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The Predictive Power of Family History Measures of Alcohol and Drug Problems and Internalizing Disorders In A College Population

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Abstract

A family history (FH) of psychiatric and substance use problems is a potent risk factor for common internalizing and externalizing disorders. In a large web-based assessment of mental health in college students, we developed a brief set of screening questions for a FH of alcohol problems (AP), drug problems (DP) and depression-anxiety in four classes of relatives (father, mother, aunts/uncles/grandparents, and siblings) as reported by the student. Positive reports of a history of AP, DP, and depression-anxiety were substantially correlated within relatives. These FH measures predicted in the student, in an expected pattern, dimensions of personality and impulsivity, alcohol consumption and problems, smoking and nicotine dependence, use of illicit drugs, and symptoms of depression and anxiety. Using the mean score from the four classes of relatives was more predictive than using a familial/sporadic dichotomy. Interactions were seen between the FH of AP, DP, and depression-anxiety and peer deviance in predicting symptoms of alcohol and tobacco dependence. As the students aged, the FH of AP became a stronger predictor of alcohol problems. While we cannot directly assess the validity of these FH reports, the pattern of findings suggest that our brief screening items were able to assess, with some accuracy, the FH of substance misuse and internalizing psychiatric disorders in relatives. If correct, these measures can play an important role in the creation of developmental etiologic models for substance and internalizing psychiatric disorders which constitute one of the central goals of the overall project.

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Keywords

family history; college students; alcohol; tobacco; illicit drugs

INTRODUCTION

All major psychiatric and substance use disorders are familial [Kendler and Eaves, 2005]. Because a positive family history (FH) is one of the strongest and most consistent risk factors for many psychiatric syndromes, it is difficult to develop comprehensive etiological models of risk without the inclusion of measures of familial liability.

Meeting this requirement in large-scale longitudinal studies raises three practical problems. First, directly interviewing relatives of a large subject sample is very resource intensive and often impractical. Therefore, FH methods, where the proband is asked about psychiatric and substance use problems in their relatives, is a more viable option despite methodological limitations [Andreasen et al., 1977; Kendler et al., 1991]. Second, large scale surveys often attempt to cover a wide array of disorders and risk factors. FH assessments that ask detailed questions about each relative one at a time—like the Family History Research Diagnostic Criteria [Endicott et al., 1975]—are therefore often impractical. Briefer assessments that cover groups of relatives (e.g., siblings, aunts/uncles) are more feasible. Third, ethical questions have been raised about the appropriateness of asking one individual to reveal potentially sensitive information about a second person without that second person's consent [Coy, 2001; Kendler, 2001; Pelias, 2001]. Therefore, some ethical committees in the United States require that FH questions focus on the subject's opinion of the possible “problems” of relatives rather than specific nature of the relative's symptoms or signs.

A major goal of the Spit for Science survey, now on-going for all in-coming freshmen at a large public US university [Dick et al., 2014], is to develop comprehensive etiologic models for the common externalizing and internalizing symptoms and disorders that occur in young adulthood. We wished to include measures of FH both because of the strong evidence of the importance of familial factors in large adult samples [Kendler and Eaves, 2005] as well as specific evidence of the importance of a positive FH in the prediction of the use and misuse of alcohol, tobacco and illicit drugs in college students [Spielberger et al., 1983; Perkins, 1985; Kushner and Sher, 1993; Hestick et al., 2001; Baer, 2002]. Facing the difficulties noted above in FH assessment, we decided to utilize brief screening items directed at three key psychiatric/substance use syndromes in relatives: alcohol problems, drug problems and the internalizing disorders of depression and anxiety. We asked single questions asking the student respondent their opinion about whether four classes of relatives (mother, father, aunts/uncles/grandparents, and siblings) had any of these problems. Utilizing information from the first three cohorts of Spit for Science (approximate n of ~ 7,000 students), we examine the performance of these items with a focus on the prediction of alcohol and cigarette related outcomes and their associated risk factors. We hope to evaluate the potential utility of such brief measures so that others designing similar surveys can make informed decisions about whether to include them.

MATERIALS AND METHODS

As described elsewhere [Dick et al., 2014], the “Spit for Science” project attempted to enroll all incoming freshman, who were 18 years of age or older, at Virginia Commonwealth University, a diverse, urban US public university. The study design involves multiple waves of data collection including two in the freshman year, the first initiated as the freshman prepare to arrive on campus in the fall and the second in the middle of the spring semester. Further waves of data collection then occur yearly in the spring. The study is on-going and the present paper focuses on results from wave one for cohorts one through three. We also examine results from waves two and three of cohort one. DNA collection is part of the protocol but not involved in the present analyses.

Study data were collected and managed using REDCap electronic data capture tools hosted at Virginia Commonwealth University [Harris et al., 2009]. REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies, providing: (i) an intuitive interface for validated data entry; (ii) audit trails for tracking data manipulation and export procedures; (iii) automated export procedures for seamless data downloads to common statistical packages; and (iv) procedures for importing data from external sources.

Cooperation at the first wave ranged from 57–60% across the first three cohorts. Retention rates were 80% in cohort one, and 76% in cohort two at wave two, and 59% in cohort one at wave three. Cohort one (typical for the other cohorts) was 60.3% female with a mean age (SD) of 18.5 (0.5) with the following ethnic self-identifications: American Indian/Native Alaskan (n=10, 0.5%), Asian (n=311, 15.1%), Black/African American (n=395, 19.2%), Hispanics/Latino (n=120, 5.8%), Native Hawaiian/Pacific Islander (n=17, 0.8%), White (n=1056, 51.4%), and more than one race (n=109, 5.3%), which is representative of the overall university demographics.

At wave one for all our cohorts, we assessed FH of alcohol problems (AP), drug problems (DP), and depression and anxiety (Dep–Anx) for four types of relatives: mother, father, aunts/uncles/grandparents, and siblings. Here is how the three items appeared for mothers:

Do you think your biological mother has ever had problems with alcohol? (By problems with alcohol we mean that her alcohol use caused problems at home, at work, with her health, or with the police, or that she received alcohol treatment.

Do you think your biological mother has ever had problems with other drugs? (By problems with drugs we mean that her drug use caused problems at home, at work, with her health, or with the police, or that she received drug treatment.

Do you think your biological mother has ever had problems with depression or anxiety?

These three questions were then repeated for “biological father,” aunts/uncles/grandparents, and “biological siblings.”

From the responses to each of these three questions for the four categories of relatives, we constructed two FH “scores.” The first, which was used throughout our analyses, was the standardized mean of the responses for all four categories of relatives. The second, used in one analysis, reflected whether a positive FH was reported in any of the four relative groups. We termed this the familial/sporadic measure.

At wave one, peer group deviance (PGD) was assessed by six items obtained from two validated instruments [Johnston et al., 1982; Tarter and Hegeudus, 1991] that assessed the proportion of the respondent’s friends who engaged in specific deviant behaviors such as smoking cigarettes, getting drunk, having problems with alcohol, and smoking marijuana.

Personality was assessed by shortened scales from the big five inventory (BFI) [John and Srivastava, 1999]. We also utilized shortened forms of the four subscales of the UPPS Impulsive Behavior Scales from Whiteside and Lynam [Whiteside and Lynam, 2001; Lynam et al., 2006]. These scales were used in the first wave of data collection only in the second and third cohorts. We also utilized DSM-IV criteria (American Psychiatric Association, 1994) for Alcohol Abuse and Dependence (here termed Alcohol Use Disorder) and the Fagerström Scale for the assessment of symptoms of nicotine dependence [Heatherton et al., 1991]. Symptoms of anxiety and depression within the last 30 days were assessed using items from the SCL [Derogatis et al., 1973]. Illicit drug use was assessed by summing yes/no responses to ever use of cannabis, sedatives, stimulants, cocaine or opioids (exclusive of those prescribed by a doctor).

For all analyses, missingness was quite modest. We analyzed the mean response for all individuals who answered 30% of the items. All continuous scales were then z-transformed for ease of interpretation.

RESULTS

Descriptive Statistics

The mean endorsement rates across the four groups of relatives were considerably higher for Depression or Anxiety (Dep–Anx) ($42.0 \pm 0.4\%$) than for Alcohol Problems (AP) ($26.2 \pm 0.3\%$) which in turn were higher than for Drug Problems (DP) ($16.7 \pm 0.3\%$). Table I shows the specific responses by relative class. Comparing mothers and fathers, we see the expected higher rates of Dep–Anx in mothers and higher rates of AP and DP in fathers. The very high rate of AP in any aunts/uncles/grandparents is noteworthy. Only in the siblings are rates of DP higher than rates of AP.

The total FH scores were substantially inter-correlated. The Pearson correlations ($N \sim 7,300$) were highest for AP and DP ($+ 0.56$), intermediate for AP and Dep–Anx ($+ 0.46$), and lowest for DP and Dep–Anx ($+ 0.42$). Tables II and III depict the tetrachoric correlations for FH Report of AP, DP, and Dep–Anx across the four different relative groups. The correlations were highest for Dep–Anx (with a mean inter-relative correlation of $+ 0.63$), intermediate for DP (with a mean of $+ 0.44$) and lowest for AP (with a mean of $+ 0.40$).

Associations with Family History Scores

We next explored the associations between the FH scores and certain key predictor and outcome variables in the study when both predictor and dependent variables were standardized. Table IV shows that the associations with personality assessed by the five factor model were generally quite modest. A FH of AP and DP were weakly and negatively associated with conscientiousness and agreeableness, and weakly and positively associated with openness, extraversion and neuroticism. The strongest finding was the association between a FH of Dep–Anx and high neuroticism levels.

As seen in Table V, a FH of AP and DP were associated with modestly higher levels of all the impulsivity dimensions. Unexpectedly, a FH of Dep–Anx was even more strongly associated with the impulsivity, although not with sensation seeking.

We then examined, in the upper part of Table VI, the association between our aggregate FH measures averaged across all four classes of relatives and six substance use and problem outcomes, and symptoms of depression and anxiety. These measures were, in general, more robust than those seen with the personality and personality-like constructs. For example, one standard deviation increase in our FH measure of AP was associated with a 59% increased risk of initiating drinking and increased of nearly a fifth of a standard deviation in the level of alcohol consumption and number of endorsed alcohol use disorder criteria. The effect of a FH of DP and Dep–Anx on these alcohol related outcomes were slightly weaker.

Given that these were our primary outcomes of interest, we examined whether the predictive effect of FH varied by the sex of the student. For the six continuous dependent variables in Table V (alcohol consumption, and number of AUD and nicotine dependence symptoms, number of illicit drugs used and number of depressive and anxious symptoms), we interacted sex with our three FH measures. None of the 18 interactions were significant indicating no evidence for cross-sex differential prediction from FH measures.

Smoking initiation was most strongly predicted by a FH of Dep–Anx followed by AP and then DP. A one standard deviation increase in our FH measure of Dep–Anx was associated with a 49% increased risk of initiating smoking. Symptoms of nicotine dependence were most strongly predicted by a FH of DP.

Each of our three FH measures was associated with a moderately increased risk of illicit drug use. Symptoms of anxiety and depression were relatively strongly predicted by a FH of Dep–Anx and more weakly by family histories of AP and DP.

In the lower half of Table VI, we repeated these analyses applying a familial/sporadic dichotomy to our FH scores. We were interested in seeing how much predictive power would have been lost by down-coding our data to a simple “familial/sporadic” dichotomy. Nearly all of the regression coefficients were modestly to moderately lower than those seen where we used an average score across our four classes of relatives.

We then examined how FH reports about different classes of relatives predicted three of our key drug outcome measures: alcohol consumption, and symptoms of alcohol and nicotine abuse/dependence. As seen in Table VII, there was relatively modest variation across the different reports. Reports from aunts/uncles/grandparents were among the strongest

predictors of our two alcohol-related outcomes, but the weakest in predicting symptoms of nicotine dependence.

In Table VIII, we examined whether those at familial risk for AP, DP or Dep–Anx were more sensitive to the effects of peer deviance in predicting three substance-related outcomes: alcohol consumption, and symptoms of alcohol and nicotine abuse/dependence. Of the nine analyses, six demonstrated significant interactions all in the expected direction—that FH factors had a stronger impact on substance use measures when the respondent reported high levels of peer deviance.

Finally, we examined in Table IX whether FH measures obtained at wave one early in the freshman year became a better predictor of substance use related outcomes over the next two years of college. For alcohol consumption, our FH measures actually became less predictive over time. However, FH of both AP and Dep–Anx became more predictive of symptoms of alcohol use disorder and nicotine dependence over the first three years of college.

DISCUSSION

The goal of this paper was to explore the utility of brief FH screening items for AP, DP, and Dep–Anx in a large sample of college students. Because we have no direct information about the diagnostic status of relatives of these students, we could not directly address the validity of these measures. Rather, we have to judge their potential value more indirectly.

Before we turn to the potential validity of these measures, some more practical observations are in order. Our four categories of relatives were heterogeneous. Two of them (mother and father) involved single relatives and two of them multiple relative (aunts/uncles/grandparents, and siblings). To save time, we did ask the student to record the total number of siblings or aunts/uncles/grandparents they had. Three of the categories (mother, father, and aunts/uncles/grandparents) included older relatives who would have largely lived through their age at risk for AP, DP, and mood and anxiety disorders, and one category (siblings) would have been much younger and still at future risk for these syndromes. Finally, one of the categories (aunts/uncles/grandparents) consisted of second degree relatives while the other three were all first degree relatives. In light of these substantial differences, it was rather surprising that all the categories were, to an approximately similar degree inter-correlated. No one category stood out as particularly poorly related to the others. Furthermore, in examining the prediction of key drug-related outcome variables, none of the four categories were consistently more poorly related to these outcomes than the others. Despite their heterogeneity, it would appear as each of these four categories of relatives provided useful information about family risk. This conclusion was verified when we “down-coded” our results across the four classes of relatives into a simple familial/sporadic dichotomy. We lost, for nearly all of our outcomes, a modest to moderate amount of predictive power.

Turning to the potential validity of our measures, we note that, consistent with epidemiological evidence [Kessler et al., 1994], our FH measures produced the expected differences in rates of disorders in mothers versus fathers with the former having higher

rates of Dep–Anx and the latter of AP and DP. Interestingly, we see cohort effects with the ratio of DP to AP only exceeding unity in siblings—those of the same generation as the student respondents. Consistent with our findings, prior reports have noted positive genetic correlations between alcohol problems and personality measures of negative emotionality and undercontrol [Slutske et al., 2002] as well as between drug use and misuse, and neuroticism, extraversion, and sensation seeking [Agrawal et al., 2004]. A large literature on the children of alcoholics has noted, congruent with our findings, that they often have higher levels of extraversion, impulsivity, and neuroticism [Sher, 1997]. While the observed associations between our FH measures and personality-like traits are small, they are in the expected direction. The modest predictive ability of our FH measures might in part be explained by the lower stability of personality measures in late adolescence compared to adulthood [Caspi and Roberts, 2001].

Consistent with prior studies in college students [Spielberger et al., 1983; Perkins, 1985; Kushner and Sher, 1993; Hestick et al., 2001; Baer, 2002], we found more robust associations between our FH measures and psychoactive substance use and problems. Given the evidence for substantial sharing of familial vulnerability to AP and DP [Kendler et al., 2003; Hicks et al., 2004; Kendler et al., 2011a], our observations of cross-prediction (e.g., a FH of DP predicts alcohol use and problems and a FH of AP predicts illicit substance use) was expected. Our observed association of a FH of Dep–Anx and smoking are also congruent with prior studies showing a relatively robust genetic relationship between vulnerability to MD and smoking [Kendler et al., 1993b; Lyons et al., 2008].

In accord with a large body of work showing substantial familial/genetic influences on depression and anxiety [Sullivan et al., 2000; Hettema et al., 2001], a FH of Dep–Anx was moderately correlated with self-report symptoms of depression and anxiety. Consistent with prior studies showing only partial overlap of familial/genetic risk for depression and alcohol use disorders [Kendler et al., 1993a], the association of familial AP with depressive and anxious symptoms was quite a bit weaker than that observed for a FH for Dep–Anx. A range of prior studies found that individuals at high familial/genetic risk for drug or alcohol problems were more sensitive to the pathogenic effects of high levels of peer deviance [Dick et al., 2007; Harden et al., 2008; Kendler et al., 2011b; Kendler et al., 2014]. We tested this using our FH measures, attempting to predict alcohol intake and symptoms of alcohol use disorder and nicotine dependence. Three of the six analyses were significant and in the expected direction. We also found that a high familial risk for Dep–Anx also increased sensitivity to deviant peers in the prediction of symptoms of alcohol use disorder and nicotine dependence.

Several studies have suggested that the impact of genetic factors on alcohol and nicotine intake and/or problems increase over the years of late adolescence and early adulthood [Koopmans et al., 1997; White et al., 2003; Malone et al., 2004; Kendler et al., 2008; McGue et al., 2014]. We explored whether we might see a similar effect utilizing our FH measures. We partially replicated these prior findings. In particular, our FH measures of AP and Dep–Anx became more predictive of both symptoms of alcohol use disorder and nicotine dependence over the first three years of college.

A large literature has suggested that psychopathology can be usefully divided into two broad categories of internalizing and externalizing disorders [Krueger, 1999; Krueger et al., 2001] and that this division is in part the result of the genetic factors [Kendler et al., 1995; Kendler et al., 2011a]. Of our FH measures, two—AP and DP—were clearly externalizing syndromes and one—Dep–Anx— was clearly internalizing. We had expected that family histories of AP and DP would be consistently more strongly associated with externalizing symptoms and problems in our student probands than the FH of Dep–Anx. For most externalizing outcomes this was not the case as they were frequently predicted nearly as strongly by a FH of Dep–Anx as of AP and/or DP. We also expected that a FH of Dep–Anx would be more robustly associated with internalizing traits and symptoms in our students than a family background characterized by AP and DP. Here our results were consistent with expectation. Dep–Anx in relatives predicted the classical internalizing personality trait — neuroticism —and symptoms of anxiety and depression much more strongly than a FH of AP and DP. We currently have no compelling explanation for this asymmetry in relationships and will be particularly curious to see if it changes as the students age.

Waldron et al. [2012] recently reported that across relative agreement for FH reports of alcohol problems were lower in African–American (AA) versus European–American (EA) families. We therefore examined interactions between EA vs AA status and aggregate FH measures for AP, DP and Dep–Anx for the six continuous dependent measures in table V. Of the 18 analyses, six were significant at $P < 0.01$ in the same direction indicating weaker prediction in AA vs EA families and all involved prediction of nicotine dependence or drug abuse/dependence. These results, unlikely due to chance effects, are consistent with findings from Waldron et al suggesting that FH measures may be less predictive in AA families.

Limitations

The main methodological limitation of this study relates to the FH measures themselves. Prior research has demonstrated that, in general, when validated against personal interviews, FH measures typically have high specificity (i.e., generate few false positives) but moderate sensitivity (generates many false negatives) [Andreasen et al., 1977; Thompson et al., 1982; Gershon and Guroff, 1984; Andreasen et al., 1986]. Prior work has also suggested that FH methods work better for drug related disorders than for mood or anxiety disorders, perhaps because the former often have more overt and easily observable behavioral consequences than the latter [Kosten et al., 1992; Roy et al., 1996]. However, further research had demonstrated other potential biases. For example, respondents are generally more accurate in reporting on psychiatric problems in their parents than in reporting on their own children [Roy et al., 1996; Mendlewicz et al., 1975]. Most importantly, there is evidence for a potentially complex set of “projection biases” on FH reports. For major depression or generalized anxiety disorder, affected individuals are more likely to report that diagnosis in relatives than unaffected individuals [Kendler et al., 1991; Chapman et al., 1994; Roy et al., 1996]. In one of the most careful studies of this question to date [Kendler et al., 2002] which included structural modeling of personal interview, FH diagnosis and potential projection biases in twin pairs showed that the latent liability to illness was somewhat better indexed by personal interview for major depression, generalized anxiety disorder and drug abuse but alcohol use disorders was better indexed by the FH report. Furthermore, projection biases

were positive for major depression and generalized anxiety disorder but negative for alcohol and drug use disorders! One way to understand these results is that once an individual has suffered from depression or anxiety she is more sensitive to seeing those problems in relatives. However, someone who heavily uses drugs or alcohol is more likely to consider heavy use to be normative and very high levels of problems would be needed in a relative from then to consider them disordered.

CONCLUSIONS

In a large sample of college students attending a public US University, we found that simple questions that inquired about the history of AP, DP, and Dep–Anx from four relative classes were highly inter-correlated, with each class of relatives contributing useful information. These scores modestly predicted personality, impulsivity and sensation seeking in a manner consistent with prior literature. FH measures somewhat more strongly predicted alcohol and nicotine use and abuse/dependence, illicit drug use and symptoms of depression and anxiety in patterns broadly consistent with prior findings. The measures of AP and Dep–Anx interacted with peer deviance in the prediction of alcohol and nicotine outcomes and became stronger predictors of symptoms of alcohol and nicotine dependence over the first three years of college. We cannot determine the degree to which these observed associations with our FH variables result from positive projection bias on the part of the student respondents versus the true impact of familial vulnerability. Both the prior literature and the overall pattern of our findings however suggest that a substantial part of the predictive power of these measures derive from their ability to accurately assess the FH of substance misuse and internalizing psychiatric disorders. If correct, these measures will play an important role in the creation of developmental etiologic models for substance and internalizing psychiatric disorders which constitute one of the central goals of the Spitz for Science study.

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TABLE I
Proportion of Positive Family History Reports by Relative Class (n = 6,032–7169)

Relatives	% Alcohol problems	% Drug problems	% Depression or anxiety
Mother	8.7 ± 0.3	5.8 ± 0.3	44.8 ± 0.6
Father	23.9 ± 0.5	14.0 ± 0.4	30.0 ± 0.6
Aunts/Uncles/Grandparents	59.8 ± 0.6	34.8 ± 0.6	54.7 ± 0.6
Siblings	11.4 ± 0.4	12.3 ± 0.4	32.6 ± 0.6

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TABLE II
Tetrachoric Correlations for Family History Report of Alcohol Problems (above the Diagonal) and Drug Problems (below the Diagonal) in Different Groups of Relatives (n = 5511–6476)

Relatives	Mother	Father	Aunts, Uncles and Grandparents	Siblings
Mother	–	+ 0.36 ± 0.03	+ 0.41 ± 0.03	+ 0.41 ± 0.03
Father	+ 0.56 ± 0.03	–	+ 0.49 ± 0.02	+ 0.37 ± 0.03
Aunts/Uncles/Grandparents	+ 0.45 ± 0.03	+0.51 ± 0.02	–	+ 0.37 ± 0.03
Siblings	+ 0.42 ± 0.03	+ 0.34 ± 0.03	+ 0.34 ± 0.03	–

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TABLE III
Tetrachoric Correlations for Family History Report of Depression and Anxiety in
Different Groups of Relatives (n = 5244–5723)

Relatives	Mother	Father	Aunts, uncles and grandparents	Siblings
Mother	–	+0.61 ± 0.02	+0.71 ± 0.01	+0.61 ± 0.02
Father		–	+0.68 ± 0.02	+0.57 ± 0.02
Aunts/uncles/grandparents			–	+0.63 ± 0.02
Siblings				–

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TABLE IV
Prediction of Personality from Aggregate Indices of Family History for Alcohol Problems, Drug Problems and Depression and Anxiety (n = 7,181–7,285)

Family history of	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism
Alcohol problems	+0.07 [#]	-0.02	+0.03 ⁺	-0.06 [#]	+0.09 [#]
Drug problems	+0.08 [#]	-0.04 ⁺	+0.05 [#]	-0.06 [#]	+0.07 [#]
Depression or anxiety	+0.14 [#]	-0.09 [#]	-0.01	-0.06 [#]	+0.21 [#]

All variables are standardized. Controlling for cohort.

*
p<0.05

+
p<0.01

&
p<0.001

p<0.0001.

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TABLE V
Prediction of Dimensions of Impulsivity from Aggregate Indices of Family History for Alcohol Problems, Drug Problems and Depression and Anxiety (n = 3,891–3,924)

Family history of	Negative urgency	Lack of premeditation	Lack of perseverance	Positive urgency	Sensation seeking
Alcohol problems	+0.08 [#]	+0.11 [#]	+0.06 ^{&}	+0.04 [*]	+0.03
Drug problems	+0.07 [#]	+0.09 [#]	+0.06 ^{&}	+0.04 ⁺	+0.04 [*]
Depression or anxiety	+0.14 [#]	+0.12 [#]	+0.09 [#]	+0.06 ^{&}	+0.00

All variables are standardized. Controlling for cohort.

*
p<0.05

+
p<0.01

&
p<0.001

p<0.0001.

TABLE VI
Prediction of Alcohol Consumption and Symptoms of Alcohol Use Disorder and Nicotine Dependence from Aggregate Indices or Dichotomies of the Family History for Alcohol Problems, Drug Problems and Depression and Anxiety

Family history of	Index (I) or dichotomy (D) ~	Ever drank alcohol @	Alcohol Consumption ^	Number of aud symptoms ^	Ever smoked cigarettes @	Symptoms of nicotine dependence ^	Number of illicit drugs used ^	Symptoms of depression ^	Symptoms of anxiety ^
Alcohol problems	I	1.59 [#]	+0.18 [#]	+0.17 [#]	1.39 [#]	+0.13 [#]	+0.22 [#]	+0.16 [#]	+0.14 [#]
Drug problems	I	1.45 [#]	+0.14 [#]	+0.16 [#]	1.34 [#]	+0.16 [#]	+0.24 [#]	+0.14 [#]	+0.14 [#]
Depression or anxiety	I	1.36 [#]	+0.15 [#]	+0.18 [#]	1.49 [#]	+0.14 [#]	+0.25 [#]	+0.30 [#]	+0.25 [#]
Alcohol problems	D	1.44 [#]	+0.17 [#]	+0.13 [#]	1.32 [#]	+0.07 [#]	+0.16 [#]	+0.13 [#]	+0.10 [#]
Drug problems	D	1.41 [#]	+0.14 [#]	+0.13 [#]	1.33 [#]	+0.12 [#]	+0.21 [#]	+0.13 [#]	+0.12 [#]
Depression or anxiety	D	1.36 [#]	+0.16 [#]	+0.16 [#]	1.41 [#]	+0.09 [#]	+0.21 [#]	+0.23 [#]	+0.18 [#]
N		7,117-7,213	6,990-7,085	5,845-5,917	7,169-7,270	6,506-6,596	5,763-5,840	5,753-5,823	5,754-5,824

Controlling for cohort.

* p<0.05

+ p<0.01

& p<0.001

p<0.0001, ffr - linear regression, beta presented;

@ logistic regression, OR presented.

~ The dichotomy means that families were divided into those that had one or more versus no relatives with Alcohol Problems, Drug Problems and Depression and Anxiety.

TABLE VII
Relative Strength of the Prediction of Alcohol Consumption and Symptoms of Alcohol Use Disorder and Nicotine Dependence from a History of for Alcohol Problems, Drug Problems and Depression and Anxiety in Mother, Father, Aunts/uncles/grandparents (GP) and Siblings

Family history of	Beta coefficient (± se) for alcohol consumption (n = 5,785–6,808)				Beta coefficient (± se) for number of aud symptoms (n = 4,822–5,677)				Beta coefficient (± se) for symptoms of nicotine dependence (n = 5,379–6,386)			
	Mother	Father	Aunts, uncles, GPs	Siblings	Mother	Father	Aunts, uncles, GPs	Siblings	Mother	Father	Aunts, uncles, GPs	Siblings
Alcohol problems	+ 0.10 [#] (± 0.01)	+ 0.11 [#] (± 0.01)	+ 0.15 [#] (± 0.01)	+ 0.09 [#] (± 0.01)	+ 0.10 [#] (± 0.01)	+ 0.10 [#] (± 0.01)	+ 0.12 [#] (± 0.01)	+ 0.12 [#] (± 0.01)	+ 0.09 [#] (± 0.01)	+ 0.07 [#] (± 0.01)	+ 0.07 [#] (± 0.01)	+ 0.10 [#] (± 0.01)
Drug problems	+ 0.08 [#] (± 0.01)	+ 0.08 [#] (± 0.01)	+ 0.12 [#] (± 0.01)	+ 0.10 [#] (± 0.01)	+ 0.09 [#] (± 0.01)	+ 0.10 [#] (± 0.01)	+ 0.11 [#] (± 0.01)	+ 0.12 [#] (± 0.01)	+ 0.12 [#] (± 0.01)	+ 0.11 [#] (± 0.01)	+ 0.09 [#] (± 0.01)	+ 0.13 [#] (± 0.01)
Depression or anxiety	+ 0.12 [#] (± 0.01)	+ 0.11 [#] (± 0.01)	+ 0.15 [#] (± 0.01)	+ 0.11 [#] (± 0.01)	+ 0.13 [#] (± 0.01)	+ 0.13 [#] (± 0.01)	+ 0.17 [#] (± 0.01)	+ 0.16 [#] (± 0.01)	+ 0.10 [#] (± 0.01)	+ 0.12 [#] (± 0.01)	+ 0.09 [#] (± 0.01)	+ 0.12 [#] (± 0.01)

All variables are standardized

- * p<0.05
- + p<0.01
- & p<0.001
- # p<0.0001.

TABLE VIII
Interactions between Family History for Alcohol Problems, Drug Problems and Depression and Anxiety and Peer Deviance in the Prediction of Alcohol Consumption, and Symptoms of Alcohol Use Disorder (AUD) and Nicotine Dependence

Family History of	Alcohol consumption (n = 6,962-7,057)			Number of AUD symptoms (n = 5,823-5,892)			Symptoms of nicotine dependence (n = 6,486-6,576)		
	FH measure	Peer deviance	Interaction	FH measure	Peer deviance	Interaction	FH measure	Peer deviance	Interaction
Alcohol problems	+ 0.05 [#]	+ 0.52 [#]	-0.01	+ 0.08 [#]	+ 0.41 [#]	+ 0.03 [*]	+ 0.06 [#]	+ 0.26 [#]	+ 0.05 [#]
Drug problems	+ 0.03 [#]	+ 0.53 [#]	-0.04 [#]	+ 0.09 [#]	+ 0.42 [#]	0.00	+ 0.09 [#]	+ 0.25 [#]	+ 0.05 [#]
Depression or anxiety	+ 0.01	+ 0.53 [#]	0.00	+ 0.08 [#]	+ 0.41 [#]	+0.08 [#]	+ 0.07 [#]	+ 0.25 [#]	+ 0.07 [#]

All variables are standardized

* p<0.05

+ p<0.01

& p<0.001

p<0.0001.

TABLE IX
Prediction of Alcohol Consumption and Symptoms of Alcohol Use Disorder and Nicotine Dependence Across the First Three Years of College from Aggregate Indices of Family History for Alcohol Problems, Drug Problems and Depression and Anxiety

Family history of	Beta coefficient (± se) for alcohol consumption			Beta coefficient (± se) for number of alcohol use disorder symptoms			Beta coefficient (± se) for symptoms of nicotine dependence		
	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3
Alcohol problems	+0.17 [#] (± 0.02)	+0.16 [#] (± 0.03)	+0.13 [#] (± 0.03)	+0.16 [#] (± 0.02)	+0.18 [#] (± 0.03)	+0.23 [#] (± 0.03)	+0.11 [#] (± 0.02)	+0.14 [#] (± 0.03)	+0.15 [#] (± 0.03)
Drug problems	+0.12 [#] (± 0.02)	+0.12 [#] (± 0.03)	+0.09 ⁺ (± 0.03)	+0.14 [#] (± 0.02)	+0.15 [#] (± 0.03)	+0.13 [#] (± 0.03)	+0.15 [#] (± 0.02)	+0.19 [#] (± 0.03)	+0.16 [#] (± 0.03)
Depression or anxiety	+0.12 [#] (± 0.02)	+0.12 [#] (± 0.03)	+0.10 ⁺ (± 0.03)	+0.15 [#] (± 0.02)	+0.16 [#] (± 0.03)	+0.19 [#] (± 0.03)	+0.15 [#] (± 0.02)	+0.18 [#] (± 0.03)	+0.21 [#] (± 0.03)
N	2366–2405	1200–1226	898–923	1966–1996	1055–1077	823–845	2230–2269	1042–1064	838–860

All variables are standardized

* p<0.05

+ p<0.01

& p<0.001

p<0.0001.