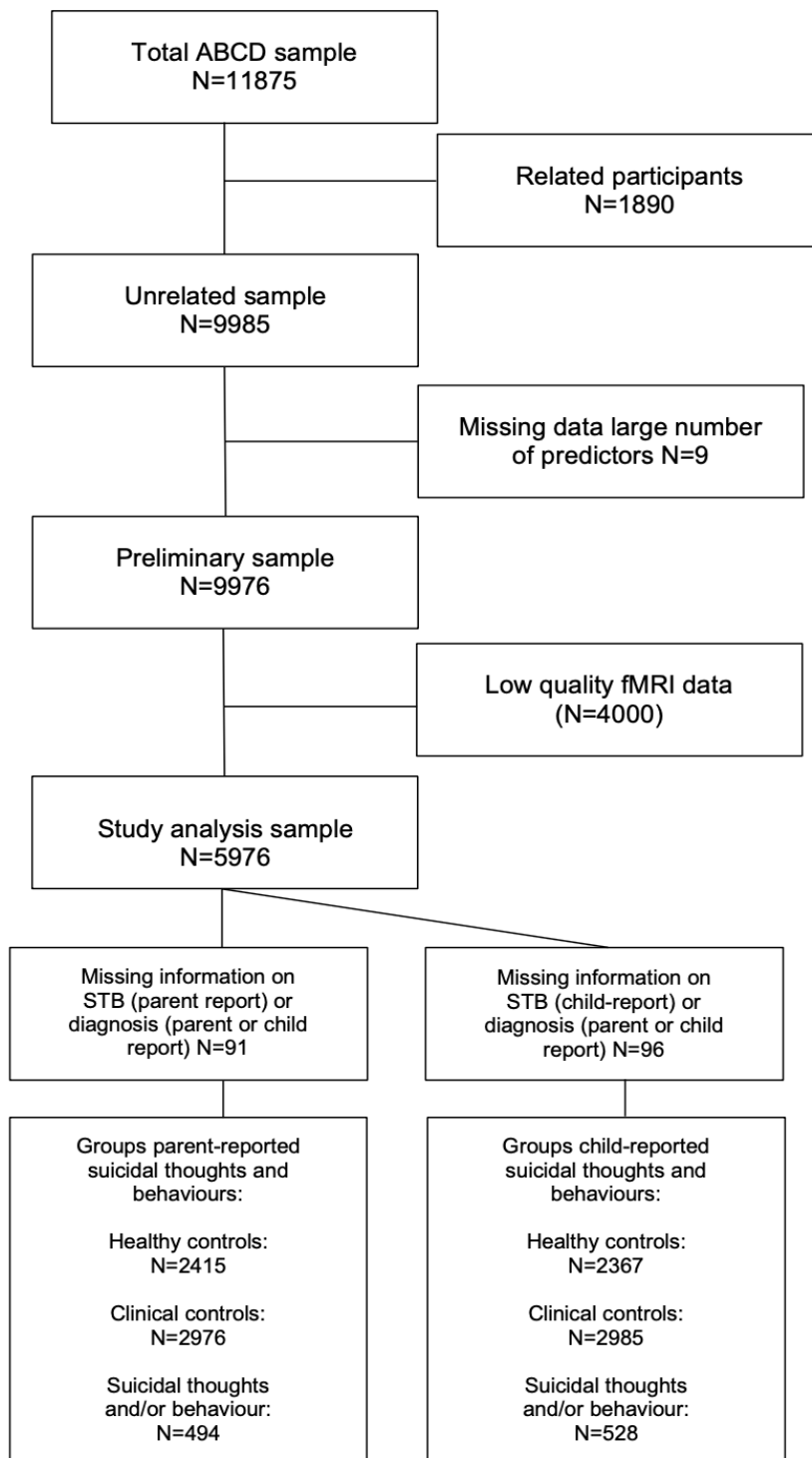


Supplemental Materials

Supplemental Figure S1. Sample selection and group sample sizes



Supplemental Note 1: Selection of unrelated participants

The ABCD study includes a total of 11,875 children, some of whom are siblings. In the current study, we chose to include only unrelated participants. Instead of randomly selecting a sibling from a family, we chose to select siblings based on STB using the selection strategy described below to maximize the sample size of the STB groups.

In particular, if one of the siblings had a lifetime history of suicidal behavior (actual, interrupted or aborted attempt according to the parent- or child reported), this sibling was selected from that family. If in a family, multiple siblings had a lifetime history of suicidal behavior, we selected the sibling that had a history of an actual attempt over siblings with an aborted or interrupted attempt.

If none of the siblings had a lifetime history of suicidal behavior, we examined lifetime history of suicidal ideation (parent- or child-reported). If multiple siblings had a history of suicidal ideation, we selected the sibling with the most severe ideation (coded as: 5: active ideation with a plan, 4: active ideation with intent, 3: active ideation with a specific method, 2: active non-specific ideation, 1: passive ideation). If there were multiple siblings with similar severity of suicidal ideation, one sibling was selected randomly.

If none of the siblings had a lifetime history of suicidal behavior or suicidal ideation, one sibling was then selected randomly.

The sample of selected siblings was then combined with the sample of participants who did not have siblings included in the ABCD study, resulting in a total of 9985 participants.

Supplemental Note 2: STB outcome group definition

Previous findings showed low correspondence between parent- and child reported STB (1), therefore we created two STB outcome variables: the parent-reported STB group variable and the child-reported STB group variable.

Child-reported STB group variable

The child reported STB group variable consists of three groups:

1. STB group (N=528)
2. Clinical control group (N=2985)
3. Healthy control group (N=2367)

The STB group includes children who reported lifetime suicidal ideation or suicidal behavior, which means that they endorse one or more of the following measures from the K-SADS-5: present or past passive suicidal ideation (ksads_23_946_t, ksads_23_957_t), present or past active non-specific suicidal ideation (ksads_23_947_t, ksads_23_958_t), present or past active suicidal ideation with a specific method (ksads_23_948_t, ksads_23_959_t), present or past active suicidal ideation with intent (ksads_23_949_t, ksads_23_960_t), present or past active suicidal ideation with a plan (ksads_23_950_t, ksads_23_961_t), present or past preparatory actions toward imminent suicidal behavior (ksads_23_951_t, ksads_23_962_t), present or past interrupted suicide attempt (ksads_23_952_t, ksads_23_963_t), present or past aborted suicide attempt (ksads_23_953_t, ksads_23_964_t), present or past actual suicide attempt (ksads_23_954_t, ksads_23_965_t).

The clinical control group did not report lifetime suicidal ideation or suicidal behavior, but did have a lifetime psychiatric diagnosis based on parent- or child-reported of the K-SADS-5 of one or more of the following disorders: bipolar disorder, depressive disorder, psychotic

disorder, ADHD, panic disorder, social anxiety disorder, specific phobia, generalized anxiety disorder, substance use disorder, obsessive-compulsive disorder, alcohol disorder, PTSD, eating disorder. As the available K-SADS-5 diagnoses based on child-reported are very limited, we determined there was a diagnosis if this was derived from the parent-reported or the child-reported.

The healthy control group includes children who have not reported lifetime history of suicidal thoughts or behaviors, and who do not have a lifetime diagnosis of a psychiatric disorder according to the K-SADS-5 parent- and child-reports.

Parent-reported STB group variable

The parent-reported STB group variable consists of three groups:

1. STB group (N=494)
2. Clinical control group (N=2976)
3. Healthy control group (N=2415)

Here, the STB group includes children whose parents reported that their child had a lifetime history of suicidal ideation or suicidal behavior, which includes the following measures from the K-SADS-5 parent-reported: present or past passive suicidal ideation (ksads_23_946_p, ksads_23_957_p), present or past active non-specific suicidal ideation (ksads_23_947_p, ksads_23_958_p), present or past active suicidal ideation with a specific method (ksads_23_948_p, ksads_23_959_p), present or past active suicidal ideation with intent (ksads_23_949_p, ksads_23_960_p), present or past active suicidal ideation with a plan (ksads_23_950_p, ksads_23_961_p), present or past preparatory actions toward imminent suicidal behavior (ksads_23_951_p, ksads_23_962_p), present or past interrupted suicide attempt (ksads_23_952_p, ksads_23_963_p), present or past aborted suicide attempt (ksads_23_953_p, ksads_23_964_p), present or past actual suicide attempt (ksads_23_954_p, ksads_23_965_p).

The clinical control group did not have a history of suicidal thoughts and behavior according to the K-SADS-5 parent report, but had a lifetime diagnosis of psychiatric disorder (parent-reported or child-reported), similar to what is described above for the child-reported STB group).

The healthy control group does not have a history of suicidal thoughts and behavior according to the K-SADS-5 parent reported and does not have a lifetime diagnosis of psychiatric disorder according to the K-SADS-5 parent or child-reported.

Supplemental Note 3: Overlapping outcome groups

The child-reported and parent-reported outcome groups differed from each other, therefore the analyses were repeated using only the individuals that were in the same group according to the K-SADS-5 child and parent report (the overlapping sample). The overlapping outcome variable included the following three groups: 1) healthy control (N=2,298), 2) clinical control group (N=2,693), 3) STB group (N=139). The results in the overlapping sample are presented in Table S3.

Supplemental Note 4: Ideation vs suicidal behavior group definition

Child-reported Ideation vs. suicidal behavior group variable

The child-reported Ideation vs. attempt group variable consists of two groups:

1. Lifetime self-reported suicidal ideation, but no self-reported history of attempt group (N=461)

2. Self-reported history of suicidal behavior group (N=67)

The suicidal behavior group includes children who endorse one or more of the following KSADS-5 items: present or past interrupted suicide attempt (ksads_23_952_t, ksads_23_963_t), present or past aborted suicide attempt (ksads_23_953_t, ksads_23_964_t), present or past actual suicide attempt (ksads_23_954_t, ksads_23_965_t).

Children in the suicidal ideation group did not report past or present interrupted, aborted or actual suicide attempts, but endorsed one or more of the following items on suicidal ideation: present or past passive suicidal ideation (ksads_23_946_t, ksads_23_957_t), present or past active non-specific suicidal ideation (ksads_23_947_t, ksads_23_958_t), present or past active suicidal ideation with a specific method (ksads_23_948_t, ksads_23_959_t), present or past active suicidal ideation with intent (ksads_23_949_t, ksads_23_960_t), present or past active suicidal ideation with a plan (ksads_23_950_t, ksads_23_961_t).

Parent-reported Ideation vs. suicidal behavior group variable

The parent-reported Ideation vs. attempt group variable consists of two groups:

1. Lifetime parent-reported suicidal ideation, but no parent-reported history of attempt group (N=464)
2. Parent-reported history of suicidal behavior group (N=30)

Here, the suicidal behavior group includes children whose parents reported that their child has a lifetime history of suicidal behavior, which included the following measures from the K-SADS-5 parent-reported: present or past interrupted suicide attempt (ksads_23_952_p, ksads_23_963_p), present or past aborted suicide attempt (ksads_23_953_p, ksads_23_964_p), present or past actual suicide attempt (ksads_23_954_p, ksads_23_965_p).

The suicidal ideation group did not have a history of aborted, interrupted or actual suicide attempts according to their parents, but their parents endorsed one or more of the following KSADS items on suicidal ideation: present or past passive suicidal ideation (ksads_23_946_p, ksads_23_957_p), present or past active non-specific suicidal ideation (ksads_23_947_p, ksads_23_958_p), present or past active suicidal ideation with a specific method (ksads_23_948_p, ksads_23_959_p), present or past active suicidal ideation with intent (ksads_23_949_p, ksads_23_960_p), present or past active suicidal ideation with a plan (ksads_23_950_p, ksads_23_961_p).

Supplemental Note 5: Included features per dimension

Sociodemographic factors

Age at time of assessment (in months), birth sex, parent-reported race of the child (White, Black, Native-American, Asian, other or mixed race), marital status of the parents, combined educational level of both parents, total family income (as a measure of socio-economic status) and the number of cohabitants in the household were determined using questions from the PhenX toolkit (parent-reported (2)) and included as sociodemographic predictor variables.

Physical factors

The included physical factors were pubertal development, sleep disturbance, physical activity, BMI, screen time and physical illness. Pubertal status (child-reported) was assessed using the Pubertal Development Scale (3). Total scores from the Sleep Disturbance Scale for Children (4,5) (parent-reported) and its subscales (sleep breathing disorders, disorders of sleep arousal, sleep-wake transition disorders, disorders of excessive somnolence and sleep hyperhydrosis) were included as measures of sleep function. Body mass index (BMI) was

calculated based on weight and height. Exercise was assessed by questions from the Youth Risk behavior Survey (6), by asking the child how many days in the past week they were active for at least an hour and how many days they did exercises to strengthen their muscles. Physical illness was included as a dichotomous variable, which was scored as 'yes' when parents reported the child had (a history of) brain injury, cancer, cerebral palsy, diabetes, epilepsy, multiple sclerosis or heart disease in the Magic Health Services Utilization Questionnaire (7). Finally, screen time was assessed by asking children how many hours they typically spend during a weekday and a weekend day on a computer, tablet, cellphone or other electronic device (8).

Social environment factors

The social environmental factors included parental monitoring, family conflict, prosocial behavior, parental acceptance, bullying, friendship, neighborhood safety and school environment. Friendship was assessed by asking parents if their child has a best friend and if their child has a group of friends in the introduction to the KSADS-5 (9). Bullying at school or in the neighborhood was assessed using the parent-reported of the introduction to the KSADS-5(9). Neighborhood safety/crime was assessed by calculating the mean of the parent-reported Neighborhood Safety/Crime Survey (10). While bullying, friendships and neighborhood safety were available from the parent- and child-reported, the parent-reported was used here due to the high number of missing values in the child-reported bullying measure and because more detailed information was available on neighborhood safety and friendships in the parent-reported. Family conflict was assessed with the family conflict subscale score of the Family Environment Scale (child-reported) (11). Prosocial behavior was measured using the mean of the prosocial behavior subscale of the Strengths and Difficulties Questionnaire (child-reported) (12). Child-reported parental acceptance was assessed using the acceptance subscale from the short version of the Children's report of Parental behavior Inventory (CRPBI-short) (13). Parental monitoring was determined with the mean of the child-reported Parental Monitoring Questionnaire (14). School environment, involvement and disengagement were assessed with the child-reported School Risk and Protective Factors Survey (15).

Clinical psychiatric factors

Psychopathology, prodromal psychosis, mania symptoms, mental health service use, current and lifetime psychiatric diagnosis and family history of psychopathology were included as clinical psychiatric factors. As the scores on clinical psychiatric measures were very low and by definition no psychiatric diagnoses were present in the HC group, the clinical psychiatric measures described below (with the exception of the family history of mental health issues) were only included in the binomial penalized logistic regression models when comparing the clinical controls and individuals with suicide thoughts or behavior.

Dimensional psychopathology was assessed using the T-scores of the 20 subscales of the Achenbach Child behavior Checklist (CBCL; parent-reported) (16). Mental health service use was determined by asking parents if their child ever received treatment for mental health issues or addiction and what type of treatment was received (e.g. outpatient care, inpatient care) in the Introduction to KSADS-5 (9). Family history of mental health issues was determined using a modified version of the Family History Assessment from NCANDA (17) (parent-reported), and was coded in this study as a dichotomous variable, with 'yes' indicating a family history of mania, psychosis, nerves, mental health hospitalization or mental health treatment. Dimensional mania symptoms of the child were assessed using the ten-item parent-reported Mania Scale from the Parent General behavior Inventory (PGBI) (18). Child-reported psychotic symptoms were assessed using the brief version of the Pediatric Psychosis Questionnaire (19). Current and past psychiatric diagnoses were determined from the KSADS-5 parent-reported and child-reported.

Cognitive factors

Age-corrected standardized scores (one measure per test) were obtained from the NIH Toolbox picture vocabulary test, flanker inhibitory control and attention test, list sorting working memory test, dimensional change card sorting test, pattern comparison processing speed test, picture sequence memory test and oral reading recognition test (<http://www.nihtoolbox.org>). In addition, the total score of the WISC-V Matrix Reasoning scale (20) and the Cash Choice Task delay of gratification measure (21) were included. Finally, total scores on the five subscales of the self-reported UPPS-P scale (negative urgency, lack of planning, sensation seeking, positive urgency and perseverance) were included as measures of impulsivity (22,23).

Task-based neuroimaging measures

Participants underwent a functional magnetic resonance imaging (MRI) scan. The neuroimaging protocol, scan acquisition parameters, and pre-processing procedures are described in detail elsewhere (24). For the current study, we included derived brain activity measures from various regions of interest during the Stop Signal Task (which measures response inhibition) and the Monetary Incentive Delay Task (which measures reward monitoring and processing) as predictors in our model. Details about these tasks can be found in (24).

For the Stop Signal Task, we included regionally averaged beta-estimates from 14 cortical and 8 subcortical regions of interest during the correct stop versus correct go condition (see Supplemental Table S1). These regions of interest were selected based on findings from previous meta-analyses (25,26).

For the Monetary Incentive Delay task we included beta weights for reward anticipation from 22 cortical and 12 subcortical regions during the reward versus neutral condition, and beta weights for loss anticipation from 18 cortical and 14 subcortical regions during the loss versus neutral condition (see Supplemental Table S1). These regions of interest were selected based on findings from previous meta-analyses (27–29).

Genetic factors

Genome-wide association studies (GWAS)' summary statistics allow for the estimation of a polygenic risk score in a genotyped independent sample. We leveraged previously published GWAS for four psychiatric diseases: major depression (30), bipolar disorder (31), anorexia (32) and schizophrenia (33); as well as the most recent cross-disorder (34) GWAS performed by the psychiatric genomics consortium (PGC) (for methods see Supplemental Note 6).

Supplemental Note 6: Polygenic risk scores method

To avoid bias due to correlated SNPs arising from linkage-disequilibrium (LD), the GWAS summary statistics were subjected to a Bayesian analysis to approximate the results of a conditional GWAS (i.e. one estimating the effect for all SNPs simultaneously). This was done using the software SbayesR (35) implemented within a tool for Genome-wide Complex Trait Bayesian analysis (GCTB). The estimated conditional effect sizes were then used for polygenic scoring in the ABCD sample. The ABCD genotyping has been previously described (36). Briefly, saliva samples were obtained at the baseline visit and genotyping was performed using a Smokescreen array following standard DNA extraction protocols. Quality control removed genetic variants with a low call rate (less than 99% of the sample), and samples with a missing rate greater than 20 percent or with conflicting IDs. This quality controlled dataset was then imputed to the 1000G Phase 3 reference panel using the Michigan Imputation Server (37). Imputed genotype probabilities were extracted from the imputed data using QCTOOL v2. Only SNPs passing quality control (minor allele frequency >0.01, call rate > 0.9 and imputation score > 0.6) were included in the polygenic risk scores which were estimated using PLINKv2.

Supplemental Table S1. Variables used in binomial penalized logistic regression analysis to predict group status (healthy controls vs. clinical controls vs. suicidal ideation or attempt)

Measure	Description	Assessment
Sociodemographic		
Age	Chronological age in months	Demographics survey
Sex	Male or female	Demographics survey
Parental marital status	1=married; 2=widowed; 3= divorced; 4=separated; 5=never married; 6=living with partner	Parent demographics survey
Family income in last 12 months	1= Less than \$5,000; 2=\$5,000 through \$11,999; 3=\$12,000 through \$15,999; 4=\$16,000 through \$24,999; 5=\$25,000 through \$34,999; 6=\$35,000 through \$49,999; 7=\$50,000 through \$74,999; 8= \$75,000 through \$99,999; 9=\$100,000 through \$199,999; 10=\$200,000 and greater	Parent demographics survey
Parental education	1=1st grade 2=2nd grade 3=3rd grade 4=4th grade 5=5th grade 6=6th grade 7=7th grade 8=8th grade 9=9th grade 10=10th grade 11=11th grade 12=12th grade 13=high School 14= GED or equivalent diploma 15=some college 16=associate degree: Occupational 17=associate degree: Academic program 18= bachelor's degree 19= master's degree 20= professional school degree 21=doctoral degree	Parent demographics survey: Highest grade or level of school or the highest degree completed: Calculated as parent education score + partner education score
Race of the child	Recoded to: white, black, native-american, asian, mixed, other	Parent demographics survey
Number of cohabitants	Number of individuals living in the same household	Parent demographics survey
Physical health		
Physical illness (parent reported)	Dichotomous variable, scored 1 if parent reported that the child had a history of brain injury, cancer, cerebral palsy, diabetes, epilepsy, multiple sclerosis or heart disease	ABCD Medical History Questionnaire
Pubertal status (child reported)	Categories: 1=prepuberty; 2=early puberty;	Pubertal Developmental Scale - categories based on sum scores

	3=mid puberty; 4=late puberty; 5=post puberty	
Sleep breathing disorders	Score on the sleep breathing disorder subscale	Sleep Disturbance Scale for Children
Sleep arousal disorders	Score on the sleep arousal disorder subscale	Sleep Disturbance Scale for Children
Sleep-wake transition disorders	Score on the sleep-wake transition disorder subscale	Sleep Disturbance Scale for Children
Sleep-excessive somnolence	Score on the excessive somnolence subscale	Sleep Disturbance Scale for Children
Sleep - hyperhydrosis	Score on the hyperhydrosis disorder subscale	Sleep Disturbance Scale for Children
Sleep disturbance - total score	Total score on the Sleep Disturbance Scale for Children	Sleep Disturbance Scale for Children
Physical activity in past week (child-reported)	Number of days in the past week during which the child was physically active for at least sixty minutes per day	Youth Risk Behavior Survey
Physical activity training muscles in past week (child-reported)	Number of days in the past week during which the child was did exercises to strengthen or tone muscles	Youth Risk Behavior Survey
Body Mass Index	Body mass index was calculated from height (in inches) and weight (in lbs)	Physical exam
Screen time weekday (child-reported)	Sum of hours during a weekday a child typically spends on a computer, cellphone, tablet or other electronic device	ABCD Youth Screen Time Survey
Screen time weekend (child-reported)	Sum of hours during a weekend day a child typically spends on a computer, cellphone, tablet or other electronic device	ABCD Youth Screen Time Survey
Social environment		
Parental monitoring (youth-reported)	Responses to each item were coded as 1-5 and the mean of the responses was calculated	ABCD Parental Monitoring Survey
Family conflict (child-reported)	Responses to 9 items were coded 0/1 and a sum score was created	ABCD Family Environment Scale: Family Conflict Subscale Modified from PhenX
Prosocial behavior (child-reported)	Responses to 3 items were coded 0-2 and the mean was calculated	Prosocial Behavior Subscale from the Strengths and Difficulties Questionnaire
Parental acceptance (child-reported)	Responses to 5 items were coded 1-3 and the mean was calculated	Acceptance subscale from the Children's reported of Parental Behavioral Inventory
Bullying (child-reported)	Problems with bullying at school or in the neighborhood: coded yes/no	Introduction to the K-SADS5

Best friend (parent-reported)	Does the child have a best friend: coded yes/no/unsure	Introduction to the K-SADS5
Friend group (parent-reported)	Does the child have a friend group: coded: yes/no/unsure	Introduction to the K-SADS5
Neighborhood safety (parent reported)	Mean of three items	ABCD Neighborhood Safety/Crime Survey Modified from PhenX
School environment (child-reported)	Responses to 5 items were coded 1-4 and a sumscore was calculated	ABCD School Risk and Protective Factors Survey - Environment Subscale
School involvement (child-reported)	Responses to 4 items were coded 1-4 and a sumscore was created	ABCD School Risk and Protective Factors Survey - Involvement Subscale
School disengagement (child-reported)	Responses to 2 items were coded 1-4 and a sumscore was created	ABCD School Risk and Protective Factors Survey Disengagement Subscale
Negative life event – car accident (parent-report)	Has your child every been in a car accident where your child or another person in the car was hurt bad enough to require medical attention? coded: no/yes	KSADS PTSD module
Negative life event –accident (parent-report)	Has your child ever been in any other significant accident for which your child needed specialized and intensive medical treatment? Coded: no/yes	KSADS PTSD module
Negative life event – caught in a fire (parent-report)	Has your child ever witnessed or been caught in a fire that caused significant property damage or personal injury? Coded: no/yes	KSADS PTSD module
Negative life event – natural disaster (parent-report)	Has your child ever witnessed or been caught in a natural disaster that caused significant damage or personal injury? Coded: no/yes	KSADS PTSD module
Negative life event – terrorism (parent-report)	Has your child ever witnessed or been present during an act of terrorism? Coded no/yes	KSADS PTSD module
Negative life event – death or mass destruction (parent-report)	Has your child ever witnessed death or mass destruction in a war zone? Coded no/yes	KSADS PTSD module
Negative life event – witness violence in the community (parent-report)	Has your child ever witnessed someone being shot or stabbed in the community? Coded no/yes	KSADS PTSD module
Negative life event – shot, stabbed, beaten by non-family member (parent-report)	Has your child been shot, stabbed, or beaten brutally by a non-family member? Coded no/yes	KSADS PTSD module

Negative life event – shot, stabbed, beaten by a grown up in the home (parent-report)	Has your child been shot, stabbed, or beaten by a grown up in the home? Coded no/yes	KSADS PTSD module
Negative life event – beaten up at home (parent-report)	Has your child been beaten to the point of having bruises by a grown up in the home? Coded no/yes	KSADS PTSD module
Negative life event – threatened non-family member (parent-report)	Has a non-family member ever threatened to kill your child? Coded no/yes	KSADS PTSD module
Negative life event – threatened by family member (parent-report)	Has a family member threatened to kill your child? Coded no/yes	KSADS PTSD module
Negative life event – witnessed domestic violence (parent-report)	Has your child ever witnessed the grownups in the home push, shove or hit one another? Coded no/yes	KSADS PTSD module
Negative life event – sexual assault (parent-report)	Has a grown up in the home touched your child in his/her privates or had your child touch their privates or did other sexual things to your child? Coded no/yes	KSADS PTSD module
Negative life event – sexual assault outside of family (parent-report)	Has an adult outside the family touched your child in his/her privates or had your child touch their privates or did other sexual things to your child? Coded no/yes	KSADS PTSD module
Negative life event – sexual assault by peer (parent-report)	Has a peer forced your child to do something sexual? Coded no/yes	KSADS PTSD module
Negative life event – sudden death loved one (parent-report)	Has your child learned about the sudden unexpected death of a loved one? Coded no/yes	KSADS PTSD module
Clinical psychiatric (only included in analyses with clinical controls & suicide group)		
CBCL Anxious Depression	T-score for the anxious/depressed subscale	Achenbach Child Behavior Checklist
CBCL Withdrawn Depressed	T-score for the withdrawn/depressed subscale	Achenbach Child Behavior Checklist
CBCL Somatic Complaints	T-score for the somatic complaints subscale	Achenbach Child Behavior Checklist
CBCL Social Problems	T-score for the social problems subscale	Achenbach Child Behavior Checklist
CBCL Thought Problems	T-score for the thought problems subscale	Achenbach Child Behavior Checklist
CBCL Attention Problems	T-score for the attention problems subscale	Achenbach Child Behavior Checklist
CBCL Rule Breaking behavior	T-score for the rule-breaking behavior subscale	Achenbach Child Behavior Checklist
CBCL Aggressive behavior	T-score for the aggressive behavior subscale	Achenbach Child Behavior Checklist
CBCL Internalizing Broad Band Score	T-score for the internalizing broad	Achenbach Child Behavior Checklist

	band score	
CBCL Externalizing Broad Band Score	T-score for the externalizing broad band score	Achenbach Child Behavior Checklist
CBCL Total problems Score	T-score for the total problems score	Achenbach Child Behavior Checklist
CBCL Depression	T-score for the DSM5 depression KSADS PTSD module subscale	Achenbach Child Behavior Checklist
CBCL Anxiety Disorder	T-score for the DSM5 anxiety disorder subscale	Achenbach Child Behavior Checklist
CBCL Somatic	T-score for the DSM5 somatic complaints subscale	Achenbach Child Behavior Checklist
CBCL ADHD	T-score for the DSM5 ADHD subscale	Achenbach Child Behavior Checklist
CBCL Oppositional Defiant Problems	T-score for the DSM5 ODD subscale	Achenbach Child Behavior Checklist
CBCL Conduct Problems	T-score for the DSM5 conduct problems subscale	Achenbach Child Behavior Checklist
CBCL Sluggish Cognitive Tempo	T-score for the sluggish cognitive tempo subscale	Achenbach Child Behavior Checklist
CBCL Obsessive-compulsive problems	T-score for the DSM5 OCD subscale	Achenbach Child Behavior Checklist
CBCL Stress	T-score for the stress tempo subscale	Achenbach Child Behavior Checklist
Prodromal psychosis	21 items scored 1-5 and 1 item scored 0-1, a sum score is calculated	Brief version of the Pediatric Psychosis Questionnaire
Mania symptoms	10 items scored 1-3, a sum score is calculated	Mania Scale from the Parent General Behavior Inventory
Mental health service use	Has the child ever received mental health or substance abuse services? Coded yes/no	Introduction to the K-SADS5
Service use - Outpatient care	Has the child ever received outpatient mental health services? Coded yes/no	Introduction to the K-SADS5
Service use - Partial hospitalization	Has the child ever been partially hospitalized for mental health issues? Coded yes/no	Introduction to the K-SADS5
Service use - Inpatient care	Has the child ever received inpatient mental health services? Coded yes/no	Introduction to the K-SADS5
Service use - Psychotherapy	Has the child ever received psychotherapy? Coded yes/no	Introduction to the K-SADS5
Service use - Medication	Has the child ever been prescribed medication for mental health issues? Coded yes/no	Introduction to the K-SADS5
Service use - Other treatment	Has the child ever received other types of treatment for mental health issues? Coded yes/no	Introduction to the K-SADS5
Service use - Clinical treatment	Has the child not received treatment for mental health issues? Coded	Introduction to the K-SADS5

	yes/no	
Bipolar disorder - present	Current diagnosis of bipolar disorder. Coded yes/no	K-SADS5 (parent reported)
Depressive disorder - present	Current diagnosis of a depressive disorder. Coded yes/no	K-SADS5 (parent reported)
Psychotic disorder - present	Current diagnosis of a psychotic disorder. Coded yes/no	K-SADS5 (parent reported)
ADHD - present	Current diagnosis of ADHD disorder. Coded yes/no	K-SADS5 (parent reported)
PD - present	Current diagnosis of panic disorder. Coded yes/no	K-SADS5 (parent reported)
SA - present	Current diagnosis of social anxiety. Coded yes/no	K-SADS5 (parent reported)
SP - present	Current diagnosis of specific phobia. Coded yes/no	K-SADS5 (parent reported)
Generalized anxiety disorder - present	Current diagnosis of generalized anxiety disorder. Coded yes/no	K-SADS5 (parent reported)
Substance use disorder - present	Current diagnosis of substance use disorder. Coded yes/no	K-SADS5 (parent reported)
Obsessive compulsive disorder - present	Current diagnosis of obsessive compulsive disorder. Coded yes/no	K-SADS5 (parent reported)
Post-traumatic stress disorder - present	Current diagnosis of post-traumatic stress disorder. Coded yes/no	K-SADS5 (parent reported)
Eating disorder - present	Current diagnosis of an eating disorder. Coded yes/no	K-SADS5 (parent reported)
Bipolar disorder - past	Past diagnosis of bipolar disorder. Coded yes/no	K-SADS5 (parent reported)
Depressive disorder - past	Past diagnosis of a depressive disorder. Coded yes/no	K-SADS5 (parent reported)
Psychotic disorder - past	Past diagnosis of a psychotic disorder. Coded yes/no	K-SADS5 (parent reported)
ADHD - past	Past diagnosis of ADHD disorder. Coded yes/no	K-SADS5 (parent reported)
PD - past	Past diagnosis of panic disorder. Coded yes/no	K-SADS5 (parent reported)
SA - past	Past diagnosis of social anxiety. Coded yes/no	K-SADS5 (parent reported)
SP - past	Past diagnosis of specific phobia. Coded yes/no	K-SADS5 (parent reported)
Generalized anxiety disorder - past	Past diagnosis of generalized anxiety disorder. Coded yes/no	K-SADS5 (parent reported)
Substance use disorder - past	Past diagnosis of substance use disorder. Coded yes/no	K-SADS5 (parent reported)
Eating disorder - past	Past diagnosis of an eating disorder. Coded yes/no	K-SADS5 (parent reported)
Depressive disorder (child-reported)	Lifetime diagnosis of a depressive disorder. Coded yes/no	K-SADS5 (child reported)

Bipolar disorder (child-reported)	Lifetime diagnosis of bipolar disorder. Coded yes/no	K-SADS5 (child reported)
Anxiety disorder (child-reported)	Lifetime diagnosis of an anxiety disorder. Coded yes/no	K-SADS5 (child reported)
Family history of psychopathology	Dichotomous variable, with 'yes' indicating a family history of mania, psychosis, nerves, mental health hospitalization or mental health treatment	Family History Assessment from NCANDA
Cognition		
Flanker inhibitory control	Age-corrected standard score	NIH Toolbox Flanker Inhibitory Control and Attention Test
Card Sorting	Age-corrected standard score	NIH Toolbox Dimensional Change Card Sort Test
Cash choice task	Would you rather have \$75 in three days or \$115 in 3 months? Scored 1-2	Cash Choice Task - Delay Discounting
Impulsivity - negative urgency	4 items scored 1-4 a sum score is created	UPPS-P Negative Urgency subscale
Impulsivity - lack of planning	4 items scored 1-4 a sum score is created	UPPS-P Lack of Planning subscale
Impulsivity- sensation seeking	4 items scored 1-4 a sum score is created	UPPS-P Sensation Seeking subscale
Impulsivity - positive urgency	4 items scored 1-4 a sum score is created	UPPS-P Positive Urgency subscale
Impulsivity - lack of perseverance	4 items scored 1-4 a sum score is created	UPPS-P Lack of Perseverance subscale
Picture vocabulary	Age-corrected standard score	NIH Toolbox Picture Vocabulary Test
List sorting task	Age-corrected standard score	NIH Toolbox List Sorting Working Memory Test
Pattern comparison	Age-corrected standard score	NIH Toolbox Pattern Comparison Processing Speed Test
Picture sequence memory	Age-corrected standard score	NIH Toolbox Picture Sequence Memory Test
Reading test	Age-corrected standard score	NIH Toolbox Oral Reading Recognition Test
Matrix reasoning	Total scaled score	WISC-V Matrix Reasoning
Neuroimaging		
Correct stop vs correct go - left thalamus	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Correct stop vs correct go - left caudate	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Correct stop vs correct go - left putamen	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Correct stop vs correct go - left pallidum	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast

Correct stop vs correct go - right thalamus	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Correct stop vs correct go - right caudate	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Correct stop vs correct go - right putamen	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Correct stop vs correct go - right pallidum	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Correct stop vs correct go - left inferior parietal gyrus	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Correct stop vs correct go - left pars opercularis	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Correct stop vs correct go - left pars orbitalis	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Correct stop vs correct go - left triangularis	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Correct stop vs correct go - left precentral	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Correct stop vs correct go - left superior temporal	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Correct stop vs correct go - left insula	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Correct stop vs correct go - right inferior parietal gyrus	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Correct stop vs correct go - right pars opercularis	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Correct stop vs correct go - right pars orbitalis	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Correct stop vs correct go - right triangularis	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Correct stop vs correct go - right precentral gyrus	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Correct stop vs correct go - right superior temporal gyrus	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Correct stop vs correct go - right insula	Mean beta weight for SST correct stop versus correct go contrast	Stop Signal task - Correct stop vs. correct go contrast
Reward vs neutral - left thalamus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - left caudate	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - left putamen	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - left pallidum	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task

Reward vs neutral - left amygdala	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - left accumbens	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - right thalamus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - right caudate	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - right putamen	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - right pallidum	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - right amygdala	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - right accumbens	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - left caudal middle frontal gyrus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - left cuneus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - left inferior temporal gyrus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - left parahippocampal gyrus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - left paracentral gyrus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - left precentral gyrus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - left rostral middle frontal gyrus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - left superior frontal gyrus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - left superior temporal gyrus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - left supramarginal gyrus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task

Reward vs neutral - left insula	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - right caudal middle frontal gyrus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - right cuneus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - right inferior temporal gyrus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - right parahippocampal gyrus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - right paracentral gyrus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - right precentral gyrus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - right rostral middle frontal gyrus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - right superior frontal gyrus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - right superior temporal gyrus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - right supramarginal gyrus	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Reward vs neutral - right insula	Mean beta weight for MID anticipation of reward versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - left thalamus	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - left caudate	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - left putamen	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - left pallidum	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - left hippocampus	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - left amygdala	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task

Loss vs neutral - left accumbens	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - right thalamus	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - right caudate	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - right putamen	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - right pallidum	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - right hippocampus	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - right amygdala	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - right accumbens	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - left caudal anterior cingulate cortex	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - left caudal middle frontal gyrus	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - left fusiform gyrus	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - left precentral gyrus	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - left rostral anterior cingulate cortex	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - left rostral middle frontal gyrus	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - left superior frontal gyrus	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - left supramarginal gyrus	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - left insula	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - right caudal anterior cingulate cortex	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task

Loss vs neutral - right caudal middle frontal gyrus	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - right fusiform gyrus	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - right precentral gyrus	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - right rostral anterior cingulate cortex	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - right rostral middle frontal gyrus	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - right superior frontal gyrus	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - right supramarginal gyrus	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Loss vs neutral - right insula	Mean beta weight for MID anticipation of loss versus neutral contrast	Monetary Incentive Delay task
Genetic		
Depression polygenic risk score	Weighted sum of allele SBayesR conditional GWAS effect sizes.	Genotyping
Bipolar disorder polygenic risk score	Weighted sum of allele SBayesR conditional GWAS effect sizes.	Genotyping
Schizophrenia polygenic risk score	Weighted sum of allele SBayesR conditional GWAS effect sizes.	Genotyping
Anorexia polygenic risk score	Weighted sum of allele SBayesR conditional GWAS effect sizes.	Genotyping
Cross-disorder (psychiatric) polygenic risk score	Weighted sum of allele SBayesR conditional GWAS effect sizes.	Genotyping

Supplemental Table S2. Demographic in the train and test set (in child-reported and parent-reported groups)

	Child reported			Validation set		
	Training set			Validation set		
	HC (N=1650)	CC (N=2122)	STB (N=396)	HC (N=717)	CC (N=863)	STB (N=132)
Age	9.9	9.9	9.9	9.9	10.0	9.9
Sex (%F, n)	51.5% (849)	48.0% (1017)	44.2% (175)	56.1% (402)	46.6% (402)	47.7% (63)
Ideation (% , n)	NA	NA	86.9% (344)	NA	NA	88.6% (117)
Attempt (% , n)	NA	NA	13.1% (52)	NA	NA	11.3% (15)
	Parent reported			Validation set		
	Training set			Validation set		
	HC (N=1683)	CC (N=2128)	STB (N=361)	HC (N=732)	CC (N=848)	STB (N=133)
Age	9.9	9.9	9.9	10.0	10.0	10.0
Sex (%F, n)	51.8% (871)	48.5% (1032)	38.8% (140)	55.8% (409)	48.0% (407)	37.6% (50)
Ideation (% , n)	NA	NA	94.7% (342)	NA	NA	91.7% (122)
Attempt (% , n)	NA	NA	5.3% (19)	NA	NA	8.3% (11)

Note: CC: clinical control group; HC: healthy control group; STB: suicidal thoughts and behaviors group

Supplemental note 7

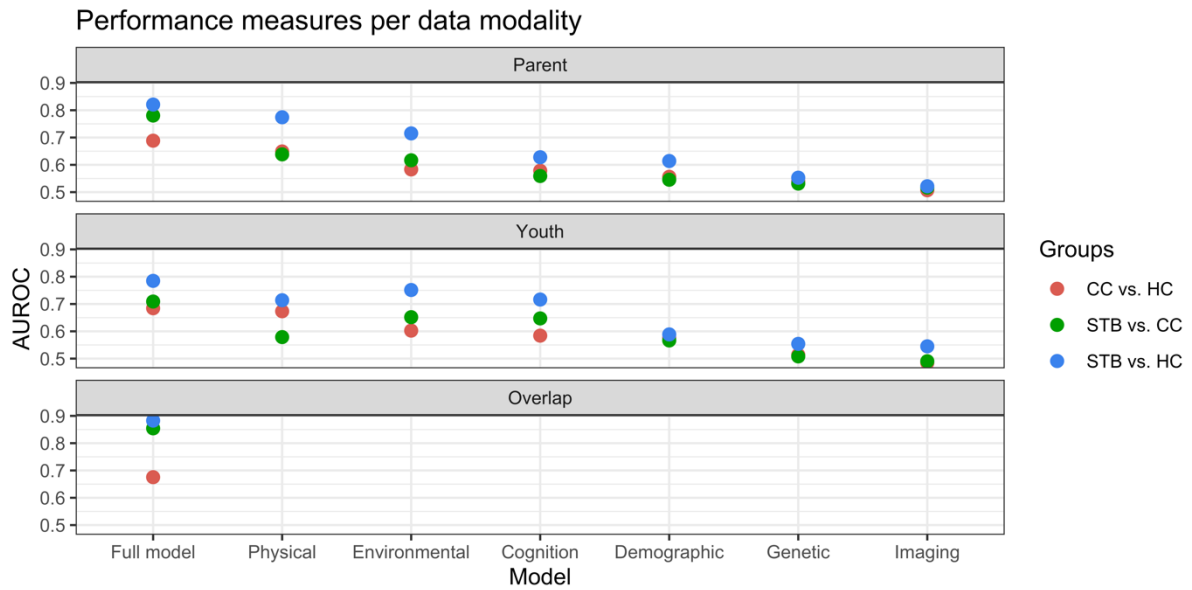
Use of a default alpha parameter is preferred since this avoids model selection bias due to vibration effects. However, to examine the effect of a set alpha, we repeated the main analyses using a nested alpha function using the glmnet package. This function finds the optimal alpha and lambda simultaneously in a cross-validation. This did not affect the performance measures, please see the table below.

Classification of STB groups (child-reported and parent-reported): Results of binomial penalized logistic regression analysis in cross-validation when optimal alpha was determined in the inner loop using a nested-alpha approach.

Comparison	Average alpha	AUROC	SD AUROC	Sensitivity	Specificity	Accuracy	PPV	NPV
Child-reported STB								
HC vs. CC	0.886	0.688	0.022	0.695	0.577	0.636	0.621	0.654
HC vs. STB	0.973	0.799	0.041	0.678	0.774	0.726	0.750	0.706
CC vs. STB	0.934	0.704	0.052	0.592	0.697	0.645	0.662	0.631
Parent-reported STB								
HC vs. CC	0.793	0.684	0.027	0.678	0.582	0.630	0.619	0.644
HC vs. STB	0.973	0.814	0.043	0.672	0.804	0.738	0.774	0.710
CC vs. STB	0.575	0.763	0.058	0.636	0.746	0.691	0.714	0.672

Note: CC: clinical control group; HC: healthy control group; STB: suicidal thoughts and behaviours group

Supplemental Figure 2. Average AUROC per data modality. The dots represent the AUROC of the binomial penalized logistic regression between two groups when only features from a specific modality were included.

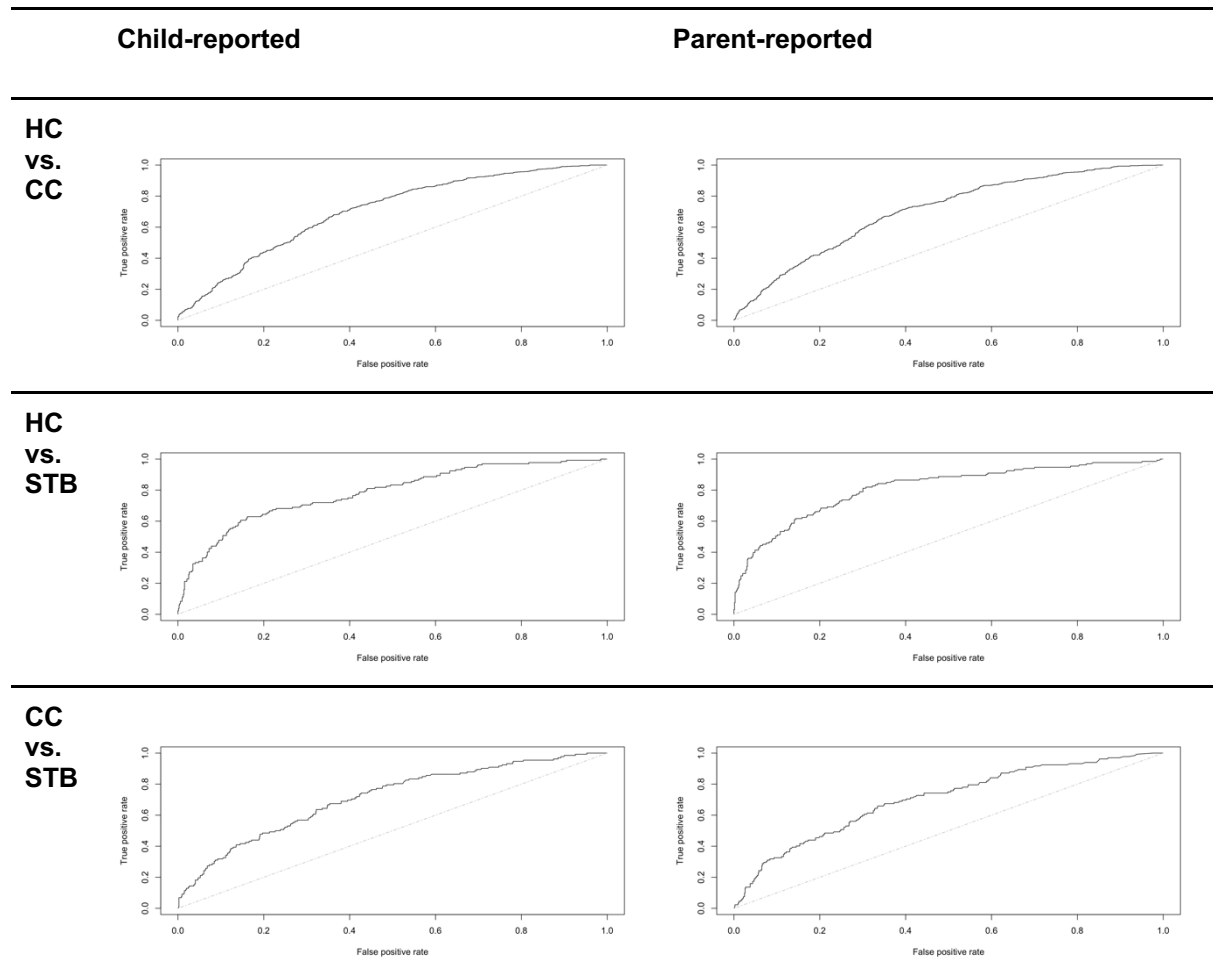


Supplemental Table S3. Performance measures of group classification in the overlapping sample (consistent parent and child-reported STB)

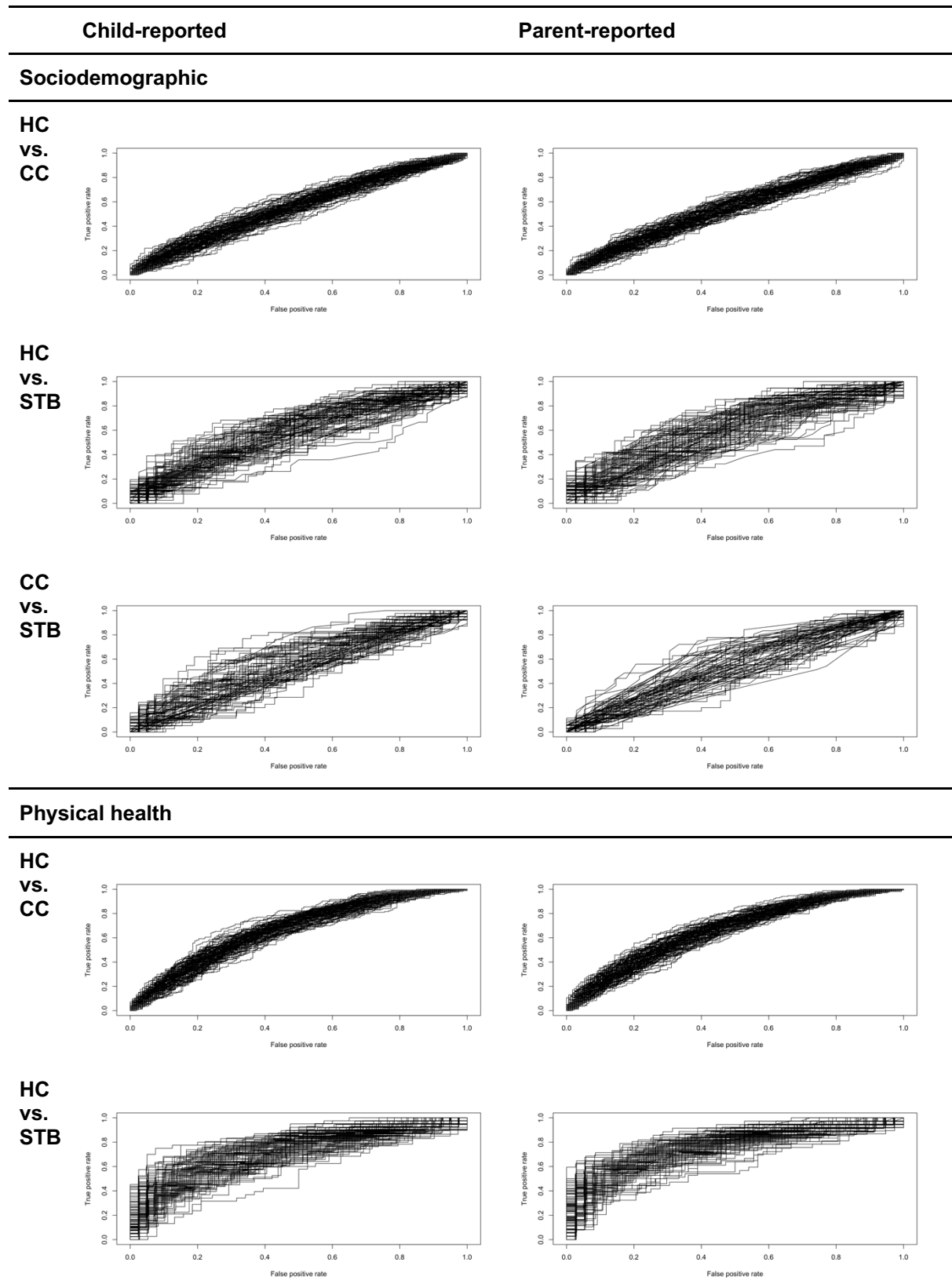
Comparison	Alpha	AUROC	SD AUROC	Sensitivity	Specificity	Accuracy	PPV	NPV
HC vs. CC								
	0.25	0.691	0.021	0.686	0.589	0.638	0.625	0.652
	0.50	0.690	0.022	0.689	0.585	0.637	0.624	0.653
	0.75	0.693	0.021	0.687	0.588	0.637	0.625	0.652
	1.00	0.690	0.021	0.688	0.586	0.637	0.624	0.653
HC vs. STB								
	0.25	0.879	0.053	0.758	0.829	0.793	0.816	0.774
	0.50	0.883	0.064	0.764	0.834	0.799	0.822	0.779
	0.75	0.880	0.062	0.758	0.834	0.796	0.820	0.775
	1.00	0.888	0.053	0.757	0.848	0.803	0.833	0.777
CC vs. STB								
	0.25	0.859	0.069	0.761	0.807	0.784	0.797	0.771
	0.50	0.866	0.069	0.761	0.825	0.793	0.813	0.776
	0.75	0.849	0.069	0.745	0.795	0.770	0.784	0.757
	1.00	0.859	0.066	0.739	0.804	0.772	0.791	0.755

Note: CC: clinical control group; HC: healthy control group; STB: suicidal thoughts and behaviors group

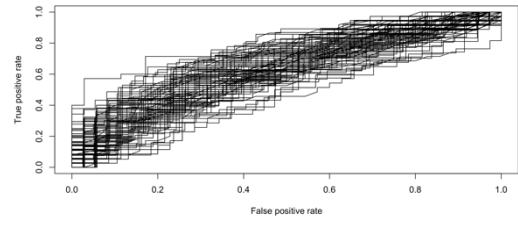
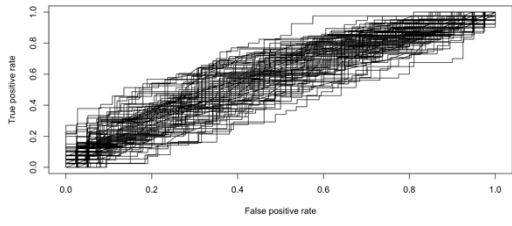
Supplementary Figure S3. Receiver Operating Characteristic (ROC) curves in the validation set.



Supplementary Figure S4. Receiver Operating Characteristic (ROC) curves in the training set per modality at alpha=0.5.

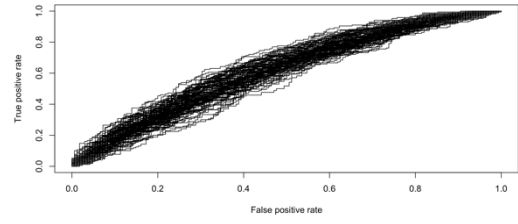
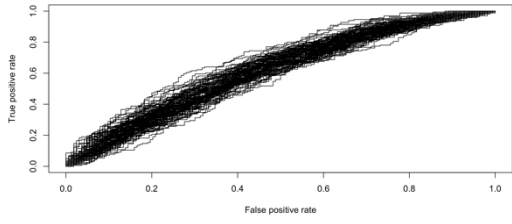


**CC
vs.
STB**

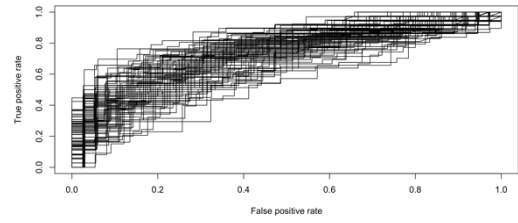
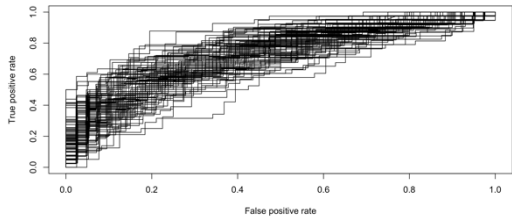


Social environment

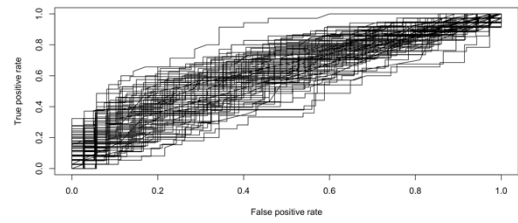
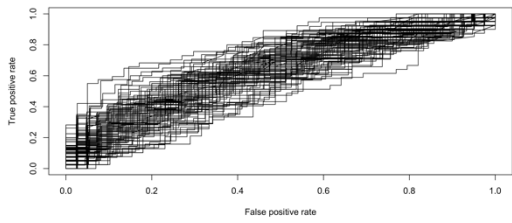
**HC
vs.
CC**



**HC
vs.
STB**

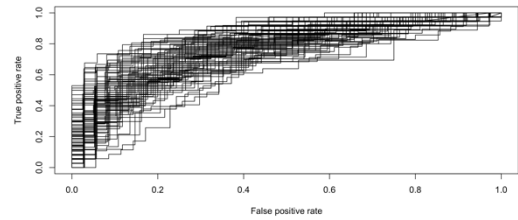
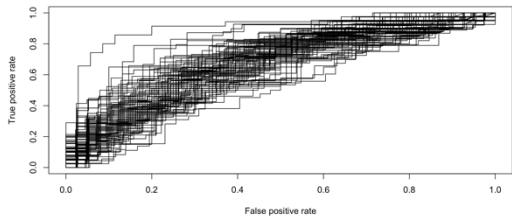


**CC
vs.
STB**



Clinical psychiatric

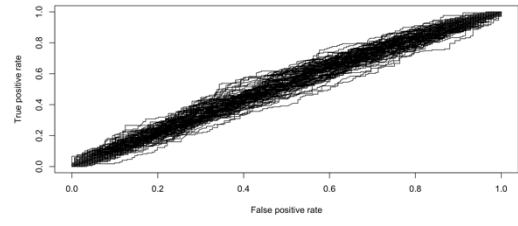
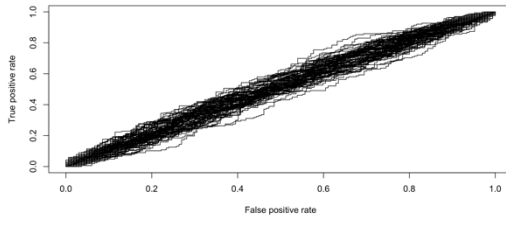
**CC
vs.
STB**



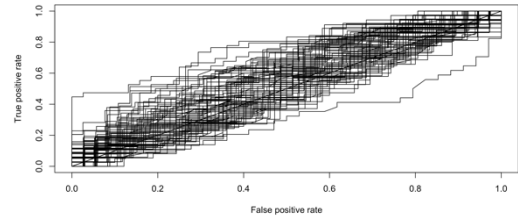
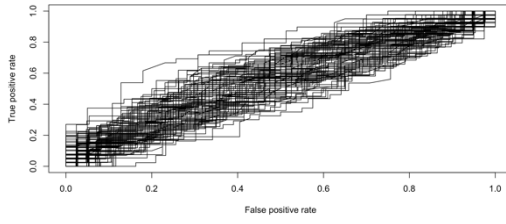
Cognition

Genetic

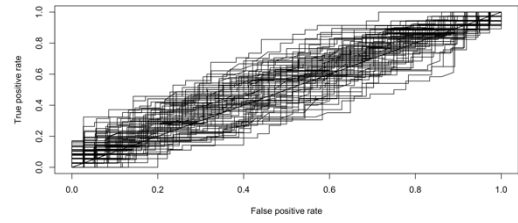
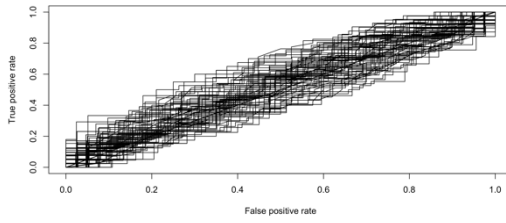
**HC
vs.
CC**



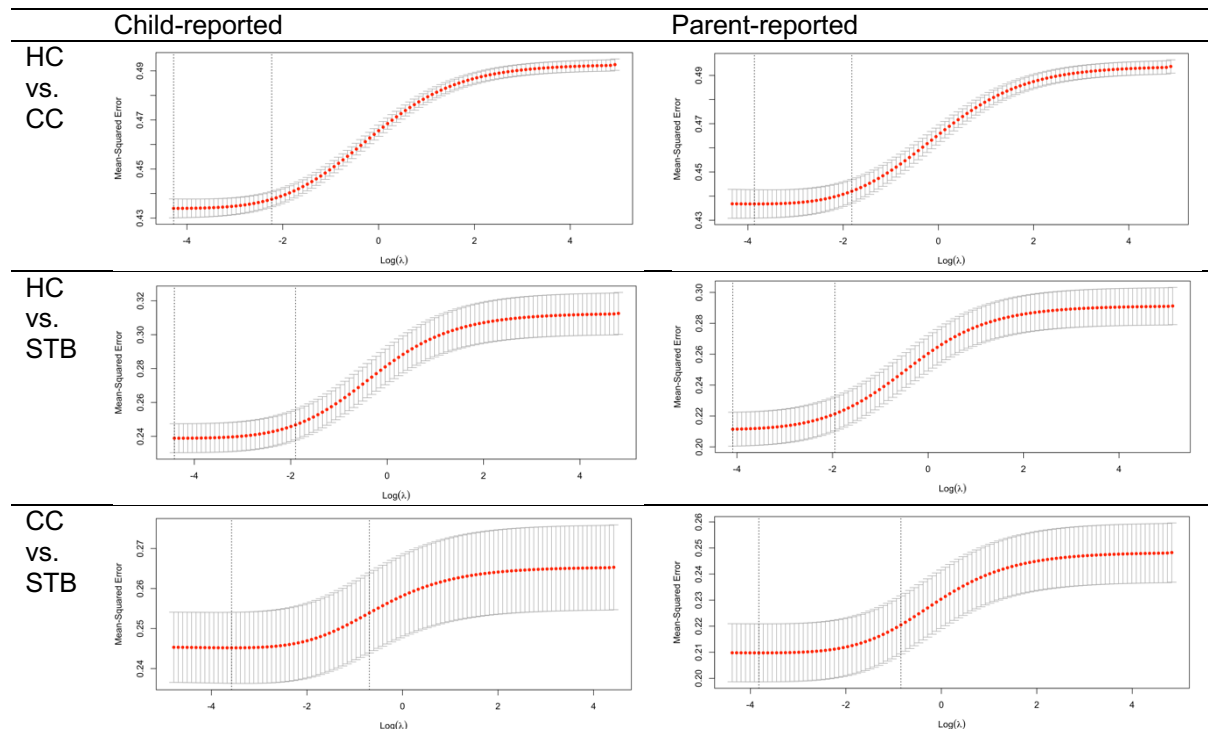
**HC
vs.
STB**



**CC
vs.
STB**



Supplementary Figure S5. Cross-validation curve, with upper and lower standard deviation curves, as a function of lambda value



Supplemental Table S4. Average Brier Score per binomial penalized logistic regression analysis per alpha

Comparison, alpha:	0.25	0.50	0.75	1.00
Child-reported STB				
HC vs. CC	0.461	0.459	0.459	0.461
HC vs. STB	0.459	0.457	0.457	0.457
CC vs. STB	0.540	0.537	0.535	0.537
Parent-reported STB				
HC vs. CC	0.463	0.462	0.461	0.459
HC vs. STB	0.451	0.454	0.453	0.454
CC vs. STB	0.494	0.501	0.502	0.510

Supplemental Table S5. Results of feature selection (child-reported)

Comparison	Alpha:	0.25	0.5	0.75	1
HC vs. CC		Age	Age	Age	Age
		Race	Parental income	Parental income	Parental income
		Parental income	Sleep: total score	Sleep: total score	Sleep: total score
		Sleep: excessive somnolescence	BMI	BMI	BMI
		Sleep: total score	Screen time weekend	Family conflict	Family conflict
		BMI	Family conflict	School involvement	School involvement
			School involvement	Bullying	Bullying
		Screen time weekend	Bullying	Family history of psychopathology	Family history of psychopathology
		Family conflict	Family history of psychopathology	Impulsivity: positive urgency	Impulsivity: positive urgency
		School involvement	Impulsivity: positive urgency	Impulsivity: lack of perseverance	Impulsivity: lack of perseverance
		Bullying	Impulsivity: lack of perseverance	Picture sequence memory task performance	Picture sequence memory task performance
		Family history of psychopathology	Picture sequence memory task performance	Left caudate activation during loss anticipation	Left caudate activation during loss anticipation
		Impulsivity: lack of planning	Left caudate activation during loss anticipation	Life event – domestic violence	Life event – domestic violence
		Impulsivity: positive urgency	Life event – domestic violence	Life event – unexpected death loved one	Life event – unexpected death loved one
		Impulsivity: lack of perseverance	Life event – unexpected death loved one		
		Picture sequence memory task performance			
		Right inferior temporal lobe activation during reward anticipation			
		Left caudate activation during loss anticipation			
		Life event – accident			
		Life event – domestic violence			
	Life event – unexpected death loved one				

HC vs. STB	Sleep: excessive somnolesence	Sleep: total score	Sleep: total score	Sleep: total score
	Sleep: total score	Screen time weekend	Screen time weekend	Screen time weekend
	Screen time weekend	Parental monitoring	Parental monitoring	Family conflict
	Parental monitoring	Family conflict	Family conflict	Bullying
	Family conflict	Pubertal status	School involvement	Impulsivity: negative urgency
	School involvement	Bullying	Bullying	Impulsivity: lack of planning
	Pubertal status	Impulsivity: negative urgency	Impulsivity: negative urgency	
	Bullying	Impulsivity: lack of planning	Impulsivity: lack of planning	
	Having a group of friends			
	Impulsivity: negative urgency			
	Impulsivity: lack of perseverance			
	Impulsivity: lack of planning			
CC vs. STB	Family conflict	Family conflict	Family conflict	Family conflict
	Prodromal psychosis	Prodromal psychosis	Prodromal psychosis	Prodromal psychosis
	CBCL: DSM5 Depression subscale	Impulsivity: negative urgency	Impulsivity: negative urgency	Impulsivity: negative urgency
	Impulsivity: negative urgency	Impulsivity: lack of planning	Impulsivity: lack of planning	Impulsivity: lack of planning
	Impulsivity: lack of planning			

Note: CC: clinical control group; HC: healthy control group; STB: suicidal thoughts and behaviors group

Supplemental Table S6. Results of feature selection (parent-reported)

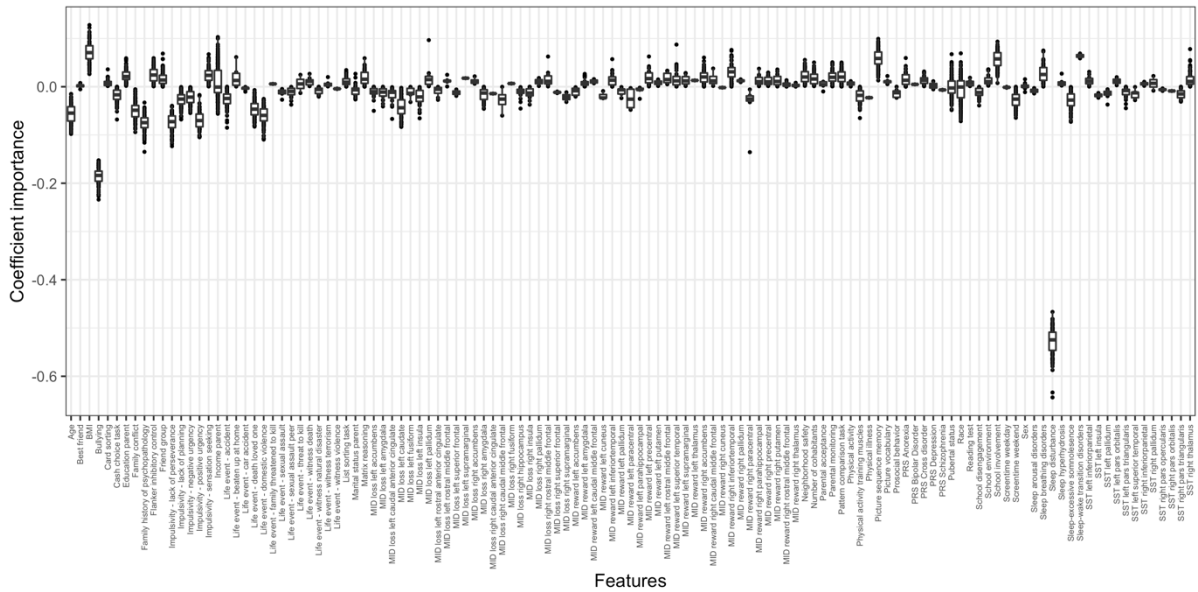
Comparison	Alpha:	0.25	0.5	0.75	1
HC vs. CC		Age	Age	Age	Age
		Race	Race	Race	Race
		Parental income	Parental income	Parental income	Parental income
		Sleep-excessive somnolence	Sleep - total sleep score	Sleep - total sleep score	Sleep - total sleep score
		Sleep - total sleep score	Exercise in the past week	BMI	BMI
		Exercise in the past week	BMI	Screen time in weekends	Screen time in weekends
		BMI	Screen time in weekends	Family conflict	Family conflict
		Pubertal status	Pubertal status	School involvement	School involvement
		Screen time in weekends	Family conflict	Bullying	Bullying
		Family conflict	School involvement	Friend group	Family history of psychopathology
		School involvement	Bullying	Family history of psychopathology	Impulsivity: sensation seeking
		Bullying	Friend group	Impulsivity: sensation seeking	Impulsivity: positive urgency
		Friend group	Family history of psychopathology	Impulsivity: positive urgency	Impulsivity: lack of perseverance
		Family history of psychopathology	Impulsivity: sensation seeking	Impulsivity: lack of perseverance	Impulsivity: negative urgency
		Cash Choice Task performance	Impulsivity: positive urgency	Impulsivity: negative urgency	Impulsivity: lack of planning
		Impulsivity: sensation seeking	Impulsivity: lack of perseverance	Impulsivity: lack of planning	Picture sequence memory
		Impulsivity: positive urgency	Impulsivity: negative urgency	Picture sequence memory	Pattern comparison: processing speed
		Impulsivity: lack of perseverance	Impulsivity: lack of planning	Left caudate activation during loss anticipation	Left caudate activation during loss anticipation
		Impulsivity: negative urgency	Pattern comparison: processing speed	Right amygdala activation during loss anticipation	Right amygdala activation during loss anticipation
		Impulsivity: lack of planning	Picture sequence memory	Life event – accident	Life event – accident
	Pattern comparison: processing speed	Left caudate activation during loss anticipation	Life event – domestic violence	Life event – domestic violence	
	Picture sequence memory	Right amygdala activation during loss anticipation	Life event – unexpected death loved one	Life event – unexpected death loved one	
	Left caudate activation during loss anticipation	Right inferior temporal gyrus during reward			

		anticipation		
	Right amygdala activation during loss anticipation	Life event – accident		
	Right thalamus activation during successful response inhibition	Life event – domestic violence		
	Right inferior temporal gyrus during reward anticipation	Life event – unexpected death loved one		
	Life event – accident			
	Life event – domestic violence			
	Life event – unexpected death loved one			
HC vs. STB	Sex	Sex	Sleep-excessive somnolesence	Sleep - total sleep score
	Sleep-excessive somnolesence	Sleep-excessive somnolesence	Sleep - total sleep score	Family conflict
	Sleep - total sleep score	Sleep - total sleep score	Family conflict	Bullying
	Family conflict	Family conflict	Bullying	Family history of psychopathology
	School environment	Bullying	Family history of psychopathology	Impulsivity: negative urgency
	Bullying	Family history of psychopathology	Impulsivity: negative urgency	Life event – domestic violence
	Family history of psychopathology	Impulsivity: negative urgency	Life event – domestic violence	
	Impulsivity: negative urgency	Life event – domestic violence		
	Life event – domestic violence			
CC vs. STB	CBCL: Anxious Depression subscale	CBCL: Anxious Depression subscale	CBCL: Anxious Depression subscale	CBCL: Internalizing Broad Band Score
	CBCL: Internalizing Broad Band Score	CBCL: Internalizing Broad Band Score	CBCL: Internalizing Broad Band Score	CBCL: Externalizing Broad Band Score
	CBCL: Externalizing Broad Band Score	CBCL: Externalizing Broad Band Score	CBCL: Externalizing Broad Band Score	CBCL: DSM5 Depression subscale
	CBCL: DSM5 Depression subscale	CBCL: DSM5 Depression subscale	CBCL: DSM5 Depression subscale	History of mental health treatment
	CBCL: Conduct Disorder subscale	History of mental health treatment	History of mental health treatment	
	History of mental health service use			
	History of mental health treatment			

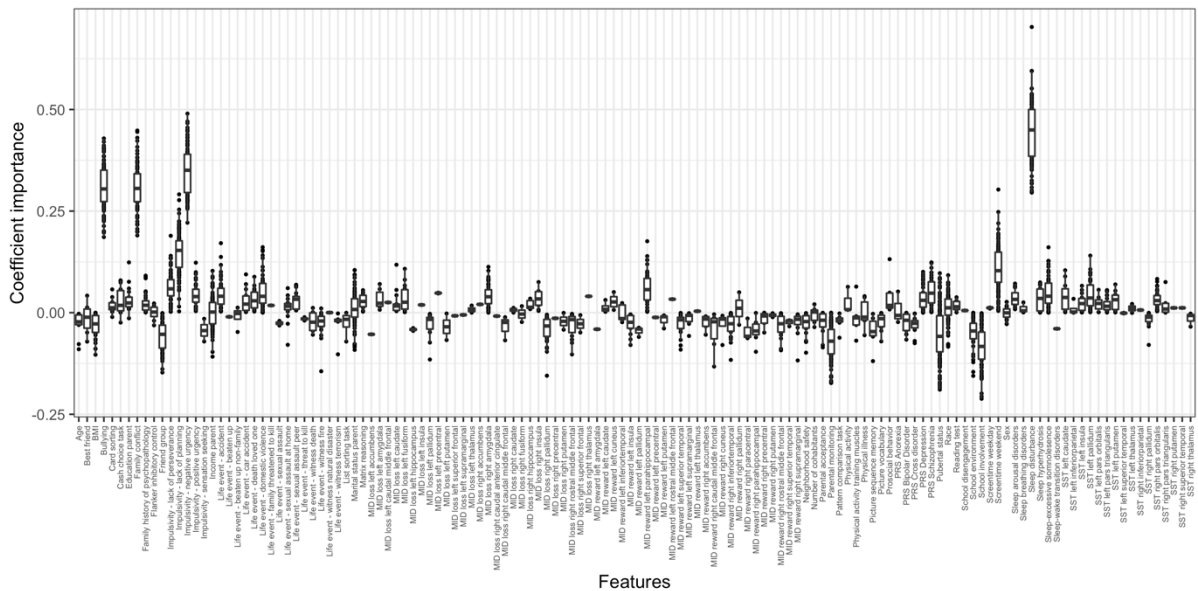
Note: CC: clinical control group; HC: healthy control group; STB: suicidal thoughts and behaviors group

Supplementary Figure S6. Coefficients of the features in the penalised logistic regression in the training set. The boxplots represent the coefficients across CV folds. They thereby show the stability of the coefficients across folds.

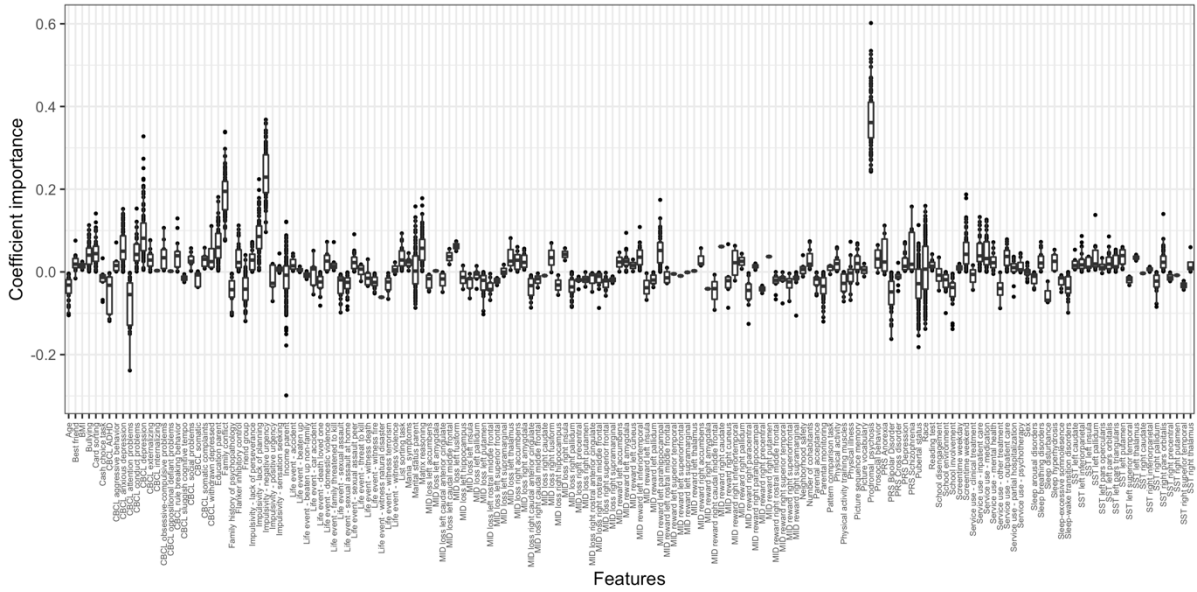
A. Child-reported HC vs. CC



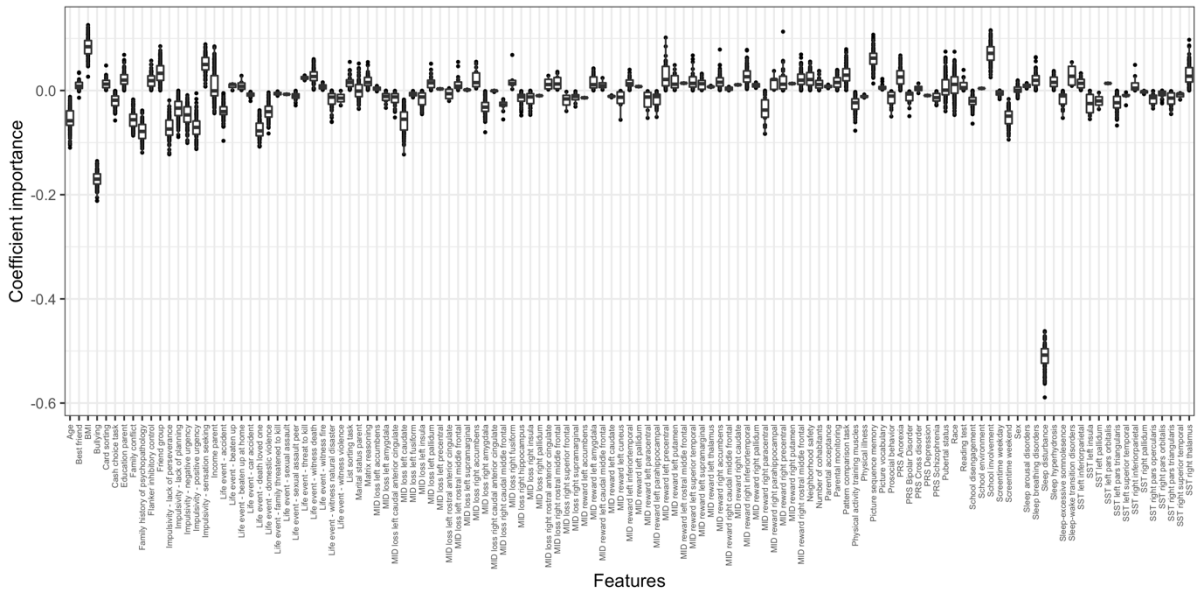
B. Child-reported HC vs. STB



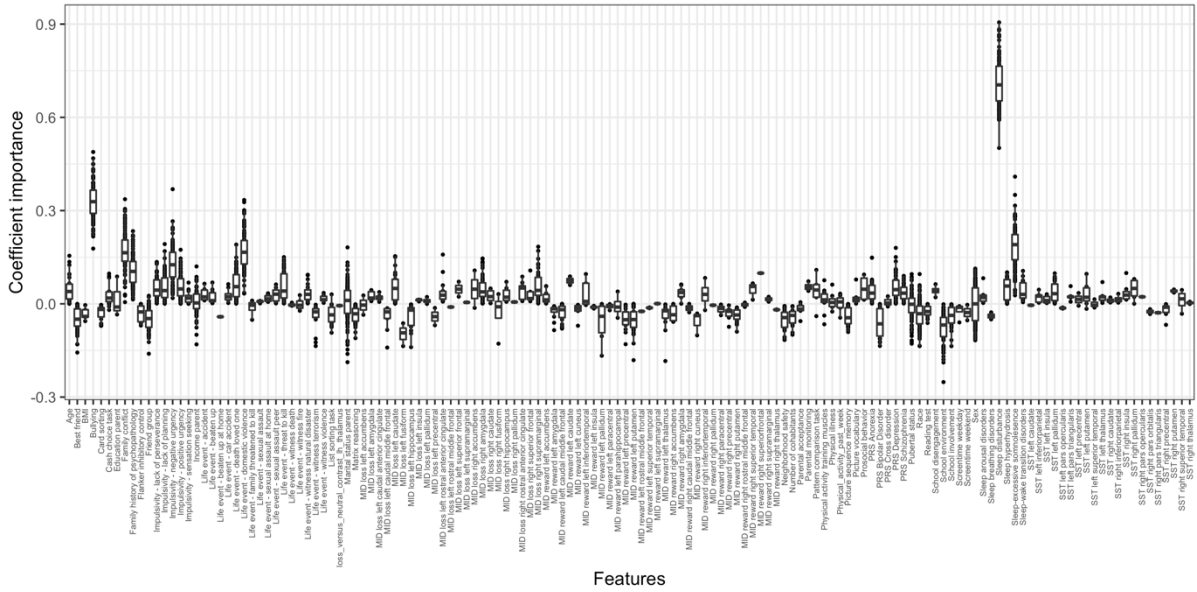
C. Child-reported CC vs. STB



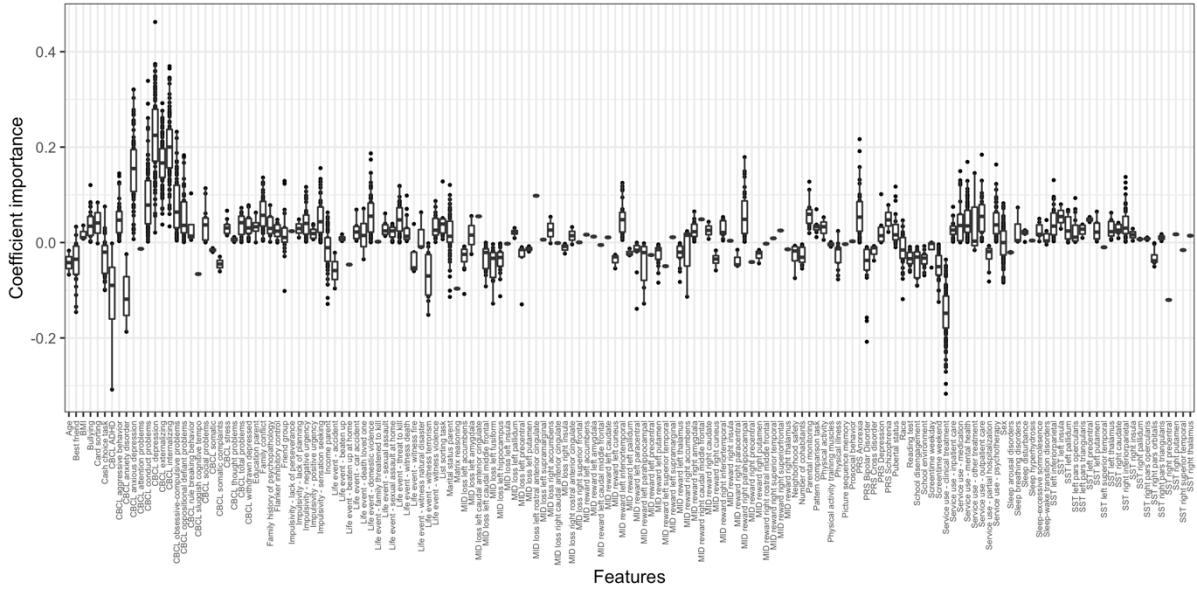
D. Parent-reported HC vs. CC



E. Parent-reported HC vs. STB



F. Parent-reported CC vs. STB



Supplemental note 8

To examine the effect of using a more strict stability selection approach, we used the C060 package (38). This method combines feature selection methods from elastic-net with resampling, meaning that the model is repeatedly fitted on subsamples. Here we used an alpha threshold of 0.5 as the main analysis showed that the performance of the models were very similar across the different alpha levels. The default values for the threshold for stability selection and family-wise error rate (FWER) recommended by the authors of the stability selection method were used, which included a threshold of 0.75 and an error rate of 0.05 (please see 39). The results show that the features selected using this strict stability selection approach are similar to those observed using our initial feature selection analysis, however, this time, less features were selected (see table below). Including the features from the stricter feature selection approach into the prediction model for the independent validation dataset showed that prediction was poorer than using the features from the feature selection approach used in the manuscript (see table below)

Results of feature selection when a strict stability selection was applied

Child-reported			
Comparison:	HC vs CC	HC vs STB	CC vs STB
	Sleep: total score	Sleep: total score	Family conflict
	Bullying	Family conflict	Prodromal psychosis
			Impulsivity: negative urgency
Parent-reported			
	Sleep: total score	Sleep: excessive somnolence	CBCL: Anxious Depression subscale
	Bullying	Sleep: total score	CBCL: DSM5 Depression subscale
		Bullying	

Note: CC: clinical control group; HC: healthy control group; STB: suicidal thoughts and behaviors group

Classification of STB groups (child-reported and parent-reported): Results of binomial penalized logistic regression analysis in the validation set when a strict stability selection approach was used.

Comparison	AUROC	Sensitivity	Specificity	Accuracy	PPV	NPV
Child-reported STB						
HC vs. CC	0.690	0.734	0.538	0.636	0.569	0.708
HC vs. STB	0.704	1.000	0.000	0.500	0.155	NA
CC vs. STB	0.692	0.720	0.534	0.627	0.191	0.926
Parent-reported STB						
HC vs. CC	0.684	0.684	0.572	0.628	0.580	0.677
HC vs. STB	0.765	1.000	0.000	0.500	0.154	NA
CC vs. STB	0.500	1.000	0.000	0.500	0.136	NA

Note: CC: clinical control group; HC: healthy control group; STB: suicidal thoughts and behaviours group

Supplemental Table S7. Classification of groups (child-reported) in independent dataset using only the features selected at different alpha levels in the training dataset

Comparison	Using features selected in training dataset at alpha	AUROC	Sensitivity	Specificity	Accuracy	PPV	NPV
HC vs. CC							
	0.25	0.706	0.671	0.644	0.658	0.610	0.702
	0.50	0.703	0.674	0.640	0.657	0.608	0.702
	0.75	0.703	0.669	0.642	0.656	0.608	0.700
	1.00	0.703	0.669	0.642	0.656	0.608	0.700
HC vs. STB							
	0.25	0.790	0.735	0.649	0.692	0.278	0.930
	0.50	0.783	0.727	0.647	0.687	0.275	0.928
	0.75	0.792	0.758	0.664	0.711	0.293	0.937
	1.00	0.784	0.720	0.657	0.688	0.279	0.927
CC vs. STB							
	0.25	0.703	0.712	0.567	0.639	0.201	0.928
	0.50	0.711	0.758	0.553	0.655	0.206	0.937
	0.75	0.711	0.758	0.553	0.655	0.206	0.937
	1.00	0.711	0.750	0.557	0.654	0.206	0.936

Note: CC: clinical control group; HC: healthy control group; STB: suicidal thoughts and behaviors group, PPV: positive predictive value, NPV: negative predictive value

Supplemental Table S8. Classification of groups (parent-reported) in independent dataset using only the features selected at different alpha levels in the training dataset

Comparison	Using features selected in training dataset at alpha	AUROC	Sensitivity	Specificity	Accuracy	PPV	NPV
HC vs. CC							
	0.25	0.707	0.637	0.673	0.655	0.627	0.682
	0.50	0.706	0.642	0.670	0.656	0.627	0.684
	0.75	0.705	0.642	0.658	0.650	0.618	0.680
	1.00	0.704	0.643	0.666	0.655	0.625	0.684
HC vs. STB							
	0.25	0.823	0.767	0.738	0.752	0.347	0.946
	0.50	0.821	0.774	0.736	0.755	0.348	0.947
	0.75	0.814	0.767	0.738	0.752	0.347	0.946
	1.00	0.813	0.744	0.728	0.736	0.332	0.940
CC vs. STB							
	0.25	0.706	0.583	0.714	0.649	0.241	0.917
	0.50	0.706	0.583	0.700	0.642	0.233	0.915
	0.75	0.706	0.583	0.699	0.641	0.232	0.915
	1.00	0.703	0.598	0.700	0.649	0.237	0.918

Note: CC: clinical control group; HC: healthy control group; STB: suicidal thoughts and behaviors group, PPV: positive predictive value, NPV: negative predictive value

Supplemental Table S9. Classification of STB groups (child-reported): Results of binomial penalized logistic regression analysis only including specific types of predictors

Sociodemographic								
Comparison	Alpha	AUROC	SD AUROC	Sensitivity	Specificity	Accuracy	PPV	NPV
HC vs. CC								
	0.25	0.559	0.026	0.551	0.532	0.542	0.541	0.542
	0.50	0.558	0.029	0.542	0.535	0.538	0.538	0.539
	0.75	0.560	0.025	0.538	0.540	0.539	0.539	0.539
	1.00	0.557	0.029	0.544	0.539	0.541	0.541	0.541
HC vs. STB								
	0.25	0.581	0.056	0.500	0.614	0.557	0.565	0.551
	0.50	0.582	0.062	0.498	0.624	0.561	0.570	0.555
	0.75	0.577	0.056	0.505	0.615	0.560	0.568	0.554
	1.00	0.575	0.061	0.516	0.593	0.555	0.559	0.551
CC vs. STB								
	0.25	0.552	0.062	0.552	0.528	0.540	0.539	0.541
	0.50	0.547	0.062	0.594	0.469	0.532	0.528	0.536
	0.75	0.539	0.068	0.572	0.483	0.528	0.525	0.530
	1.00	0.537	0.052	0.649	0.404	0.526	0.521	0.535
Physical health								
Comparison	Alpha	AUROC	SD AUROC	Sensitivity	Specificity	Accuracy	PPV	NPV
HC vs. CC								
	0.25	0.669	0.021	0.692	0.553	0.622	0.607	0.642
	0.50	0.668	0.028	0.695	0.550	0.623	0.607	0.643
	0.75	0.668	0.028	0.695	0.552	0.624	0.608	0.644
	1.00	0.669	0.029	0.696	0.552	0.624	0.608	0.645
HC vs. STB								
	0.25	0.712	0.053	0.596	0.720	0.658	0.680	0.640
	0.50	0.725	0.059	0.606	0.744	0.675	0.703	0.654
	0.75	0.718	0.053	0.602	0.735	0.668	0.694	0.649
	1.00	0.715	0.060	0.602	0.726	0.664	0.687	0.646
CC vs. STB								
	0.25	0.584	0.064	0.538	0.577	0.557	0.559	0.555
	0.50	0.585	0.063	0.561	0.567	0.564	0.564	0.563

0.75	0.581	0.060	0.547	0.558	0.553	0.553	0.552
1.00	0.583	0.052	0.536	0.576	0.556	0.558	0.554

Social environment

Comparison	Alpha	AUROC	SD AUROC	Sensitivity	Specificity	Accuracy	PPV	NPV
HC vs. CC								
	0.25	0.619	0.025	0.698	0.474	0.586	0.570	0.611
	0.50	0.619	0.026	0.696	0.479	0.587	0.572	0.612
	0.75	0.620	0.031	0.699	0.477	0.588	0.572	0.613
	1.00	0.616	0.028	0.699	0.474	0.587	0.571	0.612
HC vs. STB								
	0.25	0.739	0.054	0.619	0.748	0.683	0.711	0.662
	0.50	0.733	0.053	0.610	0.742	0.676	0.703	0.656
	0.75	0.733	0.052	0.608	0.750	0.679	0.708	0.656
	1.00	0.734	0.058	0.608	0.747	0.678	0.706	0.656
CC vs. STB								
	0.25	0.627	0.065	0.543	0.647	0.595	0.606	0.586
	0.50	0.634	0.063	0.539	0.658	0.599	0.612	0.588
	0.75	0.631	0.057	0.537	0.652	0.594	0.606	0.584
	1.00	0.628	0.060	0.540	0.653	0.596	0.609	0.587

Clinical psychiatric

Comparison	Alpha	AUROC	SD AUROC	Sensitivity	Specificity	Accuracy	PPV	NPV
CC vs. STB								
	0.25	0.675	0.060	0.528	0.726	0.627	0.658	0.606
	0.50	0.683	0.059	0.519	0.733	0.626	0.661	0.604
	0.75	0.675	0.057	0.517	0.725	0.621	0.653	0.600
	1.00	0.675	0.055	0.513	0.730	0.622	0.655	0.600

Cognition

Comparison	Alpha	AUROC	SD AUROC	Sensitivity	Specificity	Accuracy	PPV	NPV
HC vs. CC								
	0.25	0.587	0.027	0.578	0.547	0.563	0.561	0.565
	0.50	0.588	0.022	0.581	0.549	0.565	0.563	0.567
	0.75	0.589	0.029	0.582	0.551	0.566	0.564	0.568
	1.00	0.588	0.030	0.581	0.546	0.563	0.561	0.566
HC vs. STB								
	0.25	0.710	0.054	0.648	0.662	0.655	0.658	0.653

0.50	0.709	0.052	0.646	0.666	0.656	0.659	0.653
0.75	0.711	0.056	0.645	0.670	0.658	0.662	0.654
1.00	0.709	0.048	0.643	0.663	0.653	0.656	0.650

CC vs. STB

0.25	0.645	0.058	0.596	0.608	0.602	0.603	0.601
0.50	0.654	0.063	0.595	0.631	0.613	0.617	0.609
0.75	0.648	0.068	0.604	0.613	0.608	0.609	0.607
1.00	0.651	0.069	0.595	0.617	0.606	0.608	0.603

Neuroimaging

Comparison	Alpha	AUROC	SD AUROC	Sensitivity	Specificity	Accuracy	PPV	NPV
------------	-------	-------	----------	-------------	-------------	----------	-----	-----

HC vs. CC

0.25	0.504	0.021	0.542	0.462	0.502	0.502	0.503
0.50	0.503	0.022	0.524	0.475	0.499	0.499	0.499
0.75	0.504	0.019	0.536	0.471	0.503	0.503	0.504
1.00	0.504	0.018	0.586	0.422	0.504	0.503	0.505

HC vs. STB

0.25	0.518	0.047	0.664	0.370	0.517	0.513	0.524
0.50	0.514	0.044	0.695	0.328	0.511	0.508	0.518
0.75	0.519	0.046	0.681	0.352	0.517	0.513	0.525
1.00	0.520	0.044	0.660	0.366	0.513	0.510	0.519

CC vs. STB

0.25	0.496	0.027	0.781	0.216	0.498	0.499	0.497
0.50	0.498	0.026	0.802	0.195	0.499	0.499	0.497
0.75	0.500	0.033	0.812	0.185	0.499	0.499	0.496
1.00	0.498	0.027	0.801	0.193	0.497	0.498	0.492

Genetic

Comparison	Alpha	AUROC	SD AUROC	Sensitivity	Specificity	Accuracy	PPV	NPV
------------	-------	-------	----------	-------------	-------------	----------	-----	-----

HC vs. CC

0.25	0.517	0.025	0.556	0.472	0.514	0.513	0.515
0.50	0.513	0.024	0.501	0.520	0.510	0.511	0.510
0.75	0.517	0.023	0.574	0.456	0.515	0.513	0.517
1.00	0.515	0.023	0.553	0.474	0.514	0.513	0.515

HC vs. STB

0.25	0.570	0.060	0.542	0.556	0.549	0.550	0.549
0.50	0.563	0.064	0.540	0.548	0.544	0.544	0.544

0.75	0.562	0.058	0.540	0.550	0.545	0.545	0.545
1.00	0.562	0.055	0.558	0.528	0.543	0.542	0.544
<hr/>							
CC vs. STB							
0.25	0.518	0.048	0.649	0.380	0.515	0.511	0.520
0.50	0.524	0.050	0.613	0.416	0.515	0.512	0.518
0.75	0.522	0.046	0.649	0.387	0.518	0.514	0.524
1.00	0.517	0.050	0.615	0.407	0.511	0.509	0.514
<hr/>							

Note: CC: clinical control group; HC: healthy control group; STB: suicidal thoughts and behaviors group, PPV: positive predictive value, NPV: negative predictive value

**Supplemental Table S10. Classification of STB groups (parent-reported):
Results of binomial penalized logistic regression analysis only including
specific types of predictors**

Sociodemographic								
Comparison	Alpha	AUROC	SD AUROC	Sensitivity	Specificity	Accuracy	PPV	NPV
HC vs. CC								
	0.25	0.555	0.030	0.539	0.542	0.540	0.540	0.540
	0.50	0.551	0.027	0.533	0.544	0.538	0.539	0.538
	0.75	0.553	0.029	0.532	0.540	0.536	0.537	0.536
	1.00	0.550	0.029	0.529	0.539	0.534	0.534	0.534
HC vs. STB								
	0.25	0.606	0.068	0.566	0.582	0.574	0.575	0.573
	0.50	0.594	0.069	0.564	0.576	0.570	0.571	0.569
	0.75	0.592	0.068	0.569	0.566	0.568	0.568	0.568
	1.00	0.593	0.061	0.537	0.590	0.563	0.567	0.560
CC vs. STB								
	0.25	0.540	0.054	0.580	0.492	0.536	0.533	0.539
	0.50	0.530	0.059	0.580	0.473	0.526	0.524	0.529
	0.75	0.528	0.065	0.648	0.406	0.527	0.522	0.536
	1.00	0.534	0.059	0.617	0.443	0.530	0.526	0.536
Physical health								
Comparison	Alpha	AUROC	SD AUROC	Sensitivity	Specificity	Accuracy	PPV	NPV
HC vs. CC								
	0.25	0.663	0.025	0.686	0.552	0.619	0.605	0.637
	0.50	0.664	0.026	0.688	0.550	0.619	0.605	0.638
	0.75	0.662	0.029	0.688	0.547	0.618	0.603	0.637
	1.00	0.663	0.024	0.688	0.550	0.619	0.605	0.638
HC vs. STB								
	0.25	0.766	0.052	0.626	0.776	0.701	0.736	0.675
	0.50	0.764	0.049	0.628	0.776	0.702	0.737	0.676
	0.75	0.771	0.052	0.633	0.783	0.708	0.744	0.681
	1.00	0.767	0.060	0.632	0.778	0.705	0.740	0.679
CC vs. STB								
	0.25	0.626	0.062	0.517	0.685	0.601	0.621	0.586
	0.50	0.635	0.065	0.520	0.694	0.607	0.629	0.591

0.75	0.633	0.065	0.526	0.684	0.605	0.625	0.591
1.00	0.645	0.061	0.516	0.704	0.610	0.636	0.593

Social environment

Comparison	Alpha	AUROC	SD AUROC	Sensitivity	Specificity	Accuracy	PPV	NPV
HC vs. CC								
	0.25	0.619	0.025	0.677	0.498	0.587	0.574	0.606
	0.50	0.619	0.030	0.675	0.500	0.588	0.575	0.606
	0.75	0.618	0.030	0.675	0.497	0.586	0.573	0.605
	1.00	0.623	0.028	0.675	0.505	0.590	0.577	0.608
HC vs. STB								
	0.25	0.727	0.053	0.573	0.783	0.678	0.725	0.647
	0.50	0.727	0.061	0.567	0.777	0.672	0.718	0.642
	0.75	0.718	0.058	0.566	0.768	0.667	0.709	0.639
	1.00	0.715	0.054	0.565	0.769	0.667	0.709	0.638
CC vs. STB								
	0.25	0.619	0.059	0.479	0.696	0.588	0.612	0.572
	0.50	0.625	0.069	0.484	0.708	0.596	0.624	0.578
	0.75	0.627	0.063	0.482	0.713	0.597	0.627	0.579
	1.00	0.623	0.061	0.475	0.710	0.593	0.621	0.575

Clinical psychiatric

Comparison	Alpha	AUROC	SD AUROC	Sensitivity	Specificity	Accuracy	PPV	NPV
CC vs. STB								
	0.25	0.773	0.057	0.658	0.753	0.705	0.727	0.688
	0.50	0.776	0.055	0.659	0.768	0.713	0.739	0.692
	0.75	0.771	0.053	0.663	0.754	0.709	0.730	0.691
	1.00	0.781	0.049	0.663	0.767	0.715	0.740	0.695

Cognition

Comparison	Alpha	AUROC	SD AUROC	Sensitivity	Specificity	Accuracy	PPV	NPV
HC vs. CC								
	0.25	0.595	0.029	0.590	0.556	0.573	0.570	0.575
	0.50	0.595	0.028	0.588	0.560	0.574	0.572	0.576
	0.75	0.593	0.025	0.588	0.552	0.570	0.568	0.572
	1.00	0.592	0.028	0.588	0.554	0.571	0.568	0.573
HC vs. STB								
	0.25	0.643	0.055	0.580	0.626	0.603	0.608	0.598

0.50	0.635	0.061	0.575	0.618	0.597	0.601	0.593
0.75	0.635	0.067	0.581	0.609	0.595	0.598	0.593
1.00	0.638	0.061	0.582	0.628	0.605	0.610	0.600

CC vs. STB

0.25	0.538	0.065	0.608	0.457	0.532	0.528	0.538
0.50	0.539	0.067	0.585	0.476	0.530	0.527	0.534
0.75	0.542	0.063	0.588	0.479	0.533	0.530	0.537
1.00	0.529	0.055	0.574	0.480	0.527	0.525	0.530

Neuroimaging

Comparison	Alpha	AUROC	SD AUROC	Sensitivity	Specificity	Accuracy	PPV	NPV
------------	-------	-------	----------	-------------	-------------	----------	-----	-----

HC vs. CC

0.25	0.510	0.020	0.566	0.446	0.506	0.506	0.507
0.50	0.514	0.026	0.565	0.451	0.508	0.507	0.509
0.75	0.507	0.019	0.606	0.399	0.503	0.502	0.503
1.00	0.512	0.026	0.542	0.475	0.509	0.508	0.509

HC vs. STB

0.25	0.488	0.036	0.644	0.340	0.492	0.494	0.488
0.50	0.501	0.032	0.671	0.334	0.502	0.502	0.504
0.75	0.497	0.040	0.624	0.373	0.499	0.499	0.498
1.00	0.495	0.036	0.609	0.387	0.498	0.498	0.497

CC vs. STB

0.25	0.500	0.036	0.628	0.367	0.498	0.498	0.497
0.50	0.504	0.037	0.652	0.354	0.503	0.502	0.505
0.75	0.495	0.049	0.673	0.314	0.494	0.495	0.490
1.00	0.500	0.037	0.637	0.356	0.496	0.497	0.495

Genetic

Comparison	Alpha	AUROC	SD AUROC	Sensitivity	Specificity	Accuracy	PPV	NPV
------------	-------	-------	----------	-------------	-------------	----------	-----	-----

HC vs. CC

0.25	0.526	0.025	0.556	0.483	0.520	0.518	0.521
0.50	0.524	0.027	0.556	0.481	0.519	0.517	0.520
0.75	0.524	0.025	0.543	0.491	0.517	0.516	0.518
1.00	0.526	0.025	0.555	0.486	0.521	0.519	0.522

HC vs. STB

0.25	0.546	0.055	0.575	0.487	0.531	0.529	0.534
0.50	0.544	0.070	0.548	0.513	0.530	0.529	0.531

0.75	0.550	0.061	0.535	0.528	0.532	0.531	0.532
1.00	0.537	0.056	0.526	0.523	0.525	0.525	0.525
<hr/>							
CC vs. STB							
0.25	0.531	0.067	0.571	0.461	0.516	0.514	0.518
0.50	0.530	0.061	0.573	0.467	0.520	0.518	0.522
0.75	0.529	0.057	0.544	0.491	0.518	0.517	0.519
1.00	0.525	0.058	0.524	0.509	0.516	0.516	0.516

Note: CC: clinical control group; HC: healthy control group; STB: suicidal thoughts and behaviors group, PPV: positive predictive value, NPV: negative predictive value

Supplemental note 9

The classification performance of the modalities were compared by using a Wilcoxon signed-rank test to test if the mean squared error of the probability was different from other modalities (for the results see Supplementary Table S11 and Table S12 below).

Supplementary figure S11. FDR-corrected p-values for Wilcoxon signed-rank tests comparing the mean squared error of the probability for every two modality types in the main analyses based on child-reported STB.

Child-reported STB							
HC vs. CC							
	Cognition	Socio-demographic	Social environment	Genetic	Imaging	Physical health	Mental health
Cognition	NA	$p < .0001$	$p < .0001$	$p < .0001$	$p < .0001$	$p < .0001$	NA
Socio-demographic		NA	$p < .0001$	$p < .0001$	$p < .0001$	$p < .0001$	NA
Social environment			NA	$p < .0001$	$p < .0001$	$p < .0001$	NA
Genetic				NA	$p < 0.05$	$p < .0001$	NA
Imaging					NA	$p < .0001$	NA
Physical health						NA	NA
Mental health							NA
HC vs. STB							
	Cognition	Socio-demographic	Social environment	Genetic	Imaging	Physical health	Mental health
Cognition	NA	$p < .0001$	$p < .0001$	$p < .0001$	$p < .0001$	$p < .05$	NA
Socio-demographic		NA	$p < .0001$	0.053	$p < .0001$	$p < .0001$	NA
Social environment			NA	$p < .0001$	$p < .0001$	$p < .05$	NA
Genetic				NA	$p < .0001$	$p < .0001$	NA
Imaging					NA	$p < .0001$	NA
Physical health						NA	NA
Mental health							NA
CC vs. STB							
	Cognition	Socio-demographic	Social environment	Genetic	Imaging	Physical health	Mental health
Cognition	NA	$p < .0001$	$p < .05$	$p < .0001$	$p < .0001$	$p < .0001$	$p < .0001$
Socio-demographic		NA	$p < .0001$	$p < .05$	$p < .0001$	$p < .05$	$p < .0001$

Social environment	NA	$p < .0001$	$p < .0001$	$p < .0001$	$p < .0001$
Genetic		NA	$p < .05$	$p < .0001$	$p < .0001$
Imaging			NA	$p < .0001$	$p < .0001$
Physical health				NA	$p < .0001$
Mental health					NA

Supplementary figure S12. FDR-corrected p-values for Wilcoxon signed-rank tests comparing the mean squared error of the probability for every two modality types in the main analyses based on parent-reported STB.

Parent-reported STB							
HC vs. CC							
	Cognition	Socio-demographic	Social environment	Genetic	Imaging	Physical health	Mental health
Cognition	NA	$p < .0001$	$p < .0001$	$p < .0001$	$p < .0001$	$p < .0001$	NA
Socio-demographic		NA	$p < .0001$	$p < .0001$	$p < .0001$	$p < .0001$	NA
Social environment			NA	$p < .0001$	$p < .0001$	$p < .0001$	NA
Genetic				NA	$p < .05$	$p < .0001$	NA
Imaging					NA	$p < .0001$	NA
Physical health						NA	NA
Mental health							NA
HC vs. STB							
	Cognition	Socio-demographic	Social environment	Genetic	Imaging	Physical health	Mental health
Cognition	NA	$p < .0001$	$p < .0001$	$p < .0001$	$p < .0001$	$p < .0001$	NA
Socio-demographic		NA	$p < .0001$	$p < .0001$	$p < .0001$	$p < .0001$	NA
Social environment			NA	$p < .0001$	$p < .0001$	$p < .0001$	NA
Genetic				NA	$p < .0001$	$p < .0001$	NA
Imaging					NA	$p < .0001$	NA
Physical health						NA	NA
Mental health							NA
CC vs. STB							
	Cognition	Socio-demographic	Social environment	Genetic	Imaging	Physical health	Mental health
Cognition	NA	0.135	$p < .0001$	0.930	$p < .0001$	$p < .0001$	$p < .0001$
Socio-demographic		NA	$p < .0001$	0.238	$p < .05$	$p < .0001$	$p < .0001$
Social environment			NA	$p < .0001$	$p < .0001$	0.715	$p < .0001$
Genetic				NA	$p < .05$	$p < .0001$	$p < .0001$
Imaging					NA	$p < .0001$	$p < .0001$

Physical health	NA	$p < .0001$
Mental health		NA

Supplemental Note 10

Instead of using a Ridge logistic regression to test the performance of the classification model with the selected features on the validation set, the performance of a random forest model was tested. Random forest modelling was performed using the randomForest package in R (40). The features selected in the training set using the penalised logistic regression with $\alpha = 0.5$ were used as input. The optimal number of variables that are randomly sampled as candidate for each split (m_{try}) was tuned and the number of trees was set to 1000. The random forest model was calibrated using Platt's scaling (41). The random forest performed worse than the Ridge logistic regression on the validation set (please see the table below).

Comparison	AUROC	Sensitivity	Specificity	Balanced accuracy	PPV	NPV	Brier
Child-reported STB							
HC vs. CC	0.697	0.290	0.878	0.584	0.664	0.598	0.221
HC vs. STB	0.773	0.568	0.826	0.697	0.375	0.912	0.115
CC vs. STB	0.665	0.356	0.815	0.585	0.227	0.892	0.118
Parent-reported STB							
HC vs. CC	0.698	0.309	0.871	0.590	0.675	0.594	0.220
HC vs. STB	0.800	0.443	0.981	0.681	0.496	0.901	0.103
CC vs. STB	0.682	0.174	0.948	0.561	0.343	0.880	0.115

References

1. Janiri D, Doucet GE, Pompili M, Sani G, Luna B, Brent DA, et al. Risk and protective factors for childhood suicidality: a US population-based study. *Lancet Psychiatry*. 2020 Apr;7(4):317–26.
2. Stover PJ, Harlan WR, Hammond JA, Hendershot T, Hamilton CM. PhenX: a toolkit for interdisciplinary genetics research. *Curr Opin Lipidol*. 2010 Apr;21(2):136–40.
3. Petersen AC, Crockett L, Richards M, Boxer A. A self-report measure of pubertal status: Reliability, validity, and initial norms. *J Youth Adolesc*. 1988 Apr;17(2):117–33.
4. Bruni O, Ottaviano S, Guidetti V, Romoli M, Innocenzi M, Cortesi F, et al. The Sleep Disturbance Scale for Children (SDSC) Construction and validation of an instrument to evaluate sleep disturbances in childhood and adolescence. *J Sleep Res*. 1996 Dec;5(4):251–61.
5. Spruyt K, Gozal D. Pediatric sleep questionnaires as diagnostic or epidemiological tools: A review of currently available instruments. *Sleep Med Rev*. 2011 Feb 1;15(1):19–32.
6. CDC. Youth risk behavior survey (YRBS). 2019; Available from: <https://nvcv.dspacedirect.org/handle/20.500.11990/1420>
7. Todd RD, Joyner CA, Heath AC, Neuman RJ, Reich W. Reliability and stability of a semistructured DSM-IV interview designed for family studies. *J Am Acad Child Adolesc Psychiatry*. 2003 Dec;42(12):1460–8.
8. Sharif I, Wills TA, Sargent JD. Effect of visual media use on school performance: a prospective study. *J Adolesc Health*. 2010 Jan;46(1):52–61.
9. Kobak KA, Kratochvil CJ, Stanger C, Kaufman J. Computerized screening of comorbidity in adolescents with substance or psychiatric disorders. *Anxiety Disorders and Depression (La Jolla, CA)*. 2013
10. PhenXToolkit. Neighborhood Safety (#210900 & 210901). 2016; Available from: https://www.phenxtoolkit.org/toolkit_content/PDF/PX210901.pdf
11. Moos R, Moos B. Family Environment Scale Manual. 1981. Palo Alto, CA: Consulting Psychologists Press;
12. Goodman R, Meltzer H, Bailey V. The Strengths and Difficulties Questionnaire: a pilot study on the validity of the self-report version. *Int Rev Psychiatry*. 2003 Feb;15(1-2):173–7.
13. Schaefer ES. A configurational analysis of children's reports of parent behavior. *J Consult Psychol*. 1965 Dec;29(6):552–7.
14. Chilcoat HD, Anthony JC. Impact of parent monitoring on initiation of drug use through late childhood. *J Am Acad Child Adolesc Psychiatry*. 1996 Jan;35(1):91–100.
15. PhenXToolkit. School Risk and Protective Factors (#540500). 2016
16. Achenbach TM. Achenbach System of Empirically Based Assessment (ASEBA): Development, Findings, Theory, and Applications. University of Vermont, Research Center of Children, Youth & Families; 2009. 154 p.
17. Brown SA, Brumback T, Tomlinson K, Cummins K, Thompson WK, Nagel BJ, et al. The National Consortium on Alcohol and NeuroDevelopment in Adolescence (NCANDA): A Multisite Study of Adolescent Development and Substance Use. *J Stud Alcohol Drugs*. 2015 Nov 1;76(6):895–908.

18. Youngstrom EA, Frazier TW, Demeter C, Calabrese JR, Findling RL. Developing a 10-item mania scale from the Parent General Behavior Inventory for children and adolescents. *J Clin Psychiatry*. 2008 May;69(5):831–9.
19. Loewy RL, Therman S, Manninen M, Huttunen MO, Cannon TD. Prodromal psychosis screening in adolescent psychiatry clinics. *Early Interv Psychiatry*. 2012 Feb;6(1):69–75.
20. Wechsler D. Wechsler Intelligence Scale for Children®, 5th ed. Pearson, Bloomington, MN; 2014.
21. Wulfert E, Block JA, Santa Ana E, Rodriguez ML, Colzman M. Delay of gratification: impulsive choices and problem behaviors in early and late adolescence. *J Pers*. 2002 Aug;70(4):533–52.
22. Zapolski TCB, Stairs AM, Settles RF, Combs JL, Smith GT. The measurement of dispositions to rash action in children. *Assessment*. 2010 Mar;17(1):116–25.
23. Lynam DR. Development of a short form of the UPPS-P Impulsive Behavior Scale. Unpublished Technical Report. 2013;
24. Casey BJ, Cannonier T, Conley MI, Cohen AO, Barch DM, Heitzeg MM, et al. The Adolescent Brain Cognitive Development (ABCD) study: Imaging acquisition across 21 sites. *Dev Cogn Neurosci*. 2018 Aug;32:43–54.
25. Zhang R, Geng X, Lee TMC. Large-scale functional neural network correlates of response inhibition: an fMRI meta-analysis. *Brain Struct Funct*. 2017 Dec;222(9):3973–90.
26. Rae CL, Hughes LE, Weaver C, Anderson MC, Rowe JB. Selection and stopping in voluntary action: A meta-analysis and combined fMRI study . Vol. 86, *NeuroImage*. 2014. p. 381–91.
27. Wilson RP, Colizzi M, Bossong MG, Allen P, Kempton M, MTAC, et al. The Neural Substrate of Reward Anticipation in Health: A Meta-Analysis of fMRI Findings in the Monetary Incentive Delay Task. *Neuropsychol Rev*. 2018 Dec;28(4):496–506.
28. Oldham S, Murawski C, Fornito A, Youssef G, Yücel M, Lorenzetti V. The anticipation and outcome phases of reward and loss processing: A neuroimaging meta-analysis of the monetary incentive delay task. *Hum Brain Mapp*. 2018;39(8):3398–418.
29. Dugré JR, Dumais A, Bitar N, Potvin S. Loss anticipation and outcome during the Monetary Incentive Delay Task: a neuroimaging systematic review and meta-analysis. *PeerJ*. 2018 May 10;6:e4749.
30. Howard DM, Adams MJ, Clarke T-K, Hafferty JD, Gibson J, Shirali M, et al. Genome-wide meta-analysis of depression identifies 102 independent variants and highlights the importance of the prefrontal brain regions. *Nat Neurosci*. 2019 Mar;22(3):343–52.
31. Stahl EA, Breen G, Forstner AJ, McQuillin A, Ripke S, Trubetskoy V, et al. Genome-wide association study identifies 30 loci associated with bipolar disorder. *Nat Genet*. 2019 May;51(5):793–803.
32. Watson HJ, Yilmaz Z, Thornton LM, Hübel C, Coleman JRI, Gaspar HA, et al. Genome-wide association study identifies eight risk loci and implicates metabo-psychiatric origins for anorexia nervosa. *Nat Genet*. 2019 Aug 1;51(8):1207–14.
33. Ripke S, Walters JTR, O'Donovan MC, the Psychiatric Genomics Consortium SWG of, Others. Mapping genomic loci prioritises genes and implicates synaptic biology in schizophrenia. *MedRxiv* . 2020
34. Lee PH, Anttila V, Won H, Grünblatt E, Walitza S. Genome wide meta-analysis identifies genomic relationships, novel loci, and pleiotropic mechanisms across eight psychiatric disorders . 2019 [cited 2021 Jan 20]. (bioRxiv).

35. Lloyd-Jones LR, Zeng J, Sidorenko J, Yengo L, Moser G, Kemper KE, et al. Improved polygenic prediction by Bayesian multiple regression on summary statistics. *Nat Commun.* 2019 Nov 8;10(1):5086.
36. Uban KA, Horton MK, Jacobus J, Heyser C, Thompson WK, Tapert SF, et al. Biospecimens and the ABCD study: Rationale, methods of collection, measurement and early data. *Dev Cogn Neurosci.* 2018 Aug;32:97–106.
37. Das S, Forer L, Schönherr S, Sidore C, Locke AE, Kwong A, et al. Next-generation genotype imputation service and methods. *Nat Genet.* 2016 Oct;48(10):1284–7.
38. Sill M, Hielscher T, Becker N, Zucknick M. C060: Extended inference with lasso and elastic-net regularized cox and generalized linear models. *J Stat Softw* 2014; **62**.
39. Meinshausen N, Bühlmann P. Stability selection. *J R Stat Soc Series B Stat Methodol* 2010; **72**: 417–73.
40. Liaw A, Wiener M, Others. Classification and regression by randomForest. *R news* 2002; **2**: 18–22
41. Platt J, Others. Probabilistic outputs for support vector machines and comparisons to regularized likelihood methods. *Advances in large margin classifiers* 1999; **10**: 61–74.