

Trait Impulsivity in Alcohol-naïve Offspring at High Risk for Alcoholism

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ABSTRACT

Background: Impulsivity is considered to be a vulnerability marker for substance use disorders, including alcoholism, in offspring with familial alcoholism. However, it is not adequately explored whether different age groups offspring at high risk for alcoholism differ in their impulsivity. The present study examined trait impulsivity in offspring at high risk for alcoholism, and further examined impulsivity by categorizing these offspring into different age groups. The study also examined the association between impulsivity and age, and the association of executive functions with age and education. **Materials and Methods:** Sample consisted of alcohol-naïve offspring at high ($n = 34$) and low ($n = 34$) risk for alcoholism. Participants were matched on age (± 1 year), education (± 1 year), and gender. The measures included were: Mini-international neuropsychiatric interview, family interview for genetic studies, sociodemographic data sheet, Annett's handedness questionnaire, Barratt's Impulsiveness Scale-version 11, and tests assessing executive functions. **Results:** Offspring at high risk for alcoholism demonstrated significantly high impulsivity. Furthermore, offspring at high risk were categorized into three subgroups with age. Results showed no significant difference between the subgroups with respect to impulsivity. Correlation analysis revealed no significant association between impulsivity and age. However, executive functions (concept formation, working memory, and safe decision-making) showed significant positive association, while perseveration and risky decision-making showed a negative association with age and education in both the groups. **Conclusion:** The present study demonstrates high impulsivity trait in offspring at high risk for alcoholism. The high impulsivity could pose a risk for addiction and may require preventive intervention.

Key words: Alcoholism, executive functions, high risk, offspring, trait impulsivity

INTRODUCTION


Alcoholism is a complex disease comprising a complex mixture of genetic, personality, and environmental factors that play a major role in the risk of development, dependence, and maintenance of alcoholism.^[1-6] Studies have demonstrated that the risk of alcohol

use disorder is much higher among offspring with a family history of alcoholism.^[6-9] Hence, offsprings with a family history of alcoholism are considered to be at high risk for developing alcoholism. Further, the risk for developing alcoholism is known to be higher in the

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sons with the father having alcohol dependence.^[4,10] There are primarily two types of alcoholism. This classification is based on family history, the age of onset, clinical symptoms, and personality traits.^[11-13] The first type is Type A or Type 2, also known as early onset alcoholism (i.e., alcohol dependence before the age of 25 years). This cluster is primarily male-dominated, marked by an earlier onset of alcohol dependence and greater severity with a 9-fold genetic risk. The second type is Type B or Type 1, also referred to as late-onset alcoholism (i.e., alcohol dependence after the age of 25 years). This type of alcoholism comprises both male and female, with a lesser genetic risk but with significant environmental influence. It is posited that early-onset alcoholism is more severe and heritable subtype of alcoholism, generally associated with externalizing disorders.^[14-18]

Thus, offspring with a family history of alcoholism, particularly with early-onset familial alcoholism, are considered to be at high risk for developing alcoholism. In the present study, this criterion is used for defining offspring at high risk for alcoholism, while offspring without a family history of alcoholism were represented as low risk for alcoholism.

Personality traits of impulsivity and sensation seeking have been proposed as important characteristics of substance use disorders, including alcoholism.^[19-22] Impulsivity is considered to be one of the important predictors of substance abuse and related problems as indicated by self-report, report from significant others, or behavioral and neuropsychological tests.^[23-27] Impulsivity is defined “as a predisposition toward rapid, unplanned reactions to internal or external stimuli without regard to the negative consequences of these reactions to the impulsive individuals or to others.”^[23] Impulsivity is considered to be a stable, trait variable of an individual.^[28,29] Impulsivity is often assessed on self-report questionnaires such as Barratt’s Impulsiveness Scale (BIS), which is known to reflect enduring “trait” disposition.^[30] Impulsivity as a personality trait could also represent mediation of intergenerational transmission of alcoholism.^[31,32] It has a strong association with future substance abuse including alcohol use disorders in the offspring even after controlling for other markers of risk such as parental and family history of substance dependence, socioeconomic status, and low intelligence.^[24,25,33-36] However, most of the studies which used offspring with a family history of alcoholism have not segregated offspring who have already initiated alcohol and/or substance use while assessing predisposing vulnerability.^[37] This could have confounded their results. Impulsivity, which is strongly linked to substance use disorders, including alcoholism, can be a contributing factor and/or it can be

a consequence of alcohol/substance use.^[38] Hence, the present study used alcohol-naïve offspring (no alcohol and/or drug use) with and without a family history of alcoholism for examining predisposed impulsivity trait.

Several risk theories of addiction have hypothesized the role of high impulsivity or reactive system and hypo-functioning of executive system in addiction.^[39-41] These theories reported that high impulsivity might hijack or weaken the prefrontal regulation or self-regulation, and the ultimate result would be behavior guided by impulsivity. The present study aimed to examine the dispositional personality trait of impulsivity in alcohol-naïve offspring with a family history of alcoholism, designated as at high risk for alcoholism, and without a family history of alcoholism, designated as at low risk for alcoholism. Further, we categorized offspring at high risk into three subgroups: Early adolescents (11–15 years), late adolescents (16–20 years), and adults (21–25 years). We examined whether these subgroups differ in their impulsivity. Correlation analysis was applied to explore any significant association between impulsivity and age.

Studies have demonstrated executive dysfunctions, as assessed on neuropsychological tests, in offspring at high risk for alcoholism.^[42,43] Offspring with a family history of alcoholism have demonstrated neurocognitive deficits in the domains covering language, general intelligence, vocabulary, memory,^[44,45] and several executive functions.^[46-48] However, the relationships of executive functions with age and education have not been adequately explored in these offspring. The second aim of the present study was to examine the association of executive functions with age and education in offspring at high risk for alcoholism.

MATERIALS AND METHODS

Participants and procedure

The present study was a cross-sectional study, and consecutive sampling method was used for recruiting alcohol-naïve offspring at high risk ($n = 34$) and low risk ($n = 34$) for alcoholism. Subjects were matched on age (± 1 year), education (± 1 year), and gender. The age range of participants was 11–25 years. Alcohol-naïve offspring at high risk for alcoholism were recruited from the offspring of the clinically diagnosed patients with alcohol dependence admitted at the Centre for Addiction Medicine (CAM), National Institute of Mental Health and Neurosciences (NIMHANS), Bangalore. In case a person with alcohol dependence had more than one offspring in the mentioned age range (11–25 years), he was asked to bring any two offspring, in order to have a heterogeneous sample. Alcohol-naïve offspring at low risk for alcoholism were recruited

from the healthy normal parents from the hospital staff, two junior high schools, and two undergraduate colleges in Bangalore city. Participants of both the groups (high and low risk) were screened for alcohol and other drug uses as well as any major psychiatric disorders, such as schizophrenia and mood disorders, on Mini-International Neuropsychiatric Interview (MINI): MINI KID^[49] and MINI Plus^[50] version 5.0. They were screened for mental retardation from clinical observation/interview. Only right handedness participants, as assessed by Annett's handedness questionnaire,^[51] were included in the study.

To ensure the high familial risk for alcoholism, the present study followed established criteria for fathers of the high-risk offspring.^[52,53] The inclusion criteria for fathers of offsprings at high risk were: (a) Alcohol dependence according to ICD-10 Research Diagnostic Criteria.^[54] (b) Two or more first degree relatives with a history of alcohol dependence syndrome. (c) Early-onset alcohol dependence (i.e., alcohol dependence before the age of 25 years). The exclusion criteria for fathers of offspring at high risk were: (a) abuse of other drugs such as cannabis or opioid (except nicotine) and (b) any major psychiatric disorders such as schizophrenia or mood disorders.

Fathers of offspring at low risk were screened for alcohol and other substance abuse (except nicotine) on MINI Screen and MINI Plus version 5.0. The Family Interview for Genetic Studies (FIGS) was used to document alcohol and other substance use in first-degree relatives. Offspring were excluded from the study if they had any first-degree relatives with abuse of alcohol or other substances (except nicotine). Similarly, they were excluded if parents or first-degree relatives had any major psychiatric disorders such as schizophrenia or mood disorders.

Written informed consent (from subjects above 18 years of age and the parents of minors) and assent were obtained from the high-risk and low-risk groups before recruiting them for the study. Subjects were informed that participation in the study is voluntary and that they may or may not benefit from the study. They were also informed that there are no monetary benefits for participation in the study. Ethical considerations enunciated in the declaration of Helsinki were complied with. The study was approved by the local Institutional Ethics Committee.

Tools

Tools used in the study were: (1) Sociodemographic data sheet: This was prepared to document demographic information such as age, gender, education, handedness, socioeconomic status, and other relevant information.

(2) Mini-International Neuropsychiatric Interview (MINI): This is a structured diagnostic interview that was developed by Sheehan *et al.*^[50] for DSM-IV and ICD-10 psychiatric disorders. This was used to screen out any major psychiatric illness in the parent as well as offspring in both the groups. The MINI Screen, MINI KID, and MINI Plus-version 5.0 were used in this study. (3) The Family Interview for Genetic Studies (FIGS):^[55] This was used to document family loading for alcoholism and screening for other psychiatric disorders in the first-degree relatives. (4) Annett's handedness questionnaire:^[51] This was used to test for handedness and laterality. Only right-handed subjects were taken in the study.

Other tools were (5) Barratt's Impulsiveness Scale-version 11 (BIS-11):^[28] BIS is a 30-item self-report instrument designed to assess the personality/behavioral construct of impulsiveness. It is used extensively in psychological, sociological, and educational research. It assesses general impulsiveness, taking into account the multifactorial nature of the construct. The structure of the instrument allows for the assessment of six first-order factors: attention, motor, self-control, cognitive complexity, perseverance, and cognitive instability; and three second-order factors: attentional impulsiveness (attention and cognitive instability), motor impulsiveness (motor and perseverance), and nonplanning impulsiveness (self-control and cognitive complexity). (6) Wisconsin Card Sorting Test (WCST):^[56] This classic test was used to measure executive functions such as concept formation, abstract reasoning, the ability to shift cognitive strategies in response to changing environments, cognitive flexibility, and maintenance of an appropriate problem-solving strategy across changing stimulus conditions to achieve a future goal. (7) Spatial Span—[from the Wechsler Memory Scale (WMS-III, 1997)]—Backward condition of spatial span test was used to assess spatial working memory. (8) Digit Span—[from the Wechsler Memory Scale (WMS-III, 1997)]—Backward condition of digit span test was used to assess verbal working memory. (9) Game of Dice Task:^[57] This task assesses decision making under risk conditions. In this task, subjects were asked to maximize a fictitious starting capital within 30 trials by guessing which number of a single dice will be thrown by the computer. The amounts of gains and losses are linked to winning probabilities, i.e., high potential gains/losses are associated with low winning probabilities, and low gains/losses are associated with high winning probabilities.

Statistical analysis

The data were analyzed using Statistical Package for Social Sciences-version 15 (SPSS-15) for Windows. Variables were tested for the normality using

Shapiro-Wilk test and found to be not normally distributed. Descriptive statistics were used for demographic variables such as mean, standard deviation, frequency, and percent. Chi-square was used for comparison on categorical variables (such as socioeconomic status). Wilcoxon signed-rank test was used for comparison between two groups (i.e., offspring at high and low risk for alcoholism) on impulsivity, and Kruskal–Wallis test was used for comparison among three subgroups on impulsivity.

RESULTS

Sociodemographic details

Both groups had an equal number of participants ($n = 34$). Subjects were predominantly male [$n = 26$ (76.5%)] and the majority of subjects were from middle socioeconomic status in both the groups [$n = 30$ (88.2%) in the low-risk group and $n = 27$ (79.4%) in the high-risk group]. There was no significant difference between the groups with regard to socioeconomic status ($\chi^2 = 0.512$). The groups were matched on age (± 1 year) and education (± 1 year). The mean age of offspring in the low-risk group was 17.47 ± 4.27 years and the high-risk group was 17.32 ± 4.18 years. The average years of education in the low-risk group was 11.09 ± 3.19 and in the high-risk group was 10.88 ± 3.19 .

Impulsivity in alcohol-naïve offspring at high risk for alcoholism

Wilcoxon signed-rank test was applied to see the difference between alcohol-naïve offspring at high-risk and low-risk group on the BIS. Results showed that there was a significant difference between two groups on BIS total score as well as subscales of BIS [Table 1].

Alcohol-naïve offspring at high risk for alcoholism reported significantly high impulsivity compared to the offspring at low risk. This suggests disposition of

impulsivity in alcohol-naïve offspring at high risk for alcoholism. To explore whether impulsivity differs in different age group offspring at high risk for alcoholism, we categorized high-risk offspring into three subgroups: Early adolescents (11–15 years), late adolescents (16–20 years), and adults (21–25 years). Kruskal–Wallis H test was employed to see the significant difference among the three subgroups. Results showed that there was no significant difference among the subgroups [Table 2]. No significant difference with respect to impulsivity among different age groups in the low risk group can be hypothesized in view of low impulsivity. Results showed that there was no significant difference among the three subgroups in the low risk group [Table 3].

Correlation analysis

Association between impulsivity and age

Spearman's correlation coefficient was used to determine the presence of any significant association of impulsivity with age in offspring at high risk for alcoholism. Results showed that there was no significant relationship between age and impulsivity in the high-risk group and low-risk group (except one subcomponent in low-risk group) [Table 4].

Executive functions with age and education

Spearman's coefficient of correlation was used to determine the presence of any significant association of age and education with executive function in offspring at high risk for alcoholism. Executive functions (concept formation, working memory, and safe decision-making) showed significant positive association, while perseveration and risky decision-making showed a negative association with age and education in both the groups [Table 5].

DISCUSSION

Impulsivity is considered to be one of the important factors for developing substance use, including alcohol use disorders^[22,26,58,59] and for prediction of escalation of substance use, including alcohol use, in young adults and adolescents.^[60,61] Studies have reported that children with parental history of alcohol use disorders demonstrate high impulsivity than children without such a history.^[22,62,63] BIS is one of the most extensively used scales as measures of trait impulsivity. The BIS assesses predispositional personality trait of impulsivity in individuals prior to the onset of drug use.^[28,30] It is also reported that the personality trait might represent mediation of intergenerational transmission of alcoholism.^[31,32] Impulsivity correlates with several other clinical indices of alcoholism such as the age of onset and severity of alcohol abuse.^[64-66]

Table 1: Comparison between the two groups on impulsivity

Variables	Mean±SD		P
	Low-risk group	High-risk group	
BIS Total	62.24±7.46	69.97±8.09	0.001*
BIS Attention	9.50±2.31	11.59±2.86	0.004*
BIS Motor	15.85±3.29	18.32±3.76	0.008*
BIS Self	11.88±3.20	13.00±3.46	0.183
BIS Cognitive complexity	11.79±2.95	12.79±2.57	0.044**
BIS perseverance	7.15±1.74	7.59±2.39	0.480
BIS Cognitive instability	6.68±2.14	7.09±2.21	0.521
BIS Attentional impulsiveness	16.47±3.19	19.21±3.89	0.006*
BIS Motor impulsiveness	22.85±3.45	26.00±4.69	0.008*
BIS Nonplanning impulsiveness	23.06±4.84	25.35±4.73	0.060

BIS – Barratt's Impulsiveness Scale, * $P < 0.01$ (two-tailed), ** $P < 0.05$ (two-tailed)

Table 2: Comparison of impulsivity among the different age groups in the high-risk group

Variables	Mean±SD			P
	Early adolescents (11-15 years), n=13	Late adolescents (16-20 years) n=14	Adults (21-25 years), n=7	
BIS Total	71.62±7.72	70.86±8.90	65.14±5.87	0.185
BIS Attention	12.00±2.51	11.43±2.31	11.14±4.49	0.683
BIS Motor	18.62±4.37	17.43±2.21	19.57±4.99	0.506
BIS Self	13.15±3.18	13.79±3.96	11.14±2.41	0.198
BIS Cognitive complexity	13.36±2.26	11.93±2.16	13.29±3.59	0.263
BIS Perseverance	7.31±2.72	8.36±2.13	6.57±1.99	0.237
BIS Cognitive instability	7.38±2.22	7.00±2.54	6.71±1.60	0.840
BIS Attentional impulsiveness	19.38±3.18	19.50±3.50	18.29±5.94	0.601
BIS Motor impulsiveness	25.92±6.05	26.07±3.52	26.00±4.58	0.804
BIS Nonplanning impulsiveness	26.31±4.11	25.29±5.47	23.71±4.42	0.614

BIS – Barratt Impulsiveness Scale

Table 3: Comparison of impulsivity among the different age groups in the low-risk group

Variables	Mean±SD			P
	Early adolescents (11-15 years), n=13	Late adolescents (16-20 years) n=14	Adults (21-25 years), n=7	
BIS Total	61.15±7.47	62.50±7.06	63.71±8.99	0.663
BIS Attention	8.69±2.32	9.86±2.68	10.29±0.76	0.135
BIS Motor	14.85±2.07	16.00±2.88	17.43±5.29	0.529
BIS Self	11.62±3.75	11.93±3.05	12.29±2.75	0.830
BIS Cognitive complexity	11.54±2.50	11.86±3.92	12.14±1.34	0.585
BIS Perseverance	7.38±2.10	7.29±1.63	6.43±1.13	0.371
BIS Cognitive instability	7.31±2.32	6.29±2.02	6.29±2.06	0.517
BIS Attentional impulsiveness	16.00±2.08	16.71±4.03	16.86±3.39	0.600
BIS Motor impulsiveness	22.08±3.35	23.07±2.92	23.86±4.67	0.576
BIS Non-planning impulsiveness	23.31±4.92	22.21±5.56	24.29±3.15	0.679

Table 4: Correlation between impulsivity and age in both groups

Variables	Age	
	Low-risk group	High-risk group
BIS Total	0.225	-0.287
BIS Attention	0.399**	-0.150
BIS Motor	0.168	-0.057
BIS Self	0.090	-0.155
BIS Cognitive complexity	0.092	-0.137
BIS Perseverance	-0.028	-0.101
BIS Cognitive instability	-0.140	-0.034
BIS Attentional impulsiveness	0.215	-0.052
BIS Motor impulsiveness	0.248	-0.046
BIS Nonplanning impulsiveness	0.043	-0.165

BIS – Barratt Impulsiveness Scale, **P<0.05 (two-tailed)

Most of the previous studies, which included offspring with and without a family history of alcoholism, have methodological limitations such as they have not segregated offspring who have already initiated alcohol and/or other substance use while assessing predisposed risk factors for substance use disorder, including alcoholism. Also, studies have not adequately explored whether different age groups of offspring at high risk for alcoholism differ in their impulsivity trait.

The present study examined trait impulsivity in alcohol-naïve offspring at high- and low-risk for alcoholism. To examine this, the present study consisted of two groups: (1) Alcohol-naïve offspring with a family history of alcoholism designated as at high risk for alcoholism and (2) alcohol-naïve offspring without a family history of alcoholism designated as at low risk for alcoholism. Both groups were assessed on BIS, and results showed that offspring at high risk reported significantly high impulsivity compared to the offspring at low risk. There was significant difference between two groups on BIS total score as well as subtypes of impulsivity such as attention (not focusing on the task), motor (acting on the spur of the moment), cognitive complexity (tendency to make quick decision), attentional impulsiveness (inability to focus attention or concentrate), motor impulsiveness (acting without thinking), and nonplanning impulsiveness (a lack of future or forethought). Studies have demonstrated that different subtypes of impulsivity can be more precisely associated with alcoholism. For example, nonplanning impulsivity is found to be more specifically associated with early-onset alcoholism.^[67]

The results of the present study demonstrate that high impulsivity trait could represent predisposed

Table 5: Correlation between age and executive functions, and education and executive functions in both groups

Variables	Age		Education	
	Low-risk group	High-risk group	Low-risk group	High-risk group
WCST PR	-0.533*	-0.554*	-0.551*	-0.564*
WCST PPR	-0.364**	-0.528*	-0.385**	-0.530*
WCST NPE	-0.468*	-0.651*	-0.510*	-0.659*
WCST CC	0.502*	0.618*	0.451*	0.606*
WCST PE	-0.522*	-0.559*	-0.550*	-0.582*
Digit span B	0.461*	0.357**	0.589*	0.452*
Spatial Span B	0.361**	0.460*	0.514*	0.508*
GDT-Net	0.456**	0.475*	0.493*	0.480*
GDT-FB	0.561*	0.384**	0.574*	0.439*
GDT-Single	-0.583*	-0.501*	-0.616*	-0.543*
GDT-Quad	0.339**	0.513*	0.294	0.524*
GDT-Risk	-0.531*	-0.475*	-0.565*	-0.518*
GDT-Safe	0.531*	0.475*	0.565*	0.518*

* $P < 0.01$ (two-tailed), ** $P < 0.05$ (two-tailed). WCST – Wisconsin Card Sorting Test; PR – Perseverative responses; PPR – Percentage of perseverative responses; NPE – Nonperseverative error; CC – Category completed; PE – Perseverative error; B – Backward condition; GDT – Game of dice task; GDT NET – Total safe responses-total risky responses [(triple + quad responses) – (single + pair responses)], FB – Final balance

personality trait (prior to alcohol use) in offspring at high risk for alcoholism. Further, results showed that there was no significant difference between different age groups (i.e., early adolescents, late adolescents, and adults) offspring at high risk for alcoholism with respect to impulsivity. The correlation analysis also showed no significant association between age and impulsivity in high-risk group as well as low-risk group (except one subcomponent with low correlation). Hence, it can be hypothesized that personality trait of impulsivity could be similar in different age groups of offspring at high risk for alcoholism. On the contrary, it is reported that impulsivity would change with increasing age in the normal population.^[68,69] Several factors may cause predisposed high impulsivity in offspring at high risk for alcoholism, such as underlying neurocognitive endophenotype.^[70] Studies have demonstrated that offspring at high risk for alcoholism differ from those with low risk for alcoholism on several neurobiological and endophenotype markers.^[71-73] Studies have shown that high-risk offspring demonstrates subtle neurodevelopmental lag in certain brain areas compared to healthy controls.^[74-76] Executive functions which are predominantly associated with prefrontal regions play an important role in exercising will-power/self-control. Hence, executive dysfunctions may increase impulsivity.^[77-80] Predisposed high impulsivity in offspring at high risk for alcoholism/substance use disorder might be linked with heritable differences in brain morphology.^[81] Studies have also demonstrated the genetic link between impulsivity and addiction.^[82,83] Similarly, early life adversity, which is more common in

a family with substance abuse, can produce cognitive deficits and high impulsivity.^[84]

However, there was a significant association between executive functions and age, as well as executive functions and education in both groups. It is well known that age and education can have an impact on executive functions.^[85-90] Studies have described that developmental process takes place in the brain through an increase in myelination and synaptogenesis. These processes enhance the speed of signal transmission between neurons and facilitate the computation of complex cognition by combining information from multiple sources.^[91,92] Education is an important determinant of executive/cognitive functions.^[93,94] Studies have reported that more years of education was associated with a greater neuronal reserve, increased number of synapses, and good cerebral vascularization, which may lead to better cognitive functions.^[95,96] Thus, maturation of brain areas due to age and education may augment executive functioning.

Risk theories of addiction have postulated risk for developing a substance use disorder, including alcohol use disorder, due to high impulsivity and hypo-function or dysfunction of executive functions. A suboptimal balance between these two can lead to failure in self-regulation and involvement in alcohol and drug abuse.^[39,41] Findings of the present study implicate that though executive function may improve in offspring at high risk for alcoholism with age and education, high impulsivity could pose them at high risk for developing alcohol use disorders. The impulsivity alone may weaken or hijack executive functions and thus produce self-regulatory failure. The ultimate result would be behavior guided by impulsivity.^[41] Studies have demonstrated an association between impulsivity and early experimentation of substance use as well as an increased risk for substance abuse in later life in children and adolescents.^[65,97]

CONCLUSION AND LIMITATION

Findings of the present study may have important preventive intervention implications for offspring at high risk for alcoholism. It emphasized the need for intervention for high impulsivity, as results showed that offspring at high risk for alcoholism reported high impulsivity. Furthermore, there was no significant difference in impulsivity between different age groups in offspring at high risk for alcoholism. Hence, it can be inferred that impulsivity could be similar in at risk population despite differences in age. Several studies have shown a strong link between impulsivity and substance use disorders including alcoholism.^[38,60,63,65] Hence, children with familial alcoholism need to be assessed for predisposing impulsivity, and

pharmacological and/or psychosocial interventions for impulsivity could be used as a preventive intervention.

The present study has some limitations. First, the small sample size. Studies with larger sample size could enhance generalizability. Second, the role of predisposing impulsivity could not be investigated from the longitudinal perspective along with other behavioral profile. Adding measures of alcohol consumption could make an interesting follow-up/cohort study. Similarly, a longitudinal study with assessment of substance use and/or behavioral addiction and engagement in high-risk behaviors might help in better understanding of the impact of impulsivity in offspring at high risk for alcoholism. The present study included only self-report measures of impulsivity. Future studies could use other behavioral measures of impulsivity such as a Go/NoGo or Stop-Signal Task along with trait impulsivity. Future studies could consider the role of other personality traits such as sensation seeking, borderline personality, or externalizing traits in offspring at high risk for alcoholism.

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Conflicts of interest

There are no conflicts of interest.

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