Neurocognitive Function Among School-Aged Children Affected by HIV in Botswana

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BACKGROUND

- Children living with HIV (HIV+) have higher rates of cognitive dysfunction, particularly in domains of attention, processing speed, episodic memory, psychomotor, and executive functioning.
- HIV-exposed uninfected children (HEU) have been shown in some, but not all, studies to suffer from more neurodevelopmental delays than HIV-unexposed uninfected children (HUU).
- The Penn Computerized Neurocognitive Battery (PCNB) includes 14 tests that have been adapted for school-aged children in Botswana to assess memory, complex cognition, motor/processing speed, and executive function (See Figure 1).

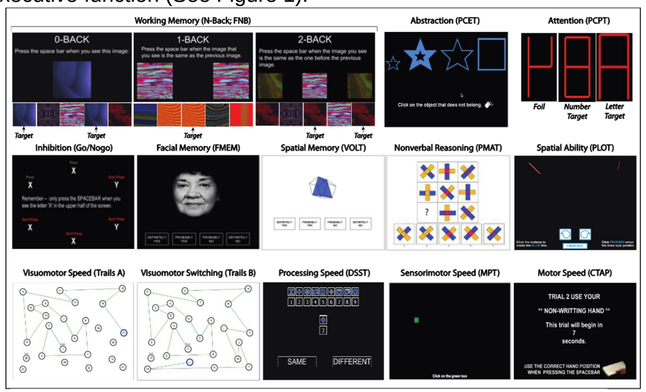

Figure 1: Screenshots of Penn Computerized Neurocognitive Battery Tests

- We hypothesized that differences between HIV+, HEU and HUU children would be measurable using the PCNB.

METHODS

- We compared PCNB accuracy, speed, and efficiency scores in children aged 7-< 18 years in each of the following groups:
  a) HIV+, randomly selected from a clinic;
  b) HUU, randomly selected from public schools; and
  c) HEU, 18% randomly selected from public schools and 82% opportunistically-selected HEU family members of clinic patients.

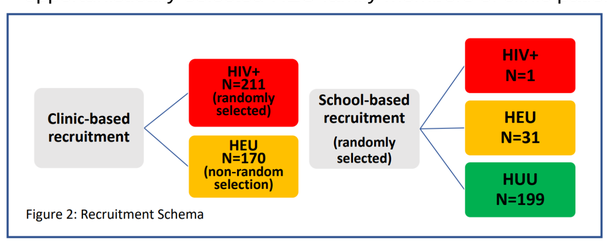

Figure 2: Recruitment Schema

METHODS (continued)

- Scores were age-normed using non-linear multiple regression.
- Multivariate normative comparisons (MNC) were used to detect clinically relevant impairment (i.e., below the lower bound of the 95% confidence interval for HUU children) in individuals.

Based on locally-validated PCNB assessments, HIV+ children in Botswana have worse neurocognitive outcomes than HUU children. However, our results suggest that previous findings of worse performance in HEU children may be related to biased sampling or unmeasured confounding.

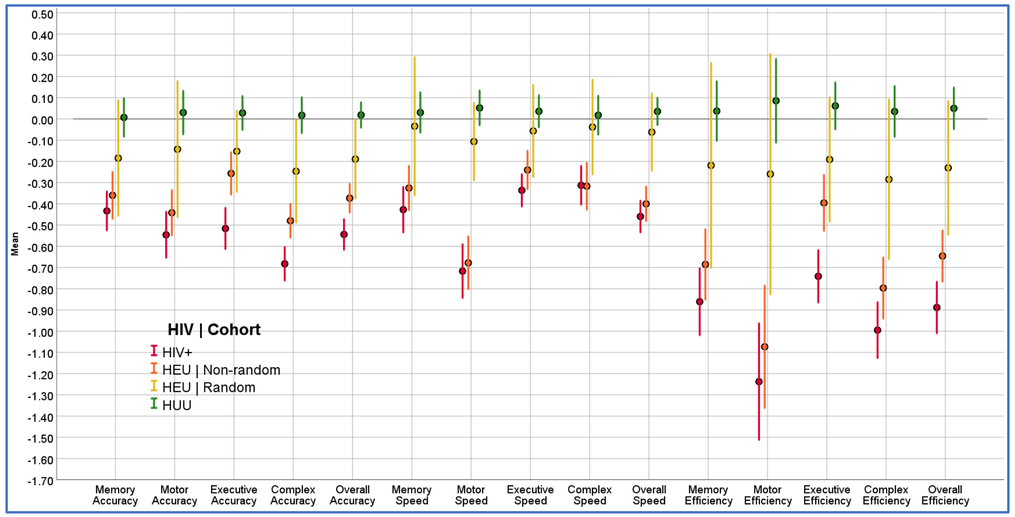

Figure 3: PCNB Test Scores, Stratified by HIV Status and Recruitment Group

RESULTS

- Overall and domain-specific scores were significantly lower for HIV+ children than for HUU children.
- In nine out of 15 comparisons, the means of HIV+ and HEU (non-random) groups were contained within each other's Confidence Intervals (CIs), indicating some level of equivalence
- There was not a single comparison in which HEU (random) CIs included the HIV+ mean (or vice versa)
- HUU CIs included the HEU (random) mean in six of the 15 comparisons
- MNC flagged 27% of HIV+ children, 23% of HEU children and 9% of HUU children as clinically impaired
  - In the HEU subgroup: 49 of 168 (29%) non-randomly selected and 6/36 (17%) randomly selected were flagged as impaired

CONCLUSIONS

- The culturally-adapted PCNB is sensitive to domain-specific differences in neurocognitive function in Botswana
- PCNB data from Botswana confirm that HIV+ children have worse neurocognitive function than HUU children
- Results raise questions of whether previous findings of worse performance in HEU children were related to biased sampling or unmeasured confounding.

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