Development of Domain-General Cognition in Adolescents With HIV Is Slower Than Healthy Individuals

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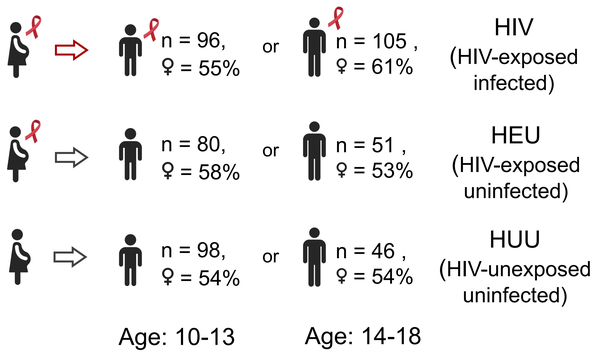
BACKGROUND

- While neuropsychological tests are designed to test specific cognitive abilities, a person who performs well in one task tends to perform well in others ("general cognitive ability" or g-factor).
- If perinatal HIV exposure can negatively affect white matter integrity, it's possible that the development of g-factor in these individuals might differ from individuals with no exposure.

METHODS

- Data from the RESILIENCE study, a prospective observational cohort study conducted from 2015-2019.
- Participants were grouped by perinatal HIV status and age :



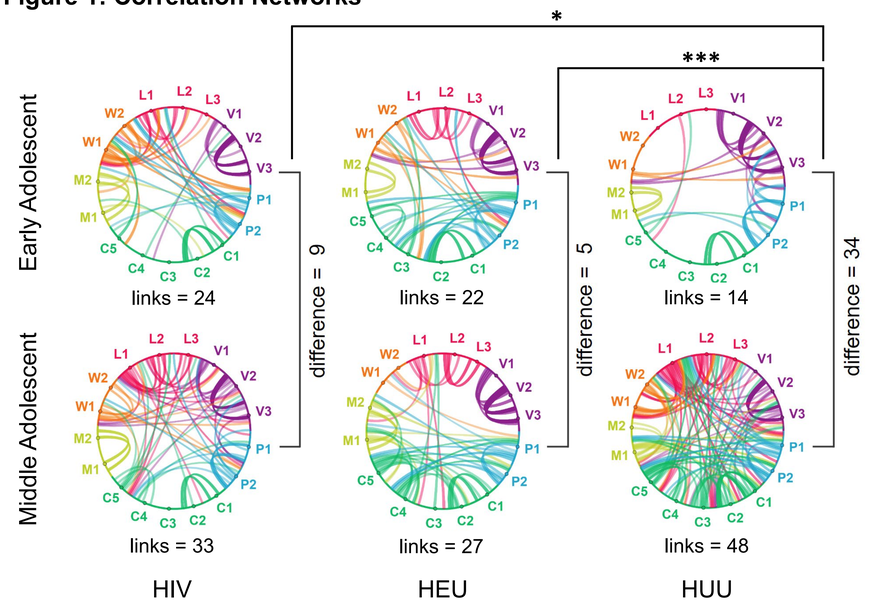
- Assess the correlation among 17 neuropsychological tests subscores across 6 cognitive domains.
- The number of moderate-to-strong correlations (Spearman's correlation coefficient ≥ 0.4) between cognitive tests were used as a marker of domain-general cognitive ability.
- We used permutation methods and Bonferroni correction for the test statistic.

RESULTS

In the early adolescent group, we found no difference in the number of connections. However, the HUU group showed a significantly greater increase in connections across age ranges (difference = 34) compared to the HIV (difference = 9, $p<0.05$) and HEU (difference = 5, $p<0.001$) groups.

Adolescents with HIV exposure exhibit a significantly slower domain-general cognitive development compared to healthy individuals.

Figure 1: Correlation Networks



links = number of links with a correlation coefficient of 0.4 or higher

Verbal fluency (V)
V1: D-KEFS Verbal: Category fluency
V2: D-KEFS Verbal: Category switching
V3: D-KEFS Verbal: Switching accuracy

Processing speed (P)
P1: WISC-III: Coding
P2: WISC-III: Symbol search

Cognitive flexibility (C)
C1: D-KEFS Design: Filled dots
C2: D-KEFS Design: Empty dots
C3: D-KEFS Design: Switching
C4: Children's color trails 1
C5: Children's color trails 2

Motor function (M)
M1: Grooved pegboard - dominant
M2: Grooved pegboard - non dominant

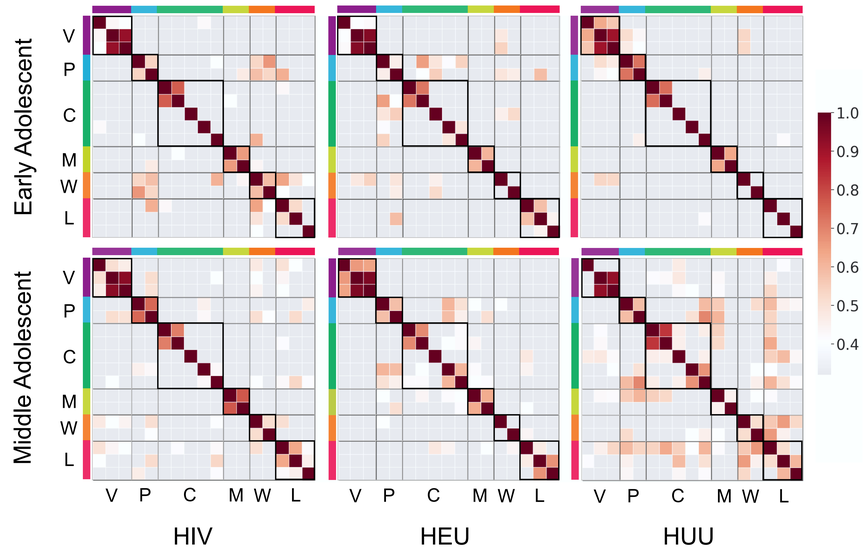
Working memory & Attention (W)
W1: WISC-III: Arithmetic
W2: WISC-III: Digit span

Learning ability (L)
1 : SPM
L2: WRAML-2: Design
L3: WRAML-2: Recognition

CONCLUSIONS

- Our finding reveals a slower progression of general cognitive ability among individuals exposed to HIV.
- This observation aligns with the well-documented impact of HIV on white matter integrity and extends our comprehension of cognitive development within the HIV-exposed population.

Figure 2: Heatmaps of Correlation Coefficient Values Between Subtest Scores Grouped Into 6 Cognitive Domains.



The black subblocks along the diagonal indicate connections within the same cognitive domain (intra-domain), while the grey subblocks off the diagonal indicate connections between different domains (inter-domain).

FUTURE DIRECTION

- Our future research will involve a direct exploration of functional connectivity and its relationship with the g-factor.
- Further analysis of inter-domain and intra-domain correlations would uncover the cognitive development in relation to HIV exposure.

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