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Latent class analysis of gambling subtypes and impulsive/compulsive associations: Time to rethink diagnostic boundaries for gambling disorder?

Samuel R. Chamberlain[a,b], Jan Stochl[a,b], Sarah A. Redden[c], Brian L. Odlaug[d], Jon E. Grant[c,*]

[a] Department of Psychiatry, University of Cambridge, UK
[b] Cambridge and Peterborough NHS Foundation Trust, UK
[c] Department of Psychiatry & Behavioral Neuroscience, University of Chicago, United States
[d] Department of Public Health, Faculty of Health and Medical Sciences, University of Copenhagen, Copenhagen, Denmark

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ABSTRACT

Background: Gambling disorder has been associated with cognitive dysfunction and impaired quality of life. The current definition of non-pathological, problem, and pathological types of gambling is based on total symptom scores, which may overlook nuanced underlying presentations of gambling symptoms. The aims of the current study were (i) to identify subtypes of gambling in young adults, using latent class analysis, based on individual responses from the Structured Clinical Interview for Gambling Disorder (SCI-GD); and (ii) to explore relationships between these gambling subtypes, and clinical/cognitive measures.

Methods: Total 582 non-treatment seeking young adults were recruited from two US cities, on the basis of gambling five or more times per year. Participants undertook clinical and neurocognitive assessment, including stop-signal, decision-making, and set-shifting tasks. Data from individual items of the Structured Clinical Interview for Gambling Disorder (SCI-GD) were entered into latent class analysis. Optimal number of classes representing gambling subtypes was identified using Bayesian Information Criterion and differences between them were explored using multivariate analysis of variance.

Results: Three subtypes of gambling were identified, termed recreational gamblers (60.2% of the sample; reference group), problem gamblers (29.2%), and pathological gamblers (10.5%). Common quality of life impairment, elevated Barratt Impulsivity scores, occurrence of mainstream mental disorders, having a first degree relative with an addiction, and impaired decision-making were evident in both problem and pathological gambling groups. The diagnostic item 'chasing losses' most discriminated recreational from problem gamblers, while endorsement of 'social, financial, or occupational losses due to gambling' most discriminated pathological gambling from both other groups. Significantly higher rates of impulse control disorders occurred in the pathological group, versus the problem group, who in turn showed significantly higher rates than the reference group. The pathological group also had higher set-shifting errors and nicotine consumption.

Conclusions: Even problem gamblers who had a relatively low total SCI-PG scores (mean endorsement of two items) exhibited impaired quality of life, objective cognitive impairment on decision-making, and occurrence of other mental disorders that did not differ significantly from those seen in the pathological gamblers. Furthermore, problem/pathological gambling was associated with other impulse control disorders, but not increased alcohol use. Groups differed on quality of life when classified using the data-driven approach, but not when classified using DSM cut-offs. Thus, the current DSM-5 approach will fail to discriminate a significant fraction of patients with biologically plausible, functionally impairing illness, and may not be ideal in terms of diagnostic classification. Cognitive distortions related to 'chasing losses' represent a particularly important candidate treatment target for early intervention.

1. Introduction

Gambling is a commonplace activity across cultures, and in extreme forms, can evolve into gambling disorder, a behavioral problem characterized by persistent, recurrent maladaptive patterns of gambling behavior and functional impairment. Lower levels of gambling pathol-

* Corresponding author at: Department of Psychiatry & Behavioral Neuroscience, University of Chicago, Pritzker School of Medicine, 5841 S. Maryland Avenue, MC 3077, Chicago, IL 60637, United States.
E-mail address: jongrant@uchicago.edu (J.E. Grant).

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ogy, however, have remained largely unexamined. For years, researchers and clinicians noted an intermediate level of gambling, termed "problem gambling", which did not meet full diagnostic criteria but was associated with significant financial and personal difficulties (Currie et al., 2012). This lower level of gambling symptomatology, however, was never codified as a formal diagnosis.

Currently, the DSM-5 categorizes gambling disorder severity based on total symptom scores. For a diagnosis of gambling disorder, endorsement of four or more, out of nine criteria, is required (American Psychiatric Association, 2013). The DSM-5 definitions of disease severity are 4–5 criteria for mild, 6–7 for moderate, and 8–9 for severe gambling disorder. Problem gambling is not formally listed in DSM-5, but has been variably defined as endorsing two, or three, of the nine criteria in previous literature (Hodgins, Stea, & Grant, 2011). Existing definitions both for the disorder itself and for its severity levels are somewhat arbitrary: they are not necessarily based on meaningful subtypes, and may overlook underlying patterns in the distribution of diagnostic criteria endorsements. However, item-response analysis from a large dataset suggests that all the gambling disorder diagnostic criteria load onto one underlying dimension, and therefore that the sum can be used as a measure of severity (Strong & Kahler, 2007). Using classification and regression tree analysis, the diagnostic item related to preoccupation with gambling best distinguished social from problem gamblers in college athletes (Temcheff, Paskus, Potenza, & Derevensky, 2016).

Understanding of gambling 'subtypes' and how to classify people with gambling problems is highly relevant from neurobiological and clinical perspectives. Recent research suggests that selective cognitive dysfunction may already be present at lower levels of gambling pathology, even before individuals meet full criteria for gambling disorder. Specifically, Grant, Chamberlain, Schreiber, Odlaug, and Kim (2011) classified non pathological gamblers according to the total number of DSM criteria met, into two groups: social non-problem gamblers (zero diagnostic criteria met) and at-risk gamblers (1–2 diagnostic criteria met) (Grant et al., 2011). The at-risk gamblers, versus the control group, showed impaired performance on a computerized decision-making task – they gambled more points, made more irrational decisions, and were more likely to go bankrupt on the task. Decision-making deficits have commonly been reported in studies of patients with gambling disorder compared to healthy controls (Clark, 2010). Viewed collectively, these data suggest that some cognitive problems may exist not only in people with gambling disorder, but also in people with subthreshold symptoms.

It is important to consider whether quality of life might also be impaired in intermediate forms of gambling pathology. In a study using a large community-based sample, pathological gamblers had lower quality of life than problem gamblers, who in turn had lower quality of life than the non-problem gamblers (Scherrer et al., 2005). After adjustment for potential comorbidities, this group difference appeared to be specific for mental rather than physical health quality of life scores. In problem gamblers recruited from treatment programs, quality of life appeared to be worse in subtypes with psychological distress or multiple morbidities, as compared to subtypes with low comorbidities those with alcohol abuse (Suomi, Dowling, & Jackson, 2014). In a large study conducted in academic recruitment settings, quality of life was significantly different across controls, at-risk gamblers, and pathological gamblers (Loo, Shi, & Pu, 2016). The main effects of group on quality of life were significant and the at-risk gamblers were numerically intermediate between pathological gamblers and controls.

Understanding of underlying subtypes of gambling, with milder symptoms, may thereby allow for earlier interventions to thwart the development of gambling disorder with its potentially devastating consequences.

Latent class analysis represents a form of mixture modelling, whereby categorical responses on (for example) diagnostic questionnaires can be used to identify underlying latent subtypes in a data-driven fashion, such that individuals can be assigned to homogenous groups with similar symptom profiles (Goodman, 1974; Lazarsfeld & Henry, 1968). The technique has received only little application in gambling disorder research. In a study that drew data from two stratified surveys (n = 2417, and n = 530), at-risk gamblers and problem gamblers (defined using number of DSM-IV criteria) most commonly endorsed 'chasing' followed by 'preoccupation and escape' (Toce-Gerstein, Gerstein, & Volberg, 2003). 'Withdrawal' and 'loss of control' most distinguished pathological from problem gamblers. When the authors used regression modelling, they identified a latent dimension of gambling that was significantly linearly related to each individual gambling disorder criterion, excepting 'chasing' and 'illegal acts'. A study of 3901 high school students, using latent class analysis with multiple health behaviors, classified adolescents into four classes: low-risk gambling (86.4%), at-risk chasing gambling (7.6%), at-risk negative consequences gambling (3.7%), and problem gambling (2.3%). At-risk and problem gambling groups were associated with greater negative functioning and more gambling behaviors (Kong et al., 2014).

In the case of adults, Carragher and McWilliams (2011) applied latent class analysis to the ten DSM-IV pathological gambling criteria using data from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) (n = 11,104) (Carragher & McWilliams, 2011). They identified three latent classes based on gambling severity: no gambling problems (93.3%), moderate problems (6.1%) primarily endorsed the preoccupation, tolerance, and chasing criteria, and pervasive gambling problem (0.6%) endorsing the majority of the criteria. Similarly, McBride, Adamson, and Shevlin (2010) examined data from adults (n = 5644) who participated in the 2007 British Gambling Prevalence Survey and found three distinct classes of gamblers: non-problematic gamblers (88.9%); preoccupied chaser gamblers (9.7%); and antisocial impulsivist gamblers (1.4%) (McBride et al., 2010). Males, non-Whites and smokers were all more likely to be preoccupied chasers or antisocial impulsivist gamblers. Some of the work by McBride and colleagues has been further elaborated upon by James, O'Malley, and Tunney (2016). By examining multiple UK studies they argue that although there appear to be three classes based on gambling severity, there is evidence suggesting that intermediate and high severity disordered gamblers differed systematically in their responses to items related to loss of control, and not simply on likelihood of endorsing all diagnostic items equally (James et al., 2016).

These previous studies have been largely consistent showing that a small number of individuals qualify for severe gambling problems and that those who do usually endorse specific criteria (e.g., illegal behaviors) or often have related substance issues. Other studies examining personality traits and gambling symptomatology have found greater levels of sensation-seeking, high negative emotionality, and aggression in the more severe gambling (Savage, Slutske, & Martin, 2014; Studer et al., 2016). Elevated obsessive-compulsive traits have been reported in pathological gambling individuals compared to controls using a dimensional questionnaire (the Padua inventory) (Bottesi, Ghisi, Ouimet, Tira & Sanavio, 2015). In a latent class analysis study based on telephone interviews (participants from the Vietnam Era Twin Registry), participants were classified based on obsessive-compulsive (OC) symptoms (Scherrer, Xian, Slutske, Eisen, & Potenza, 2015). Four OC classes were identified: unaffected, rituals/symmetry, germs/fears, and severe. Compared to the unaffected class, the other classes had significantly higher endorsement rates of many individual pathological gambling criteria.

However, the available latent class modelling studies have not characterized whether different subtypes of gambling are associated with common or distinct neuropsychological profiles, which would be very informative from a neurobiological perspective. Furthermore, gambling disorder was regarded as an impulse control disorder in DSM-IV, yet the existing latent modelling studies largely did not screen for impulse control disorders, to evaluate comorbidity rates between subgroups. This issue is highly relevant since gambling disorder was