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The Relationship of DSM-IV Pathological Gambling to Compulsive Buying and other Possible Spectrum Disorders: Results from the Iowa PG Family Study

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Abstract

This study investigates the possible relationship between pathological gambling (PG) and potential spectrum disorders including the DSM-IV impulse control disorders (intermittent explosive disorder, kleptomania, pyromania, trichotillomania) and several non-DSM disorders (compulsive buying disorder, compulsive sexual behavior, Internet addiction). PG probands, controls, and their first-degree relatives were assessed with instruments of known reliability. Detailed family history information was collected on relatives who were deceased or unavailable. Best estimate diagnoses were assigned blind to family status. The results were analyzed using logistic regression by the method of generalized estimating equations. The sample included 95 probands with PG, 91 controls, and 1075 first-degree relatives (537 PG, 538 control). Compulsive buying disorder, having 1–2 spectrum disorder(s), and having “any spectrum disorder” were more frequent in the PG probands and their first-degree relatives vs. controls and their relatives. Spectrum disorders were significantly more prevalent among PG relatives compared to control relatives (adjusted OR = 8.37), though much of this difference was attributable to the contribution from compulsive buying disorder. We conclude that compulsive buying disorder is likely part of familial PG spectrum.

Keywords

family study; genetics; pathological gambling; gambling spectrum; impulse control disorders; compulsive buying disorder; compulsive sexual behavior

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Drs. Crowe, Coryell, and Allen, Mr. McCormick, and Ms. Shaw report no conflicts.

1. Introduction

The concept of a familial spectrum of disorders emerged in the 1970s. The schizophrenia spectrum was embraced by the psychiatric community and has influenced classification of these disorders in DSM-5 (American Psychiatric Association, 2013). Likewise, the obsessive-compulsive spectrum was identified in the 1990s and has since been accepted by the field, influencing the authors of DSM-5 who included a chapter on obsessive-compulsive and related disorders (Hollander, 1993; American Psychiatric Association 2013; Black and Grant, 2014). In each instance, evidence from family and twin studies, as well as patterns of familial aggregation of disorders and psychiatric comorbidity, led investigators and clinicians to conclude that other conditions were related to the disorder in question (e.g., schizotypal personality disorder and schizophrenia, body dysmorphic disorder and obsessive-compulsive disorder). The spectrum concept has offered researchers and clinicians a new way to think about the relationship among disorders in terms of phenomenology and treatment, and to reconsider the idea of phenotypic expression, a central issue in genetic studies.

The concept of a spectrum of disorders related to PG has been slower to gain support. The possibility is of great theoretical interest and is suggested by both clinical experience and theory (Black et al., 2010). An array of behaviorally-defined conditions potentially related to PG includes compulsive buying disorder, compulsive sexual behavior (sexual addiction), kleptomania, and Internet addiction. These conditions overlap with the “externalizing” disorders whose main feature is behavioral dyscontrol that places the individual in conflict with other persons or society (Black et al., 2014).

In DSM-IV (American Psychiatric Association, 1994), PG was placed in the chapter on impulse control disorders not elsewhere classified. The category included several orphan disorders characterized by loss of control of one’s behavior resulting in explosive temper outbursts, stealing, firesetting, or excessive gambling. In an earlier communication (Black et al., 2014), we presented the major findings of the Iowa family study of PG. We showed that PG is familial, but also that these same families are filled with substance misuse and antisocial personality disorder, providing partial confirmation to the concept of a PG spectrum.

We now present further results from the Iowa PG family study. We report data testing the relationship between several DSM-IV disorders considered by some to be related to PG (intermittent explosive disorder, kleptomania, pyromania, trichotillomania), but also several non-DSM-IV disorders that are of theoretical interest (compulsive buying disorder, compulsive sexual behavior, Internet addiction) (Comings, 1998; Dannon et al, 2004; Hollander et al., 2006; Black et al., 2010; Aboujaoude, 2010; Grant and Odlaug, 2012). These latter conditions have been called “behavioral addictions,” that is, disorders characterized by uncontrolled (or poorly controlled) behaviors not due to the use of alcohol or other drugs. The National Institute on Drug Abuse considers behavioral addictions relatively pure models of addiction because they are uncontaminated by the presence of an exogenous substance (Holden, 2001). In DSM-5, PG was moved to the chapter on substance

use and other addictive disorders in partial recognition of the subcategory of behavioral addictions (American Psychiatric Association, 2013).

With this background in mind, we shall focus on the status of PG and potential spectrum disorders. First, we examine their prevalence in PG probands and controls. Next, we examine their prevalence in their respective first-degree relatives. Finally, we examine whether the conditions occur more frequently in PG relatives whether or not the case proband had the same diagnosis.

2. Methods

2.1 Participants

PG probands were recruited through a study registry (n=19); psychiatric treatment facilities (n=15); gambling treatment programs (n=19); advertisements (n=19); Gamblers Anonymous meetings (n=15); and word-of-mouth (n=7). Controls were recruited via random digit dialing through the Center of Social and Behavioral Research at the University of Northern Iowa (Cedar Falls, IA). They were group matched to PG subjects for age (within 5 years), sex, and educational level.

Probands were interviewed between February 2005 and June 2010. PG probands were required to have a South Oaks Gambling Score (SOGS; Lesieur and Blume, 1987) ≥ 5 and a National Opinion Research Center DSM Screen for Gambling Problems (NODS; NORC, 1999) score ≥ 5 ; they also had to meet DSM-IV PG criteria (American Psychiatric Association, 1994). The SOGS is a screener used to identify likely cases of PG. The NODS is a structured instrument used to diagnose PG. PG and control probands were required to be ≥ 18 years and to speak English. They could not have a psychotic, cognitive, or a chronic neurological disorder (e.g., Parkinson's disease). Control probands were required to have a SOGS score ≤ 2 and a NODS score of 0. Written informed consent was obtained from all probands according to procedures approved by University of Iowa Institutional Review Board.

2.2 Procedures

Probands were interviewed in person. Permission was obtained to interview their first-degree relatives ≥ 18 years who were systematically contacted and invited to participate by telephone blind to case vs. control status. Informant interviews were conducted for those who were deceased, chose not to participate, could not be located, or where the proband refused to allow contact. Informants included their first-degree relatives who consented to an interview. For example, all interviewed relatives were systematically asked about all of *their* relatives, so we generally had information from multiple individuals about the person who was deceased or otherwise did not participate. All of this information was relevant to the best estimate diagnostic process.

Diagnostic assessments relevant to this analysis included the Structured Clinical Interview for DSM-IV (Spitzer et al., 1994) and the Structured Interview for DSM-IV Personality (Pfohl et al., 1994). The Family History Research Diagnostic Criteria adapted to include criteria for PG (Andreasen et al., 1977; 1986) was used to collect information from collateral

informants. The Minnesota Impulsive Disorders interview (Christensen et al., 1994; Grant et al., 2005) used to collect data on intermittent explosive disorder, compulsive buying disorder, kleptomania, compulsive sexual behavior, pyromania, and trichotillomania. We added a module to diagnose Internet addiction. The definition emphasized preoccupation with Internet use, excessive time spent, and subjective distress or impairment of social or occupational functioning. Social and demographic data were collected from all subjects. The methods are further described elsewhere (Black et al., 2014).

A blind consensus procedure was used to make diagnostic assignments for each study subject (Leckman et al., 1982). Raw materials were reviewed independently by two senior diagnosticians. This included a brief narrative summary prepared by the interviewer. If criteria required for the disorder were met, then a definite diagnosis was assigned. If any necessary criterion was absent, the diagnosis was considered “probable.” If it seemed likely that the subject had the diagnosis, but the diagnosticians could not be certain of a given criterion, then the diagnosis was considered “possible.” If the diagnosticians could not be sure of the presence or absence of a given diagnosis, then that diagnosis was recorded as unknown. Each subject was rated for phenotypes of interest in this study: PG, subclinical PG, recreational gambling, no gambling. Only definite and probable cases of PG and subclinical PG were included in the analyses.

2.3 Statistical analysis

The lifetime prevalence of spectrum conditions in PG probands and controls was compared using the Chi-square test (or Fisher’s exact test) as necessary. The same tests were used to compare conditions in case and control first-degree relatives. We examined the familial relationship between PG and presence of any potential spectrum condition using a method described by Bienvenu et al. (2000). First, we established whether spectrum conditions occurred more frequently among the first-degree relatives of PG probands, indicating a common familial etiology. To control for the potential that spectrum conditions are transmitted independently of PG, the proband’s diagnosis of any spectrum condition was included in the logistic regression model. Finally, the presence of PG in relatives was included in the model to determine whether the co-occurring spectrum condition is transmitted independent of PG. Generalized estimating equations (GEE models) were used to account for within-family correlation. Three GEE models were run sequentially with the following predictors: 1) proband years of education, interview type (in person versus telephone), and proband PG status (the base model); 2) the base model and the proband’s diagnosis for any spectrum condition; and 3) the base model, the proband’s diagnosis for any spectrum condition, and the relative’s PG status (diagnosis of definite/probable PG). Each model provided an odds ratio and 95% confidence interval for each predictor variable, including a comparison of PG relatives to control relatives. The proband’s years of education and interview type were used as covariates in the models. Statistical tests were 2-tailed with $\alpha = 0.05$.

3. Results

The total sample included 1261 individuals: 186 probands (95 PG, 91 control), 318 directly interviewed FDRs (148 PG, 170 control), and 757 indirectly assessed relatives (389 PG, 368 control). Of PG relatives directly interviewed, 38 were interviewed in-person, while 110 were interviewed by telephone. Of control relatives directly interviewed, 25 were interviewed in person and 148 by telephone. The difference was statistically significant (chi square = 6.37, df = 1, $P = 0.012$).

The PG and control probands were well-matched for age (mean of 45.6 and 49.4 for PG probands and controls, respectively) and sex (58% and 63% female for PG probands and controls, respectively). Statistically significant differences were observed with education (mean of 14.1 years for PG probands and 15.2 years for controls) and race/ethnicity because 15% of PG probands and 5% of controls were non-white; 8 PG probands were African-American, and 2 were American Indian, while among controls 4 were African-American and 1 was an American Indian. For that reason, these variables were used as covariates in the statistical analysis.

The lifetime prevalence of potential spectrum conditions in PG probands and controls is shown in Table 1. Compulsive buying disorder, having 1–2 spectrum disorders, and having “any spectrum disorder” occurred significantly more frequently in PG probands than controls. Compulsive sexual behavior occurred in 5 of 95 PG probands and none of 91 controls, but the difference did not reach statistical significance. Other spectrum conditions, including intermittent explosive disorder, Internet addiction, kleptomania, and trichotillomania occurred infrequently in PG probands and controls. There were no cases of pyromania.

PG and control relatives were well-matched on sex (PG relatives, 50% female; control relatives, 49% female), mean age (PG relatives, 49.4 years; control relatives, 48.0 years), race/ethnicity, and relationship to proband (i.e., offspring, sibling, parent) (Black et al., 2014). The groups differed with respect to interview type (in-person vs. telephone), with more control relatives interviewed by telephone (86% of control relatives vs. 74% of PG relatives). Control relatives had more mean years of education (14.6 vs. 13.6 years) than PG relatives. Data on a relative’s years of education was not available for most of the sample, so proband’s years of education was used as the covariate in the regression analysis.

The lifetime prevalence of potential spectrum conditions in PG and control first-degree relatives is shown in Table 2. Compulsive buying disorder and “any spectrum disorder” occurred more frequently in PG probands relative to control probands. Other disorders were rare in case and control relatives.

In Table 3, we present the sequential logistic regression results controlling for withinfamily correlation, proband’s years of education and interview type (in person vs. telephone). In the base model, the adjusted odds ratio estimate for proband’s PG status is 8.37 (95% confidence interval [1.89, 37.12]), indicating that prevalence of at least one spectrum condition was much higher in PG relatives. Relatives who were interviewed in person were more likely to be diagnosed with at least one spectrum condition (adjusted OR = 6.93, 95%

confidence interval [2.04, 23.55]). The proband's years of education was not predictive of spectrum conditions in relatives.

The model was then extended to adjust for any spectrum condition in the proband. The odds ratio decreased from 8.37 to 6.83, suggesting that independent transmission of spectrum conditions does not fully explain the increased odds of spectrum conditions among PG relatives. Risk of a spectrum condition was not significantly higher for relatives of individuals with a spectrum condition.

The final model adjusted for PG status in the relative, with a resulting odds ratio of 6.63, suggesting that the increased odds of the spectrum conditions are not due to co-segregation with PG. Note that the logistic regression analyses were only reported for "any spectrum condition;" because individual spectrum conditions were so infrequent, resulting logistic regression models were not testable.

It is important to note that compulsive buying disorder was significantly more prevalent in PG relatives than for control relatives, accounting for 14 of the 17 cases of spectrum conditions in PG relatives. The cell sizes did not permit the sequential logistic regression models because no control relatives were diagnosed with compulsive buying disorder. However, if we artificially code a control relative as having compulsive buying disorder (which would lead to a more conservative PG odds ratio), we can then fit the sequential regression models. Using this approach, the odds ratio estimate is large and significant in all three models (final model OR = 11.84, 95% confidence interval [1.52, 92.38]), suggesting a strong familial association between PG and compulsive buying disorder.

4. Discussion

Compulsive buying disorder appears to be the strongest candidate of the various conditions assessed to fall within the PG spectrum. While the study results show an increased prevalence of possible spectrum disorders in PG probands and their relatives, this finding is largely due to the contribution of compulsive buying disorder. Other possible spectrum conditions had low rates in PG probands and their relatives and, while their aggregate numbers were increased, the differences for specific conditions were not statistically significant. Apart from compulsive buying disorder, only compulsive sexual behavior had rates that approached significance in PG probands ($P = 0.059$). This analysis does not rule out the possibility of familial co-transmission of other potential spectrum disorders including compulsive sexual behavior, kleptomania, trichotillomania, and Internet addiction, yet the findings suggest that these conditions are not a prominent part of the familial PG spectrum despite phenomenological similarities.

The possible relationship between PG and compulsive buying disorder merits discussion. The two disorders are frequently comorbid with one another and they appear to overlap in terms of phenomenology (Argo and Black, 2004; Black, 2007). Further, the frequency of compulsive buying disorder (17%) in PG probands is in line with earlier work and suggests that comorbidity between PG and these disorders is not unexpected (Specker et al., 1995; Black and Moyer, 1998; Grant and Kim, 2001; Grant et al., 2005; Shaw and Black, 2008).

Last, both occur in response to urges that are poorly resisted, are associated with trait impulsivity, and are viewed as pleasurable by the individual until secondary, deleterious consequences develop (e.g., debt accumulation) (Black et al., 2012; 2013). The odds ratio in the final model (OR = 11.84) provides robust evidence supporting a familial association for the two disorders, and supports their inclusion in a PG spectrum. Interestingly, this odds ratio is much higher than that supporting the relationship between substance use disorders and PG (OR = 1.12), and PG, despite the fact that PG is now classified with the addictions (Black et al., 2014).

The strength of this study is in its rigorous, blinded, and controlled methodology, though some limitations are present. First, PG probands recruited through an epidemiologic sample would have been more desirable, but this would have required screening thousands of subjects and was not feasible. Second, the low participation rate of racial/ethnic minority subjects reduces the generalizability of our findings in these populations. Third, not all interviews were direct and in person, and many relatives were interviewed by telephone. Fourth, some relatives could not be interviewed due to death or other reasons, and while we aimed to include these relatives by conducting informant interviews, it is possible that some disorders were missed because the relatives were not sufficiently familiar with the individual. Last, assessment of spectrum disorders is imperfect and this may have led to some disorders being missed.

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Highlights

1. The study explores the concept of a spectrum of disorders related to pathological gambling (PG).
2. The data derive from the NIDA-funded Iowa family study of PG.
3. The sample included 95 probands with PG, 91 controls, and 1075 first-degree relatives.
4. The data were analyzed using logistic regression by the method of generalized estimating equations.
5. Putative spectrum disorders were more frequent in probands with PG and their first-degree relatives than in controls and their relatives (adjusted OR = 8.37, $P < .01$).
6. Compulsive buying disorder appears to have a familial relationship with PG.

Table 1

Prevalence of lifetime spectrum disorders in probands with pathological gambling and controls

Spectrum Disorder	Proband Diagnosis		χ^2 , df	P-value
	PG (n=95)	Control (n=91)		
Compulsive buying disorder, no.(%)	16(17%)	2(2%)	11.4, 1	<0.001
Compulsive sexual behavior, no.(%)	5(5%)	0(0%)	FET	0.059
Intermittent explosive disorder, no. (%)	1(1%)	1(1%)	FET	1.000
Internet addiction, no.(%)	3(3%)	2(2%)	FET	1.000
Kleptomania, no.(%)	2(2%)	1(1%)	FET	1.000
Pyromania, no.(%)	0	0		
Trichotillomania, no.(%)	2(2%)	1(1%)	FET	1.000
Any spectrum disorder, no.(%)	24(25%)	4(4%)	15.8, 1	<0.001

FET=Fisher's Exact Test

Table 2

Prevalence of lifetime spectrum disorders in first-degree relatives of probands with pathological gambling and controls

Spectrum Disorder	Proband Diagnosis		χ^2 , df	P-value
	PG (n=537)	Control (n=538)		
Compulsive buying disorder, no. (%)	14 (3%)	0 (0%)	14.2, 1	<0.001
Compulsive sexual behavior, no. (%)	1 (<1%)	0 (0%)	FET	1.000
Intermittent explosive disorder, no. (%)	0(0%)	0 (0%)	FET	1.000
Internet addiction, no. (%)	1(<1%)	1(<1%)	FET	1.000
Kleptomania, no. (%)	3(1%)	0 (0%)	FET	0.124
Pyromania, no. (%)	0	0		
Trichotillomania, no. (%)	1(<1%)	1(<1%)	FET	1.000
Any spectrum disorder, no. (%)	17(3%)	2(<1%)	12.1,1	< .001

FET=Fisher's Exact Test

Table 3

Odds Ratios (ORs) and 95% Confidence Intervals (CIs) for Predictors of Any Spectrum Condition in First-Degree Relatives

Variable	Odds Ratio (95% CI)		
	Base Model	Adjusted for proband diagnosis of spectrum condition	Adjusted for proband diagnosis of spectrum condition and PG
Group (PG vs Control)	8.37 (1.89, 37.12) **	6.83 (1.49, 31.38) *	6.63 (1.41, 31.16) *
Proband years of education	1.04 (0.81, 1.33)	1.08 (0.83, 1.41)	1.09 (0.83, 1.42)
Interview type (in person versus telephone)	6.93 (2.04, 23.55) **	7.20 (2.12, 24.43) **	7.36 (2.17, 25.02) **
Presence of spectrum disorder in proband		2.22 (0.81, 6.07)	2.23 (0.80, 6.22)
Relative's PG status			1.35 (0.27, 6.69)

Based on GEE model;

*
p<0.05,

**
p<0.01,

p<0.001.