

Personality and Problem Gambling

A Prospective Study of a Birth Cohort of Young Adults

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Context: Individual differences in dimensions of personality may play an important role in explaining risk for disordered gambling behavior as well as the comorbidity between disordered gambling behavior and other substance-related addictive disorders.

Objectives: To identify the personality correlates of problem gambling in a representative non-treatment-seeking sample, as well as to determine whether these are similar to the personality correlates of other substance-related addictive disorders and whether individual differences in personality might account for the comorbidity between disordered gambling behavior and other substance-related addictive disorders.

Design: Longitudinal population-based study.

Participants: A complete birth cohort of young adults born in Dunedin, New Zealand, between April 1, 1972, and March 31, 1973 (N=939; 475 men, 464 women).

Main Outcome Measures: Multidimensional Personality Questionnaire assessments of personality were obtained at age 18 years; structured interview-based diagnoses of past-year problem gambling and alcohol, cannabis, and nicotine dependence were obtained at age 21 years.

Results: Problem gambling at age 21 years was associated with higher scores on the higher-order personality dimension of negative emotionality ($d=0.90$) and with lower scores on the personality dimension of constraint ($d=-0.72$) measured at age 18 years compared with control subjects who did not have a past-year addictive disorder at age 21 years. Problem gambling was also associated with Multidimensional Personality Questionnaire indicators of risk-taking ($d=0.50$) and impulsivity ($d=0.56$). The personality profile associated with problem gambling was similar to the profiles associated with alcohol, cannabis, and nicotine dependence. The relations between problem gambling and the substance-related addictive disorders (odds ratios=3.32-3.61) were reduced after controlling for individual differences in personality (odds ratios=1.90-2.32).

Conclusions: From the perspective of personality, problem gambling has much in common with the addictive disorders, as well as with the larger class of "externalizing" or "disinhibitory" disorders. Knowledge gained from the study of common personality underpinnings may be helpful in determining where disordered gambling behavior should reside in our diagnostic classification system.

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CONCEPTUALIZATIONS OF gambling and disordered gambling behavior are inseparable in our language and nomenclature from the concepts of risk-taking and impulsivity; gambling is, by definition, a form of risk-taking behavior, and pathological gambling has been categorized as an "impulse control disorder" in the DSM-IV.¹ It is therefore surprising that personality research has not more convincingly demonstrated an association between risk-taking, impulsivity, and disordered gambling behavior.²⁻⁴ Several theories on the etiology of pathological gambling have also implicated the personality dimension of negative emotionality as an impor-

tant risk factor for the subsequent development of disordered gambling behavior.^{5,6} In this case, however, the empirical evidence has been more consistent in demonstrating elevated levels of negative emotionality among those suffering from gambling problems.^{3,7-9}

Limitations of the extant literature make it difficult to draw firm conclusions about the relationship between personality and disordered gambling behavior. This literature has been based primarily on studies of small samples of patients in treatment for pathological gambling. Because the likelihood of seeking treatment for a gambling disorder is exceedingly rare,¹⁰ treatment-based samples of individuals with pathological gambling are unrepresentative.

sentative of the majority of individuals in the community who have gambling problems and do not seek treatment.¹¹ For instance, individuals who seek treatment are more likely to be distressed or in crisis than those who do not seek treatment, and this might explain their elevated levels of negative emotionality. Community-based studies of personality and disordered gambling behavior are needed to disentangle the personality correlates of disordered gambling behavior from the personality correlates of treatment-seeking.

The literature has been more consistent in establishing the much greater than chance co-occurrence of gambling disorders with alcohol dependence.¹²⁻²⁰ For example, in community-based surveys, the odds of a lifetime diagnosis of alcohol dependence are about 2 to 4 times higher among those with a lifetime diagnosis of pathological or problem gambling than among those without a gambling disorder.^{12,13} Although there are fewer studies examining the comorbidity of gambling disorders with other substance use disorders, it appears that there also may be substantial associations with drug²⁰ and nicotine¹² dependence as well. However, the origin of the comorbidity between gambling disorders and substance use disorders is still unknown. One possibility that has not yet been explored is that the comorbidity may be due, at least in part, to common personality underpinnings.

In the present study, young adult men and women from a total birth cohort completed a comprehensive inventory of personality at age 18 years, and at age 21 years they took part in a structured diagnostic interview that assessed past-year problem gambling and alcohol, cannabis, and nicotine dependence. We were thus able to identify the personality correlates of problem gambling in a representative non-treatment-seeking sample, as well as to determine whether these were similar to the personality correlates of other substance-related addictive disorders and whether individual differences in personality might account for the comorbidity between disordered gambling behavior and other substance-related addictive disorders.

METHODS

PARTICIPANTS

Participants are members of the Dunedin Multidisciplinary Health and Development Study, a longitudinal investigation of the health and behavior of a complete birth cohort.²¹ The cohort of 1037 children (52% boys) was constituted at age 3 years when the investigators enrolled 91% of consecutive births between April 1, 1972, and March 31, 1973, in Dunedin, New Zealand. Cohort families represent the full range of socioeconomic status in the general population of New Zealand's South Island and are primarily (approximately 93%) of white European ancestry. Seventy percent of the young adults attended high school through age 18 years, and 19% had enrolled in a 4-year college or university by age 21 years. At assessment age 21 years, 53% of the cohort were working, 15% were unemployed, 27% were at university, 3% were married, and 8% had borne a child. (For more information about the Dunedin cohort, see Moffitt et al.²²)

In this report, we focus on personality data collected at age 18 years and problem gambling data collected at age 21 years. By age 21 years, the young adults had already been assessed on 8

occasions and had a long history of revealing sensitive personal information to the study without a breach of confidentiality.

GAMBLING IN NEW ZEALAND

Past-year problem gambling was assessed during 1993-1994. There were 3 main forms of legal gambling available in New Zealand during the period covered by this assessment (in descending order of expenditures in New Zealand in 1994): lotteries and scratchcards, on- and off-track betting on horse and dog races, and gambling machines in taverns, sports clubs, and social clubs.²³ The first casino was not opened in New Zealand until November 1994, after the conclusion of data collection. However, there were a total of 8303 gambling machines located outside of casinos,²⁴ corresponding to a density of 0.0023 machines per person, slightly above the current median state density in the United States (similar to the states of Wisconsin, Michigan, and Arizona²⁵). By comparison, in 1994 in the United States, casino gambling and lotteries accounted for the lion's share of gambling expenditures,²⁶ betting on horse and dog races accounted for substantially less of the gambling expenditures than in New Zealand (9% vs 32%, respectively), and gambling machines had not yet penetrated into nongambling venues in most states.

The availability of legal gambling opportunities for adolescents and young adults in New Zealand in the early 1990s exceeded the opportunities currently available for adolescents and young adults in the United States. In New Zealand in 1994, there was no age limit for participation in the lotteries or for playing a gambling machine, and the minimum ages for purchasing scratchcards and betting on races were 16 and 18 years, respectively. In the United States, there are few legal gambling options for those under age 18 years, and states with casinos are nearly evenly split between those imposing minimum age limits of 18 vs 21 years to participate in casino gambling or to play gambling machines.²⁷

One clear advantage of studying disordered gambling behavior in a country such as New Zealand is that gambling is regulated at the national level rather than at the state level (such as in the United States). A consequence of this is that there is much less regional variability in the access to gambling opportunities in New Zealand.

MEASURES

Problem Gambling

At age 21 years (in 1993-1994), participants completed an 8-item modified short-form version of the South Oaks Gambling Screen²⁸ (SOGS) that was administered via structured face-to-face interviews. Despite its weaknesses, the SOGS is the most commonly used instrument for assessing problem and pathological gambling.^{29,30} The reliability and validity of the SOGS have been more extensively examined than they have been for any other instrument, and at the time of the age 21 years assessment of this cohort, it was the only measure of problem and pathological gambling that had undergone such an evaluation. The SOGS has high internal consistency reliability ($r=0.81$), suggesting that the different items of the SOGS are all tapping the same latent construct,¹⁴ and diagnoses and scores based on the SOGS are strongly correlated with other measures designed to assess problem and pathological gambling ($r=0.80$), suggesting that the SOGS is tapping the same core construct as these other instruments.¹⁴

Although the original SOGS is a lifetime measure of gambling problems, the questions in this study were modified to focus on just the past year. The problem gambling questions (**Table 1**) were only asked of those participants who reported

that they had bet \$50 or more in a single month in the past year. Participants were diagnosed with problem gambling if, in addition to betting \$50 or more in a single month in the past year, they endorsed 3 of the 8 problem gambling symptoms.

Eighty-seven percent of the participants reported that they had gambled at least once in the past year, and 17.8% of the participants reported that they had bet \$50 or more in a single month in the past year. The past-year prevalence of the individual symptoms of problem gambling ranged from 0.6% to 9.9%, and the past-year prevalence of problem gambling was 5.9% (8.4% among men, 3.2% among women). One percent of the participants (18.2% of those in the problem gambling group) endorsed at least 5 of the 8 problem gambling symptoms and would meet the SOGS criteria for probable pathological gambling in the past year²⁸ (Table 1).

Among those with a diagnosis of problem gambling, the mean and median maximum amounts bet in a single month in the past year were \$249 (\$156 after excluding a single outlier) and \$101, respectively, and only 9% of these participants reported betting a maximum of \$50 to \$59 in a single month. Overall, 44%, 42%, and 14% of participants reported betting a maximum of \$50 to \$99, \$100 to \$199, and more than \$199 in a single month, respectively. Among those with a diagnosis of problem gambling, the mean and median numbers of times these participants gambled in the past year were 73 and 52, respectively (range, 8-550). None of the individuals diagnosed with problem gambling developed problems based on a single episode of gambling, and most of them were fairly heavily involved in gambling.

Substance Use Disorders

At age 21 years, the *Diagnostic Interview Schedule, Version III-R*³¹ was used to obtain past-year diagnoses of substance use disorders (alcohol, cannabis, and nicotine dependence) according to the *DSM-III-R* criteria.³² To minimize the contribution of common method variance³³ to the associations among disorders, a separate interviewer for each participant conducted the assessments of (1) problem gambling, (2) alcohol and cannabis dependence, and (3) nicotine dependence. The past-year prevalences of alcohol dependence, cannabis dependence, and nicotine dependence were 9.6% (13.3% among men, 5.8% among women), 9.4% (14.0% among men, 4.8% among women), and 17.8% (17.3% among men, 18.4% among women), respectively.

The past-year prevalence of alcohol dependence observed in the Dunedin cohort is similar to the prevalences observed among 18- to 24-year-olds in the United States by the National Comorbidity Survey³⁴ (13.6%) conducted in 1990-1992 and by the National Epidemiologic Survey on Alcohol and Related Conditions³⁵ (11.7%) conducted in 2001-2002. The prevalence of nicotine dependence is also within the range of estimates obtained for 18- to 24-year-olds in the United States from the National Comorbidity Survey (13.2%) and the National Epidemiologic Survey on Alcohol and Related Conditions (17.2%). This is consistent with cross-national comparisons of alcohol and tobacco use that show similar rates of past-year alcohol and tobacco use in 1990 and 2000.³⁶ The only noteworthy difference is the prevalence of cannabis dependence: it is substantially higher in the Dunedin cohort than that observed among 18- to 24-year-olds in the United States by the National Comorbidity Survey (3.6%) and by the National Epidemiologic Survey on Alcohol and Related Conditions (1.5%), but it is remarkably similar to the lifetime prevalence of cannabis dependence observed at age 21 years in a Christchurch, New Zealand, birth cohort (9.0%).³⁷ Again, this is consistent with cross-national comparisons that show that the prevalence of any past-year cannabis use among those aged 15 and older in New Zealand in 1999 was nearly double the prevalence in the United States.³⁶ The higher rates of cannabis use and

Table 1. Past-Year Prevalence of Gambling Problems at Age 21 Years*

	No. (%)
Gambling problem	
Chased losses	93 (9.9)
Gambled more than intended	82 (8.7)
Felt guilty about gambling	54 (5.8)
People criticized gambling	31 (3.3)
Lied about winning	20 (2.1)
Borrowed money, sold property, or went into overdraft	12 (1.3)
Gambled with household money	7 (0.7)
Hide signs of gambling	6 (0.6)
Problem gambling (≥3 problems)	55 (5.9)
3 Problems	32 (3.4)
4 Problems	13 (1.4)
5 Problems	6 (0.6)
6 Problems	4 (0.4)
7 Problems	0 (0.0)
8 Problems	0 (0.0)

*N = 939 (475 men, 464 women). Gambling problems were assessed among those who bet \$50 or more in a single month in the last year.

cannabis use disorders in New Zealand as compared with those rates in the United States may be because (1) cannabis is widely available in New Zealand—much of it is grown locally, it is often shared between friends, and it is often supplied for free,³⁸ and (2) other illicit drugs, such as cocaine, are much harder to obtain in New Zealand. Given the limited availability of other illicit drugs in New Zealand, it may be that cannabis dependence provides a good proxy for the more general category of illicit drug dependence.

Personality

At age 18 years (in 1990-1991), participants completed a modified 177-item version of the Multidimensional Personality Questionnaire³⁹ (MPQ) adapted for use in New Zealand.⁴⁰⁻⁴² Of the 939 individuals for whom problem gambling data were available from the age 21 years assessment, 899 (96%) had complete MPQ data from the age 18 years assessment.

The personality scales composing the MPQ can be viewed at the higher-order level as defining 3 distinct superfactors (positive emotionality, negative emotionality, and constraint) and at the lower-order level as defining 10 more basic aspects of personality variation (an 11th lower-order scale, absorption, was not included in this modification of the MPQ). Individuals scoring high on the dimension of positive emotionality have a lower threshold for the experience of positive emotions and for positive engagement in their social and work environments, and they tend to view life as being essentially a pleasurable experience. The positive emotionality scale is a combination of scores from the lower-order MPQ scales of well-being, social potency, achievement, and social closeness. Individuals scoring high on the dimension of negative emotionality have a low general threshold for the experience of negative emotions such as anxiety and anger, and they tend to break down under stress. The negative emotionality scale is a combination of scores from the lower-order MPQ scales of stress reaction, alienation, and aggression. Individuals scoring high on the dimension of constraint tend to endorse conventional social norms, avoid thrills, and act in a cautious and restrained manner. The constraint scale is a combination of scores from the lower-order MPQ scales of self-control, harm avoidance, and traditionalism.

Two of the lower-order MPQ scales from the constraint dimension, self-control and harm avoidance, are of particular interest as predictors of problem gambling. Self-control can be

thought of as a reversed measure of impulsivity. Low scorers on this scale are impulsive, spontaneous, reckless, and careless—an example item from the self-control scale is “I often act on the spur of the moment” (scored false). Harm avoidance can be thought of as a reversed measure of a risk-taking or sensation-seeking disposition. Low scorers on this scale tend to engage in risky activities and adventures and enjoy the excitement of dangerous situations. An example item from the harm avoidance scale is “I would not like to try bungee jumping” (scored true).

STATISTICAL ANALYSIS

Because the 3 MPQ superfactors represent linear combinations of the 10 MPQ primary scales, all of the multivariate analyses included the MPQ primary scales but not the superfactors. The MPQ scale score differences between each of the 4 diagnostic groups (which included individuals with past-year problem gambling [n=52], alcohol dependence [n=89], cannabis dependence [n=85], and nicotine dependence [n=159]) and an unaffected control group (which included individuals who did not meet the diagnostic criteria for any of the 4 past-year addictive disorders [n=626]) were determined using multivariate analyses of variance. When the multivariate analysis indicated that there was a significant omnibus difference between groups, follow-up *t* tests of group differences for each individual MPQ scale were carried out.

Additional multivariate analyses were conducted, controlling for sex differences in personality and after excluding comorbid cases from the diagnostic groups to create “pure” diagnostic groups. For example, 60% of the young adults in the problem gambling group had at least 1 additional addictive disorder diagnosis: 26%, 24%, and 40% had a comorbid diagnosis of alcohol dependence, cannabis dependence, and nicotine dependence, respectively. Participants in the pure problem gambling group were the remaining 40% who did not have a comorbid diagnosis of alcohol, cannabis, or nicotine dependence in the past year. The MPQ profiles of members of each of the 4 pure diagnostic groups (pure problem gambling [n=21], pure alcohol dependence [n=36], pure cannabis dependence [n=28], and pure nicotine dependence [n=90]) were compared with the profiles of members of the unaffected control group (n=626).

Associations of problem gambling with the 3 substance use disorders were examined using logistic regression. Two sets of analyses were conducted. We first examined the unadjusted associations between problem gambling and each of the substance use disorders. Then, to examine the extent to which personality differences might account for the comorbidity between problem gambling and other substance-related addictive disorders, we repeated the logistic regressions, controlling for the effect of all 10 of the MPQ primary scales.

In both the multivariate analyses of variance and the logistic regression analyses, we also tested whether the associations between the personality factors and the addictive disorders, or the associations between problem gambling and substance-related addictive disorders, differed for men and women by including interaction terms in the models. In no instance was there a significant sex interaction term (*P* values = .27-.81). For this reason and because there were relatively few women with diagnoses of past-year problem gambling (n=14), we report analyses for men and women together.

RESULTS

There was an omnibus difference in the MPQ profiles of individuals who met the criteria for past-year problem gambling compared with the control group ($F_{10,667}=5.96$,

$P<.001$), even after controlling for the effect of sex ($F_{10,666}=4.70$, $P<.001$). After controlling for comorbid addictive disorders, the omnibus difference was substantially reduced but still statistically significant ($F_{10,636}=1.84$, $P=.047$). The results of the follow-up univariate analyses are graphically depicted in the **Figure**, A. The personality scores were standardized into *z* scores so that the mean and standard deviation for each scale in the control group were 0 and 1, respectively. Therefore, the differences between the diagnostic groups and the control group can be directly interpreted as effect size estimates in standard deviation units (*d*). The positive emotionality superfactor was not associated with problem gambling ($d=-0.06$). Compared with members of the unaffected control group, young adults with problem gambling had significantly higher scores on the negative emotionality superfactor ($d=0.90$) and all of its primary scales (d values = 0.44-0.95), and significantly lower scores on the constraint superfactor ($d=-0.72$) and all of its primary scales (d values = -0.50 to -0.56). After excluding participants with comorbid addictive disorders from this group, young adults with problem gambling still had lower scores on the constraint superfactor and several of the constraint primary scales, and higher scores on several of the negative emotionality primary scales (Figure).

Omnibus differences between the alcohol dependence ($F_{10,704}=11.89$, $P<.001$), cannabis dependence ($F_{10,700}=17.64$, $P<.001$), and nicotine dependence ($F_{10,774}=11.63$, $P<.001$) groups and the control group were also observed. After controlling for sex, the differences between the alcohol dependence ($F_{10,703}=10.15$, $P<.001$), cannabis dependence ($F_{10,699}=14.82$, $P<.001$), and nicotine dependence ($F_{10,773}=11.87$, $P<.001$) groups and the control group remained statistically significant. After controlling for comorbid addictive disorders, the omnibus differences between the alcohol dependence ($F_{10,651}=3.08$, $P=.001$), cannabis dependence ($F_{10,643}=5.37$, $P<.001$), and nicotine dependence ($F_{10,705}=4.95$, $P<.001$) groups and the control group remained statistically significant, although they were substantially reduced. The results of the follow-up univariate analyses are graphically depicted in the Figure, B-D. The results in the Figure show that the personality profile associated with problem gambling is very similar to that associated with other substance-related addictive disorders.

Past-year problem gambling was significantly associated with past-year alcohol dependence, cannabis dependence, and nicotine dependence (**Table 2**). The associations between problem gambling and the 3 substance use disorders were similar in magnitude and were nearly as large as the well-established association between alcohol and nicotine dependence. The odds ratio of the association between problem gambling and alcohol dependence (3.61, $P<.001$) was substantially reduced and was no longer significantly greater than 1.0 (2.02, $P=.06$) after controlling for the 10 MPQ primary scales. Similar results were obtained for the association between problem gambling and cannabis dependence (odds ratio before controlling for personality, 3.32, $P<.001$; odds ratio after controlling for personality, 1.90, $P=.10$) and nicotine dependence (odds ratio before controlling for personality, 3.39, $P<.001$; odds ratio after controlling for personality, 2.32, $P=.01$), al-

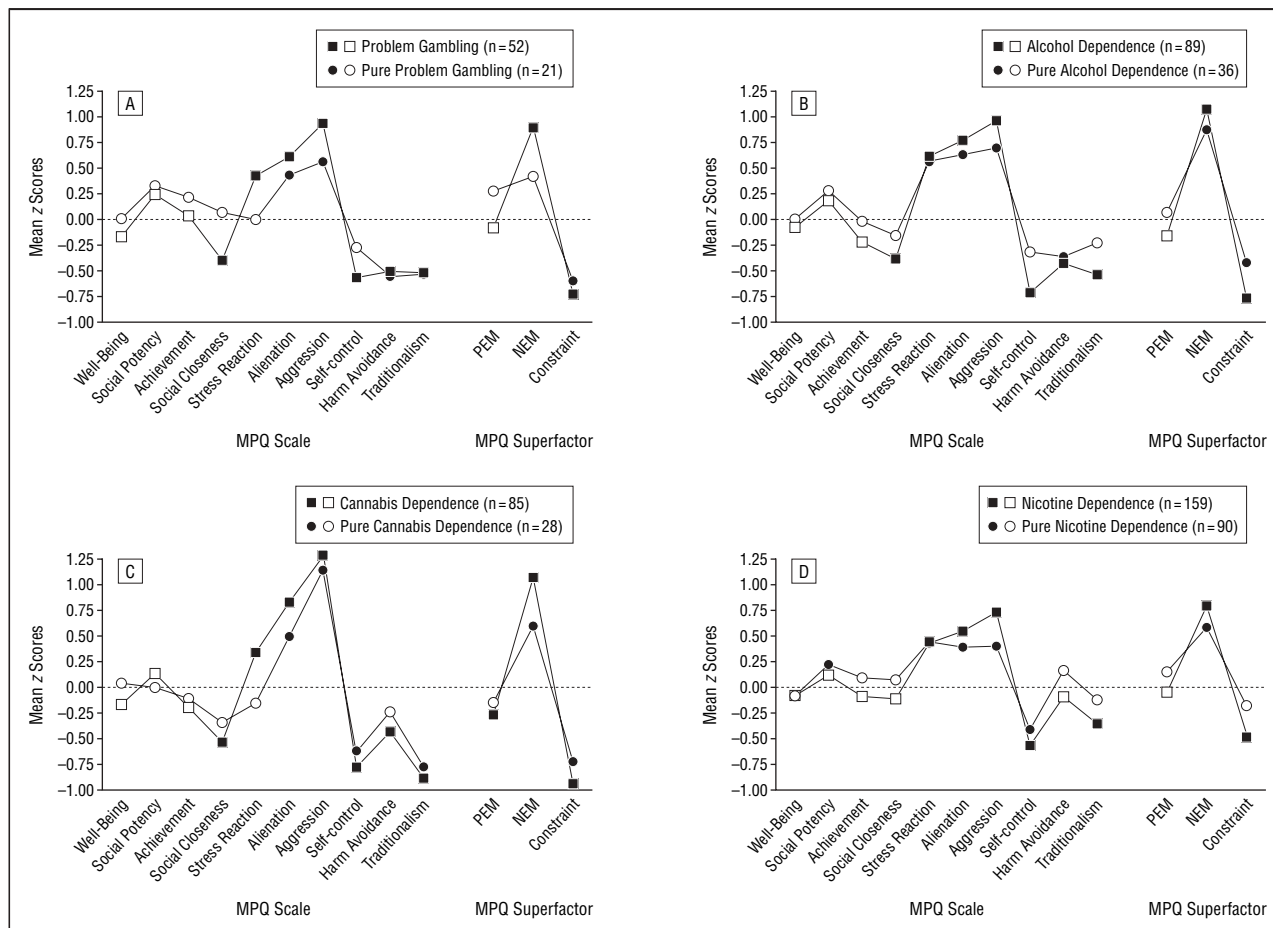


Figure 4. A, Multidimensional Personality Questionnaire (MPQ) profiles of young adults at age 18 years with a diagnosis of past-year problem gambling at age 21 years. B, The MPQ profiles of young adults at age 18 years with a diagnosis of past-year alcohol dependence at age 21 years. C, The MPQ profiles of young adults at age 18 years with a diagnosis of past-year cannabis dependence at age 21 years. D, The MPQ profiles of young adults at age 18 years with a diagnosis of past-year nicotine dependence at age 21 years. All diagnostic groups are compared with a control group unaffected by problem gambling, alcohol dependence, cannabis dependence, or nicotine dependence in the past year ($n=626$). The scores for the diagnostic groups and control group are transformed so that the mean and standard deviation of the control group are 0 and 1, respectively. The z scores for the diagnostic groups can therefore be directly interpreted as effect size estimates in standard deviation units (d). Filled boxes and circles represent significant differences ($P < .05$), and open boxes and circles represent nonsignificant differences from the control group. PEM indicates positive emotionality; NEM, negative emotionality.

though the association between problem gambling and nicotine dependence was still significant even after controlling for personality. This pattern of results was the same when the effect of sex was controlled in the models.

COMMENT

Epidemiologic surveys of disordered gambling behavior have been beset by low participation rates: recent national surveys in the United States have obtained participation rates of 56%⁴³ and 65%,¹⁴ and recent national surveys in Australia,⁴⁴ Britain,⁴⁵ and New Zealand²³ have obtained participation rates of 47%, 65%, and 75%, respectively. With a participation rate of 91% of a complete birth cohort, the present study is one of the most representative epidemiologic studies of disordered gambling behavior conducted.

Young adults with a past-year problem gambling diagnosis at age 21 years were, on average, more deviant on indicators of negative emotionality and behavioral constraint measured at age 18 years than control subjects who did not have a past-year addictive disorder at age 21 years.

Table 2. Associations Between Problem Gambling and Substance-Related Addictive Disorders at Age 21 Years

Addictive Disorder	Problem Gambling*	Alcohol Dependence*	Cannabis Dependence*
Alcohol dependence	3.61 (1.88-6.92)
Cannabis dependence	3.32 (1.71-6.46)	6.33 (3.78-10.59)	...
Nicotine dependence	3.39 (1.92-5.98)	3.83 (2.42-6.06)	4.97 (3.14-7.87)

*Values are expressed as odds ratio (95% confidence interval).

In particular, young adults with a diagnosis of problem gambling were characterized by negative emotions such as nervousness or worry, anger or aggressiveness, feeling mistreated or victimized, and unconstrained behaviors of risk-taking, impulsivity, and rebelliousness. Whether the same dimensions of personality will also predict gambling problems that are experienced later in life or in other environmental contexts is an open question for future research.

By measuring personality and problem gambling on occasions separated by 3 years, it is more likely that these are enduring, "trait-like" personality risk factors for disordered gambling behavior than the acute "state-like" reactions to gambling problems that are likely to be evidenced among treated samples of patients with pathological gambling. These results are consistent with an important causal relationship between preexisting individual differences in personality and disordered gambling behavior. However, establishing a temporal association is not sufficient for demonstrating a causal relationship. There are several alternative explanations for these findings, including the possibility that unmeasured problem gambling occurring before age 18 years may have antedated the measurement of personality.

This is the only epidemiologic study of disordered gambling behavior that has included such a comprehensive assessment of individual differences in personality. Nevertheless, the results of the present study are consistent with previous community-based studies that have focused on a single aspect of personality. For example, in a longitudinal study of 754 boys living in disadvantaged neighborhoods in Montreal, Quebec, a brief self-report measure of impulsiveness completed at age 13 years predicted gambling problems at age 17 years.⁴⁶ In addition, previous community-based studies that have focused on nonpathological indicators of gambling, such as gambling versatility, are also consistent with the present study. For instance, in a study of nonpathological gambling behavior among 790 adults, the number of different gambling activities that an individual participated in was significantly associated with impulsivity and sensation-seeking.⁴⁷ The emerging evidence from epidemiologic studies stands in sharp contrast to the conclusion drawn from patient populations that "pathological gamblers are neither impulsive nor sensation-seekers."²

Because nearly two thirds of the young adults with problem gambling had a comorbid substance use disorder, the similarity of the personality profiles associated with problem gambling to those of the other addictive disorders might be explained by the presence of individuals with substance use disorders in the problem gambling group. Therefore, we examined the personality profiles of a pure problem gambling group as well as the problem gambling group that contained individuals with comorbid substance use disorders. Many of the personality differences obtained in the full problem gambling sample were also observed in the pure problem gambling group. In particular, indicators of risk-taking (low harm avoidance scale scores) and rebelliousness (low traditionalism scale scores) were still more deviant among the pure problem gambling group compared with the control group, suggesting that these personality correlates cannot be explained by comorbid addictive disorders. Indicators of nervousness or worry (high negative emotionality and stress reaction scale scores), however, were no longer elevated among the problem gambling group compared with the control group, which suggests that high levels of negative affect observed among individuals with problem gambling may be due to their comorbid alcohol or nicotine dependence.

The investigation of pure diagnostic groups has limitations,⁴⁸ so caution must be exercised when drawing inferences from the failure to replicate the personality differences with the pure diagnostic groups that were obtained with the comorbid diagnostic groups. The pure diagnostic groups represent an atypical (and less impaired) subset of individuals with an addictive disorder; for example, only 40%, 40%, and 33% of the problem gambling, alcohol-dependent, and cannabis-dependent groups, respectively, did not have any additional addictive disorder diagnosis, and 57% of the nicotine-dependent group did not have a comorbid addictive disorder diagnosis. It is not clear whether the failure to replicate the personality differences in the pure groups is because the differences are owing to the comorbid addictive disorder, or whether the lack of differences is owing to the atypical composition of the pure diagnostic group or the reduced sample sizes and resulting loss of statistical power when focusing on the pure vs comorbid diagnostic groups.

A focus on more basic traits, such as individual differences in personality, is a promising approach for understanding the high rate of comorbidity of pathological and problem gambling with other addictive disorders. In the present study, the personality profile associated with problem gambling was strikingly similar to the profiles associated with alcohol, cannabis, and nicotine dependence, and the relations between problem gambling and the substance-related addictive disorders (odds ratios=3.32-3.61) were reduced by 45% to 61% (above a baseline of 1.0) after controlling for individual differences in personality (odds ratios=1.90-2.32). These results are compatible with twin study evidence suggesting that the correlation in liability between pathological or problem gambling and alcohol dependence may be largely explained by overlapping genetic risk factors,¹³ and that all of this overlapping genetic risk may be accounted for by genetic risk shared with the antisocial behavior disorders.⁴⁹ Taken together, these findings raise the possibility that genetically influenced dimensions of personality, especially personality dimensions of low behavioral control, may be partially responsible for the comorbidity of disordered gambling behavior with other addictive disorders.

These results also have implications for the classification of disordered gambling behavior. Although it is probably appropriate to classify pathological gambling as an "impulse control disorder," a consequence of relegating it to this heterogeneous category of unrelated disorders "not elsewhere classified" is that we may be limiting the extent to which it is embraced by the broader psychiatric research community as a disorder of interest. From the perspective of epidemiological personality,⁵⁰ gambling disorders have much in common with the other addictive disorders as well as with the larger class of "externalizing"⁴⁸ or "disinhibitory"⁵¹ disorders. Perhaps in future incarnations of the *DSM*, pathological gambling will find its home among these disorders.

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