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The Reliability and Validity of the Family History Method for Assessing Pathological Gambling and Gambling Involvement

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Abstract

The family history (FH) method, which involves the use of an informant to gather information about one or more family members, has been used in a number of previous gambling studies. However, no evaluation of the reliability and validity has been conducted on the use of the FH method for assessing pathological gambling (PG) and gambling involvement. The current study examined the test-retest and inter-rater reliability and the validity of the FH method for assessing PG and gambling involvement among a large community-based sample of adult twins (N = 4,764) reporting on their parents, cotwins, and spouses. The test-retest and inter-rater reliabilities of the FH reports of PG were high. Validity of the FH reports of PG was low, primarily due to substantial underestimation of pathology (low sensitivity). The test-retest and inter-rater reliabilities of the FH reports of gambling involvement (ever gambled, ever gambled monthly, and ever gambled weekly) were moderate and the sensitivities were quite high. The results of this study support the use of the FH method for studies of PG and gambling involvement. A number of potential explanations for the low sensitivity of FH reports of PG are elaborated.

Keywords

gambling; family history; reliability; validity; sensitivity

The family history (FH) method involves the use of an informant to gather information about one or more family members. With the FH method, many individuals can be screened via a single informant, compared to the family study (FS) method that collects data using self-reports obtained by individually interviewing each available family member (Andreasen, Endicott, Spitzer, & Winokur, 1977). The FH method, compared to the FS method, is especially time- and cost-efficient, and depending on the purpose, can be used as the sole method of data collection or as an adjunct to the FS method when direct information is not available via self-report for some family members.

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The FH method is used in a number of contexts: (a) in high-risk studies to characterize the risk status of offspring when direct interviews with parents are not feasible (Sher, Gotham, Erickson, & Wood, 1996; Sher, Walitzer, Wood, & Brent, 1991), (b) in molecular genetic studies when the affection status of an entire family pedigree must be created even in the absence of direct interviews (Almasy et al., 2001), (c) in clinical practice to aid in diagnosis (Odgers et al., 2007), and (d) to obtain collateral information about the status of patients in treatment studies (Diskin & Hodgins, 2009; Petry et al., 2006; Weinstock, Ledgerwood, & Petry, 2007).

Missing information in a family-based study can be problematic because individuals who do not participate or are unavailable may differ systematically from those who do participate or can be located, and these individuals may be especially informative cases when studying familial patterns of the transmission of psychiatric disorders (Andreasen, Rice, Endicott, Reich, & Coryell, 1986; Rice, Reich, Bucholz, & Neuman, 1995; Slutske et al., 2009). The FH method is particularly useful for studies of addictive and externalizing disorders because those with alcoholism, drug abuse, and antisocial personality disorder can be especially difficult to locate and recruit into family-based studies (Andreasen et al., 1986). In particular, there is consistent evidence suggesting that individuals with gambling problems are less likely to participate in research (Black, Monahan, Temkit, & Shaw, 2006; Slutske, Jackson, & Sher, 2003; Slutske et al., 2009).

The FH method has been used to characterize the pathological gambling (PG) status of relatives of participants in a number of previous studies. This may be attributable in part to the popularity of the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987) as a measure of gambling pathology and the inclusion of a FH item in the SOGS ("Do/did your parents have a gambling problem?" with response options of: both, father, mother, or neither). For example, Winters et al. (1998) conducted a survey of 1,361 Minnesota college students in which FH and self-reports of gambling problems were assessed using the SOGS; they obtained an odds ratio of the association between a parental gambling problem and self-reported PG diagnoses of 8.2. Although the FH method has been extensively used to diagnose PG in relatives, there is yet to be an evaluation of the reliability and validity of the use of the FH method for this purpose.

The reliability and validity of the FH method have been examined for many other psychiatric disorders (e.g. Heun & Muller, 1998; Hudson, 1983; Li et al., 1997; Orvaschel, Thompson, Belanger, Prusoff, & Kidd, 1982), and acceptable reliability and validity have been demonstrated for most (Hardt & Franke, 2007). However, there is consistent evidence (e.g. Andreasen et al., 1977), including a recent meta-analysis (Hardt & Franke, 2007), that the sensitivity of FH reports is low for most disorders, that is, only a minority of individuals with a psychiatric disorder are identified using FH reports. In the meta-analysis of Hardt and Franke (2007) the sensitivities for major depression, anxiety disorders, and substance use disorders were 0.41, 0.23, and 0.36, respectively (based on weighted averages of the individual estimates reported). In other words, only about one-third of individuals with these disorders were correctly diagnosed by the FH method.

The current study assessed the reliability and validity of the FH method for assessing PG by utilizing data collected from a large community-based sample of adult twins. In addition to diagnoses of PG, the reliability and validity of three indicators of the frequency of gambling involvement (ever gambled, ever gambled monthly, and ever gambled weekly) were evaluated. Three different methods were used. First, the test-retest reliability of FH reports of fathers, mothers, cotwins, and spouses/partners was examined among a subsample of twins who provided FH reports on two separate occasions. Second, the inter-rater reliability of FH reports was examined by assessing agreement between the two members of a twin pair reporting on their father's and mother's history of PG and gambling involvement. Third, the validity of the

FH method was examined by assessing the agreement between the FH report of a twin informant with the self-report of the target co-twin.

Methods

Participants

Participants were members of the national community-based Australian Twin Registry (ATR) Cohort II (Slutske et al., 2009). In 2004 – 2007, 4,764 participants (2073 men, 2691 women, 1875 complete twin pairs, 1014 incomplete twin pairs) completed a structured psychiatric telephone interview that included measures of PG, gambling involvement, and family history of PG and gambling involvement. The present study was part of a larger twin investigation of the epidemiology and causes of individual differences in gambling involvement and gambling disorder (Slutske et al., 2009). Family history measures were included in the larger study in order to: (a) obtain a gambling history for parents and spouses, (b) fill in missing information on the gambling history of non-participating cotwins, and (c) capitalize on the power of the twin study for examining the reliability, validity, and potential biases of the FH method. Twin pairs can be used in much the same way as ordinary siblings in providing multiple-informant reports on the same set of parents (to assess inter-rater reliability of FH reports). Studying both members of a twin pair using both self- and FH-reports is a built-in test of the correspondence between self- and FH-reports (to assess the validity of FH reports).

Trained lay-interviewers who were supervised by a clinical psychologist conducted the telephone interviews. To ensure acceptable interview quality, interviews were recorded and randomly selected for review. Participants were 32 – 43 years when interviewed (M = 37.67, SD = 2.31). Of those individuals from the ATR Cohort II that were targeted for the study, 80.4% agreed to participate and were interviewed (see Slutske et al., 2009 for more details). All data collection was approved by the Institutional Review Boards at the University of Missouri—Columbia and the Queensland Institute of Medical Research.

Test-retest reliability sample—Re-interviews were conducted with 166 participants who had completed the baseline interview (follow-up interval M = 3.4 months, SD = 1.4 months, range = 1.2 – 9.5 months). Individuals with a history of gambling problems were over-sampled for the test-retest reliability study.

Inter-rater reliability sample—There were 1,875 twin pairs used to examine the inter-rater reliability of FH reports of parental gambling involvement. Twin pairs consisted of 867 monozygotic (MZ) pairs (520 female-female, 347 male-male) and 1008 dizygotic (DZ) pairs (367 female-female, 227 male-male, and 414 female-male).

Validity sample—Complete twin pairs were also used to examine the validity of FH reports of cotwins. Each twin pair yielded two data points for these analyses: the FH report of Twin A → self-report of Twin B, and the FH report of Twin B → self-report of Twin A. In other words, each individual twin was involved in two observations, once as the informant reporting on their cotwin and again as the target family member being reported on by their cotwin. This yielded 3,750 observations altogether for the validity analyses.

Measures

FH of PG and gambling involvement—FH of PG and gambling involvement was assessed for each participant's father, mother, twin and spouse/partner. A "partner" was defined for the (non-married) participants as currently living with someone as though married; 3,058 (64%) of the participants were currently married, and 572 (12%) were living as though married, yielding 3,630 (76%) participants who had a spouse/partner for the FH assessment (henceforth

"spouse"). Participants were asked whether each of these individuals had ever: 1) gambled in their lifetime, 2) gambled at least once a month for at least six months, 3) gambled at least once a week for at least six months, and 4) had a period in their life when they had financial, legal, family, work, relationship, or emotional problems because of their gambling. The first three of these FH questions assessed non-pathological gambling involvement, and the fourth assessed pathological gambling involvement.

Self-reported PG—Self-reported PG was assessed using the NODS (NORC DSM-IV Screen for Gambling Problems; Gerstein et al., 1999). Diagnoses of PG and symptom-count scales based on the NODS have good test-retest reliability (test-retest reliability, $\kappa = 0.67$, $Y = 0.79$) and good internal consistency reliability ($\alpha = 0.85$; Slutske et al., 2009), respectively. Two levels of self-reported gambling problems were used to examine the validity of the FH reports – at least one lifetime DSM-IV PG symptom (corresponding to "problem gambling" test-retest reliability, $\kappa = 0.79$, $Y = 0.80$), and at least five lifetime DSM-IV PG symptoms (corresponding to a diagnosis of PG disorder). The lifetime prevalences of problem gambling and PG in the overall study sample were 12.5% and 2.2%, respectively, and were 36.1% and 11.5%, respectively, in the test-retest reliability sample (these prevalences are higher than in the overall study sample because individuals with a history of gambling problems were over-sampled for the test-retest reliability study).

Self-reported gambling involvement—Three indicators of self-reported lifetime frequency of gambling involvement were used to examine the validity of FH reports: ever gambled (test-retest reliability, $\kappa = 1.00$), ever gambled at least once a month for at least six months in a row ("gambled monthly"; test-retest reliability, $\kappa = 0.69$, $Y = 0.73$), and ever gambled at least once a week for at least six months in a row ("gambled weekly"; test-retest reliability, $\kappa = 0.77$, $Y = 0.78$).

Twin zygosity—Zygosity was assessed using a combination of self-reports and interview surveys regarding physical similarity (e.g. height, eye and hair color, "as alike as two peas in a pod") and the degree to which parents, relatives, friends, or teachers could tell the co-twins apart. If inconsistencies existed between co-twin reports, photographs were requested. The accuracy of zygosity assignment was assessed against DNA analyses done for 241 same-sex twin pairs who were also participating in another unrelated study. Zygosity assignments yielded excellent accuracy (MZ = 100%, DZ = 97%).

Data Analysis

Test-retest reliability—Test-retest reliability of FH reports of parent, co-twin, and spouse PG and gambling involvement was determined by assessing the agreement across time points for the 166 participants who were re-tested. Test-retest reliability was evaluated using kappa (Cohen, 1968), an agreement coefficient that takes into account agreement expected by chance, and Yule's Y (Spitznagel & Helzer, 1985). Yule's Y is an alternative agreement coefficient that is base-rate independent and is ideal for use with items that have very low (e.g. PG) or very high (e.g. ever gambled) base rates, and for comparing levels of agreement for items that differ in their base rates.

Inter-rater reliability—Inter-rater reliability of parental gambling involvement was based on the agreement of two twins from a pair (who were reporting on the same parents). Interrater reliability was also evaluated using kappa and Yule's Y.

Validity—Validity of FH reports of gambling was investigated by assessing how well a twin's FH report of their cotwin corresponded to the cotwin's self-report, with self-report serving as the indicator of the true condition (e.g. see Kendler et al., 2002). The agreement between the

twins' FH report and the cotwins' self-report was indexed by kappa and Yule's Y. Validity was also evaluated based on sensitivity and specificity, which measure the percentage of positive and negative self-reports, respectively, that are correctly identified by the FH reports. In addition, positive predictive value (PPV) and negative predictive value (NPV) were examined to determine the percentage of positive and negative FH reports, respectively, that were correct. For many uses of FH reports (e.g. filling in missing diagnostic information in a family pedigree for a molecular genetic investigation), high sensitivity and specificity are most important, but there are some uses (e.g. identifying individuals from a larger pool who are affected and unaffected with a disorder for a high-risk study), that high PPV and NPV are more critical.

Analyzing clustered data—The inclusion of individual twins from a pair in statistical analyses, or using double-entered twin data with each twin serving as both an informant and a target, violates the assumption of independence of observations in statistical analyses. Standard errors and confidence intervals will be underestimated with standard statistical procedures. This was addressed using survey data analysis procedures to adjust for the non-independence of observations obtained from two members of a twin pair. The data were treated as clustered, with the family unit (in this case, the twin pair) serving as the cluster. In instances where standard statistical software was not available (e.g. in the computation of Yule's Y), bootstrapping methods (Efron & Tibshirani, 1986) were used to correctly estimate standard errors and confidence intervals. In the current study, 10,000 replicate samples were drawn from the original dataset, using sampling with replacement. Bootstrapping procedures have been previously used in similar studies using twin data (Slutske, Heath, Madden, & Bucholz, 1996).

Effects of zygosity and sex on reliability and validity—For all of the reliability and validity analyses, twins from five different sex and zygosity groupings were combined together: male MZ, female MZ, male DZ, female DZ, and female-male DZ. A series of follow-up analyses were conducted to determine whether there were differences in the levels of agreement for: (1) MZ versus DZ twin pairs, (2) male versus female twin pairs, and (3) same versus opposite-sex twin pairs. Each of these binary indicators was individually entered into a logistic regression as an interaction term with the informant's FH report in predicting the target FH report (or in the case of validity analyses, the target self-report). Differences in twin agreement of, for example, FH reports of paternal PG for MZ versus DZ twin pairs was inferred when there was a significant interaction of twin zygosity (coded 0 = DZ, 1 = MZ) and the informant's FH report in predicting paternal PG as indicated by the FH report of the cotwin.

Results

Rates of FH reports of paternal and maternal gambling involvement are displayed by informant gender in Table 1. There were differences by informant gender for endorsing maternal FH reports, with females being more likely to report that their mother had ever gambled (odds ratio = 0.79, $p = .001$), gambled monthly (odds ratio = 0.77, $p < .001$), or gambled weekly (odds ratio = 0.75, $p < .001$). Examination of the composition of unlike-sex twin pairs that were discordant for their FH reports confirmed that within families, the female twins were more likely to report that her mother had ever gambled monthly (matched-pair odds ratio = 0.56, $p < 0.001$) and ever gambled weekly (matched-pair odds ratio = 0.57, $p < 0.001$) than their male co-twins. There were no gender differences in FH reports of gambling behavior in the informants' father.

There were also differences in the rates of FH reports by the gender of the target family member, as displayed in Table 2. As expected, prevalences were higher for men than for women for nearly every index of gambling involvement. Table 2 also shows that the prevalences of self-

reported gambling involvement among twins were higher than FH reports provided for cotwins and spouses (who were in the same age range as the twins) for every gambling-related behavior.

Test-Retest Reliability

Table 3 presents the test-retest reliability coefficients of FH reports of paternal, maternal, cotwin and spouse gambling involvement. The mean kappa of FH reports for fathers' (κ = .69), mothers' (κ = .67), and cotwins' (κ = .63) gambling involvement were high, but were only moderate for spouses (κ = .49). Across the different indices of gambling involvement, the test-retest reliability increased as the intensity level of gambling involvement increased, with the item pertaining to ever gambling having moderate reliability (mean κ = .50) and the item pertaining to problem gambling having strong reliability (mean κ = .69).

Inter-rater Reliability

Table 4 presents the agreement coefficients for twin pairs' FH reports of paternal and maternal gambling involvement. Overall, inter-rater reliability was fair to moderate, and there were no observable differences between agreement of reports of maternal and paternal gambling involvement. For either parent, there was moderate agreement for having ever gambled or gambling monthly (mean κ = .39; mean Y = .40), and fair agreement was found for having ever gambled weekly (mean κ = .27; mean Y = .38). There was good agreement for lifetime problem gambling (mean κ = .49; mean Y = .76).

Validity

Table 5 presents the agreement coefficients for the validity of FH reports of co-twin gambling behavior. Overall, kappa values indicate consistently fair validity (mean κ = 0.27) across the five indicators of gambling involvement. Sensitivity, specificity, PPV, and NPV were also calculated to identify whether responses indicating the presence or absence of gambling behavior tended to be more or less accurate. For gambling involvement (i.e., whether the informant's cotwin ever gambled, gambled monthly, or gambled weekly), responses indicating the presence of a behavior tended to perform better, as reflected by high sensitivity and PPV values (mean sensitivity = .73, mean PPV = .80), than those indicating the absence of a behavior, as reflected by low specificity and NPV (mean specificity = .63, mean NPV = .45). Conversely, for problem gambling and PG, responses indicating the absence of gambling-related problems (mean specificity = .99, mean NPV = .94) performed better than those indicating the presence of gambling-related problems (mean sensitivity = .20, mean PPV = .46).

Effects of Zygosity and Sex on Reliability and Validity

None of the estimates of the inter-rater reliability and validity of FH reports of PG and gambling involvement were affected by the sex of the twin pair, and there were only a few instances in which they were affected by the zygosity of the twin pair. The significant differences observed were modest and did not alter the interpretation of the results. For two of the parental FH gambling involvement items there was greater agreement between MZ than between DZ twin pairs: whether the mother had ever gambled (κ of 0.50 versus 0.35), and whether the informants' father had ever gambled weekly (κ of 0.48 versus 0.35), and for two of the cotwin FH gambling involvement items, MZ twins were more accurate in reporting on the gambling behavior of their cotwin than were DZ twins: whether the cotwin had gambled monthly (κ of 0.37 versus 0.27) or weekly (κ of 0.38 versus 0.28).

Discussion

The reliability and validity of FH reports of PG and gambling involvement of parents, cotwins, and spouses were examined in a large national community-based adult Australian twin sample. Although extensively used in research to identify individuals who may be at risk for developing PG, this represents the first evaluation of the reliability and validity of the FH method for this purpose. We found that the reliabilities of FH reports of PG were high and comparable to that of other psychiatric disorders, but like other psychiatric disorders, the sensitivity of FH reports of PG was quite low (Andreasen et al., 1977; Rice et al., 1995; Thompson, Orvaschel, Prusoff, & Kidd, 1982). Only 28% and 11% of individuals who reported a history of PG and problem gambling, respectively, were correctly identified with the FH method. That is, informants in the current study, as well as those in previous studies using the FH method, consistently underestimated the presence of psychiatric disorder in their relatives.

It is noteworthy that the sensitivity for the more severe PG disorder (requiring at least 5 lifetime symptoms) was substantially higher than the sensitivity for the less severe problem gambling (requiring at least 1 lifetime symptom). This makes sense in that it suggests that relatives will be more aware of severe pathology in their family members than they will be of less severe pathology. This also suggests that the sensitivity will be lower among individuals with PG from community-based, rather than clinic-based studies, because the severity of PG among those affected is lower on average.

The low sensitivity of FH reports of PG may also be due to its transient nature. Many individuals with PG in the community experience only a single episode that is relatively short-lived (Slutske, 2006). In this Australian twin cohort, for example, over 40% of those with a lifetime history of PG were completely symptom free in the past 12 months (Slutske, Blaszczynski, & Martin, in press). Consequently, FH reports may not identify a large proportion of individuals who have experienced PG in their lifetime because the informant may not have witnessed the period in which the problems occurred. This also suggests, however, that individuals with the most severe or chronic PG or those who are currently experiencing gambling problems will be those identified by lifetime FH reports.

The low sensitivity of retrospective lifetime FH reports should be interpreted within the context of the sensitivity of retrospective lifetime *self-reports*. For example, a retrospective lifetime prevalence estimate of problem gambling at the fourth wave of a longitudinal study was 5% compared to a lifetime prevalence estimate of 12% obtained by cumulating the problem gambling reports from each of four waves of the study (Slutske et al., 2003), in other words, the retrospective lifetime self-report of problem gambling underestimated the true prevalence of problem gambling by more than 50%. In a seven-year follow-up of a New Zealand national gambling survey, 72% of individuals who met criteria for a lifetime diagnosis of PG at the baseline survey failed to meet lifetime diagnostic criteria at the follow-up survey seven years later (Abbott, Volberg, Williams, Zealand, & Affairs, 1999). In essence, the sensitivity of the retrospective lifetime self-report was only 28%, which is (remarkably) the same as the sensitivity of the lifetime FH reports of PG among cotwins in this study.

The FH assessments of PG consisted of only a single item – it is possible that a more intensive FH assessment might have yielded higher sensitivities than was obtained with our single-item assessment. Although global items have been shown to be reliable for assessing parental alcohol-related problems (Sher & Descutner, 1986; Slutske et al., 1996), it is not clear whether a single-item assessment can yield adequate validity in comparison to a more detailed assessment. The focus of future research might be the development of multi-item FH PG assessments to potentially improve measurement accuracy.

The validity of FH reports of PG and gambling involvement was examined only for cotwins. One would expect the accuracy of reports of cotwins to be especially high, in which case the sensitivity estimates obtained for cotwins, as low as they were, may represent an overestimate when applied to most other types of family members, such as parents. It will be important in future studies to examine the validity of FH reports of paternal and maternal gambling problems by corroborating against paternal and maternal self-reports.

The present study is one of only a handful that has capitalized on the multi-informant data available with studies of twins or siblings to examine the inter-rater reliability of paternal and maternal FH reports (Crews & Sher, 1992; Rhea, Nagoshi, & Wilson, 1993; Sher & Descutner, 1986; Slutske et al., 1996). For example, Slutske et al. (1996) obtained estimates of the inter-rater reliabilities of a single-item FH assessment of paternal ($\kappa = .66$; $Y = .73$) and maternal ($\kappa = .58$; $Y = .82$) alcohol-related problems that were quite similar to the estimates obtained for the single-item assessment of paternal ($\kappa = .50$; $Y = .74$) and maternal ($\kappa = .47$; $Y = .78$) gambling-related problems in the present study.

In addition to facilitating the examination of inter-rater reliability, the inclusion of more than a single family member in FH studies can be used to increase sensitivity and minimize the problem of under-reporting by combining the FH reports obtained from multiple informants (Andreasen et al., 1977; Kosten, Anton, & Rounsaville, 1992; Smith, Przybeck, Bradford, & Gogineni, 1994). Milne et al. (2009) showed that the sensitivities of FH reports for six different offspring psychiatric disorders were increased when the reports were combined across both parental informants compared to the use of a single parental informant. For example, the sensitivity increased from .22 to .32 for alcohol dependence (Milne et al., 2009).

The FH reports were all based on assessing whether a particular behavior had ever occurred in the target family member's lifetime, rather than their current status. This is the approach that is typically used for high-risk and molecular genetic studies and as an aid in psychiatric diagnosis because the goal is to determine the lifetime familial and genetic risk for developing a disorder. The limitation of lifetime FH reports for use in high-risk studies of episodic disorders like PG is that they may not be as informative for determining the environmental risk of being exposed to a family member (e.g. a parent or a spouse) with PG. For this purpose, it may be useful to also obtain current FH reports. Current FH reports likely will yield higher sensitivities than lifetime FH reports.

In addition to assessing PG, the FH assessment included an assessment of nonpathological gambling involvement. FH reports of current nonpathological gambling involvement are typically used to obtain collateral information about the status of patients in treatment studies; the goal is to use the collateral informants as a second source for verifying the patients' reports of the extent of their current gambling behavior during and after completing treatment. For instance, Petry et al. (2006) used patient-nominated collateral informants to report on the number of days gambled and the amount of money spent when gambling in the past month at baseline and follow-ups conducted one, two, six, and twelve months after treatment.

In the present study, the purpose of the inclusion of these additional questions about nonpathological gambling involvement was to obtain a more nuanced picture of the family member's gambling history than can be afforded by simply asking about problems. The FH questions can be used to either fill in missing information or to supplement self-reports. For instance, one can use the FH reports of twins to characterize the gambling involvement of their nonparticipating cotwins, that is, in the absence of self-report, or to confirm the self-reported gambling status of the participating cotwins. Overall, the reliabilities of these gambling involvement questions were moderate, but compared to the assessment of PG, the sensitivities (mean = 0.73) and PPVs (mean = 0.80) were quite high. This means, for example, that those

who reported that they had ever gambled at least weekly were adequately identified by the FH method, and that a positive FH report of weekly gambling was usually correct. Thus, FH assessments of gambling involvement may be a useful adjunct to FH assessments of PG because family members may be somewhat more aware of and able to judge the frequency of participating in gambling than they are aware of and able to judge the presence of problems.

In sum, this study represents the first attempt to establish the reliability and validity of FH assessments of PG and nonpathological gambling involvement. The results generally support the use of the FH method for studying PG and gambling involvement, but like other domains that have been assessed using the FH method, the ability to identify problems in family members is less than ideal. Possible contributors to low sensitivity in FH reports of PG are: (1) a low level of PG severity in the target family member, (2) the episodic, transient nature of PG for many individuals, (3) the low sensitivity of retrospective lifetime reports in general, (4) the use of a single-item assessment, (5) a focus on lifetime rather than current pathology, and (6) the subjective nature of judging the presence of problems in a family member. Suggestions for future research are the development of a more thorough multi-item FH assessment of PG, the use of combined reports obtained from multiple informants, and including questions about nonpathological gambling involvement in FH studies of PG.

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Table 1

Prevalence of Family History Reports of Paternal and Maternal Gambling Involvement by Gender of Informant

	Gender of Informant				
Gambling Behavior	**Males (%)(N = 2037)**	**Females (%)(N = 2727)**	**Odds Ratio[a]**	**95% CI**	**p-value**
Ever Gambled					
Father	80.94	80.67	1.02	(0.88 – 1.18)	0.82
Mother	75.47	79.52	0.79	(0.69 – 0.91)	< .01
Gambled Monthly					
Father	40.75	40.89	0.99	(0.88 – 1.12)	0.93
Mother	32.78	38.80	0.77	(0.68 – 0.87)	< .001
Gambled Weekly					
Father	31.89	33.64	0.92	(0.81 – 1.05)	0.22
Mother	25.57	31.35	0.75	(0.66 – 0.86)	< .001
Gambling Problem					
Father	4.12	4.86	0.84	(0.63 – 1.12)	0.24
Mother	1.98	2.74	0.72	(0.48 – 1.06)	0.10

[a]*Note:* Odds ratios were computed with females as the reference group (i.e., female = 0, male = 1).

Table 2

Rates of Family History Reports of Gambling Involvement of Cotwin and Spouse by Gender of Target, and Prevalences of Twin Self-Reports for Comparison

	Gender of Target				
Gambling Behavior	**Males (%)**	**Females (%)**	**Odds Ratio[c]**	**95% CI**	**p-value**
Ever Gambled					
Cotwin (N = 4,604)	93.96	92.62	1.24	(0.98 – 1.57)	0.07
Spouse (N = 3,733)	90.82	86.95	1.33	(1.21 – 1.83)	< .001
Twin[a] (N = 4,758)	98.38	97.72	1.41	(0.92 – 2.16)	0.11
Gambled Monthly					
Cotwin (N = 4,301)	37.79	30.03	1.42	(1.25 – 1.61)	< .001
Spouse (N = 3,710)	35.47	24.92	1.40	(1.43 – 1.91)	< .001
Twin[a] (N = 4,764)	55.87	47.30	1.41	(1.26 – 1.58)	< .001
Gambled Weekly					
Cotwin (N = 4,254)	25.23	19.31	1.41	(1.22 – 1.63)	< .001
Spouse (N = 3,702)	24.64	15.47	1.44	(1.51 – 2.12)	< .001
Twin[a] (N = 4,764)	39.08	33.66	1.26	(1.12 – 1.42)	< .001
Gambling Problem					
Cotwin (N = 4,567)	3.65	1.71	2.18	(1.49 – 3.19)	< .001
Spouse (N = 3,722)	2.80	1.01	1.65	(1.67 – 5.64)	< .001
Twin[a,b] (N = 4,764)	18.16	8.25	2.47	(2.07 – 2.95)	< .001

[a] *Note*: Based on self-report.

[b] Gambling problem defined as one or more lifetime DSM-IV PG symptoms.

[c] Odds ratios were computed with females as the reference group (i.e., female = 0, male = 1).

Table 3

Test – Retest Reliability of Family History Reports of Gambling Behavior.

Gambling Behavior	Father	Mother	Cotwin	Spouse
Ever Gambled				
Kappa	0.58 (.36 – .76)	0.64 (.48 – .79)	0.28 (−0.04 – 0.65)	0.49 (.19 – .74)
Yule's Y	0.71 (.53 – .86)	0.72 (.58 – .85)	0.38 (−1.00 – 0.83)	0.67 (.41 – .86)
Gambled Monthly				
Kappa	0.65 (.52 – .77)	0.67 (.54 – .79)	0.63 (.46 – .78)	0.53 (.36 – .69)
Yule's Y	0.67 (.54 – .79)	0.71 (.58 – .83)	0.69 (.52 – .84)	0.58 (.40 – .75)
Gambled Weekly				
Kappa	0.73 (.62 – .83)	0.70 (.57 – .82)	0.73 (.56 – .87)	0.53 (.33 – .71)
Yule's Y	0.78 (.66 – .89)	0.74 (.63 – .86)	0.80 (.66 – .90)	0.64 (.45 – .82)
Gambling Problem[a]				
Kappa	0.82 (.67 – .97)	0.65 (.37 – .94)	0.87 (.69 – 1.00)	0.42 (.01 – .84)

Note: N = 166

[a]Yule's Y estimates were not computable due to empty cells.

Table 4

Interrater Reliability of Family History Reports of Gambling Behavior Across Twin Pairs.

Gambling Behavior	Father	Mother
Ever Gambled		
Kappa	0.40 (.35 – .46)	0.41 (.36 – .47)
Yule's Y	0.49 (.43 – .54)	0.48 (.43 – .53)
Gambled Monthly		
Kappa	0.38 (.33 – .44)	0.40 (.34 – .46)
Yule's Y	0.39 (.33 – .45)	0.40 (.34 – .46)
Gambled Weekly		
Kappa	0.25 (.08 – .43)	0.28 (.10 – .45)
Yule's Y	0.37 (.15 – .55)	0.39 (.18 – .57)
Gambling Problem		
Kappa	0.50 (.37 – .62)	0.47 (.30 – .63)
Yule's Y	0.74 (.65 – .81)	0.78 (.68 – .87)

Note: N = 1,750 twin pairs.

Table 5

Agreement between informants' reports of twin with concurrent self-report of co-twin.

Gambling Behavior	Ever	Monthly	Weekly	Problem (1+)	Pathological (5+)
Kappa	0.28 (.19 – .37)	0.30 (.26 – .35)	0.22 (.14 – .31)	0.16 (.10 – .22)	0.26 (.12 – .40)
Yule's Y	0.67 (.57 – .76)	0.34 (.30 – .39)	0.24 (.15 – .32)	0.59 (.47 – .71)	0.65 (.50 – .77)
Sensitivity	0.95 (.94 – .96)	0.50 (.47 – .53)	0.74 (.69 – .79)	0.11 (.07 – .16)	0.28 (.13 – .44)
Specificity	0.59 (.44 – .74)	0.81 (.78 – .84)	0.48 (.41 – .54)	0.99 (.99 – 1.00)	0.98 (.98 – .99)
PPV	0.99 (.99 – .99)	0.74 (.71 – .78)	0.68 (.63 – .73)	0.66 (.50 – .82)	0.27 (.13 – .42)
NPV	0.21 (.14 – .28)	0.59 (.56 – .62)	0.56 (.49 – .63)	0.89 (.87 – .90)	0.99 (.98 – .99)

Note: PPV = positive predictive value, NPV = negative predictive value