Investigating Suicide Risk and Attempts in Behavioral, Cognitive Scores, and White Matter Tract Measures using the ABCD Study

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Introduction

- **Suicide ideation (SI)** and **suicide attempt (SA)** rates are rising in children (Wiglesworth et al., 2023).
- The **Adolescent Brain Cognitive Development (ABCD**) study collects children's behavioral, cognitive and white matter tract measures.
- White matter maturation is essential for higher cognitive functions; its integrity is measured by **fractional anisotropy (FA)**.
- Adults with suicidal behavior and depression exhbited lower FA, but the field lacks studies on children (Breit et al., 2022).

Main goals:

1. Investigate differences in behavioral and cognitive scores using the **Child Behavior Checklist (CBCL)** and **National Institutes of Health (NIH) Toolbox** across four groups: no history of suicide, non-suicidal self-injury (NSSI), SI, SA.
2. Investigate white matter differences between no history of suicide, NSSI, SI and SA.

Hypothesis:

- Children experiencing SI and SA will exhibit lower FA and cognitive scores, higher behavioral scores compared to children with no history.
- SA group will exhibit most pronounced results.

Methods

8,675 children aged 9-10 years were categorized into 4 suicidal groups based on **Kidde Schedule for Affective Disorders and Schizophreiza (K-SADS)** responses.

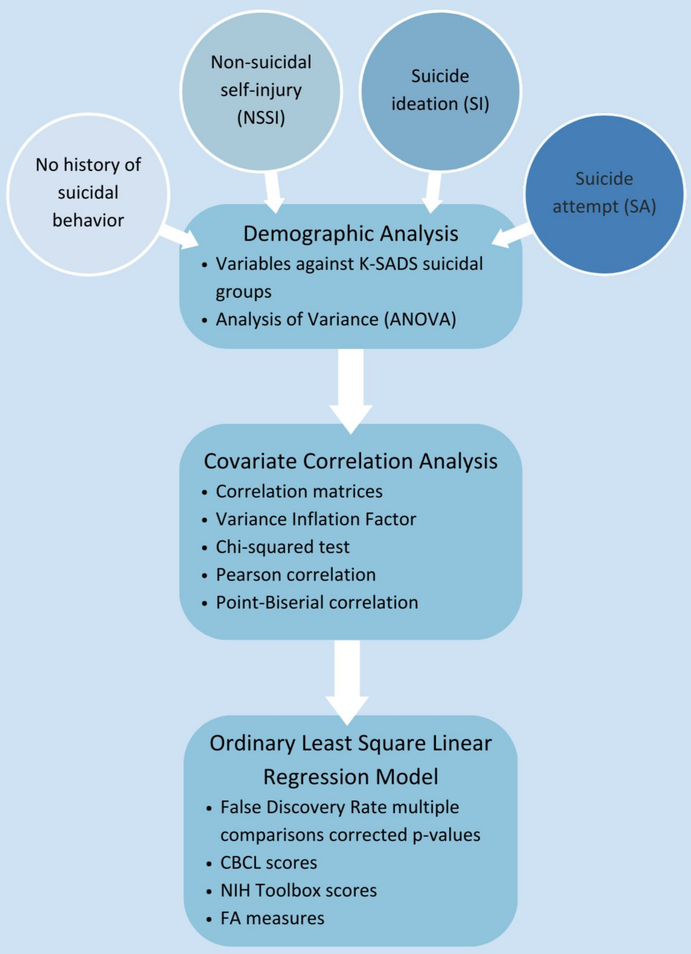

Fig. 1 Flowchart of the statistical analysis conducted. Covariates with high multicollinearity were excluded in the regression model.

Results

CBCL

- Significant difference between K-SADS groups across 11 CBCL domains: **anxious/depressed, depressed, somatic complaints, social problems, thought problems, attention problems, rule-breaking behavior, aggressive behavior, internalizing, externalizing, and total problems** ($p < 0.001$).
- SA group exhibits higher problem scores, indicating more severe behavioral issues.

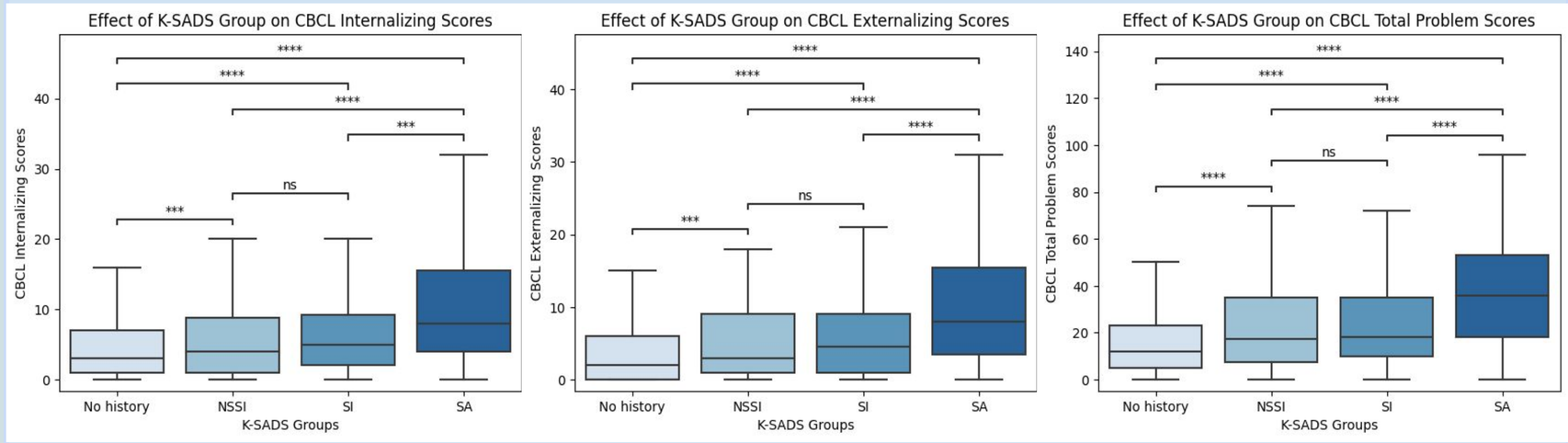

Fig. 2 Selected CBCL domain pairwise analysis results. p-value annotation legend: **ns**: $0.0500 < p \leq 1.00$, ***: $0.000100 < p \leq 0.00100$, ****: $p \leq 0.000100$.

NIH Toolbox

- No significant difference in NIH Toolbox scores across K-SADS groups.

White Matter FA

- Significant between-group FA differences observed in the **right intracerebellar tract** (corrected-p=0.036).
- Lower FA observed in SA group compared to no history group.
- This tract runs through the 2 hemispheres of the cerebellum (Fig. 3).

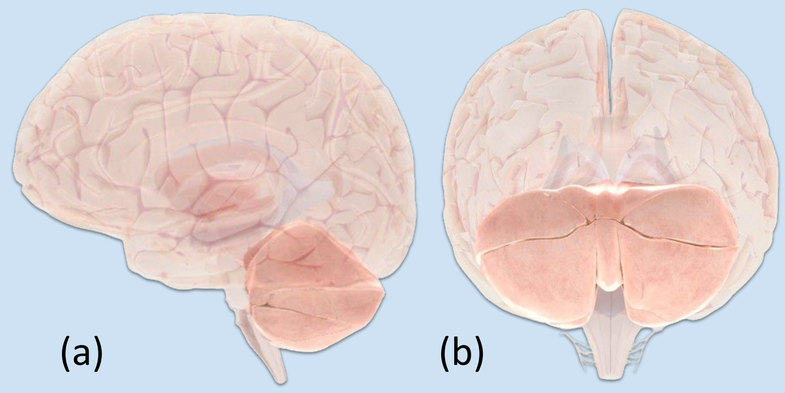

Fig. 3 Sagittal (a) and posterior (b) view of the brain with the cerebellum emphasized.
Source: Society for Neuroscience

Conclusion

Discussion

Behavioral and **white matter microstructural changes** are associated with suicide in children. Children in the SA group exhibit:

Higher CBCL scores, indicating severe behavioral problem across various domains.

Lower right intracerebellar tract FA. This tract controls motor and cognitive functions, including emotion and aggression (Jackman et al., 2020). The interplay between this tract with suicidality remains unclear.

Strengths

- Large study set, including more children in the SA group
- Focuses on pre-adolescent children, under-studied in current literature.

Limitations

- Conclusions do not indicate causal relationships as this study is cross-sectional.
- Suicide is a multi-factorial occurance. This study only considered some of these factors.

Future Studies

- Tracking longitudinal changes in behavior, cognitive abilities, and intracerebellar tracts in children.
- Investigating sex differences in white matter tracts of children who engage in SI or SA.

References

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