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Association between family history of suicide attempt and neurocognitive functioning in community youth

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Background: Suicidal behavior is highly familial. Neurocognitive deficits have been proposed as an endophenotype for suicide risk that may contribute to the familial transmission of suicide. Yet, there is a lack of research on the neurocognitive functioning of first-degree biological relatives of suicide attempters. The aim of the present study is to conduct the largest investigation to date of neurocognitive functioning in community youth with a family history of a fatal or nonfatal suicide attempt (FH). **Methods:** Participants aged 8–21 years from the Philadelphia Neurodevelopmental Cohort completed detailed clinical and neurocognitive evaluations. A subsample of 501 participants with a FH was matched to a comparison group of 3,006 participants without a family history of suicide attempt (no-FH) on age, sex, race, and lifetime depression. **Results:** After adjusting for multiple comparisons and including relevant clinical and demographic covariates, youth with a FH had significantly lower executive function factor scores ($F[1,3432] = 6.63$, $p = .010$) and performed worse on individual tests of attention ($F[1,3382] = 7.08$, $p = .008$) and language reasoning ($F[1,3387] = 5.12$, $p = .024$) than no-FH youth. **Conclusions:** Youth with a FH show small differences in executive function, attention, and language reasoning compared to youth without a FH. Further research is warranted to investigate neurocognitive functioning as an endophenotype for suicide risk. Implications for the prevention and treatment of suicidal behaviors are discussed. **Keywords:** Family history; suicide; endophenotype; cognition.

Introduction

Suicide is the 10th leading cause of death overall in the United States (US) and the second leading cause of death among youth aged 10–24 (Hedegaard, Curtin, & Warner, 2018). In 2017, 47,173 individuals died by suicide and an estimated 1.4 million people attempted suicide in the United States (American Foundation for Suicide Prevention, 2019). Evidence suggests that suicidal behavior affects not only the suicide decedent or attempter, but also many other people in the individual's life, including family members (Cerel et al., 2016). There is a substantial literature documenting associations between family history of a fatal or nonfatal suicide attempt (FH) and a host of negative clinical outcomes, including suicidal and self-harm behaviors, substance abuse, various psychiatric diagnoses, and psychiatric hospitalizations (Brent & Melhem, 2008; Cerel et al., 1999; Geulayov, Metcalfe, Heron, Kidger, & Gunnell, 2014; O'Brien, Salas-Wright, Vaughn, & LeCloux, 2015; Wilcox et al., 2010). In addition, FH is associated with broader psychosocial outcomes in youth, such as interpersonal difficulties, low self-esteem, and poor school adjustment (Cerel et al., 1999; Pfeffer, Karus, Siegel, & Jiang, 2000; Pfeffer et al., 1997). However, there is very little research on the neurocognitive functioning of individuals with a FH and almost no research on this topic in youth.

There are several reasons it is important to investigate neurocognitive functioning in youth with a FH. First, studies have identified various neurocognitive deficits in suicide attempters (Jollant, Lawrence, Olié, Guillaume, & Courtet, 2011). For example, compared to controls without a history of suicide attempts, attempters have been shown to have deficits in attention, executive function (EF), verbal fluency, and decision-making (Bartfai et al., 1990; Bridge et al., 2012; Keilp, Gorlyn, Oquendo, Burke, & Mann, 2008; Keilp et al., 2001). Second, evidence indicates that neurocognitive deficits may distinguish suicide ideators from suicide attempters, such that attempters show greater deficits in EF than ideators (Saffer & Klonsky, 2018). Third, EF deficits have been associated with high-lethality suicide attempts (Keilp et al., 2001). Fourth, better neurocognitive functioning may protect against suicide risk (Zelazny et al., 2019). Fifth, neurocognitive deficits have been proposed as an endophenotype (i.e., an intermediate phenotype between genes and behavioral outcome) for suicidal behaviors (Brent & Melhem, 2008; Mann et al., 2009). Suicide is highly familial, and the results of adoption, twin, and family studies suggest that the aggregation of suicidal behaviors within families is partly due to genetic factors with heritability estimates of approximately 40%–55% (Brent & Melhem, 2008). The relatively high heritability of suicide and the complexity of suicidal behaviors have led to growing interest in identifying endophenotypes that may mediate the

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familial transmission of suicide (Mann et al., 2009). Although other candidate endophenotypes, such as impulsive-aggression, have received much research attention, there has been less focus on neurocognitive deficits. The limited research on the neurocognitive functioning of individuals with a FH is a major gap in the literature.

The sparse literature suggests that individuals with a FH perform worse on neurocognitive tests compared to individuals without a family history of suicide attempts (no-FH). However, these studies have focused mainly on adults, generally utilized small samples, and explored only a limited range of neurocognitive domains. Studies indicate that FH is associated with deficits in decision-making and altered brain processing during a decision-making task (Bridge et al., 2015; Ding et al., 2017; Hoehne, Richard-Devantoy, Ding, Turecki, & Jollant, 2015). In a small sample of adult first-degree relatives of suicide decedents, McGirr and colleagues (McGirr et al., 2010; McGirr, Jollant, & Turecki, 2013) found deficits in cognitive control and a lack of improvement in cognitive inhibition upon repeated testing after a social stressor, relative to no-FH comparison subjects. Finally, in a large prospective study of youth, a maternal history of suicide attempt was associated with poorer academic performance at age 14 (Geulayov, Metcalfe, & Gunnell, 2016). To the best of our knowledge, this is the extent of the literature on neurocognitive functioning in individuals with a FH.

The aim of the present study is to address this gap using data from the largest investigation to date of neurocognitive functioning in first-degree biological relatives of suicide attempters. We utilized data from the Philadelphia Neurodevelopmental Cohort (PNC) to compare the performance of youth with a FH to a matched no-FH comparison group on a comprehensive neurocognitive battery. We also performed follow-up sensitivity analyses to account for potential sociodemographic and clinical confounders: suicidal ideation, overall psychopathology, trauma exposure, and socioeconomic status (SES). These constructs were selected as covariates based on previous studies showing that they are associated with neurocognitive performance in the PNC and other samples (e.g., Barzilay, Calkins, Moore, Boyd et al., 2019; Barzilay, Calkins, Moore, Wolf et al., 2019; Gur et al., 2019; Moore et al., 2016). We hypothesized that youth with a FH would perform worse on the neurocognitive battery compared to matched no-FH youth.

Methods

Participants

The PNC is a community-based sample of 9,498 youth between the ages of 8 and 21 years. Participants were recruited from the Children's Hospital of Philadelphia (CHOP) pediatric healthcare network. Importantly, participants were not recruited from psychiatric treatment centers; therefore, the PNC is not enriched for individuals seeking mental health treatment. Inclusionary criteria included the following: (a) aged 8–21 years, (b) English proficiency, and (c) absence of developmental, physical, or cognitive conditions that could interfere with the completion of study procedures. Detailed descriptions of the PNC sample and study procedures have been reported elsewhere (Calkins et al., 2015; Merikangas et al., 2015; Moore et al., 2016).

The present study employed a case–control design. We identified 501 PNC participants (5% of total sample) with a family history of a fatal or nonfatal suicide attempt in a first-degree biological relative (81.2% parent, 17.4% sibling, 1.4% both parent and sibling). These 501 participants were matched to a no-FH control group of 3,006 (6:1 match) participants. The groups were matched on age, sex, race, and lifetime youth depression. Clinical and demographic characteristics of this subsample are presented in Table 1.

Procedures

Written parental permission and youth assent were obtained for minors, and participants over the age of 18 provided written informed consent. Participants completed a detailed clinical screening interview and a comprehensive neurocognitive battery. The clinical assessment was completed by a caregiver/legal guardian (ages 8–10), the youth proband (ages 18–21), or both (ages 11–17). The Institutional Review Boards of CHOP and the University of Pennsylvania approved all study procedures.

Measures

Clinical assessment. GOASSESS (Calkins et al., 2015) is a computerized, structured clinical interview derived from the K-SADS (Kaufman et al., 1997). GOASSESS screens for major domains of psychopathology as well as suicidal ideation and trauma exposure. Participants were classified as having experienced a significant lifetime depressive episode if the reported symptoms approximated the frequency and duration criteria outlined in the *DSM-IV-TR* and were accompanied by significant distress and/or impairment. Lifetime suicidal ideation was assessed with the question, 'Have you ever thought about killing yourself?' Affirmative responses were followed up with questions about current ideation. Interviewers were trained in a standardized protocol for responding to suicide risk, as described previously (Jones et al., 2019). Lifetime trauma exposure was assessed with eight items assessing exposure to a range of potentially traumatic stressors. Given a growing body of literature supporting a latent general psychopathology dimension (Ronald, 2019), we calculated an overall psychopathology ('p') score for each participant. The score was derived from a bifactor model that included item-level GOASSESS data covering all major domains of psychopathology (Calkins et al., 2015; Moore et al., 2019). Scores were standardized with a Z-transformation.

As part of the clinical assessment, participants completed the Family Interview for Genetic Studies (Maxwell, 1992), a measure designed to systematically gather information about family history of mental disorders. The interview begins by having the participant or collateral informant generate a family pedigree which in the PNC was limited to first-degree biological relatives of the proband (i.e., parents, full siblings, offspring). For each person in the family tree, the participant or collateral informant was asked about fatal and nonfatal suicide attempts. Responses were coded dichotomously (yes/no) to indicate whether a participant had a FH. We identified 501 PNC participants with a FH (93% reported nonfatal attempts, 7% reported fatal attempts).

Table 1 Demographic and clinical characteristics

Variable	Total (*N* = 3,507)	FH (*N* = 501)	No-FH (*N* = 3,006)	*p*
Age, *M* (*SD*)	14.52 (3.58)	14.42 (3.63)	14.54 (3.57)	.48
Sex (% female)	54%	54%	54%	1.00
Race (% minority)	52%	52%	52%	1.00
SES, *M* (*SD*)	.00 (1.00)	−.16 (.99)	.03 (1.00)	<.001
Lifetime depression (%yes)	22%	22%	22%	1.00
Overall psychopathology, *M* (*SD*)	.00 (1.00)	.32 (.91)	−.05 (1.00)	<.001
Suicidal ideation (%yes)	11%	19%	10%	<.001
Trauma exposure, *M* (*SD*)	.93 (1.28)	1.29 (1.49)	.87 (1.23)	<.001

FH, family history of suicide attempt.

Table 2 Computerized neurocognitive battery domains and tests

Neurocognitive domain	Construct	Test
Executive function	Attention	Penn Continuous Performance Test
	Working memory	Letter N-Back Task
	Mental flexibility	Penn Conditional Exclusion Test
Complex cognition	Language reasoning	Penn Verbal Reasoning Test
	Nonverbal reasoning	Penn Matrix Reasoning Test
	Spatial ability	Penn Line Orientation Test
Episodic memory	Face memory	Penn Face Memory Task
	Verbal memory	Penn Word Memory Task
	Spatial memory	Visual Object Learning Test
Social cognition	Emotion identification	Penn Emotion Identification Test
	Emotion differentiation	Penn Emotion Differentiation Test
	Age differentiation	Penn Age Differentiation Test

Neurocognitive assessment. Participants completed the reading subtest (READ) of the Wide Range Achievement Test-4th Edition (WRAT; Wilkinson & Robertson, 2006), which provides an estimate of participants' verbal IQ (Ramsden, et al., 2013). We used participants' standardized WRAT-READ scores, with a mean standardized score of 100. Participants also completed the 1-hr Penn Computerized Neurocognitive Battery (CNB; Gur et al., 2012). The CNB was designed to measure performance accuracy and speed in four neurocognitive domains: EF, complex cognition, episodic memory, and social cognition. The subtests that compose each domain are listed in Table 2. As described previously (Gur et al., 2012), the CNB tests were administered in a fixed order designed to maintain participant engagement and minimize fatigue. Participants were offered breaks approximately every 15 min and/or as needed. Extensive procedures were in place to ensure data quality. The battery was proctored by a trained administrator who entered a data validity code for each test. The data then underwent an automated validation check and, if necessary, were reviewed by a trained data validator (see Gur et al., 2012).

For each subtest, participants' accuracy (percent correct) and speed (reaction time) scores were normed by age using 2-year age bins. Age-normed reaction time scores were then multiplied by −1 so that a higher score indicates faster responding. *Efficiency* scores reflect the balance between accuracy and speed (Moore et al., 2015). To calculate efficiency scores, the accuracy and speed *Z*-scores were summed and then restandardized at the full-sample level. Thus, a participant's efficiency score reflects the number of standard deviations he/she is above or below the mean for that participant's age cohort (defined as a 2-year bin). Prior research supports the factor structure of the CNB (Moore et al., 2015).

SES. Participants' addresses were linked to census data, and these variables were factor analyzed to create an SES index for each participant's census block group. The SES factor score reflects neighborhood characteristics such as percent of residents with at least a high school education, median household income, percent of residents in poverty, and percent of residents who are employed. SES factor scores were standardized with a Z-transformation. In prior research with the PNC, the SES factor score was associated with neurocognitive performance, psychopathology, and both structural and functional brain parameters (Gur et al., 2019; Moore et al., 2016).

Analytic approach

We employed a two-step analytic approach. First, we examined mean differences in neurocognitive performance between the matched groups using *t* tests. We compared the groups on WRAT-READ scores, overall CNB performance, efficiency scores on the four CNB factors, and efficiency scores on the 12 individual cognitive tests that compose the four CNB factors. To correct for multiple comparisons, we adjusted the significance threshold using the Bonferroni correction. Second, we performed follow-up sensitivity analyses to further evaluate significant differences identified in step one. The sensitivity analyses included the following covariates entered simultaneously: overall psychopathology, suicidal ideation, SES, and trauma exposure.

Results

Preliminary analyses

Preliminary analyses did not reveal any significant non-normality in the dependent variables. Given the large difference in sample size between the FH and no-FH groups, we used Levene's test to evaluate potential violations of homogeneity of variance for each of the neurocognitive outcomes. Levene's test was significant for the complex cognition efficiency score (p = .006) and the spatial ability efficiency score (p = .005). As a result, to test mean differences in these two variables, we used Welch's t test, which adjusts the degrees of freedom to accommodate unequal variances.

Overall performance and CNB efficiency factor scores

As seen in Table 3, youth with a FH had lower scores on WRAT-READ, overall CNB accuracy, overall CNB efficiency, EF efficiency, and complex cognition efficiency compared to no-FH youth. After correcting for multiple comparisons, the group differences in overall CNB efficiency and complex cognition efficiency became nonsignificant.

Individual CNB test efficiency scores

Youth with a FH were significantly less efficient in attention, working memory, and language reasoning compared to no-FH youth (Table 4). After correcting for multiple comparisons, the group difference in working memory efficiency became nonsignificant.

Sensitivity analyses

Youth with a FH had significantly higher overall psychopathology ('p') factor scores, higher rates of lifetime suicidal ideation, greater trauma exposure, and lower SES factor scores than no-FH youth (Table 1). With these covariates included in the models, the group differences in EF efficiency (F[1,3432] = 6.63, p = .010), attention efficiency (F[1,3382] = 7.08, p = .008), and language reasoning efficiency (F[1,3387] = 5.12, p = .024) remained statistically significant. The group differences in overall CNB accuracy (F[1,3432] = 2.94, p = .087) and WRAT-READ scores (F[1,3432] = 2.78, p = .095) became marginally significant (see Table S1).

Discussion

Compared to matched youth without a FH, youth with a FH performed significantly worse on tests of EF, attention, and language reasoning and had marginally lower overall CNB accuracy and WRAT-READ scores. The observed effects were small in magnitude, but appear to be robust in that the differences in efficiency of EF, attention, and language reasoning survived correction for multiple comparisons and were not explained by SES, overall psychopathology, suicidal ideation, or trauma exposure. In addition, the groups were matched such that age, sex, race, and lifetime depression were roughly equivalent. Small effects can have potentially large implications, particularly when considered within a developmental context. EF skills, for example, have broad implications for many aspects of adolescent development and well-being that have significant public health relevance, such as academic achievement, mental health (including suicidal behaviors), risk-taking behaviors, and obesity (Best, Miller, & Naglieri, 2011; Keilp et al., 2001; Liang, Matheson, Kaye, & Boutelle, 2014; Pharo, Sim, Graham, Gross, & Hayne, 2011). Thus, small differences in neurocognitive performance in adolescence could cascade into progressively larger effects in a range of developmental outcomes over time, indicating that neurocognitive functioning may be an important target for prevention and intervention efforts.

These findings are consistent with several prior studies that reported EF and attention deficits among adult suicide attempters and first-degree relatives of suicide decedents (Keilp et al., 2001, 2008; McGirr et al., 2013). Notably, Keilp and colleagues found that attention deficits differentiated high-lethality suicide attempters from low-lethality attempters and nonattempters. Our results extend these previous findings by demonstrating similar EF and attention differences in youth and in a sample characterized mostly by family history of nonfatal suicide attempts. Lower EF may result in poorer decision-making and problem-solving capacities that could increase the risk for suicidal behaviors.

Table 3 Unadjusted mean differences in overall performance scores and efficiency factor scores

	FH		No-FH					
Variable	*M*	*SD*	*M*	*SD*	*t*	*df*	*p*	*d*
WRAT-READ	98.96	16.07	101.69	16.43	3.45	3483	**.001**	.17
Overall accuracy	−.13	.96	.02	1.01	3.17	3479	**.002**	.15
Overall speed	−.01	1.02	.002	1.00	.29	3479	.773	.01
Overall efficiency	−.10	.99	.02	1.00	2.45	3479	.014	.12
Executive function efficiency	−.15	1.05	.02	.99	3.62	3479	**<.001**	.19
Complex cognition efficiency	−.08	.89	.01	1.02	2.03	726	.043	.09
Episodic memory efficiency	−.04	1.05	.01	.99	1.07	3479	.285	.05
Social cognition efficiency	−.07	1.01	.01	1.00	1.73	3479	.084	.08

FH, family history of suicide attempt. p-values are unadjusted, those in bold survived Bonferroni correction.

Table 4 Unadjusted mean differences in individual test efficiency scores

Variable	FH		No-FH					
	M	*SD*	*M*	*SD*	*t*	*df*	*p*	*d*
Attention	−.13	1.00	.02	1.00	3.10	3422	**.002**	.15
Working memory	−.11	1.06	.02	.99	2.63	3365	.009	.13
Mental flexibility	−.01	.95	.001	1.01	.21	3429	.831	.01
Language reasoning	−.16	1.02	.03	1.00	3.73	3428	**<.001**	.19
Nonverbal reasoning	−.08	.96	.01	1.01	1.93	3427	.053	.09
Spatial ability	−.001	.85	.002	1.02	.26	677	.796	.01
Face memory	−.05	1.03	.009	.99	1.28	3431	.202	.06
Verbal memory	−.03	1.08	.004	.99	.64	3444	.524	.03
Spatial memory	−.05	1.03	.01	1.00	1.19	3413	.232	.06
Emotion identification	−.07	1.05	.01	.99	1.62	3478	.106	.08
Emotion differentiation	−.06	1.00	.01	1.00	1.40	3435	.160	.07
Age differentiation	−.03	1.00	.004	1.00	.61	3409	.539	.03

FH, family history of suicide attempt. *p*-values are unadjusted, those in bold survived Bonferroni correction.

Further, EF deficits have been proposed as a neurocognitive substrate of impulsive-aggression, which has consistently been linked to suicidal behavior (Brent & Melhem, 2008). Combined with previous work showing that EF may differentiate suicide ideators from attempters and low-lethality attempters from high-lethality attempters (Keilp et al., 2001; Saffer & Klonsky, 2018), the present results suggest that EF may be an important factor to consider when investigating suicide risk among those with a FH. However, although the groups differed significantly on the EF factor score, it is important to note that EF is a multi-faceted construct, and therefore, caution is warranted in interpreting the present findings as indicating broad EF deficits in FH youth. The difference in EF factor scores seems to be driven largely by differences in attention and, to a lesser extent, working memory. The groups did not differ on the test of mental flexibility/problem-solving, an important component of EF. Further, some aspects of EF, such as inhibitory control, are not assessed in the CNB. Future research using a larger range of EF tests could help determine which aspects of EF differentiate FH youth from non-FH youth.

There is less research on the association between verbal/language skills and suicide. Bartfai et al. (1990) found poorer verbal fluency among a small sample of recent adult suicide attempters compared to nonattempters. In addition, Keilp et al. (2001) found that deficits in letter fluency were part of a discriminant function that distinguished high-lethality suicide attempters from low-lethality attempters and nonattempters. The results of the present study substantially extend this limited prior work by demonstrating lower language reasoning skills among youth with a FH compared to no-FH youth, and a trend for lower estimated verbal IQ (as measured by WRAT-READ). Although it is relatively easy to understand links between EF and suicide risk, the role of verbal/language skills may be less clear. One speculative possibility is that difficulties verbally labeling and expressing emotions and mental states may impede verbal mediation of behavior, which could contribute to increased risk of suicidal behaviors. Thus, language deficits may hinder an individual's ability to 'talk' themselves out of suicidal behaviors. Notably, verbal deficits have been associated with violence and aggression and there is some evidence that impulsive-aggression is characterized by both language and EF deficits (Cohen et al., 2003; Villemarette-Pittman, Stanford, & Greve, 2003). Future research should further investigate the association between verbal reasoning and suicide risk among those with a FH.

The present results suggest that further research is warranted to investigate neurocognitive deficits as a potential endophenotype for suicide that may help explain the familial transmission of suicidal behavior. As noted above, prior studies have provided strong evidence for neurocognitive deficits among suicide attempters. In addition, several neurocognitive domains, including EF, are highly heritable (Friedman et al., 2008). The present findings showing worse neurocognitive functioning among first-degree biological relatives of suicide attempters relative to matched controls adds another compelling piece of evidence that should be further explored in future research.

Interestingly, a prior study using PNC data (Barzilay, Calkins, Moore, Boyd et al., 2019) found that youth who reported lifetime suicidal ideation showed superior overall performance on the CNB compared to youth who did not report suicidal ideation. The present study differed from this prior study in that the subsample was selected on the basis of a FH rather than on the presence of suicidal ideation, and the previous study did not examine the role of FH. In the present study, 19% of the participants with a FH reported lifetime suicidal ideation. The observed differences in EF, attention, and language reasoning remained significant when covarying for suicidal ideation. The differences in findings across the two studies highlight the importance of distinguishing ideation, attempts, and FH in future research, as the evidence for neurocognitive deficits appears to be more consistent for attempters and those with a FH than for ideators (Barzilay, Calkins, Moore, Boyd et al, 2019; Hoehne et al., 2015; Saffer & Klonsky, 2018).

The present study findings, although requiring further replication, may have clinical implications for youth and families. It is important to ask routinely about fatal and nonfatal suicide attempts among relatives when conducting clinical evaluations with youth, as their presence confers a risk for suicidal behavior. Additionally, when a clinician is aware of a FH, assessing neurocognitive functioning should be considered and any identified deficits could be targeted in treatment. There is growing interest in targeting neurocognitive deficits as part of the treatment or prevention of a range of psychiatric disorders in youth. For example, disordered attention has been proposed as a transdiagnostic problem that could be targeted in interventions, though more research is needed (Racer & Dishion, 2012). Moreover, empirically supported interventions, such as cognitive-behavioral therapy, include treatment modules focused on helping youth verbalize thoughts and feelings; problem-solve; and understand antecedents, behaviors, and consequences, which may be beneficial in addressing EF and language difficulties. Another clinical avenue is incorporating family assessment and early supportive intervention when an individual makes a suicide attempt, as the other family members (e.g., child, sibling) may be experiencing their own psychiatric risk factors that are undetected. As family-based therapies have been shown to be efficacious for suicidal youth (Asarnow & Mehlum, 2019), a family-focused approach may be similarly beneficial for relatives of suicide attempters. As there are no clear intervention recommendations for youth with a FH, further research is needed to examine the effects of interventions focused on targeting neurocognitive functioning.

Findings should be interpreted in the context of study limitations. First, given the scale of the PNC study, the clinical assessment was, by necessity, brief. Nonetheless, GOASSESS has been shown to be a valid psychopathology screener in multiple studies (Barzilay, Calkins, Moore, Wolf et al., 2019; Calkins et al., 2015; Jones et al, 2019; Moore et al., 2016). Second, the clinical evaluation included assessment of lifetime depressive episodes, rather than current depressive episode. Therefore, it was not possible to match the two groups on current depression or include current depressive symptoms as a covariate in the models. Similarly, although we covaried for important confounders that have been shown to be related to neurocognitive performance on the CNB, there are certainly other psychological and environmental factors relevant to cognitive functioning that were not assessed in the PNC and, therefore, could not be accounted for in this study. Third, we estimated SES using neighborhood census data and verbal IQ with WRAT-READ scores. Future studies could include more comprehensive assessments of these constructs. Fourth, self-reported FH may be imprecise. It is possible that an individual may not be aware of a family member's suicide attempt, or it may be unclear whether an incident actually constituted a suicide attempt or some other event such as an accidental drug overdose. Fifth, the FH group included mainly individuals with a family history of a nonfatal suicide attempt. It is unclear whether the present results would generalize to relatives of suicide decedents. Sixth, the cross-sectional design precluded us from examining whether neurocognitive functioning predicts subsequent suicidal ideation or attempts. If neurocognitive deficits are an endophenotype for suicide, they should mediate the association between FH and suicidal behavior. This type of analysis requires longitudinal data.

In conclusion, the present study is the largest to date to comprehensively investigate neurocognitive functioning among youth with a FH. Compared to no-FH youth, first-degree biological relatives of suicide attempters performed worse on tests of EF, attention, and language reasoning after correcting for multiple comparisons and adjusting for important confounders. This study highlights the potential clinical utility of including neurocognitive evaluations in suicide risk assessments among those with a FH and suggests potential avenues for prevention and intervention efforts.

Supporting information

Additional supporting information may be found online in the Supporting Information section at the end of the article:

Table S1. Estimated marginal means adjusted for covariates.

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Key points

- Suicidal behavior is highly familial. Family history of fatal and nonfatal suicide attempt is associated with a host of negative clinical and functional outcomes.
- There is very limited research on the neurocognitive functioning of individuals with a family history of suicide attempt.
- In the largest investigation to date, youth with a family history of suicide attempt performed significantly worse on tests of executive function, attention, and language reasoning compared to youth without a family history.
- Further research is needed to evaluate whether assessing or targeting neurocognitive functioning might inform the prevention or treatment of suicidal behavior.

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