Auditory Profiles and Neurocognitive Function in HIV Children

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Acknowledgements

- **Megan Mulvey, AuD.**
- **Anai Cuadra, Ph.D.**
- **Elizabeth Willen, Ph.D.**
- **Maria Goldman, Psy.D.**
- **Lisa Jacobson, Ph.D.**

Original Purpose of Project

- Idea originated from clinical patients based on the number of auditory abnormalities noted.
- Abnormalities included:
  - Hearing loss
  - Auditory Processing Disorder

Background Information

- Limitations of published research on auditory disorders in HIV
  - Focused on adults
  - Small sample sizes (Case reports)
  - Focus on otitis media or general hearing loss

Foundation Statistics

- Hearing loss (school-aged children):
  - 8 per 1000
- Auditory processing disorders
  - ≈ 2% of school aged population
- Abnormal auditory brainstem response (children): <1%
- Abnormal auditory middle latency response (children): unknown

Methods

- 37 HIV + children
- Standard Audiometry
  - Normal hearing children receive full test battery
  - No further testing on children with hearing loss
- Auditory Processing Test Battery
- Auditory Evoked Potentials
  - Auditory Brainstem Response (ABR)
  - Middle Latency Response (MLR)

Methods

- Chart Review
  - Neuropsychological results
  - Viral load (multiple dates)
  - CD-4 count (multiple dates)

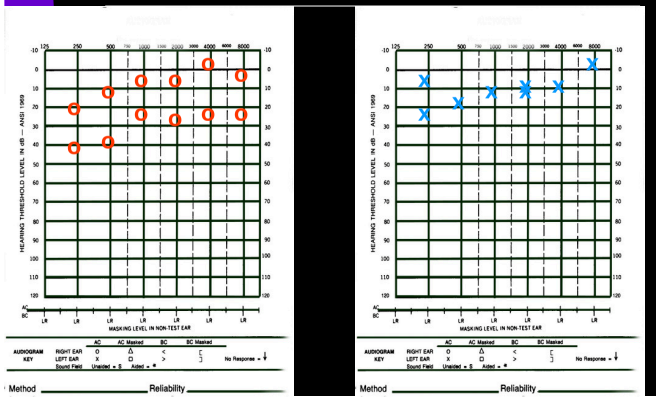
Normal Hearing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	32	86.5	86.5	86.5
	No	5	13.5	13.5	100.0
	Total	37	100.0	100.0	

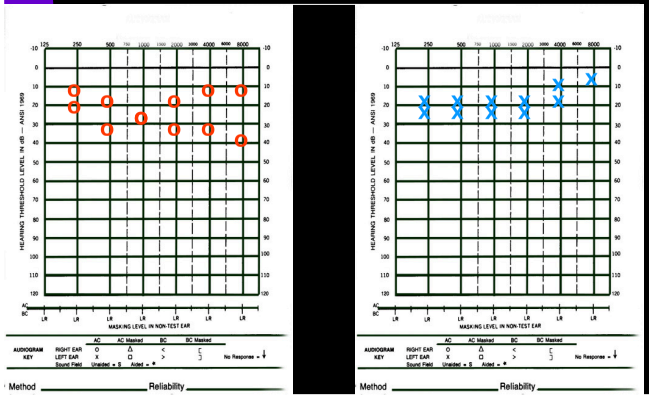
Auditory Profile Numbers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Abnoral MLR and Abnormal Auditory Processing	9	24.3	28.1	28.1
	Abnormal ABR	6	16.2	18.8	46.9
	Abnormal ABR, MLR and Auditory Processing	4	10.8	12.5	59.4
	Abnormal MLR	3	8.1	9.4	68.8
	Abnormal Auditory Processing	6	16.2	18.8	87.5
	Normal ABR, MLR, and Auditory Processing	4	10.8	12.5	100.0
	Total	32	86.5	100.0	
Missing	-99	5	13.5		
Total		37	100.0		

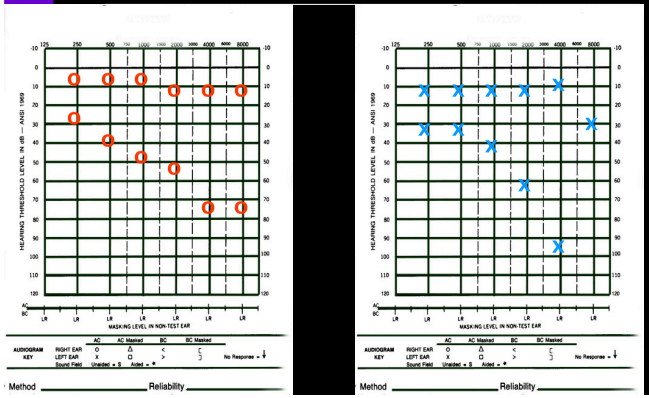
Subject: 27 Test 1: 9/19/2007
Test 2: 2/20/2008
Improvement in Thresholds

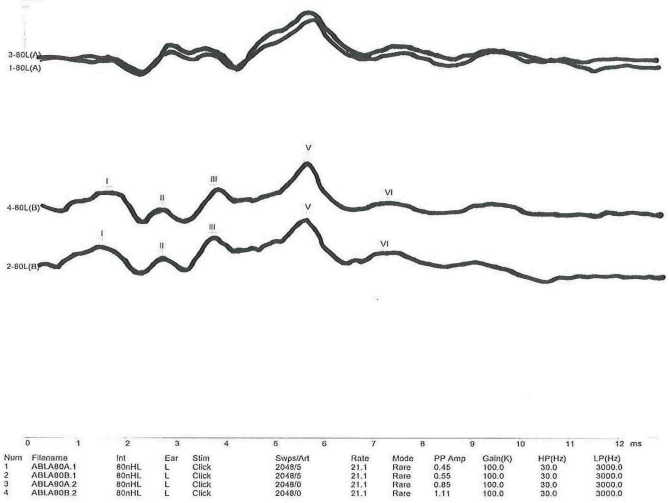


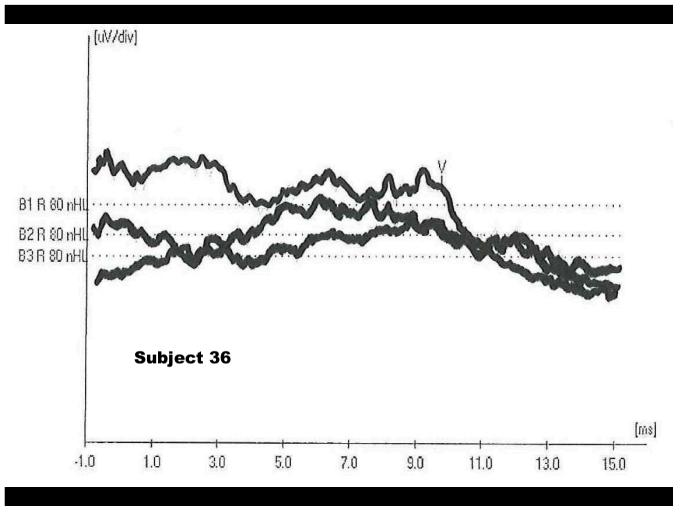
Subject: 2 Test 1: 6/18/2007
Test 2: 3/6/2008
Improvement in Thresholds

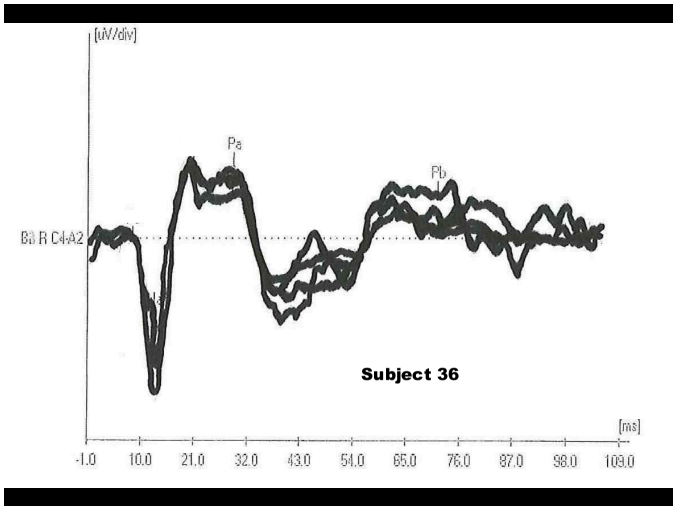


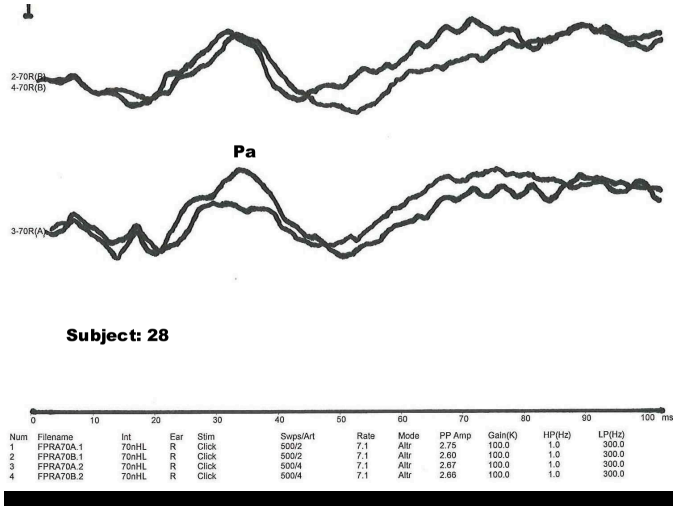
Subject: 8 Test 1: 2/23/2006
Test 2: 5/16/2007
Decrement in Thresholds



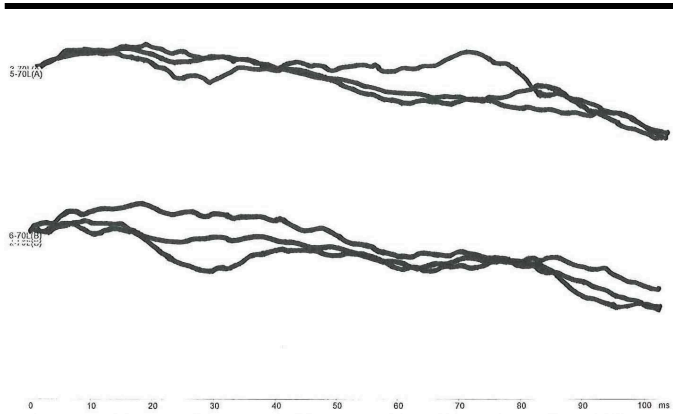








Num	Filename	Int	Ear	Stim	Swps/Art	Rate	Mode	PP Amp	Gain(K)	HP(Hz)	LP(Hz)
1	FPRA70A.1	70nHL	R	Click	500/2	7.1	Altr	2.75	100.0	1.0	300.0
2	FPRA70B.1	70nHL	R	Click	500/2	7.1	Altr	2.60	100.0	1.0	300.0
3	FPRA70A.2	70nHL	R	Click	500/4	7.1	Altr	2.67	100.0	1.0	300.0
4	FPRA70B.2	70nHL	R	Click	500/4	7.1	Altr	2.66	100.0	1.0	300.0



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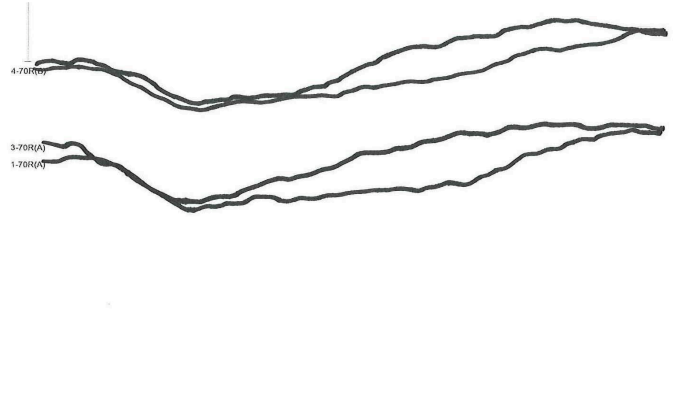
1	ABLA70A.1	70nHL	L	Click	500/70	7.1	Altr	2.58	100.0	1.0	300.0
2	ABLA70B.1	70nHL	L	Click	500/70	7.1	Altr	2.70	100.0	1.0	300.0
3	ABLA70A.2	70nHL	L	Click	500/134	7.1	Altr	4.19	100.0	1.0	300.0
4	ABLA70B.2	70nHL	L	Click	500/134	7.1	Altr	4.18	100.0	1.0	300.0
5	ABLA70A.3	70nHL	L	Click	500/89	7.1	Altr	3.28	100.0	1.0	300.0
6	ABLA70B.3	70nHL	L	Click	500/89	7.1	Altr	2.87	100.0	1.0	300.0



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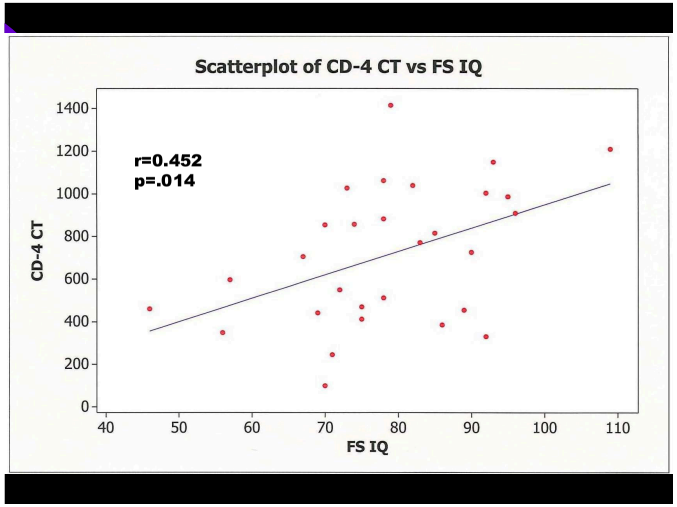
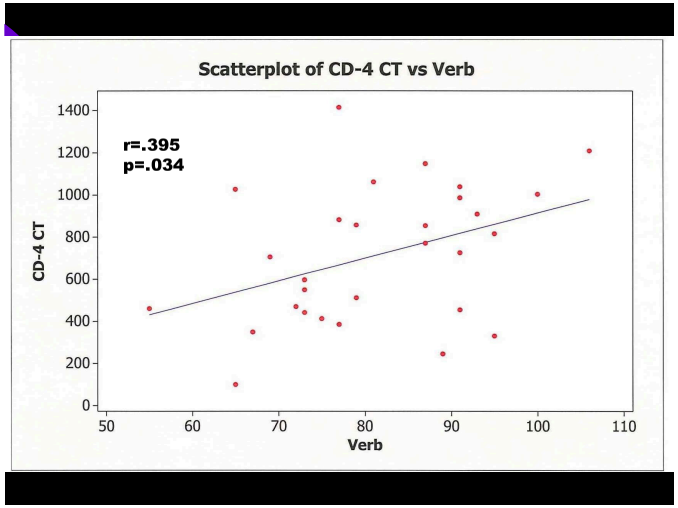
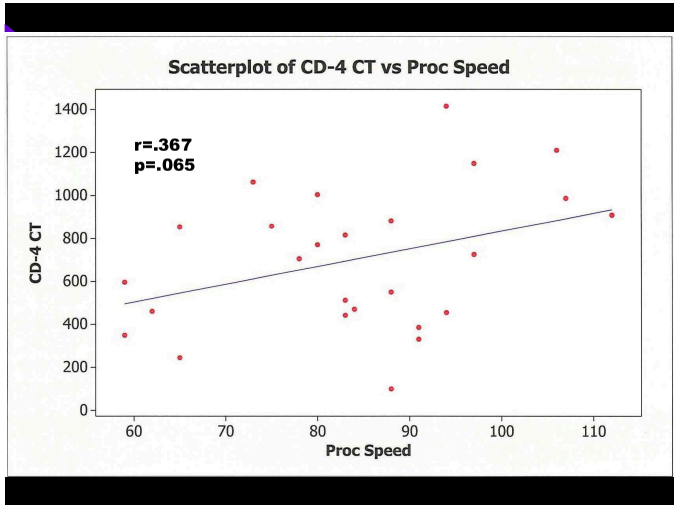
1	JLRA70A.1	70nHL	R	Click	500/1	7.1	Altr	3.49	100.0	1.0	300.0
2	JLRA70B.1	70nHL	R	Click	500/1	7.1	Altr	3.83	100.0	1.0	300.0
3	JLRA70A.2	70nHL	R	Click	500/1	7.1	Altr	2.85	100.0	1.0	300.0
4	JLRA70B.2	70nHL	R	Click	500/1	7.1	Altr	3.16	100.0	1.0	300.0

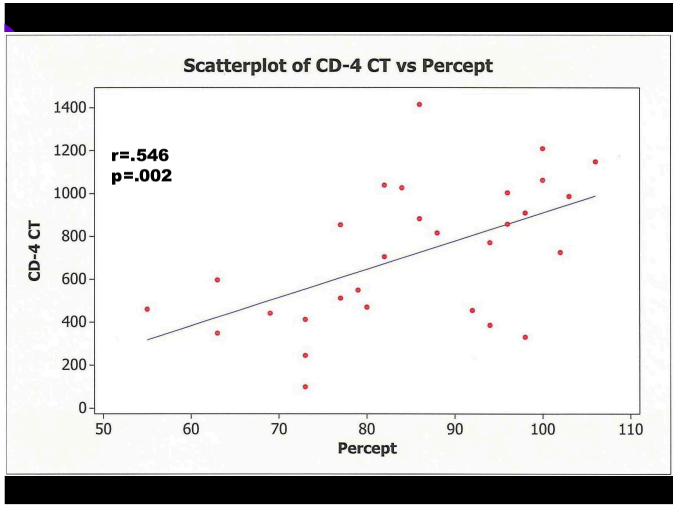
Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
WISC/WAIS Full Scale IQ Standard Score	Normal	8	78.75	13.802	4.880	67.21	90.29	56	96
	Abnormal MLR	10	79.80	16.437	5.198	68.04	91.56	46	109
	Abnormal ABR	9	75.11	10.410	3.470	67.11	83.11	57	93
	Total	27	77.93	13.508	2.600	72.58	83.27	46	109
WISC/WAIS Verbal Comprehension Standard Score	Normal	8	82.00	13.512	4.777	70.70	93.30	65	100
	Abnormal MLR	10	82.30	13.728	4.341	72.48	92.12	55	106
	Abnormal ABR	9	80.78	9.135	3.045	73.76	87.80	69	95
	Total	27	81.70	11.854	2.281	77.01	86.39	55	106
WISC/WAIS Perceptual Reasoning/Organization Standard Score	Normal	8	83.88	12.911	4.565	73.08	94.67	63	98
	Abnormal MLR	10	84.80	14.551	4.601	74.39	95.21	55	102
	Abnormal ABR	9	84.56	14.749	4.916	73.22	95.89	63	106
	Total	27	84.44	13.611	2.619	79.06	89.83	55	106
WISC/WAIS Working Memory Standard Score	Normal	7	80.43	11.759	4.445	69.55	91.30	65	94
	Abnormal MLR	10	82.40	17.212	5.443	70.09	94.71	52	116
	Abnormal ABR	9	74.89	11.826	3.942	65.80	83.98	59	91
	Total	26	79.27	13.993	2.744	73.62	84.92	52	116
WISC/WAIS Processing Speed Standard Score	Normal	8	84.13	16.694	5.902	70.17	98.08	59	112
	Abnormal MLR	10	86.20	15.761	4.984	74.93	97.47	62	106
	Abnormal ABR	9	78.44	11.001	3.667	69.99	86.90	59	97
	Total	27	83.00	14.483	2.787	77.27	88.73	59	112









Adding Audiology in the Care of HIV Children

- Hearing loss:
  - Compromise receptive communication
  - Examine for fluctuations
- Auditory processing disorder
  - Variation from test to retest re: dynamic status of HIV
- Evoked Potentials
  - Abnormal neural function from defined pathways
- Influence on neuropsychology
  - Influence testing and academic achievement

Significance of Investigation

- Auditory problems are invisible disabilities
- Negative impact on academics and socialization
  - Intervention for hearing loss/auditory processing alleviates effects
- Non-invasive mechanism for monitoring CNS/immune system status

Summary of Findings

- Significant incidence of hearing loss in small sample size
- Fluctuations of hearing indicating active disease and dynamic conditions
- Abnormal auditory brainstem response showed trend with working memory and processing speed
- Elements of cognitive abilities appear to be related to immune system status (degrees of encephalopathy)

Questions?