007/s10899-010-9209-x>

Sartor, C. E., Scherrer, J. F., Shah, K. R., Xian, H., Volberg, R., & Eisen, S. A. (2007). Course of pathological gambling symptoms and reliability of the Lifetime Gambling History measure.

Psychiatry Research, 152(1), 55–61. <http://doi.org/10.1016/j.psychres.2006.05.015>

Shaffer, H. J., & Hall, M. N. (2002). The natural history of gambling and drinking problems among casino employees. *The Journal of Social Psychology*, 142(4), 405–24.

<http://doi.org/10.1080/00224540209603909>

Sleczka, P., Braun, B., Piontek, D., Bühringer, G., & Kraus, L. (2015). DSM-5 criteria for gambling disorder: Underlying structure and applicability to specific groups of gamblers.

Journal of Behavioral Addictions, 4(4), 226–35. <http://doi.org/10.1556/2006.4.2015.035>

Slutske, W. S., Ellingson, J. M., Richmond-Rakerd, L. S., Zhu, G., & Martin, N. G. (2013).

Shared genetic vulnerability for disordered gambling and alcohol use disorder in men and

- women: evidence from a national community-based Australian Twin Study. *Twin Research and Human Genetics : The Official Journal of the International Society for Twin Studies*, 16(2), 525–34. <http://doi.org/10.1017/thg.2013.11>
- Slutske, W. S., Zhu, G., Meier, M. H., & Martin, N. G. (2011). Disordered gambling as defined by the Diagnostic and Statistical Manual of Mental Disorders and the South Oaks Gambling Screen: Evidence for a common etiologic structure. *Journal of Abnormal Psychology*, 120(3), 743–51. <http://doi.org/10.1037/a0022879>
- Stinchfield, R. (2003). Reliability, validity, and classification accuracy of a measure of DSM-IV diagnostic criteria for pathological gambling. *The American Journal of Psychiatry*, 160(1), 180–2. <http://doi.org/10.1176/appi.ajp.160.1.180>
- Stinchfield, R., Govoni, R., & Frisch, G. R. (2005). DSM-IV diagnostic criteria for pathological gambling: reliability, validity, and classification accuracy. *The American Journal on Addictions / American Academy of Psychiatrists in Alcoholism and Addictions*, 14(1), 73–82. <http://doi.org/10.1080/10550490590899871>
- Stinchfield, R., McCreedy, J., Turner, N. E., Jiménez-Murcia, S., Petry, N. M., Grant, J., ... Winters, K. C. (2015). Reliability, validity, and classification accuracy of the DSM-5 diagnostic criteria for gambling disorder and comparison to DSM-IV. *Journal of Gambling Studies*. <http://doi.org/10.1007/s10899-015-9573-7>
- Stinchfield, R., & Winters, K. C. (1998). Gambling and problem gambling among youths. *The Annals of the American Academy of Political and Social Science*. <http://doi.org/10.2307/1049337>
- Strong, D. R., & Kahler, C. W. (2007). Evaluation of the continuum of gambling problems using the DSM-IV. *Addiction*, 102(5), 713–721. <http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1111/j.1360-0443.2007.01789.x>

- Temcheff, C. E., Paskus, T. S., Potenza, M. N., & Derevensky, J. L. (2016). Which diagnostic criteria are most useful in discriminating between social gamblers and individuals with gambling problems? An examination of DSM-IV and DSM-5 criteria. *Journal of Gambling Studies*, 1–12. <http://doi.org/10.1007/s10899-015-9591-5>
- Toce-Gerstein, M., Gerstein, D. R., & Volberg, R. A. (2003). A hierarchy of gambling disorders in the community. *Addiction*, 98(12), 1661–1672.
<http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1111/j.1360-0443.2003.00545.x>
- Welte, J. W., Barnes, G. M., Tidwell, M.-C. O., & Hoffman, J. H. (2008). The prevalence of problem gambling among U.S. adolescents and young adults: results from a national survey. *Journal of Gambling Studies*, 24(2), 119–133. <http://doi.org/10.1007/s10899-007-9086-0>
- Welte, J. W., Barnes, G. M., Tidwell, M.-C. O., & Hoffman, J. H. (2011). Gambling and problem gambling across the lifespan. *Journal of Gambling Studies*, 27(1), 49–61.
<http://doi.org/10.1007/s10899-010-9195-z>
- Welte, J. W., Barnes, G. M., Tidwell, M.-C. O., Hoffman, J. H., & Wieczorek, W. F. (2015). Gambling and Problem Gambling in the United States: Changes Between 1999 and 2013. *Journal of Gambling Studies*, 31(3), 695–715. <http://doi.org/10.1007/s10899-014-9471-4>
- Yau, Y. H. C., & Potenza, M. N. (2015). Gambling disorder and other behavioral addictions: recognition and treatment. *Harvard Review of Psychiatry*, 23(2), 134–46.
<http://doi.org/10.1097/HRP.0000000000000051>
- Zimmerman, M., Chelminski, I., & Young, D. (2006). A psychometric evaluation of the DSM-IV pathological gambling diagnostic criteria. *Journal of Gambling Studies*, 22(3), 329–337.
<http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1007/s10899-006-9020-x>

CHAPTER TWO

STUDY ONE

Changes in Gambling Diagnostic Criteria from DSM-IV to DSM-5: Effects on Mental Disorder Comorbidity Across Younger, Middle-Aged, and Older Adults

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Abstract

Changes in Diagnostic and Statistical Manual (DSM) criteria for a gambling disorder from DSM-IV to DSM-5 included a drop in the minimum number of criteria required to qualify for a diagnosis. This threshold reduction resulted in a near doubling of prevalence in non-gambling focused populations. However, the impact of this change on psychiatric comorbidity with gambling is unknown. The current study aimed to: (a) examine whether the diagnostic change affected the severity of those diagnosed with a gambling disorder with respect to mental disorder comorbidity, and (b) determine whether this relationship differed across younger (18-34 years old), middle-aged (35-54 years old), and older (55-89 years old) age groups. This study utilized data from the National Epidemiological Survey for Alcohol and Related Conditions (NESARC). Results indicated that the prevalence of comorbid mental health/substance use disorders did not significantly change between the DSM-IV pathological gambling group and DSM-5 disordered gambling group in the overall sample. However, among older adults, the DSM-5 disordered gamblers were more likely to exhibit any anxiety disorder as well as any comorbid mental health/substance-use disorder compared to the DSM-IV pathological gamblers. No other significant differences were observed in mental health or substance-use disorders within age-specific groupings. Findings suggest that the new, less restrictive DSM-5 criteria for gambling addiction capture older disordered gamblers with more severe clinical presentations in terms of co-occurring mental disorders, contrary to our expectation that the lowered threshold for diagnosis would result in less severe clinical cases.

Introduction

Since gambling was first introduced as a diagnosable condition in the third edition of the Diagnostic and Statistical Manual (DSM-III; American Psychiatric Association [APA], 1980) there have been changes in its conceptualization, reflected by diagnostic re-categorization and changes to diagnostic criteria. Most recently there was a threshold reduction for gambling disorder in the 5th edition of the Diagnostic and Statistical Manual (DSM-5; APA, 2013). This study aims to determine how this change in diagnostic criteria impacted the severity of gambling as a disorder through mental disorder comorbidity in the overall sample and within age-specific groupings.

Diagnostic Inflation

Disordered gambling was reclassified from an 'impulse control disorder' in the DSM-IV to a form of 'substance-related and addictive disorder' in the DSM-5. Along with this reclassification, the least prevalent criterion, 'Has committed illegal acts such as forgery, fraud, theft or embezzlement to finance gambling' was eliminated and the minimum criteria threshold required for a disordered gambling diagnosis was reduced from five to four (APA, 2013). Removing the 'illegal acts' criteria has not significantly impacted the prevalence of disordered gambling as those who met this criteria most often met enough other criteria to still qualify for a diagnosis. Reduction in minimum threshold required for a diagnosis has resulted in a greater number of individuals falling under the umbrella of disordered gambling in the DSM-5. Such potential diagnostic inflation is a source of criticism often leveled towards expanding diagnostic criteria (e.g., Kudlow, 2013). Diagnostic inflation suggests that changes to expand the scope of a disorder serve to: (1) increase prevalence of the disorder and (2) capture less severely disordered individuals who would not have previously received a diagnosis, but now fit within the less restrictive criteria.

Proponents of reducing the criteria threshold argue that individuals who fall under the scope of a gambling disorder given this new criteria were previously missed, or subthreshold, otherwise known as false negatives (Reilly & Smith, 2013; Stinchfield, 2003; Stinchfield et al., 2005), while opponents of these changes argue that once normal behaviors are now being labeled as mental illness (Bolton, 2013; Kudlow, 2013). Distress and/or impairment has been highlighted as a potential method of differentiating between mental disorders and regular functioning (Bolton, 2013); however, determining the minimum threshold level of distress or impairment is a problem similar to setting the number of minimum diagnostic criteria required.

The decrease in threshold from the DSM-IV to DSM-5 has hypothetically allowed for less severe, or milder, gamblers to be included within the lowered gambling threshold that now defines a 'gambling disorder'. This inclusion of less severe gamblers may have changed the overall composition of disordered gamblers as a group. Research suggests few sociodemographic differences in the makeup of disordered gamblers with the new DSM-5 criteria (Petry, Blanco, Jin, & Grant, 2014; Stinchfield et al., 2015). However, more severe gamblers have been shown to present with different DSM-5 gambling disorder diagnostic criteria compared to less severe gamblers (Sleczka, Braun, Piontek, Bühringer, & Kraus, 2015). Specifically, more severe gamblers are more likely to report that they jeopardize important matters and conceal the extent of their gambling than less severe gamblers, while less severe gamblers are more closely related to a preoccupation with gambling and to chasing losses than their more severe counterparts. This suggests that gamblers are not a homogenous group, with gamblers of differing severities potentially exhibiting different symptoms. Mild disordered gamblers, defined as meeting 4 to 5 of the DSM-5 gambling criteria tend to be older, have later onset, and have worse quality of life than moderate (6-7 criteria) and severe (8 or more criteria) gamblers (Grant, Odlaug, & Chamberlain, 2017).

The everchanging criteria of disordered gambling as defined by the DSM is further complicated by the litany of diagnostic tools used to measure gambling disorders and/or severity, including DSM criteria (APA, 2000, 2013), the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987), the Canadian Problem Gambling index (PGSI; Ferris & Wynne, 2001a, 2001b), and the NORC DSM Screen for Gambling Problems (NODS; Gerstein et al., 1999). The differing measures and operational definitions used highlight the challenge in diagnosing disordered gambling. Many measures, including the PGSI and SOGS, classify gambling in degrees of severity rather than a dichotomous measure. The DSM-5 introduced degrees of severity based on number of criteria met but solely as a subclassification under the umbrella of the dichotomous disorder. It has been argued that the previous DSM-IV system under-reported disordered gambling while the DSM-5 criteria provides a more accurate representation of those experiencing impairment or distress due to gambling (Stinchfield, 2003; Stinchfield et al., 2005). Others have similarly suggested that endorsing as few as one gambling related symptom may be indicative of difficulties related to disordered gambling (Blanco, Hasin, Petry, Stinson, & Grant, 2006; Toce-Gerstein et al., 2003), which would suggest that the DSM reduction in minimum criteria required for a diagnosis may result in minimal change to group mental health characteristics.

Mental Disorder Comorbidity in Relation to Gambling Severity

Much like other substance use disorders, pathological/disordered gambling frequently co-occurs with other psychiatric disorders with as many as 96% of individuals with a lifetime gambling disorder diagnosis meeting the criteria for at least one other lifetime psychiatric disorder (Rash, Weinstock, & Van Patten, 2016). A meta-analytic review found that DSM-IV pathological gambling had high prevalence of comorbidity with mental health disorders such as any substance use disorder including alcohol and nicotine (57.5%), any mood disorder (37.9%),

and any anxiety disorder (37.4%) (Lorains, Cowlishaw, & Thomas, 2011). Another meta-analysis reviewed the comorbidity of treatment seeking gamblers who may or may not have met the criteria for a clinical diagnosis with DSM-IV Axis I disorders (i.e., mood, anxiety, and substance) (Dowling et al., 2015). The findings suggest strong relationships between gambling and any current mood disorder (23.1%), any current alcohol or substance use disorder (22.2%), and any current anxiety disorder (17.6%). Studies examining comorbid disorders with DSM-5 disordered gambling are scarce with some DSM-5 gambling research citing statistics derived from DSM-IV pathological gambling comorbidity statistics (Grant & Chamberlain, 2015). The current study aims to fill that gap by examining the impact of DSM criteria changes on comorbidity as an indicator of gambling severity to examine whether that relationship differs as a function of age.

Gambling and age. The majority of studies examining gambling and comorbid psychiatric disorders have been conducted in general adult populations, adjusting for sociodemographic variables rather than examining differences among subgroups (Lorains et al., 2011). However, this ignores the importance of examining age differences in mental health severity as measured by psychiatric comorbidity for three reasons. First, the majority of research on this topic has focused on young adults, a group who has shown to have the highest prevalence of gambling, substance, and psychiatric disorders. Gambling at least once within the past year reaches its peak in young adults between the ages of 22 and 30 years, while problem gambling peaked later at age 31 to 40 years (Welte, Barnes, Tidwell, & Hoffman, 2008; Welte et al., 2011). Second, like gambling, the prevalence of other psychiatric disorders changes over the course of the lifespan (Gonçalves & Byrne, 2013; Schulte & Hser, 2014) with lower rates of anxiety and depressive disorders in older adults compared with younger adults (Gonçalves & Byrne, 2013; Westerhof & Keyes, 2010). Third, substance-use disorder prevalence peaks in adulthood before decreasing among older adults (Schulte & Hser, 2014). This focus on younger adults combined

with minimal consideration towards the changing presentation of disordered gambling means that less is generally known about the relationship between gambling and comorbid disorders in middle age and later in life.

Problem gambling has consistently been associated with greater odds of mood, anxiety, and substance-use disorders across age groups (e.g., Abdollahnejad, Delfabbro, & Denson, 2014; Afifi, Cox, Martens, Sareen, & Enns, 2010; el-Guebaly et al., 2006; Giddens, Stefanovics, Pilver, Desai, & Potenza, 2012; Petry, Stinson, & Grant, 2005; Shaffer & Korn, 2002). However, prevalence of gambling, as well as associated prevalence of comorbid psychiatric disorders, varies across the adult lifespan of gamblers. For instance, young adult gamblers are more likely to have comorbid substance use problems, rather than comorbid anxiety or depression (Hayatbakhsh, Clavarino, Williams, Bor, & Najman, 2012; Lynch, Maciejewski, & Potenza, 2004). Given the changes in both gambling and mental health across age groups, the question of how age impacts comorbidities observed in disordered gambling populations has yet to be fully examined. Further, the differences in age-related comorbidities have yet to be investigated in the context of the diagnostic change from DSM-IV to DSM-5.

Current Study

The reduction in gambling criteria threshold from DSM-IV to DSM-5 has increased the prevalence of disordered gamblers. As a result, the overall comorbid associations of the DSM-5 disordered gambling group may differ from the DSM-IV pathological gambling group, both across ages and among younger (18-34 years old), middle-aged (35-54 years old), and older (55-89 years old) adults. The first aim of the study focuses on the impact of DSM gambling diagnostic changes in terms of mental disorder comorbidity. Arguments regarding threshold reduction have focused on diagnostic inflation as well as the concept that DSM-5 corrects the under-representation of gambling in the DSM-IV. Based on these arguments, we hypothesize that

the more inclusive DSM-5 group will have either the same level of comorbidity or exhibit fewer comorbid mental health disorders than the DSM-IV pathological gambling group.

The second aim of the study extends the first by examining whether the prevalence of comorbid psychiatric disorders differs across younger, middle-aged, and older age groups of disordered gamblers. Similar to the full sample, we hypothesize that the DSM-5 disordered gambling group will be associated with either no change or a decrease in associated mental health conditions across all examined age groups relative to the DSM-IV pathological gambling group. Further, based on prior research and concerns of diagnostic inflation, we expect fewer mental disorder comorbidities to be present in the older adult age groups.

Methods

Participants

Data were from the National Epidemiological Survey for Alcohol and Related Conditions (NESARC), a structured diagnostic survey conducted on a cross-sectional, nationally representative sample of American citizens ages 18 years or older. Interviewers collected Wave 1 data through face-to-face interviews between 2001 and 2002, with 43,093 total participants completing the survey for a response rate of 81.0%. More recent versions of the NESARC, namely NESARC Wave 2 data, collected between 2004 and 2005, and the NESARC-III data, collected between 2012 and 2013, did not assess gambling. This study uses the first wave of the NESARC as it includes the largest number of individuals qualifying for a diagnosis of pathological gambling in any nationally representative sample (Nelson, Gebauer, LaBrie, & Shaffer, 2009). Information regarding sampling procedures and quality control have been previously detailed by Grant and Dawson (2006). For this type of study, formal consent is not required.

Measures

The Alcohol Use Disorder and Associated Disabilities Interview (AUDADIS-IV) assessed gambling and other psychiatric disorders in the NESARC.

Gambling. Gambling was measured according to DSM-IV criteria in the past year. Participants completed a screener question asking if they had gambled at least five times within the past year. Participants responding 'yes' to this question completed the remainder of the gambling items. To examine gambling as in the DSM-IV-TR (APA, 2000), participants endorsing at least five of the ten DSM-IV criteria received a diagnosis of a pathological gambling disorder. To examine gambling as outlined in the DSM-5 (APA, 2013), we created a new DSM-5 gambling variable by eliminating the illegal acts criteria and reducing the minimum number of criteria required from five to four of the remaining nine items. Participants meeting this new minimum threshold were given the DSM-5 disordered gambling diagnosis. Both the DSM-IV and the DSM-5 gambling diagnosis variables were dichotomous.

Substance-use disorder. Past year substance-use disorders were examined in accordance with DSM-IV criteria as per AUDADIS-IV items (Hasin, Stinson, Ogburn, & Grant, 2007). We combined 'abuse' and 'dependence' into a single 'abuse or dependence' variable for each substance assessed with the exception of nicotine, which was excluded. Test-retest reliability for substance use disorders was good ($\kappa = 0.74$; Grant et al., 2003).

Mental disorders. The AUDADIS-IV assessed anxiety disorders (i.e., social anxiety disorder, panic disorder, generalized anxiety disorder, and panic disorder) and mood disorders (i.e., major depression, dysthymia, manic/hypomanic episode) according to DSM-IV criteria (Grant et al., 2004). Reliability for the anxiety and mood disorder diagnoses was fair to good ($\kappa = 0.40 - 0.65$; Grant et al., 2003). For the purposes of this study, disorders were required to be present within the past 12 months prior to survey administration.

Age. Participants were asked for their age in years. We categorized participants into three groups: young adults (18 to 34 years old), middle-aged adults (35 to 54 years old), and older adults (55 to 89 years old). The decision to split the middle-aged and older adults groups at 55 years of age was consistent with other literature in both the geriatric and gambling research fields (e.g., Nower & Blaszczynski, 2008; Petry, 2002; Reynolds, Pietrzak, El-Gabalawy, Mackenzie, & Sareen, 2015). Further, as the prevalence of gambling generally decreases with age, using 55 years old rather than a higher cutoff allowed for greater statistical power to detect effects in the oldest age group.

Other sociodemographic factors. Information regarding sociodemographic factors included sex, marital status, ethnicity, total past year household income, and highest level of education attained. All sociodemographic factors were coded categorically. Sex was categorized as 'male' or 'female'. Marital status categories were 'single or never married', 'married or cohabitating', and 'divorced, separated, or widowed'. Ethnicity was categorized into 'White', 'Black', 'American Indian or Alaska Native', 'Asian, Hawaiian, or Pacific Islander', and 'Hispanic'. Total past year income was separated into the following categories: '<\$19,999', '\$20,000 to \$34,999', '\$35,000-\$69,999', and '\$70,000 and above'. Highest level of education attained was categorized into 'less than high school', 'high school diploma or GED', and 'post-secondary education'.

Data Analyses

To determine whether comorbid psychiatric severity changes in disordered gamblers from DSM-IV-TR to DSM-5, generalized estimating equations (GEE) assuming a binary logit model with a 'repeated' dependent measure assessed dichotomous mental health/substance use outcomes. For the purposes of this study, presence of a gambling disorder served as the 'repeated' dependent variable. As the parameters of the gambling variables were equal, the repeated

dependent measure was the most appropriate method to utilize within GEE. Other mental health disorders were independent variables. GEEs are used to model data that have an association, but cannot utilize a multivariate normal model (Johnston, 1996). In this study, the variables of interest were discrete, bivariate, categorical, and correlated, making GEE an appropriate analytic method.

To examine the impact of the change in DSM threshold on the prevalence of the specific comorbid mental health condition or substance use disorder, GEE models assessed the mental health or substance variable in question, a DSM variable (i.e., DSM-IV or DSM-5), and an interaction term of the mental health/substance variable and DSM variable. It is important to note that the DSM-5 group included those who met DSM-IV criteria. To examine the mental health or substance use disorder and DSM relationship within age-specific groupings, the same analysis was conducted across the three age groups.

We analyzed the data using SPSS (version 24) and STATA (version SE 15.0). Descriptive statistics and crosstabs analyses for both the DSM-IV and the DSM-5 gambling variables established gambling prevalence in the overall sample and across the three age groups. Both software programs utilized the Taylor Series Linearization method to account for the complex survey design of the NESARC, including survey weights, clustering, and stratification. All percentages were calculated using survey weights unless otherwise specified. Certain analyses yielded small cell sizes, which raise concern regarding statistical power. Using the largest population-based sample available allowed for greater reliability despite the small cell sizes compared to a smaller sample size. Further, analyses were designed with a standard threshold of significance ($p = 0.05$) in place prior to conducting analyses.

Results

Of the 43,093 participants, 41,989 had complete data for the key variables of interest. Of these individuals, 11,104 gambled at least five times within the past year, with 77 participants meeting at least the minimum threshold for a DSM-IV pathological gambling diagnosis. An additional 58 participants met the new DSM-5 disordered gambling criteria, for a total of 135. Prevalence of gambling disorder by DSM type and age group are displayed in Table 1. As shown in Table 2, there were no sociodemographic differences between those who met DSM-IV pathological gambling criteria and those who were newly diagnosed by the DSM-5 criteria (i.e., the DSM-5 group excluding those who met DSM-IV criteria).

The results of GEE models examining differences in comorbid mental health and substance use disorders among DSM-IV and DSM-5 disordered gambling groups for the overall sample are shown in Table 3. Results from this table demonstrated that the prevalence of comorbid mental health disorders and substance use disorders did not significantly differ between the DSM-IV pathological gambling group and the more inclusive DSM-5 disordered gambling group. Table 4 displays the same GEE analysis for each age group. Similar to the full

Table 1

Past-year prevalence of pathological (DSM-IV) and disordered (DSM-5) gambling among those gambling at least five times in the past year

	DSM-IV Pathological Gambler		DSM-5 Disordered Gambler		% Increase
	N	% (95% CI)	N	% (95% CI)	%
Full Sample	77	0.6% (0.4-0.8)	135	1.0% (0.8-1.2)	0.4%
Age 18-34 Years	28	1.0% (0.6-1.6)	53	1.8% (1.3-2.5)	0.8%
Age 35-54 Years	35	0.6% (0.4-0.8)	55	0.9% (0.6-1.2)	0.3%
Age 55-89 Years	14	0.3% (0.1-0.5)	27	0.5% (0.3-0.9)	0.2%

Table 2

Sociodemographic variable comparison between DSM-IV pathological gamblers and DSM-5 groups

	DSM-IV Gambling (N = 77; 57.0%)	DSM-5 Gambling (N = 58; 43.0%)
Sex	$\chi^2 = .258, p = .187$	
Female	34 (38.7)	25 (34.5)
Male	43 (61.3)	33 (65.5)
Age	$\chi^2 = 2.059, p = .468$	
18-34 Years	28 (45.9)	25 (50.2)
35-54 Years	35 (39.4)	20 (28.5)
55-89 Years	14 (14.7)	13 (21.3)
Marital Status	$\chi^2 = 3.716, p = .238$	
Single (never married)	28 (39.6)	25 (54.9)
Married / Cohabiting	22 (21.2)	16 (20.1)
Divorced/Separated/Widowed	27 (39.2)	17 (24.9)
Total Household Income Before Taxes – Past 12 Months	$\chi^2 = .815, p = .179$	
< \$19,999	23 (28.2)	11 (22.9)
\$20,000 - \$34,999	14 (23.1)	20 (28.8)
\$35,000 - \$69,999	26 (31.1)	18 (29.4)
\$70,000+	12 (17.6)	7 (18.9)
Ethnicity	$\chi^2 = 6.644, p = .247$	
White	37 (65.3)	22 (52.2)
Black	25 (22.1)	20 (19.7)
American Indian/Alaska Native	1 (0.4)	1 (3.1)
Asian/Hawaiian/Pacific Islander	1 (3.3)	5 (11.8)
Hispanic	13 (8.9)	10 (13.2)
Highest Level of Education	$\chi^2 = .272, p = .905$	
Less than High School	16 (18.2)	10 (15.7)
High School Diploma or GED	28 (40.2)	21 (44.3)
Post Secondary Education	33 (41.6)	27 (39.9)

Note: 'DSM-5 Gambling' includes those individuals who meet DSM-5 disordered gambling criteria but did not meet the more stringent DSM-IV pathological gambling criteria. Ns are unweighted, %s reflect NESARC representative population weights.

sample results, prevalence of comorbid mental health and substance use disorders did not differ between the DSM-IV and DSM-5 gambling groups in the 18-34 and 35-54 year-old groups. In both of these age groups, results trended toward the DSM-IV group exhibiting fewer instances of

Table 3

Comparisons of comorbid mental disorders between DSM-IV and DSM-5 gambling groups

	DSM-IV Gambling		DSM-5 Gambling			Wald χ^2	<i>p</i>
	N	%	N	%	% change		
Past Year Disorders							
Any mood or anxiety disorder	39	48.3	70	49.6	+1.3	0.12	.73
Any mood disorder	24	28.7	39	25.6	-3.1	0.46	.50
Any anxiety disorder	25	33.9	48	36.1	+2.2	0.74	.39
Alcohol use disorder	28	40.4	43	35.6	-4.8	1.75	.18
Drug including marijuana disorder	5	5.5	8	5.2	-0.3	0.11	.74
Any alcohol or drug disorder	29	41.6	45	36.9	-4.7	1.55	.21
Any mood, anxiety, alcohol, drug disorder	54	72.7	92	68.9	-3.8	0.29	.59

comorbid disorders than the DSM-5 group. In the oldest age group (55-89 years old), the presence of any anxiety disorder was greater for the DSM-5 gambling group (43.8%) than the DSM-IV gambling group (23.0%). Similarly, the prevalence rate of any mood, anxiety, or substance use disorder was greater for the DSM-5 group (70.2%) than the DSM-IV group (44.5%).

Discussion

Results from the current study indicated similar rates of comorbid mental disorders between the DSM-IV and DSM-5 gambling groups in the overall sample and in younger- and middle-aged groups. However, in the 55-89 year old age group, gamblers meeting new DSM-5 disordered gambling criteria were more likely to have any anxiety disorder compared to DSM-IV pathological gamblers and were also more likely to have any comorbid mental health disorder compared to DSM-IV pathological gamblers. Research prior to the DSM-5 had found older adult pathological gamblers experience increased severity of psychiatric problems compared to older

Table 4

Comparisons of comorbid mental disorders between DSM-IV and DSM-5 gambling groups among three age groups

Age Group	Past Year Mental Health Disorder Comorbidity	DSM-IV		DSM-5		% change	Wald χ^2	p
		N	%	N	%			
18-34 Years	Any mood or anxiety disorder	17	57.5	29	51.8	-5.7	.80	.37
	Any mood disorder	11	33.7	18	29.1	-4.6	.78	.38
	Any anxiety disorder	11	43.4	18	37.2	-6.2	.78	.38
	Alcohol use disorder	13	47.6	21	41.7	-5.9	1.16	.28
	Drug including marijuana disorder	2	7.6	4	7.1	-0.5	.01	.91
	Any alcohol or drug disorder	13	47.6	22	43.0	-4.6	.58	.45
	Any mood, anxiety, alcohol, drug disorder	23	79.5	39	70.6	-8.9	1.69	.19
35-54 Years	Any mood or anxiety disorder	16	40.8	25	42.0	+1.2	.00	.97
	Any mood disorder	9	26.7	15	25.6	-1.1	.12	.73
	Any anxiety disorder	11	27.0	18	30.6	+3.6	.08	.78
	Alcohol use disorder	14	45.4	18	38.4	-7.0	2.65	.10
	Drug including marijuana disorder	3	5.2	4	5.0	-0.2	.32	.57
	Any alcohol or drug disorder	15	48.3	19	40.3	-8.0	3.33	.07
	Any mood, anxiety, alcohol, drug disorder	24	75.3	34	66.1	-9.2	1.58	.21
55-89 Years	Any mood or anxiety disorder	6	39.7	16	58.5	+18.8	3.21	.07
	Any mood disorder	4	18.7	6	16.2	-2.5	.82	.36
	Any anxiety disorder	3	23.0	12	43.8	+20.8	4.26	.04
	Alcohol use disorder	1	4.8	4	13.4	+8.6	.86	.35
	Drug including marijuana disorder	0	---	0	---	---	---	---
	Any alcohol or drug disorder	1	4.8	4	13.4	+8.6	.86	.35
	Any mood, anxiety, alcohol, drug disorder	7	44.5	19	70.2	+25.7	6.98	.01

Note: Significant findings are bolded.

individuals with greater psychiatric comorbidity severity, suggesting that older gamblers with fewer endorsed disordered gambling criteria may present with greater prevalence of comorbid psychiatric conditions.

Our findings did not support concerns of diagnostic inflation (i.e., that the DSM-5 gambling group would include less severely disordered individuals who would not have met DSM-IV criteria and would, as a result, have fewer comorbid conditions). However, the results trended in this hypothesized direction of reduced comorbidity in the DSM-5 for the younger and, to a lesser extent, middle-aged adults. Prior research noted that those qualifying only for a DSM-5 disordered gambling diagnosis view their gambling as a less severe problem compared to those qualifying for a diagnosis under both criteria sets, with 33% of DSM-5 diagnosis only gamblers stating that gambling caused problems for them compared to 70% of those with both DSM diagnoses and 10% of non-problem gamblers (Rennert et al., 2014). The current findings suggest that, while perceived gambling severity may differentiate the DSM-5 only diagnosis group from those receiving both a DSM-IV and DSM-5 diagnosis, the two groups do not significantly differ in terms of mental health severity as measured by comorbid psychiatric disorder prevalence among young and middle-aged adults or in the sample as a whole.

One potential benefit to the DSM criteria changes appears to be a reduced discrepancy in disorder comorbidity between the older adult and other age groups. As described earlier, diagnostic changes from DSM-IV to DSM-5 were associated with greater prevalence rates in the older adult age group while rates in younger- and middle-aged adults were relatively unchanged or trending towards a reduction in prevalence. These opposing directional trends, combined with the DSM-IV comorbidity rates appearing to be smaller in the older adult group than the other two groups, appear to have brought DSM-5 comorbidity rates in older adults relatively closer to those observed in the younger and middle-aged groups.

Explanations for the conflicting comorbid severity results between older adults and the other two age groups include a number of potential factors, such as gambling severity differentiation, age-related symptom endorsement, age-related physiological responses to stress, and time of gambling onset. In terms of gambling severity differentiation, the DSM-5 noted that disordered gambling can be further categorized into specifiers including 'mild' (4-5), 'moderate' (6-7), and 'severe' (8+) based on the number of diagnostic criteria met (APA, 2013). Recent research has found that mild disordered gamblers were older and had later age of onset, lower quality of life, and higher state-trait depression and anxiety scores compared to moderate and severe gamblers (Grant, Odlaug, & Chamberlain, 2017). Moderate and severe cases were similar to each other in terms of various psychopathology measures and functionality of gambling symptoms. DSM-5 changes to minimum threshold served to increase the membership of the mild group while leaving the moderate and severe groups relatively unchanged due to the minimal impact caused by removing the illegal acts criterion (e.g., Agrawal, Heath, & Lynskey, 2011; Petry, Blanco, Auriacombe, et al., 2014; Zimmerman et al., 2006). For instance, in the current study, the number of older adult gamblers nearly doubled with the reduced minimum threshold. However, these newly included 'mild' gamblers are not a homogenous group across age categories as gamblers differ in criteria endorsed, participation, and other gambling-related factors (e.g., Grant, Odlaug, & Chamberlain, 2017; Sacco et al, 2011; Tse, Hong, Wang, & Cunningham-Williams, 2012).

Further, older adults may not have the same opportunities to qualify for certain substance disorder criteria as younger or middle-aged adults given age-related changes in familial relationships and occupational and financial responsibilities (e.g., retired, widowed; Benyon, 2011). Considering older adults are more likely to have opportunities and the financial means to gamble than other age groups (Kerber, Black, & Buckwalter, 2008), they are less likely to

consider finances and generally commit more gambling-related decisions that could result in long-term financial difficulties than younger adults (Fein et al., 2007). Older adults are also less likely to gamble to win money, escape boredom, or to chase losses as compared to younger gamblers (Desai et al., 2004; Sacco et al., 2011). Unequal opportunity to qualify for certain disordered gambling criteria may equate to 'mild' gamblers with comorbid conditions falling shy of more stringent DSM-IV criteria but meeting the more inclusive DSM-5 criteria.

In addition to gambling severity differentiation and age-related symptom endorsement, age-related responses to stress may also help explain findings of the current study. Strength and Vulnerability Integration (SAVI) theory (Charles, 2010) suggests that older adults generally achieve higher levels of overall affective well-being than younger adults due to increased priority placed on positive emotion-related goals, as well as experience regulating emotions. Under ideal circumstances, older adults are generally better able to cope with problems, find ways to escape from them, or generally disengage from negativity, thereby reporting fewer daily stressors and allowing for better emotional health than young adults (Almeida & Horn, 2004; Charles, 2010). However, these age-related benefits can be nullified or reversed when stressors are chronic and significant, such as in the case of chronic gambling addiction (Charles, 2010). In these cases, there is no longer an ability to use age-related coping advantages to avoid, disengage, or de-escalate from the sustained stressor. Without these mechanisms available, older adults must rely on physiological tolerance to stress, which research shows generally decreases with age. Charles (2010) outlines the physiological details of age-related changes that result in the body being less capable of reducing stress levels with increased age, including changes in the cardiovascular, neuroendocrine, and immune systems, as well as greater inflexibility to regulate activity in the hypothalamic-pituitary-adrenal (HPA) axis. As a result of these age-related changes, older adults lack the physiological flexibility to recover from high levels of sustained arousal compared to

younger adults and, therefore, experience reductions in overall well-being. With the new DSM-5 gambling criteria capturing a greater number of gamblers as disordered, the SAVI theory would suggest that older adults with mild gambling severity experience sustained physical or emotional stressors that result in lower levels of overall well-being and, therefore, more comorbid mental health conditions than young adults who maintain the ability to physiologically down-regulate responses to stressors.

Finally, the timing of gambling onset needs to be considered as a potential factor for age-related comorbidity differences. For older adults, time of onset can be conceptually dichotomized into two groups: those exhibiting symptoms of disordered gambling early in life and those who developed a gambling disorder in later life. These two groups (early and late onset) would likely present differently in terms of motives, behaviors, primary- versus secondary-use, and co-occurring disorders, the last of which may relate to further individual aspects like personality or dysfunction. Within the older group, the increased DSM-5 scope may have potentially captured more gamblers using gambling to self-medicate in response to unavoidable stressors or life changes compared to other age groups, who may differ in their motivation for gambling or in the means by which they choose to self-medicate in response to stressors. Previous research on other forms of addiction and long-term stressors supports this age-related differentiation as findings show that motivation for substance use differs across the lifespan. For example, Huag and colleagues (2017) demonstrated that cannabis use was most commonly used to relieve boredom in younger adults, as an insomnia aid in middle-aged adults, and to cope with chronic conditions in older adults.

Our results showed a non-significant trend toward reduced comorbidity from DSM-IV to DSM-5 in the young and middle-aged groups as well as in the overall sample. Those concerned about the effects of diagnostic inflation due to DSM-5 changes would argue that including those

who were once sub-threshold gamblers would widen the net of what defines pathological gambling, thereby weakening the overall severity associated with an actual diagnosable disorder. Instead of capturing those who are suffering most from their condition, and therefore most in need of treatment, diagnostic inflation proponents would argue that the change now includes members of the 'worried well' group, who may have relatively low levels of pathology but can take mental health resources away from those experiencing greater psychological distress. The opposing perspective would argue that mild forms of disorders should not be ignored in the DSM as mental disorders vary in severity and may change within an individual over time (Kessler et al., 2003). The findings of the current study suggest that concerns of diagnostic inflation are largely unfounded when viewing the sample without age considerations. Furthermore, findings from the older age group would suggest that the opposite is true, with higher levels of comorbid severity observed using DSM-5 criteria.

Determining where the line of 'disordered' gambling falls along the continuum of gambling behaviors has been a longstanding issue, with research frequently utilizing different operational definitions of 'problem' or 'pathological' gambling. These two terms are used liberally but often with differing operational definitions across research studies. Commonly employed gambling measurements, including DSM criteria, Seven Oaks Gambling Screen (SOGS), and Problem Gambling Severity Index (PGSI), each assess gambling severity with a unique operational definition. Across measures, gambling research has regularly utilized sub-threshold gamblers in order to increase statistical power. This inclusion of sub-threshold gamblers is supported by previous research which has found sub-threshold gamblers to be more akin to pathological gamblers than to recreational gamblers (Cox, Enns, & Michaud, 2004). The findings of this study suggest that other factors, including age, are important to consider when determining what level of gambling severity should be considered clinically significant as the

severity of comorbid disorders may change dramatically across these other factors with even slight changes to the definition of a gambling disorder.

Limitations

This study utilized the largest community survey of problem gambling available. The survey followed strict protocol in its administration and had a strong response rate. Despite the strengths of the survey and the study, the results of this research should be viewed in light of a number of limitations. First, despite the large overall sample, the number of disordered gamblers was relatively small, especially within the oldest age group. The small samples of individuals meeting DSM gambling criteria within each age group limit the ability to reliably examine age differences in those meeting DSM-IV versus DSM-5 criteria. Second, Wave 1 of the NESARC assessed psychological disorders using DSM-IV-TR diagnostic criteria. Despite the ability to use the available information to accurately assess DSM-5 criteria for disordered gambling, the same could not be done for the remaining psychiatric disorders. While the use of DSM-IV comorbid disorders is not ideal, a better alternative was not available at this time and others have used this sub-optimal approach with NESARC data (e.g., Parhami, Mojtabai, Rosenthal, Afifi, & Fong, 2014). Future research employing DSM-5 criteria for all mental disorders is needed to address this limitation. Third, as is commonly the case with large-scale epidemiologic surveys, trained lay-interviewers conducted diagnostic interviews with the AUDADIS-IV. Fortunately, research has found few differences between trained-lay interviews and medical doctors when diagnosing disorders using structured interviews (Amstadter et al., 2010). Finally, the age of data, collected from 2001-02, is a further limitation to the NESARC. While a third wave of the NESARC was collected from 2012-13, it did not use the same participants from the first two waves and did not assess for gambling related variables (Grant, Amsbary, & Chu, 2014). In the time since data collection, gambling has become increasingly accessible through a variety of means, including

the legalization and expansion of state and provincial lotteries and the proliferation of online gambling websites (Horváth & Paap, 2012). However, prevalence rates of disordered gambling remained stable from 1999/2000 to 2011/2013 in a study of American adults (Welte, Barnes, Tidwell, Hoffman, & Wiczorek, 2015). It is possible that these new forms of gambling may have shifted the overall demographic and diagnostic appearance of disordered gamblers.

Conclusion

In contrast to the hypothesis that the expanded and more inclusive DSM-5 criteria would result in disordered gamblers exhibiting less comorbidity, the findings from the current study suggest that the new criteria do not significantly impact levels of psychiatric comorbidity in younger and middle age adults. Despite the increase in those qualifying for a gambling disorder diagnosis, changes in comorbid disorder severity were only observed in the older adult age group. Among the oldest age group, increased prevalence of comorbid mental health disorders was observed when using the DSM-5 gambling criteria compared to DSM-IV gambling criteria. From a public health perspective, the diagnostic change from DSM-IV to DSM-5 suggests more gamblers within the community may now fall under the 'disordered gambling' umbrella, though the change appears to have minimal impact on disorder rates for gamblers already involved in treatment (Petry et al., 2013; Stinchfield et al., 2015). The findings of the current study suggest that DSM-5 alterations allow for similar treatment methods to be applied with consideration to comorbid difficulties for the overall sample, as well as in younger- and middle-aged adults. The DSM-5 criteria changes also allow for a greater number of people to be identified as being in need of effective treatments through classification as a 'disordered gambler' despite these individuals having less severe clinical presentations. For older adults, treatment providers may be well served to consider the impact of increased comorbidity within the disordered gambling

population, as the presence of co-occurring issues may be critical in terms of understanding gambling disorder etiology and maintenance.

References

- Abdollahnejad, R., Delfabbro, P., & Denson, L. (2014). Psychiatric co-morbidity in problem and pathological gamblers: Investigating the confounding influence of alcohol use disorder. *Addictive Behaviors*, 39(3), 566–572. <http://doi.org/10.1016/j.addbeh.2013.11.004>
- Afifi, T. O., Cox, B. J., Martens, P. J., Sareen, J., & Enns, M. W. (2010). Demographic and social variables associated with problem gambling among men and women in Canada. *Psychiatry Research*, 178(2), 395–400. <http://doi.org/10.1016/j.psychres.2009.10.003>
- Agrawal, A., Heath, A. C., & Lynskey, M. T. (2011). DSM-IV to DSM-5: The impact of proposed revisions on diagnosis of alcohol use disorders. *Addiction*, 106(11), 1935–1943. <http://doi.org/10.1111/j.1360-0443.2011.03517.x>
- Almeida, D. M., & Horn, M. C. (2004). Is daily life more stressful during middle adulthood? In O. G. Brim, C. D. Ryff, & R. C. Kessler (Eds.), *How healthy are we? A national study of well-being at midlife* (pp. 425–451). Chicago, IL: University of Chicago Press.
- American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). Washington, DC.
- Amstadter, A. B., Richardson, L., Acierno, R., Kilpatrick, D. G., Gaboury, M. T., Tran, T. L., ... Thach, T. D. (2010). Does interviewer status matter? An examination of lay interviewers and medical doctor interviewers in an epidemiological study in Vietnam. *International Perspectives in Victimology*, 5(1), 55.
- Blanco, C., Hasin, D. S., Petry, N., Stinson, F. S., & Grant, B. F. (2006). Sex differences in subclinical and DSM-IV pathological gambling: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Psychological Medicine*, 36(7), 943–953. <http://doi.org/10.1017/S0033291706007410>
- Bolton, D. (2013). Overdiagnosis problems in the DSM-IV and the new DSM-5: Can they be

resolved by the distress-impairment criterion? *Canadian Journal of Psychiatry*, 58(11), 612–617.

- Charles, S. T. (2010). Strength and vulnerability integration: A model of emotional well-being across adulthood. *Psychological Bulletin*, 136(6), 1068–91. <http://doi.org/10.1037/a0021232>
- Cox, B. J., Enns, M. W., & Michaud, V. (2004). Comparisons between the South Oaks Gambling Screen and a DSM-IV-based interview in a community survey of problem gambling. *Canadian Journal of Psychiatry*, 49(4), 258–64.
- Dowling, N. A., Cowlishaw, S., Jackson, A. C., Merkouris, S. S., Francis, K. L., & Christensen, D. R. (2015). Prevalence of psychiatric co-morbidity in treatment-seeking problem gamblers: A systematic review and meta-analysis. *The Australian and New Zealand Journal of Psychiatry*. <http://doi.org/10.1177/0004867415575774>
- el-Guebaly, N., Patten, S. B., Currie, S., Williams, J. V. A., Beck, C. A., Maxwell, C. J., & Wang, J. L. (2006). Epidemiological associations between gambling behavior, substance use & mood and anxiety disorders. *Journal of Gambling Studies*, 22(3), 275–287. <http://doi.org/10.1007/s10899-006-9016-6>
- Ferris, J., & Wynne, H. (2001a). *The Canadian problem gambling index: Final report*. Ottawa, ON.
- Ferris, J., & Wynne, H. (2001b). *The Canadian problem gambling index: User manual*. Ottawa, ON.
- Gerstein, D., Murphy, S., Toce, M., Volberg, R., Harwood, H., Tucker, A., ... Sinclair, S. (1999). Gambling impact and behavior study: Report to the National Gambling Impact Study Commission.
- Giddens, J. L., Stefanovics, E., Pilver, C. E., Desai, R., & Potenza, M. N. (2012). Pathological gambling severity and co-occurring psychiatric disorders in individuals with and without

- anxiety disorders in a nationally representative sample. *Psychiatry Research*, 199(1), 58–64.
<http://doi.org/10.1016/j.psychres.2012.03.052>
- Gonçalves, D. C., & Byrne, G. J. (2013). Who worries most? Worry prevalence and patterns across the lifespan. *International Journal of Geriatric Psychiatry*, 28(1), 41–9.
<http://doi.org/10.1002/gps.3788>
- Grant, B., Amsbary, M., & Chu, A. (2014). *Source and accuracy statement: National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III)*. Rockville, MD.
- Grant, B. F., & Dawson, D. A. (2006). Introduction to the National Epidemiologic Survey on Alcohol and Related Conditions. *Alcohol Research & Health*, 29(2), 74–78.
- Grant, B. F., Dawson, D. A., Stinson, F. S., Chou, P. S., Kay, W., & Pickering, R. (2003). The Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADIS-IV): reliability of alcohol consumption, tobacco use, family history of depression and psychiatric diagnostic modules in a general population sample. *Drug and Alcohol Dependence*, 71(1), 7–16.
- Grant, B. F., Stinson, F. S., Dawson, D. A., Chou, P., Dufour, M. C., Compton, W., ... Kaplan, K. (2004). Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: Results From the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of General Psychiatry*, 61(8), 807–816.
<http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1001/archpsyc.61.8.807>
- Grant, J. E., & Chamberlain, S. R. (2015). Gambling disorder and its relationship with substance use disorders: implications for nosological revisions and treatment. *The American Journal on Addictions*, 24(2), 126–31. <http://doi.org/10.1111/ajad.12112>
- Grant, J. E., Odlaug, B. L., & Chamberlain, S. R. (2017). Gambling disorder, DSM-5 criteria and

symptom severity. *Comprehensive Psychiatry*, 75, 1–5.

<http://doi.org/10.1016/j.comppsy.2017.02.006>

Hasin, D. S., Stinson, F. S., Ogburn, E., & Grant, B. F. (2007). Prevalence, correlates, disability, and comorbidity of DSM-IV alcohol abuse and dependence in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of General Psychiatry*, 64(7), 830–842.

<http://doi.org/http://dx.doi.org.proxy2.lib.umanitoba.ca/10.1001/archpsyc.64.7.830>

Haug, N. A., Padula, C. B., Sottile, J. E., Vandrey, R., Heinz, A. J., & Bonn-Miller, M. O. (2017). Cannabis use patterns and motives: A comparison of younger, middle-aged, and older medical cannabis dispensary patients. *Addictive Behaviors*, 72, 14–20.

<http://doi.org/10.1016/j.addbeh.2017.03.006>

Hayatbakhsh, M. R., Clavarino, A., Williams, G. M., Bor, W., & Najman, J. M. (2012). Young adults' gambling and its association with mental health and substance use problems. *Australian and New Zealand Journal of Public Health*, 36(2), 160–166.

<http://doi.org/10.1111/j.1753-6405.2011.00815.x>

Horváth, C., & Paap, R. (2012). The effect of recessions on gambling expenditures. *Journal of Gambling Studies*, 28(4), 703–17. <http://doi.org/10.1007/s10899-011-9282-9>

Johnston, G. (1996). *Repeated measures analysis with discrete data using the SAS system*. Cary, NC.

Kessler, R. C., Merikangas, K. R., Berglund, P., Eaton, W. W., Koretz, D. S., & Walters, E. E. (2003). Mild disorders should not be eliminated from the DSM-V. *Archives of General Psychiatry*, 60(11), 1117. <http://doi.org/10.1001/archpsyc.60.11.1117>

Kudlow, P. (2013). The perils of diagnostic inflation. *Canadian Medical Association Journal*, 185(1), E25-6. <http://doi.org/10.1503/cmaj.109-4371>

- Lesieur, H. R., & Blume, S. B. (1987). The South Oaks Gambling Screen (SOGS): a new instrument for the identification of pathological gamblers. *The American Journal of Psychiatry*, 144(9), 1184–8.
- Lorains, F. K., Cowlishaw, S., & Thomas, S. A. (2011). Prevalence of comorbid disorders in problem and pathological gambling: Systematic review and meta-analysis of population surveys. *Addiction*, 106(3), 490–498. <http://doi.org/10.1111/j.1360-0443.2010.03300.x>
- Lynch, W. J., Maciejewski, P. K., & Potenza, M. N. (2004). Psychiatric correlates of gambling in adolescents and young adults grouped by age at gambling onset. *Archives of General Psychiatry*, 61(11), 1116–22. <http://doi.org/10.1001/archpsyc.61.11.1116>
- Nelson, S. E., Gebauer, L., LaBrie, R. A., & Shaffer, H. J. (2009). Gambling problem symptom patterns and stability across individual and timeframe. *Psychology of Addictive Behaviors*, 23(3), 523–533. <http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1037/a0016053>
- Nower, L., & Blaszczynski, A. (2008). Characteristics of problem gamblers 56 years of age or older: A statewide study of casino self-excluders. *Psychology and Aging*, 23(3), 577–84. <http://doi.org/10.1037/a0013233>
- Parhami, I., Mojtabai, R., Rosenthal, R. J., Afifi, T. O., & Fong, T. W. (2014). Gambling and the onset of comorbid mental disorders: A longitudinal study evaluating severity and specific symptoms. *Journal of Psychiatric Practice*, 20(3), 207–19. <http://doi.org/10.1097/01.pra.0000450320.98988.7c>
- Petry, N. M. (2002). A comparison of young, middle-aged, and older adult treatment-seeking pathological gamblers. *The Gerontologist*, 42(1), 92–9.
- Petry, N. M., Blanco, C., Auriacombe, M., Borges, G., Bucholz, K., Crowley, T. J., ... O'Brien, C. (2014). An overview of and rationale for changes proposed for pathological gambling in DSM-5. *Journal of Gambling Studies*, 30(2), 493–502. <http://doi.org/10.1007/s10899-013->

9370-0

- Petry, N. M., Blanco, C., Jin, C., & Grant, B. F. (2014). Concordance between gambling disorder diagnoses in the DSM-IV and DSM-5: Results from the National Epidemiological Survey of Alcohol and Related Disorders. *Psychology of Addictive Behaviors : Journal of the Society of Psychologists in Addictive Behaviors*, 28(2), 586–91.
<http://doi.org/10.1037/a0034661>
- Petry, N. M., Blanco, C., Stinchfield, R., & Volberg, R. (2013). An empirical evaluation of proposed changes for gambling diagnosis in the DSM-5. *Addiction (Abingdon, England)*, 108(3), 575–81. <http://doi.org/10.1111/j.1360-0443.2012.04087.x>
- Petry, N. M., Stinson, F. S., & Grant, B. F. (2005). Comorbidity of DSM-IV pathological gambling and other psychiatric disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *The Journal of Clinical Psychiatry*, 66(5), 564–74.
- Pietrzak, R. H., Molina, C. A., Ladd, G. T., Kerins, G. J., & Petry, N. M. (2005). Health and psychosocial correlates of disordered gambling in older adults. *The American Journal of Geriatric Psychiatry : Official Journal of the American Association for Geriatric Psychiatry*, 13(6), 510–9. <http://doi.org/10.1176/appi.ajgp.13.6.510>
- Rash, C. J., Weinstock, J., & Van Patten, R. (2016). A review of gambling disorder and substance use disorders. *Substance Abuse and Rehabilitation*, 7, 3–13.
<http://doi.org/10.2147/SAR.S83460>
- Reilly, C., & Smith, N. (2013). *The evolving definition of pathological gambling in the DSM-5*. Beverly, MA.
- Rennert, L., Denis, C., Peer, K., Lynch, K. G., Gelernter, J., & Kranzler, H. R. (2014). DSM-5 gambling disorder: prevalence and characteristics in a substance use disorder sample. *Experimental and Clinical Psychopharmacology*, 22(1), 50–6.

<http://doi.org/10.1037/a0034518>

Reynolds, K., Pietrzak, R. H., El-Gabalawy, R., Mackenzie, C. S., & Sareen, J. (2015).

Prevalence of psychiatric disorders in U.S. older adults: Findings from a nationally representative survey. *World Psychiatry : Official Journal of the World Psychiatric Association (WPA)*, 14(1), 74–81. <http://doi.org/10.1002/wps.20193>

Schulte, M. T., & Hser, Y.-I. (2014). Substance use and associated health conditions throughout the lifespan. *Public Health Reviews*, 35(2), 1–27.

<http://doi.org/10.1146/annurev.publhealth.23.100901.140532>

Shaffer, H. J., & Korn, D. A. (2002). Gambling and related mental disorders: a public health analysis. *Annual Review of Public Health*, 23(1), 171–212.

<http://doi.org/10.1146/annurev.publhealth.23.100901.140532>

Sleczka, P., Braun, B., Piontek, D., Bühringer, G., & Kraus, L. (2015). DSM-5 criteria for gambling disorder: Underlying structure and applicability to specific groups of gamblers. *Journal of Behavioral Addictions*, 4(4), 226–35. <http://doi.org/10.1556/2006.4.2015.035>

Stinchfield, R. (2003). Reliability, validity, and classification accuracy of a measure of DSM-IV diagnostic criteria for pathological gambling. *The American Journal of Psychiatry*, 160(1), 180–2. <http://doi.org/10.1176/appi.ajp.160.1.180>

Stinchfield, R., Govoni, R., & Frisch, G. R. (2005). DSM-IV diagnostic criteria for pathological gambling: Reliability, validity, and classification accuracy. *The American Journal on Addictions*, 14(1), 73–82. <http://doi.org/10.1080/10550490590899871>

Stinchfield, R., McCreedy, J., Turner, N. E., Jiménez-Murcia, S., Petry, N. M., Grant, J., ...

Winters, K. C. (2015). Reliability, validity, and classification accuracy of the DSM-5 diagnostic criteria for gambling disorder and comparison to DSM-IV. *Journal of Gambling Studies*. <http://doi.org/10.1007/s10899-015-9573-7>

- Toce-Gerstein, M., Gerstein, D. R., & Volberg, R. A. (2003). A hierarchy of gambling disorders in the community. *Addiction*, 98(12), 1661–1672.
<http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1111/j.1360-0443.2003.00545.x>
- Welte, J., Barnes, G., Tidwell, M., & Hoffman, J. (2008). The prevalence of problem gambling among U.S. adolescents and young adults: Results from a national survey. *Journal of Gambling Studies*, 24, 119–133. <http://doi.org/10.1007/s10899-007-9086-0>
- Welte, J. W., Barnes, G. M., Tidwell, M.-C. O., & Hoffman, J. H. (2011). Gambling and problem gambling across the lifespan. *Journal of Gambling Studies*, 27(1), 49–61.
<http://doi.org/10.1007/s10899-010-9195-z>
- Welte, J. W., Barnes, G. M., Tidwell, M.-C. O., Hoffman, J. H., & Wieczorek, W. F. (2015). Gambling and problem gambling in the United States: Changes between 1999 and 2013. *Journal of Gambling Studies*, 31(3), 695–715. <http://doi.org/10.1007/s10899-014-9471-4>
- Westerhof, G. J., & Keyes, C. L. M. (2010). Mental illness and mental health: The two continua model across the lifespan. *Journal of Adult Development*, 17(2), 110–119.
<http://doi.org/10.1007/s10804-009-9082-y>
- Zimmerman, M., Chelminski, I., & Young, D. (2006). A psychometric evaluation of the DSM-IV pathological gambling diagnostic criteria. *Journal of Gambling Studies*, 22(3), 329–337.
<http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1007/s10899-006-9020-x>

CHAPTER THREE

STUDY TWO

An Examination of Comorbid Psychiatric Disorders in Disordered Gamblers Versus Other
Substance-Related Disorders

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Abstract

Substantial changes were made with the creation of the Substance Related and Addictive Disorders category in the fifth edition of the Diagnostic and Statistical Manual (DSM-5), including the addition of disordered gambling to the category and a reduction in the minimum threshold of diagnostic criteria required for gambling. As gambling shares many similarities with substance use disorders, it stands to reason that comorbidity rates of other psychiatric disorders would be similar among gambling and substance use disorders. The current study examines whether changes in gambling diagnostic criteria from DSM-IV to DSM-5 correspond to changes in prevalence of comorbid psychiatric disorders among disordered gamblers that result in prevalence rates more similar to those observed in alcohol and cannabis use disorders. This study utilized data from the National Epidemiological Survey for Alcohol and Related Conditions (NESARC). Results suggested that the prevalence for any comorbid disorder among disordered gamblers appeared to be similar from DSM-IV (56.7%) to DSM-5 (53.7%) disordered gambling. Comorbidity using DSM-5 criteria were just slightly closer to, but still noticeably higher than, comorbidity prevalence observed in alcohol (25.3%) and cannabis (37.7%) disorders. Similar trends were observed in most examined comorbid disorders/groupings. Our findings suggest that lowering the threshold for minimum diagnosis of gambling disorder resulted in a slight decrease in comorbidity rates though substantial differences remain between comorbid rates of disordered gambling and substance use disorders. Future DSM editions may consider a further diagnostic threshold reduction, which might result in comorbidity rates being more similar to other substance use disorders and increasing disorder similarity within the Substance Related and Addictive Disorders category.

Introduction

The majority of adults who engage in some form of gambling do so in a non-problematic manner, though a subsection of gamblers experience a sufficient number of associated negative symptoms related to their gambling behaviors that they qualify for a diagnosis of disordered gambling (Welte, Barnes, Tidwell, & Hoffman, 2008). In 2013, the American Psychiatric Association (APA) released the Diagnostic and Statistical Manual – 5th edition (DSM-5), which reclassified disordered gambling from an 'impulse control disorder' to a new group with substance use disorders called 'Substance Related and Addictive Disorders' (APA, 2013a). This change was made primarily due to a litany of similarities existing between problematic gambling use and substance use disorders, including symptomatology, genetics, biology, and both psychological and pharmacological treatment (Hasin et al., 2013). With these noted similarities, one might expect prevalence rates of comorbid disorders to be relatively similar between gambling and substance use disorders, such as alcohol and cannabis. The current study examines whether moving from DSM-IV to DSM-5 disordered gambling is associated with a change in comorbid psychiatric disorder prevalence among disordered gamblers that results in greater similarity to those observed in substance use disorders, particularly alcohol and cannabis use disorders.

Disordered Gambling

Disordered gambling is defined by the DSM-5 as “persistent and recurrent problematic gambling behavior leading to clinically significant impairment or distress” (APA, 2013a). A multi-national examination of prevalence data suggests that between 0.8% and 1.8% of adults experience a gambling disorder with an additional 1.2% to 2.4% engaging in problem gambling behaviors (Stucki & Rihs-Middel, 2007). Other estimates of pathological gambling estimate

lifetime prevalence rates of between 0.4% and 2.0% (Petry, Stinson, & Grant, 2005; Welte, Barnes, Wieczorek, Tidwell, & Parker, 2001).

Prior to the publication of the DSM-5 (APA, 2013a), the DSM-IV had categorized pathological gambling as an 'impulse-control disorder not otherwise specified' (APA, 2000). Among the goals of the DSM-5 were to improve the metastructure of disorders based on shared characteristics including genetics, clinical risks, neuroscience, clinical experience, and various other factors, rather than by DSM-IV's 'descriptive and phenomenological approach' (Regier, Kuhl, & Kupfer, 2013). Considering these factors, gambling addiction bore little resemblance to other disorders within the impulse-control disorders category, many of which were more focused on the body and/or repetitive behavioral impulses (e.g., body dysmorphic disorder and trichotillomania). Rather, reviews of clinical, neurological, and genetic evidence supported the reclassification of gambling in the DSM-5 in a new category entitled 'Substance-Related Disorders and Addictive Disorders', along with alcohol use, cannabis use, and other traditionally conceptualized substance use disorders (APA, 2013a; Petry, 2006; Potenza, 2006; Potenza, Koran, & Pallanti, 2009). Other non-substance disorders were considered for inclusion in this category; however, none were listed in DSM-5, though Internet gaming disorder was listed as a condition requiring further study (Petry & O'Brien, 2013).

Substance-Related Disorders

Alcohol. The majority of North American adults consume alcohol with estimates from the past 25 years suggesting 56% to 67% of adults aged 18 years and above drink alcohol with the majority of usage being non-problematic (Newport, 2010). Epidemiological studies estimate the lifetime prevalence of alcohol abuse to be between 9.4% and 17.8%. (Grant, Dawson, et al., 2004; Hasin et al., 2007; Kessler et al., 1994, 1997, 2005b; Stein, Torgrud, & Walker, 2000). The DSM-IV-TR specified two alcohol use disorders (alcohol dependence and alcohol abuse), both of

which were characterized by maladaptive patterns of alcohol consumption resulting in significant life impairments with alcohol dependence considered the more severe of the two (APA, 2000). Together, these two alcohol use disorders were among the most common DSM-IV psychological disorders. Changes from the DSM-IV to the DSM-5 eliminated the distinction between abuse and dependence, instead measuring substance use disorders on a continuum from mild to severe (APA, 2013b). Certain demographic risk factors have been linked to higher rates of alcohol use disorders, including being male, younger in age, of White or Native American ethnicity, and not being married (Grant, Dawson, et al., 2004; Hasin et al., 2007).

Cannabis. Cannabis is the most commonly used illicit (or partially illicit) substance in North America (Compton, Thomas, Stinson, & Grant, 2007) with 12.3% of Canadians age 15 years and older reporting past-year use in 2015 (Statistics Canada, 2017) and 13.2% of Americans age 12 years and older with past-year use in 2014 (Azofeifa et al., 2016). Along with increased past-year use, rates of marijuana use disorders have increased in recent years with prevalence estimates suggesting a near doubling in rates of marijuana use disorders from 2001-02 to 2012-13 across most demographic groupings (Hasin et al., 2015).

The increase in marijuana usage and disorder prevalence has been attributed to a variety of factors. Some have proposed the increases in usage and disorder prevalence may be related to the heightened potency of the active ingredient Δ^9 -THC in available marijuana strains (Compton et al., 2007). More recent research, however, has implicated easier access, changing attitudes, and continually expanding medical marijuana laws in the increase of cannabis use disorders (Bonn-Miller, Harris, & Trafton, 2012; Hasin, 2018; Hasin et al., 2017; Kerridge et al., 2017). Age is a particularly important factor to consider in connecting these potential sources of increased marijuana use and disorder prevalence. Odds of past-year cannabis use disorder were higher in younger adults (18-29 years old) than older adults (45 years and older) (Hasin et al.,

2016). Further, younger adults demonstrated an increase in cannabis use disorder prevalence over a 10-year period that was significantly greater than the increase observed in the older adult age group. Hasin and colleagues (2016) noted that the overall increase and age-related differences observed in usage and disorders were consistent with research on attitude towards recreational cannabis legalization (Motel, 2015).

Similarities Between Disordered Gambling and Substance Use Disorders

Publication of the DSM-5 resulted in substantial revisions to diagnostic criteria in both traditionally conceptualized substance use disorders (e.g., alcohol and cannabis) and gambling. For the traditional substance use disorders, the DSM-5 removed the distinction between 'abuse' and 'dependence', instead creating a single amalgamated category based on evidence suggesting these disorders are better conceptualized within a continuum. In the DSM-5, severity is measured via the number of criteria endorsed (Hasin, Fenton, Beseler, Park, & Wall, 2012; Robinson & Adinoff, 2016).

Gambling was reclassified as a substance-related disorder largely due to the similarities between disordered gambling and substance use disorders. Gambling addiction was renamed from 'pathological gambling' in DSM-IV to 'disordered gambling' in DSM-5 in an attempt to reduce stigma associated with the term 'pathological' (Grant & Chamberlain, 2015). More substantially, the diagnostic criteria for a gambling disorder was modified from DSM-IV to DSM-5 with the elimination of the 'illegal acts' criterion and reduction in the minimum threshold required to qualify for a diagnosis from five to four (APA, 2013a). Further threshold reduction was considered, though ultimately decided against due to concerns about a significant increase in prevalence without substantial evidence that changes led to an improvement in diagnostic ability (Hasin et al., 2013). Consistent criteria overlap has existed between gambling and other substance use since the initial development of pathological gambling in DSM-III as these

original criteria were largely shaped by substance use criteria at that time (Lesieur & Rosenthal, 1991). However, the DSM-5 substance use disorder workgroup chose to modify the DSM-IV criteria for gambling rather than adopt criteria similar to other substance disorders within the DSM-5 substance-related disorder group (Schuckit, 2013).

Three symptom clusters have been proposed as a means of connecting diagnostic similarities between gambling and other substance use disorders: loss of control, craving/withdrawal, and areas of life neglect (Romanczuk-Seiferth, van den Brink, & Goudriaan, 2014). Beyond the behavioral indications of individual diagnostic criteria found within each cluster, Romanczuk-Seiferth and colleagues (2014) argue these three symptom clusters are related to commonly examined 'experimental paradigms' from neurobiology, with loss of control relating to executive control and response inhibition, craving and withdrawal associating with attentional bias and cue reactivity, and neglect of other life areas relating to reward processing. As indicated by diagnostic criteria, these similarities are manifested through symptoms such as cravings, urges to engage due to environmental cues and triggers, and the impact of the addiction on individuals including work and family disturbances, financial difficulties, and increased rates of hospitalization and suicide. Beyond symptomatology, recent review articles highlight numerous common characteristics between gambling and other forms of substance use disorders including etiology and course (Grant & Chamberlain, 2015; Rash, Weinstock, & Van Patten, 2016; Romanczuk-Seiferth et al., 2014). These similarities include higher prevalence in men, frequent early onset of initial use followed by problematic use in early adulthood, and similar lifetime disorder trajectories with prevalence rates higher in young adulthood and lower in older adults (Chambers & Potenza, 2003; McGorry, Purcell, Goldstone, & Amminger, 2011; Slutske, 2006). Research also suggests the similarities between gambling and substance use extends to

neurobiology, specifically reward pathways and personality (Slutske, Caspi, Moffitt, & Poulton, 2005; Zack et al., 2017).

Comorbidity Within Gambling and Substance Use Disorders

Approximately half of Americans will qualify for a DSM-IV diagnosis in their lifetime (Kessler, Berglund, et al., 2005). Of those currently experiencing a DSM-IV diagnosis, just under half (45%) met criteria for at least one other diagnosis (Kessler, Chiu, et al., 2005). High rates of comorbidity are consistently observed within substance use disorders, including gambling, alcohol, and cannabis (e.g., Brady, Haynes, Hartwell, & Killeen, 2013; Grant & Chamberlain, 2015; Hasin, Stinson, Ogburn, & Grant, 2007; Kessler, Chiu, Demler, Merikangas, & Walters, 2005; Kessler, Crum, Warner, & Nelson, 1997; Quello, Brady, & Sonne, 2005). Among individuals experiencing a substance use disorder, mood and anxiety disorders are the most common psychiatric comorbidities (Brady et al., 2013; Quello et al., 2005).

Gambling and comorbid disorders. Gambling has been strongly correlated with mood, anxiety, and personality disorders (e.g., Black & Moyer, 1998; Crockford & El-Guebaly, 1998). As many as 96% of individuals with a diagnosed lifetime gambling disorder diagnosis have met the criteria for at least one other lifetime psychiatric disorder (Rash et al., 2016). Problem gamblers, including those with subthreshold gambling problems, exhibited high levels of comorbidity with any anxiety disorder (37.4%) and any mood disorder (37.9%; Lorains, Cowlshaw, & Thomas, 2011). Comorbidity is increased in individuals in treatment for gambling with any current mood disorder (23.1%), any current alcohol or substance use disorder (22.2%), and any current anxiety disorder (17.6%) all found to be significantly associated (Dowling et al., 2015).

The severity of gambling symptoms plays a role in the development and prevalence of psychiatric disorders (Parhami, Mojtabai, Rosenthal, Afifi, & Fong, 2014). In a longitudinal

examination of gambling outcomes, individuals who reported any level of gambling participation at baseline were at increased risk for any mood, any anxiety, and any substance use disorder compared to non-gamblers three years later. Similarly, the severity of gambling involvement at baseline was also associated with increased risk as those with a gambling disorder were more likely to develop a psychiatric disorder than those who met the criteria for a less-severe, sub-threshold gambling disorder.

Alcohol and comorbid disorders. Research has repeatedly demonstrated strong correlations between alcohol use disorders and anxiety disorders (e.g., Brady et al., 2013; Hasin et al., 2007; Kessler et al., 1996; Merikangas et al., 1998; Regier et al., 1990; Sareen, McWilliams, Cox, & Stein, 2004), with specific comorbidity prevalence varying based on the anxiety disorder examined and whether alcohol abuse or dependence is being differentiated. The impact of comorbidity on future outcomes may be best described by findings from in-patient alcohol disorder treatment, where a co-occurring decrease in anxiety disorder prevalence was observed after a period of sobriety spanning six or more treatment sessions (Denney & Baugh, 1992). Similarly, in studies of individuals who have completed alcohol treatment programs, later incidence of stress or psychiatric distress and increases in anxiety symptoms were found to be associated with higher rates of relapse (Brown, Vik, Patterson, Grant, & Schuckit, 1995; Driessen et al., 2001; Tómasson & Vaglum, 1996).

Akin to the relationship with anxiety, alcohol use disorders have also been strongly associated with mood disorders (Blanco et al., 2012; Cho et al., 2002; Grant & Harford, 1995; Harrington, Robinson, Bolton, Sareen, & Bolton, 2011; Hasin & Grant, 2002; Kenneson, Funderburk, & Maisto, 2013; Pacek, Martins, & Crum, 2013). Among mood disorders, the bipolar disorders are thought to have the strongest association with alcohol use disorders (Merikangas et al., 2008) with a systematic review of alcohol-bipolar literature stating that

approximately 30 to 35% of individuals with a bipolar disorder also presented with an alcohol use disorder (Di Florio, Craddock, & van den Bree, 2014). The review also found that those presenting with a bipolar disorder were anywhere between 2.5 and 5.1 times as likely to develop an alcohol use disorder when compared to the general population.

Cannabis and comorbid disorders. The vast majority of research on psychiatric disorders and substance use disorders has focused on alcohol, which makes sense given the long history and availability of alcohol in Western society. However, marijuana is receiving increased attention in research regarding substance use and comorbidity. Both cross-sectional and longitudinal studies have found associations between cannabis use disorders and other substance use disorders, including alcohol (e.g., Blanco et al., 2016; Cougle, Hakes, Macatee, Zvolensky, & Chavarria, 2016; Hayley, Stough, & Downey, 2017).

The correlation between cannabis use disorders and other psychiatric disorders, specifically mood and anxiety disorders, has been well established in the literature (e.g., Burns & Teesson, 2002; Chen, Wagner, & Anthony, 2002; Feingold, Weiser, Rehm, & Lev-Ran, 2014; Grant et al., 2004; Hasin et al., 2016; Pacek et al., 2013; Teesson, Hall, Lynskey, & Degenhardt, 2000). However, findings regarding the directionality of the relationship between psychiatric conditions and cannabis use disorder have been mixed. Some have found evidence for cannabis use disorders leading to incident depression (Bovasso, 2001; Fergusson & Horwood, 1997; van Laar, van Dorsselaer, Monshouwer, & de Graaf, 2007) and anxiety (Degenhardt et al., 2013) while other studies have found no evidence of cannabis use leading to new mood or anxiety disorders (Blanco et al., 2016). Others suggest that the use of cannabis as a means of coping with negative emotions or psychological distress, including mood or anxiety, is associated with the development of a cannabis use disorder (Feingold et al., 2014; Moitra, Christopher, Anderson, & Stein, 2015; Pacek et al., 2013). It is important to note that many of the significant findings from

longitudinal studies examining causality between psychiatric conditions and cannabis use have found that associations were no longer significant after adjusting for confounding variables (Danielsson, Lundin, Agardh, Allebeck, & Forsell, 2016; Feingold, Rehm, & Lev-Ran, 2017; Stapinski, Montgomery, & Araya, 2016; van Laar et al., 2007).

Gambling, Substance Use, and Comorbidity

As previously discussed, gambling shares a number of commonalities with substance use disorders, including diagnostic themes, genetics, and neurobiology (Grant & Chamberlain, 2015; Petry, 2007). As such, it makes sense that disordered gambling and substance use disorders frequently co-occur (Grant & Chamberlain, 2015). Approximately 25% of lifetime pathological gamblers currently meet criteria for alcohol dependence (Welte et al., 2001) with pathological gamblers being about five times more likely to have co-occurring alcohol dependence compared to non-pathological gamblers (Petry et al., 2005). Other substance use disorders also occur frequently with gambling; one study found that 38.1% of pathological gamblers had a comorbid illicit drug use disorder compared to only 8.8% of non-gamblers (Petry et al., 2005). The associations between gambling and substance use may appear as early as adolescence with a literature review finding that gambling was associated with both alcohol use and illicit drug use in seven of eight studies examined (Peters et al., 2015). Research on the temporal relationship between gambling and substance use is limited and mixed with some evidence suggesting gambling precedes substance use (Hall et al., 2000) while other research suggests the opposite (Cho et al., 2002).

Current Study

The primary reasoning behind the DSM-5 reorganization of gambling into the same category as substance use disorders was to improve the metastructure of disorders based on shared characteristics (Petry et al., 2014). Diagnostic changes in gambling from DSM-IV to

DSM-5 have led to an increase in disordered gambling prevalence (Denis, Fatséas, & Auriacombe, 2012; Rennert et al., 2014; Temcheff, Paskus, Potenza, & Derevensky, 2016). As a result, the prevalence of comorbid psychiatric disorders may have potentially changed as well. The current study examines whether changes in gambling diagnostic criteria from DSM-IV to DSM-5 correspond to changes in prevalence of comorbid psychiatric disorders among disordered gamblers that result in prevalence being more similar to those observed in alcohol and cannabis use disorders. With research supporting the similarities between gambling and other forms of substance use disorders, we expect that the prevalence of comorbid psychiatric disorders will be similar between gambling, alcohol, and cannabis, with the DSM-5 form of gambling having comorbidity prevalence closer to those of alcohol and cannabis disorders, reflecting increased disorder characteristic cohesion within the substance-related and addictive disorders category.

Methods

Participants

The National Epidemiological Survey for Alcohol and Related Conditions (NESARC) is a structured survey of American adults aged 18 years and older. Trained lay interviewers collected Wave 1 data between 2001 and 2002 (43,093 participants; 81.0% response rate) and Wave 2 data between 2004 and 2005 (34,635 participants; 86.7% response rate from those eligible to complete Wave 2). The cumulative response rate of both survey waves was 70.2%. Wave 1 of the NESARC includes the largest number of individuals qualifying for a diagnosis of DSM-IV pathological gambling in any nationally representative sample (Nelson, Gebauer, LaBrie, & Shaffer, 2009), making it ideal for use in this study. Sampling procedures and quality control information had been detailed previously (e.g., Grant & Dawson, 2006). For this type of study, formal consent is not required.

Measures

In the NESARC, the Alcohol Use Disorder and Associated Disabilities Interview (AUDADIS-IV) assessed gambling and other psychiatric disorders.

Gambling. Gambling was measured in Wave 1 according to DSM-IV criteria in the past year. Participants responding 'yes' to a screener question asking if they had gambled at least five times within the past year completed the remainder of the gambling items. To examine DSM-IV gambling (APA, 2000), participants endorsing at least five of the ten DSM-IV criteria received a diagnosis of a pathological gambling disorder. To examine gambling as defined in the DSM-5 (APA, 2013), we created a new DSM-5 gambling variable through elimination of the illegal acts criteria and reduction of the minimum number of criteria required from five to four of the remaining nine items. Both the DSM-IV and the DSM-5 gambling diagnosis variables were dichotomous, resulting in a high degree of overlap between the two gambling variables as all DSM-IV gamblers meet criteria for DSM-5 gambling by definition.

Substance use disorder. Past year substance use disorders were examined in accordance with DSM-IV criteria as per AUDADIS-IV items (Hasin et al., 2007). We combined 'abuse' and 'dependence' into a single 'abuse or dependence' variable for alcohol (AUD) and cannabis (CUD). DSM-5 criteria for alcohol and cannabis use differed from DSM-IV criteria in two notable ways (APA, 2013a; Kelly et al., 2014; Mewton, Slade, & Teesson, 2013; National Institute on Alcohol Abuse and Alcoholism, 2013). First, the criterion related to legal problems was removed, similar to the removal of the illegal acts criterion from gambling. Second, a criterion regarding cravings, or a strong desire to use, was added. As it is not possible to replicate the new criterion of craving within the context of the NESARC data set, the alcohol and cannabis use disorder variables will utilize DSM-IV criteria, with abuse and dependence merged into a single category. While the study would ideally use DSM-5 substance use variables, the general

purpose of the study is to determine whether changes in gambling criteria have resulted in comorbidity prevalence reflective of its reclassification as a substance use disorder. As alcohol and cannabis were previously included within this category in earlier DSM iterations, using the DSM-IV criteria for alcohol and cannabis serves the intended purpose for our research question. Similarly, disorder severity, as outlined by new DSM 5 guidelines, will not be incorporated. Test-retest reliability for substance use disorders using the DSM-IV criteria was good within the NESARC ($\kappa = 0.74$; Grant et al., 2003).

Mental disorders. The AUDADIS-IV assessed anxiety disorders (i.e., social anxiety disorder, panic disorder, generalized anxiety disorder, and panic disorder) and mood disorders (i.e., major depression, dysthymia, manic/hypomanic episode) according to DSM-IV criteria (Grant et al., 2004). Reliability for the anxiety and mood disorder diagnoses was fair to good ($\kappa = 0.40 - 0.65$; Grant et al., 2003). For the purposes of this study, disorders were required to be present within the past 12 months prior to either wave of survey administration.

Sociodemographic factors. Information regarding sociodemographic factors included age, sex, marital status, ethnicity, total past year household income, and highest level of education attained. All sociodemographic factors were coded categorically. Participants were asked for their age in years. We categorized participants into three groups: young adults (18 to 34 years old), middle-aged adults (35 to 54 years old), and older adults (55 to 78 years old). The decision to use 55 years of age as the cut-off point between middle-aged and older adults was consistent with previous literature in the geriatric and gambling research fields (e.g., Nower & Blaszczynski, 2008; Petry, 2002; Reynolds, Pietrzak, El-Gabalawy, Mackenzie, & Sareen, 2015). Sex was categorized as 'male' or 'female'. Marital status categories were 'single or never married', 'married or cohabitating', and 'divorced, separated, or widowed'. Ethnicity was categorized into 'White', 'Black', 'American Indian or Alaska Native', 'Asian, Hawaiian, or Pacific Islander', and

'Hispanic'. Total past year income was separated into the following categories: '<\$19,999', '\$20,000 to \$34,999', '\$35,000-\$69,999', and '\$70,000 and above'. Highest level of education attained was categorized into 'less than high school', 'high school diploma or GED', and 'post-secondary education'.

Data Analyses

Weighted frequencies and cross-tabulations were computed to assess sociodemographic factors within each of the four substance use variables (DSM-IV gambling, DSM-5 gambling, alcohol, and cannabis). To examine whether the relationship among longitudinal outcomes of psychiatric disorders differ between gambling, alcohol, and cannabis disorders, logistic regression analyses were employed. Comorbid psychiatric disorders at Wave 2 acted as the dependent variable (DV), each examined within an individual regression analysis. The substance use disorder in question (i.e., DSM-IV gambling, DSM-5 gambling, alcohol, or cannabis) at Wave 1 served as the independent variable (IV). The choice of dependent versus independent variable is not based on a temporal relationship as either disorder could develop first or develop concurrently. The purpose of this study is not the etiology of the disorder but rather a comparison of addiction models with psychiatric disorder deriving as the depending measure to compare the addiction models. Analyses yielded odds ratios (OR) and 95% confidence intervals.

With high degrees of correlation occurring among the four substance use disorders, the models are not uniquely independent from one another. Limiting participant criteria to individuals presenting with only one substance use disorder would limit statistical power and reduce the applicability of any findings to real world scenarios, where comorbidity is found regularly. The partial nesting of the substance use variables also prevents the comparison of logistic regression models through difference-testing. The standard approach to difference-testing regression models is generally either the likelihood-ratio test (LRT) or the Wald test; however,

these methods are utilized for nested regressions. As we are examining the difference related to using unique independent variables with partial overlap (addiction), the LRT and Wald are not appropriate. While either the Vuong (Vuong, 1989) or the Clarke (Clarke, 2007) tests would normally be used in this situation, the high degree of correlation between the substance use variables makes them inappropriate to use. As a result of limitations associated with the approaches we considered, our hypotheses were not examined using standard levels of significance, or *p*-values. Rather, we chose to test our hypotheses via general trends from odds ratios and associated confidence intervals derived from individual logistic regressions.

We analyzed the data using SAS (version 9.4). The software program utilized the Taylor Series Linearization method to account for the complex survey design of the NESARC, including survey weights, clustering, and stratification. All percentages were calculated using survey weights.

Results

Of the 34,653 participants completing Wave 1 and Wave 2 of the NESARC, 33,975 had complete data for the key variables of interest. Of these individuals, 62 participants met the criteria for a DSM-IV pathological gambling diagnosis. After removing the illegal acts criteria and reducing the minimum criteria required to adhere to DSM-5 diagnostic standards, an additional 45 participants met the DSM-5 disordered gambling criteria, for a total of 107. A total of 2694 participants met criteria for either alcohol abuse or dependence, referred to herein as 'alcohol use disorder' or 'AUD'. Similarly, 444 participants met criteria for 'cannabis use disorder' or 'CUD', consisting of DSM-IV cannabis abuse or dependence. Table 1 displays a breakdown of sociodemographic factors among these four examined substance use disorder groups. While direct comparisons could not be made due to the overlapping nature of participants in the four addiction groups, the gambling groups appeared to have a slightly higher percentage of females

than cannabis and alcohol groups while cannabis use disorder appeared to be the youngest of the four substance disorder groups. Table 2 contains unweighted participant counts and weighted percentages showing the prevalence of individual and grouped psychiatric disorders for the substance disorder groups. The prevalence of any comorbid mental health disorder (mood or anxiety) was 56.7% in DSM-IV pathological gamblers, 53.7% in DSM-5 disordered gamblers, 25.3% in alcohol use disorders, and 37.7% in cannabis use disorders.

The results of the longitudinal logistic regression models showing the associations between addiction (IV) and psychiatric disorder (DV) are shown in Table 3. All four substance use disorders were significantly associated with disorder groupings (i.e., any disorder, mood disorder, or anxiety disorder) as well as with most individual comorbid psychiatric disorders. Comorbidity for any mental health disorder appear to be relatively higher (but not statistically tested) in both DSM-IV ($OR = 5.17$) and DSM-5 ($OR = 4.59$) gambling groups compared to both cannabis use disorders ($OR = 2.42$) and alcohol use disorders ($OR = 1.38$). Comorbid disorder prevalence for any mental health disorder appear to be slightly greater in the DSM-IV gambling group compared to the DSM-5 gambling group, though not directly compared. By disorder type, the DSM-IV gambling group appears to have a greater association with the presence of a comorbid mood disorder than the DSM-5 gambling group. Minimal difference appears to exist between the two groups in regard to comorbid anxiety disorders. In comparing AUD and CUD, prevalence of comorbid disorders were generally higher in those with CUD compared to AUD with the exception of panic disorders.

Table 1

Sociodemographic variable comparison between substance-related disorders

	DSM-IV Gambling N = 62	DSM 5 Gambling N = 107	Alcohol Use Disorder N = 2694	Cannabis Use Disorder N = 444
Sex				
Female	27 (41.7%)	46 (38.8%)	942 (30.9%)	146 (29.3%)
Male	35 (58.3%)	61 (61.2%)	1752 (69.1%)	298 (70.7%)
Age				
18-34 Years	21 (44.8%)	39 (45.8%)	1366 (52.9%)	321 (74.4%)
35-54 Years	31 (43.6%)	47 (38.2%)	1083 (39.6%)	116 (24.3%)
55-78 Years	10 (11.6%)	21 (16.0%)	245 (7.5%)	7 (1.4%)
Marital Status				
Single (never married)	21 (38.2%)	32 (31.9%)	1048 (37.4%)	266 (57.5%)
Married / Cohabiting	25 (44.8%)	46 (49.8%)	1048 (46.3%)	109 (29.5%)
Divorced/Separated/Widowed	16 (16.9%)	29 (18.3%)	598 (16.3%)	69 (13.0%)
Total Household Income Before Taxes – Past 12 Months				
< \$19,999	19 (26.9%)	27 (24.8%)	560 (17.8%)	149 (29.6%)
\$20,000 - \$34,999	10 (23.6%)	24 (24.8%)	616 (21.2%)	96 (21.1%)
\$35,000 - \$69,999	20 (26.9%)	36 (28.0%)	924 (34.9%)	136 (33.1%)
\$70,000+	13 (22.6%)	20 (22.4%)	594 (26.1%)	63 (16.2%)
Ethnicity				
White	31 (68.1%)	49 (63.1%)	1731 (76.3%)	275 (71.5%)
Black	19 (20.1%)	34 (19.3%)	391 (8.7%)	71 (11.3%)
American Indian/Alaska Native	---	---	61 (3.0%)	16 (4.6%)
Asian/Hawaiian/Pacific Islander	---	---	41 (2.0%)	7 (3.1%)
Hispanic	10 (7.2%)	18 (9.5%)	470 (9.9%)	75 (9.5%)
Highest Level of Education				
Less than High School	14 (19.4%)	24 (19.9%)	347 (12.4%)	88 (18.9%)
High School Diploma or GED	21 (37.2%)	36 (39.3%)	786 (28.5%)	148 (34.3%)
Post Secondary Education	27 (43.4%)	47 (40.7%)	1561 (59.1%)	208 (46.8%)

Note: Ns are unweighted, %s reflect NESARC representative population weights. --- denotes cell information suppressed due to low sample size.

Table 2

Sample size and weighted percentages for comorbid mental health disorders among substance-related disorders

Comorbid Disorder (Wave 2, Since Wave 1)	Pathological Gambling (DSM-IV)	Disordered Gambling (DSM-5)	Alcohol Use Disorder	Cannabis Use Disorder
	N (%)	N (%)	N (%)	N (%)
Any mood or anxiety disorder	35 (56.7%)	55 (53.7%)	691 (25.3%)	153 (37.7%)
Any mood disorder	23 (44.9%)	35 (39.4%)	433 (15.8%)	106 (24.9%)
Depression	18 (34.1%)	28 (30.6%)	375 (13.7%)	85 (19.6%)
Dysthymia	---	6 (4.3%)	49 (1.6%)	12 (2.9%)
Hypomania	6 (14.1%)	8 (10.7%)	78 (2.9%)	22 (5.9%)
Any anxiety disorder	14 (33.1%)	39 (33.3%)	465 (17.3%)	95 (24.3%)
Panic disorder w/o agoraphobia	---	7 (6.0%)	95 (13.6%)	21 (5.9%)
Panic disorder w/ agoraphobia	---	---	39 (9.3%)	13 (2.5%)
Social phobia	---	6 (4.2%)	118 (4.2%)	33 (4.3%)
Specific phobia	14 (21.0%)	24 (23.2%)	245 (8.8%)	51 (12.0%)
GAD	12 (16.7%)	20 (17.0%)	151 (5.6%)	35 (9.2%)

Note: Ns are unweighted, %s reflect NESARC representative population weights. --- denotes suppressed cells with less than 5 respondents.

Table 3

Logistic regression analyses examining comorbid mental health disorders among substance-related disorders

Comorbid Disorder (Wave 2, Since Wave 1)	Pathological Gambling (DSM-IV)	Disordered Gambling (DSM-5)	Alcohol Use Disorder	Cannabis Use Disorder
	OR	OR	OR	OR
Any mood or anxiety disorder	5.17 (3.70-7.21)***	4.59 (3.56-5.93)***	1.38 (1.32-1.44)***	2.42 (2.15-2.72)***
Any mood disorder	6.37 (4.22-9.61)***	5.09 (3.82-6.80)***	1.52 (1.41-1.63)***	2.63 (2.28-3.03)***
Depression	4.64 (2.73-7.89)***	3.97 (2.76-5.71)***	1.47 (1.35-1.59)***	2.22 (1.91-2.57)***
Dysthymia	---	3.22 (1.49-6.95)**	1.20 (1.06-1.37)**	2.17 (2.04-2.32)***
Hypomania	10.46 (6.19-17.66)***	7.65 (5.21-11.21)***	2.04 (1.78-2.34)***	4.12 (3.09-5.49)***
Any anxiety disorder	2.98 (1.83-4.85)***	3.02 (2.21-4.12)***	1.28 (1.21-1.36)***	1.95 (1.73-2.21)***
Panic disorder w/o agoraphobia	---	2.56 (2.00-3.27)***	1.74 (1.51-2.00)***	2.54 (1.90-3.40)***
Panic disorder w/ agoraphobia	---	---	1.11 (0.90-1.38)	2.75 (1.90-3.96)***
Social phobia	---	1.39 (1.11-1.76)**	1.44 (1.29-1.61)***	3.21 (2.68-3.85)***
Specific phobia	2.96 (1.41-6.22)**	3.37 (2.19-5.20)***	1.08 (1.00-1.16)*	1.53 (1.31-1.78)***
GAD	4.32 (1.86-10.06)***	4.41 (2.58-7.55)***	1.31 (1.20-1.43)***	2.21 (1.83-2.68)***

* $p < .05$, ** $p < .01$, *** $p < .001$, --- denotes suppressed cells with less than 5 respondents.

Discussion

The current study evaluated comorbidity prevalence of DSM-IV gambling, DSM-5 gambling, alcohol, and cannabis disorders in a nationally representative sample of Americans. Without utilizing tests of significance, results appeared to suggest the prevalence of any comorbid mental health disorder, any mood, and any anxiety disorder was greater in gambling disorders compared to disorders more traditionally categorized as substance use disorders: AUD and CUD. While our first hypothesis indicated prevalence of comorbid psychiatric disorders would be similar between gambling, alcohol, and cannabis, this was not supported we found that the prevalence of both gambling disorders were higher than those in cannabis and alcohol, though statistical differences were not tested. Our second hypothesis was minimally supported as the DSM-5 form of gambling had slightly reduced comorbidity compared to DSM-IV gambling in the direction of those found for alcohol and cannabis disorders (though, again, not tested for significance).

The prevalence of a comorbid Axis I disorder in the DSM-IV gambling group (56.7%) were generally lower than the prevalence found in previous research conducted using large-scale datasets. For example, in the NCS-R, research has found 96.3% of pathological gamblers met criteria for at least one comorbid psychological disorder, including other substance use and impulse-control disorders (Petry et al., 2005). Similarly, in a study from the German general population, 93.6% of pathological gamblers met criteria for another Axis I disorder. Two substantial differences in methods between this study and the previous research are the inclusion of other substance use disorders as a comorbid condition and the lowering of the minimum threshold required for disordered gambling from five criteria to four. Reducing the criteria required to qualify for a diagnosis of disordered gambling is a strategy frequently utilized in gambling research, often as a means of increasing statistical power, with previous gambling

studies using the NESARC and other large datasets routinely lowering the minimum diagnostic criteria required to qualify as a disordered gambler (e.g., Alegria et al., 2009; Chou & Afifi, 2011; Grant, Desai, & Potenza, 2009; Toce-Gerstein, Gerstein, & Volberg, 2003). In addition to increasing statistical power, a desire to incorporate gamblers throughout the spectrum of the disorder has been cited as a reason behind the choice to include less severe gamblers in the disordered gambling category, with previous research suggesting that even at-risk gamblers meeting one or two DSM criteria can experience levels of comorbidity similar to those qualifying for a DSM disordered gambling diagnosis (Alegria et al., 2009; Bischof et al., 2013). Given the findings of the current study, that DSM disordered gambling exhibits greater comorbid severity than other forms of addiction, capturing sub-threshold gamblers may substantially change the overall picture of what gambling would look like with a reduced threshold in terms of prevalence and comorbidity.

Changes from DSM-IV to DSM-5 gambling criteria were associated with a slight decrease (that we were not able to test statistically) in comorbid mental health disorder prevalence, with the DSM-5 comorbidity trending toward the much lower prevalence we found in AUD and CUD. Among the disorders traditionally categorized as substance use disorders, comorbid prevalence was higher in those with CUD compared with AUD for nearly all assessed disorders and disorder groupings. In the DSM-5, substance abuse and substance dependence disorders were combined into one singular diagnosis with degrees of severity depending on the number of criteria met. Gambling research has often employed a form of this severity continuum by describing gamblers with fewer criteria met as 'at-risk' or 'problem', though these terms are unofficial and often describe differing criteria thresholds or measurement tools. The findings of this research suggest concerns of diagnostic inflation and lessened comorbid severity that may arise from further reduction of the minimum gambling threshold required for a diagnosis are

unfounded. Further research may examine comorbid prevalence if the minimum threshold in gambling was reduced to better reflect the threshold found in other types of addiction and to recognize the 'at-risk' gambling groups often included in disordered gambling research.

As the majority of gambling treatments are modified versions of those developed for other addictions, it stands to reason that treatment options may be more suitable for gamblers with fewer criteria met who may be less severe and considered by some as 'at-risk' gamblers, equivalent to those falling into the mild-severity level of substance use disorders (Slutske, 2006). Though some gambling treatments may serve to reduce the severity of comorbid conditions (Jiménez-Murcia et al., 2015; Moghaddam, Campos, Myo, Reid, & Fong, 2015), the presence of psychiatric symptoms and disorder severity have been associated with greater likelihood of continued disordered gambling symptoms despite treatment efforts (Morefield et al., 2014; Smith et al., 2010). Any potential changes to further reduce the minimum criteria threshold should consider the impact of comorbid disorders on treatment efficacy. While comorbid psychiatric symptoms may improve through the course of gambling disorder treatment, more severe comorbid conditions may still require more individualized treatment to address these remaining difficulties (Jiménez-Murcia et al., 2010; Moghaddam et al., 2015; Rash et al., 2016).

Limitations

Several limitations of the data and analyses should be acknowledged. First, given the high correlation between substance use disorders and desire to include participants with more than one substance disorder, this study did not include significance testing to compare the prevalence of comorbidity across substance disorder types. In addition, small disordered gambling samples sizes may have resulted in a lack of power required to produce significant results. Therefore, the comorbidity trends are discussed rather than significant differences or confidence intervals of odds ratios.

Second, this study primarily used DSM-IV diagnostic criteria. While gambling was easily altered to DSM-5 criteria without impacting the integrity of the diagnosis, the other disorders are not as clear-cut. For both alcohol use disorder and cannabis use disorder, one of the diagnostic criteria from the DSM-5 was missing, leading to an underrepresentation of individuals with this disorder. Also, the comorbid psychiatric disorders examined was done using DSM-IV criteria and, therefore, may not give a true representation of the current state of comorbidity with substance use disorders.

Third, the NESARC utilized trained-lay interviewers to conduct the AUDADIS-IV instead of mental health professionals. Although unlikely, this leaves the opportunity open for potential missed diagnoses. However, a recent study has suggested that trained-lay interviews perform similarly to medical doctors in diagnosing disorders with a structured interview (Amstadter et al., 2010). The use of self-report data in the NESARC may be problematic as alcohol and marijuana use have both been associated with cognitive deficits in memory (Ling, Heffernan, Luczakiewicz, & Stephens, 2010; Montgomery, Seddon, Fisk, Murphy, & Jansari, 2012).

Finally, this study utilizes NESARC data from 2001 to 2005, raising concerns regarding the age of the data, particularly as it relates to marijuana use and disorder prevalence. Marijuana use in America increased from 2002 to 2011-14 while the perceived risk of harm decreased from 2006-7 to 2011-14 (Compton, Han, Jones, Blanco, & Hughes, 2016). One likely reason for increased marijuana use is the increase in states allowing legal marijuana use and/or medical marijuana permits. One study of an American state two years after medical marijuana was legalized found the prevalence of marijuana use disorders increased in adolescents (12 to 17 years old) and young adults (18 to 25 years old) but not in adults (26 years and older) (Schuermayer et al., 2014).

Despite an increase in reported marijuana use in the decade following Wave 1 of the NESARC, there was no increase in marijuana use disorder observed (Compton et al., 2016). This time period was able to capture some legal changes within the American system in regard to marijuana regulation, notably certain states permitting medical marijuana. However, with Canada prepared to legalize marijuana use, it is unknown how full legalization will impact marijuana use and marijuana use disorders as nearly all research to this point has examined medical marijuana legalization rather than full legalization and, in Canada's case, planned sale through provincial governments.

Further, gambling rates in the general population may have changed since the NESARC dataset was collected as gambling laws have changed regarding various gaming types, including lotteries, slot/video machines, and internet gambling (e.g., Horváth & Paap, 2002). A study of American adults found rates of problem gambling remained stable between 1990-2000 to 2011-13 (Welte, Barnes, Tidwell, Hoffman, & Wieczorek, 2015), suggesting the age of the dataset may not be as critical in disordered gambling as it may be for marijuana use disorder.

Conclusion

Our research found that disorder severity, as measured by comorbidity prevalence, appear to be greater in both forms of disordered gambling than in more traditionally conceptualized substance use disorders. Further, changes to the DSM criteria for disordered gambling appear to have resulted in a very slight reduction in psychiatric comorbidity prevalence in the direction of those found in alcohol and cannabis use disorders. The remaining discrepancy between gambling and other substance use disorders suggests the need to re-examine the way disordered gambling is conceptualized. The findings of the current study suggest that DSM-5 gambling captures individuals with greater psychopathology, as measured by comorbid disorders, than other forms of DSM-5 substance use disorders, which indicates disordered gambling may need to include

less severe gamblers under its diagnostic umbrella. Rather than existing as a dichotomous disorder in future versions of the DSM, gambling may be better classified as existing on a severity continuum with a lower minimum criteria threshold for general diagnosis as utilized in DSM-5 substance use disorders and alternative measures of disordered gambling.

References

- Alegria, A. A., Petry, N. M., Hasin, D. S., Liu, S.-M., Grant, B. F., & Blanco, C. (2009). Disordered gambling among racial and ethnic groups in the US: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *CNS Spectrums*, 14(3), 132–42.
- American Psychiatric Association. (2013a). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- American Psychiatric Association. (2013b). Substance-related and addictive disorders. Retrieved from [http://www.dsm5.org/Documents/Substance Use Disorder Fact Sheet.pdf](http://www.dsm5.org/Documents/Substance%20Use%20Disorder%20Fact%20Sheet.pdf)
- Amstadter, A. B., Richardson, L., Acierno, R., Kilpatrick, D. G., Gaboury, M. T., Tran, T. L., ... Thach, T. D. (2010). Does interviewer status matter? An examination of lay interviewers and medical doctor interviewers in an epidemiological study in Vietnam. *International Perspectives in Victimology*, 5(1), 55.
- Azofeifa, A., Mattson, M. E., Schauer, G., McAfee, T., Grant, A., & Lyster, R. (2016). National estimates of marijuana use and related indicators — National Survey on Drug Use and Health, United States, 2002–2014. *MMWR. Surveillance Summaries*, 65(11), 1–28. <http://doi.org/10.15585/mmwr.ss6511a1>
- Bischof, A., Meyer, C., Bischof, G., Kastirke, N., John, U., & Rumpf, H.-J. (2013). Comorbid Axis I-disorders among subjects with pathological, problem, or at-risk gambling recruited from the general population in Germany: Results of the PAGE study. *Psychiatry Research*, 210(3), 1065–1070. <http://doi.org/10.1016/j.psychres.2013.07.026>
- Black, D. W., & Moyer, T. (1998). Clinical features and psychiatric comorbidity of subjects with pathological gambling behavior. *Psychiatric Services (Washington, D.C.)*, 49(11), 1434–1439.
- Blanco, C., Hasin, D. S., Wall, M. M., Flórez-Salamanca, L., Hoertel, N., Wang, S., ... Olfson,

- M. (2016). Cannabis Use and Risk of Psychiatric Disorders. *JAMA Psychiatry*, 73(4), 388.
<http://doi.org/10.1001/jamapsychiatry.2015.3229>
- Blanco, C., Vesga-López, O., Stewart, J. W., Liu, S.-M., Grant, B. F., & Hasin, D. S. (2012). Epidemiology of major depression with atypical features: Results from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). *The Journal of Clinical Psychiatry*, 73(2), 224–32. <http://doi.org/10.4088/JCP.10m06227>
- Bonn-Miller, M. O., Harris, A. H. S., & Trafton, J. A. (2012). Prevalence of cannabis use disorder diagnoses among veterans in 2002, 2008, and 2009. *Psychological Services*, 9(4), 404–416. <http://doi.org/10.1037/a0027622>
- Bovasso, G. B. (2001). Cannabis abuse as a risk factor for depressive symptoms. *The American Journal of Psychiatry*, 158(12), 2033–7.
- Brady, K. T., Haynes, L. F., Hartwell, K. J., & Killeen, T. K. (2013). Substance use disorders and anxiety: a treatment challenge for social workers. *Social Work in Public Health*, 28(3–4), 407–23. <http://doi.org/10.1080/19371918.2013.774675>
- Brown, S. A., Vik, P. W., Patterson, T. L., Grant, I., & Schuckit, M. A. (1995). Stress, vulnerability and adult alcohol relapse. *Journal of Studies on Alcohol*, 56(5), 538–545.
- Burns, L., & Teesson, M. (2002). Alcohol use disorders comorbid with anxiety, depression and drug use disorders: Findings from the Australian National Survey of Mental Health and Well Being. *Drug and Alcohol Dependence*, 68(3), 299–307.
- Chambers, R. A., & Potenza, M. N. (2003). Neurodevelopment, impulsivity, and adolescent gambling. *Journal of Gambling Studies*, 19(1), 53–84.
<http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1023/A:1021275130071>
- Chen, C.-Y., Wagner, F. A., & Anthony, J. C. (2002). Marijuana use and the risk of Major Depressive Episode. Epidemiological evidence from the United States National

- Comorbidity Survey. *Social Psychiatry and Psychiatric Epidemiology*, 37(5), 199–206.
<http://doi.org/10.1007/s00127-002-0541-z>
- Cho, M. J., Hahm, B.-J., Suh, T., Suh, G.-H., Cho, S.-J., & Lee, C. K. (2002). Comorbid mental disorders among the patients with alcohol abuse and dependence in Korea. *Journal of Korean Medical Science*, 17(2), 236–41.
- Chou, K.-L., & Afifi, T. O. (2011). Disordered (pathologic or problem) gambling and axis I psychiatric disorders: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *American Journal of Epidemiology*, 173(11), 1289–1297k.
<http://doi.org/10.1093/aje/kwr017>
- Clarke, K. A. (2007). A simple distribution-free test for nonnested model selection. *Political Analysis*, 15(3), 347–363. <http://doi.org/10.1093/pan/mpm004>
- Compton, W. M., Han, B., Jones, C. M., Blanco, C., & Hughes, A. (2016). Marijuana use and use disorders in adults in the USA, 2002–14: Analysis of annual cross-sectional surveys. *The Lancet Psychiatry*, 3(10), 954–964. [http://doi.org/10.1016/S2215-0366\(16\)30208-5](http://doi.org/10.1016/S2215-0366(16)30208-5)
- Compton, W. M., Thomas, Y. F., Stinson, F. S., & Grant, B. F. (2007). Prevalence, correlates, disability, and comorbidity of DSM-IV drug abuse and dependence in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of General Psychiatry*, 64(5), 566–576.
<http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1001/archpsyc.64.5.566>
- Cougle, J. R., Hakes, J. K., Macatee, R. J., Zvolensky, M. J., & Chavarria, J. (2016). Probability and correlates of dependence among regular users of alcohol, nicotine, cannabis, and cocaine. *The Journal of Clinical Psychiatry*, 77(4), e444–e450.
<http://doi.org/10.4088/JCP.14m09469>
- Crockford, D. N., & El-Guebaly, N. (1998). Psychiatric comorbidity in pathological gambling: a

- critical review. *Canadian Journal of Psychiatry*, 43(1), 43–50.
- Danielsson, A.-K., Lundin, A., Agardh, E., Allebeck, P., & Forsell, Y. (2016). Cannabis use, depression and anxiety: A 3-year prospective population-based study. *Journal of Affective Disorders*, 193, 103–108. <http://doi.org/10.1016/j.jad.2015.12.045>
- Degenhardt, L., Coffey, C., Romaniuk, H., Swift, W., Carlin, J. B., Hall, W. D., & Patton, G. C. (2013). The persistence of the association between adolescent cannabis use and common mental disorders into young adulthood. *Addiction (Abingdon, England)*, 108(1), 124–33. <http://doi.org/10.1111/j.1360-0443.2012.04015.x>
- Denis, C., Fatséas, M., & Auriacombe, M. (2012). Analyses related to the development of DSM-5 criteria for substance use related disorders: 3. An assessment of Pathological Gambling criteria. *Drug and Alcohol Dependence*, 122(1–2), 22–7. <http://doi.org/10.1016/j.drugalcdep.2011.09.006>
- Denney, M. R., & Baugh, J. L. (1992). Symptom reduction and sobriety in the male alcoholic. *International Journal of Addiction*, 27(11), 1293–1300.
- Di Florio, A., Craddock, N., & van den Bree, M. (2014). Alcohol misuse in bipolar disorder. A systematic review and meta-analysis of comorbidity rates. *European Psychiatry : The Journal of the Association of European Psychiatrists*, 29(3), 117–24. <http://doi.org/10.1016/j.eurpsy.2013.07.004>
- Dowling, N. A., Cowlishaw, S., Jackson, A. C., Merkouris, S. S., Francis, K. L., & Christensen, D. R. (2015). Prevalence of psychiatric co-morbidity in treatment-seeking problem gamblers: A systematic review and meta-analysis. *The Australian and New Zealand Journal of Psychiatry*. <http://doi.org/10.1177/0004867415575774>
- Driessen, M., Meier, S., Hill, A., Wetterling, T., Lange, W., & Junghanns, K. (2001). The course of anxiety, depression and drinking behaviours after completed detoxification in alcoholics

with and without comorbid anxiety and depressive disorders. *Alcohol and Alcoholism*, 36(3), 249–255.

<http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1093/alcalc/36.3.249>

Feingold, D., Rehm, J., & Lev-Ran, S. (2017). Cannabis use and the course and outcome of major depressive disorder: A population based longitudinal study. *Psychiatry Research*, 251, 225–234. <http://doi.org/10.1016/j.psychres.2017.02.027>

Feingold, D., Weiser, M., Rehm, J., & Lev-Ran, S. (2014). The association between cannabis use and mood disorders: A longitudinal study. *Journal of Affective Disorders*, 172C, 211–218. <http://doi.org/10.1016/j.jad.2014.10.006>

Fergusson, D. M., & Horwood, L. J. (1997). Early onset cannabis use and psychosocial adjustment in young adults. *Addiction*, 92(3), 279–296.

Grant, B. F., & Dawson, D. A. (2006). Introduction to the National Epidemiologic Survey on Alcohol and Related Conditions. *Alcohol Research & Health*, 29(2), 74–78.

Grant, B. F., Dawson, D. A., Stinson, F. S., Chou, P. S., Kay, W., & Pickering, R. (2003). The Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADIS-IV): reliability of alcohol consumption, tobacco use, family history of depression and psychiatric diagnostic modules in a general population sample. *Drug and Alcohol Dependence*, 71(1), 7–16.

Grant, B. F., Dawson, D. A., Stinson, F. S., Chou, S. P., Dufour, M. C., & Pickering, R. P. (2004). The 12-month prevalence and trends in DSM-IV alcohol abuse and dependence: United States, 1991-1992 and 2001-2002. *Drug and Alcohol Dependence*, 74(3), 223–234. <http://doi.org/10.1016/j.drugalcdep.2004.02.004>

Grant, B. F., & Harford, T. C. (1995). Comorbidity between DSM-IV alcohol use disorders and major depression: Results of a national survey. *Drug and Alcohol Dependence*, 39(3), 197–

206.

- Grant, B. F., Stinson, F. S., Dawson, D. A., Chou, P., Dufour, M. C., Compton, W., ... Kaplan, K. (2004). Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: Results From the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of General Psychiatry*, 61(8), 807–816.
<http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1001/archpsyc.61.8.807>
- Grant, J. E., & Chamberlain, S. R. (2015). Gambling disorder and its relationship with substance use disorders: Implications for nosological revisions and treatment. *The American Journal on Addictions*, 24(2), 126–31. <http://doi.org/10.1111/ajad.12112>
- Grant, J. E., Desai, R. A., & Potenza, M. N. (2009). Relationship of nicotine dependence, subsyndromal and pathological gambling, and other psychiatric disorders: Data from the National Epidemiologic Survey on Alcohol and Related Conditions. *The Journal of Clinical Psychiatry*, 70(3), 334–43.
- Hall, G. W., Carriero, N. J., Takushi, R. Y., Montoya, I. D., Preston, K. L., & Gorelick, D. A. (2000). Pathological gambling among cocaine-dependent outpatients. *The American Journal of Psychiatry*, 157(7), 1127–33.
- Harrington, M., Robinson, J., Bolton, S.-L., Sareen, J., & Bolton, J. (2011). A longitudinal study of risk factors for incident drug use in adults: Findings from a representative sample of the US population. *Canadian Journal of Psychiatry*, 56(11), 686–95.
- Hasin, D. S. (2018). US epidemiology of cannabis use and associated problems. *Neuropsychopharmacology*, 43(1), 195–212. <http://doi.org/10.1038/npp.2017.198>
- Hasin, D. S., Fenton, M. C., Beseler, C., Park, J. Y., & Wall, M. M. (2012). Analyses related to the development of DSM-5 criteria for substance use related disorders: 2. Proposed DSM-5 criteria for alcohol, cannabis, cocaine and heroin disorders in 663 substance abuse patients.

Drug and Alcohol Dependence, 122(1–2), 28–37.

<http://doi.org/10.1016/j.drugalcdep.2011.09.005>

Hasin, D. S., & Grant, B. F. (2002). Major depression in 6050 former drinkers: association with past alcohol dependence. *Archives of General Psychiatry*, 59(9), 794–800.

Hasin, D. S., Kerridge, B. T., Saha, T. D., Huang, B., Pickering, R., Smith, S. M., ... Grant, B. F. (2016). Prevalence and Correlates of DSM-5 Cannabis Use Disorder, 2012-2013: Findings from the National Epidemiologic Survey on Alcohol and Related Conditions–III. *American Journal of Psychiatry*, 173(6), 588–599. <http://doi.org/10.1176/appi.ajp.2015.15070907>

Hasin, D. S., O'Brien, C. P., Auriacombe, M., Borges, G., Bucholz, K., Budney, A., ... Grant, B. F. (2013). DSM-5 criteria for substance use disorders: Recommendations and rationale. *The American Journal of Psychiatry*, 170(8), 834–51.

<http://doi.org/10.1176/appi.ajp.2013.12060782>

Hasin, D. S., Saha, T. D., Kerridge, B. T., Goldstein, R. B., Chou, S. P., Zhang, H., ... Grant, B. F. (2015). Prevalence of Marijuana Use Disorders in the United States Between 2001-2002 and 2012-2013. *JAMA Psychiatry*, 72(12), 1235–42.

<http://doi.org/10.1001/jamapsychiatry.2015.1858>

Hasin, D. S., Sarvet, A. L., Cerdá, M., Keyes, K. M., Stohl, M., Galea, S., & Wall, M. M. (2017). US adult illicit cannabis use, cannabis use disorder, and medical marijuana laws. *JAMA Psychiatry*, 74(6), 579. <http://doi.org/10.1001/jamapsychiatry.2017.0724>

Hasin, D. S., Stinson, F. S., Ogburn, E., & Grant, B. F. (2007). Prevalence, correlates, disability, and comorbidity of DSM-IV alcohol abuse and dependence in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of General Psychiatry*, 64(7), 830–842.

<http://doi.org/http://dx.doi.org.proxy2.lib.umanitoba.ca/10.1001/archpsyc.64.7.830>

- Hayley, A. C., Stough, C., & Downey, L. A. (2017). DSM-5 cannabis use disorder, substance use and DSM-5 specific substance-use disorders: Evaluating comorbidity in a population-based sample. *European Neuropsychopharmacology*, 27(8), 732–743.
<http://doi.org/10.1016/j.euroneuro.2017.06.004>
- Horváth, C., & Paap, R. (2012). The effect of recessions on gambling expenditures. *Journal of Gambling Studies*, 28(4), 703–17. <http://doi.org/10.1007/s10899-011-9282-9>
- Jiménez-Murcia, S., Alvarez-Moya, E. M., Stinchfield, R., Fernández-Aranda, F., Granero, R., Aymamí, N., ... Menchón, J. M. (2010). Age of onset in pathological gambling: clinical, therapeutic and personality correlates. *Journal of Gambling Studies*, 26(2), 235–48.
<http://doi.org/10.1007/s10899-009-9175-3>
- Jiménez-Murcia, S., Granero, R., Fernández-Aranda, F., Arcelus, J., Aymamí, M. N., Gómez-Peña, M., ... Menchón, J. M. (2015). Predictors of outcome among pathological gamblers receiving cognitive behavioral group therapy. *European Addiction Research*, 21(4), 169–78.
<http://doi.org/10.1159/000369528>
- Kelly, S. M., Gryczynski, J., Mitchell, S. G., Kirk, A., O’Grady, K. E., & Schwartz, R. P. (2014). Concordance between DSM-5 and DSM-IV nicotine, alcohol, and cannabis use disorder diagnoses among pediatric patients. *Drug and Alcohol Dependence*, 140, 213–6.
<http://doi.org/10.1016/j.drugalcdep.2014.03.034>
- Kenneson, A., Funderburk, J. S., & Maisto, S. A. (2013). Substance use disorders increase the odds of subsequent mood disorders. *Drug and Alcohol Dependence*, 133(2), 338–43.
<http://doi.org/10.1016/j.drugalcdep.2013.06.011>
- Kerridge, B. T., Mauro, P. M., Chou, S. P., Saha, T. D., Pickering, R. P., Fan, A. Z., ... Hasin, D. S. (2017). Predictors of treatment utilization and barriers to treatment utilization among individuals with lifetime cannabis use disorder in the United States. *Drug and Alcohol*

Dependence, 181, 223–228. <http://doi.org/10.1016/j.drugalcdep.2017.09.032>

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005).

Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry*, 62(6), 593–602.

<http://doi.org/10.1001/archpsyc.62.6.593>

Kessler, R. C., Chiu, W. T., Demler, O., Merikangas, K. R., & Walters, E. E. (2005). Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry*, 62(6), 617–627.

<http://doi.org/10.1001/archpsyc.62.6.617>

Kessler, R. C., Crum, R. M., Warner, L. A., & Nelson, C. B. (1997). Lifetime co-occurrence of DSM-III-R alcohol abuse and dependence with other psychiatric disorders in the National Comorbidity Survey. *Archives of General Psychiatry*, 54(4), 313–321.

<http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1001/archpsyc.1997.01830160031005>

Kessler, R. C., McGonagle, K. A., Zhao, S. S., Nelson, C. B., Hughes, M. M., Eshleman, S. S., ... Kendler, K. S. (1994). Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. Results from the National Comorbidity Survey. *Archives of General Psychiatry*, 51(1), 8–19.

Kessler, R. C., Nelson, C. B., McGonagle, K. A., Edlund, M. J., Frank, R. G., & Leaf, P. J.

(1996). The epidemiology of co-occurring addictive and mental disorders: Implications for prevention and service utilization. *American Journal of Orthopsychiatry*, 66(1), 17–31.

<http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1037/h0080151>

Lesieur, H. R., & Rosenthal, R. J. (1991). Pathological gambling: A review of the literature

(prepared for the American Psychiatric Association task force on DSM-IV committee on

- disorders of impulse control not elsewhere classified). *Journal of Gambling Studies*, 7(1), 5–39. <http://doi.org/10.1007/BF01019763>
- Ling, J., Heffernan, T. M., Luczakiewicz, K., & Stephens, R. (2010). Subjective ratings of prospective memory deficits in chronic alcohol users. *Psychological Reports*, 106(3), 905–917.
- Lorains, F. K., Cowlishaw, S., & Thomas, S. A. (2011). Prevalence of comorbid disorders in problem and pathological gambling: Systematic review and meta-analysis of population surveys. *Addiction*, 106(3), 490–8. <http://doi.org/10.1111/j.1360-0443.2010.03300.x>
- McGorry, P. D., Purcell, R., Goldstone, S., & Amminger, G. P. (2011). Age of onset and timing of treatment for mental and substance use disorders: Implications for preventive intervention strategies and models of care. *Current Opinion in Psychiatry*, 24(4), 301–6. <http://doi.org/10.1097/YCO.0b013e3283477a09>
- Merikangas, K. R., Herrell, R., Swendsen, J., Rössler, W., Ajdacic-Gross, V., & Angst, J. (2008). Specificity of bipolar spectrum conditions in the comorbidity of mood and substance use disorders: Results from the Zurich cohort study. *Archives of General Psychiatry*, 65(1), 47–52. <http://doi.org/10.1001/archgenpsychiatry.2007.18>
- Merikangas, K. R., Mehta, R. L., Molnar, B. E., Walters, E. E., Swendsen, J. D., Auilar-Gaziola, S., ... Kessler, R. C. (1998). Comorbidity of substance use disorders with mood and anxiety disorders: Results of the international consortium in psychiatric epidemiology. *Addictive Behaviors*, 23(6), 893–908. [http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1016/S0306-4603\(98\)00076-8](http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1016/S0306-4603(98)00076-8)
- Mewton, L., Slade, T., & Teesson, M. (2013). An evaluation of the proposed DSM-5 cannabis use disorder criteria using Australian national survey data. *Journal of Studies on Alcohol and Drugs*, 74(4), 614–21.

- Moghaddam, J. F., Campos, M. D., Myo, C., Reid, R. C., & Fong, T. W. (2015). A longitudinal examination of depression among gambling inpatients. *Journal of Gambling Studies*, 31(4), 1245–55. <http://doi.org/10.1007/s10899-014-9518-6>
- Moitra, E., Christopher, P. P., Anderson, B. J., & Stein, M. D. (2015). Coping-motivated marijuana use correlates with DSM-5 cannabis use disorder and psychological distress among emerging adults. *Psychology of Addictive Behaviors*, 29(3), 627–632. <http://doi.org/10.1037/adb0000083>
- Montgomery, C., Seddon, A. L., Fisk, J. E., Murphy, P. N., & Jansari, A. (2012). Cannabis-related deficits in real-world memory. *Human Psychopharmacology*, 27(2), 217–225. <http://doi.org/10.1002/hup.1273>
- Morefield, K., Walker, C., Smith, D., Harvey, P., Dunn, K., & Battersby, M. (2014). An inpatient treatment program for people with gambling problems: Synopsis and early outcomes. *International Journal of Mental Health and Addiction*, 12(3), 367–379. <http://doi.org/10.1007/s11469-013-9462-1>
- Motel, S. (2015). 6 facts about marijuana. Retrieved from <http://www.pewresearch.org/fact-tank/2015/04/14/6-facts-about-marijuana/>
- National Institute on Alcohol Abuse and Alcoholism. (2013). *Alcohol Use Disorder: A Comparison Between DSM–IV and DSM–5*.
- Nelson, S. E., Gebauer, L., LaBrie, R. A., & Shaffer, H. J. (2009). Gambling problem symptom patterns and stability across individual and timeframe. *Psychology of Addictive Behaviors*, 23(3), 523–533. <http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1037/a0016053>
- Newport, F. (2010). U.S. Drinking Rate Edges Up Slightly to 25-Year High. Retrieved from <http://www.gallup.com/poll/141656/drinking-rate-edges-slightly-year-high.aspx>
- Nower, L., & Blaszczynski, A. (2008). Characteristics of problem gamblers 56 years of age or

- older: A statewide study of casino self-excluders. *Psychology and Aging*, 23(3), 577–84.
<http://doi.org/10.1037/a0013233>
- Pacek, L. R., Martins, S. S., & Crum, R. M. (2013). The bidirectional relationships between alcohol, cannabis, co-occurring alcohol and cannabis use disorders with major depressive disorder: Results from a national sample. *Journal of Affective Disorders*, 148(2–3), 188–95.
<http://doi.org/10.1016/j.jad.2012.11.059>
- Parhami, I., Mojtabai, R., Rosenthal, R. J., Afifi, T. O., & Fong, T. W. (2014). Gambling and the onset of comorbid mental disorders: A longitudinal study evaluating severity and specific symptoms. *Journal of Psychiatric Practice*, 20(3), 207–19.
<http://doi.org/10.1097/01.pra.0000450320.98988.7c>
- Peters, E. N., Nordeck, C., Zanetti, G., O’Grady, K. E., Serpelloni, G., Rimondo, C., ... Schwartz, R. P. (2015). Relationship of gambling with tobacco, alcohol, and illicit drug use among adolescents in the USA: Review of the literature 2000-2014. *The American Journal on Addictions / American Academy of Psychiatrists in Alcoholism and Addictions*.
<http://doi.org/10.1111/ajad.12214>
- Petry, N. M. (2002). A comparison of young, middle-aged, and older adult treatment-seeking pathological gamblers. *The Gerontologist*, 42(1), 92–9.
- Petry, N. M. (2006). Should the scope of addictive behaviors be broadened to include pathological gambling? *Addiction (Abingdon, England)*, 101 Suppl, 152–60.
<http://doi.org/10.1111/j.1360-0443.2006.01593.x>
- Petry, N. M. (2007). Gambling and substance use disorders: Current status and future directions. *The American Journal on Addictions*, 16(1), 1–9.
<http://doi.org/10.1080/10550490601077668>
- Petry, N. M., Blanco, C., Auriacombe, M., Borges, G., Bucholz, K., Crowley, T. J., ... O’Brien,

- C. (2014). An overview of and rationale for changes proposed for pathological gambling in DSM-5. *Journal of Gambling Studies*, 30(2), 493–502. <http://doi.org/10.1007/s10899-013-9370-0>
- Petry, N. M., & O'Brien, C. P. (2013). Internet gaming disorder and the DSM-5. *Addiction*, 108(7), 1186–1187. <http://doi.org/10.1111/add.12162>
- Petry, N. M., Stinson, F. S., & Grant, B. F. (2005). Comorbidity of DSM-IV pathological gambling and other psychiatric disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *The Journal of Clinical Psychiatry*, 66(5), 564–74.
- Potenza, M. N. (2006). Should addictive disorders include non-substance-related conditions? *Addiction (Abingdon, England)*, 101 Suppl, 142–51. <http://doi.org/10.1111/j.1360-0443.2006.01591.x>
- Potenza, M. N., Koran, L. M., & Pallanti, S. (2009). The relationship between impulse-control disorders and obsessive-compulsive disorder: a current understanding and future research directions. *Psychiatry Research*, 170(1), 22–31. <http://doi.org/10.1016/j.psychres.2008.06.036>
- Quello, S. B., Brady, K. T., & Sonne, S. C. (2005). Mood disorders and substance use disorder: a complex comorbidity. *Science & Practice Perspectives*, 3(1), 13–21.
- Rash, C. J., Weinstock, J., & Van Patten, R. (2016). A review of gambling disorder and substance use disorders. *Substance Abuse and Rehabilitation*, 7, 3–13. <http://doi.org/10.2147/SAR.S83460>
- Rash, C., Weinstock, J., & Van Patten, R. (2016). A review of gambling disorder and substance use disorders. *Substance Abuse and Rehabilitation*, 7, 3. <http://doi.org/10.2147/SAR.S83460>
- Regier, D. A., Farmer, M. E., Rae, D. S., Locke, B. Z., Keith, S. J., Judd, L. L., & Goodwin, F. K. (1990). Comorbidity of mental disorders with alcohol and other drug abuse. Results from

- the Epidemiologic Catchment Area (ECA) study. *JAMA*, 264(19), 2511–2518.
- Regier, D. A., Kuhl, E. A., & Kupfer, D. J. (2013). The DSM-5: Classification and criteria changes. *World Psychiatry : Official Journal of the World Psychiatric Association (WPA)*, 12(2), 92–8. <http://doi.org/10.1002/wps.20050>
- Rennert, L., Denis, C., Peer, K., Lynch, K. G., Gelernter, J., & Kranzler, H. R. (2014). DSM-5 gambling disorder: Prevalence and characteristics in a substance use disorder sample. *Experimental and Clinical Psychopharmacology*, 22(1), 50–6. <http://doi.org/10.1037/a0034518>
- Reynolds, K., Pietrzak, R. H., El-Gabalawy, R., Mackenzie, C. S., & Sareen, J. (2015). Prevalence of psychiatric disorders in U.S. older adults: Findings from a nationally representative survey. *World Psychiatry : Official Journal of the World Psychiatric Association (WPA)*, 14(1), 74–81. <http://doi.org/10.1002/wps.20193>
- Robinson, S., & Adinoff, B. (2016). The classification of substance use disorders: Historical, contextual, and conceptual considerations. *Behavioral Sciences*, 6(3), 18. <http://doi.org/10.3390/bs6030018>
- Romanczuk-Seiferth, N., van den Brink, W., & Goudriaan, A. E. (2014). From symptoms to neurobiology: Pathological gambling in the light of the new classification in DSM-5. *Neuropsychobiology*, 70(2), 95–102. <http://doi.org/10.1159/000362839>
- Sareen, J., McWilliams, L., Cox, B., & Stein, M. B. (2004). Does a U-shaped relationship exist between alcohol use and DSM-III-R mood and anxiety disorders? *Journal of Affective Disorders*, 82(1), 113–118. <http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1016/j.jad.2002.12.001>
- Schuermeier, J., Salomonsen-Sautel, S., Price, R. K., Balan, S., Thurstone, C., Min, S.-J., & Sakai, J. T. (2014). Temporal trends in marijuana attitudes, availability and use in Colorado

- compared to non-medical marijuana states: 2003–11. *Drug and Alcohol Dependence*, 140, 145–155. <http://doi.org/10.1016/j.drugalcdep.2014.04.016>
- Schuckit, M. A. (2013). Editor's corner: DSM-5—Ready or not, here It comes. *Journal of Studies on Alcohol and Drugs*, 74(5), 661–663. <http://doi.org/10.15288/jsad.2013.74.661>
- Slutske, W. S. (2006). Natural recovery and treatment-seeking in pathological gambling: Results of two U.S. national surveys. *The American Journal of Psychiatry*, 163(2), 297–302. <http://doi.org/10.1176/appi.ajp.163.2.297>
- Slutske, W. S., Caspi, A., Moffitt, T. E., & Poulton, R. (2005). Personality and problem gambling: A prospective study of a birth cohort of young adults. *Archives of General Psychiatry*, 62(7), 769–775. <http://doi.org/10.1001/archpsyc.62.7.769>
- Smith, D., Harvey, P., Battersby, M., Pols, R., Oakes, J., & Baigent, M. (2010). Treatment outcomes and predictors of drop out for problem gamblers in South Australia: a cohort study. *The Australian and New Zealand Journal of Psychiatry*, 44(10), 911–20. <http://doi.org/10.3109/00048674.2010.493502>
- Stapinski, L. A., Montgomery, A. A., & Araya, R. (2016). Anxiety, depression and risk of cannabis use: Examining the internalising pathway to use among Chilean adolescents. *Drug and Alcohol Dependence*, 166, 109–115. <http://doi.org/10.1016/j.drugalcdep.2016.06.032>
- Statistics Canada. (2017). *Canadian Tobacco, Alcohol and Drugs Survey: Summary of results for 2015*.
- Stein, M. B., Torgrud, L. J., & Walker, J. R. (2000). Social phobia symptoms, subtypes, and severity: Findings from a Community survey. *Archives of General Psychiatry*, 57(11), 1046–1052.
- Stucki, S., & Rihs-Middel, M. (2007). Prevalence of adult problem and pathological gambling between 2000 and 2005: An update. *Journal of Gambling Studies*, 23(3), 245–257.

<http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1007/s10899-006-9031-7>

Teesson, M., Hall, W., Lynskey, M., & Degenhardt, L. (2000). Alcohol- and drug-use disorders in Australia: Implications of the National Survey of Mental Health and Wellbeing. *Australian & New Zealand Journal of Psychiatry*, 34(2), 206–213.

Temcheff, C. E., Paskus, T. S., Potenza, M. N., & Derevensky, J. L. (2016). Which diagnostic criteria are most useful in discriminating between social gamblers and individuals with gambling problems? An examination of DSM-IV and DSM-5 criteria. *Journal of Gambling Studies*, 1–12. <http://doi.org/10.1007/s10899-015-9591-5>

Toce-Gerstein, M., Gerstein, D. R., & Volberg, R. A. (2003). A hierarchy of gambling disorders in the community. *Addiction*, 98(12), 1661–1672.

<http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1111/j.1360-0443.2003.00545.x>

Tómasson, K., & Vaglum, P. (1996). Psychopathology and alcohol consumption among treatment-seeking alcoholics: A prospective study. *Addiction*, 91(7), 1019–1030.

<http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1111/j.1360-0443.1996.tb03598.x>

van Laar, M., van Dorsselaer, S., Monshouwer, K., & de Graaf, R. (2007). Does cannabis use predict the first incidence of mood and anxiety disorders in the adult population? *Addiction*, 102(8), 1251–1260. <http://doi.org/10.1111/j.1360-0443.2007.01875.x>

Vuong, Q. (1989). Likelihood ratio tests for model selection and non-nested hypotheses. *Econometrica: Journal of the Econometric Society*.

Welte, J., Barnes, G., Wiczorek, W., Tidwell, M. C., & Parker, J. (2001). Alcohol and gambling pathology among U.S. adults: Prevalence, demographic patterns and comorbidity. *Journal of Studies on Alcohol*, 62(5), 706–712.

Welte, J. W., Barnes, G. M., Tidwell, M.-C. O., & Hoffman, J. H. (2008). The prevalence of

problem gambling among U.S. adolescents and young adults: Results from a national survey. *Journal of Gambling Studies*, 24(2), 119–133. <http://doi.org/10.1007/s10899-007-9086-0>

Welte, J. W., Barnes, G. M., Tidwell, M.-C. O., Hoffman, J. H., & Wieczorek, W. F. (2015).

Gambling and problem gambling in the United States: Changes between 1999 and 2013.

Journal of Gambling Studies, 31(3), 695–715. <http://doi.org/10.1007/s10899-014-9471-4>

Zack, M. H., Lobo, D. S., Biback, C., Fang, T., Smart, K., Tatone, D., ... Kennedy, J. L. (2017).

Parallel role for the dopamine D1 receptor in gambling and amphetamine reinforcement in healthy volunteers. *Journal of Psychopharmacology*, 31(1), 31–42.

<http://doi.org/10.1177/0269881116665329>

CHAPTER FOUR

STUDY THREE

Age Differences in Overall Functioning, Gambling-Related Symptoms, and
Comorbid Conditions Among Problem Gamblers

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Abstract

Objectives: Previous research has examined the role of age in health and functioning among gamblers. This study aims to provide greater understanding of this relationship by examining mental and physical functioning, comorbid psychological disorders, and other gambling-related features.

Method: This study utilized data from the National Epidemiological Survey for Alcohol and Related Conditions (NESARC) with adults meeting one or more DSM-5 disordered gambling symptoms categorized into three age groups: 18 to 34 years old (N = 436), 35 to 54 years old (N = 453), and 55 to 98 years old and over (N = 321).

Results: Older adults were less likely to qualify for a DSM-5 disordered gambling diagnosis, had lower physical functioning, reduced help-seeking behaviour, lower prevalence of comorbid psychiatric conditions, and were more likely to play a single game (versus multiple games) within a casino (versus outside of a casino) compared to other age groups. The three age groups also differed in terms of the DSM-5 gambling criteria endorsed. Age also moderated the influence of social functioning on gambling severity, but did not moderate the influence of any other mental or physical functioning domain on gambling severity.

Conclusion: Our findings suggest that older adults meeting at least one disordered gambling criterion experience less severe gambling symptomatology and fewer comorbid conditions, aside from reduced physical functioning, which may be a product of aging. We propose that reduced gambling prevalence and comorbid severity in older adult gamblers may be associated with age-related increases in affective well-being.

Keywords: gambling, comorbidity, addiction, lifespan

Introduction

Similar to most addictions, disordered gambling impacts individuals across the adult lifespan (Barnes, Welte, Tidwell, & Hoffman, 2011; Welte, Barnes, Tidwell, & Hoffman, 2011). However, research suggests that disordered gambling presents differently depending on age, including the types of games played and prevalence rates (Barnes et al., 2011; Welte, Barnes, Wieczorek, Tidwell, & Parker, 2002). The increasing accessibility of gambling both in and out of the casino, including video lottery terminals (VLTs) in public locations, greater access to sports gambling due to relaxed regulations, Internet and home cash-game poker popularity, and the recent boom in fantasy sports wagering (Dwyer, Shapiro, & Drayer, 2017) emphasizes the importance of understanding the features and mental health conditions associated with disordered gambling behaviours across the adult lifespan. The purpose of this study is to examine age differences in gambling-related symptoms and features, comorbid psychiatric disorders, and physical and mental functioning in gamblers meeting at least one DSM-5 disordered gambling criteria.

Gambling Through the Adult Lifespan

The prevalence of disordered gambling does not remain static over the course of the lifespan. Overall, a meta-analysis of pathological gambling found that between 0.2 and 2.1% of the population suffer from disordered gambling, with approximately 0.5 to 4.0% experiencing sub-threshold gambling problems (Stucki & Rihs-Middel, 2007). Age-specific prevalence estimates vary between studies, although across studies a consistent general pattern is found with younger and middle-aged adults exhibiting higher prevalence of disordered gambling than older adults (Delfabbro, King, & Griffiths, 2013; Shaffer, Hall, & Bilt, 1997; Welte et al., 2011). More specifically, rates of past-year gambling participation peaked for those in the age group of 22 to 30 years old, while problem gambling behaviours peaked later at age 31 to 40 (Welte, Barnes,

Tidwell, & Hoffman, 2011). In regards to older adults, general prevalence estimates suggest that approximately 10 to 13 percent of individuals over the age of 60 gamble frequently (Nower & Blaszczynski, 2008).

Aside from prevalence, research suggests that the characteristics of pathological gamblers may also vary depending on the age of onset of the disorder. A recent study used a nationally-representative sample of Americans to examine differences between early-onset (age 25 or less) and late-onset (age 26 or above) gamblers (Verdura Vizcaíno, Fernández-Navarro, Petry, Rubio, & Blanco, 2014). Early onset gamblers were more likely to be male, single and never married, have an income below \$70,000, and exhibit traits of cluster B personality disorders than were late onset gamblers.

Gambling in young adults. When gambling in young adults becomes problematic, it is associated with a variety of negative outcomes, including poor academic performance and comorbid psychological disorders (Engwall, Hunter, & Steinberg, 2004; Stuhldreher, Stuhldreher, & Forrest, 2007). Like older adults, many who gamble do so in a healthy, non-addictive manner while others develop symptoms of disordered gambling. The pathways model of problem gambling (Allami et al., 2017; Blaszczynski & Nower, 2002; Milosevic & Ledgerwood, 2010) proposes that three pathways exist in the possible development of disordered gambling: behaviourally conditioned, emotionally vulnerable, and behaviourally vulnerable. This model has been tested on adult populations (Nower, Martins, Lin, & Blanco, 2013) as well as longitudinally with young adults (Allami et al., 2017).

Gambling in older adults. The majority of older adults who gamble do so recreationally at non-pathological levels. Engaging in gambling and gambling-related activities is generally seen as beneficial for older adults, providing the opportunity to socialize and obtain social support. Research suggests that the majority of older adults who engage in gambling are best

classified as 'social gamblers' who visit the casino infrequently as a social activity, similar to any other planned social outing (Zaranek & Chapleski, 2005). Those who endorse socialization as their main motivation for going to the casino and gambling are likely to visit the casino infrequently, as they more frequently partake in other social outings not centered on gambling, and do not experience any adverse or problematic outcomes due to their gambling behaviours (Hope & Havir, 2002).

For those older adults whose gambling is not social and healthy, however, many have experienced problem gambling episodes for prolonged periods through their lifetimes, while others will develop these problems starting in late-life. Generally, the most significant predictors of problematic gambling in older adults are unresolved losses and 'mismanagement of life stressors' (Tira, Jackson, & Tomnay, 2014). Three potential pathways have been identified to help explain both risk and protective factors in the development of disordered gambling behaviours in older adults, all of which are connected to isolation (Tira et al., 2014). The first 'grief pathway' involves problem gambling when feeling upset or needing personal space that results from a desire to avoid negative emotion related to unresolved losses. The second 'habit pathway' involves using gambling as a means of addressing a relatively minor unmet need, with initial positive experiences leading to habituation. The third 'dormant pathway' involves pre-existing comorbidities or vulnerabilities that manifest as a gambling addiction as an older adult. These three pathways appear to correspond to those proposed to exist in all adults (Blaszczynski & Nower, 2002), with behaviourally conditioned equivalent to habit, emotionally vulnerable similar to grief, and behaviourally vulnerable equivalent to dormant. However, in older adults, there is an extra emphasis placed on the role of isolation, unresolved losses, and mismanagement of life stressors (Tira et al., 2014).

As noted, a difference emerges between those older adults who utilize gambling as a healthy activity and those who experience problem gambling behaviours. Strength and vulnerability integration (SAVI) theory (Charles, 2010) suggests that age affords older adults the ability to better cope with problems and disengage from negative emotions. However, when stressors are chronic, significant, and unavoidable, age no longer provides advantages to coping with these problems. Instead, older adults must rely on the physiological ability to regulate stress, which generally decreases over the course of the lifespan. Theoretically, according to SAVI, older adults who begin to gamble late in life may do so as a means of coping with, or escaping from, other problems including reduced functionality or comorbid conditions.

Gambling and Comorbid Psychiatric Disorders

In the DSM-5, gambling was diagnostically reclassified as a substance-related disorder rather than its previous classification as an impulse control disorder (American Psychiatric Association, 2000, 2013). The World Health Organization is also planning to classify gambling as a behavioural addiction in the upcoming ICD-11 (Mann et al., 2017; Saunders, 2017). One of the main reasons for this reclassification is the close similarity that gambling exhibits in relation to others substance use disorders when it comes to motives for use (e.g., Hopley & Nicki, 2010; Raylu & Oei, 2002). As individuals frequently employ substances as a means of coping with, or escaping from, negative affect, it stands to reason that this relationship may become excessive and develop into what would be best described as a mental health problem.

Disordered gambling has been associated with a variety of psychiatric conditions and health difficulties across the lifespan. This includes, but is not limited to, major depression, bipolar disorder, post-traumatic stress disorder, generalized anxiety disorder, specific phobia, hypomania, and substance use disorders (Afifi, Nicholson, Martins, & Sareen, 2016; Di Nicola et al., 2014; Lynch, Maciejewski, & Potenza, 2004; Parhami, Mojtabai, Rosenthal, Afifi, & Fong,

2014; Pietrzak, Molina, Ladd, Kerins, & Petry, 2005; Pietrzak, Morasco, Blanco, Grant, & Petry, 2007; Quigley et al., 2014). Problem gamblers also score higher on measures of bodily pain and lower on measures of physical functioning and general health than recreational or non-gamblers (Black, Moyer, & Schlosser, 2003; Pietrzak et al., 2005).

While gambling is associated with comorbid psychiatric disorders in both younger and older adults, a recent study of Spanish treatment-seeking gamblers provides evidence that age is associated with differing clinical outcomes and comorbid conditions (Granero et al., 2014a). This study observed that older disordered gamblers exhibited more comorbid health difficulties, which may be explained by the idea that long-term gambling in older adults has a negative effect on somatic symptoms and mental capacities (Kim, Grant, Eckert, Faris, & Hartman, 2006; Pietrzak et al., 2007). For example, engaging in casino gambling may lead to fewer opportunities to engage with others in a meaningful manner, a lack of exercise, spending many hours sitting, and being in an area with frequent nicotine and alcohol consumption, high stress, high anxiety, and poor nutrition, to name a few potentially harmful outcomes.

Current Study

Previous examinations of pathological gambling and comorbid disorders with age have been conducted on samples of treatment-seeking gamblers or strictly on groups of in-treatment pathological or disordered gamblers. Our goal was to extend this previous research by comparing gamblers of differing age groups in a nationally representative sample. The current study compares physical and mental functioning, gambling-related symptoms, and the prevalence of comorbid mental health conditions in gamblers among three age groups: young adults (18 to 34 years old), middle adults (35 to 54 years old), and older adults (55 to 98 years old). Based on previous research, we expect that older adults will experience fewer comorbid psychiatric conditions and poorer overall physical and mental functioning. Further, we expect age to

moderate the relationship between both physical and mental functioning domains and gambling severity. Based on SAVI theory, we expect that older adults will have a stronger relationship between decreased quality of life domains and increased gambling severity compared to other age groups.

Methods

Participants

Data were from the National Epidemiological Survey for Alcohol and Related Conditions (NESARC), a nationally representative, cross-sectional sample of American adults ages 18 years or older. The NESARC utilized a structured diagnostic survey. Wave 1 was collected between 2001 and 2002 through in-person interviews, with 43,093 total participants completing the survey for an 81.0% response rate. More recent versions of the NESARC, namely NESARC Wave 2, collected between 2004 and 2005, and the NESARC-III, collected between 2012 and 2013, did not assess gambling. The NESARC was chosen for analyses as it includes the largest number of individuals qualifying for a diagnosis of DSM-IV pathological gambling in any nationally representative sample in addition to assessing for individual psychological disorders (Nelson, Gebauer, LaBrie, & Shaffer, 2009). Information regarding sampling procedures and quality control have been previously detailed by Grant and Dawson (2006). For this type of study, formal consent is not required.

Measures

Within the NESARC, the Alcohol Use Disorder and Associated Disabilities Interview (AUDADIS-IV) assessed gambling, gambling-related measures, and other psychiatric disorders.

Gambling. Gambling was measured via the AUDADIS-IV according to DSM-IV criteria. In order to examine participants with current gambling problems, gambling measures were limited to past-year experiences. Participants were screened into the gambling module if

they answered positively to an item asking if they had gambled five or more times within the past year with participants who responded 'yes' completing the remainder of the gambling items. Fifteen questions were asked in order to operationalize the ten pathological gambling criteria outlined in the DSM-IV. To examine gambling as outlined in the DSM-5 (APA, 2013), we eliminated the illegal acts criterion, resulting in nine disordered gambling criteria. This study includes gamblers who endorse one or more of the DSM-5 disordered gambling criteria. Gambling measures frequently include sub-threshold gamblers in order to increase statistical power. Previous research has supported the inclusion of sub-threshold gamblers as they are more similar to pathological gamblers than recreational gamblers (Cox, Enns, & Michaud, 2004). Further, others have suggested that endorsing even one gambling symptom may be a sign of difficulties related to disordered gambling behaviours (e.g., Blanco, Hasin, Petry, Stinson, & Grant, 2006; Chamberlain, Stochl, Redden, Odlaug, & Grant, 2017; Grant, Chamberlain, Schreiber, Odlaug, & Kim, 2011; Nelson et al., 2009; Strong & Kahler, 2007; Toce-Gerstein, Gerstein, & Volberg, 2003; Weinstock, April, & Kallmi, 2017). In an effort to capture individuals experiencing any sort of difficulty with gambling behaviours, participants meeting at least one DSM-5 disordered gambling criterion were accepted for inclusion in this study. In the analyses examining gambling as a disorder, participants were required to endorse a minimum of four of the nine DSM-5 criteria to receive a disordered gambling diagnosis (Nelson et al., 2009; Strong & Kahler, 2007; Toce-Gerstein et al., 2003).

The NESARC assessed other gambling-related items as part of the AUDADIS gambling module, including: (1) type of game played, (2) age of pathological gambling onset, and (3) whether the individual had sought a form of professional help for gambling. For type of game played, participants were asked whether they had participated in any of 15 different forms of gambling. In-casino games included card games, dice games, roulette, slot/video machines, and

other casino games. Assessed games outside of the casino included bingo/keno, dice games, dog races/fights, card games, games of skill, horse races, lottery, sports games, stock or commodities markets, and other gambling. For age of pathological gambling onset, we utilized the participant age in years at their first episode. To assess help seeking for gambling, participants were asked whether they had ever attended Gamblers Anonymous or gone to 'any kind of counselor, therapist, doctor, psychologist, or any other professional'. Only participants who qualified for a DSM-IV pathological gambling diagnoses responded to these gambling-related items. Therefore, while most analyses include all participants meeting at least one DSM-5 gambling criterion, regressions examining gaming type, age of onset, and whether participants had sought help for gambling issues were limited to those meeting five or more of the ten DSM-IV gambling criteria.

Substance-use disorder. Past year substance-use disorders were examined in accordance with DSM-IV criteria (Hasin, Stinson, Ogburn, & Grant, 2007). We combined 'abuse' and 'dependence' into a single 'abuse or dependence' variable for each substance assessed, excluding nicotine. Reliability for substance use disorders was good ($\kappa = 0.74$; Grant et al., 2003).

Psychiatric disorders and health measures. The AUDADIS-IV assessed anxiety disorders (i.e., panic disorder without agoraphobia, panic disorder with agoraphobia, social anxiety disorder, specific phobia, and generalized anxiety disorder) and mood disorders (i.e., major depressive episode, dysthymic disorder, and hypomanic episode) according to DSM-IV criteria. Reliability for the mood and anxiety disorder diagnoses was fair to good ($\kappa = 0.40 - 0.65$; Grant et al., 2003). Both past-year and lifetime disorders were examined. Past-year diagnoses were grouped into larger categories such as 'any mood disorder' or 'any anxiety disorder' to improve statistical power. Lifetime diagnoses were examined as individual disorders.

The AUDADIS-IV assessed for the following personality disorders according to DSM-IV criteria: antisocial, avoidant, dependent, obsessive-compulsive, paranoid, schizoid, and

histrionic, as well as conduct disorder without antisocial personality disorder. Other personality disorders, including borderline, schizotypal, and narcissistic were only assessed in Wave 2 of the NESARC and, therefore, were unavailable for examination in the current study. Reliability for the personality disorder diagnoses was fair to good ($\kappa = 0.40 - 0.67$; Grant et al., 2003).

Participants completed the Short-Form 12 Health Survey - Version 2 (SF-12; Ware, Kosinski, & Keller, 1996), which assessed overall physical and mental health quality of life. The 12 items form two subscales (mental and physical disability) and eight domains that measure areas of disability: social functioning, general health, vitality, physical functioning, physical role, mental health, emotional role, and body pain. The SF-12 subscales and domains were examined during regression analyses, while the eight domains were the focus of the moderation analysis described later. Scores for each domain range are norm-based, ranging from 0 to 100 with higher scores indicating lower levels of disability and better health.

Age. We categorized participants into three age groups: young adults (18 to 34 years old), middle-aged adults (35 to 54 years old), and older adults (55 to 98 years old). Our decision to classify those 55+ as older is consistent with previous aging and gambling research (e.g., Nower & Blaszczynski, 2008; Petry, 2002; Reynolds, Pietrzak, El-Gabalawy, Mackenzie, & Sareen, 2015) and is similar to the age groups used by Granero and colleagues (2014).

Other sociodemographic factors. Information regarding sociodemographic factors included sex, marital status, race/ethnicity, total past year household income, and highest level of education attained. Sex was categorized as 'male' or 'female'. Marital status categories were 'single or never married', 'married or cohabitating', and 'divorced, separated, or widowed'. Race/ethnicity was categorized into 'White', 'Black', 'American Indian or Alaska Native', 'Asian, Hawaiian, or Pacific Islander', and 'Hispanic'. Total past year income was categorized into: '<\$19,999', '\$20,000 to \$34,999', '\$35,000-\$69,999', and '\$70,000 and above'. Highest level of

education was categorized into 'less than high school', 'high school diploma or GED', and 'post-secondary education'.

Data Analyses

Weighted frequencies and cross-tabulations assessed differences among categorical sociodemographic factors across the three age groups (18-34 years old, 35-54 years old, and 55-98 years old) for individuals meeting at least one DSM-5 disordered gambling criterion.

To test our first hypothesis that age will vary with comorbid health conditions and overall measures of functioning, binary logistic (for categorical dependent variables) and linear (for continuous dependent variables) regression analyses compared gambling-related measures between the three age groups. Each of these analyses utilized a significance value of $p < 0.01$ to correct for Type I error.

To examine our second hypothesis that age would moderate the relationship between functioning and gambling severity, we utilized linear regression analyses to examine a potential moderating effect of age on the severity of disordered gambling as measured by the number of disordered gambling criteria endorsed. Specifically, we expected that age would moderate the effect of physical and mental health on gambling severity, with older adults showing a stronger relationship between physical and mental health on gambling severity. Age, the eight domains of the SF-12, and the eight 'age by SF-12' interaction terms were regressed onto a continuous variable for gambling severity, as measured by the number of DSM-5 disordered gambling criteria met. We created interaction terms by centering each variable before creating the interaction term to aid interpretation of the interactions. After conducting the first version of the regression analysis, any non-significant interaction terms were subsequently removed before running final version of the regression model. Moderation analyses employed a significance

value of $p < 0.05$ to determine whether interaction terms were retained from the original model to the final model.

We analyzed the data using the complex samples module of the SPSS statistical software (version 24) with the Taylor Series Linearization method used to account for the complex survey design of the NESARC, including clustering and stratification. All percentages were calculated using survey weights.

Results

Of the 43,093 participants completing Wave 1 of the NESARC, 11,153 endorsed having gambled at least five times in any previous year. Of these gamblers, 1,210 endorsed at least one of the nine DSM-5 disordered gambling criteria, including 436 in the young adult group, 453 in the middle age group, and 321 in the older adult age group. Sociodemographic comparisons between age groups for participants meeting at least one disordered gambling criteria are displayed in Table 1. Across age groups, the majority of participants were White and male. Most participants had a post-secondary education and, in the oldest two age groups, were most likely to be married. We hypothesized that age would vary with overall measures of functioning and gambling features. The results of the logistic and linear regressions examining associations between age and gambling features and SF-12 scales are shown in Table 2. In these analyses, which were restricted to individuals who met criteria for a lifetime DSM-IV gambling disorder, age of gambling onset differed between all three age groups with the duration of their current problematic gambling behaviour(s) being significantly longer in the middle and older age groups compared to the younger adult group. The oldest group was less likely than the other two groups to meet DSM-5 criteria for past-year disordered gambling. The oldest age group had a lower likelihood of seeking professional help for problem gambling behaviours.

Table 1

Sociodemographic comparison between age groups for participants endorsing at least one DSM-5 disordered gambling diagnostic symptom

	Age 18-34 Years (N = 436)		Age 35-54 Years (N = 453)		Age 55-98 Years (N = 321)	
	N	%	N	%	N	%
Sex	F(1.96,127.06) = 127.53, $p < 0.001$					
Male	281	70.8	251	63.1	158	54.3
Female	155	29.2	202	36.9	163	45.7
Marital Status	F(3.86,250.60) = 12349.40, $p < 0.001$					
Single (never married)	253	55.3	90	14.5	20	4.8
Married / Cohabiting	151	39.0	233	63.4	163	65.1
Divorced/Separated/Widowed	32	5.7	130	22.2	138	30.1
Total Household Income Before Taxes – Past 12 Months	F(4.42,287.44) = 1010.55, $p < 0.001$					
< \$19,999	114	21.8	98	16.6	110	26.2
\$20,000 - \$34,999	100	20.7	76	15.9	74	21.2
\$35,000 - \$69,999	147	36.8	157	32.3	89	31.8
\$70,000+	75	20.7	122	35.2	48	20.9
Ethnicity	F(4.82,313.45) = 521.58, $p < 0.001$					
White	210	62.9	247	73.1	212	78.3
Black	117	17.8	111	13.5	61	10.0
American Indian/Alaska Native	8	1.9	13	2.5	5	1.8
Asian/Hawaiian/Pacific Islander	21	7.0	16	3.4	9	4.6
Hispanic	80	10.4	66	7.5	34	5.3
Highest Level of Education	F(3.41,221.30) = 645.19, $p < 0.001$					
Less than High School	74	14.0	78	14.5	80	22.6
High School Diploma or GED	145	34.3	130	30.0	111	37.3
Post Secondary Education	217	51.7	245	55.4	130	40.1

In terms of SF-12 scores, physical functioning declined significantly (indicating worsening health) across age groups, whereas mental functioning among older adults was similar to the young group and better than the middle-aged group. All three age groups differed significantly from one another on the SF-12 domains of physical functioning, body pain, general health, and vitality, with worsening functionality in these domains with increased age. The youngest group was found to be in better health on the domains of physical role, emotional role,

Table 2

Linear and logistic regression analyses examining between age group and comorbid condition among gamblers meeting at least one DSM-5 disordered gambling diagnostic criterion

	Age Groups			<i>p</i>
	18-34 Years (N = 436)	35-54 Years (N = 453)	55-98 Years (N = 321)	
Gambling Features				
Age of PG onset (years)	21.85 ^a	38.24 ^b	57.26 ^c	<0.001
Duration of PG	4.17 ^a	7.02 ^b	8.65 ^b	0.002
Number of DSM gambling criteria met	1.98 ^a	1.79 ^b	1.68 ^b	<0.001
Meets criteria for DSM-5 disordered gambling past-year	38.5% ^a	36.2% ^a	25.4% ^b	<0.001
Has ever sought professional help for gambling	41.4% ^a	34.4% ^b	24.1% ^a	<0.001
SF-12 Scales				
Physical functioning	54.36 ^a	50.14 ^b	46.62 ^c	<0.001
Role physical	54.05 ^a	50.33 ^b	45.83 ^b	<0.001
Body pain	51.66 ^a	48.44 ^b	45.61 ^c	<0.001
General health	52.79 ^a	47.37 ^b	43.81 ^c	<0.001
Vitality	54.06 ^a	52.38 ^b	50.67 ^c	<0.001
Social functioning	52.29 ^a	49.21 ^b	49.29 ^b	<0.001
Role emotional	51.85 ^a	49.29 ^b	48.78 ^b	<0.001
Mental health	50.53 ^a	48.67 ^b	49.42 ^{a,b}	<0.001

N values are unweighted. %s are weighted. Similar superscript letters denote no statistically significant difference ($p > 0.01$) while dissimilar superscript letters indicate a significant difference ($p < 0.01$).

and social functioning than the other two groups. Older adults showed better mental health compared to the middle age group but worse mental health than the youngest group.

Addressing the hypothesis that game type would differ with age, results found in Table 3 show that older adults were particularly likely to play one game (84.2%), either slot machines or VLTs (62.9%), and did so nearly always in the confines of a casino (97.5%). On the other hand, the majority of those in the youngest age group played more than one game with 71.3% playing a game outside of the casino, compared to just 15.9% of older adults playing outside of the casino. It should be noted that the power of the game type analyses was limited by game type items of

Table 3

Logistic regression analyses examining gambling-related variables among age groupings

	Age Groups			<i>p</i>
	18-34	35-54	55-98	
Gambling Participation (Only DSM-IV PG)	N = 27	N = 34	N = 13	
Played more than one game type	15 (62.9%) ^{a,b}	13 (31.3%) ^b	4 (15.8%) ^a	0.057
Played game type in a casino	14 (56.6%) ^{a,b}	23 (66.8%) ^b	12 (97.5%) ^a	0.024
Played game type outside of casino	19 (71.3%) ^{a,b}	20 (57.8%) ^b	4 (15.9%) ^a	0.063
Played slot or video machine	6 (25.2%) ^a	18 (49.9%) ^a	9 (62.9%) ^a	0.039
DSM-5 Criteria Met	N = 436	N = 453	N = 321	
Preoccupation with gambling	260 (60.0%) ^a	258 (56.2%) ^a	182 (58.7%) ^a	0.494
Need to gamble with increasing amounts	157 (36.1%) ^a	129 (27.6%) ^b	75 (23.5%) ^b	<0.001
Unsuccessful efforts to reduce gambling	51 (10.4%) ^a	71 (12.0%) ^a	41 (12.2%) ^a	0.456
Restless or irritable when attempting to stop	17 (4.2%) ^{a,b}	30 (4.6%) ^a	13 (3.0%) ^b	<0.001
Gambles to escape or relieve mood	100 (21.0%) ^a	173 (35.8%) ^b	104 (32.0%) ^b	<0.001
Chasing losses	181 (43.7%) ^a	117 (23.3%) ^b	71 (22.9%) ^b	<0.001
Lies to others to conceal extent of gambling	66 (16.3%) ^a	70 (12.9%) ^{a,b}	42 (13.2%) ^b	0.015
Risked/lost significant relationship/career	12 (1.7%) ^{a,b}	16 (2.5%) ^a	4 (1.3%) ^b	0.002
Relies on others for finances	21 (5.0%) ^a	19 (3.5%) ^a	7 (0.9%) ^b	<0.001

N values are unweighted. %s are weighted. Similar superscript letters denote no statistically significant

difference ($p > 0.01$) while dissimilar superscript letters indicate a significant difference ($p < 0.01$).

the NESARC only being asked of those meeting DSM-IV pathological gambling criteria (i.e., at least 5 of 10 DSM-IV criteria met).

Specific criteria were found to present differently between age groups, as per our hypothesis that age would vary with DSM-5 gambling criteria. Mean scores and test of age group differences shown in Table 3 indicate that the youngest age group was more likely to endorse a need to gamble with increasing amounts, more likely to chase losses, and less likely to gamble as a means of escaping or relieving mood than middle and older age groups. Older adults were less likely to have risked or lost a significant career or relationship, were less likely to rely on others for finances, and were less likely to be irritable or restless when attempting to stop gambling than the middle-aged group. The older adult group were also less likely to lie to conceal the extent of their gambling than the youngest age group.

Table 4

Logistic regression analyses examining comorbid mental health disorders among age groupings for gamblers meeting as least one past-year disordered gambling criteria

	Age Groups			<i>p</i>
	18-34 (N = 436)	35-54 (N = 453)	55-98 (N = 321)	
Past Year Mental Health Disorder Groupings				
Any mood or anxiety disorder	152 (32.5%) ^a	160 (35.1%) ^a	87 (24.7%) ^b	<0.001
Any mood disorder	96 (19.0%) ^a	94 (20.8%) ^a	51 (13.4%) ^b	<0.001
Any anxiety disorder	94 (21.3%) ^a	114 (26.8%) ^b	50 (14.7%) ^c	<0.001
Alcohol use disorder	153 (36.8%) ^a	94 (22.7%) ^b	26 (6.2%) ^c	<0.001
Drug including marijuana disorder	49 (12.9%) ^a	17 (3.3%) ^b	3 (0.9%) ^b	<0.001
Any substance use disorder	167 (40.1%) ^a	100 (23.7%) ^b	27 (6.7%) ^c	<0.001
Any mood, anxiety, alcohol, drug disorder	250 (56.3%) ^a	214 (48.5%) ^b	106 (29.5%) ^c	<0.001
Lifetime Personality Disorder				
Conduct disorder (w/o antisocial)	14 (2.7%) ^a	8 (3.4%) ^a	3 (0.9%) ^b	<0.001
Antisocial PD	74 (16.7%) ^a	45 (10.5%) ^b	19 (6.4%) ^c	<0.001
Avoidant PD	23 (6.0%) ^{a,b}	35 (6.7%) ^a	10 (3.4%) ^b	<0.001
Dependent PD	7 (1.5%) ^a	8 (0.9%) ^a	1 (0.3%) ^b	<0.001
Obsessive-compulsive PD	75 (15.2%) ^a	93 (20.6%) ^b	51 (13.1%) ^a	<0.001
Paranoid PD	71 (14.1%) ^a	68 (14.8%) ^a	25 (8.2%) ^b	<0.001
Schizoid PD	42 (9.5%) ^a	42 (8.1%) ^a	14 (4.7%) ^b	<0.001
Histrionic PD	47 (10.3%) ^a	33 (6.8%) ^a	8 (2.1%) ^b	<0.001

N values are unweighted. %s are weighted. Similar superscript letters denote no statistically significant difference ($p > 0.01$) while dissimilar superscript letters indicate a significant difference ($p < 0.01$).

To examine our hypothesis that age would vary with comorbid health conditions, Table 4 shows the results of binary logistic regressions between age and comorbid mental health conditions. All assessed past-year mental health disorder groupings were associated with age. Specifically, the prevalence of any anxiety disorder, alcohol use disorder, any substance use disorder, and any mental health disorder were found to decrease with age.

Similarly, all assessed personality disorders were associated with age. The oldest age group was significantly less likely to meet criteria for conduct disorder without antisocial, dependent, paranoid, schizoid, and histrionic personality disorders compared to the other two age

Table 5

Indicators of the extent to which age moderates the Influence of SF-12 domains on gambling severity

	R ²	<i>p</i>	# of DSM-5 PG Criteria Endorsed		
			B/ β	95% CI	
Second Model	0.004				
Age		<0.001	-0.001	-0.001	-0.001
SF-12 – Physical functioning		0.532	0.000	-0.001	0.000
SF-12 – Physical role		0.472	0.000	-0.001	0.002
SF-12 – Bodily pain		0.295	0.000	0.000	0.000
SF-12 – General health		<0.001	-0.001	-0.001	-0.001
SF-12 – Vitality		0.343	0.000	0.000	0.001
SF-12 – Social functioning		0.003	-0.002	-0.003	-0.001
SF-12 – Emotional role		0.663	0.000	0.000	0.001
SF-12 – Mental health		<0.001	-0.001	-0.002	-0.001
Age * SF-12 – Physical role		0.921	7.165E-7	-1.368E-5	1.511E-5
Age * SF-12 – Social functioning		0.001	3.526E-5	1.426E-5	5.625E-5

groups. Conversely, the oldest age group was more likely to meet avoidant PD criteria compared to the middle age group. The middle age group was more likely to meet obsessive-compulsive PD criteria than the other two groups. Antisocial PD was the only assessed personality disorder to consistently decline over the course of the lifespan.

To examine the hypothesis that age would moderate the relationship between functioning and gambling severity, we conducted regression analyses including interaction terms between age and all eight SF-12 domains (see Table 5). Only the final model is displayed in Table 5. In the first version of the model, interaction terms between age and physical role as well as age and social functioning were significant contributors to the model. These were retained into the final model where age by physical role interaction term was no longer significant ($p = 0.921$) while age by social functioning ($p = 0.001$) interaction remained significant. An examination of the conditional effects of social functioning on gambling severity at three different ages suggests that younger and middle aged adults have a similar strength relationship between lower social

functioning and increased gambling severity. In older adults, this relationship remains significant but has a significantly smaller effect size.

Discussion

The current study examined the way gambling-related features, including prevalence of comorbid psychiatric disorders and both mental and physical functioning, vary across the lifespan. The findings of the study indicate that gambling behaviours and comorbid disorders present in individuals meeting at least one disordered gambling criteria vary over the course of the lifespan. Older adults are more likely than other age groups to have decreased general functionality and health, more likely to play a single casino game, and less likely to present with a past-year comorbid health condition. The three age groups also differed in the DSM-5 gambling symptoms observed. These results generally supported our hypothesis that age would have a relationship with comorbid health conditions and overall measures of well-being, supporting our expectation that the oldest age group would experience lower comorbidity and reduced well-being. Finally, age moderated the relationship between social functioning and gambling severity, but did not moderate the same proposed relationship with any other domains of functioning. The relationship between lower social functioning and greater gambling severity was stronger in young and middle age adults than in older adults.

Younger adults had better health and functioning than at least one other age group (i.e., younger or middle aged adults) on both SF-12 summary scales and all eight SF-12 domains of emotional and physical functioning. On four of the domains (i.e., physical functioning, body pain, general health, and vitality), the scores differed between all three groups with youngest age group having the best functioning in these domains and the oldest age group having the worst functioning, partially supporting our hypothesis based on natural decline observed in physical function, as measured by SF-12 or related measures, with increased age (e.g., Franks, Gold, &

Fiscella, 2003; Kim et al., 2014; Kontodimopoulos, Pappa, Niakas, & Tountas, 2007). The youngest group had better health/functioning in the remainder of the domains (i.e., role physical, social functioning, role emotional, and mental health) than at least one of the other two age groups, with minimal differences observed between the middle and oldest age groups. SAVI theory would suggest that physical health naturally declines while mental health should generally improve unless there are vulnerabilities that nullify age-related emotional advantages (Charles, 2010). This is supported by our findings that older age was associated with worse scores on domains of physical functioning (i.e., physical functioning, body pain, general health, and vitality) while minimal differences between older adults and middle age adults were observed in domains of mental functioning (i.e., role physical, social functioning, role emotional, and mental health). Previous studies have also found that younger adults in general are less likely to present with difficulties in physical or emotional functioning while older adults in general have poorer overall health (Granero et al., 2014b; Kerber, Black, & Buckwalter, 2008). Furthermore, past research has shown gamblers to be more likely to experience poorer overall mental and physical health compared to their non-gambling counterparts (Bonnaire et al., 2016; Cunningham-Williams et al., 2005; Lorains, Cowlishaw, & Thomas, 2011). Though this may be a simple product of aging in some cases, others may experience gambling as the primary disorder, as Granero and colleagues (2014) indicate. For these individuals, the largely sedentary act of gambling coupled with either the isolation frequently involved with online gaming or the common substance use observed within casinos may result in worsening physical and mental functioning over time (Granero et al., 2014; Pietrzak et al., 2007).

Significant age group differences were observed in the endorsement of DSM-5 gambling criteria. The youngest age group was more likely to chase losses and need to gamble with increasing amounts to achieve the same level of excitement than other age groups. Chasing

losses has been noted as a criterion that tends to set problem or pathological gamblers apart from more recreational gamblers in young adults and may serve as an indicator of increasing severity in the future (Chamberlain et al., 2017; Kong et al., 2014; Toce-Gerstein et al., 2003). Older adults, on the other hand, presented with the fewest number of total symptoms endorsed and differed most from the youngest group in terms of symptoms endorsed. While the youngest group endorsed the need for increased stimulation to reach a desired excitement level, the motivation for older adults appeared to be more driven by a desire to escape or relieve mood. The introduction of late-onset gamblers in the older age groups likely explains the desire for older adults to escape or relieve mood as late-life gambling largely serves to act as an escape from late-life emotional distress (Tira et al., 2014).

The results of this study found a lower prevalence of mood, anxiety, and substance use disorders, in older adults compared to other age groups. This lower prevalence of comorbid conditions in older adults is consistent with the finding that gambling in older adults is less severe in terms of total symptoms endorsed, and similar to other studies that found earlier age of onset to be associated with greater comorbid disorder severity (Granero et al., 2014b; Jiménez-Murcia et al., 2010; Petry, 2002). SAVI theory suggests that the relatively lower presence of comorbid disorders in older adult gamblers may be due to age-related improvements in well-being (Charles, 2010). The current study examined gamblers meeting at least one DSM-5 disordered gambling criteria. A recent examination using the NESARC found older adults meeting at least four DSM-5 disordered gambling criteria were more likely than younger age groups to present with a comorbid psychiatric condition (Nicholson, Mackenzie, Afifi, & Sareen, under review), suggesting more severe gamblers do not experience the age-related benefits proposed by the SAVI theory (Charles, 2010).

The development of late-onset gambling in older adults may be indicative of increasing vulnerability with age, including impaired health functioning as observed in this study. Some studies have suggested older adults may develop problem gambling behaviours later in life in part to cope with negative affect that may be related to the process of aging, including reduced social network and reduced physical capacity (Parke, Griffiths, Pattinson, & Keatley, 2018). Alternatively, chronic gamblers may have learned how to control and manage their gambling issues over a long period of time, thereby limiting the presentation of gambling symptoms and co-occurring gambling issues, as observed in other addictions (Boeri, Sterk, & Elifson, 2008). This study cannot directly address this issue directly because it is cross-sectional and we did not differentiate between chronic gambling and late-onset gambling in older adults. However, our findings generally suggest that older adults, on the whole, present as a less severe gambling group than younger or middle age groups of gamblers. It is important to note that this discrepancy in symptomatology may also be due, in part, to a lack of opportunity to meet these criteria given changes in employment and social relationships associated with old age, which have led some to call for gambling criteria designed specifically for older adults (Smith, Hategan, & Bourgeois, 2017).

In younger adults, comorbid prevalence rates, DSM-5 gambling disorder prevalence, and gambling severity as measured by number of diagnostic criteria met were all significantly greater than in the other two age groups. We found that younger adults were less likely to gamble to escape or relieve mood, which is similar to past research which has suggested that, despite experiencing gambling difficulties, young adults are often unlikely to acknowledge their gambling behaviours as problematic (Hardoon, Derevensky, & Gupta, 2003). While prevention strategies and recommendations have been suggested to target adolescents and young adults (e.g., Blinn-Pike, Worthy, & Jonkman, 2010; Dickson, Derevensky, & Gupta, 2002; Larimer et

al., 2012; Lostutter, Lewis, Cronce, Neighbors, & Larimer, 2014), a review of adolescent gambling literature noted that it is unclear whether these programs impact problem gambling behaviours or prevalence (Wilber & Potenza, 2006).

Our hypothesis that age would moderate the relationship between quality of life and gambling severity was only supported for one of the eight health variables we examined; age moderated the relationship between social functioning and gambling severity. Among the younger and middle age gamblers, participants with poorer social functioning had the greatest gambling severity, whereas among older gamblers, this relationship was present to a smaller effect. This coincides with previous findings regarding early-onset gambling being associated with more severe symptomatology (Jiménez-Murcia et al., 2010). The moderating impact of age on the relationship between social functioning and gambling severity may become increasingly important to understand given the proliferation of online gambling opportunities, where young adults may be increasingly able to engage in harmful gambling behaviours without leaving the home or even being disqualified from gambling due to being under the age of majority. As previous research has found, younger problem gamblers differentiate from older gamblers in the frequency with which they gamble apart from family or friends and their overall involvement in non-gambling related extracurricular activities (Kong et al., 2014; Lussier, Derevensky, Gupta, Bergevin, & Ellenbogen, 2007). For older adults, the relationship between lower social functioning and greater gambling severity was significant but weaker than in other age groups. This may suggest that some older adults simultaneously use gambling as a social interaction and experience a relatively high number of disordered gambling symptoms. Alternatively, older adult gamblers may have felt that their social activities were not interfered with by physical health or emotional problems if a chronic stressor had reduced their level of social support over a long

period of time, as may occur in individuals with longstanding stressors according to the SAVI theory (Charles, 2010).

While previous research has found that psychological treatment targeted towards gambling improves other psychological symptoms, it should be noted that efficacious treatment options, including cognitive-behavioural therapy and motivational interviewing tend to include individualized feedback that takes overall symptomatology and gambling motives into account (Petry, Ginley, & Rash, 2017). The results of the current study highlight the differing clinical presentation of individuals across the lifespan who meet at least one disordered gambling criterion. Specifically, the findings reinforce the importance of implementing treatment as soon as possible, particularly in young adults who present with greater severity and a higher prevalence of past-year comorbid disorders. Signs of problem gambling in older adults, alternatively, may be a sign of poorer general mental or physical functioning and should not be dismissed as a by-product of positive socialization.

Limitations

The current study has a number of substantial strengths, including the use of DSM diagnostic criteria for comorbid conditions, and the use of gamblers from a nationally representative sample rather than looking exclusively at those seeking treatment. However, this study, particularly the use of Wave 1 of the NESARC, has limitations that should be noted. Wave 1 of the NESARC examined DSM-IV-TR diagnostic criteria for comorbid psychiatric disorders, such that our psychiatric comorbidity findings might not generalize to the DSM-5. While DSM-5 disordered gambling was replicable within the NESARC without impacting the integrity of the diagnosis, the other disorders are not as clear-cut. As a result, the findings of this study reflect the DSM-IV view of psychiatric disorders. The NESARC utilized trained-lay interviewers to conduct the AUDADIS-IV instead of mental health professionals. Although trained lay

interviewers do not have the same training as professionals, they have been shown to perform similarly to medical doctors in diagnosing disorders with a structured interview (Amstadter et al., 2010). Another limitation comes from the timeliness of this research. This study utilizes data from NESARC Wave 1, collected from 2001 to 2002. Despite the age of the data, the NESARC was chosen as it offers a nationally representative large sample of gamblers, allowing for generalizability across locales and settings, making it ideal for the purposes of this research question. Further, more recent waves of the NESARC did not survey gambling. Since the time of data collection, disordered gambling rates may have changed with the proliferation of available gambling methods including Internet poker and video lottery terminals, which may be of particular interest to both younger adults with poor social functioning and older adults with poor physical functioning. Finally, the research utilized cross-sectional data and did not allow for differentiation between early- and late-onset gambling, limiting the ability to infer causality.

Conclusion

The current study found that gambling-related features differ across the lifespan in gamblers presenting with as few as one disordered gambling symptom. Mental and physical functioning, comorbid psychiatric disorders, and the disordered gambling symptoms themselves among individuals with at least one disordered gambling criterion were all found to differ significantly among younger, middle-aged, and older adults, with older adults found to have poorer physical functioning but fewer past-year comorbid psychiatric conditions than other age groups. In general, age influenced the clinical features associated with gambling. Older adults who experience gambling symptoms may still benefit from age-related strengths that are associated with fewer comorbid mental health problems. Young adults with gambling symptoms may present as more severe and require intervention as soon as possible to help prevent future difficulties. Further, age moderates the relationship between social functioning and gambling

severity, highlighting the importance of social factors, including connectivity and isolation, in the prevention and treatment of gambling issues across the lifespan.

References

- Afifi, T. O., Nicholson, R., Martins, S. S., & Sareen, J. (2016). A longitudinal study of the temporal relation between problem gambling and mental and substance use disorders among young adults. *Canadian Journal of Psychiatry*, 61(2), 102–11.
<http://doi.org/10.1177/0706743715625950>
- Allami, Y., Vitaro, F., Brendgen, M., Carbonneau, R., Lacourse, É., & Tremblay, R. E. (2017). A longitudinal empirical investigation of the pathways model of problem gambling. *Journal of Gambling Studies*, 33(4), 1153–1167. <http://doi.org/10.1007/s10899-017-9682-6>
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th, Text ed.). Washington, DC: American Psychiatric Association.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Amstadter, A. B., Richardson, L., Acierno, R., Kilpatrick, D. G., Gaboury, M. T., Tran, T. L., ... Thach, T. D. (2010). Does interviewer status matter? An examination of lay interviewers and medical doctor interviewers in an epidemiological study in Vietnam. *International Perspectives in Victimology*, 5(1), 55.
- Barnes, G. M., Welte, J. W., Tidwell, M.-C. O., & Hoffman, J. H. (2011). Gambling on the lottery: Sociodemographic correlates across the lifespan. *Journal of Gambling Studies*, 27(4), 575–86. <http://doi.org/10.1007/s10899-010-9228-7>
- Black, D. W., Moyer, T., & Schlosser, S. (2003). Quality of life and family history in pathological gambling. *The Journal of Nervous and Mental Disease*, 191(2), 124–126.
<http://doi.org/10.1097/01.NMD.0000050942.86352.47>
- Blanco, C., Hasin, D. S., Petry, N., Stinson, F. S., & Grant, B. F. (2006). Sex differences in subclinical and DSM-IV pathological gambling: Results from the National Epidemiologic

- Survey on Alcohol and Related Conditions. *Psychological Medicine*, 36(7), 943–953.
<http://doi.org/10.1017/S0033291706007410>
- Blaszczynski, A., & Nower, L. (2002). A pathways model of problem and pathological gambling. *Addiction (Abingdon, England)*, 97(5), 487–499.
- Blinn-Pike, L., Worthy, S. L., & Jonkman, J. N. (2010). Adolescent gambling: A review of an emerging field of research. *The Journal of Adolescent Health*, 47(3), 223–36.
<http://doi.org/10.1016/j.jadohealth.2010.05.003>
- Boeri, M. W., Sterk, C. E., & Elifson, K. W. (2008). Reconceptualizing early and late onset: A life course analysis of older heroin users. *The Gerontologist*, 48(5), 637–645.
<http://doi.org/10.1093/geront/48.5.637>
- Bonnaire, C. L., Kovess, V., Guignard, R., Richard, J.-B., Du-Roscoat, E., & Beck, F. O. (2016). Life events, substance use, psychological distress, and quality of life in male and female French gamblers. *Annals of Clinical Psychiatry : Official Journal of the American Academy of Clinical Psychiatrists*, 28(4), 263–279.
- Chamberlain, S. R., Stochl, J., Redden, S. A., Odlaug, B. L., & Grant, J. E. (2017). Latent class analysis of gambling subtypes and impulsive/compulsive associations: Time to rethink diagnostic boundaries for gambling disorder? *Addictive Behaviors*, 72, 79–85.
<http://doi.org/10.1016/j.addbeh.2017.03.020>
- Charles, S. T. (2010). Strength and vulnerability integration: A model of emotional well-being across adulthood. *Psychological Bulletin*, 136(6), 1068–91. <http://doi.org/10.1037/a0021232>
- Cox, B. J., Enns, M. W., & Michaud, V. (2004). Comparisons between the South Oaks Gambling Screen and a DSM-IV-based interview in a community survey of problem gambling. *Canadian Journal of Psychiatry*, 49(4), 258–64.
- Cunningham-Williams, R. M., Grucza, R. A., Cottler, L. B., Womack, S. B., Books, S. J.,

- Przybeck, T. R., ... Cloninger, C. R. (2005). Prevalence and predictors of pathological gambling: Results from the St. Louis personality, health and lifestyle (SLPHL) study. *Journal of Psychiatric Research*, 39(4), 377–90.
<http://doi.org/10.1016/j.jpsychires.2004.09.002>
- Delfabbro, P., King, D., & Griffiths, M. D. (2013). From Adolescent to Adult Gambling: An Analysis of Longitudinal Gambling Patterns in South Australia. *Journal of Gambling Studies*. <http://doi.org/10.1007/s10899-013-9384-7>
- Di Nicola, M., De Risio, L., Pettorruso, M., Caselli, G., De Crescenzo, F., Swierkosz-Lenart, K., ... Janiri, L. (2014). Bipolar disorder and gambling disorder comorbidity: Current evidence and implications for pharmacological treatment. *Journal of Affective Disorders*, 167, 285–98. <http://doi.org/10.1016/j.jad.2014.06.023>
- Dickson, L. M., Derevensky, J. L., & Gupta, R. (2002). The prevention of gambling problems in youth: a conceptual framework. *Journal of Gambling Studies*, 18(2), 97–159.
- Dwyer, B., Shapiro, S. L., & Drayer, J. (2017). Daily fantasy football and self-reported problem behavior in the United States. *Journal of Gambling Studies*. <http://doi.org/10.1007/s10899-017-9720-4>
- Engwall, D., Hunter, R., & Steinberg, M. (2004). Gambling and other risk behaviors on university campuses. *Journal of American College Health : J of ACH*, 52(6), 245–55.
<http://doi.org/10.3200/JACH.52.6.245-256>
- Franks, P., Gold, M. R., & Fiscella, K. (2003). Sociodemographics, self-rated health, and mortality in the US. *Social Science & Medicine (1982)*, 56(12), 2505–14.
- Granero, R., Penelo, E., Stinchfield, R., Fernandez-Aranda, F., Savvidou, L. G., Fröberg, F., ... Jiménez-Murcia, S. (2014). Is pathological gambling moderated by age? *Journal of Gambling Studies*, 30(2), 475–92. <http://doi.org/10.1007/s10899-013-9369-6>

- Grant, B. F., & Dawson, D. A. (2006). Introduction to the National Epidemiologic Survey on Alcohol and Related Conditions. *Alcohol Research & Health*, 29(2), 74–78.
- Grant, B. F., Dawson, D. A., Stinson, F. S., Chou, P. S., Kay, W., & Pickering, R. (2003). The Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADIS-IV): Reliability of alcohol consumption, tobacco use, family history of depression and psychiatric diagnostic modules in a general population sample. *Drug and Alcohol Dependence*, 71(1), 7–16.
- Grant, J. E., Chamberlain, S. R., Schreiber, L. R. N., Odlaug, B. L., & Kim, S. W. (2011). Selective decision-making deficits in at-risk gamblers. *Psychiatry Research*, 189(1), 115–20. <http://doi.org/10.1016/j.psychres.2011.05.034>
- Hardoon, K., Derevensky, J. L., & Gupta, R. (2003). Empirical measures vs. perceived gambling severity among youth: Why adolescent problem gamblers fail to seek treatment. *Addictive Behaviors*, 28(5), 933–46.
- Hasin, D. S., Stinson, F. S., Ogburn, E., & Grant, B. F. (2007). Prevalence, correlates, disability, and comorbidity of DSM-IV alcohol abuse and dependence in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of General Psychiatry*, 64(7), 830–842.
<http://doi.org/http://dx.doi.org.proxy2.lib.umanitoba.ca/10.1001/archpsyc.64.7.830>
- Hope, J., & Havir, L. (2002). You bet they're having fun! *Journal of Aging Studies*, 16(2), 177–197. [http://doi.org/10.1016/S0890-4065\(02\)00043-9](http://doi.org/10.1016/S0890-4065(02)00043-9)
- Hopley, A. A. B., & Nicki, R. M. (2010). Predictive factors of excessive online poker playing. *Cyberpsychology, Behavior and Social Networking*, 13(4), 379–85.
<http://doi.org/10.1089/cyber.2009.0223>
- Jiménez-Murcia, S., Álvarez-Moya, E. M., Stinchfield, R., Fernández-Aranda, F., Granero, R.,

- Aymamí, N., ... Menchón, J. M. (2010). Age of onset in pathological gambling: clinical, therapeutic and personality correlates. *Journal of Gambling Studies*, 26(2), 235–48.
<http://doi.org/10.1007/s10899-009-9175-3>
- Kerber, C. S., Black, D. W., & Buckwalter, K. (2008). Comorbid psychiatric disorders among older adult recovering pathological gamblers. *Issues in Mental Health Nursing*, 29(9), 1018–28. <http://doi.org/10.1080/01612840802274933>
- Kim, S.-H., Jo, M.-W., Ahn, J., Ock, M., Shin, S., & Park, J. (2014). Assessment of psychometric properties of the Korean SF-12 v2 in the general population. *BMC Public Health*, 14(1), 1086. <http://doi.org/10.1186/1471-2458-14-1086>
- Kim, S. W., Grant, J. E., Eckert, E. D., Faris, P. L., & Hartman, B. K. (2006). Pathological gambling and mood disorders: Clinical associations and treatment implications. *Journal of Affective Disorders*, 92(1), 109–16. <http://doi.org/10.1016/j.jad.2005.12.040>
- Kong, G., Tsai, J., Krishnan-Sarin, S., Cavallo, D. A., Hoff, R. A., Steinberg, M. A., ... Potenza, M. N. (2014). A latent class analysis of pathological-gambling criteria among high school students: associations with gambling, risk and health/functioning characteristics. *Journal of Addiction Medicine*, 8(6), 421–30. <http://doi.org/10.1097/ADM.0000000000000074>
- Kontodimopoulos, N., Pappa, E., Niakas, D., & Tountas, Y. (2007). Validity of SF-12 summary scores in a Greek general population. *Health and Quality of Life Outcomes*, 5, 55.
<http://doi.org/10.1186/1477-7525-5-55>
- Larimer, M. E., Neighbors, C., Lostutter, T. W., Whiteside, U., Crouce, J. M., Kaysen, D., & Walker, D. D. (2012). Brief motivational feedback and cognitive behavioral interventions for prevention of disordered gambling: A randomized clinical trial. *Addiction*, 107(6), 1148–1158. <http://doi.org/10.1111/j.1360-0443.2011.03776.x>
- Lorains, F. K., Cowlishaw, S., & Thomas, S. A. (2011). Prevalence of comorbid disorders in

- problem and pathological gambling: Systematic review and meta-analysis of population surveys. *Addiction*, 106(3), 490–8. <http://doi.org/10.1111/j.1360-0443.2010.03300.x>
- Lostutter, T. W., Lewis, M. A., Crouce, J. M., Neighbors, C., & Larimer, M. E. (2014). The use of protective behaviors in relation to gambling among college students. *Journal of Gambling Studies*, 30(1), 27–46. <http://doi.org/10.1007/s10899-012-9343-8>
- Lussier, I., Derevensky, J. L., Gupta, R., Bergevin, T., & Ellenbogen, S. (2007). Youth gambling behaviors: An examination of the role of resilience. *Psychology of Addictive Behaviors*, 21(2), 165–73. <http://doi.org/10.1037/0893-164X.21.2.165>
- Lynch, W. J., Maciejewski, P. K., & Potenza, M. N. (2004). Psychiatric correlates of gambling in adolescents and young adults grouped by age at gambling onset. *Archives of General Psychiatry*, 61(11), 1116–22. <http://doi.org/10.1001/archpsyc.61.11.1116>
- Mann, K., Lemenager, T., Zois, E., Hoffmann, S., Nakovics, H., Beutel, M., ... Fauth-Bühler, M. (2017). Comorbidity, family history and personality traits in pathological gamblers compared with healthy controls. *European Psychiatry*, 42, 120–128. <http://doi.org/10.1016/j.eurpsy.2016.12.002>
- Milosevic, A., & Ledgerwood, D. M. (2010). The subtyping of pathological gambling: a comprehensive review. *Clinical Psychology Review*, 30(8), 988–98. <http://doi.org/10.1016/j.cpr.2010.06.013>
- Nelson, S. E., Gebauer, L., LaBrie, R. A., & Shaffer, H. J. (2009). Gambling problem symptom patterns and stability across individual and timeframe. *Psychology of Addictive Behaviors*, 23(3), 523–533. <http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1037/a0016053>
- Nicholson, R., Mackenzie, C., Afifi, T. O., & Sareen, J. (n.d.). Changes in gambling diagnostic criteria from DSM-IV to DSM-5: Effects of mental disorder comorbidity across younger, middle-aged, and older adults. *Journal of Gambling Studies*.

- Nower, L., & Blaszczynski, A. (2008). Characteristics of problem gamblers 56 years of age or older: A statewide study of casino self-excluders. *Psychology and Aging, 23*(3), 577–84. <http://doi.org/10.1037/a0013233>
- Nower, L., Martins, S. S., Lin, K.-H., & Blanco, C. (2013). Subtypes of disordered gamblers: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Addiction (Abingdon, England), 108*(4), 789–98. <http://doi.org/10.1111/add.12012>
- Parhami, I., Mojtabai, R., Rosenthal, R. J., Afifi, T. O., & Fong, T. W. (2014). Gambling and the onset of comorbid mental disorders: A longitudinal study evaluating severity and specific symptoms. *Journal of Psychiatric Practice, 20*(3), 207–19. <http://doi.org/10.1097/01.pra.0000450320.98988.7c>
- Parke, A., Griffiths, M., Pattinson, J., & Keatley, D. (2018). Age-related physical and psychological vulnerability as pathways to problem gambling in older adults. *Journal of Behavioral Addictions, 7*(1), 137–145. <http://doi.org/10.1556/2006.7.2018.18>
- Petry, N. M. (2002). A comparison of young, middle-aged, and older adult treatment-seeking pathological gamblers. *The Gerontologist, 42*(1), 92–9.
- Petry, N. M., Ginley, M. K., & Rash, C. J. (2017). A systematic review of treatments for problem gambling. *Psychology of Addictive Behaviors, 31*(8), 951–961. <http://doi.org/10.1037/adb0000290>
- Pietrzak, R. H., Molina, C. A., Ladd, G. T., Kerins, G. J., & Petry, N. M. (2005). Health and psychosocial correlates of disordered gambling in older adults. *American Journal of Geriatric Psychiatry, 13*(6), 510–519. <http://doi.org/10.1176/appi.ajgp.13.6.510>
- Pietrzak, R. H., Morasco, B. J., Blanco, C., Grant, B. F., & Petry, N. M. (2007). Gambling level and psychiatric and medical disorders in older adults: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *The American Journal of*

- Geriatric Psychiatry*, 15(4), 301–13. <http://doi.org/10.1097/01.JGP.0000239353.40880.cc>
- Quigley, L., Yakovenko, I., Hodgins, D. C., Dobson, K. S., El-Guebaly, N., Casey, D. M., ... Schopflocher, D. P. (2014). Comorbid problem gambling and major depression in a community sample. *Journal of Gambling Studies*. <http://doi.org/10.1007/s10899-014-9488-8>
- Raylu, N., & Oei, T. P. S. (2002). Pathological gambling. A comprehensive review. *Clinical Psychology Review*, 22(7), 1009–61.
- Reynolds, K., Pietrzak, R. H., El-Gabalawy, R., Mackenzie, C. S., & Sareen, J. (2015). Prevalence of psychiatric disorders in U.S. older adults: Findings from a nationally representative survey. *World Psychiatry : Official Journal of the World Psychiatric Association (WPA)*, 14(1), 74–81. <http://doi.org/10.1002/wps.20193>
- Saunders, J. B. (2017). Substance use and addictive disorders in DSM-5 and ICD 10 and the draft ICD 11. *Current Opinion in Psychiatry*, 30(4), 227–237. <http://doi.org/10.1097/YCO.0000000000000332>
- Shaffer, H. J., Hall, M. N., & Bilt, J. V. (1997). *Estimating the prevalence of disordered gambling behavior in the United States and Canada: A meta-analysis*. Boston, MA: Harvard Medical School.
- Smith, M., Hategan, A., & Bourgeois, J. A. (2017). Geriatric gambling disorder: challenges in clinical assessment. *International Psychogeriatrics*, 29(12), 2105–2106. <http://doi.org/10.1017/S1041610217001843>
- Strong, D. R., & Kahler, C. W. (2007). Evaluation of the continuum of gambling problems using the DSM-IV. *Addiction*, 102(5), 713–721. <http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1111/j.1360-0443.2007.01789.x>
- Stucki, S., & Rihs-Middel, M. (2007). Prevalence of adult problem and pathological gambling

- between 2000 and 2005: An update. *Journal of Gambling Studies*, 23(3), 245–257.
<http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1007/s10899-006-9031-7>
- Stuhldreher, W. L., Stuhldreher, T. J., & Forrest, K. Y.-Z. (2007). Gambling as an emerging health problem on campus. *Journal of American College Health*, 56(1), 75–88.
<http://doi.org/10.3200/JACH.56.1.75-88>
- Tira, C., Jackson, A. C., & Tomnay, J. E. (2014). Pathways to Late-Life Problematic Gambling in Seniors: A Grounded Theory Approach. *The Gerontologist*, 54(6), 1035–1048.
<http://doi.org/10.1093/geront/gnt107>
- Toce-Gerstein, M., Gerstein, D. R., & Volberg, R. A. (2003). A hierarchy of gambling disorders in the community. *Addiction*, 98(12), 1661–1672.
<http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1111/j.1360-0443.2003.00545.x>
- Verdura Vizcaíno, E. J., Fernández-Navarro, P., Petry, N., Rubio, G., & Blanco, C. (2014). Differences between early-onset pathological gambling and later-onset pathological gambling: Data from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). *Addiction (Abingdon, England)*, 109(5), 807–13.
- Ware, J., Kosinski, M., & Keller, S. D. (1996). A 12-Item Short-Form Health Survey: Construction of scales and preliminary tests of reliability and validity. *Medical Care*, 34(3), 220–33.
- Weinstock, J., April, L. M., & Kallmi, S. (2017). Is subclinical gambling really subclinical? *Addictive Behaviors*, 73, 185–191. <http://doi.org/10.1016/j.addbeh.2017.05.014>
- Welte, J. W., Barnes, G. M., Tidwell, M.-C. O., & Hoffman, J. H. (2011). Gambling and problem gambling across the lifespan. *Journal of Gambling Studies*, 27(1), 49–61.
<http://doi.org/10.1007/s10899-010-9195-z>
- Welte, J. W., Barnes, G. M., Wieczorek, W. F., Tidwell, M.-C., & Parker, J. (2002). Gambling

participation in the U.S.: Results from a national survey. *Journal of Gambling Studies*, 18(4), 313–337.

Wilber, M. K., & Potenza, M. N. (2006). Adolescent gambling: Research and clinical implications. *Psychiatry (Edgmont (Pa. : Township))*, 3(10), 40–8.

Zarnek, R. R., & Chapleski, E. E. (2005). Casino gambling among urban elders: Just another social activity? *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, 60(2), S74-81.

Chapter 5: General Discussion

In the publication of the fifth, and most recent, edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM), disordered gambling underwent a number of substantial revisions including changes to its nomenclature, classification, and diagnostic criteria (American Psychiatric Association, 2013). As diagnostic criteria changes, specifically the reduction in the minimum threshold of criteria required for a diagnosis, so too may the prevalence and characteristics of disordered gamblers both in the full population and across age groups. Previous research has shown that gambling prevalence and behaviors vary over the course of the lifespan (e.g., Nower & Blaszczynski, 2008; Welte, Barnes, Tidwell, & Hoffman, 2011). The three studies that form this dissertation aimed to address issues related to diagnostic change in gamblers across the lifespan. This discussion will start with a brief overview of the goals and primary findings of each of the three studies before moving to a discussion of how the findings fit within the strength and vulnerability integration (SAVI) model (Charles, 2010), followed by the implications of findings concerning the threshold and criteria required for a gambling diagnosis. I will discuss treatment implications, an overview of the strengths and limitations of the dissertation, and end with a brief conclusion.

The overarching objective of this dissertation was to examine the impact of changes in disordered gambling diagnostic criteria and attain a better understanding of how disordered gamblers present through an examination of prevalence and comorbid relationships in disordered gambling across distinct age groups. The purpose of Study 1 was to assess whether prevalence of comorbid psychiatric disorders was impacted by the change from DSM-IV to DSM-5 criteria in the full sample of gamblers as well as whether the change in comorbidity differed across three age groups. Results from this first study suggested that the prevalence of comorbid mental health and substance use disorders did not significantly differ between the DSM-IV pathological

gambling group and DSM-5 disordered gambling group in the overall sample. However, comorbid prevalence rates differed among age groups, with only older adults meeting DSM-5 criteria being more likely to exhibit any anxiety disorder as well as any comorbid disorder compared to the DSM-IV gamblers. Similar rates of comorbid disorders between the DSM-IV and DSM-5 gambling groups were observed in the overall sample and in the younger- and middle-aged groups. The goal of Study 2 was to determine whether changes in diagnostic criteria resulted in comorbid psychiatric disorder prevalence rates among disordered gamblers being more similar to those observed in traditional substance use disorders, namely alcohol and cannabis. Similar to the primary finding of Study 1 in the full sample, Study 2 found that prevalence rates for any comorbid disorder among disordered gamblers was similar using DSM-IV and DSM-5 criteria. Comorbidity using DSM-5 gambling criteria was just slightly closer to, but still markedly higher than, comorbidity prevalence observed in other substance disorders. Finally, the purpose of Study 3 was to examine age group differences in gamblers meeting as few as one disordered gambling criteria on mental and physical functioning, psychiatric comorbidity, and other gambling-related features. This study's focus on those meeting at least one disordered gambling criterion is important because the presence of a single criterion may be a sign of further difficulties, gambling and otherwise (e.g., Blanco, Hasin, Petry, Stinson, & Grant, 2006; Chamberlain, Stochl, Redden, Odlaug, & Grant, 2017; Nelson, Gebauer, LaBrie, & Shaffer, 2009; Weinstock, April, & Kallmi, 2017). This study found significant age group differences across a variety of mental and physical functioning, comorbid psychological disorders, and gambling-related features. Older adults frequently differed from other age groups as, among other differences, they were less likely to qualify for a DSM-5 disordered gambling diagnosis, had poorer physical functioning, and lower prevalence of comorbid psychiatric conditions compared to the young and middle age groups.

Findings in Context of the Strength and Vulnerability Integration Model

One interesting finding from this dissertation research was what initially appeared to be contradictory results concerning older gamblers who met at least one gambling disorder criteria versus those who meet full DSM criteria. First, with respect to older adults who met full DSM criteria, Study 1 examined the impact of reducing the diagnostic threshold (and therefore presumably allowing less severe gamblers to be diagnosed) on rates of psychiatric comorbidity. Whereas younger and middle aged gamblers, as expected, showed non-significant decreases in comorbidity prevalence when moving from DSM-IV to DSM-5 criteria, older gamblers who were diagnosed using the newer, more relaxed criteria were more likely to present with a comorbid psychiatric disorder compared to those who met DSM-IV diagnostic criteria. This study therefore suggested that, for younger and middle-aged adults, there was support for previously raised concerns that widening the diagnostic net will result in diagnostic inflation where the inclusion of less severe gamblers resulted in lowered comorbid disorder prevalence (Kudlow, 2013). However, for older adults, I found the opposite, with increased comorbid disorder rates from DSM-IV to DSM-5, thereby capturing older adults with more severe overall clinical presentations. Second, with respect to older adults who met one or more gambling criteria in Study 3, psychiatric comorbidity prevalence rates were significantly lower in older adults than in younger and middle age adults. Furthermore, older adults in this study generally had less severe clinical presentations, as indicated by fewer diagnostic gambling criteria and lower prevalence of comorbid disorders.

To summarize, older adults meeting one or more gambling symptoms were better off than other age groups in terms of comorbid disorder prevalence but were worse off when using full diagnostic criteria, specifically when moving from DSM-IV to DSM-5 criteria. One way to make sense of the contradictory findings of the change is by considering my results within the context

of Charles' (2010) SAVI model. This model suggests that age should be associated with improvements in mental health unless serious and chronic vulnerabilities nullify or reverse age-related improvements. Through this theoretical lens, older adults who meet at least four gambling criteria can be conceptualized as experiencing chronic, significant stressors that prevent the use of age-related coping advantages. With the brunt of the stress then being placed on an aging physiological system, older adults are likely to experience reductions in well-being and increased comorbid mental health conditions. Younger adults who experience the same level of stress, whether the stress is from the gambling itself or an alternative source, are more likely to have the ability to physiologically down-regulate their stress response, thereby resulting in fewer comorbid health conditions compared to older adults.

The conflicting results from Studies 1 and 3 suggest that the stress associated with disordered gambling symptoms is only associated with increased comorbidity when the threshold is relatively high (i.e., at least four symptoms). Considering both the SAVI theory (Charles, 2010) and the socioemotional selective theory (SST; Carstensen, Isaacowitz, & Charles, 1999; Reed & Carstensen, 2012), meeting minimal gambling criteria does not appear to be a severe stressor that decreases overall well-being in older adults. Therefore, despite endorsing gambling criteria, older adults in Study 3, most of whom did not meet criteria for a gambling disorder, are still able to utilize the expertise and motivation gained over the lifespan and prioritize emotional goals to maintain well-being compared to young and middle age adults. For these individuals, the negative impact resulting from meeting one or two criterion may be outweighed by the positive benefits that gambling has on their life, including social engagement (Grant Stitt, Giacomassi, & Nichols, 2003; Zaranek & Chapleski, 2005). This allows the older adults who meet at least one diagnostic gambling criteria (and who do not meet full diagnostic criteria) to retain a relatively positive overall sense of well-being with few associated mental health conditions. The younger

age groups do not yet possess the same life experience and associated skills to maintain their emotional health in the presence of few gambling criteria and, as a result, have a greater prevalence of comorbid disorders.

An additional area of interest beyond chronological age may be the time of gambling onset in relation to comorbid psychiatric disorders. A hypothesized relationship between age of gambling-onset and gambling severity has yielded mixed results, with some research suggesting that earlier onset gambling is associated with greater severity (Jiménez-Murcia et al., 2010) while others find no such relationship (Grant et al., 2009). However, studies have found that earlier age of gambling onset is associated with higher comorbidity rates of substance use disorders (Burge, Pietrzak, Molina, & Petry, 2004; Lynch, Maciejewski, & Potenza, 2004). Alternatively, late-onset gambling was more strongly associated with comorbid anxiety disorders (Grant, Kim, Odlaug, Buchanan, & Potenza, 2009). This dissertation found a similar result in Study 1, with the move from DSM-IV to DSM-5 being associated with an increase in anxiety disorder comorbidity in older adults. If older adults are indeed more likely to experience gambling disorders and use gambling as a means of coping or escaping other difficulties, such as anxiety, the reduction in threshold may capture a greater degree of mild 'preoccupied chasing' gamblers who exhibit lower gambling severity than more severe 'antisocial impulsive' gamblers (McBride, Adamson, & Shevlin, 2010). While the three age groups analyzed in this current research had significantly different times of gambling onset, as per the results of Study 3, assigning participants to groups based on age of onset rather than chronological age may have provided further insight into the relationship between gambling and other disorders.

Implications of Findings for Gambling Threshold and Diagnosis

One of the noted concerns regarding diagnostic changes from DSM-IV to DSM-5 was the potential for the decreased gambling disorder threshold to result in diagnostic inflation, with

previously undiagnosed individuals now being diagnosed with the newer, more relaxed criteria (Bolton, 2013; Kudlow, 2013). The current research found that including less severe gamblers (i.e., those with four criteria met) did not result in a reduction in comorbidity prevalence in the group as a whole. Moreover, anxiety disorder prevalence increased in the oldest age group. Previous research commented that the reduction from five to four criteria is likely to have more pronounced increases in past-year prevalence rates of disordered gambling in epidemiological samples than in gambling-focused samples (Petry et al., 2014). Their explanation for the discrepancy in samples is that the previous DSM-IV system under-reported disordered gambling, whereas the DSM-5 criteria provide a more accurate representation of those experiencing impairment or distress due to a gambling addiction (Stinchfield, 2003; Stinchfield, Govoni, & Frisch, 2005). Others have gone even farther to suggest that endorsing as few as one gambling related symptom may be indicative of difficulties related to disordered gambling (Blanco et al., 2006; Toce-Gerstein, Gerstein, & Volberg, 2003).

The debate regarding the appropriate threshold for a diagnosis of disordered gambling is further highlighted by the number of different diagnostic tools commonly used to measure gambling disorders and/or severity, including DSM criteria (American Psychiatric Association [APA], 2000, 2013), the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987), the Canadian Problem Gambling index (PGSI; Ferris & Wynne, 2001a, 2001b), and the NORC DSM Screen for Gambling Problems (NODS; Gerstein et al., 1999). Beyond categorical diagnoses, others have advocated for a hierarchy of gambling symptoms with differing gambling criteria associated with specific gambling severities (e.g., number of criteria endorsed; Christensen, Jackson, Dowling, Volberg, & Thomas, 2015; Toce-Gerstein et al., 2003). The different measures used and the various operational definitions used to examine disordered gambling have made disordered gambling a difficult topic to study on its own, let alone considering its comorbidity

with other psychiatric disorders. However, variances in methodologies and measurement tools contribute to large range estimates. For instance, a systematic review of gambling in older adults suggested the prevalence of problem or pathological gambling was between 0.01 and 10.6% (Subramaniam et al., 2015).

Comparison to other substances. Recent diagnostic changes to other forms of substance use disorders include the elimination of a distinction between abuse and dependence as well as establishing a minimum diagnostic criteria threshold of two criteria out of a possible eleven (National Institute on Alcohol Abuse and Alcoholism, 2013). Unlike gambling, which made disordered gambling more inclusive by reducing the minimum threshold, changes to alcohol and other substance use disorders became more restrictive (Dawson, Goldstein, & Grant, 2013).

One of the stated goals of the changes to the DSM-5 was to focus on increased organization by grouping disorders through shared characteristics (Regier, Kuhl, & Kupfer, 2013). Research has repeatedly found evidence of similarities between gambling and other substances (e.g., Brewer & Potenza, 2008; Di Nicola et al., 2015; Leeman & Potenza, 2013; Rennert et al., 2014). This dissertation research suggests that comorbidity is one area where a disparity may still separate gambling from other substance use disorders. In Study 2, comorbidity prevalence was approximately doubled in disordered gamblers compared to those meeting DSM-IV alcohol use disorder (abuse or dependence) criteria. While more restrictive criteria has closed the prevalence gap slightly (Dawson et al., 2013), further reduction of the minimum threshold utilized in DSM gambling to be closer to that of other substance disorders may result in comorbidity prevalence rates being more similar across substance use disorders.

Age related diagnostic differences in gambling. Research has shown that different age groups present with different diagnostic gambling criteria. A study of NESARC gambling criteria found that age groups endorsed criteria differently, with younger adults (defined as under 25

years old in that study) being less likely to endorse gambling as a means of escaping negative affect and more likely to endorse chasing losses than middle-aged adults (25-59) (Sacco, Torres, Cunningham-Williams, Woods, & Unick, 2011). Alternatively, adults 60 and over were less likely to endorse chasing losses than the middle-aged group, suggesting younger adults are more driven by sensation seeking (Sacco et al., 2011; Stinchfield & Winters, 1998). In the current research study, six of the nine DSM-5 criteria assessed differed between at least two of the three age groups. This suggests that the current set of diagnostic criteria and minimum threshold for diagnosis does not consistently apply to all age groups.

Along with differing criteria observed across age groups, younger adults were found to present with a greater number of diagnostic criteria than the middle and older age groups in this research. Previous studies have had similar findings, with older adults meeting fewer diagnostic criteria than other age groups, indicating a greater proportion of gamblers with 'milder' severity for the oldest age group in relation to other age groups (Sacco et al., 2011). This idea is supported by the results of Study 3, where older adults meeting one or more diagnostic criteria were less likely to present with a comorbid mental health disorder than other age groups. However, when moving the minimum threshold required for a comorbid diagnosis from five to four criteria, as assessed in Study 1, comorbidity rates were observed to be closer to equal across age groups.

Generally speaking, this dissertation found steady, gradual decreases in comorbidity prevalence rates with reductions in the DSM diagnostic threshold among young and middle adult age groups. In contrast, among older adult gambler comorbidity prevalence rates increased when moving the minimum diagnostic threshold from five to four. In addition to explanations for this finding offered by SAVI theory (Charles, 2010), it is also possible that older adults may not have the same opportunities to qualify for certain substance disorder criteria as younger or middle-

aged adults given age-related changes in familial relationships and occupational and financial responsibilities (Benyon, 2011). Related to age, late-onset gamblers were also found to have fewer secondary problems related to gambling, including financial difficulties (Grant et al., 2009). This suggests that further reductions in diagnostic threshold may help to further identify older adults with significant issues who meet fewer diagnostic criteria.

The findings from this dissertation provide an example of age bias that can exist within the diagnostic criteria used for psychiatric disorders. A review of ageism in mental health care found several examples of older adults receiving differing care for the same disorder than younger adults, which relates to an ethical debate regarding the costs versus benefits of using scarce resources on an aging population (Robb, Chen, & Haley, 2002). The findings of this dissertation suggest that future editions of the DSM may need to consider different diagnostic cut-offs for different age group to avoid discrepancies in treatment availability for older adults based on qualifying for a diagnosis. The need for similar age-specific criteria and/or diagnostic thresholds have previously been proposed for a variety of DSM-based disorders (e.g., Balsis, Gleason, Woods, & Oltmanns, 2007; Grenier et al., 2011; Surman & Goodman, 2017).

Gambling over the course of the lifespan. Age group analyses across the three studies examined young (18 to 34 years old), middle (35 to 54 years old), and older (55 years and above) aged adults. It is important to consider the potential lack of homogeneity within each age group, particularly older adults, who were consistently the smallest sample examined. While the oldest age group was defined in the three studies as anyone 55 years of age or older, the maximum age was 89 years old in cross-sectional analyses and 78 years old in longitudinal analyses. The age of those in the oldest age group was skewed towards the lower end of the age group.

Previous research often defined older adulthood as beginning at 65 years of age, a common age of retirement. However, changes in retirement age, including both retiring earlier

and choosing to work into later years, has made 65 years of age less of a benchmark for older adulthood. Rather, epidemiological evidence has suggested that active comorbidity between substance use disorders and nonsubstance psychiatric disorders is much lower among persons 55 and older than among those 54 and younger (Narrow, Rae, Robins, & Regier, 2002). As a result, a variety of research groups have used 55 as a cutoff point, partly due to the ability to examine sub-groups of older adults (e.g., young-old adults aged 55-64, middle-old adults aged 65-74, and older-old adults aged 75+), and partly due to issues related to statistical power (e.g., Grant et al., 2009; Mackenzie, Scott, Mather, & Sareen, 2008; Pilver, Libby, Hoff, & Potenza, 2013). The concern regarding statistical power applies to this dissertation. For example, of the 27 individuals in the oldest age group meeting DSM-5 disordered gambling criteria in Study 1, 74.1% fell within the range of 55 to 64 years of age.

Some research suggests that the clinical picture may vary widely when considering subgroups of older adults. The lack of an agreed upon definition of what constitutes an 'older adult' has made taking the variability of older adults into account difficult. In terms of gambling, Alberghetti and Collins (2013) conducted a meta-analysis of available research, suggesting that older adults should be conceptualized as two distinct groups based on generational attributes: the Silent Generation (born from 1925 to 1942) and the Baby Boomers (born between 1942 and 1964). The Silent Generation is described as having an increased focus on economic stability due to surviving through the Great Depression. Further, gambling was considered an illegal activity for much of their lives. These factors, among others, may decrease the likelihood of those in the Silent Generation participating in frequent gambling activities. Alternatively, the Baby Boomers, children of the Silent Generation, are more likely than the previous generation to utilize gambling and other substances as a source of relaxation and entertainment (Kuerbis, Sacco, Blazer, & Moore, 2014; Lemay, Bakich, & Fontaine, 2006). As well, Baby Boomers are thought

to potentially be greater risk-takers (Papoff & Norris, 2009) and more optimistic (Gursoy, Maier, & Chi, 2008), a combination which Alberghetti and Collins (2013) note may increase the likelihood of disordered gambling behaviors. For this dissertation, all individuals aged 55 and older were grouped in the same age category due to concerns over statistical power.

It is important to note that the studies within this dissertation examine individuals and their gambling behaviors at the time of data collection: 2001-2 for Wave 1 of the NESARC and 2004-5 for Wave 2 of the NESARC. As previous research has shown, gambling participation and rates of disordered gambling are known to change over the course of the lifespan (Welte, Barnes, Tidwell, & Hoffman, 2011). Similarly, my research found that other features of gambling, including number and type of problem gambling criteria met, games played, and comorbid psychiatric disorders, also varied between gamblers of different age groups. Since the time of data collection, there has been an increase in the popularity and availability of online gambling options, including sports gambling and online poker. Though availability of online gambling has not resulted in an increase in disordered gambling prevalence (Welte, Barnes, Tidwell, Hoffman, & Wieczorek, 2015), research suggests online gamblers are typically younger than non-online gamblers and are less likely to report negative psychological health related to gambling than non-online gamblers, though this latter finding may be a product of age (Gainsbury, Russell, Hing, Wood, & Blaszczynski, 2013). However, as younger generations continue to age, the preferred method of gambling may continue on with that age group, thereby changing the associations observed within this research between a particular age group and psychiatric comorbidities and/or gambling related features.

Individual gambling changes over the course of the lifespan. While the three studies of this dissertation provide an examination of the current status of disordered gambling, related features, and comorbid disorders, the ever-changing face of gambling must be considered in

future research. Specifically, the progression of disordered gambling through an individual's lifespan remains relatively unknown. In other words, longitudinal research has yet to determine how young gamblers change as they age in regards to gambling related features, disorder severity, and comorbid disorders.

Gambling disorders can begin at any age, from early adolescence to older adulthood (e.g., Lynch et al., 2004; Medeiros, Redden, Chamberlain, & Grant, 2017; Shaffer, Hall, & Vander Bilt, 1999), though one study found 84% of all subjects with pathological gambling developed the disorder by the age of 50 (Black et al., 2015). The age of initial gambling onset appears to be an important determinant of future outcomes as early-onset gamblers are more likely to be male, have increased rates of psychiatric and medical comorbidities, and show increased gambling severity compared to late-onset gamblers (Burge et al., 2004; Rahman et al., 2012). Early-onset pathological gamblers are also more likely to be interested in strategic or action-based forms of gambling, such as card games and sports betting, than late-onset pathological gamblers, who have greater preference for slot machines (Black et al., 2015; Grant et al., 2009). Later-onset gamblers are generally found to progress to disorder gambling at a more rapid rate than early-onset gamblers (Nelson, LaPlante, LaBrie, & Shaffer, 2006). Treatment seeking behaviors in disordered gamblers may not differ with age (Petry, 2002).

Research has found that individuals with disordered gambling can often remit without treatment (Abbott, Williams, & Volberg, 2004; Sartor et al., 2007; Shaffer & Hall, 2002; Slutske, Jackson, & Sher, 2003; Slutske, 2006). However, findings are unclear as to whether the same pattern of remission applies equally across disordered gamblers of all ages, though both younger (less than 40 years old) and older (60 years old or older) showed similar reductions in gambling over a three-year follow-up period (Black, Coryell, McCormick, Shaw, & Allen, 2017). Research has suggested, however, that self-reports of gambling patterns do not differ between episodes of

disordered gambling among those who reported remitting and re-experiencing disordered gambling (Sartor et al., 2007). It should also be noted that the combination of spontaneous remission and varying age of onset lead to a diverse set of illness duration across age groups, with duration of illness being negatively correlated with quality of life (Medeiros et al., 2017).

Treatment Implications

Many treatment options available for disordered gambling are similar to those used for treating substance use disorders, including both psychological and pharmacological approaches (Grant, Schreiber, & Odlaug, 2013; Rash, Weinstock, & Van Patten, 2016). For psychological treatments, 12-step groups such as Gamblers Anonymous use the same format as Alcoholics Anonymous, encouraging abstinence from the addictive behavior and often encouraging faith-based support. Other psychological treatments, like self-help approaches, peer support groups, and cognitive-behavioral therapy (CBT), are modeled in much the same way as equivalent treatments for substance use disorders. For example, CBT for both gambling and substance use generally focus on relapse prevention and increasing skills, including problem solving and social skills (Krentzman, Higgins, Staller, & Klatt, 2015; Rossini-Dib, Fuentes, & Tavares, 2015; Tavares, Zilberman, & el-Guebaly, 2003). Pharmacological treatments for disordered gambling often also resemble those for substance use disorders, including opioid agonists, which are designed to mimic the endorphin rush experienced with substance use, and various antidepressants and mood stabilizers, often used for those with co-occurring mood disorders (van den Brink, 2012).

Psychological treatment approaches to gambling may need to further consider the impact of comorbid conditions on the efficacy of treatment (Rash et al., 2016). Though some gambling treatments may serve to reduce the severity of comorbid conditions (Jiménez-Murcia et al., 2015; Moghaddam, Campos, Myo, Reid, & Fong, 2015), the presence of psychiatric symptoms and

disorder severity has been associated with poorer gambling prognosis (Morefield et al., 2014; Smith et al., 2010). In further support of the need to treat co-occurring conditions, an Australian treatment service designed to provide treatment for disordered gamblers with comorbid psychiatric conditions found patients improved on both gambling and overall psychological distress scores after undergoing in-patient treatment consisting of cognitive-behavioral therapy and gradual exposure therapy (Morefield et al., 2013).

The findings of this study suggest that comorbidity prevalence is significant across all age groups, though the symptoms of gambling itself that are observed in each age group differ significantly. In terms of treatment, age groups may require unique considerations. For instance, cognitive-behavioral therapy for older adults may be more effective if it incorporates physical health and spiritual beliefs (Satre, Knight, & David, 2006; Wilkinson, 2013). The need to modify treatment for individuals of different ages may be especially important in gambling given the typical gambling symptoms present within each age group as well as the comorbid disorders that can be typically expected. A review of American gambling history and experiences listed the expansion of treatment services and additional research towards therapeutic treatments for dual-diagnosis gamblers as two suggestions for harm reduction going forward (Petry & Blanco, 2013). Furthermore, as older adults are more likely to experience reduced overall physical well-being, implementation of routine screening measures within regular physical appointments to assess gambling in older adults would be beneficial for treatment purposes (Grant et al., 2009; Pietrzak, Morasco, Blanco, Grant, & Petry, 2007).

Strengths and Limitations

This dissertation utilized data from the National Epidemiological Survey for Alcohol and Related Conditions (NESARC), the largest nationally-representative survey including problem gambling available for analysis. Being a population-based survey, findings from this research can

be generalized to a greater extent than research utilizing treatment-based samples. Despite the advantages afforded by use of the NESARC, the findings of this dissertation should be viewed in light of certain limitations. Study specific limitations, particularly the lack of available significance testing in Study 2, are detailed within each study. To reiterate limitations of the dataset, the NESARC contained a relatively small number of disordered gamblers, particularly when examining the older adult group, limiting the ability to make certain comparisons. The NESARC also assessed disorders according to DSM-IV criteria. Though all necessary gambling criteria were assessed to generate a DSM-5 disordered gambling diagnosis, other psychiatric disorders were examined under DSM-IV criteria in accordance with other gambling studies using the NESARC (e.g., Parhami, Mojtabai, Rosenthal, Afifi, & Fong, 2014). Additionally, the NESARC dataset only assessed gambling-related items in Wave 1 of the study, which was collected from 2001 to 2002. In the time since then, patterns of gambling and substance use have potentially changed, particularly in regard to online and mobile gambling as well as increasing legalization of marijuana (Chóliz, 2016; Gainsbury, Russell, Blaszczynski, & Hing, 2015).

As noted in each individual study, a notable limitation of using the NESARC is the age of the data. In the past nearly 20 years, gambling has become increasingly accessible, including the increasing popularity of online gambling (Horváth & Paap, 2012). However, despite the inclusion of internet gambling, no changes in disordered gambling prevalence were observed from 1999-2000 to 2011-13 in a study of American adults (Welte, Barnes, Tidwell, Hoffman, & Wieczorek, 2015).

Specifically related to online gambling, attempts to distinguish online and land-based gamblers on issues of overall mental health has yielded mixed results. A number of research studies have found higher prevalence of mental health comorbidities, including substance use disorders, among internet-based gamblers compared to non-internet gamblers (e.g., Gainsbury,

2015; Griffiths, Wardle, Orford, Sproston, & Erens, 2009; Kairouz, Paradis, & Nadeau, 2012). However, others have found land-based gamblers experience greater levels of psychological distress (Gainsbury et al., 2015), while some suggest no difference in psychopathology between online and non-online gamblers (Jiménez-Murcia et al., 2011). Age differences are important to consider regarding online gambling. Internet gambling appears to differ across age groups as internet gamblers were found to be younger than non-internet gamblers (Gainsbury et al., 2013) though this difference may not be evident when examining only pathological gamblers (Jiménez-Murcia, et al, 2011). Future research on gambling and comorbid conditions will need to assess whether changes in gambling accessibility, notably the proliferation of online gambling, is an aging effect, which would suggest younger adults in coming years will maintain higher rates of online gambling than older adults, or a cohort effect, where younger adults will maintain their relatively high rates of online gambling as they age. The finding that younger adults gamble online more than older adults (Gainsbury et al., 2013) suggest there is no period effect. With internet use being increasingly common, it appears more likely that a cohort effect would occur with current and future gamblers maintaining internet gambling use as time goes on.

While the NESARC dataset provided a population-based representation of the United States, we believe the findings of these research studies are applicable to Canada as well. A prior study that analyzed prevalence estimates from 119 other studies found no significant differences in problem gambling prevalence between USA and Canadian studies (Shaffer et al., 1999). Further, other research comparing depression rates noted minimal differences between the two nations across a variety of nationally-representative samples (Vasiliadis, Lesage, Adair, Wang, & Kessler, 2007). While small differences in laws may cause differences in certain age categories (i.e., differing ages of majority) or regions (i.e., legality of gambling), we believe the similarities

between the two adjoining countries allow for these research findings to be cautiously applied in a Canadian context.

Finally, substance use disorders have long been considered a difficult set of disorders to capture in a survey. The Total Survey Error (TSE) model was proposed to help explain why large-scale surveys often had difficulty accurately capturing, and reflecting the severity of, substance users (Groves, 1989). The TSE was later expanded to focus on two general classes of errors: measurement and representation (Lavrakas, 2013). Of particular importance for this current research is the possibility of errors of representation. Under the umbrella of representation errors, Lavrakas highlighted coverage errors, which involve not including certain segments of the population who may be more likely to present with substance use disorders such as those who are homeless, incarcerated, and those who only have cellphones. Further, many participants who abuse substances feel uneasy giving responses that accurately reflect their difficulties, instead providing more socially desirable responses. A review of sources of error found in substance use disorder prevalence studies further noted that individuals presenting with substance use disorders may be more likely to decline participation or to drop out of longitudinal studies (Johnson, 2014). While the NESARC asked questions regarding past troubles with the law and experiences with homelessness, those currently homeless or incarcerated were not assessed. As a result, substance-use and substance-related disorders may be underrepresented in the NESARC.

Conclusion

The publication of the DSM-5 categorized disordered gambling along with substance use disorders and, among other changes, reduced the minimum criteria threshold required for a diagnosis from five to four (APA, 2013). This alteration led to a near doubling in disordered gambling prevalence that significantly transformed the overall composition of this group, both as

a whole and across three distinct age groups. With gambling still receiving relatively little funding in terms of research and treatment (Petry & Blanco, 2013) yet becoming more accessible, this dissertation underscores the importance of understanding the features that constitute gambling in specific age groups and the comorbid features that frequently associate with gambling. As empirically validated treatments are designed specifically for gambling, dual diagnoses will need to be taken into account in order to achieve the best possible treatment outcomes. It is also important to recognize age differences in gambling; the current research highlights the need to better understand aging gamblers who meet DSM-5 criteria and have significant psychiatric comorbidities. Incorporating gambling screening measures developed to cater to symptoms of gambling more frequently observed in older adults within routine medical care may be one way to reach this at-risk population who are especially unlikely to pursue gambling treatment compared to other age groups. The re-categorization of disordered gambling as a 'substance-related and addictive disorder' is one step in recognizing the damaging impact of gambling, as highlighted by this research, though greater funding and research are required to help reduce future harm.

References

- Abbott, M. W., Williams, M. M., & Volberg, R. A. (2004). A prospective study of problem and regular nonproblem gamblers living in the community. *Substance Use & Misuse*, 39(6), 855–84.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Balsis, S., Gleason, M. E. J., Woods, C. M., & Oltmanns, T. F. (2007). An item response theory analysis of DSM-IV personality disorder criteria across younger and older age groups. *Psychology and Aging*, 22(1), 171–85. <http://doi.org/10.1037/0882-7974.22.1.171>
- Benyon, C. (2011). Diagnosing the use of illegal drugs by older people - Comments on the proposed changes to DSM-V. *Addiction*, 106(5), 884–885. <http://doi.org/10.1111/j.1360-0443.2010.03283.x>
- Black, D. W., Coryell, W., McCormick, B., Shaw, M., & Allen, J. (2017). A prospective follow-up study of younger and older subjects with pathological gambling. *Psychiatry Research*, 256, 162–168. <http://doi.org/10.1016/j.psychres.2017.06.043>
- Black, D. W., Shaw, M., Coryell, W., Crowe, R., McCormick, B., & Allen, J. (2015). Age at onset of DSM-IV pathological gambling in a non-treatment sample: Early- versus later-onset. *Comprehensive Psychiatry*, 60, 40–46. <http://doi.org/10.1016/j.comppsy.2015.04.007>
- Blanco, C., Hasin, D. S., Petry, N., Stinson, F. S., & Grant, B. F. (2006). Sex differences in subclinical and DSM-IV pathological gambling: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Psychological Medicine*, 36(7), 943–953. <http://doi.org/10.1017/S0033291706007410>
- Bolton, D. (2013). Overdiagnosis problems in the DSM-IV and the new DSM-5: Can they be

resolved by the distress-impairment criterion? *Canadian Journal of Psychiatry*, 58(11), 612–617.

Brewer, J. A., & Potenza, M. N. (2008). The neurobiology and genetics of impulse control disorders: relationships to drug addictions. *Biochemical Pharmacology*, 75(1), 63–75.
<http://doi.org/10.1016/j.bcp.2007.06.043>

Burge, A. N., Pietrzak, R. H., Molina, C. A., & Petry, N. M. (2004). Age of gambling initiation and severity of gambling and health problems among older adult problem gamblers. *Psychiatric Services (Washington, D.C.)*, 55(12), 1437–9.
<http://doi.org/10.1176/appi.ps.55.12.1437>

Carstensen, L. L., Isaacowitz, D. M., & Charles, S. T. (1999). Taking time seriously. A theory of socioemotional selectivity. *The American Psychologist*, 54(3), 165–81.

Chamberlain, S. R., Stochl, J., Redden, S. A., Odlaug, B. L., & Grant, J. E. (2017). Latent class analysis of gambling subtypes and impulsive/compulsive associations: Time to rethink diagnostic boundaries for gambling disorder? *Addictive Behaviors*, 72, 79–85.
<http://doi.org/10.1016/j.addbeh.2017.03.020>

Charles, S. T. (2010). Strength and vulnerability integration: A model of emotional well-being across adulthood. *Psychological Bulletin*, 136(6), 1068–91. <http://doi.org/10.1037/a0021232>

Chóliz, M. (2016). The challenge of online gambling: The effect of legalization on the increase in online gambling addiction. *Journal of Gambling Studies*, 32(2), 749–756.
<http://doi.org/10.1007/s10899-015-9558-6>

Christensen, D. R., Jackson, A. C., Dowling, N. A., Volberg, R. A., & Thomas, S. A. (2015). An examination of a proposed DSM-IV pathological gambling hierarchy in a treatment seeking population: Similarities with substance dependence and evidence for three classification systems. *Journal of Gambling Studies*, 31(3), 787–806. <http://doi.org/10.1007/s10899-014->

9449-2

- Dawson, D. A., Goldstein, R. B., & Grant, B. F. (2013). Differences in the profiles of DSM-IV and DSM-5 alcohol use disorders: Implications for clinicians. *Alcoholism: Clinical and Experimental Research*, 37, E305–E313. <http://doi.org/10.1111/j.1530-0277.2012.01930.x>
- Di Nicola, M., Tedeschi, D., De Risio, L., Pettorruso, M., Martinotti, G., Ruggeri, F., ... Janiri, L. (2015). Co-occurrence of alcohol use disorder and behavioral addictions: relevance of impulsivity and craving. *Drug and Alcohol Dependence*, 148, 118–25. <http://doi.org/10.1016/j.drugalcdep.2014.12.028>
- Ferris, J., & Wynne, H. (2001a). *The Canadian problem gambling index: Final report*. Ottawa, ON.
- Ferris, J., & Wynne, H. (2001b). *The Canadian problem gambling index: User manual*. Ottawa, ON.
- Gainsbury, S. M. (2015). Online gambling addiction: The relationship between Internet gambling and disordered gambling. *Current Addiction Reports*, 2(2), 185–193. <http://doi.org/10.1007/s40429-015-0057-8>
- Gainsbury, S. M., Russell, A., Blaszczynski, A., & Hing, N. (2015). Greater involvement and diversity of Internet gambling as a risk factor for problem gambling. *The European Journal of Public Health*, 25(4), 723–728. <http://doi.org/10.1093/eurpub/ckv006>
- Gainsbury, S. M., Russell, A., Hing, N., Wood, R., & Blaszczynski, A. (2013). The impact of internet gambling on gambling problems: A comparison of moderate-risk and problem Internet and non-Internet gamblers. *Psychology of Addictive Behaviors*, 27(4), 1092–1101. <http://doi.org/10.1037/a0031475>
- Gerstein, D., Murphy, S., Toce, M., Volberg, R., Harwood, H., Tucker, A., ... Sinclair, S. (1999). Gambling impact and behavior study: Report to the National Gambling Impact Study

Commission.

- Grant, J. E., Kim, S. W., Odlaug, B. L., Buchanan, S. N., & Potenza, M. N. (2009). Late-onset pathological gambling: clinical correlates and gender differences. *Journal of Psychiatric Research*, 43(4), 380–7. <http://doi.org/10.1016/j.jpsychires.2008.04.005>
- Grant, J. E., Schreiber, L. R. N., & Odlaug, B. L. (2013). Phenomenology and treatment of behavioural addictions. *Canadian Journal of Psychiatry*, 58(5), 252–9.
- Grant Stitt, B., Giacomassi, D., & Nichols, M. (2003). Gambling Among Older Adults: A Comparative Analysis. *Experimental Aging Research*, 29(2), 189–203. <http://doi.org/10.1080/0361073030303713>
- Grenier, S., Prévaille, M., Boyer, R., O'Connor, K., Béland, S.-G., Potvin, O., ... Scientific Committee of the ESA Study. (2011). The impact of DSM-IV symptom and clinical significance criteria on the prevalence estimates of subthreshold and threshold anxiety in the older adult population. *The American Journal of Geriatric Psychiatry*, 19(4), 316–326. <http://doi.org/10.1097/JGP.0b013e3181ff416c>
- Griffiths, M., Wardle, H., Orford, J., Sproston, K., & Erens, B. (2011). Internet gambling, health, smoking and alcohol use: Findings from the 2007 British gambling prevalence survey. *International Journal of Mental Health and Addiction*, 9(1), 1–11. <http://doi.org/http://dx.doi.org.uml.idm.oclc.org/10.1007/s11469-009-9246-9>
- Groves, R. M. (1989). *Survey Errors and Survey Costs*. Hoboken, NJ, USA: John Wiley & Sons, Inc. <http://doi.org/10.1002/0471725277>
- Gursoy, D., Maier, T. A., & Chi, C. G. (2008). Generational differences: An examination of work values and generational gaps in the hospitality workforce. *International Journal of Hospitality Management*, 27, 448–458.
- Horváth, C., & Paap, R. (2012). The effect of recessions on gambling expenditures. *Journal of*

- Gambling Studies*, 28(4), 703–17. <http://doi.org/10.1007/s10899-011-9282-9>
- Jiménez-Murcia, S., Alvarez-Moya, E. M., Stinchfield, R., Fernández-Aranda, F., Granero, R., Aymamí, N., ... Menchón, J. M. (2010). Age of onset in pathological gambling: Clinical, therapeutic and personality correlates. *Journal of Gambling Studies*, 26(2), 235–48. <http://doi.org/10.1007/s10899-009-9175-3>
- Jiménez-Murcia, S., Stinchfield, R., Fernández-Aranda, F., Santamaría, J. J., Penelo, E., Granero, R., ... Menchón, J. M. (2011). Are online pathological gamblers different from non-online pathological gamblers on demographics, gambling problem severity, psychopathology and personality characteristics? *International Gambling Studies*, 11(3), 325–337. <http://doi.org/10.1080/14459795.2011.628333>
- Jiménez-Murcia, S., Granero, R., Fernández-Aranda, F., Arcelus, J., Aymamí, M. N., Gómez-Peña, M., ... Menchón, J. M. (2015). Predictors of outcome among pathological gamblers receiving cognitive behavioral group therapy. *European Addiction Research*, 21(4), 169–78. <http://doi.org/10.1159/000369528>
- Johnson, T. P. (2014). Sources of Error in Substance Use Prevalence Surveys. *International Scholarly Research Notices*, 2014, 1–21. <http://doi.org/10.1155/2014/923290>
- Kairouz, S., Paradis, C., & Nadeau, L. (2012). Are online gamblers more at risk than offline gamblers? *Cyberpsychology, Behavior, and Social Networking*, 15(3), 175–180. <http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1089/cyber.2011.0260>
- Krentzman, A. R., Higgins, M. M., Staller, K. M., & Klatt, E. S. (2015). Alexithymia, emotional dysregulation, and recovery from alcoholism: Therapeutic response to assessment of mood. *Qualitative Health Research*, 25(6), 794–805. <http://doi.org/10.1177/1049732315577608>
- Kudlow, P. (2013). The perils of diagnostic inflation. *Canadian Medical Association Journal*, 185(1), E25-6. <http://doi.org/10.1503/cmaj.109-4371>

- Kuerbis, A., Sacco, P., Blazer, D. G., & Moore, A. A. (2014). Substance abuse among older adults. *Clinics in Geriatric Medicine*, 30(3), 629–654.
<http://doi.org/10.1016/j.cger.2014.04.008>
- Lavrakas, P. J. (2013). Presidential Address: Applying a Total Error Perspective for Improving Research Quality in the Social, Behavioral, and Marketing Sciences. *Public Opinion Quarterly*, 77(3), 831–850. <http://doi.org/10.1093/poq/nft033>
- Leeman, R. F., & Potenza, M. N. (2013). A targeted review of the neurobiology and genetics of behavioural addictions: an emerging area of research. *Canadian Journal of Psychiatry*, 58(5), 260–73.
- Lemay, A., Bakich, E., & Fontaine, A. (2006). *Betting on older adults: A problem gambling prevention clinical manual for service providers*.
- Lesieur, H. R., & Blume, S. B. (1987). The South Oaks Gambling Screen (SOGS): A new instrument for the identification of pathological gamblers. *The American Journal of Psychiatry*, 144(9), 1184–8.
- Lynch, W. J., Maciejewski, P. K., & Potenza, M. N. (2004). Psychiatric correlates of gambling in adolescents and young adults grouped by age at gambling onset. *Archives of General Psychiatry*, 61(11), 1116–22. <http://doi.org/10.1001/archpsyc.61.11.1116>
- Mackenzie, C. S., Scott, T., Mather, A., & Sareen, J. (2008). Older adults' help-seeking attitudes and treatment beliefs concerning mental health problems. *The American Journal of Geriatric Psychiatry : Official Journal of the American Association for Geriatric Psychiatry*, 16(12), 1010–9. <http://doi.org/10.1097/JGP.0b013e31818cd3be>
- McBride, O., Adamson, G., & Shevlin, M. (2010). A latent class analysis of DSM-IV pathological gambling criteria in a nationally representative British sample. *Psychiatry Research*, 178(2), 401–407. <http://doi.org/10.1016/j.psychres.2009.11.010>

- Medeiros, G. C., Redden, S. A., Chamberlain, S. R., & Grant, J. E. (2017). Gambling disorder: Association between duration of illness, clinical, and neurocognitive variables. *Journal of Behavioral Addictions*, 6(2), 194–202. <http://doi.org/10.1556/2006.6.2017.029>
- Moghaddam, J. F., Campos, M. D., Myo, C., Reid, R. C., & Fong, T. W. (2015). A longitudinal examination of depression among gambling inpatients. *Journal of Gambling Studies*, 31(4), 1245–55. <http://doi.org/10.1007/s10899-014-9518-6>
- Morefield, K., Walker, C., Smith, D., Harvey, P., Dunn, K., & Battersby, M. (2014). An inpatient treatment program for people with gambling problems: Synopsis and early outcomes. *International Journal of Mental Health and Addiction*, 12(3), 367–379. <http://doi.org/10.1007/s11469-013-9462-1>
- Narrow, W. E., Rae, D. S., Robins, L. N., & Regier, D. A. (2002). Revised prevalence estimates of mental disorders in the United States: using a clinical significance criterion to reconcile 2 surveys' estimates. *Archives of General Psychiatry*, 59(2), 115–23.
- National Institute on Alcohol Abuse and Alcoholism. (2013). *Alcohol Use Disorder: A Comparison Between DSM-IV and DSM-5*.
- Nelson, S. E., Gebauer, L., LaBrie, R. A., & Shaffer, H. J. (2009). Gambling problem symptom patterns and stability across individual and timeframe. *Psychology of Addictive Behaviors*, 23(3), 523–533. <http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1037/a0016053>
- Nelson, S. E., LaPlante, D. A., LaBrie, R. A., & Shaffer, H. J. (2006). The Proxy Effect: Gender and Gambling Problem Trajectories of Iowa Gambling Treatment Program Participants. *Journal of Gambling Studies*, 22(2), 221–240. <http://doi.org/10.1007/s10899-006-9012-x>
- Nower, L., & Blaszczynski, A. (2008). Characteristics of problem gamblers 56 years of age or older: A statewide study of casino self-excluders. *Psychology and Aging*, 23(3), 577–84. <http://doi.org/10.1037/a0013233>

Papoff, K. M., & Norris, J. E. (2009). Instant ticket purchasing by Ontario baby boomers:

Increasing risk for problem gamblers. *Journal of Gambling Studies*, 25(2), 185–99.

<http://doi.org/10.1007/s10899-009-9117-0>

Parhami, I., Mojtabai, R., Rosenthal, R. J., Afifi, T. O., & Fong, T. W. (2014). Gambling and the onset of comorbid mental disorders: A longitudinal study evaluating severity and specific symptoms. *Journal of Psychiatric Practice*, 20(3), 207–19.

<http://doi.org/10.1097/01.pra.0000450320.98988.7c>

Petry, N. M. (2002). A comparison of young, middle-aged, and older adult treatment-seeking pathological gamblers. *The Gerontologist*, 42(1), 92–9.

Petry, N. M., & Blanco, C. (2013). National gambling experiences in the United States: Will history repeat itself? *Addiction (Abingdon, England)*, 108(6), 1032–7.

<http://doi.org/10.1111/j.1360-0443.2012.03894.x>

Petry, N. M., Blanco, C., Auriacombe, M., Borges, G., Bucholz, K., Crowley, T. J., ... O'Brien, C. (2014). An overview of and rationale for changes proposed for pathological gambling in DSM-5. *Journal of Gambling Studies*, 30(2), 493–502. <http://doi.org/10.1007/s10899-013-9370-0>

Pietrzak, R. H., Morasco, B. J., Blanco, C., Grant, B. F., & Petry, N. M. (2007). Gambling level and psychiatric and medical disorders in older adults: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *The American Journal of Geriatric Psychiatry*, 15(4), 301–13. <http://doi.org/10.1097/01.JGP.0000239353.40880.cc>

Pilver, C. E., Libby, D. J., Hoff, R. a, & Potenza, M. N. (2013). Problem gambling severity and the incidence of Axis I psychopathology among older adults in the general population. *Journal of Psychiatric Research*, 47(4), 534–41.

<http://doi.org/10.1016/j.jpsychires.2012.12.013>

- Rahman, A. S., Pilver, C. E., Desai, R. A., Steinberg, M. A., Rugle, L., Krishnan-Sarin, S., & Potenza, M. N. (2012). The relationship between age of gambling onset and adolescent problematic gambling severity. *Journal of Psychiatric Research*, 46(5), 675–683.
<http://doi.org/10.1016/j.jpsychires.2012.02.007>
- Rash, C., Weinstock, J., & Van Patten, R. (2016). A review of gambling disorder and substance use disorders. *Substance Abuse and Rehabilitation*, 7, 3. <http://doi.org/10.2147/SAR.S83460>
- Reed, A. E., & Carstensen, L. L. (2012). The theory behind the age-related positivity effect. *Frontiers in Psychology*, 3, 339. <http://doi.org/10.3389/fpsyg.2012.00339>
- Regier, D. A., Kuhl, E. A., & Kupfer, D. J. (2013). The DSM-5: Classification and criteria changes. *World Psychiatry: Official Journal of the World Psychiatric Association (WPA)*, 12(2), 92–8. <http://doi.org/10.1002/wps.20050>
- Rennert, L., Denis, C., Peer, K., Lynch, K. G., Gelernter, J., & Kranzler, H. R. (2014). DSM-5 gambling disorder: Prevalence and characteristics in a substance use disorder sample. *Experimental and Clinical Psychopharmacology*, 22(1), 50–6.
<http://doi.org/10.1037/a0034518>
- Robb, C., Chen, H., & Haley, W. E. (2002). Ageism in mental health and health care: A critical review. *Journal of Clinical Geropsychology*, 8(1), 1–12.
<http://doi.org/10.1023/A:1013013322947>
- Rossini-Dib, D., Fuentes, D., & Tavares, H. (2015). A naturalistic study of recovering gamblers: What gets better and when they get better. *Psychiatry Research*.
<http://doi.org/10.1016/j.psychres.2015.03.003>
- Sacco, P., Torres, L. R., Cunningham-Williams, R. M., Woods, C., & Unick, G. J. (2011). Differential item functioning of pathological gambling criteria: An examination of gender, race/ethnicity, and age. *Journal of Gambling Studies*, 27(2), 317–330.

<http://doi.org/10.1007/s10899-010-9209-x>

- Sartor, C. E., Scherrer, J. F., Shah, K. R., Xian, H., Volberg, R., & Eisen, S. A. (2007). Course of pathological gambling symptoms and reliability of the Lifetime Gambling History measure. *Psychiatry Research, 152*(1), 55–61. <http://doi.org/10.1016/j.psychres.2006.05.015>
- Satre, D. D., Knight, B. G., & David, S. (2006). Cognitive-behavioral interventions with older adults: Integrating clinical and gerontological research. *Professional Psychology: Research and Practice, 37*(5), 489–498. <http://doi.org/10.1037/0735-7028.37.5.489>
- Shaffer, H. J., & Hall, M. N. (2002). The natural history of gambling and drinking problems among casino employees. *The Journal of Social Psychology, 142*(4), 405–24. <http://doi.org/10.1080/00224540209603909>
- Shaffer, H. J., Hall, M. N., & Vander Bilt, J. (1999). Estimating the prevalence of disordered gambling behavior in the United States and Canada: a research synthesis. *American Journal of Public Health, 89*(9), 1369–76.
- Slutske, W. S. (2006). Natural recovery and treatment-seeking in pathological gambling: Results of two U.S. national surveys. *The American Journal of Psychiatry, 163*(2), 297–302. <http://doi.org/10.1176/appi.ajp.163.2.297>
- Slutske, W. S., Jackson, K. M., & Sher, K. J. (2003). The natural history of problem gambling from age 18 to 29. *Journal of Abnormal Psychology, 112*(2), 263–74.
- Smith, D., Harvey, P., Battersby, M., Pols, R., Oakes, J., & Baigent, M. (2010). Treatment outcomes and predictors of drop out for problem gamblers in South Australia: A cohort study. *The Australian and New Zealand Journal of Psychiatry, 44*(10), 911–20. <http://doi.org/10.3109/00048674.2010.493502>
- Stinchfield, R. (2003). Reliability, validity, and classification accuracy of a measure of DSM-IV diagnostic criteria for pathological gambling. *The American Journal of Psychiatry, 160*(1),

180–2. <http://doi.org/10.1176/appi.ajp.160.1.180>

Stinchfield, R., Govoni, R., & Frisch, G. R. (2005). DSM-IV diagnostic criteria for pathological gambling: Reliability, validity, and classification accuracy. *The American Journal on Addictions, 14*(1), 73–82. <http://doi.org/10.1080/10550490590899871>

Stinchfield, R., & Winters, K. C. (1998). Gambling and problem gambling among youths. *The Annals of the American Academy of Political and Social Science*.
<http://doi.org/10.2307/1049337>

Subramaniam, M., Wang, P., Soh, P., Vaingankar, J. A., Chong, S. A., Browning, C. J., & Thomas, S. A. (2015). Prevalence and determinants of gambling disorder among older adults: A systematic review. *Addictive Behaviors, 41*, 199–209.
<http://doi.org/10.1016/j.addbeh.2014.10.007>

Surman, C. B. H., & Goodman, D. W. (2017). Is ADHD a valid diagnosis in older adults? *ADHD Attention Deficit and Hyperactivity Disorders, 9*(3), 161–168.
<http://doi.org/10.1007/s12402-017-0217-x>

Tavares, H., Zilberman, M. L., & el-Guebaly, N. (2003). Are there cognitive and behavioural approaches specific to the treatment of pathological gambling? *Canadian Journal of Psychiatry. Revue Canadienne de Psychiatrie, 48*(1), 22–7.

Toce-Gerstein, M., Gerstein, D. R., & Volberg, R. A. (2003). A hierarchy of gambling disorders in the community. *Addiction, 98*(12), 1661–1672.
<http://doi.org/http://dx.doi.org.proxy1.lib.umanitoba.ca/10.1111/j.1360-0443.2003.00545.x>

van den Brink, W. (2012). Evidence-based pharmacological treatment of substance use disorders and pathological gambling. *Current Drug Abuse Reviews, 5*(1), 3–31.

Vasiliadis, H.-M., Lesage, A., Adair, C., Wang, P. S., & Kessler, R. C. (2007). Do Canada and the United States Differ in prevalence of depression and utilization of services? *Psychiatric*

Services, 58(1), 63–71. <http://doi.org/10.1176/ps.2007.58.1.63>

Weinstock, J., April, L. M., & Kallmi, S. (2017). Is subclinical gambling really subclinical?

Addictive Behaviors, 73, 185–191. <http://doi.org/10.1016/j.addbeh.2017.05.014>

Welte, J. W., Barnes, G. M., Tidwell, M.-C. O., & Hoffman, J. H. (2011). Gambling and problem gambling across the lifespan. *Journal of Gambling Studies*, 27(1), 49–61.

<http://doi.org/10.1007/s10899-010-9195-z>

Welte, J. W., Barnes, G. M., Tidwell, M.-C. O., Hoffman, J. H., & Wieczorek, W. F. (2015).

Gambling and problem gambling in the United States: Changes between 1999 and 2013.

Journal of Gambling Studies, 31(3), 695–715. <http://doi.org/10.1007/s10899-014-9471-4>

Wilkinson, P. (2013). Cognitive behavioural therapy with older people. *Maturitas*, 76(1), 5–9.

<http://doi.org/10.1016/j.maturitas.2013.05.008>

Zaraneck, R. R., & Chapleski, E. E. (2005). Casino gambling among urban elders: Just another social activity? *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, 60(2), S74-81.