LENA as a Clinical Research Tool:

A Deaf child of Deaf parents comes to speech

Robyn Cantle Moore, PhD.
Christine Yoshinaga-Itano, PhD., CCC-A

RIDBC Renwick Centre
For Research and Professional Education

Royal Institute for
Deaf and Blind Children

THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

The subject and family

- Data to date: "Tom" 15 – 36 months of age

  13 days / 140+ hours

  W/E Home, Home+day-care → Home+preschool

- Child's hearing status: Bilateral hearing aids

  Moderate-severe, bilateral sensorineural loss

  PTA: 65dB (better ear)

- Parents' hearing status: Bilateral hearing aids

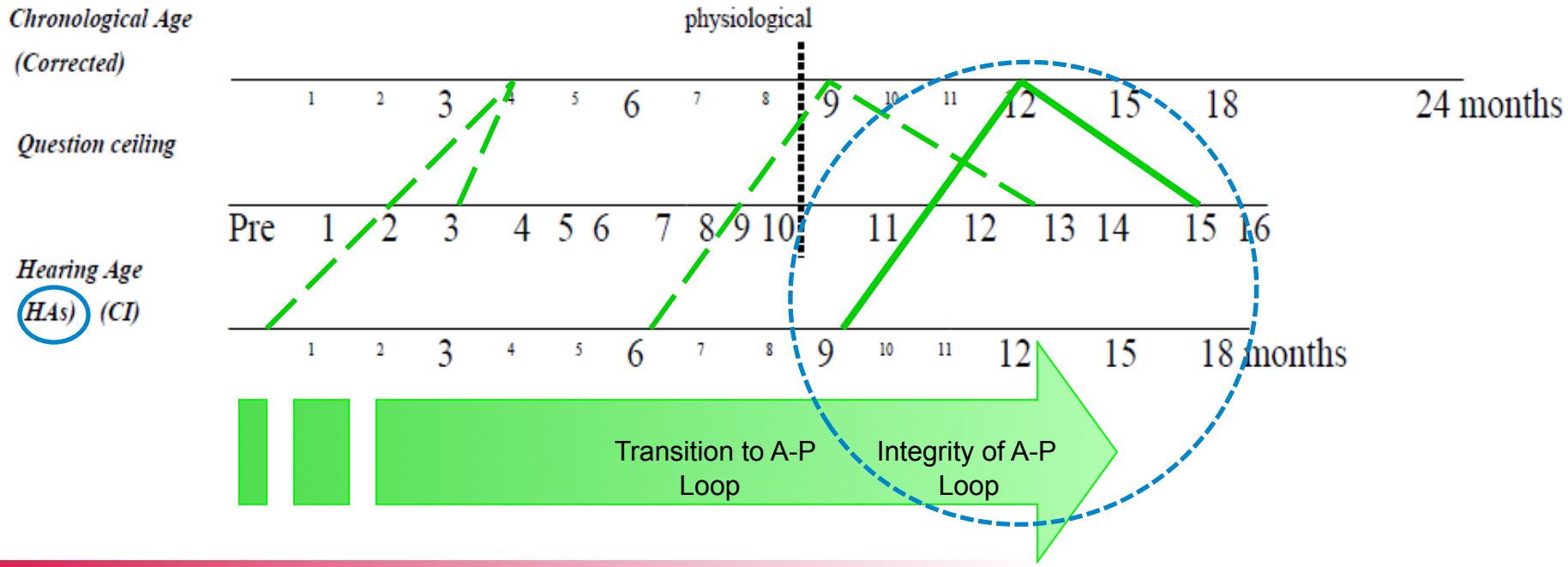
  Profound, bilateral sensorineural loss

  PTA: 100dB (better ear); 93dB (better ear)

Prior to LENA : **IMP** >12 months age

SCORE: Assessment Date ……**"Tom"**……

Child's Age:……yrs……**12**…….mths.

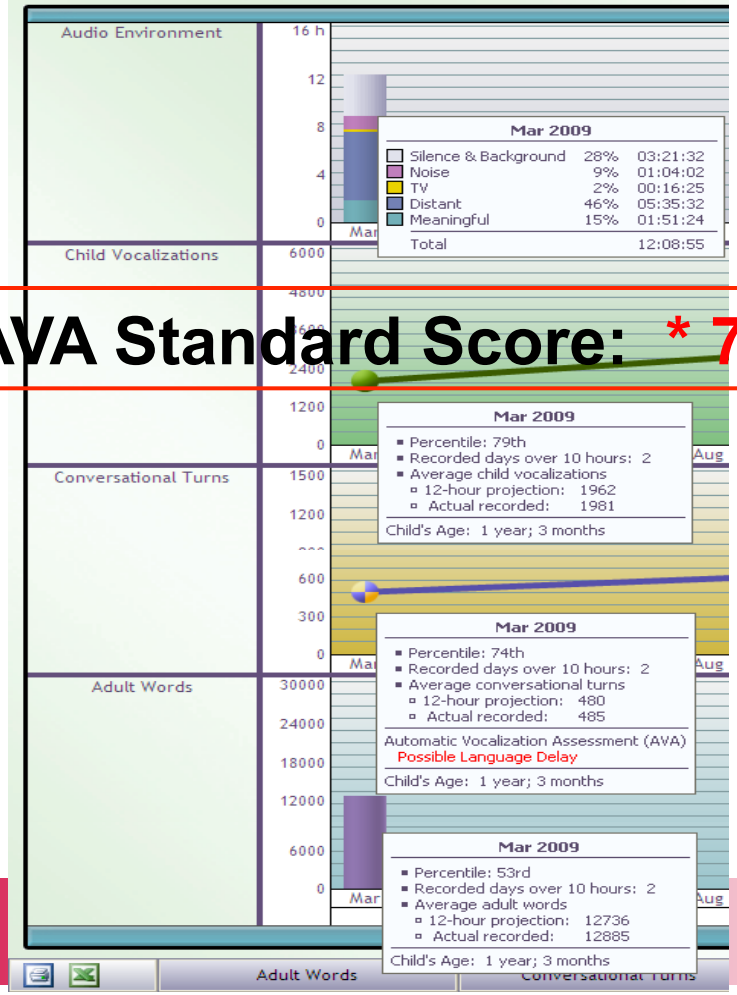


RIDBC Renwick Centre
For Research and Professional Education

captures, analyses &

LENA reports child's "auditory diet"

3rd – 7th – 12th March '09



<u>15 months of age</u>

Meaningful Speech represented

15% of Tom's auditory environment.

AVA Standard Score: * 74.96 Possible Language Delay

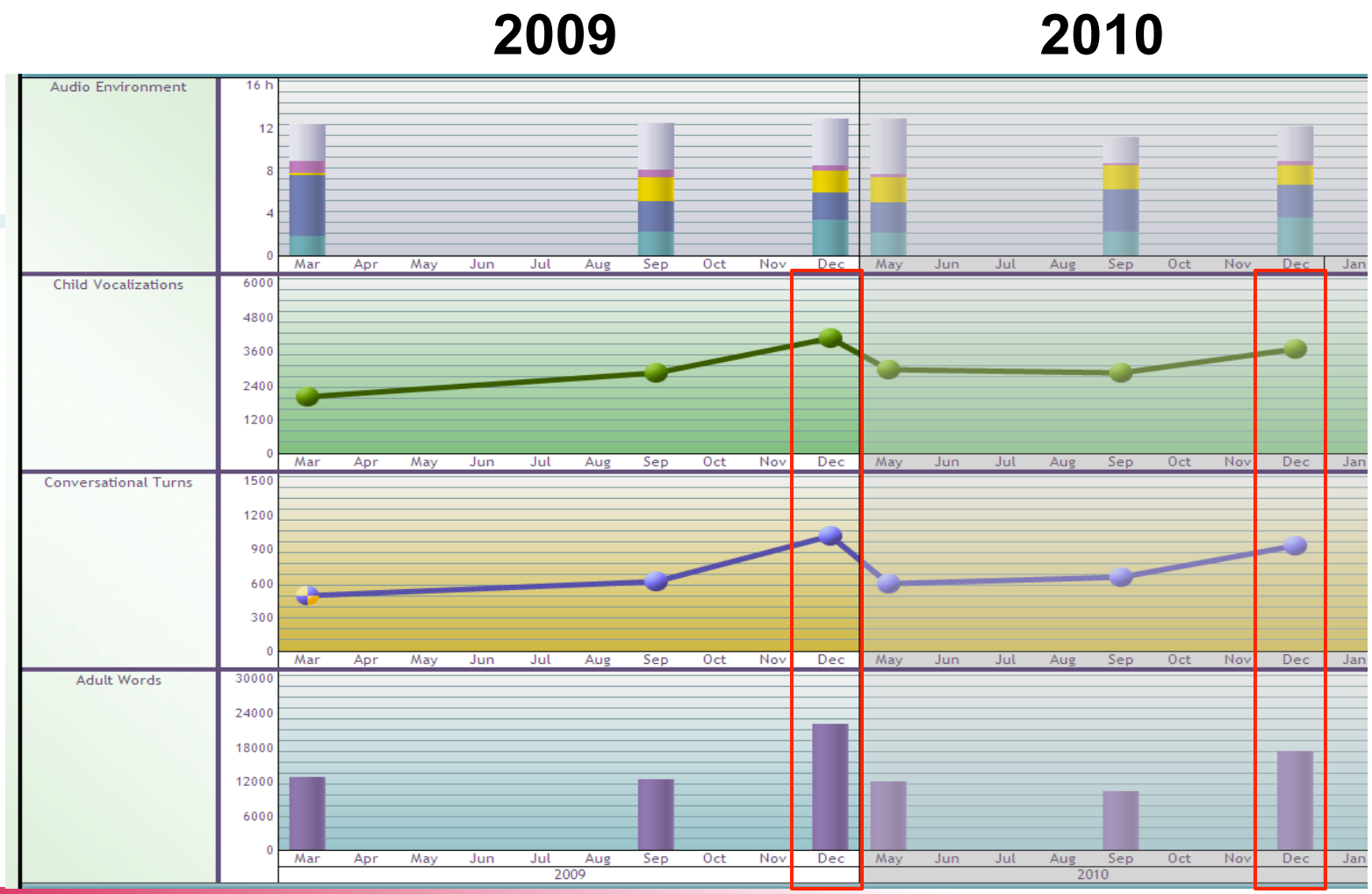
Child Vocalization Count: 79th %ile

Conversational Turn Count: 74th %ile

Adult Word Count: 53rd %ile

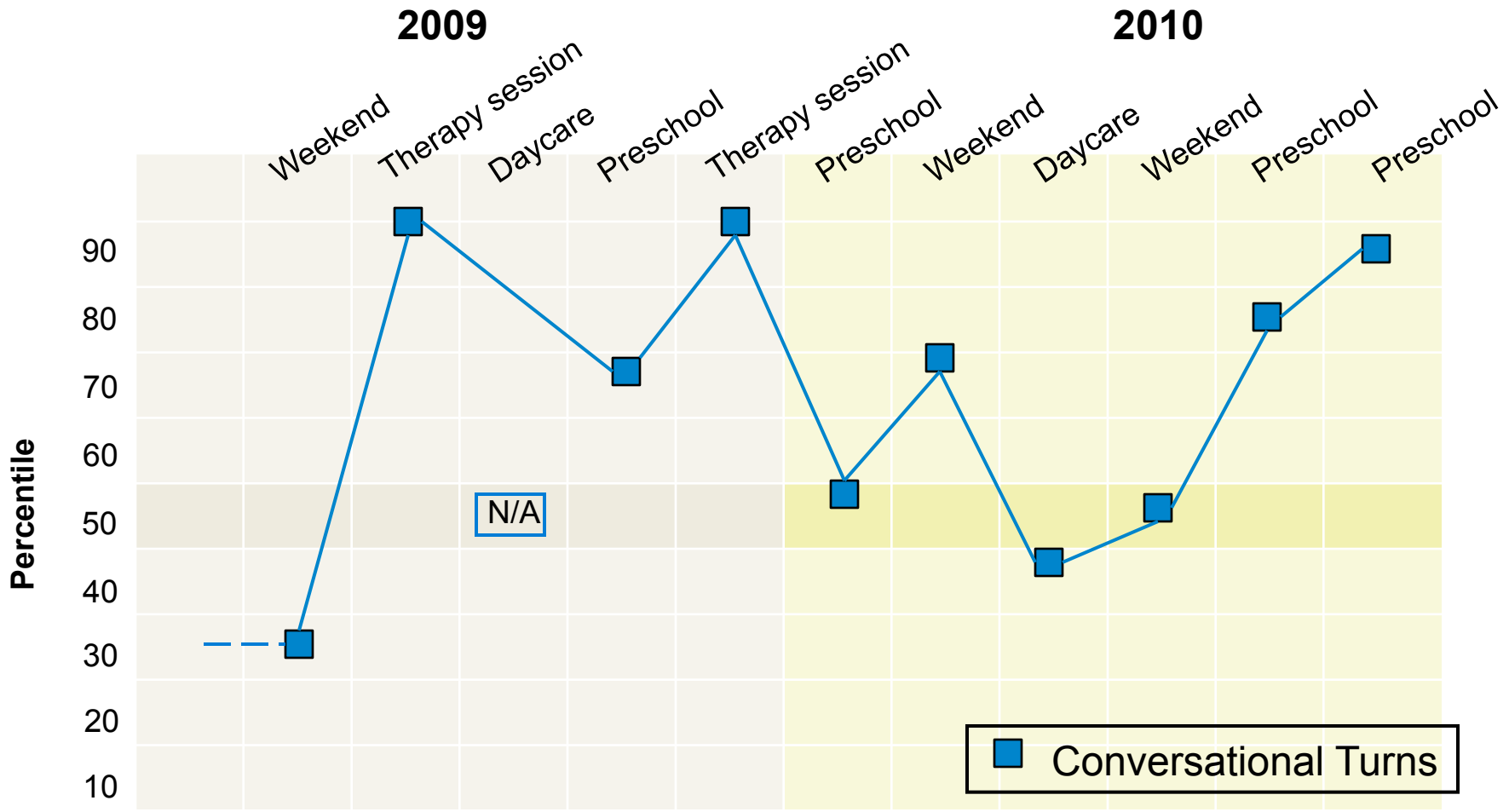
RIDBC Renwick Centre
For Research and Professional Education

LENA reveals patterns in “auditory diet”



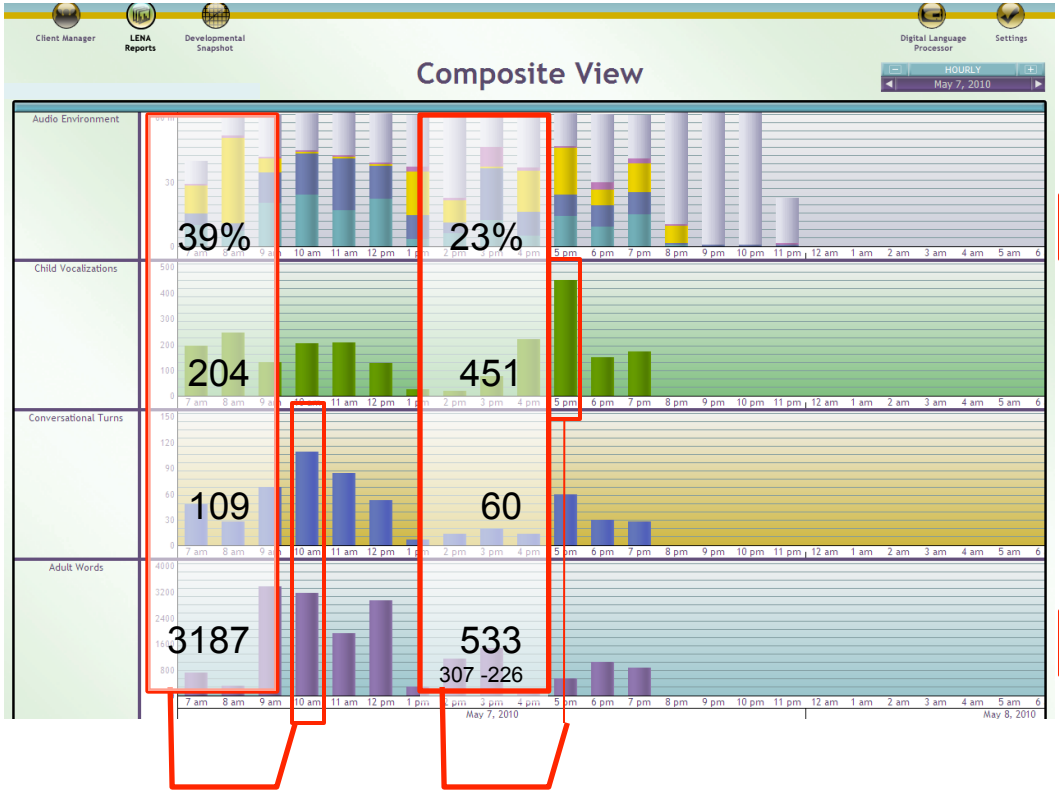
RIDBC Renwick Centre
For Research and Professional Education

The impact of different environments



Components of auditory experience

Preschool day → at home: 29 months / 26mth Hearing Age



	S	T	U	V	W	X	Y	Z
1	AWC	Turn_Count	Child_Voc_Count	Child_Voc_Duration	FAN_Word_Count	MAN_Word_Count	Clock_Time_TZAdj	Average_SignalLevel
2	324	26	75	65.49	230.36	93.69	5/06/2010 22:21	76.46
3	199	9	54	36.35	178.56	20.87	5/06/2010 22:35	72.29
4	201	13	66	79	195.6	4.87	5/06/2010 22:50	77.55
5	180	8	28	22.25	15.99	164.15	5/06/2010 23:00	78.15
6	0	0	0	0	0	0	5/06/2010 23:15	82.95
7	54	7	76	52.65	54.3	0	5/06/2010 23:30	78.6
8	94	13	144	146.71	85.54	7.68	5/06/2010 23:45	79.12
9	164	18	59	36.91	155.4	9.1	5/07/2010 0:00	78.06
10	457	12	23	19.15	445.96	10.82	5/07/2010 0:15	69.28
11	1753	29	37	22.26	1692.37	61.07	5/07/2010 0:30	71.68
12	995	9	14	9.79	932.37	62.26	5/07/2010 0:45	69.87
13	1096	47	77	50.83	1053.62	42.14	5/07/2010 1:00	72.43
14	622	21	51	37.49	602.55	19.54	5/07/2010 1:15	71.1
15	815	19	36	24.1	727.04	88.35	5/07/2010 1:30	71.47
16	654	22	40	27.97	653.82	0	5/07/2010 1:45	72.06
17	381	6	30	19.75	380.84	0	5/07/2010 2:00	70.19
18	883	37	63	44.77	881.07	1.68	5/07/2010 2:15	71.71
19	510	40	99	72.29	509.93	0	5/07/2010 2:30	75.8
20	157	2	17	10.28	156.93	0.54	5/07/2010 2:45	71.58
21	655	16	53	41.71	647.95	6.68	5/07/2010 3:00	70.11
22	895	9	27	19.15	887.77	7.74	5/07/2010 3:15	67.32
23	694	15	31	17.19	678.63	15.63	5/07/2010 3:30	69.37
24	702	13	17	11.95	692.72	9.35	5/07/2010 3:45	65.3
25	236	6	8	3.97	229.61	6.4	5/07/2010 4:00	70.19
26	51	1	18	10.93	50.54	0	5/07/2010 4:15	67.91
27	0	0	0	0	0	0	5/07/2010 4:30	68.46
28	0	0	0	0	0	0	5/07/2010 4:45	56.83
29	0	0	0	0	0	0	5/07/2010 5:00	57.12
30	13	0	0	0	12.85	0	5/07/2010 5:15	55.69
31	352	5	5	2.69	350.39	2.11	5/07/2010 5:30	62.7
32	781	9	17	8.59	780.65	0	5/07/2010 5:45	68.17
33	1054	11	18	10.28	1045.63	8.11	5/07/2010 6:00	69.75
34	434	9	51	38.83	425.69	8.34	5/07/2010 6:15	71.88
35	0	0	4	3.26	0	0	5/07/2010 6:30	74.64
36	0	0	6	3.05	0	0	5/07/2010 6:45	76.35
37	8	1	41	32.72	7.79	0	5/07/2010 7:00	81.12
38	111	12	77	70.88	90.92	20.2	5/07/2010 7:15	79.35
39	25	1	40	29.65	24.99	0.72	5/07/2010 7:30	68.57
40	2	2	22	16.62	2	0	5/07/2010 7:45	70.04
41	57	7	182	159.7	42.11	14.7	5/07/2010 8:00	79.86
42	301	38	162	124.01	172.83	128.41	5/07/2010 8:15	78.35
43	164	14	99	93.96	87.8	76.16	5/07/2010 8:30	77.37
44	11	1	8	5.58	2.98	7.66	5/07/2010 8:45	77.38
45	105	8	93	89.71	85.26	19.97	5/07/2010 9:00	77.75
46	198	11	20	12.99	156.06	42.05	5/07/2010 9:15	68.76
47	410	6	15	9.33	307.94	101.22	5/07/2010 9:30	67.11
48	332	5	24	9.24	210.06	121.98	5/07/2010 9:45	66.63
49	204	11	84	61.8	157.67	46.72	5/07/2010 10:00	77.76
50	408	12	37	23.56	270.66	136.92	5/07/2010 10:15	73.41
51	263	5	51	29.08	188.85	74.39	5/07/2010 10:30	73.24
52	0	0	1	1.12	0	0	5/07/2010 10:45	54.44
53	0	0	0	0	0	0	5/07/2010 11:00	45.85
54	0	0	0	0	0	0	5/07/2010 11:15	39.52
55	0	0	0	0	0	0	5/07/2010 11:30	34.44

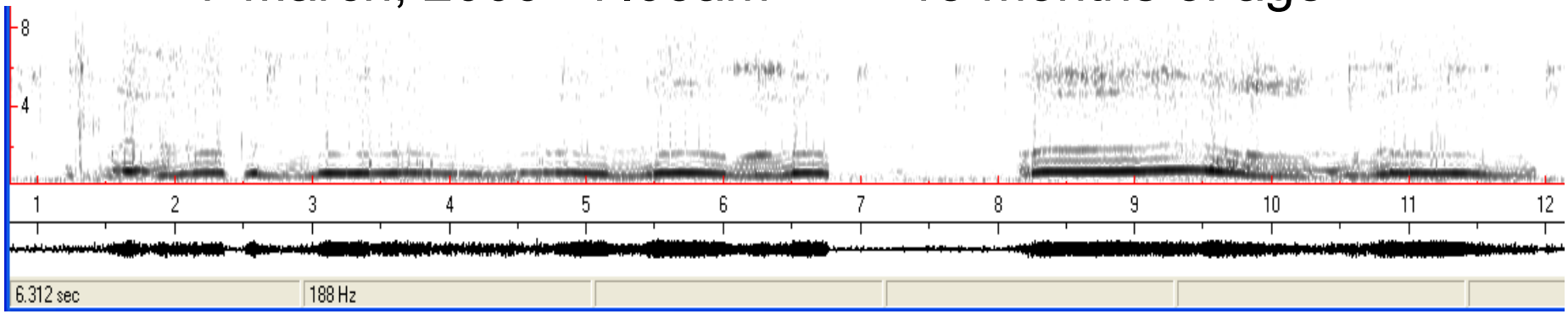
7th May-e20100512_134328_003599

RIDBC Renwick Centre
For Research and Professional Education

Quality audio →spectrographic analysis

	N	S	T	V	W	X	Y	Z	AA
1	Child_Age	Child_Voc_Count	Child_Voc_Duration	AVA_SS	EMLU	AVA_DA	Elapsed_	Clock_Time_TZAdj	Init_by
2	15	1	0.2	65.744	0.506	8	41318.9	3/07/2009 7:02	CH
3	15	1	0.6	65.744	0.506	8	41491.9	3/07/2009 7:05	CH
4									
5									

7 March, 2009 7.03am 15 months of age

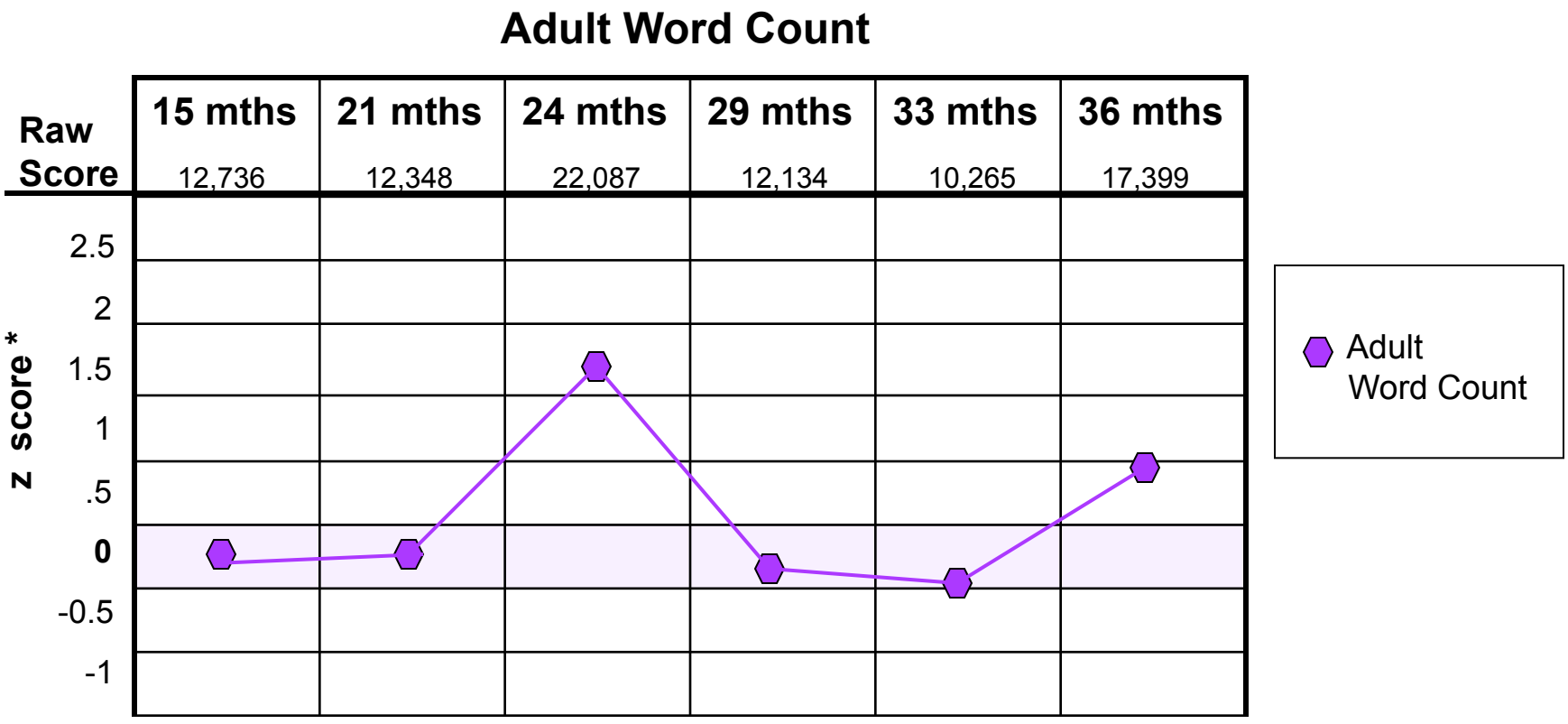


Tom's progress at 21 months of age

	LENA AVA (SS)		**Brown (1973)** Spon.language sample	**Rossetti** Expression
MLU (EMLU)	1.73	107	1.5	
Development	24 mths		Stage 1-2	18-21mths

	MacA CDI Hearing norms	**DiEL (Nott et al., 2003)**
Word count	35th %ile	63 (*IPA ≈28 different phones*)

LENA reports AWC …≈ AW quality?

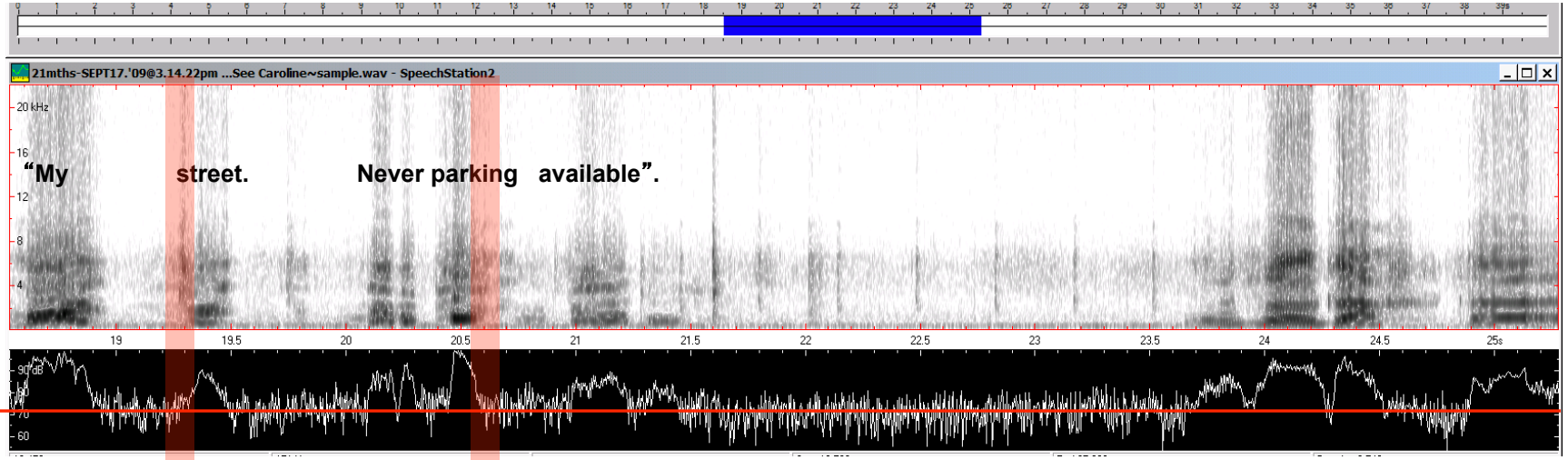


* Gilkerson & Richards (2008). The LENA natural language study (LTR-02-2). Boulder, Colorado: LENA Foundation.

“Meaningful speech”

1	AWC	Turn_Count	Child_Voc_Count	Child_Voc_Duration	EMLU	AVA_DA	Clock_Time_TZAdj
2	107	14	58	39	1.749	24	09/16/2009 21:30:10
83	11	1	28	23.4	1.749	24	09/17/2009 04:35:00
84	32	1	18	17.89	1.749	24	09/17/2009 04:40:00
85	30	1	8	4.77	1.749	24	09/17/2009 04:45:00
86	48	8	43	32.06	1.749	24	09/17/2009 04:50:00
87	86	6	25	17.99	1.749	24	09/17/2009 04:55:00
88	9	1	31	28.24	1.749	24	09/17/2009 05:00:00
89	85	4	25	19.93	1.749	24	09/17/2009 05:05:00
90	7	0	9	5.72	1.749	24	09/17/2009 05:10:00

17 September, 2009 21 months of age

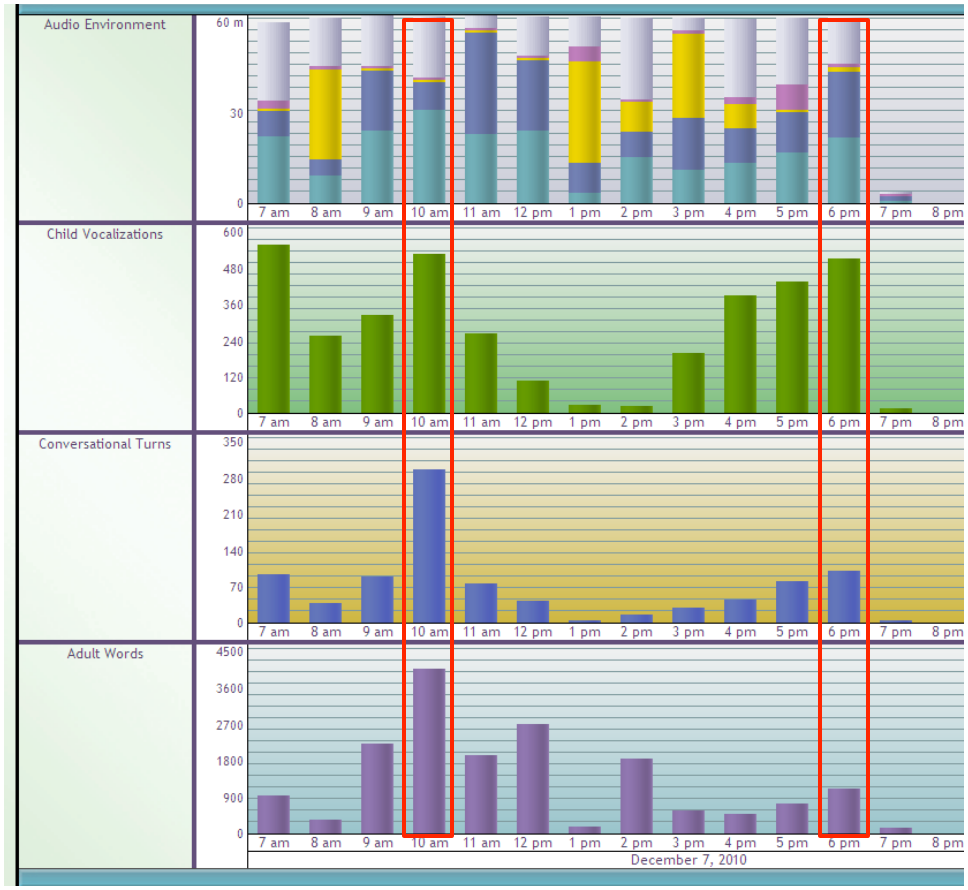


70dB

RIDBC Renwick Centre
For Research and Professional Education

The impact of the different interactors

Preschool day → at home: 36 months / 33mth Hearing Age



AWC	Turn_Count	Child_Voc_Count	Child_Voc_Duration	EMLU	AVA_DA	Elapsed_Time	Average_SignalLevel
290	18	51	42.85	2.86	38	13420	75.81
372	23	36	33.51	2.86	38	13720	75.87
155	8	17	13.46	2.86	38	14020	73.85

AWC	Turn_Count	Child_Voc_Count	Child_Voc_Duration	EMLU	AVA_DA	Elapsed_Time	Average_SignalLevel
155	17	44	43.14	2.86	38	41320	79.99
21	3	53	42.46	2.86	38	41620	78.29
117	13	88	98.38	2.86	38	41920	82.1

AWC	Turn_Count	Child_Voc_Count	Child_Voc_Duration	EMLU	AVA_DA	Elapsed_Time	Average_SignalLevel
21	3	53	42.46	2.86	38	41620	78.29
117	13	88	98.38	2.86	38	41920	82.1
64	9	50	53.7	2.86	38	42220	77.73

Tom's progress at 36 months of age

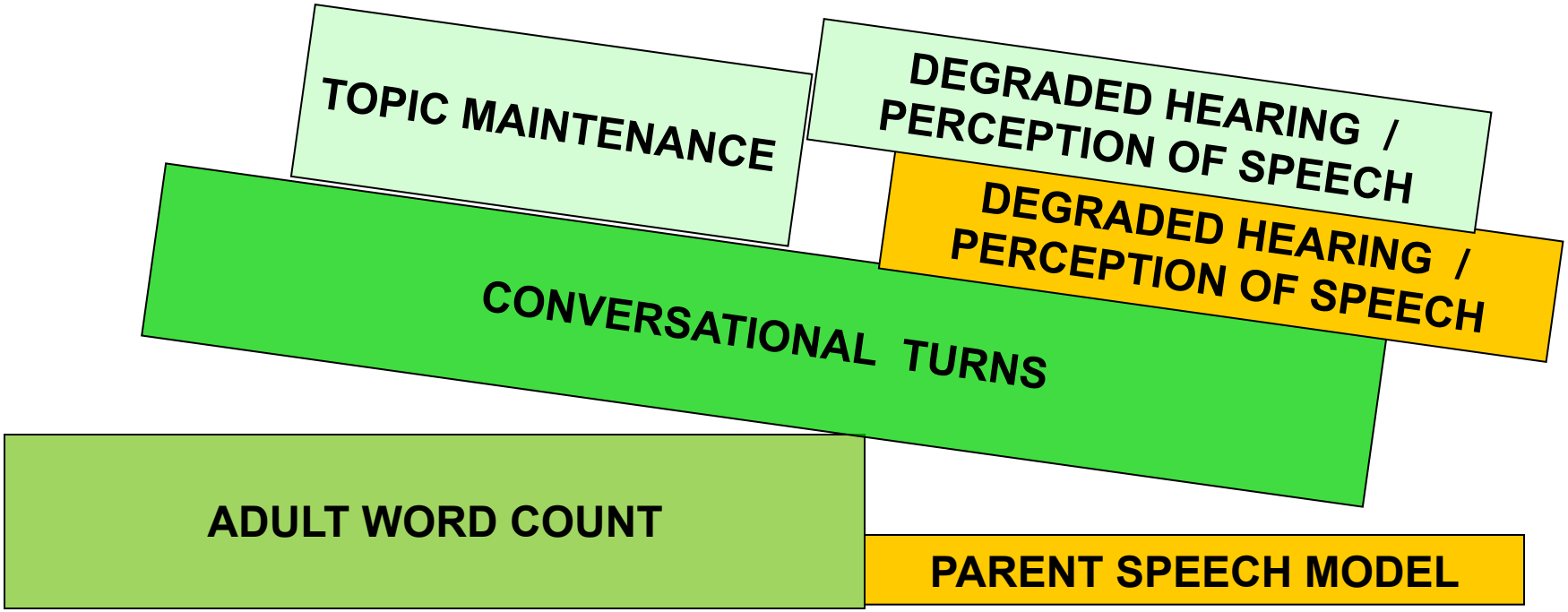
	Different types produced	Yoshinaga-Itano & Sedey, 2000 Moderate-Severe HL	DEAP Hearing norms
Vowels	12	50th %ile	9th %ile
Consonants	13	50th %ile	1st %ile

	LENA AVA (SS)		Brown (1973) Spon.language sample	PLS-4 Expressive
MLU (EMLU)	2.86	105	2.2	12th %ile
Eq.Dev.Age	38 months		28-36 months	29 months

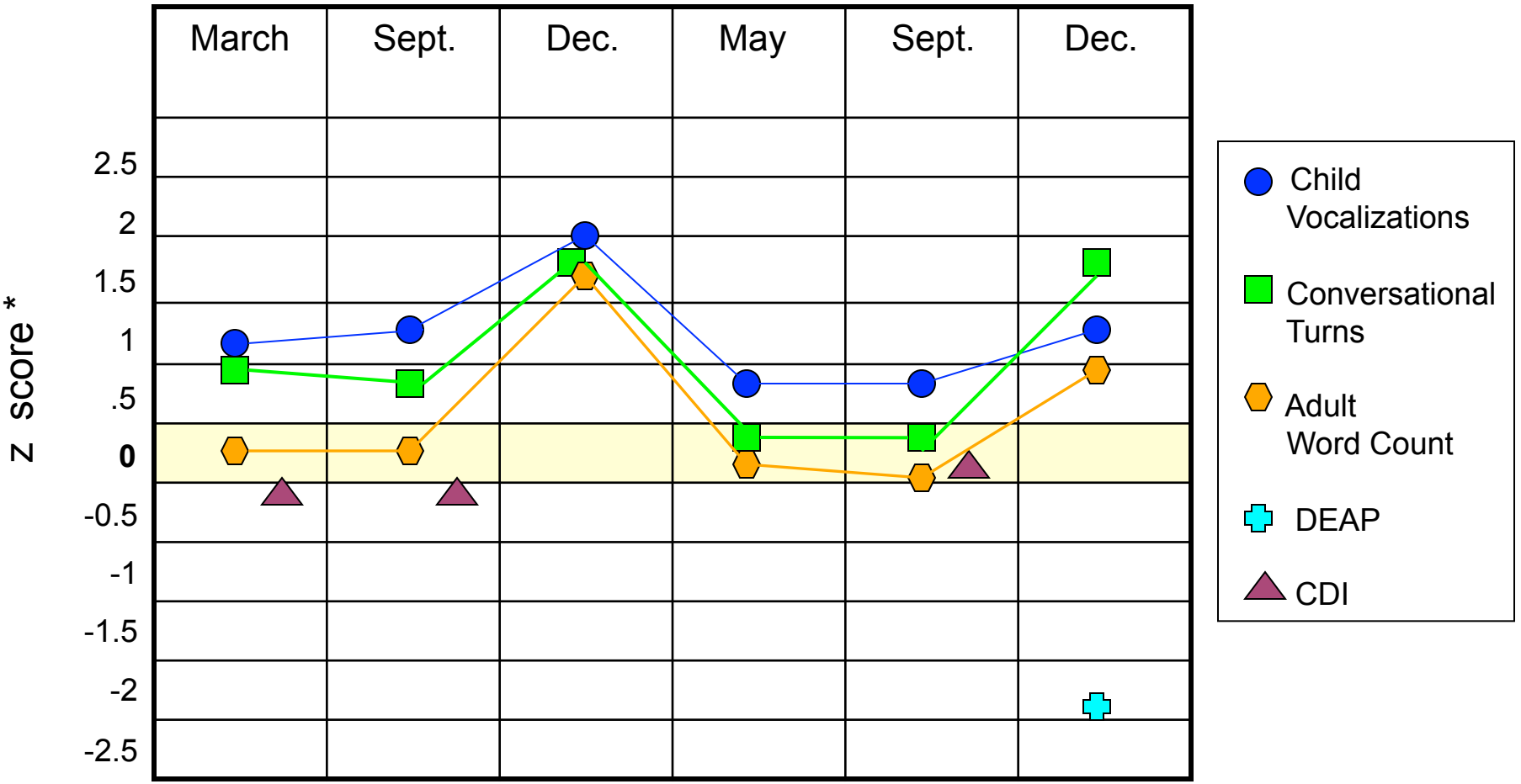
What does AVA analysis tell us?

- Tom has age-appropriate phoneme diversity (Standard Score)
- That phonemes produced are differentiated by acoustic envelopes / not yet mastered
- ... Is predictive – suggests Tom is on the way to intelligible speech
- In this case, AVA may not correlate with spoken language

Supposition



LENA : Standardized Assessments



*Gilkerson, J. & Richards, J.A. (2008). The LENA natural language study (LTR-02-2). Boulder, Colorado: LENA Foundation.

Thankyou…

Contact:

Robyn Cantle Moore, PhD
RIDBC Renwick Centre for Research & Professional Education
University of Newcastle
robyn.moore@ridbc.org.au

RIDBC Renwick Centre
For Research and Professional Education