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Changes in emotional and behavior problems, and brain morphometry following mild traumatic brain injury in early adolescence: A pre-post study design

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Introduction

Mild traumatic brain injury (mTBI)
- highly prevalent in children
- emotional & behavioral difficulties [1]

Interaction btw injury physiopathology & brain maturation may underpin long-term difficulties following mTBI [2]

Very few neuroimaging studies - conflicting results [2]
- ⇩ gray matter volumes and cortical thickness following pediatric mTBI
- no changes

Unsolved question: differences already existed before the injury ?
- Adolescent Brain Cognitive Development (ABCD) [3] - rare opportunity to explore it

Objective

To examine **longitudinal changes** in emotional and behavior **problems**, and **brain** morphometry in young adolescents with and without mTBI using a **pre-post study design**

Conclusion

As compared to non-injured peers, children with mTBI show **no different profiles in emotional and behavior problems**, but **greater global brain volume and cortical thickness** at baseline. Further exploration is needed to fully understand these findings.

References

[1] Catroppa et al., 2015; [2] King et al., 2019 ; [3] Casey et al., 2018; [4] Bogner et al., 2017; [5] Barch et al., 2018; [6] Achenbach and Rescorla, 2001; [7] Hagler et al., 2019; [8] Desikan et al., 2006; [9] Beer et al. 2020; [10] Kievit et al., 2018; [11] Rosseel, 2012

Methods

Measures

ABCD dataset
- Release 4.0
- Baseline & 2-year follow-up

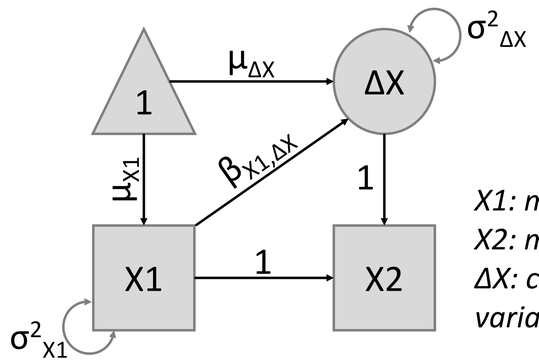
Parent's retrospective report of mTBI
- Parent Ohio State Traumatic Brain Injury Screen-Short Modified [4, 5]

Emotional and behavioral problems
- Child Behavior Checklist-Parent (CBCL) [6] internalizing & externalizing problem t-scores

Volume and Cortical thickness
- Pre-processed and quality checked T1-w MRI data (FreeSurfer 5.3) [7]
- Right & left hemisphere total volumes and mean cortical thickness in Desikan atlas [8]
- Scanner effects (n = 24) corrected before statistical analyses - longitudinal ComBat [9]

Statistical analyses

Longitudinal changes modeling
- Two-group Latent Change Score Model [10]



X1: measure at baseline
X2: measure at 2-year
ΔX: change ⇔ latent variable

- Covariates: child sex and parental education
- lavaan 0.6-12 package [11], R version 4.1.2

Group (mTBI versus controls) differences
- 4 parameters of interest : mean & variance of the baseline & change scores
- Chi-square difference tests [10]

Participants

ABCD Datase Release 4.0 (N = 11,876)

Non eligible
- TBI before the study *N = 457*
- No TBI information *N = 1,440*
- Head or neck injury *N = 2,621*
- Moderate or sever TBI *N = 4*

Eligible participants (N = 7,354)

Excluded
- No imaging data *N = 80*
- Imbalanced scanner *N = 324*
- Insufficient T1w quality *N = 15*
- Missing predictors *N = 10*

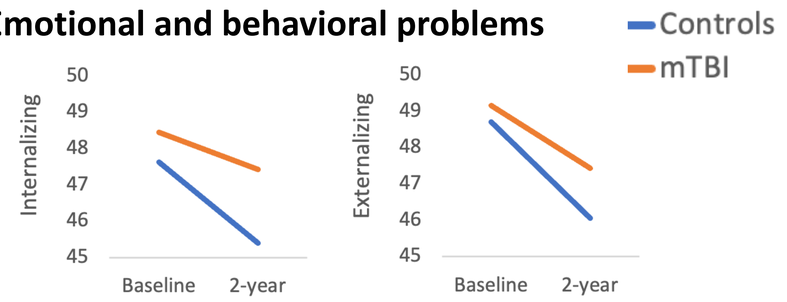
Final sample (N = 6,925)

Controls (N = 6,780)	mTBI* (N = 145)
3,309 [49%] ♂; 10 ± 0.6 years	86 [59%] ♂; 10 ± 0.6 years

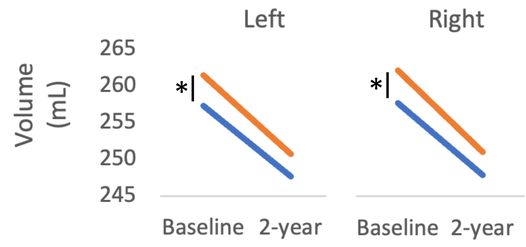
**mTBI with loss of consciousness ≤30 min or memory loss*

Results

Emotional and behavioral problems



Total volumes



Mean cortical thickness

