

Attention in early school-aged children who are HIV-exposed uninfected

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Introduction & Methods

Introduction

- Children who are HIV-exposed uninfected (CHEU) experience multi-factorial risk factors for increased neurodevelopmental challenges such as perinatal HIV and anti-retroviral (ARV) medication exposure, increased likelihood of preterm birth, potential adverse maternal physical and mental health, and socioeconomic disadvantages.¹⁻³
- A limited number of studies have identified similar ADHD symptoms and performance on attention-based assessments in CHEU compared to children who are HIV-unexposed uninfected (CHUU).⁴⁻⁶ One study identified rates of ADHD in CHEU to be 10-12% in the United States, which is higher than international prevalence rates.⁷
- The objective of the present study is to understand risk factors and prevalence of attention difficulties in young CHEU based on parent-report, associations between attention and neurodevelopmental outcomes, and associations between attention, sociodemographic, and HIV-ARV-exposure related variables.

Methods

- 55 CHEU and 51 CHUU at 5.5 years of age were recruited from the Family Centered HIV Clinic at the Hospital for Sick Children and the community in Toronto, Ontario.
- Inclusion criteria included being born to a mother living with HIV (for CHEU), having a negative HIV status, and no known medical conditions affecting neurodevelopment.
- Parents completed the Attention Deficit Hyperactivity Disorder (ADHD) Rating Scale IV.⁸
- All children underwent neurodevelopmental assessments.⁹⁻¹²
- Demographic and maternal medical data were extracted through parent interviews and the child's medical records. (*See Table 1 and Table 2*).
- Demographic and neurodevelopmental variables were compared using t-tests, Fisher's exact test, and chi-square tests. Significance was held at $p < 0.01$.

Table 1. Demographic information and birth history

	CHEU	CHUU	P-value
<i>Child, Maternal, and Social Factors</i>			
Total sample size	55	51	-
Age (years)	5.56 (0.17)	5.55 (0.74)	0.905
Sex (M/F)	21/34	22/29	0.748
Gestational Age (weeks)	37.6 (2.8)	39.4 (1.48)	<0.001
Birthweight (kg)	2.97 (0.67)	3.25 (0.49)	0.016
In day care at 3 years	41 (83.7%)	42 (82.4%)	1.00
Mother employed	19 (42.2%)	25 (51.0%)	0.518
Both parents in house	32 (62.7%)	18 (35.3%)	0.010
Maternal substance use	1 (1.8%)	2 (3.9%)	0.611
<i>Maternal education level</i>			
High school or less	11 (31.4%)	12 (23.5%)	0.572
High school plus	24 (68.6%)	39 (76.5%)	
<i>Language in home</i>			
Only English	27 (72.9%)	46 (90.2%)	0.045
English and other	10 (27.0%)	5 (9.8%)	
<i>Region of maternal origin</i>			
North America	9 (16.7%)	20 (39.2%)	0.018
Other [^]	45 (83.3%)	31 (60.8%)	

*Available Data of Total HEU and HUU Sample

[^]Top other countries (CHEU: Zimbabwe, Nigeria, Ethiopia; CHUU: Nigeria, Jamaica, Sri Lanka)

Results

Table 2. Medical variables for CHEU and mothers

Measure	5.5 Year (N = 55)	
	N*	N (%)
Perinatal ARV medication		
Zidovudine	52	52 (100%)
Lamivudine	50	8 (16%)
Nevirapine	50	7 (14%)
Maternal CD4 count		
	30	
≥ 500		23 (76.7%)
< 500		7 (23.3%)
Maternal Viral Load		
	45	
< 50		43 (95.6%)
≥ 50		2 (4.4%)
ARV medication regimen		
	52	
PI-based ARV		45 (86.5%)
NNRTI-based ARV		2 (5.8%)
Other		1 (3.8%)
None		2 (3.8%)
ARV initiation		
	44	
Prior to pregnancy		29 (65.9%)
1st trimester		11 (25.0%)
2nd trimester		3 (6.8%)
3rd trimester		1 (2.3%)
IV AZT during labor	54	52 (96.3%)
Other medical condition	53	36 (22.6%)

N*- total available data

ADHD Questionnaire and Assessments

ADHD Rating Scale IV Raw Scores

Subtest	N	CHEU	N	CHUU	t	p-value
Inattention	54	4.46 (2.88)	50	4.58 (2.84)	-0.21	0.835
Hyperactivity	52	4.71 (3.20)	48	5.10 (3.38)	-0.59	0.553
Combined	53	9.26 (5.64)	48	9.54 (5.68)	-0.25	0.806

Wechsler Preschool and Primary Scale of Intelligence, Third Edition Standard Scores

Subtest	N	CHEU	N	CHUU	t	p-value
Full Scale IQ	55	100.44 (11.99)	50	114.26 (11.19)	-6.11	<0.001
Verbal IQ	55	99.82 (11.68)	51	111.25 (11.56)	-5.06	<0.001
Performance IQ	55	100.07 (12.82)	51	113.59 (9.75)	-6.14	<0.001
Processing Speed	55	100.22 (13.27)	49	109.2 (12.95)	-3.49	<0.001

Wide Range Achievement Test, Fourth Edition Standard Scores

Subtest	N	CHEU	N	CHUU	t	p-value
Word Reading	54	98.56 (17.46)	42	108.05 (17.98)	-2.60	0.011
Spelling	53	102.17 (12.64)	42	107.33 (13.65)	-1.89	0.062
Math Computation	53	101.94 (12.17)	42	110.38 (16.24)	-2.80	0.007

Beery-Buktenica Test of Visual Motor Integration Standard Scores

Subtest	N	HEU	N	HUU	t	p-value
Visual Motor Integration	53	99.06 (8.92)	51	102.10 (9.06)	-1.72	0.088

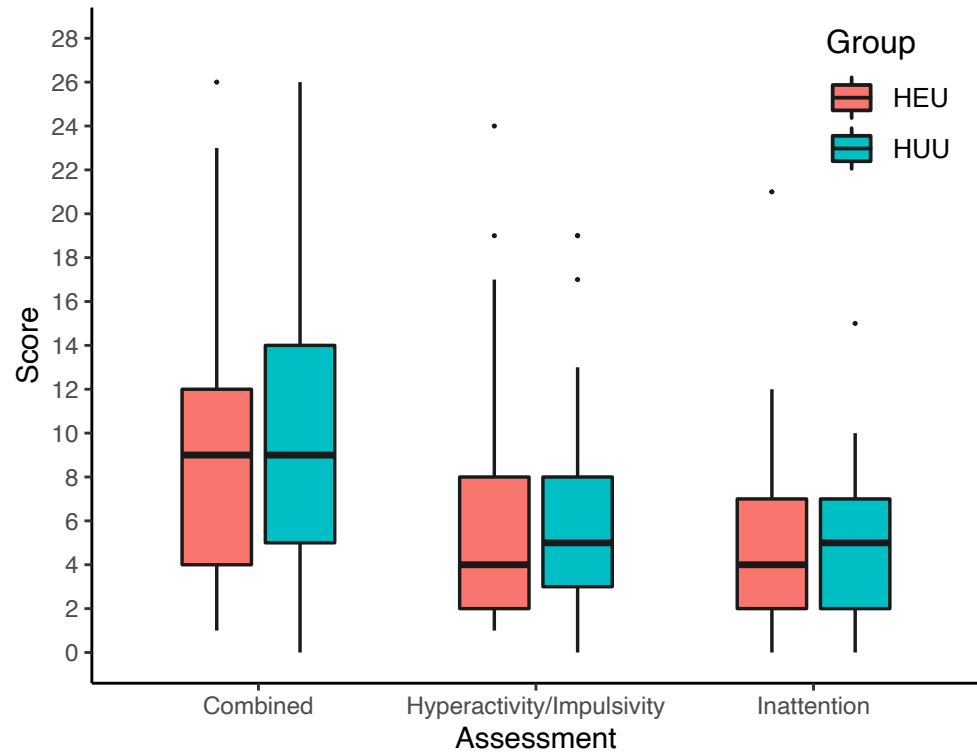
Vineland Adaptive Behaviour Scales, Second Edition Standard Scores

Subtest	N	HEU	N	HUU	t	p-value
Composite	52	98.13 (12.81)	51	106.14 (9.03)	-3.67	<0.001
Communication	52	101.92 (11.00)	51	109.16 (7.91)	-3.84	<0.001
Socialization	52	99.44 (13.65)	51	102.43 (9.49)	-1.29	0.200
Daily Living Skills	52	99.54 (14.26)	51	108.14 (9.74)	-3.58	<0.001
Motor Skills	52	93.71 (13.84)	51	101.53 (11.66)	-3.10	0.003

Results

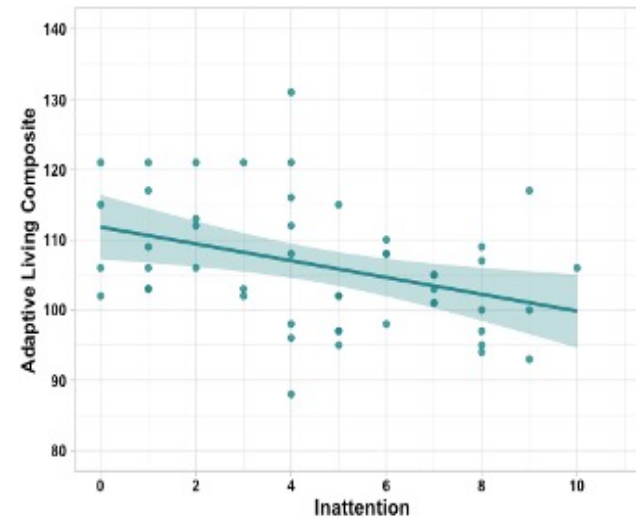
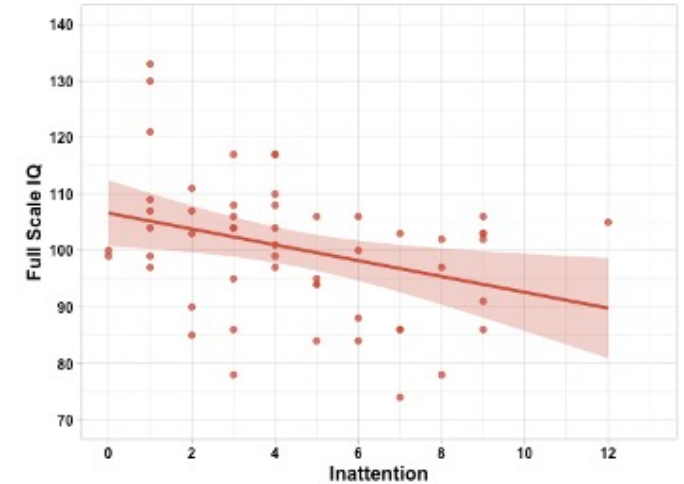
Parent-reported ADHD Rating Scale IV

- Children who met or exceeded clinical cut-off for probable ADHD were low (3.6% CHEU, 2.0% CHUU).
- No significant differences were identified between CHEU and CHUU groups on parent-reported measures of inattention, hyperactivity/impulsivity, and combined subscales of the ADHD Rating Scale IV.



Inattention and neurodevelopmental assessments

- Correlation analyses evaluated associations between ADHD and neurodevelopmental measures.
- Lower inattention scores was correlated with higher Full-Scale IQ ($r = -0.334$, $p = 0.014$) in the **CHEU** group.

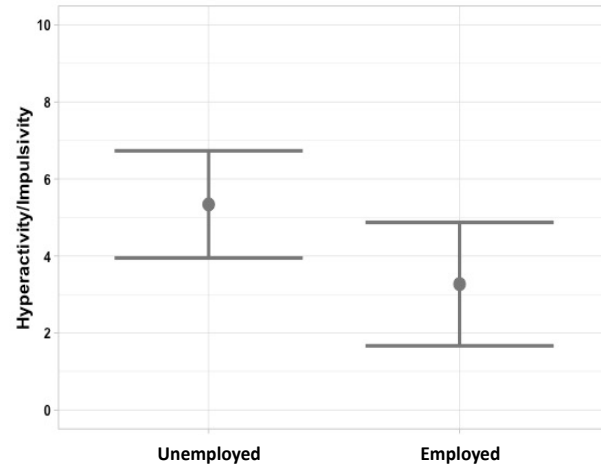


- Lower inattention scores was correlated with higher adaptive living composite scores ($r = -0.38$, $p = 0.007$) in the **CHUU** group.

Results & Discussion

Hyperactivity/impulsivity and maternal employment

- Multiple regression models revealed significant associations between higher hyperactivity/impulsivity scores and maternal unemployment status across **both groups**.



Discussion

- CHEU were rated as exhibiting similar levels of inattention and hyperactive/impulsive behaviour as CHUU. Rates in both groups identified as meeting criteria for ADHD were low.
- CHEU obtained lower scores on adaptive behaviour and assessment measures of intelligence and early academics.
- Maternal unemployment was associated with higher scores of hyperactivity/impulsivity in both groups, suggesting a risk factor for poorer behaviour regulation.
- Monitoring of attention and developmental outcomes is important to elucidate risks of attention difficulties and their relation to cognition as CHEU develop through childhood and adolescence.

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