Neurocognitive Outcomes among Perinatally-HIV Infected Young Adults

Reuben Robbins1, Amelia Buczk1, Jeannette Raymond1, Nadia Nguyen1, Curtis Dolezal2, Elaine J. Abrams2, Andrew Wiznia3, Cheng-Shiun Leu1, C. Jean Choi4, Adam Ciarleglio4, Claude A. Mellins1

1New York State Psychiatric Institute & Columbia University, Division of Gender, Sexuality, & Health, HIV Center, New York, United States, 2Mailman School of Public Health, Columbia University, International Center for AIDS Care and Treatment Program, New York, United States, 3Albert Einstein College of Medicine, Pediatric Allergy & Immunology, New York, United States, 4 New York State Psychiatric Institute, Division of Biostatistics

INTRODUCTION

- Neurocognitive problems are barriers to perinatally HIV-infected (PHIV+) young adults (YA) achieving optimal health, behavioral and functional outcomes.
- Few studies have examined longitudinal outcomes of key domains of neurocognition (i.e., processing speed, working memory, and executive functions) among PHIV+ and perinatally HIV-exposed, uninfected (HEU) YA.
- We examined: 1) differences in Processing Speed, Working Memory, and Executive Functions between PHIV+ and HEU YA across three time points and by age, and 2) associations between viral load (VL) over time and neurocognitive outcomes among PHIV+ youth.

METHOD

- CASAH is an ongoing New York City-based, longitudinal cohort study of PHIV+ and PHEU youth recruited at ages 9-16 (2003-2008) and followed at 12-18 month intervals.
- YA Working Memory (WAIS Digit Span), Processing Speed (Trail Making Test, Part A & B) and Executive Functions (Trail Making Test, Part B) were assessed at follow-ups (FU) 5, 6 and 7, when participants were ≥18 years of age.
- Generalized estimating equations (GEE) were used to examine differences in neurocognitive test performance between groups across FU.
- We also conducted a longitudinal mixed effect model with a random intercept to examine if test performance changes over time (age) by HIV status, with performance from one additional FU (FU 4) when some participants were <18 years of age.

RESULTS

- Participants at FU5 were: 18-28 years old (mean=21.90; SD=2.68); 53% female; 56% African-American/Black; 40% Latino. Age ranges for FU6 were 19-28, and 20-29 for FU7.
- PHIV+ YA had significantly slower Processing Speed scores compared to the HEU YA at all FU's (Table 1.)
- PHIV+ YA had significantly slower Processing Speed scores compared to the HEU YA at all FU's (Table 1.)

Table 1. Test Performance Across Follow-Ups

<table>
<thead>
<tr>
<th></th>
<th>FU5</th>
<th>FU6</th>
<th>FU7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HEU %</td>
<td>PHIV%</td>
<td>HEU %</td>
</tr>
<tr>
<td>Digit Span</td>
<td>66.7% (92)**</td>
<td>44.8% (39)</td>
<td>65.4% (89)**</td>
</tr>
<tr>
<td>Trails A</td>
<td>64.5% (71)**</td>
<td>40.0% (28)</td>
<td>61.9% (65)**</td>
</tr>
<tr>
<td>Trails B</td>
<td>60.8% (48)</td>
<td>34.7% (17)</td>
<td>55.6% (45)**</td>
</tr>
</tbody>
</table>

Note: *FU7 data collection ongoing, p<.05, **p<.01

- CASAH is an ongoing New York City-based, longitudinal cohort study of PHIV+ and PHEU youth recruited at ages 9-16 (2003-2008) and followed at 12-18 month intervals.
- YA Working Memory (WAIS Digit Span), Processing Speed (Trail Making Test, Part A & B) and Executive Functions (Trail Making Test, Part B) were assessed at follow-ups (FU) 5, 6 and 7, when participants were ≥18 years of age.
- Generalized estimating equations (GEE) were used to examine differences in neurocognitive test performance between groups across FU.
- We also conducted a longitudinal mixed effect model with a random intercept to examine if test performance changes over time (age) by HIV status, with performance from one additional FU (FU 4) when some participants were <18 years of age.

Figure 1. Mixed Effect Model for Trails A

- Trails A: There was a significant interaction between age and HIV status (F1,1502=8.61, p= .0035). Among HEUs, each increasing year in age was associated with a 3.3% performance boost (p<.0001) in Trails A completion time. No change was observed in the PHIV+ group.
- Trails B: There was a trend-level significant interaction between child age and HIV status (F1,499=3.32, p=0.069) such that HEUs saw performance gains as they got older. No change was observed among the PHIV+ group.
- Digit Span: There is no significant interaction between child age and HIV status (F1, 507 = 0.03, p=.86), suggesting no difference in Digit Span change by HIV status.

Figure 2. Mixed Effect Model for Trails B

- Trails A: There was a significant interaction between age and HIV status (F1,1502=8.61, p= .0035). Among HEUs, each increasing year in age was associated with a 3.3% performance boost (p<.0001) in Trails A completion time. No change was observed in the PHIV+ group.
- Trails B: There was a trend-level significant interaction between child age and HIV status (F1,499=3.32, p=0.069) such that HEUs saw performance gains as they got older. No change was observed among the PHIV+ group.
- Digit Span: There is no significant interaction between child age and HIV status (F1, 507 = 0.03, p=.86), suggesting no difference in Digit Span change by HIV status.

CONCLUSIONS

- PHIV+ YA performed worse than HEU YA at most follow-ups on tests of Working Memory, Processing Speed, and Executive Functions.
- When examined longitudinally, HEU performance on Trails A significantly increased as they got older, whereas PHIV+ performance remained flat. A similar trend relationship was found for performance on Trails B.
- PHIV+ YA may be at risk for worse neurocognitive outcomes as they grow older, which could interfere with achievement of important adult milestones and activities of daily living.
- While PHIV+ YA did not see test performance increases over time compared to HEUs, it is important to note that large proportions of HEU YA performed poorly on all tests (e.g., ~50% performed at least 1.5 standard deviations below the norm on Digit Span).
- Continued research is needed to understand neurocognitive outcomes among PHIV+ YA as they grow older and how neurocognitive impairments impact their health and behavioral outcomes.
- Research is also needed understand how factors such as poverty, prenatal exposure, and educational opportunity can impact neurocognition in both groups.

ACKNOWLEDGMENTS

This research was supported by NIMH grant R01-MH069133 (PI: Mellins) and NIMH center grant P30-MH43520 (PI: Remien).