Evidence-Based Assessment of Children who are Deaf or Hard of Hearing (DHH)

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Hearing Loss Statistics

2 per 1000 babies are born with hearing loss

By school age, close to 15% of children exhibit some level/type of hearing loss

Approximately 80% of students who are D/HH attend their neighborhood school

40% of students who are D/HH have additional needs

U.S. Department of Education, Office of Special Education and Rehabilitative Services, & Office of Special Education Programs, 2004

Evidence-based practices

- A significant amount of the published research we have to date describes the population- doesn't really help us as service providers.

Historically

- Compared children based on communication modality
- ASL- Oral communication

As technology became more common….

- Started looking at age of implantation
- Comparing “early” to “late” implantation

Today

- Research comparing young children with hearing loss to age-matched peers without hearing loss

HOWEVER...

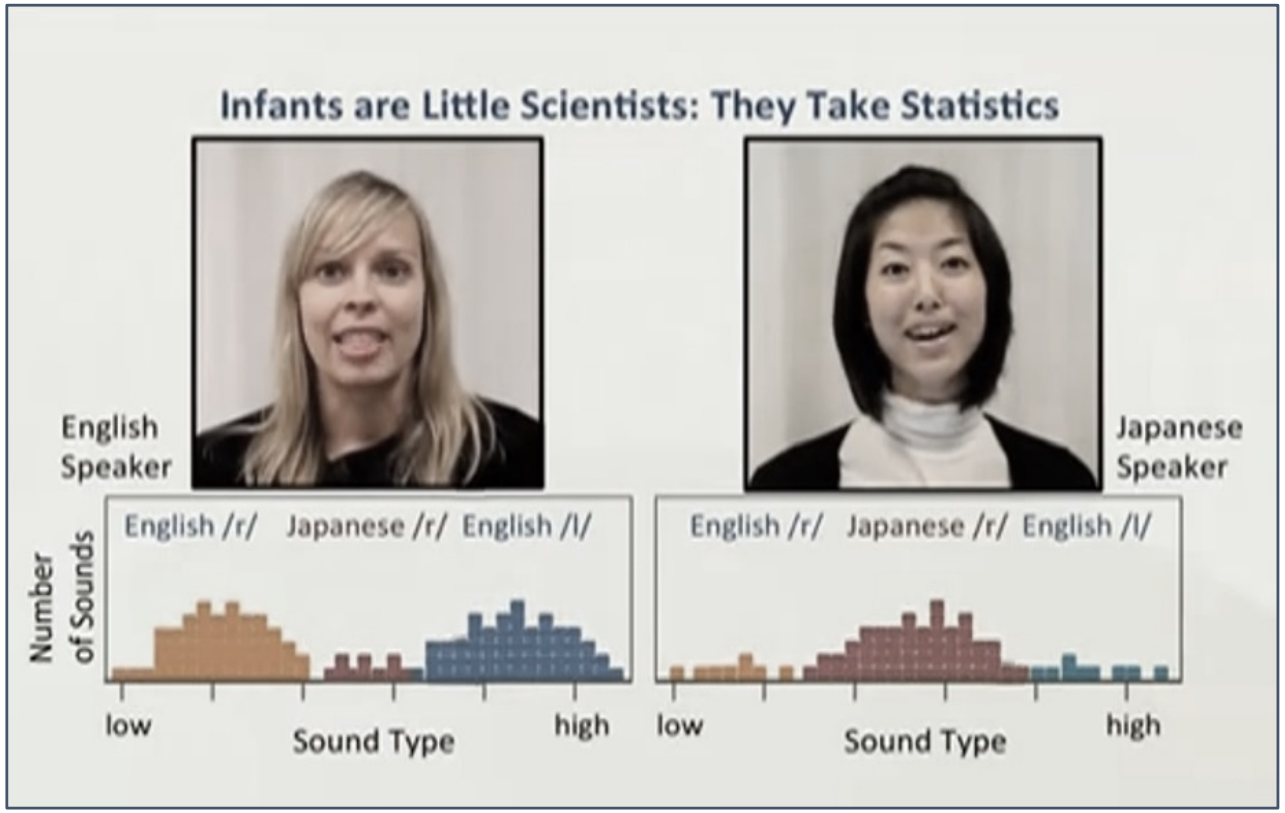
- As a field we see a disconnect between preparation, caseload, and best practice recommendations
- Lack of confidence of providers (Blaiser & Mahshie, 2018; Harrison et al., 2016)
- Graduate level courses do not include hearing-specific information for serving any population

The importance of access

Perceptual saliency

- What is seen
- What is heard

Infants take statistics on the language(s) they are exposed to



https://www.ted.com/talks/patricia_kuhl_the_linguistic_genius_of_babies?language=en

Pat Kuhl (Dec. 13, 2010)

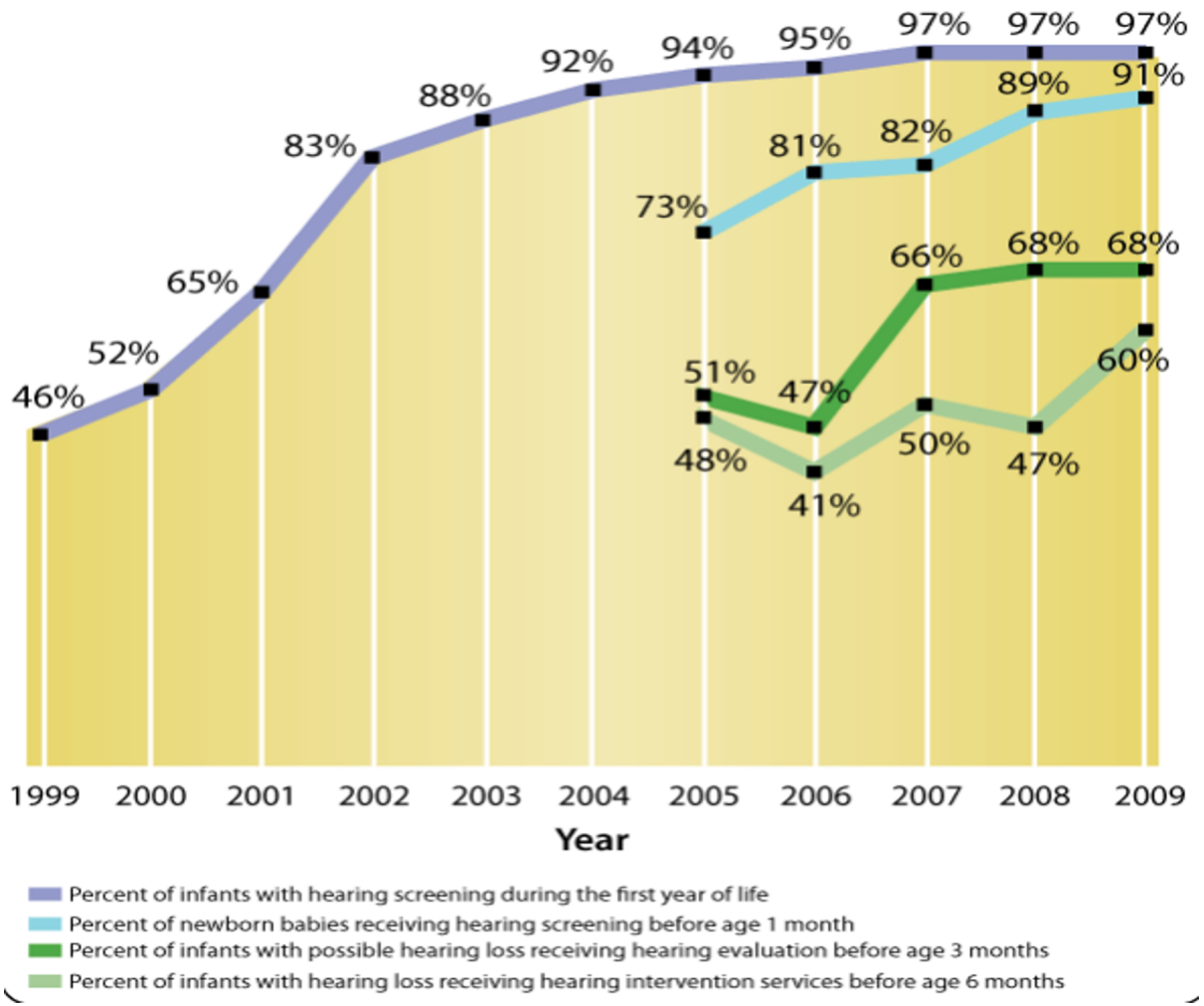
"Babies absorb the statistics of their language to become culture bound listeners based on the representations in their memory that are formed early in development"

Importance of Access

Access has changed

- When a child has access to sound
- How the child accesses sound

WHEN…



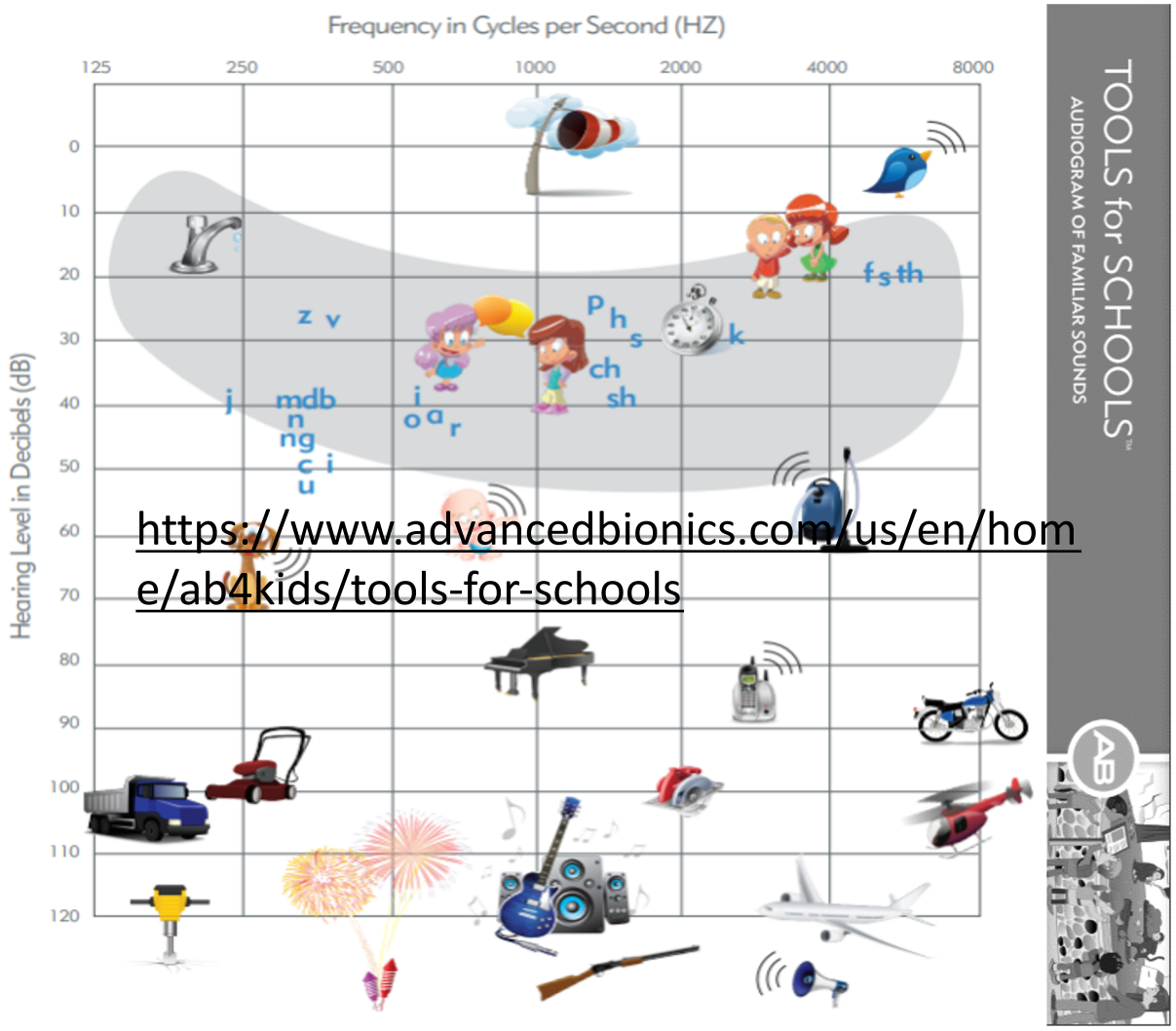
https://www.nidcd.nih.gov/health/statistics/infant-hearing-screening-rates-1999-2009

HOW…


ABC
2
DEF
3
GHI
4
JKL
5
MNO
6
PRS
7
TUV
8
WXY
9
OPERATOR
0
1


cingular
12:34 PM
start
5.00
Phone
Parallels
Web
iPod


Rosie
Funk
4:21
0.96
7:27
105
7:09



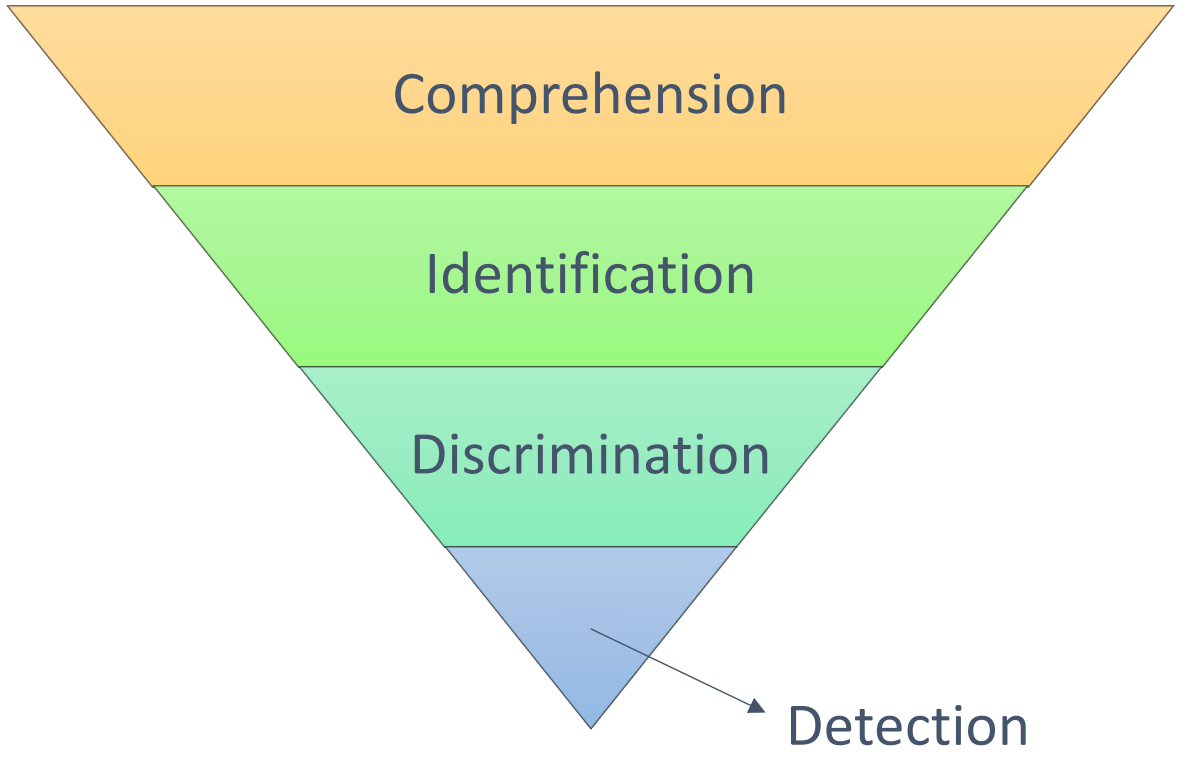
https://www.advancedbionics.com/us/en/home/ab4kids/tools-for-schools

https://www.advancedbionics.com/us/en/home/ab4kids/tools-for-schools.html

UNFAIR HEARING TEST

Erber's Hierarchy

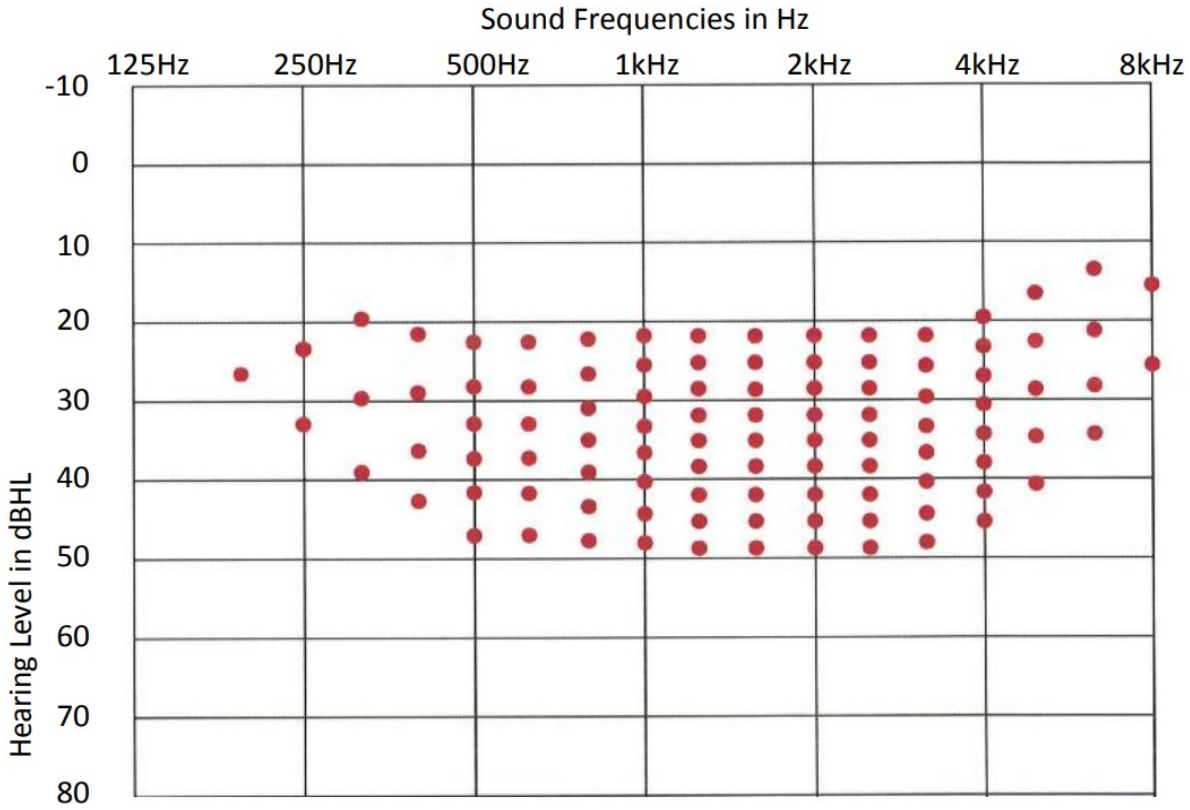
- Describes the limitations of using the audiogram
- Focuses on detection only:
  We do so much more with sound!



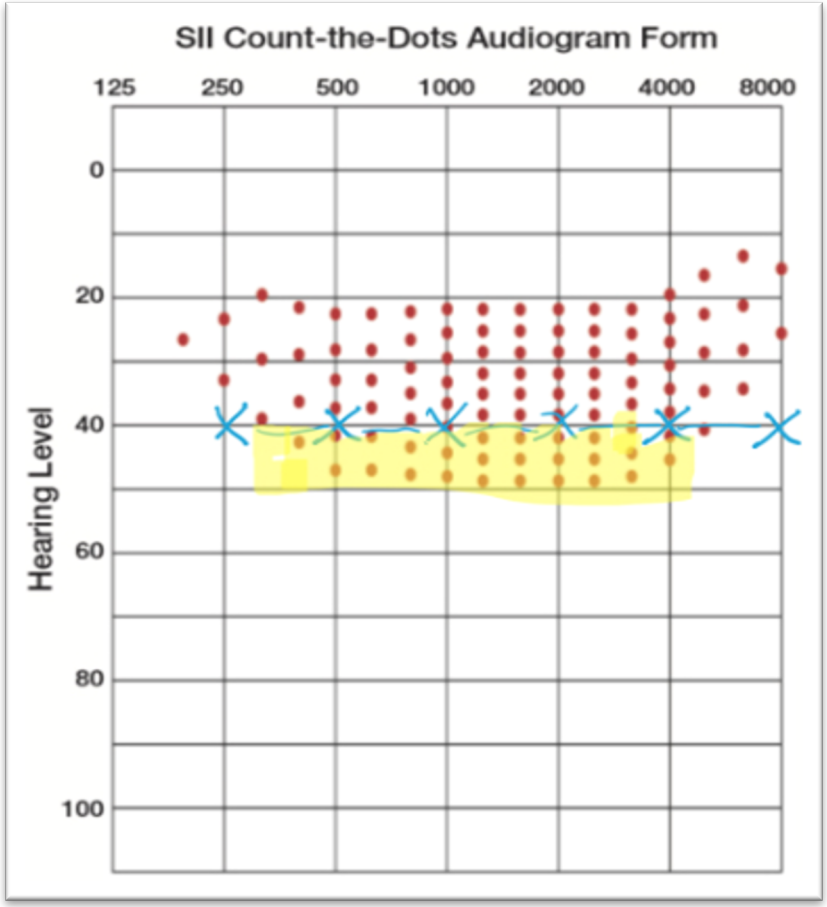
Moving From the Audiogram

Access to audibility:

- Speech Intelligibility Index (SII)
  - How much speech information is available to the student
  - Detection--- ACCESS
  - Simple calculation can be made by audiologist based on student's audiogram
    - SII from hearing aid verification: Real ear measures
    - SII app
    - Count the dot audiogram
  - Need to request this information from community/educational audiologist
    - Helps to direct recommendations related to technology/communication options/"least restrictive environment"



SII Audiogram



Flat 40dB Loss

- # of highlighted dots would be audible
- 28 dots are audible= 28% SII
- A person with normal hearing (15dBHL flat loss) would have 100 dots audible = 100% SII

20Q: Using the Aided Speech Intelligibility Index in Hearing Aid Fittings.

Susan Scollie, Ph.D. Audiology Online.

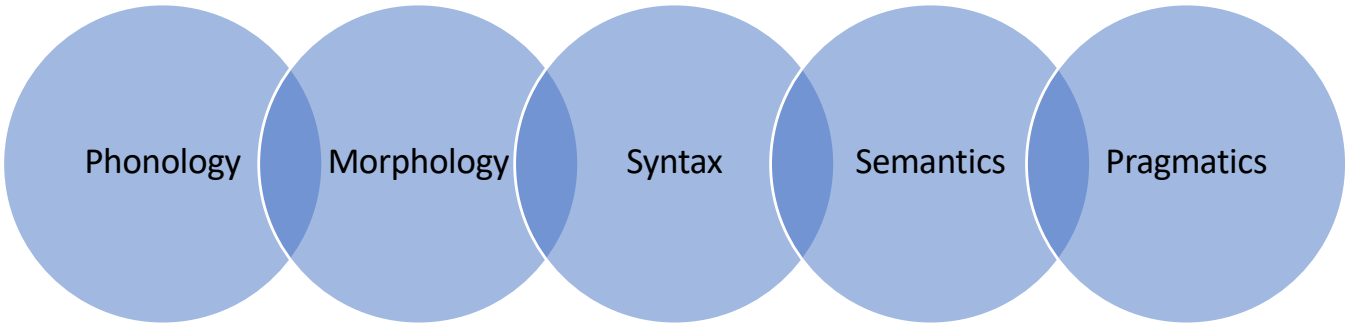
New “Apps”

- What if a two-year-old scores within normal limits on the PLS? Do they qualify? What about the CELF?
- Does the PLS, the CELF tell the whole picture?
- What assessments are most sensitive?
- What else do we do?

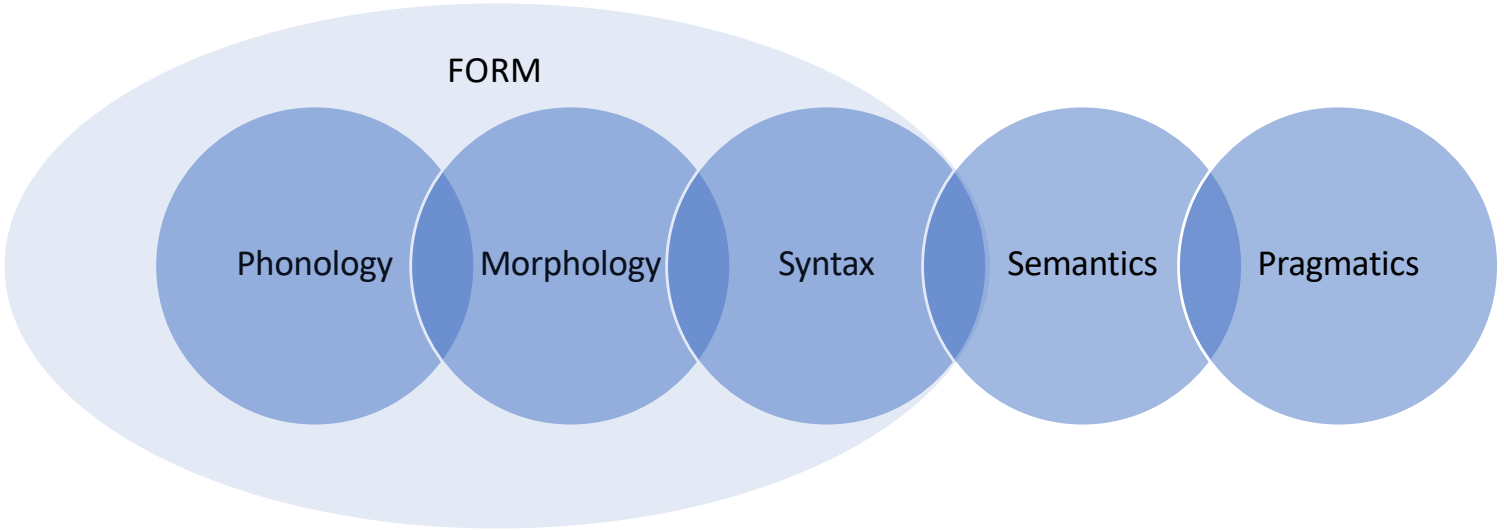
How do we assess young children WHO are DHH?

- What are the tools?
- Formal assessments
- Informal assessments
- Diagnostic intervention

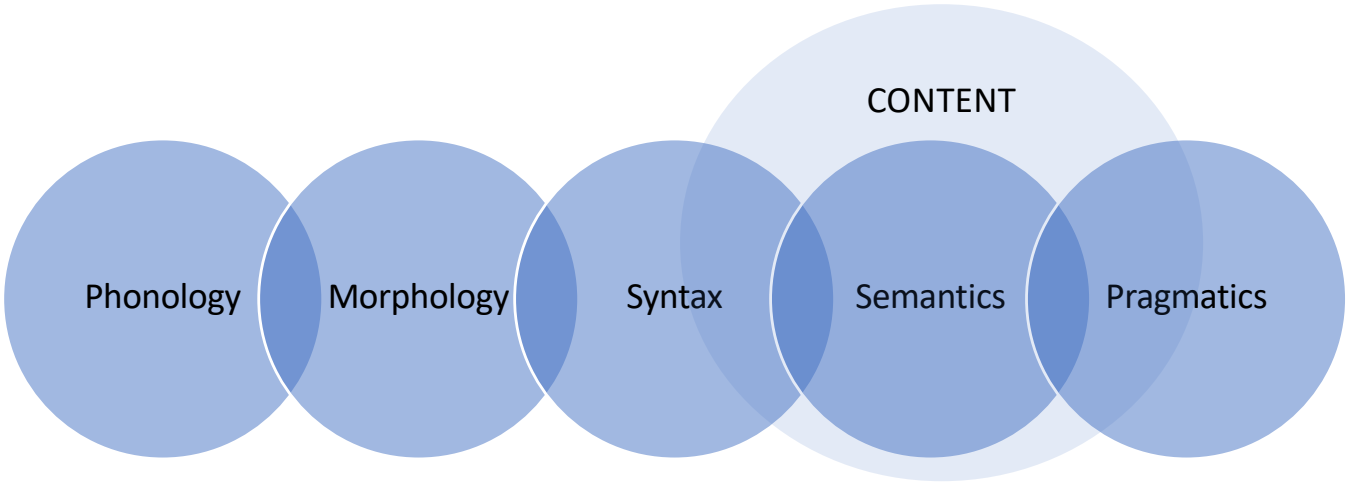
Communication Domains



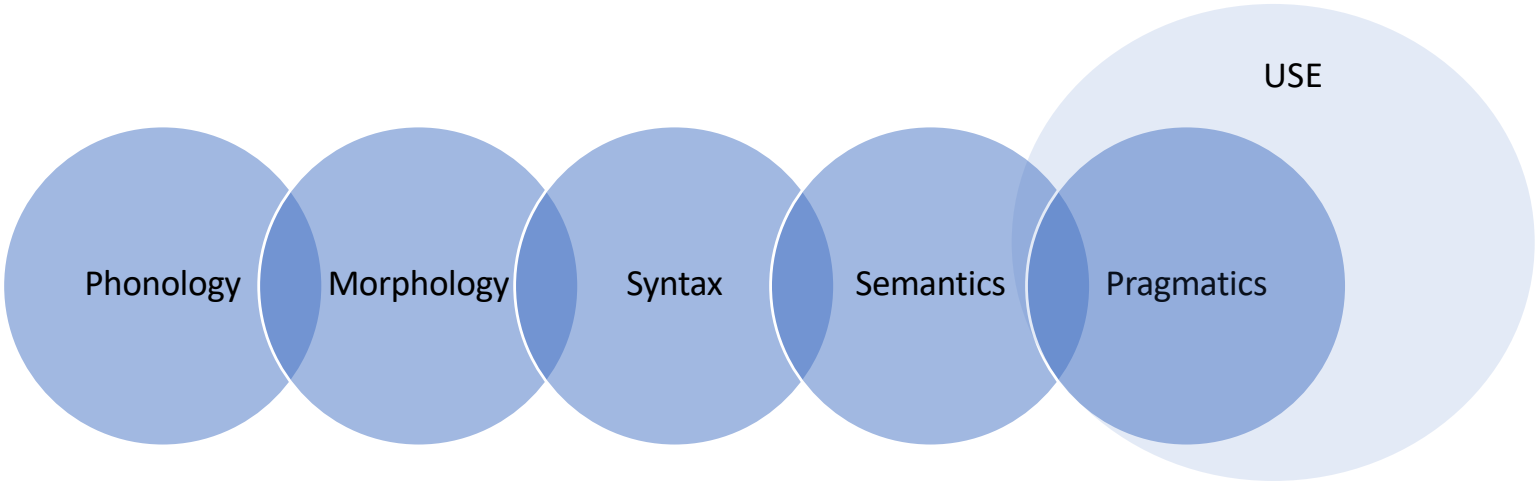
Blaiser, O'Neill, & Darling, 2021



Blaiser, O'Neill, & Darling, 2021



Blaiser, O'Neill, & Darling, 2021



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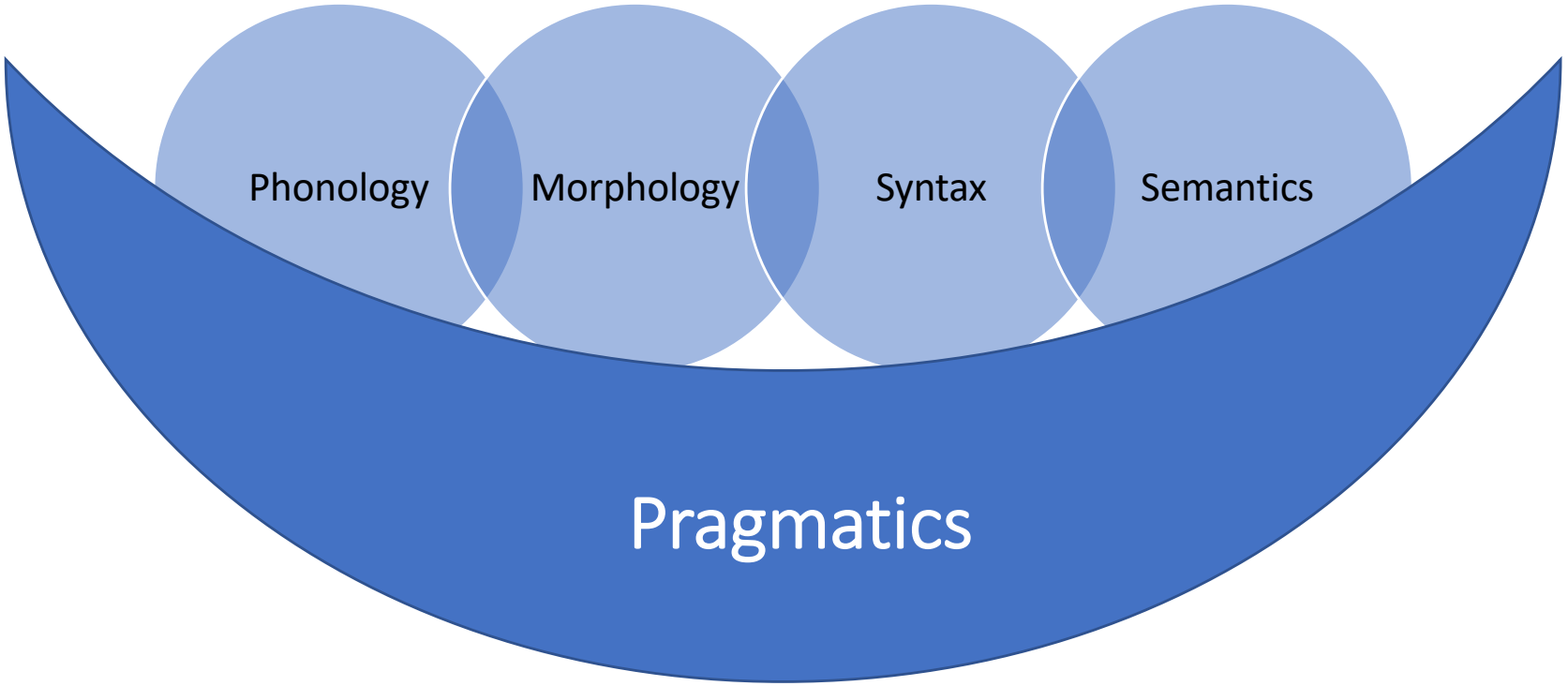
Rethinking Pragmatics



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Importance of **pragmatics**

- Behavior (Keetelars, Cuperus, Jansonius & Verhoeven, 2010)
- Difficulties with peer friendships and psychosocial functioning (Whitehouse, Watt, Line & Bishop, 2009),
- Lower quality of life ratings (Blaskova & Gibson, 2012)

Blaiser, O'Neill, & Darling, 2021

Pragmatics in children who are DHH

Delays compared to peers in:

- Types of communication (Goberis et al., 2012)
- Variations of interactions (Most et al., 2010)
- Success of initiations (DeLuzio & Giralometto, 2011)

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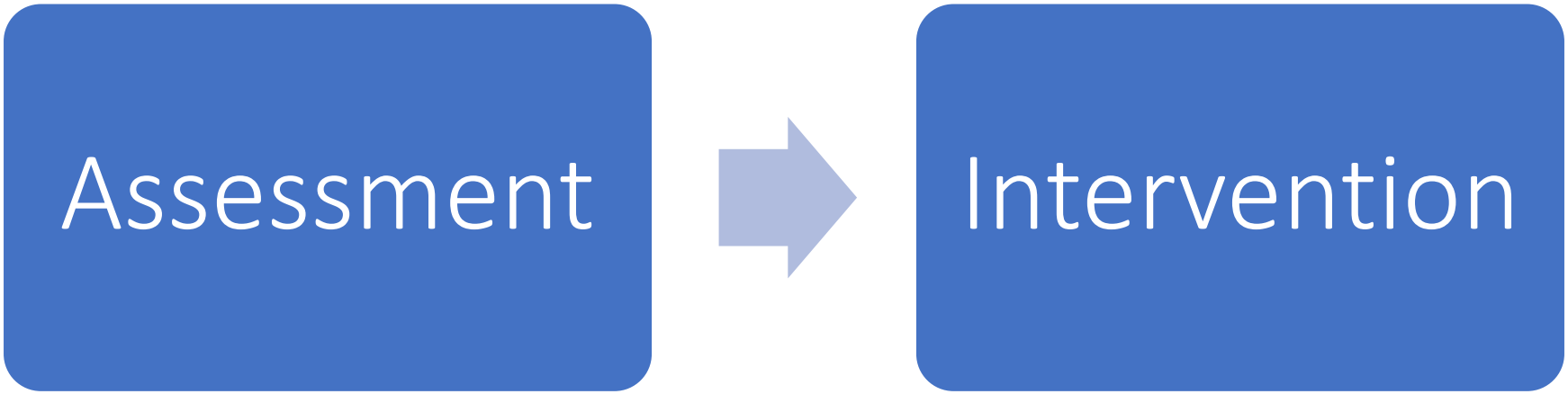

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How do we assess pragmatics?

Observation

Checklists

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Challenges with assessment

Challenge observing

all of the behaviors

Lack of

standardizati

on

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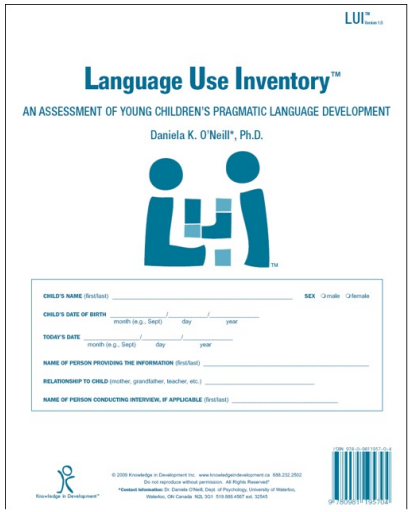
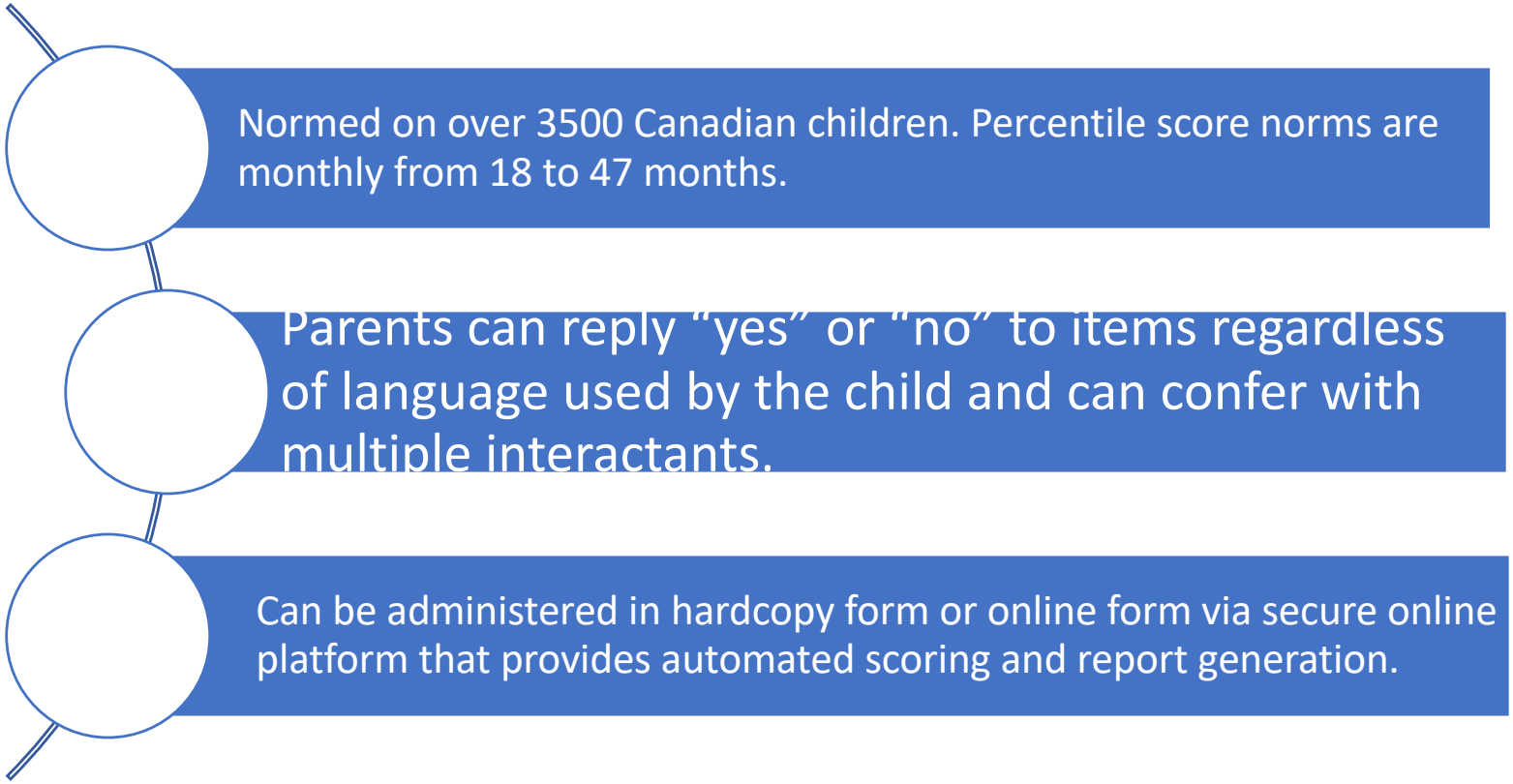
Assessing Pragmatics in Toddlers



- Language Use Inventory (LUI, O'Neill, 2009), a standardized parent-report measure for 18 to 47 month old children.
- uniquely broad overview of young children's social communicative
- The LUI has high sensitivity and specificity and scores correlate with later language measures (e.g., CELF-P2, CCC-2).

Blaiser, O'Neill, & Darling, 2021

Assessing Early Pragmatics



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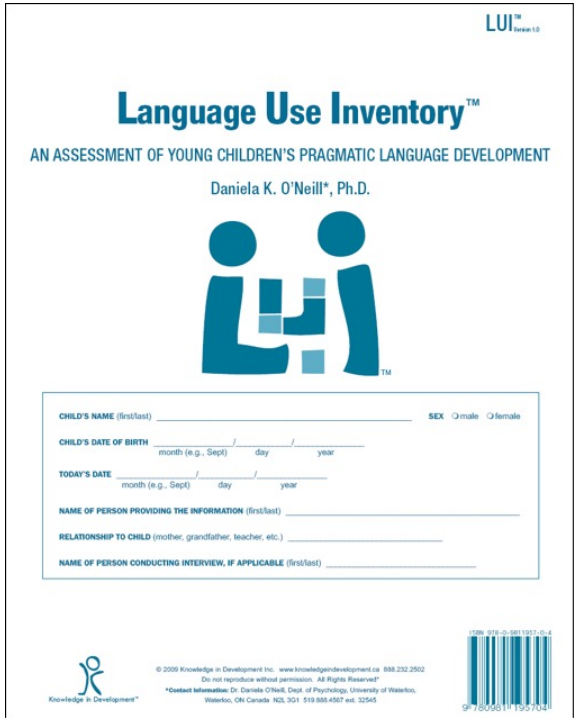
LUI Subscales Comprising the LUI Total Score

Part 2: Communication with Words

- Types of words used
- Requests for help

Part 3: Longer Sentences

- Use of words to get you to notice something
- Questions and comments about things
- Question and comments about self & others
- Use of words in activities with others
- Teasing and sense of humour
- Interest in words and language
- Adapting communication to other people
- Building sentences and stories



Total LUI Score = 161 items of Parts 2 & 3

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Idaho Collaborative Assessment Project (ICAP)

Blaiser & Bargen, 2020

Identifying Metrics

Outcome	Measure
Child language (content)	
Child language (use)	
Child hearing skill development	
Child hearing technology use	
Family Support	

Blaiser & Bargen, 2020

Identifying Measures to Address Outcomes

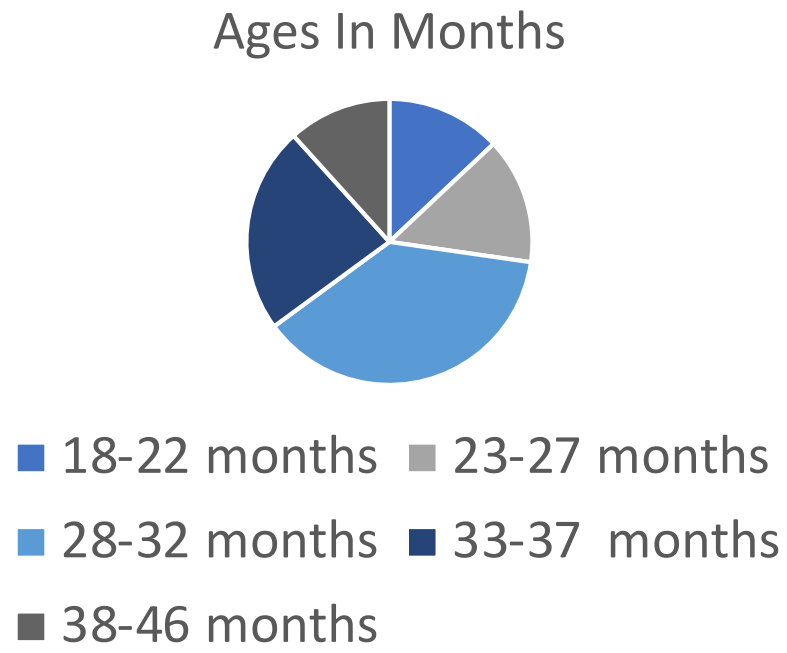
Outcome	Measure
Child language (content)	MacArthur Bates Communication Development Inventory
Child language (use)	Language Use Inventory
Child hearing skill development	LittlEars
Child hearing technology use	Audiology reports
Family Support	Family Outcomes Survey

Blaiser & Bargen, 2020

Participants (LUI specific)

N=85 (Females= 46; Males=39)

Age Range: 18-48 months (*M*=30.8 months)



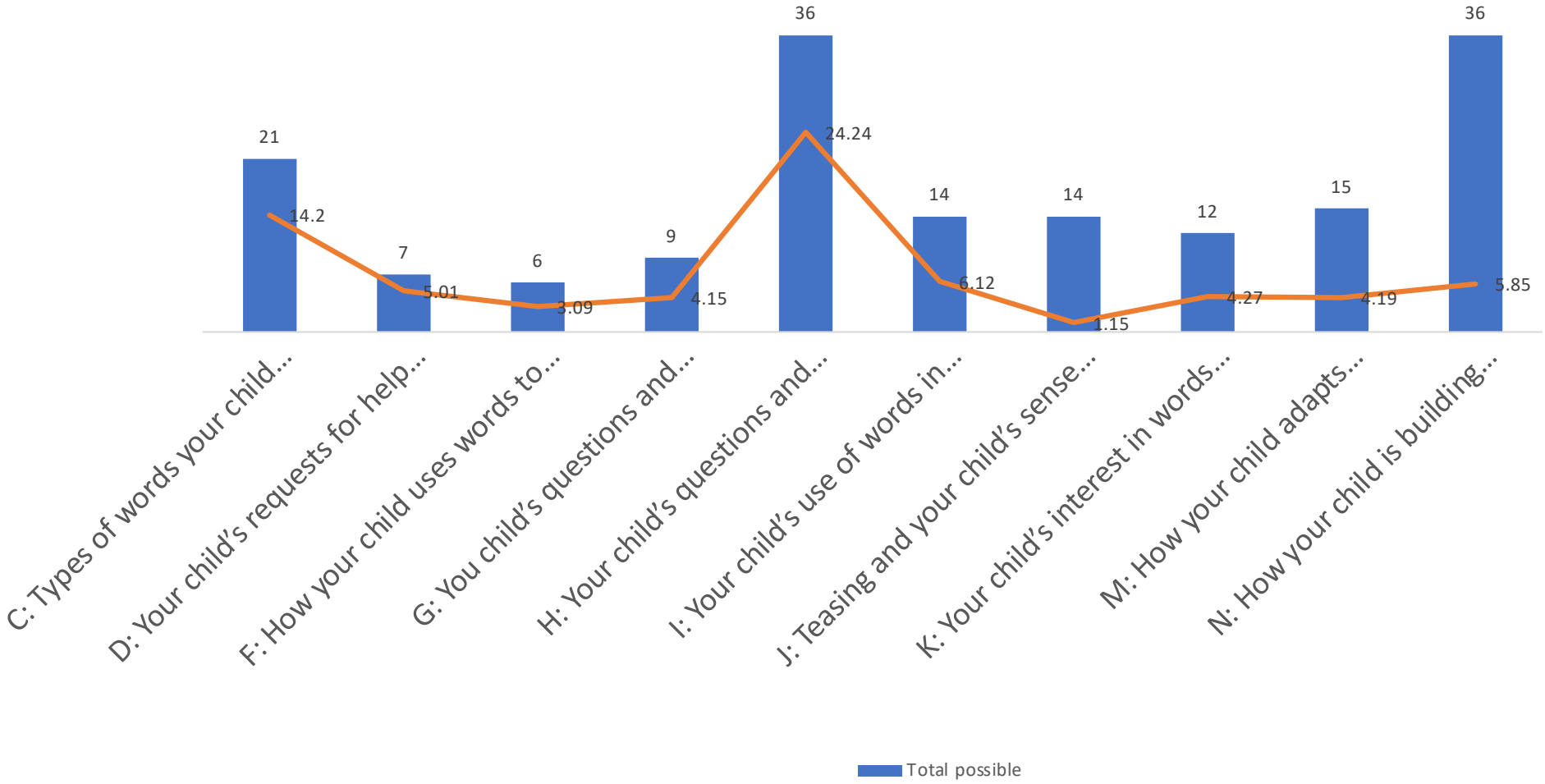
Blaiser, O'Neill, & Darling, 2021

LUI Percentile Scores

	Part 1 (Gestures)	Part 2 (Words)	Part 3 (Sentences)	Total
M	77	35.3	12.3	12.6
SD	29.7	38.8	20.5	21
Range	98	98.5	98.5	98.5

Blaiser, O'Neill, & Darling, 2021

Average Number of Skills (n=85) of Total Possible



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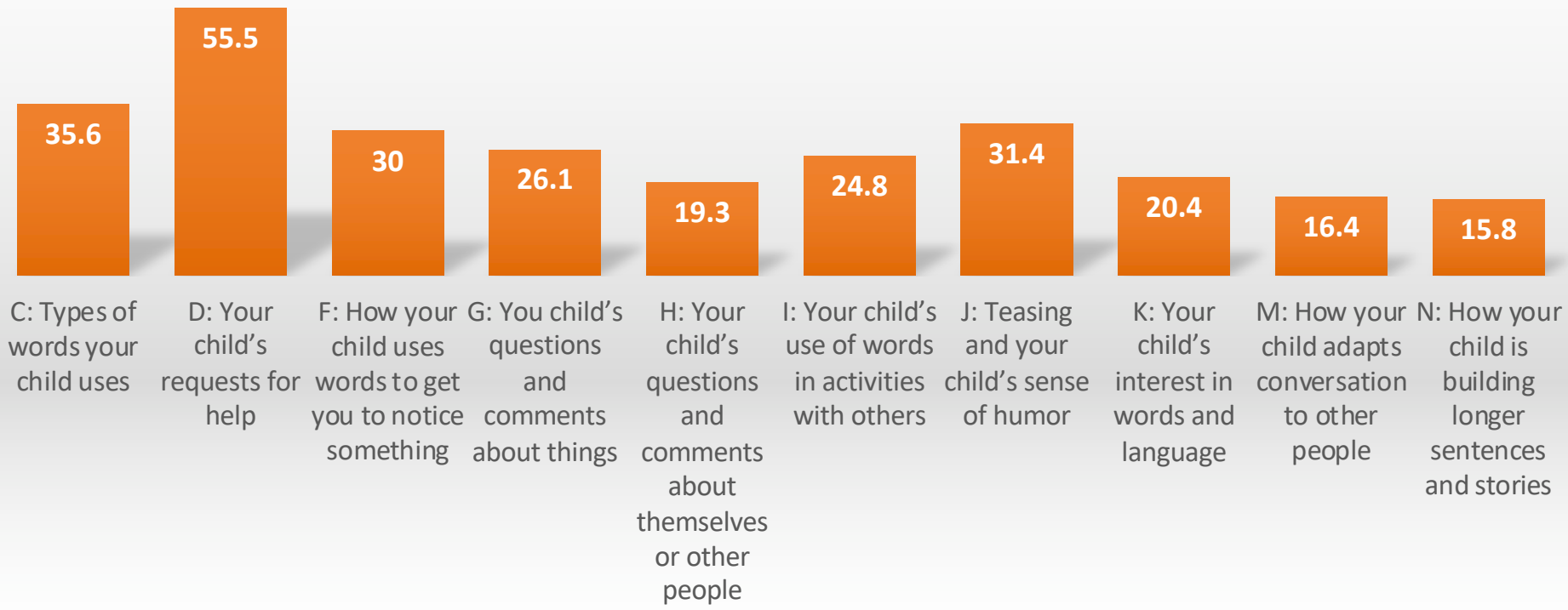
Average Percentile Rank for the LUI



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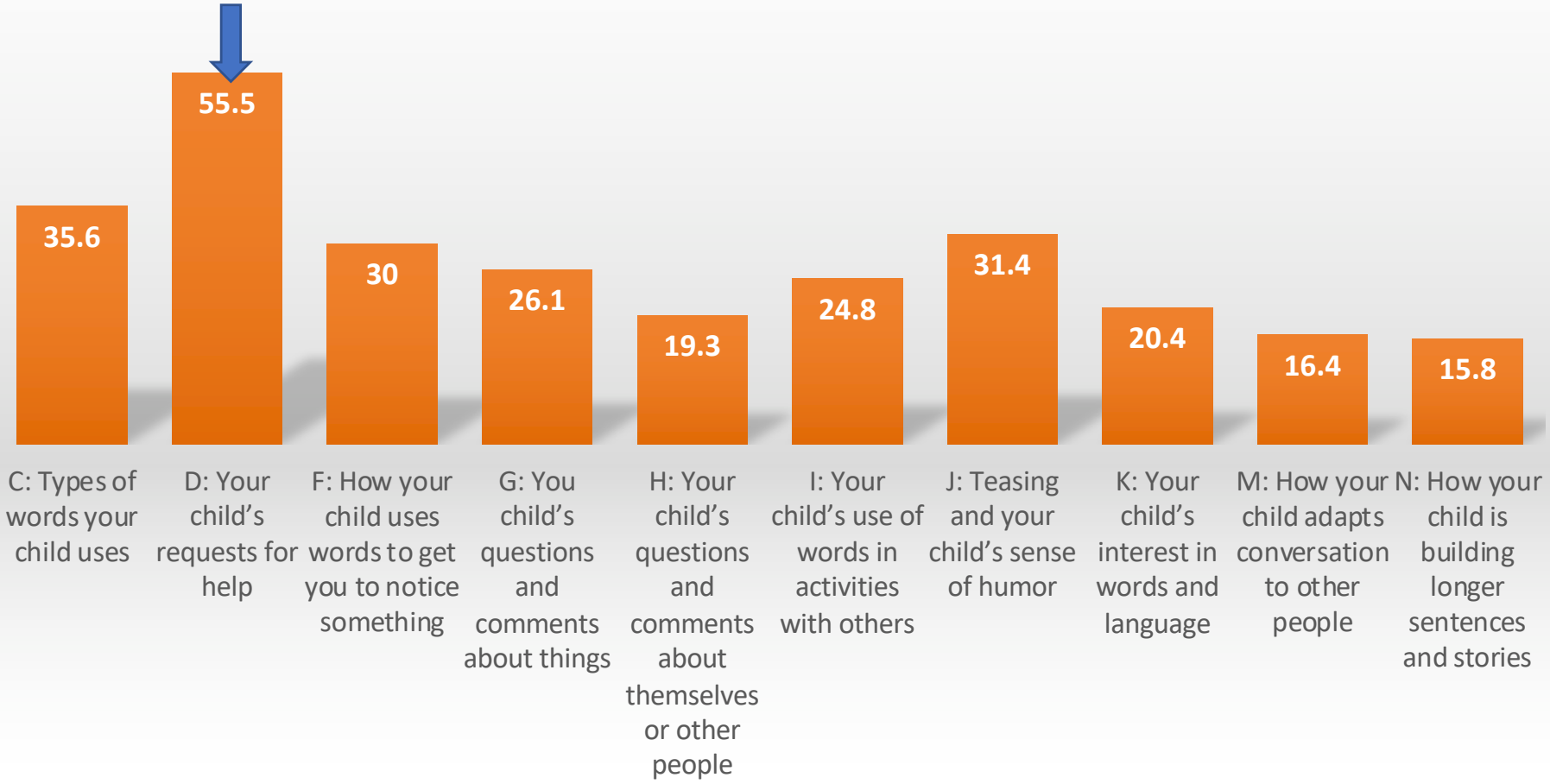
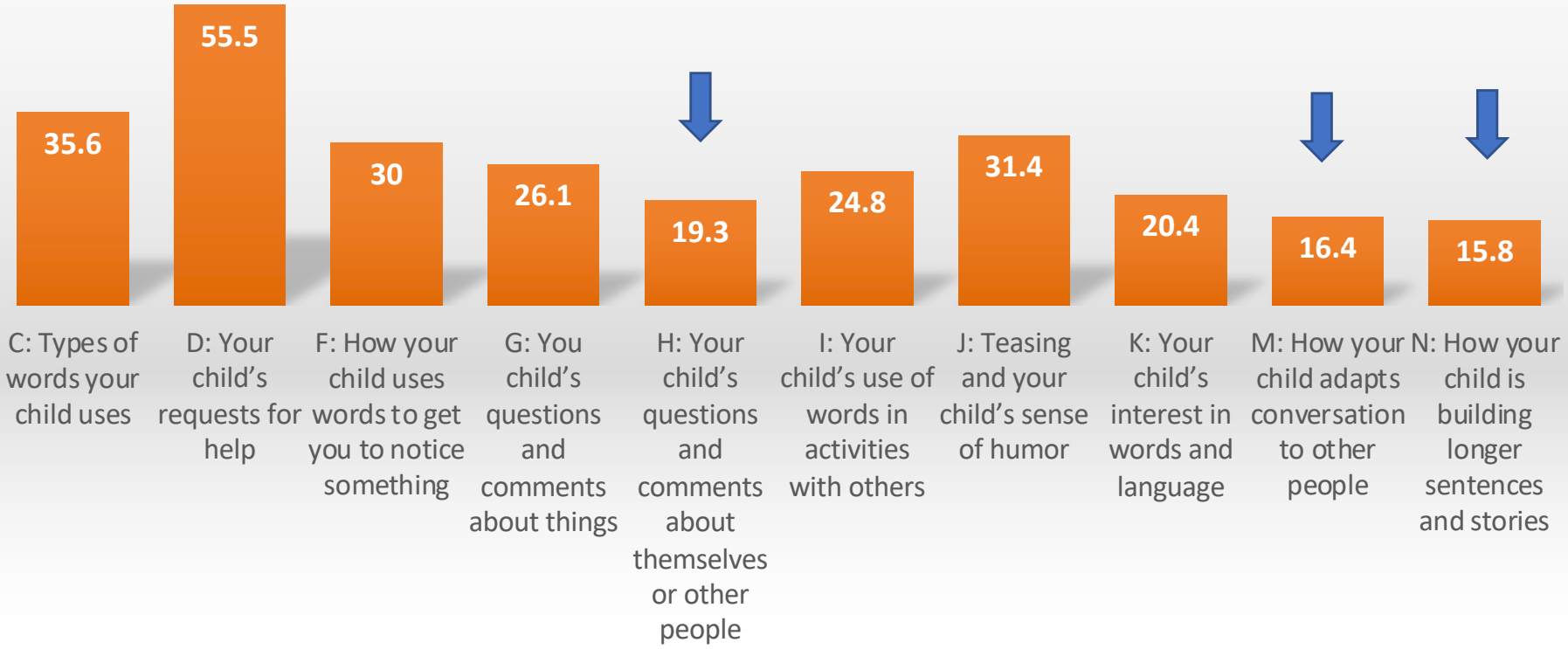
Average Percentile Rank for the LUI Subscales



Blaiser, O'Neill, & Darling, 2021

Average Percentile Rank for the LUI Subscales



Blaiser, O'Neill, & Darling, 2021

Language Use Inventory: Heat map

			Child age (months) (bins)								
Part (group)	Section (group)	Question/Section	16	20	24	28	32	36	40	44	Total
Part 1: How your child co..	Part 1 Percentile	Part 1 Percentile	99.0	85.0	91.3	63.2	84.7	77.5	65.0	87.0	80.1
Part 2: Your child's communication with words	Part 2 Percentile	Part 2 Percentile	88.0	40.0	33.0	58.0	40.1	73.0	99.0	71.5	53.6
	Section C: Types of words your child u..	C Percentile	97.0	36.0	25.0	58.8	46.7	70.8	99.0	70.5	55.8
	Section D: Your child's requests for he..	D Percentile	42.0	51.5	60.7	48.3	56.7	99.0	99.0	66.3	62.2
Part 3: Your child's longer sentences	Section F: How your child uses words t..	F Percentile	21.0	42.3	31.7	28.7	38.2	68.4	99.0	35.0	43.6
	Section G: Your child's questions and ..	G Percentile	69.0	63.0	19.0	19.3	31.2	64.2	99.0	23.0	41.5
	Section H: Your child's questions and comments about themselves or other people	H Percentile	49.0	24.2	30.5	22.0	14.8	50.8	12.0	11.5	27.2
		H Self Percentile	34.0	27.6	76.0	36.0	21.5	65.0	33.0	15.0	34.2
		H Other Percentile	57.0	32.8	19.7	6.4	9.8	64.5	5.0	13.5	23.3
	Section I: Your child's use of words in ..	I Percentile	25.0	29.0	17.0	52.5	35.3	56.8	56.0	38.5	37.6
	Section J: Teasing and your child's sen..	J Percentile	47.0	32.3	55.7	17.9	26.2	30.4	14.0	32.0	28.2
	Section K: Your child's interest in wor..	K Percentile	60.0	28.3	26.0	37.3	20.3	38.0	5.0	39.0	28.1
	Section M: How your child adapts con..	M Percentile	28.0	21.5	27.0	18.0	17.4	36.5	19.0	2.0	22.3
	Section N: How your child is building l..	N Percentile	43.0	31.2	19.3	6.1	15.7	15.0	24.0	5.0	17.8
	Part 3 Percentile	Part 3 Percentile	36.0	19.2	11.0	19.0	13.0	24.3	16.0	4.0	17.1
Totals	Total LUI Percentile	Total LUI Percentile	45.0	16.2	16.5	21.5	12.1	25.8	19.0	5.0	17.8

Blaiser, O'Neill, & Darling, 2021

Level of Pragmatic Difficulty (Percentiles)

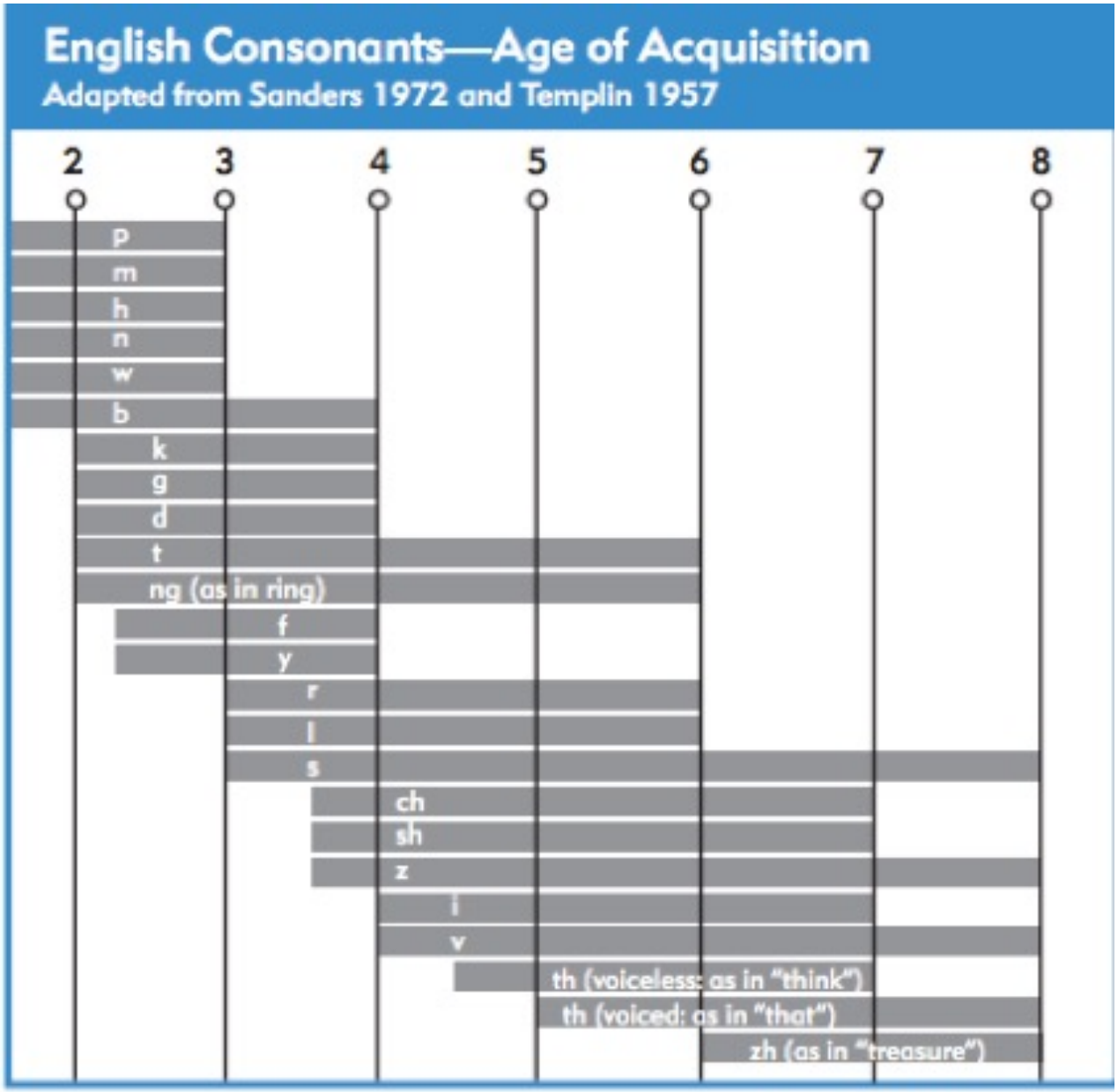
	N	%
Pragmatic Difficulties (Percentile ≤ 7)	57	67%
Severe Pragmatic Difficulties (Percentile ≤ 2)	45	53%

Blaiser, O'Neill, & Darling, 2021

Form

Phonology/Speech production

Early Milestones


English Consonants—Age of Acquisition
Adapted from Sanders 1972 and Templin 1957
2
3
4
5
6
7
8
p
m
h
n
w
b
k
g
d
t
ng (as in ring)
f
y
r
l
s
ch
sh
z
j
v
th (voiceless: as in "think")
th (voiced: as in "that")
zh (as in "treasure")

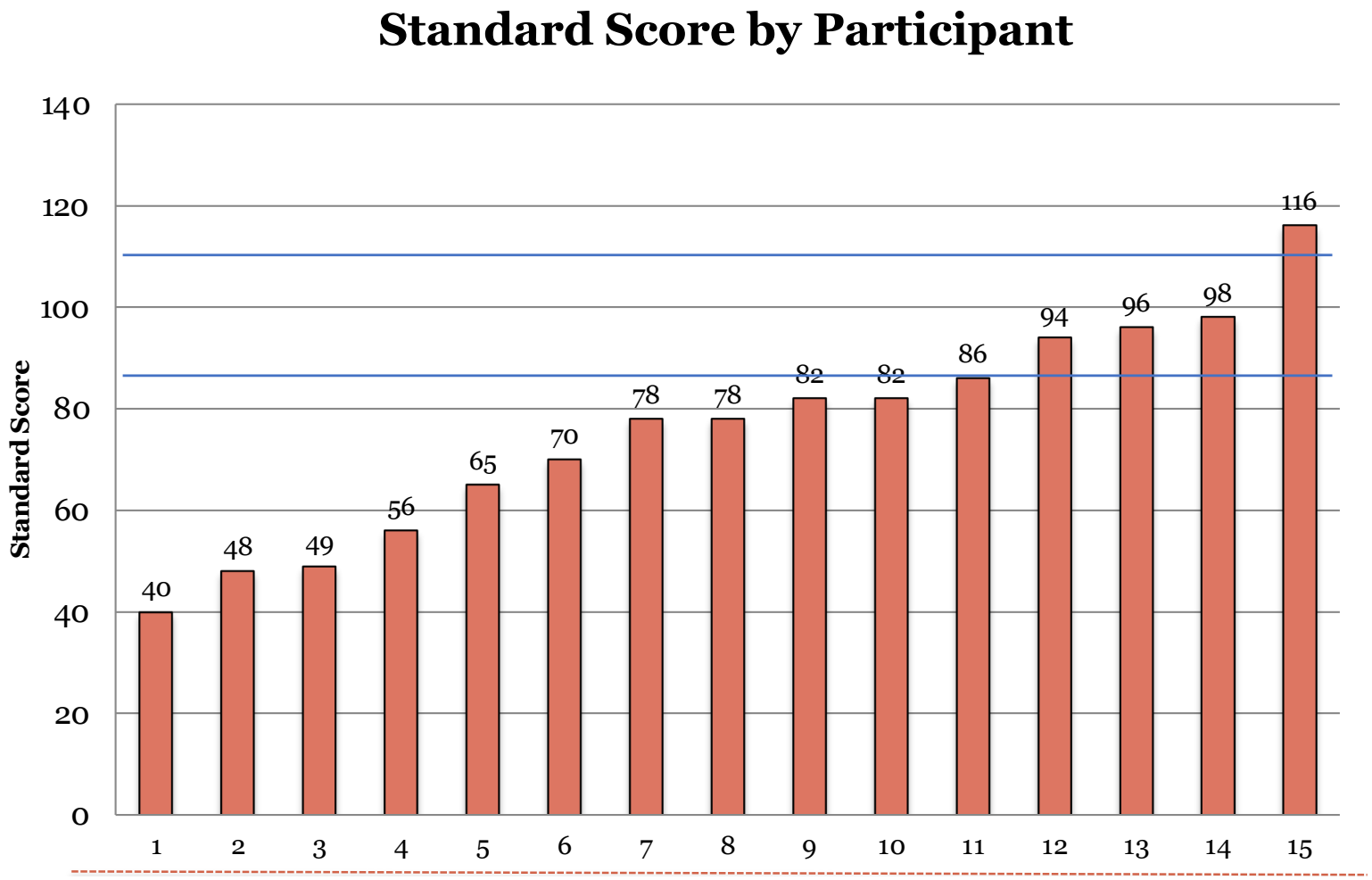
Speech perception-
Speech production

- FOUNDATION: Children need to be able to hear a sound to produce it, to alter it, to match a target
- (Optimized) technology is key!
- If a child is having difficulty with producing a sound, you need to make sure that they can hear the sound!

Assessment

- Goldman Fristoe is commonly used
- Provides a normative sample
- Doesn’t tell us much (or anything) about acoustic information

- Average Standard Score: 75.87 (sd= 21.30)



Acoustic Monitoring Protocol (AMP)

Acoustic Monitoring Protocol (Lamb & Blaiser, 2012)

- Developed to supplement the GFTA
- Meet the need of having an acoustic lens
- Support interprofessional collaboration
- Piloting/in preparation now

PLACE-MANNER-VOICING ANALYSIS

- Look at all errors the child is producing.
- For example, what type of errors:
  - A child who is producing tat for pat and cat
  - A child who is making m/n errors

Table 2–1. Speech Information Carried by the Key Speech Frequencies of 250–4000 Hz (± one half octave)

250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
• First formant of vowels /u/ and /i/ • Fundamental frequency of females' and children's voices • Nasal murmur associated with the phonemes /m/, /n/, and /ng/ • Prosody • Suprasegmental patterns (stress, rate, inflection, intonation) • Male voice harmonics • Voicing cues	• First formants of most vowels • Harmonics of all voices (male, female, child) • Voicing cues • Nasality cues • Suprasegmentals • Some plosive bursts associated with /b/ and /d/	• The important acoustic cues for manner of articulation • Second formants of back and central vowels • Consonant-vowel and vowel-consonant transition information • Some plosive bursts • Voicing cues • Suprasegmentals • Unstressed morphemes	• The important acoustic cues for place of articulation • The key frequency for speech intelligibility • Second and third formant information for front vowels • Consonant-vowel and vowel-consonant transition information • Acoustic information for the liquids /r/ and /l/ • Plosive bursts • Affricate bursts • Fricative turbulence	• The key frequency for /s/ and /z/ audibility that is critical for language learning: – plurals – idioms – possessives – auxiliaries – third person singular verb forms – questions – copulas – past perfect • Consonant quality

Source: Adapted from *Speech and the Hearing Impaired Child* (2nd ed.) by D. Ling, 2002, Washington, DC: Alexander Graham Bell Association of the Deaf and Hard of Hearing. Reprinted with permission.

Relational Analysis Form

Acoustic and Developmental Features

Initial Position

Low Frequency	m /3	n /3	ŋ n/a	b /6	d /2	g /3

Middle Frequency	p /4	t /2	k /4	h /1	w /4	j /2	l /4	r /3	tʃ /2	dʒ /2	z /2	ð /2

High Frequency	v /2	ʃ /2	f /3	s /3	θ /1

Initial Clusters:

Final Position

Low Frequency	m /4	n /8	ŋ /7	b /1	d /1	g /1

Middle Frequency	p /1	t /2	k /3	h n/a	w n/a	j n/a	l /3	r & ɚ /6	tʃ /1	dʒ n/a	z /3	ð n/a

High Frequency	v /1	ʃ /1	f /1	s /2	θ /2

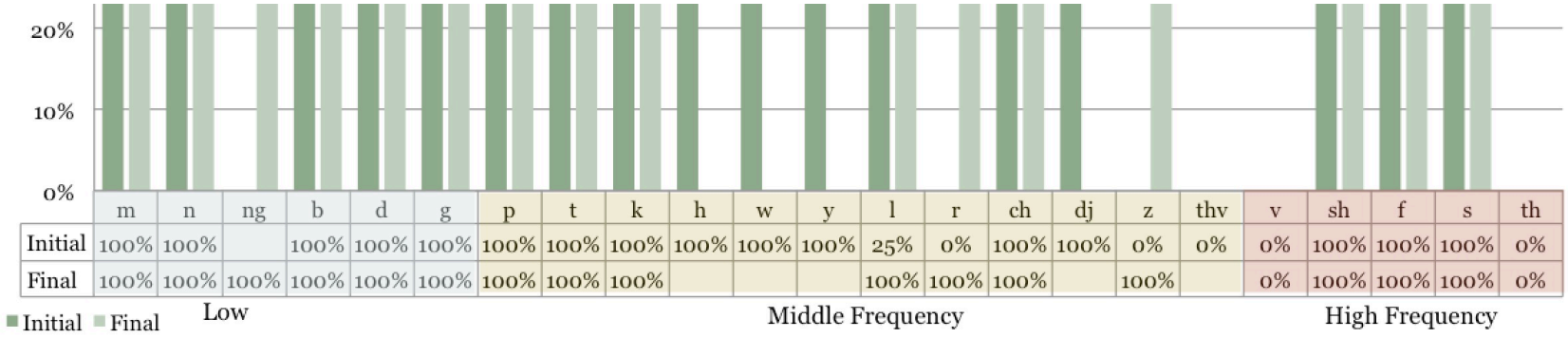
Final Clusters:

Color Key

Correct: I

Omissions: Ø I

Substitutions: m I

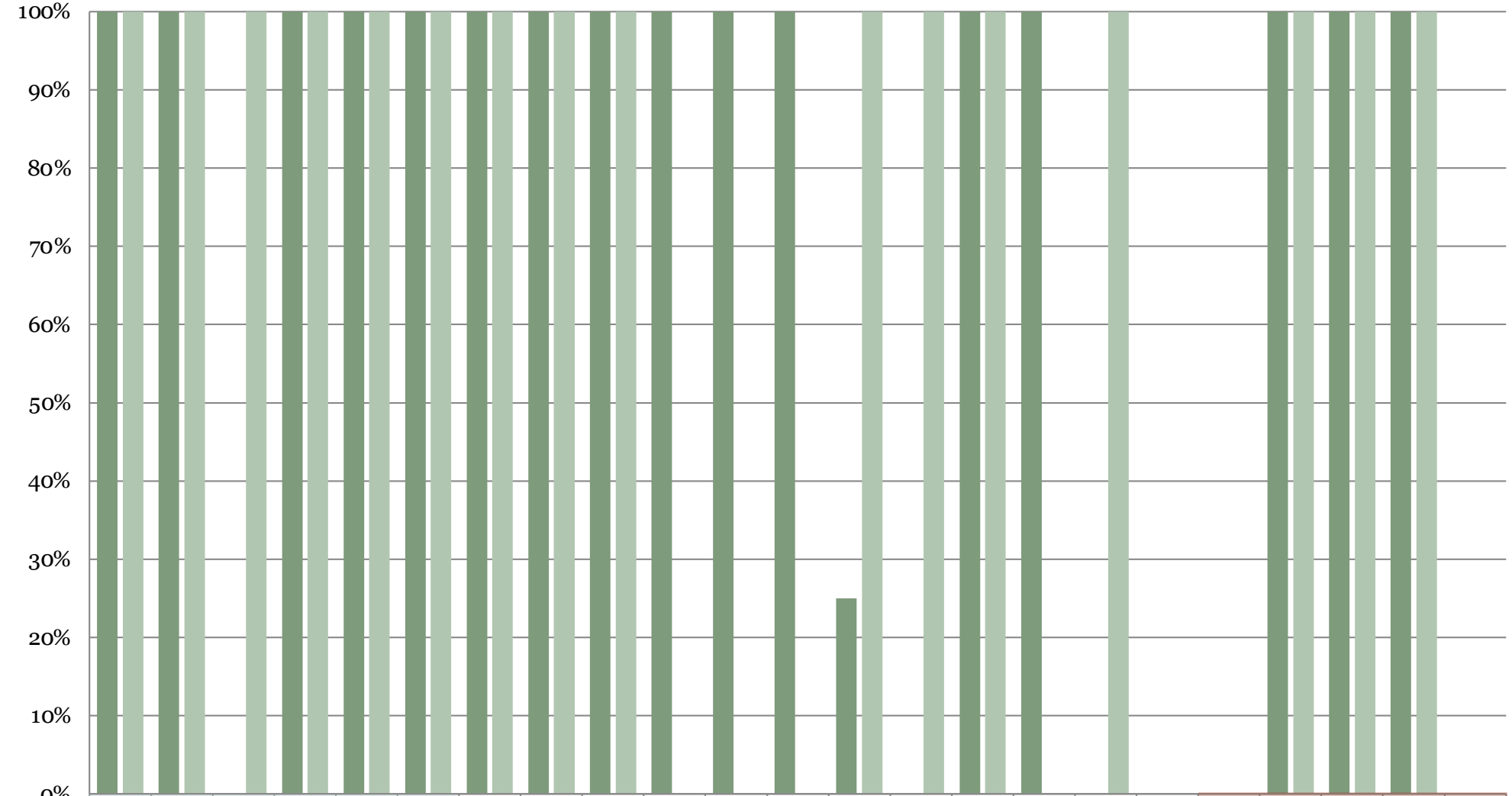


	m	n	ng	b	d	g	p	t	k	h	w	y	l	r	ch	dj	z	thv	v	sh	f	s	th
Initial	100%	100%		100%	100%	100%	100%	100%	100%	100%	100%	100%	25%	0%	100%	100%	0%	0%	0%	100%	100%	100%	0%
Final	100%	100%	100%	100%	100%	100%	100%	100%	100%				100%	100%	100%		100%		0%	100%	100%	100%	0%

LOW → HIGH

00009

Male, Age: 37, BAHA, Fit: 15 Enrolled: 18



	m	n	ng	b	d	g	p	t	k	h	w	y	l	r	ch	dj	z	thv	v	sh	f	s	th
Initial	100%	100%		100%	100%	100%	100%	100%	100%	100%	100%	100%	25%	0%	100%	100%	0%	0%	0%	100%	100%	100%	0%
Final	100%	100%	100%	100%	100%	100%	100%	100%	100%				100%	100%	100%		100%		0%	100%	100%	100%	0%

Initial Final

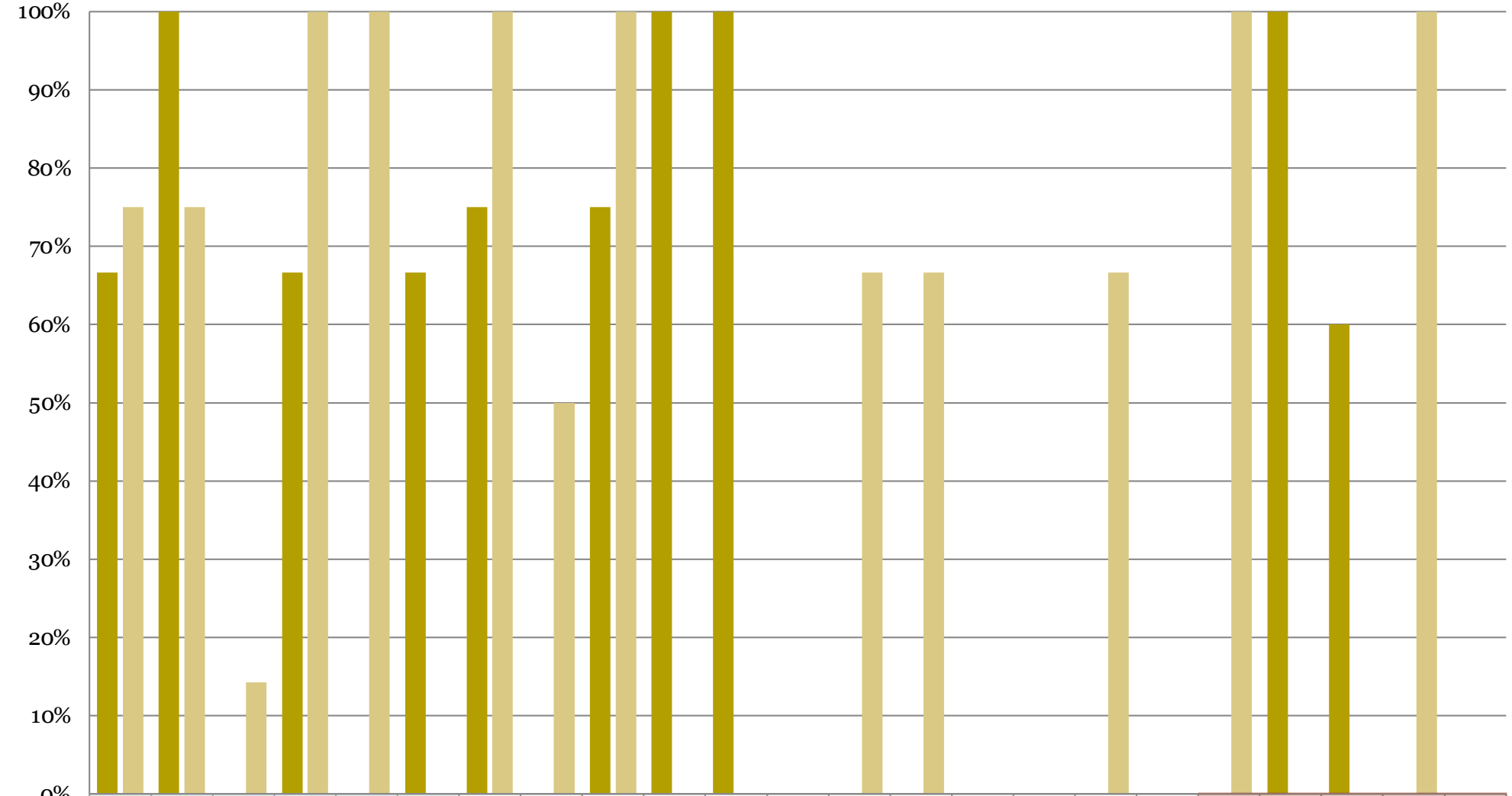
Low

Middle Frequency

High Frequency

10020

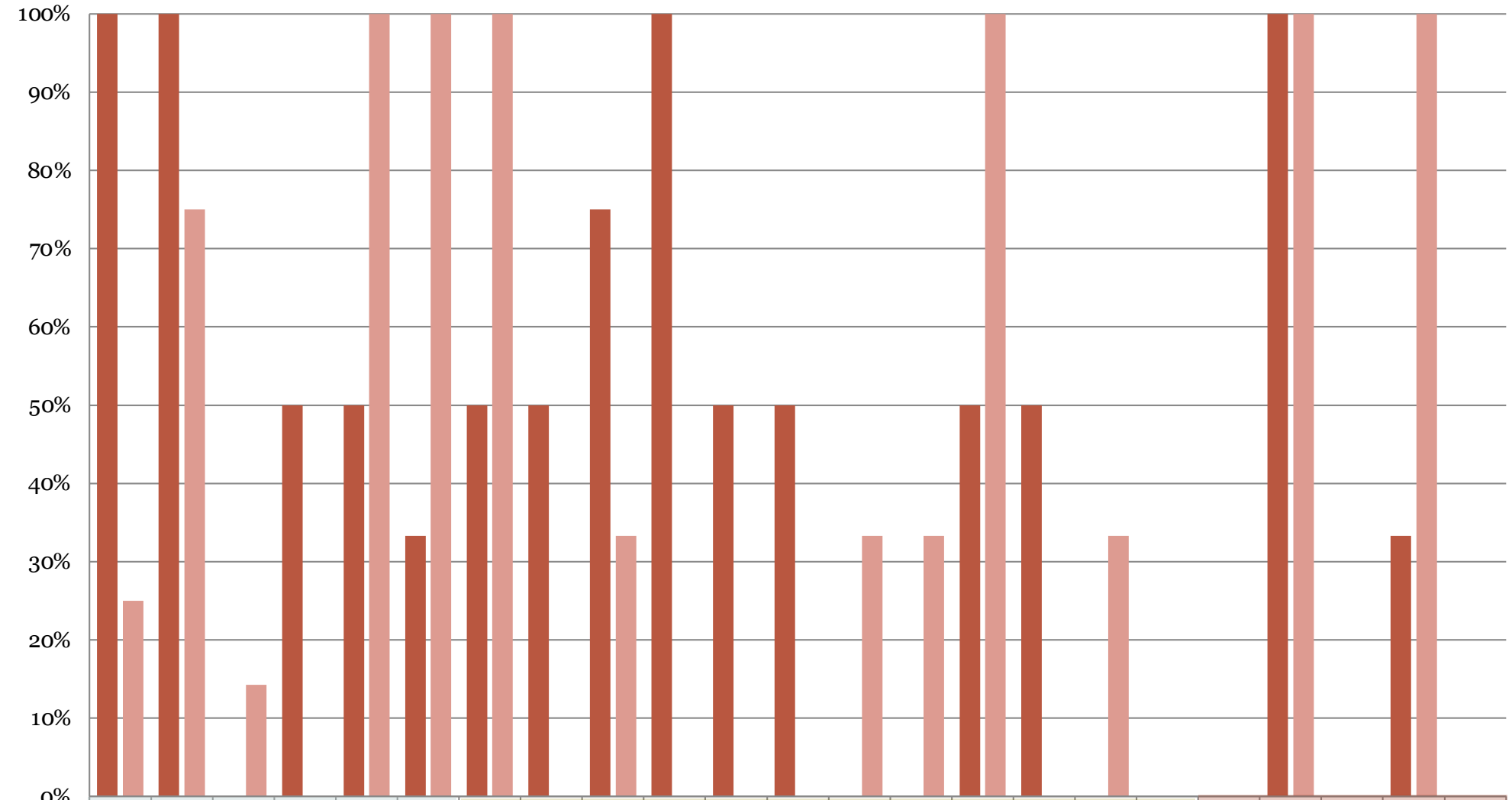
Male, Age: 63, CI, Fit: 3 Enrolled: 54



	m	n	ng	b	d	g	p	t	k	h	w	y	l	r	ch	dj	z	thv	v	sh	f	s	th
Initial	67%	100%		67%	0%	67%	75%	0%	75%	100%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	60%	0%	0%
Final	75%	75%	14%	100%	100%	0%	100%	50%	100%				67%	67%	0%		67%		100%	0%	0%	100%	0%

00013

Male, Age: 62, HA, Fit: 18 Enrolled: 40



	m	n	ng	b	d	g	p	t	k	h	w	y	l	r	ch	dj	z	thv	v	sh	f	s	th
Initial	100%	100%		50%	50%	33%	50%	50%	75%	100%	50%	50%	0%	0%	50%	50%	0%	0%	0%	100%	0%	33%	0%
Final	25%	75%	14%	0%	100%	100%	100%	0%	33%				33%	33%	100%		33%		0%	100%	0%	100%	0%

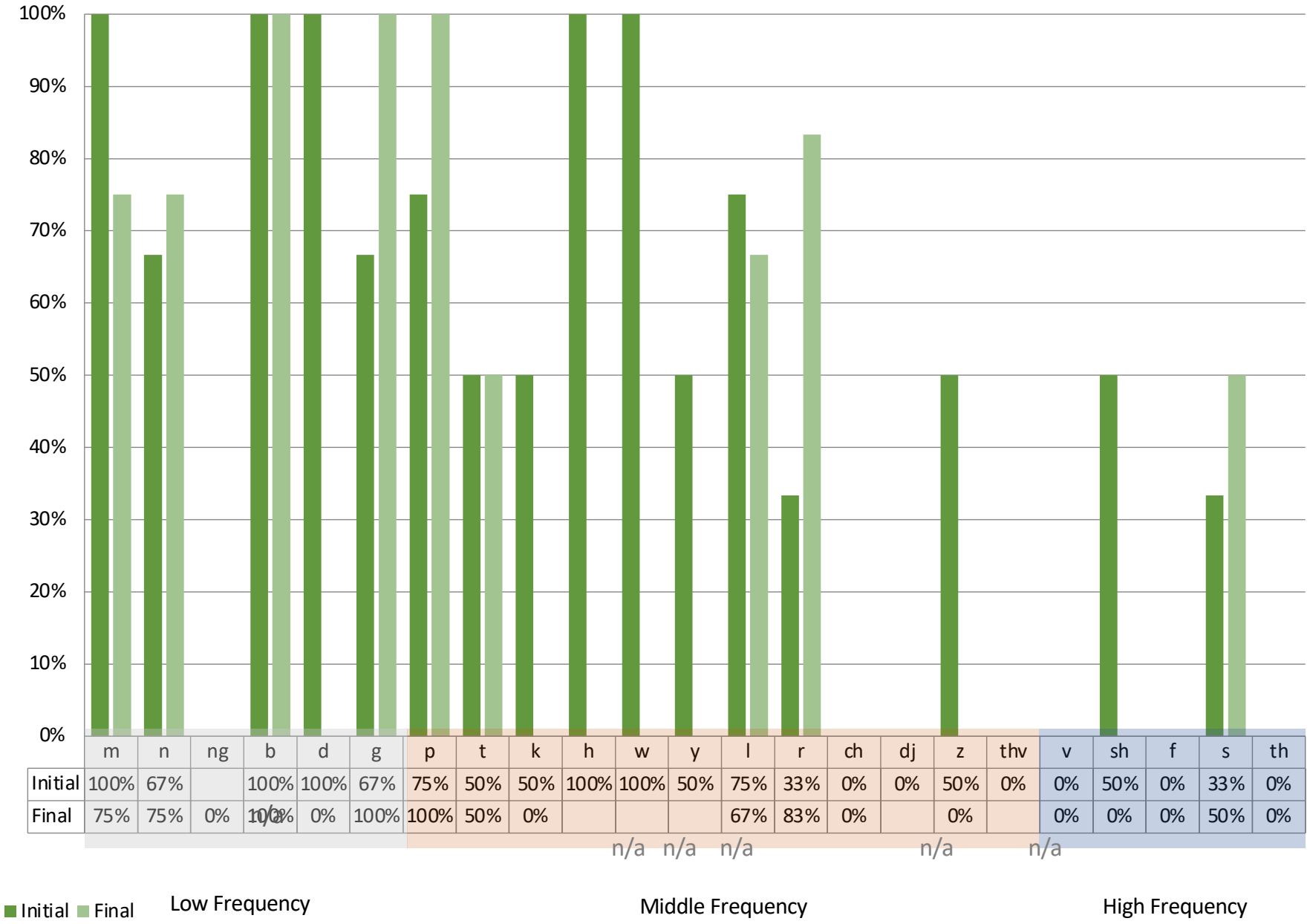
Initial Final

Low

Middle Frequency

High Frequency

You try…



	m	n	ng	b	d	g	p	t	k	h	w	y	l	r	ch	dj	z	thv	v	sh	f	s	th
Initial	100%	67%		100%	100%	67%	75%	50%	50%	100%	100%	50%	75%	33%	0%	0%	50%	0%	0%	50%	0%	33%	0%
Final	75%	75%	0%	n/a	0%	100%	100%	50%	0%				67%	83%	0%		0%		0%	0%	0%	50%	0%
											n/a	n/a	n/a				n/a		n/a				

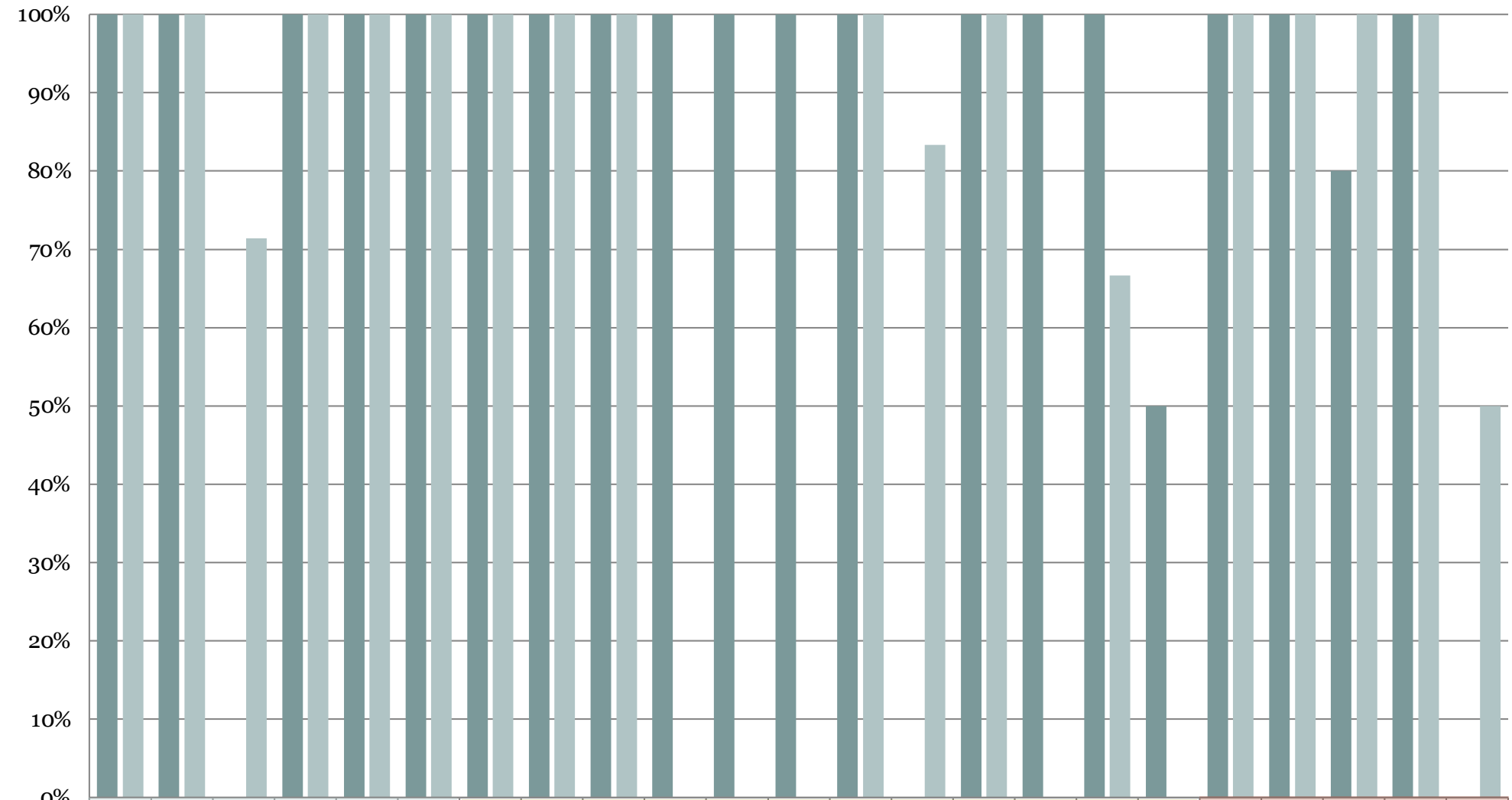
Initial Final

Low Frequency

Middle Frequency

High Frequency

Female, Age: 78, CI, Fit: 18 Enrolled: 22 70001



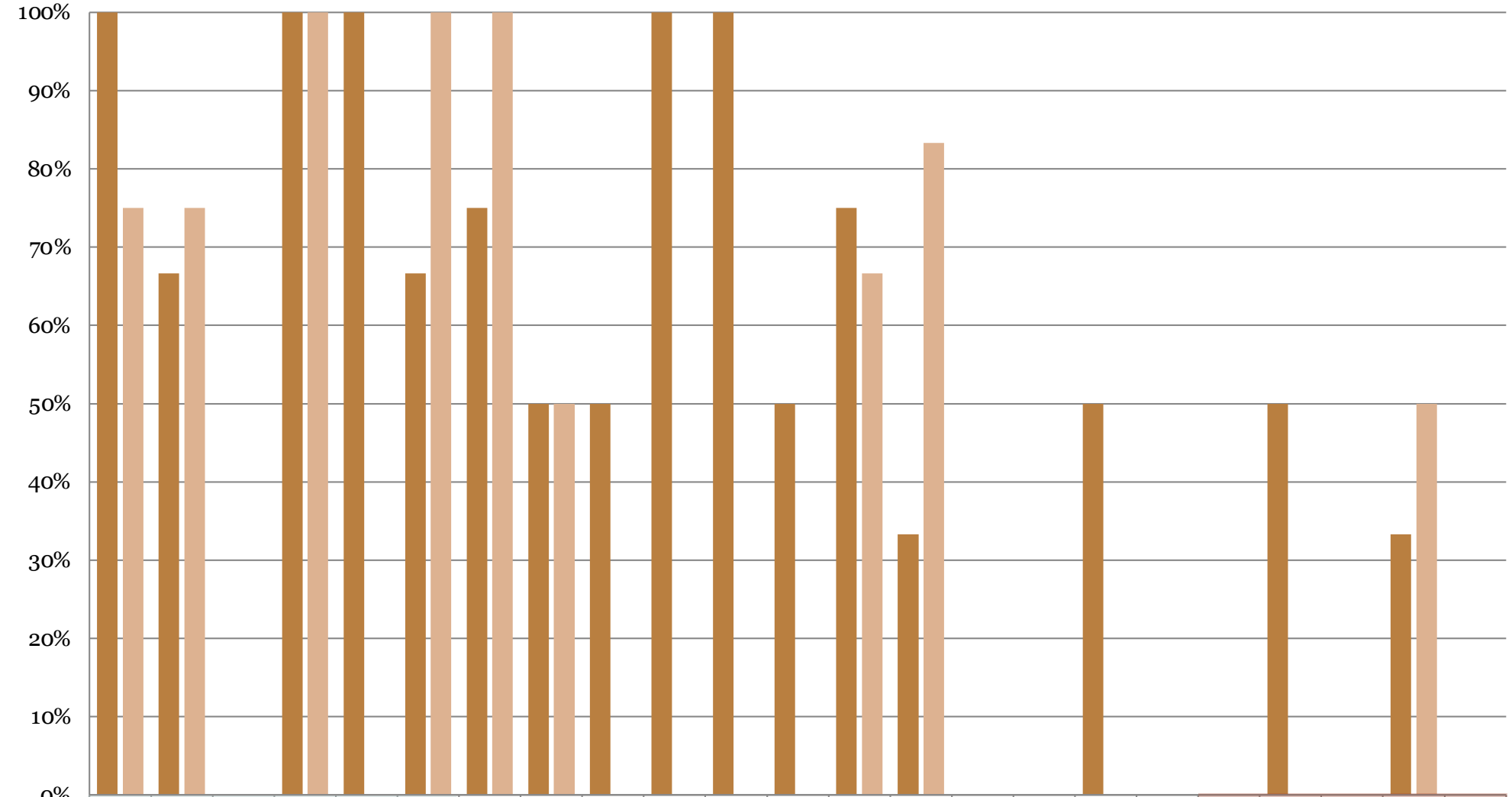
	m	n	ng	b	d	g	p	t	k	h	w	y	l	r	ch	dj	z	thv	v	sh	f	s	th
Initial	100%	100%		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	0%	100%	100%	100%	50%	100%	100%	80%	100%	0%
Final	100%	100%	71%	100%	100%	100%	100%	100%	100%				100%	83%	100%		67%		100%	100%	100%	100%	50%

Initial Final

Low Middle Frequency High Frequency

10017

Female, Age: 58, CI, Fit: 20 Enrolled: 50



	m	n	ng	b	d	g	p	t	k	h	w	y	l	r	ch	dj	z	thv	v	sh	f	s	th
Initial	100%	67%		100%	100%	67%	75%	50%	50%	100%	100%	50%	75%	33%	0%	0%	50%	0%	0%	50%	0%	33%	0%
Final	75%	75%	0%	100%	0%	100%	100%	50%	0%				67%	83%	0%		0%		0%	0%	0%	50%	0%

Initial Final

Low

Middle Frequency

High Frequency

Take away

- Must know how to communicate with audiologist about speech production
- Find common errors
- Understand errors and error patterns

Intelligibility

- Intelligibility ratings based on sentence repetition or reading tasks
- Challenges with sentence tasks for younger children with HL
- Ertmer (2010, 2011)

Intelligibility Scale

SPEECH INTELLIGIBILITY CHECKLIST
FOR
UNFAMILIAR LISTENER

Please rate the child's speech intelligibility using the following scale. Think about how well you understand this child's speech in a casual communication situation. CIRCLE the most appropriate number. If the child is not using speech circle "No Rating".

Rating	Current Functioning
6	I always or almost always understand the child's speech with little or no effort
5	I always or almost always understand the child's speech; however, I need to listen carefully
4	I typically understand about half of the child's speech
3	I typically understand about 25% of the child's speech
2	The child's speech is very hard to understand. I typically understand only occasional, isolated words and/or phrases
1	I never or almost never understand the child's speech
No Rating	Speech intelligibility could not be judged because the child is producing few or no word approximations

Child's name: _____ Date of video: _____

Name of person completing this form: _____

Intervention

- Ensure that the child can hear the differences
  - Use discrimination tasks to highlight differences
- Reinforce the sounds that the child can produce
- Don’t over-produce or feel like things need to be “more visual”
- Understand that kids with HL can have phonological/articulation disorders too!

SPEECH INTELLIGIBILITY CHECKLIST
FOR
UNFAMILIAR LISTENER

Please rate the child's speech intelligibility using the following scale. Think about how well you understand this child's speech in a casual communication situation. CIRCLE the most appropriate number. If the child is not using speech circle "No Rating".

Rating	Current Functioning
6	I always or almost always understand the child's speech with little or no effort
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4	I typically understand about half of the child's speech
3	I typically understand about 25% of the child's speech
2	The child's speech is very hard to understand. I typically understand only occasional, isolated words and/or phrases
1	I never or almost never understand the child's speech
No Rating	Speech intelligibility could not be judged because the child is producing few or no word approximations

Child's name: _____ **Date of video:** _____

Name of person completing this form: _____

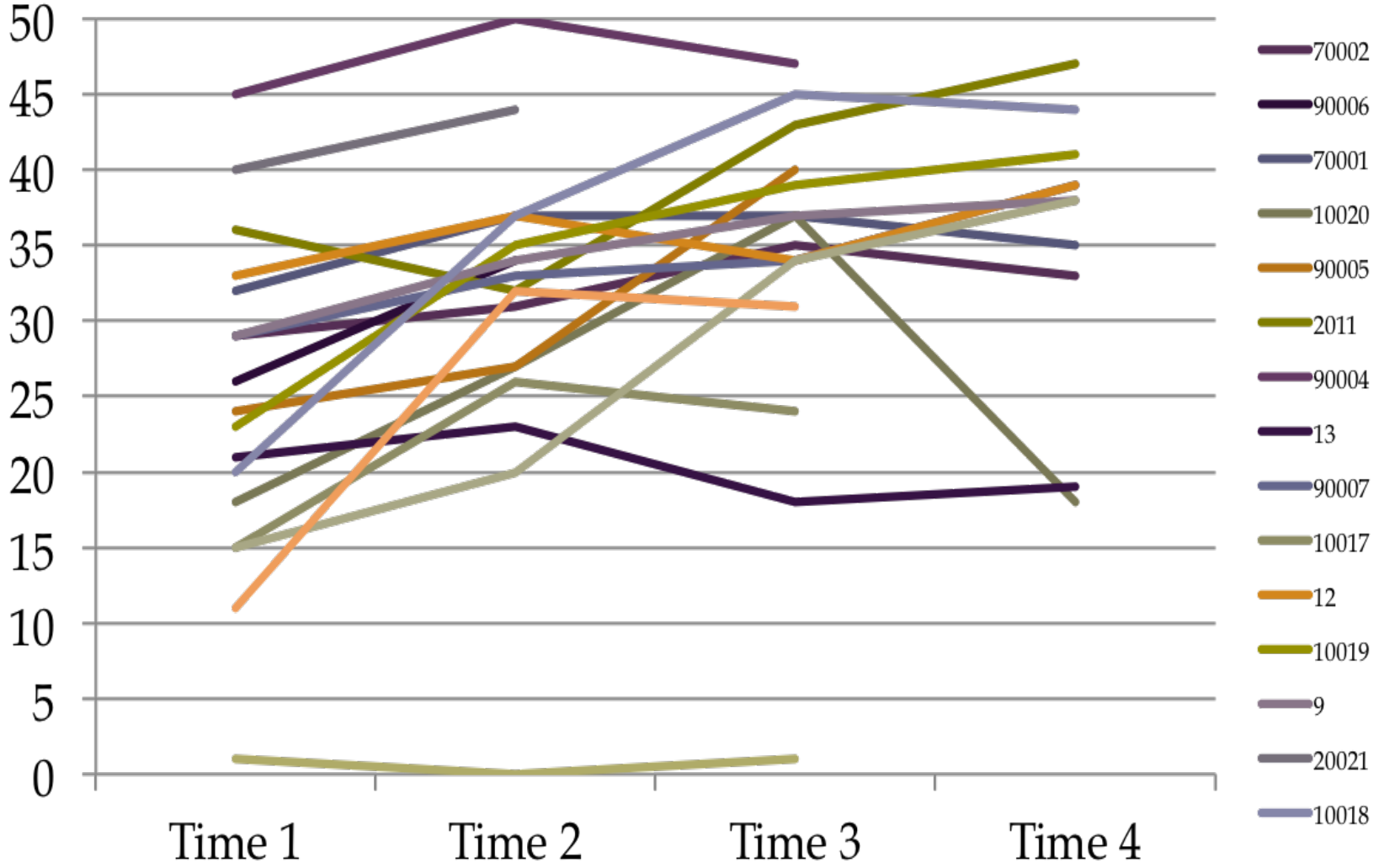
Trusting your professional judgment

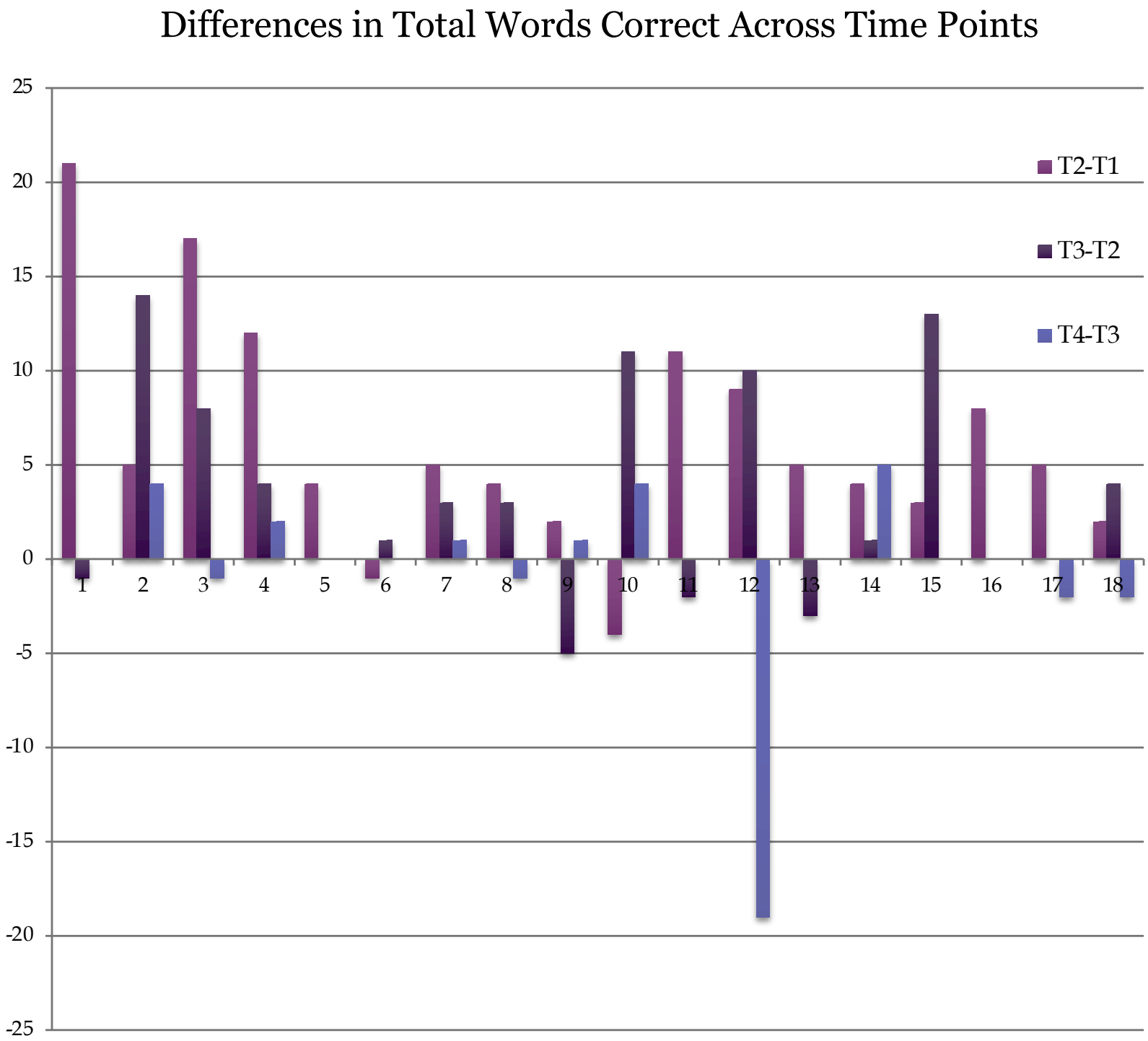
Communication/Collaboration

- Positive relationship between speech production and speech perception

- Speech perception practices are also in transition as we have younger populations performing better (Muñoz, Blaiser, & Schofield, 2012)

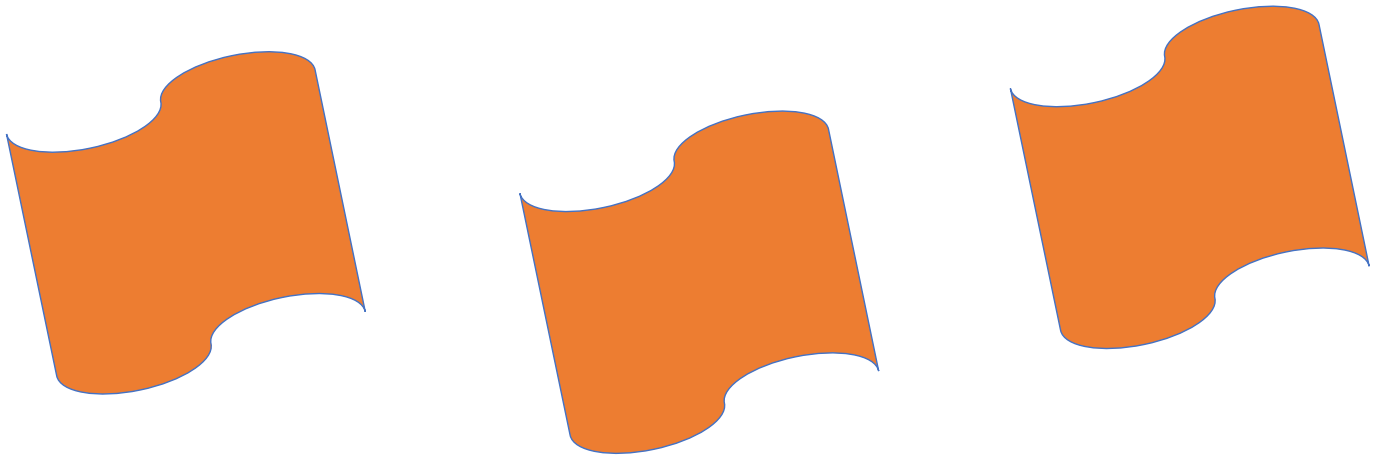
Words Correct Over Each Time Point




Differences in Total Words Correct Across Time Points
25
20
15
10
5
0
-5
-10
-15
-20
-25
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
T2-T1
T3-T2
T4-T3

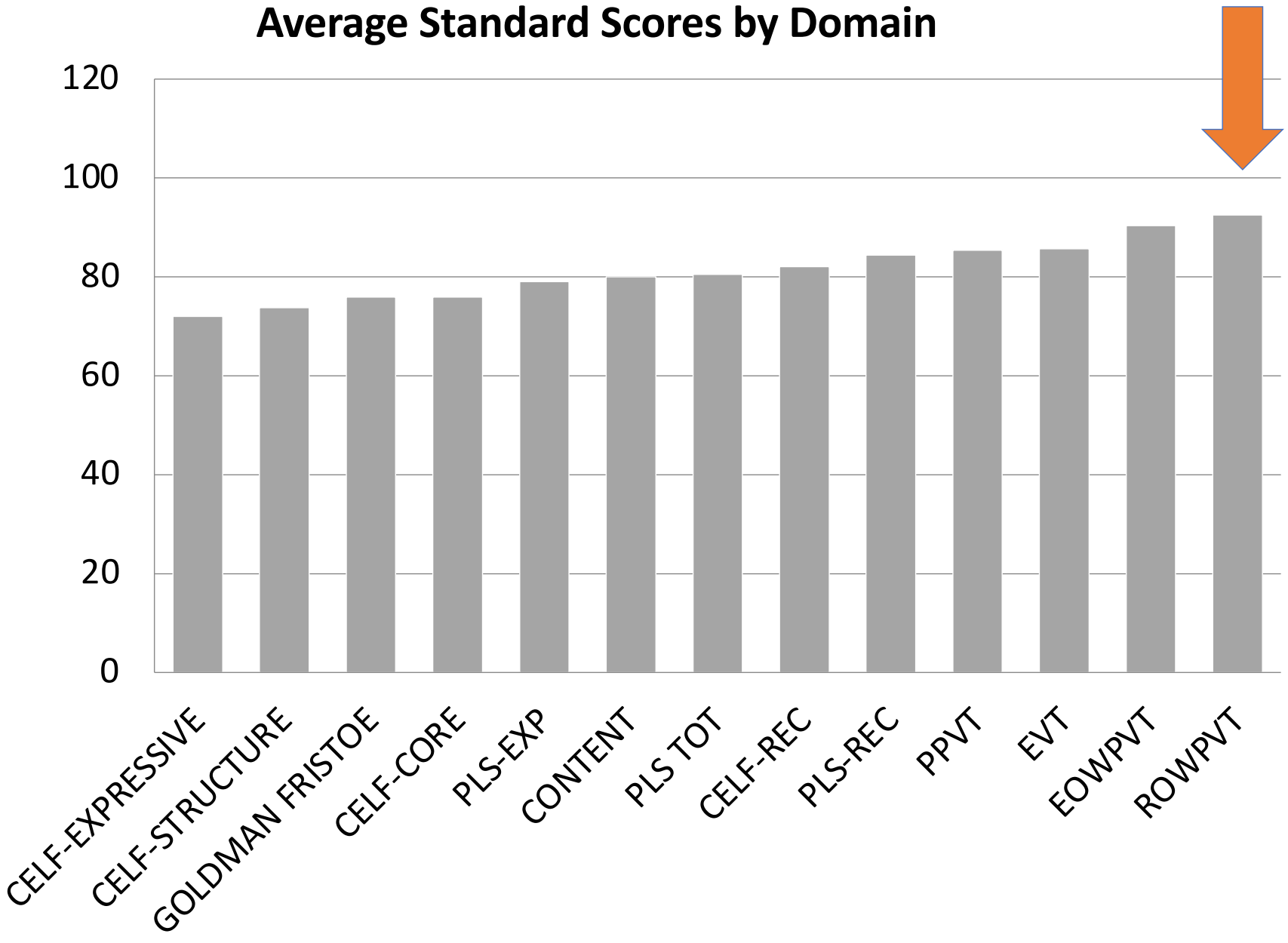
Red flags

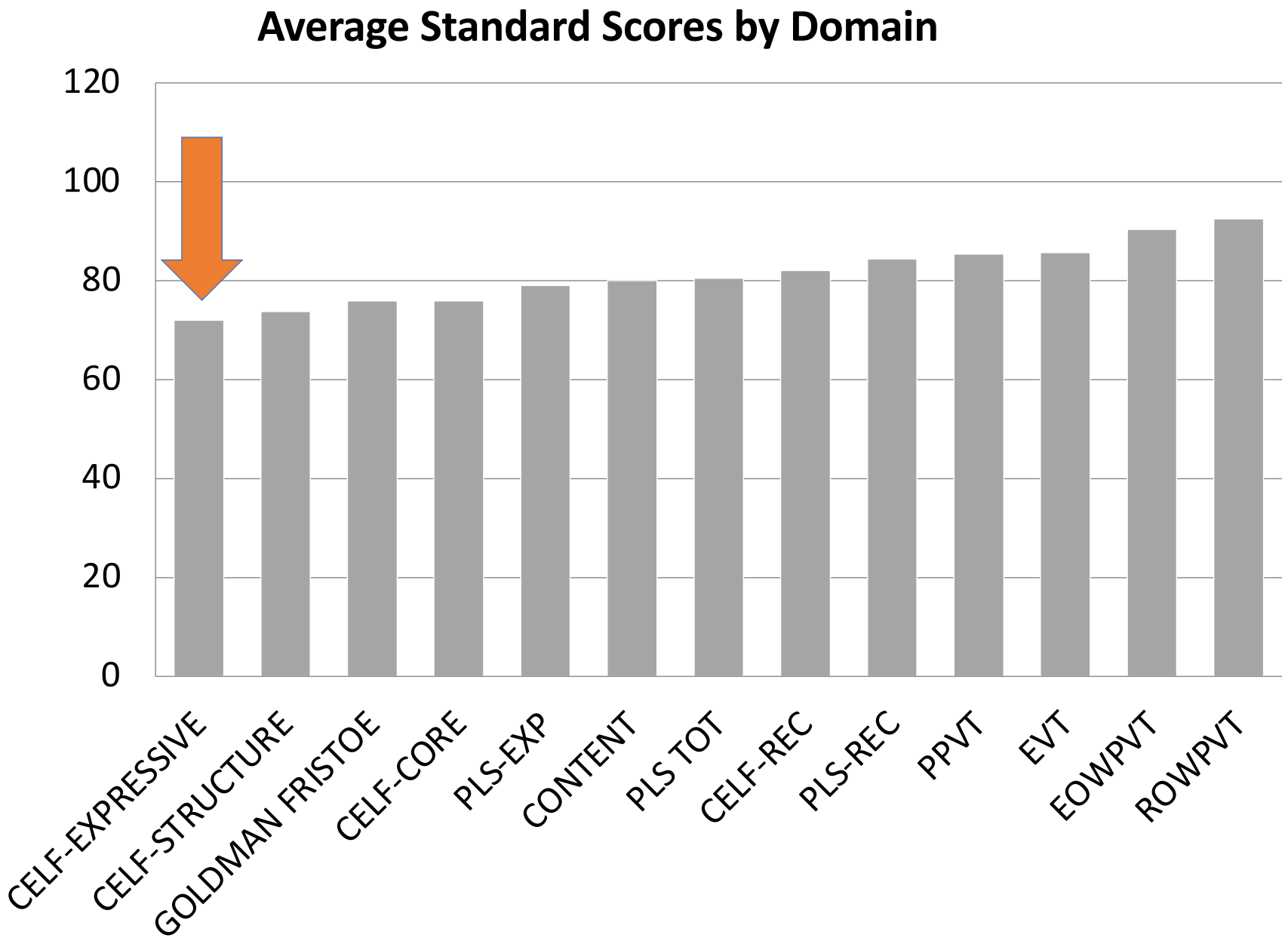
- Decrease in speech production
- Decrease in intelligibility
- “Slushy speech”
- Omission or substitution of phonemes



Morphology & Syntax

ASSESSMENTS


Average Standard Scores by Domain
120
100
80
60
40
20
0
CELF-EXPRESSIVE
CELF-STRUCTURE
GOLDMAN FRISTOE
CELF-CORE
PLS-EXP
CONTENT
PLS TOT
CELF-REC
PLS-REC
PPVT
EVT
EOWPVT
ROWPVT


Average Standard Scores by Domain
120
100
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40
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0
CELF-EXPRESSIVE
CELF-STRUCTURE
GOLDMAN FRISTOE
CELF-CORE
PLS-EXP
CONTENT
PLS TOT
CELF-REC
PLS-REC
PPVT
EVT
EOWPVT
ROWPVT

Participants

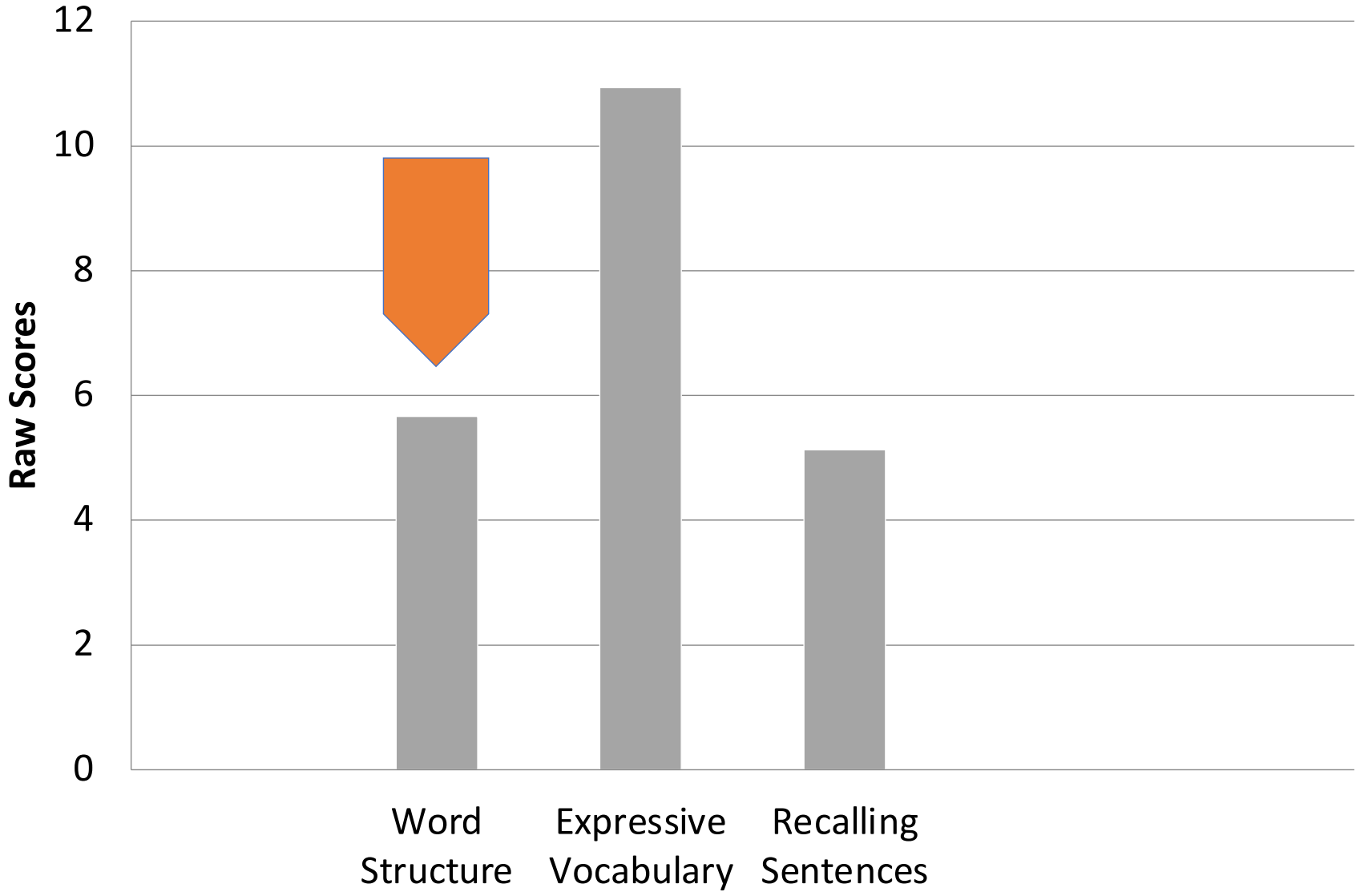
- 47 preschool children who are DHH
- All attended oral preschool programs across the US

Do all composites reflect the same information?

- Core Language: M= 86.79; SD=17.98
- Language Structure: M= 83.30; SD=18.34

Statistically significant difference: $t(46)=5.254$, $p=.000$

Within the composite scores (Expressive)



Word Structure (WS)

Scores	Materials Needed	Repetitions	Discontinue Rule
Core Language score Expressive Language index Language Structure index	Stimulus Book 1	Allowed	After 8 consecutive zero scores

Circle 1 for a correct response and 0 for an incorrect response. If the child gives a response that is different from the expected response, but demonstrates the target and is meaningful to the context of the item, write it in the space provided and score the response as correct.

Demo Here is a boy [point] and here... [point] is a girl.

Trial 1 This boy [point] is standing. This boy is [point] _____. (sitting)

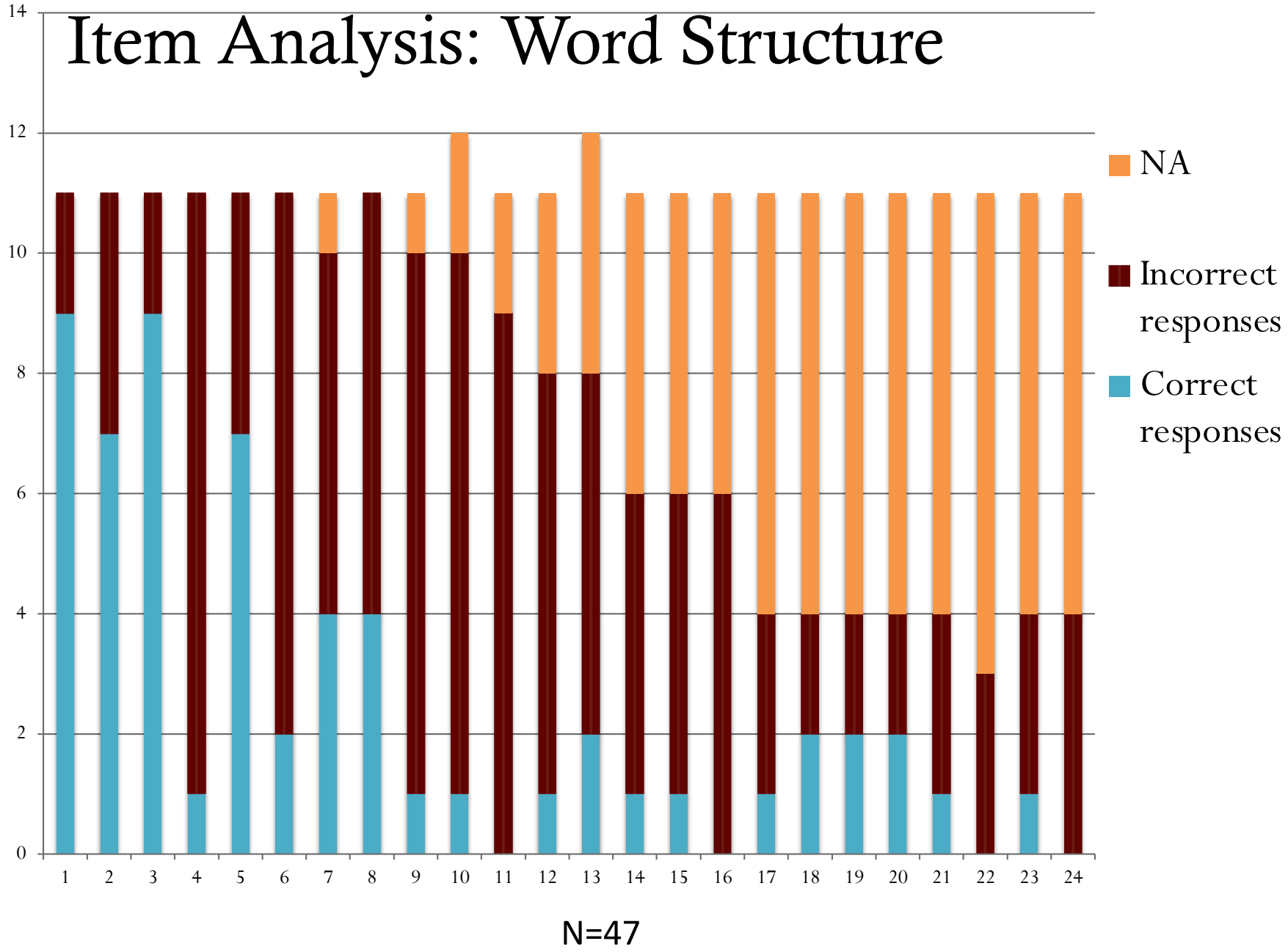
Trial 2 This girl [point to the girl on the left] has two cats. This girl [point to the girl on the right] has two _____. (dogs)

	Score
1. sleeping	1 0
2. walking	1 0
3. in/inside the box	1 0
4. hers	1 0
5. on the chair	1 0
6. her	1 0
7. It is/It's big.	1 0
8. him	1 0
9. sleeps	1 0

	Score
10. horses	1 0
11. flies	1 0
12. king's/queen's	1 0
13. singer	1 0
14. He is./He is standing.	1 0
15. will slide/will be sliding	1 0
16. herself	1 0
17. climbed	1 0
18. faster	1 0

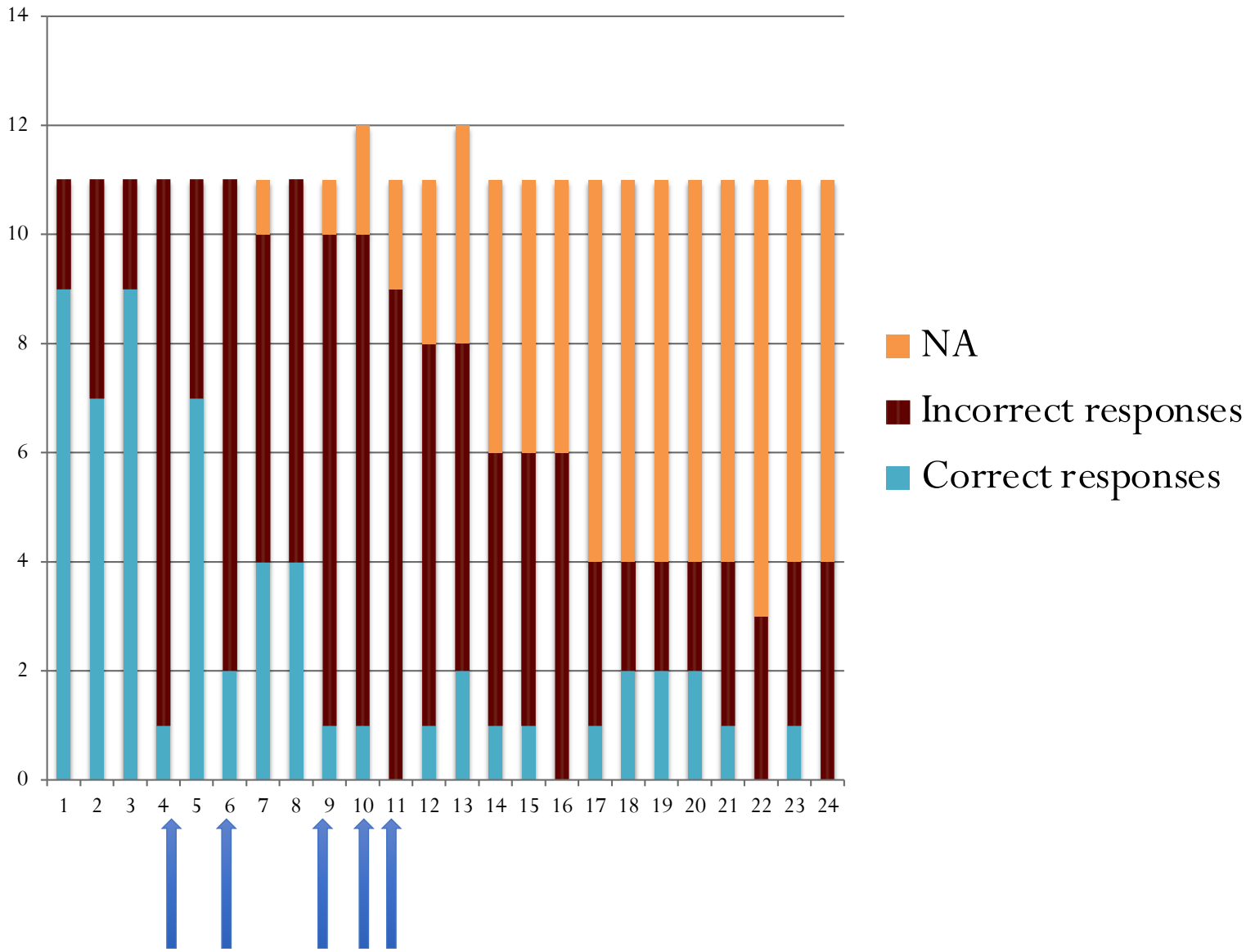
	Score
19. fastest	1 0
20. She does.	1 0
21. She is.	1 0
22. They are.	1 0
23. blew	1 0
24. fell	1 0
Raw Score	

Item Analysis: Word Structure



N=47

Item Analysis: Word Structure



Word Structure (WS)

Scores	Materials Needed	Repetitions	Discontinue Rule
Core Language score Expressive Language index Language Structure index	Stimulus Book 1	Allowed	After 8 consecutive zero scores

Circle 1 for a correct response and 0 for an incorrect response. If the child gives a response that is different from the expected response, but demonstrates the target and is meaningful to the context of the item, write it in the space provided and score the response as correct.

Demo Here is a boy [point] and here... [point] is a girl.

Trial 1 This boy [point] is standing. This boy is [point] _____. (sitting)

Trial 2 This girl [point to the girl on the left] has two cats. This girl [point to the girl on the right] has two _____. (dogs)

	Score
1. sleeping	1 0
2. walking	1 0
3. in/inside the box	1 0
4. hers	1 0
5. on the chair	1 0
6. her	1 0
7. It is/It's big.	1 0
8. him	1 0
9. sleeps	1 0

	Score
10. horses	1 0
11. flies	1 0
12. king's/queen's	1 0
13. singer	1 0
14. He is./He is standing.	1 0
15. will slide/will be sliding	1 0
16. herself	1 0
17. climbed	1 0
18. faster	1 0

	Score
19. fastest	1 0
20. She does.	1 0
21. She is.	1 0
22. They are.	1 0
23. blew	1 0
24. fell	1 0
Raw Score	

Table 2–1. Speech Information Carried by the Key Speech Frequencies of 250–4000 Hz (± one half octave)

250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
• First formant of vowels /u/ and /i/ • Fundamental frequency of females' and children's voices • Nasal murmur associated with the phonemes /m/, /n/, and /ng/ • Prosody • Suprasegmental patterns (stress, rate, inflection, intonation) • Male voice harmonics • Voicing cues	• First formants of most vowels • Harmonics of all voices (male, female, child) • Voicing cues • Nasality cues • Suprasegmentals • Some plosive bursts associated with /b/ and /d/	• The important acoustic cues for manner of articulation • Second formants of back and central vowels • Consonant-vowel and vowel-consonant transition information • Some plosive bursts • Voicing cues • Suprasegmentals • Unstressed morphemes	• The important acoustic cues for place of articulation • The key frequency for speech intelligibility • Second and third formant information for front vowels • Consonant-vowel and vowel-consonant transition information • Acoustic information for the liquids /r/ and /l/ • Plosive bursts • Affricate bursts • Fricative turbulence	• The key frequency for /s/ and /z/ audibility that is critical for language learning: – plurals – idioms – possessives – auxiliaries – third person singular verb forms – questions – copulas – past perfect • Consonant quality

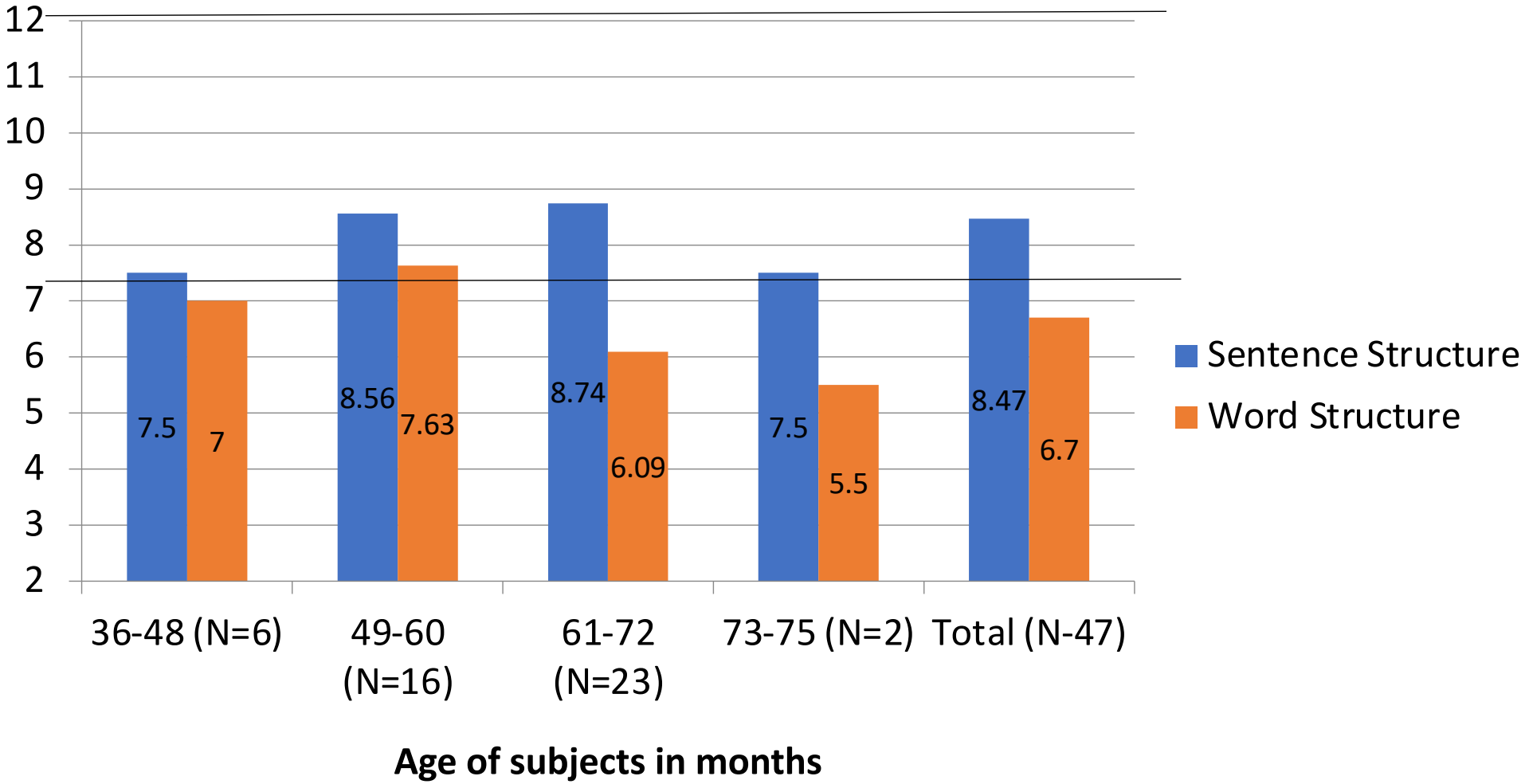
Source: Adapted from *Speech and the Hearing Impaired Child* (2nd ed.) by D. Ling, 2002, Washington, DC: Alexander Graham Bell Association of the Deaf and Hard of Hearing. Reprinted with permission.

Grammatical Morphemes Acquired In Early Childhood

Adapted from Brown, R.,1973

Grammatical morpheme	**Age (in months)**	**Example**
Present progressive –ing	19-28	*"Mommy eating"*
Plural –s	27-30	*"Baby shoes"*
Preposition *in*	27-30	*"Hat in box"*
Preposition *on*	31-34	*"Hat on chair"*
Possessive 's	31-34	*"Baby's ball"*
Regular past tense –ed	43-46	*"Kitty jumped"*
Irregular past tense	43-46	*"We ate"*
Regular third person singular –s	43-46	*"Mommy drives"*
Articles *a, the, an*	43-46	*"The car"*
Contractible copula *be*	43-46	*"She's happy"*
Contractible auxiliary	47-50	*"She's coming"*
Uncontractible copula *be*	47-50	*"We were here"*
Irregular third person	47-50	*"She did it"*

Comparing Scaled Scores



Subtest Scaled Score		Core Language	Receptive Language		Expressive Language	Language Content		Language Structure
		3–6	3–4	5–6	3–6	3–4	5–6	3–6
Sentence Structure	SS	11	11					11
Word Structure	WS	12			12			12
Expressive Vocabulary	EV	10			10	10		
Concepts & Following Directions	C&FD		12			12		
Recalling Sentences	RS				10			10
Basic Concepts	BC		12			12		
Word Classes–Receptive	WC–R							
Word Classes–Total	WC–T							
Core Language Score and Indexes								
Sum of Subtest Scaled Scores		33	35		32	34		33
Standard Score*		106	109		104	106		106
Standard Score Points +/–		7						
Confidence Interval (___% Level)		99 to 113	to	to	to	to	to	to
Percentile Rank		66	73		61	66		66
Percentile Rank Confidence Interval		to	to	to	to	to	to	to
		Core Language	Receptive Language		Expressive Language	Language Content		Language Structure

*See Appendix C in Examiner's Manual.

Preschool Language Scale (PLS)

Item Analysis: PLS

- Preschool Language Scale-4 (Zimmerman, Steiner & Pond, 2002)
- Initially given to 31 children in the preschool program
- Scores removed < 85 Standard Score to focus on those within normal limits

(King, Olson, Shaver & Blaiser, 2009)

PLS Item Analysis: Final Study Sample

PLS Scores of Final Sample			
N = 21	Mean	*SD*	Range
Age	4;1	9.2	3;0 – 5;5
Auditory Comp	99.3	7.4	88-112
Expressive Communication	99.1	9.3	86-115

(King, Olson, Shaver & Blaiser, 2009)

Trends in Auditory Comprehension

- Morphology
  - His/her pronouns
  - Negatives in sentences*
  - -er endings
  - Passive voice*

  * 50% or more of students missed these questions

(King, Olson, Shaver & Blaiser, 2009)

Trends in Expressive Communication

- Morphology
  - Plural “s”
  - Possessive “s”
  - Repeating sentences (due to morphological markers)*
  - -er endings*
  - Past tense *

  * 50% or more of students missed these questions

(King, Olson, Shaver & Blaiser, 2009)

Trends in Auditory Comprehension

- CONTENT
  - Identify items within categories
  - Objects that don't belong
  - Quantity concepts (more/most, half/whole)*
  - Time concepts (night/day)

  * 50% or more of students missed these questions

(King, Olson, Shaver & Blaiser, 2009)

Trends in Expressive Communication

- CONTENT
  - Object function
  - Completing analogies
  - Describing similarities
  - Naming items within a category

  * 50% or more of students missed these questions

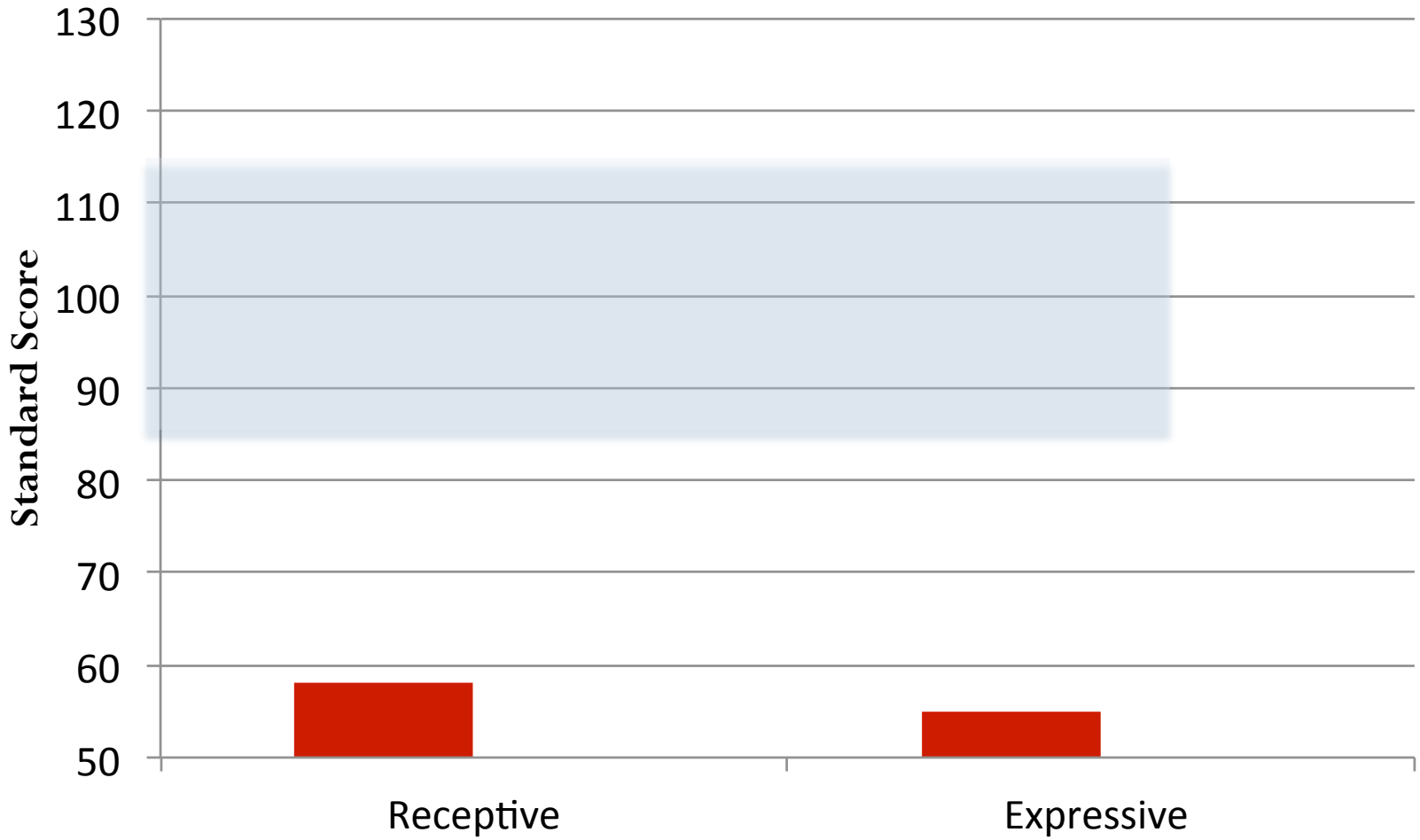
(King, Olson, Shaver & Blaiser, 2009)

Case Study #1: DEVIN

- Current Age: 6;2
- Diagnosis: Failed hearing screening, Auditory Neuropathy
- Significant Medical History: Born premature at 26 weeks
- Hearing Loss: Bilateral sensorineural severe to profound, late amplification
- Hearing aid trial with limited success
- Age of Implantation: Bilateral implantation in shortly after stared school (at age 3;8)
- Treatment Duration: Since after trial

(King, Olson, Shaver & Blaiser, 2009)

Devin: Time 1
PLS-4 Standard Scores



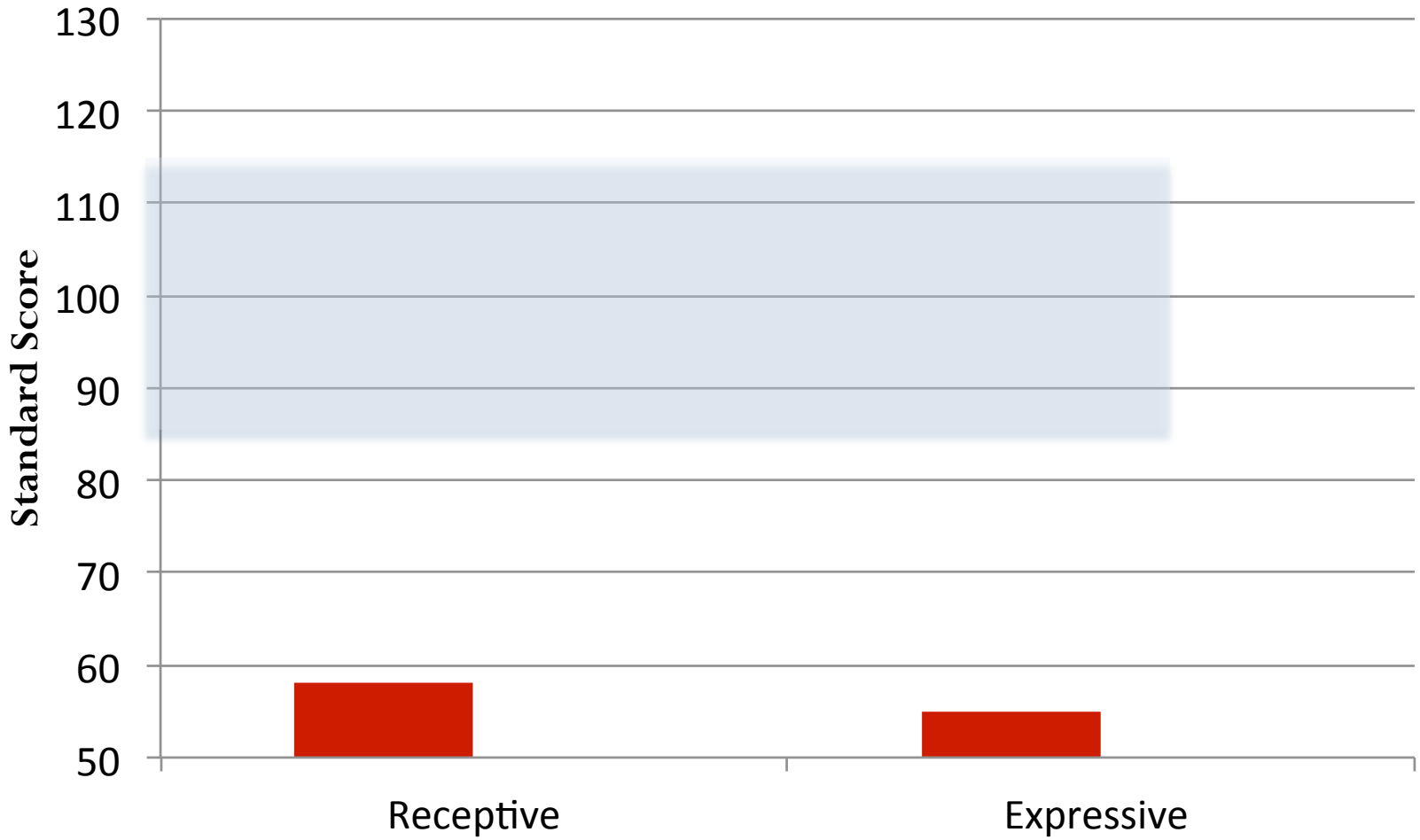
(King, Olson, Shaver & Blaiser, 2009)

Language Sample: Time 1

- Walk
- He running
- In school scream
- No
- Yes
- Watching
- Be quiet
- Hearing
- Car
- Take turn with car
- Stop
- Me
- Matt glue

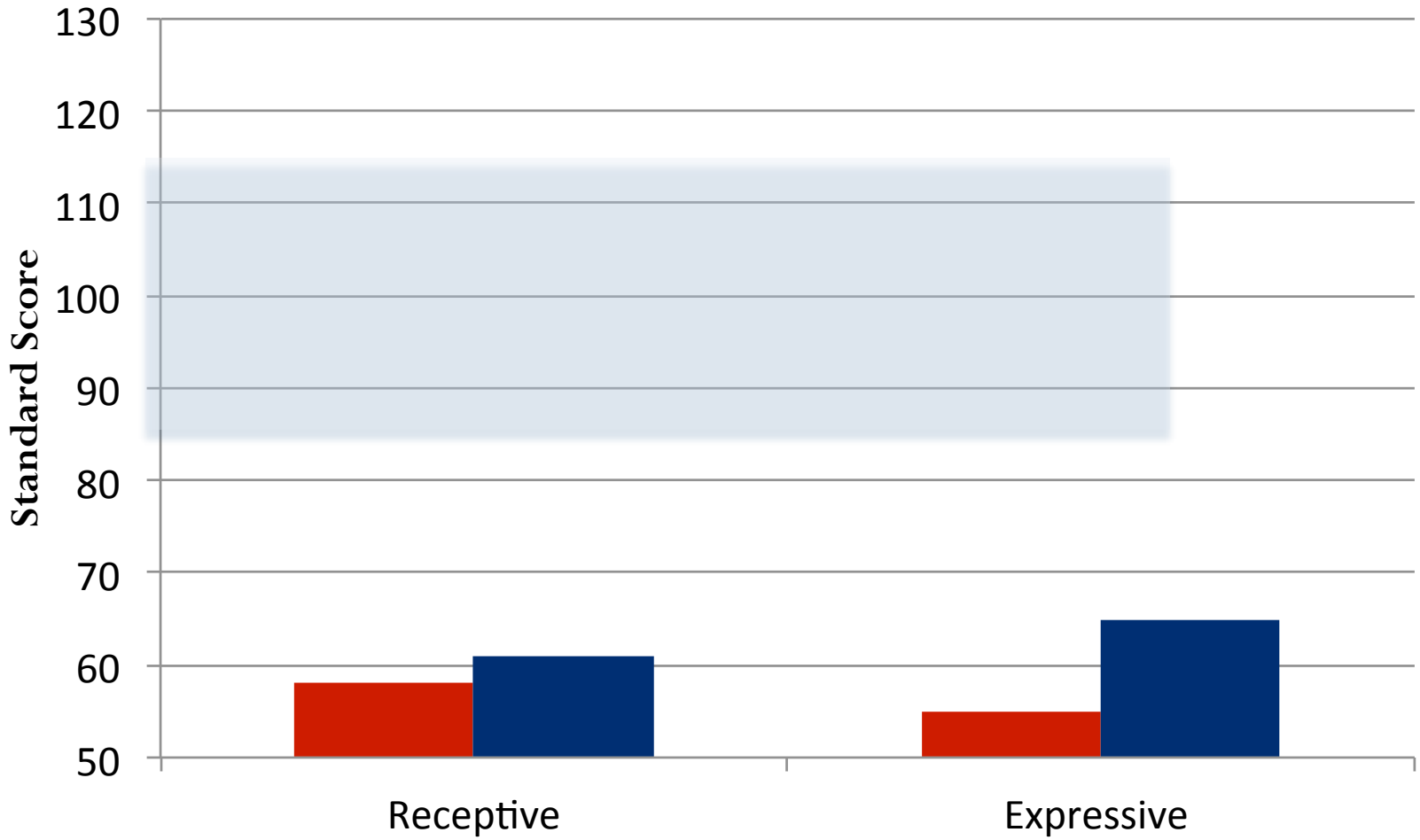
(King, Olson, Shaver & Blaiser, 2009)

Devin: Time 2
PLS-4 Standard Scores



(King, Olson, Shaver & Blaiser, 2009)

Devin: Time 2
PLS-4 Standard Scores



(King, Olson, Shaver & Blaiser, 2009)

Language Sample: Time 2

- Who gave you the clip?
- Grandma is walking inside.
- I go to a baseball game.
- A lot of little kid go to the baseball game.
- Lucy didn’t go to the baseball game.
- Lucy go to the football game
- That’s a monster.
- You gotta little monster and I got a big monster.
- Where Erika R at?
- Maybe she go to the bumper car.
- Why no field trip?
- He is getting bigger. He growing up.

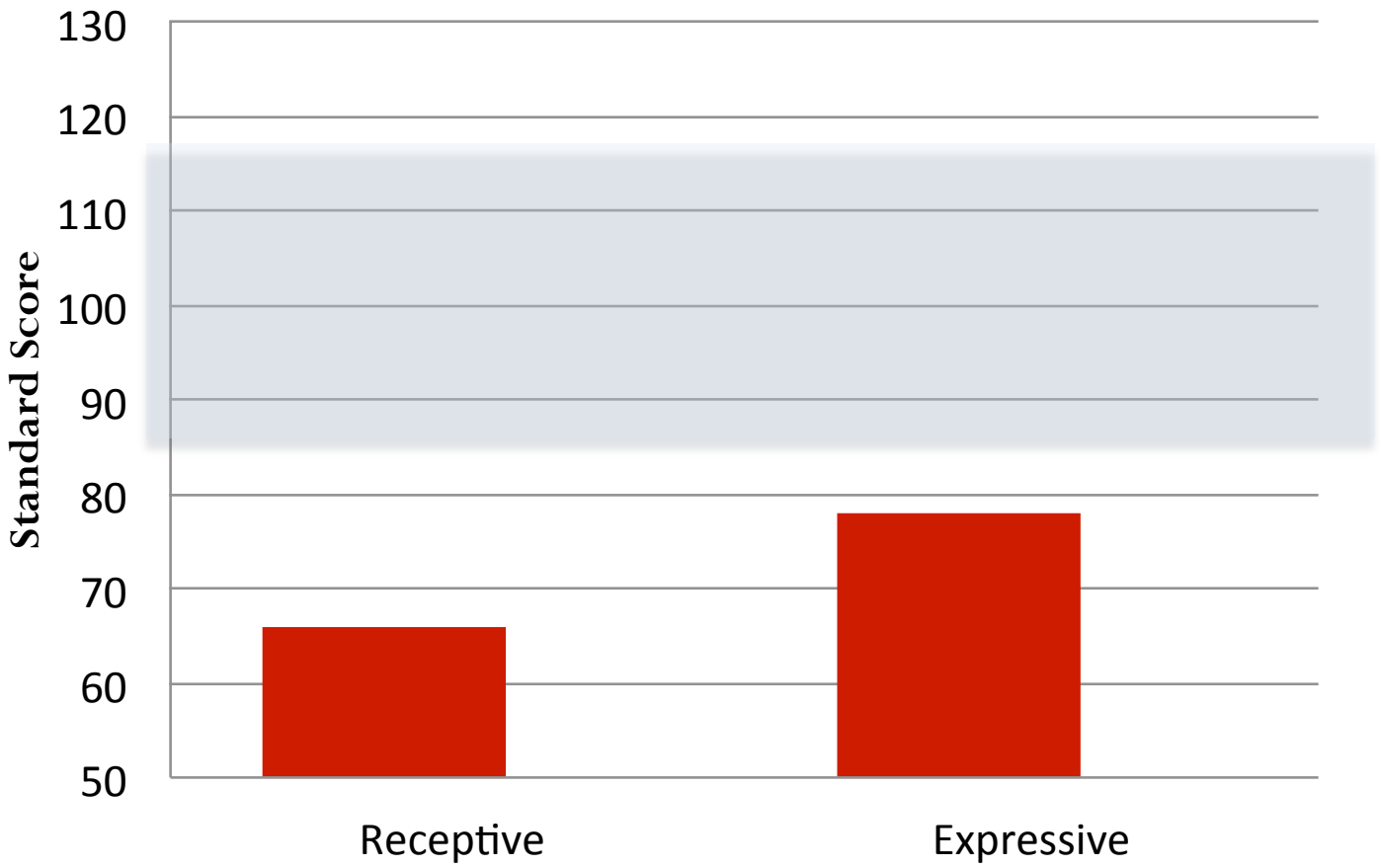
(King, Olson, Shaver & Blaiser, 2009)

Case Study #2: Steven

- Current Age: 3; 8
- Diagnosis: Bilateral sensorineural hearing loss
- Significant Medical History: Malnutrition, internationally adopted from orphanage care
- Hearing Loss: Bilateral sensorineural moderate to severe, late identification
- Bilaterally aided at 19 months

(King, Olson, Shaver & Blaiser, 2009)

Case Study: Steven



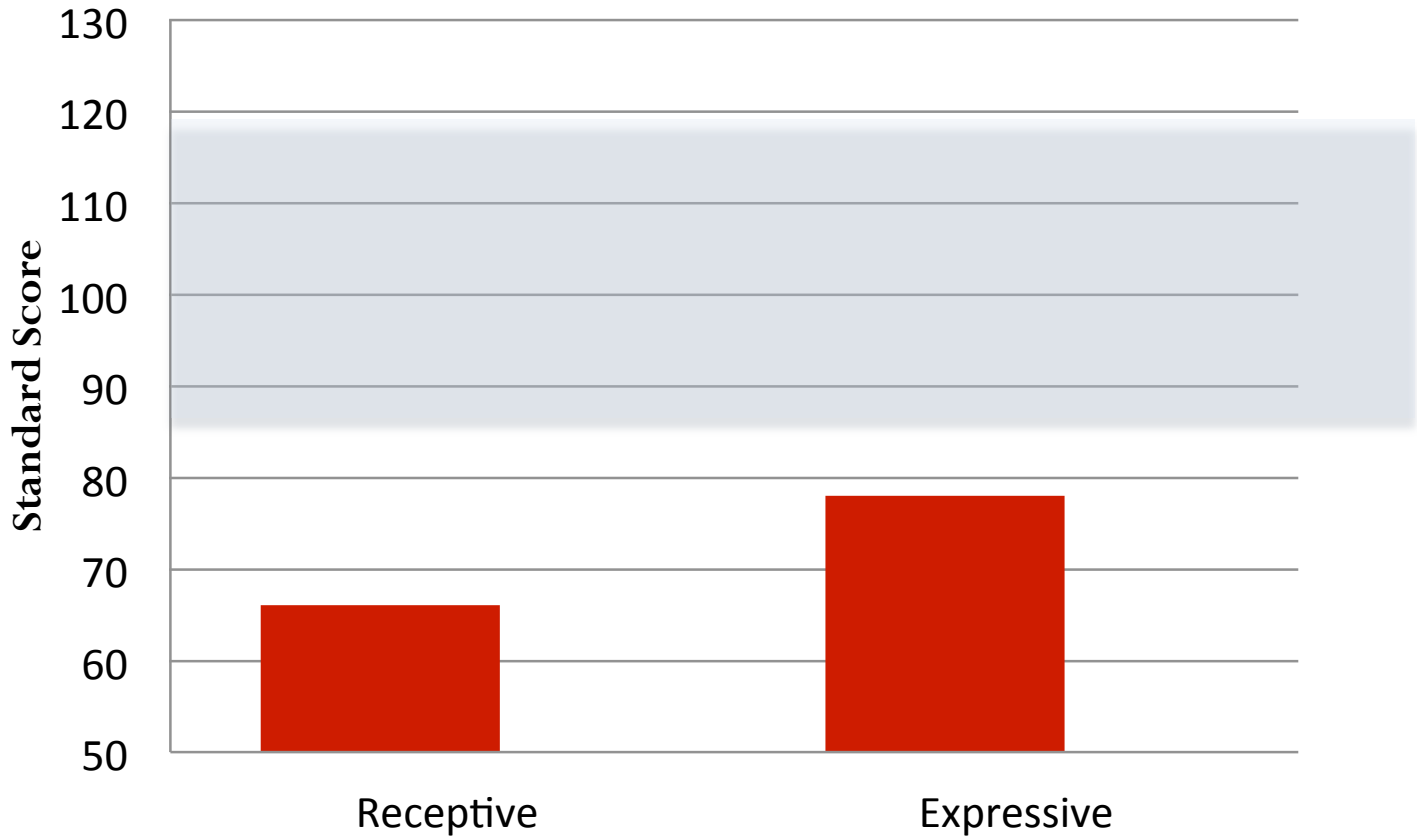
(King, Olson, Shaver & Blaiser, 2009)

Language Sample: Time 1

- Mommy
- Mommy sleeping
- Daddy
- Night night, Mommy
- Daddy sleeping
- Night night, Daddy
- Bye bye, Dad
- Bye bye, Mom
- Eat
- Open
- Puppy

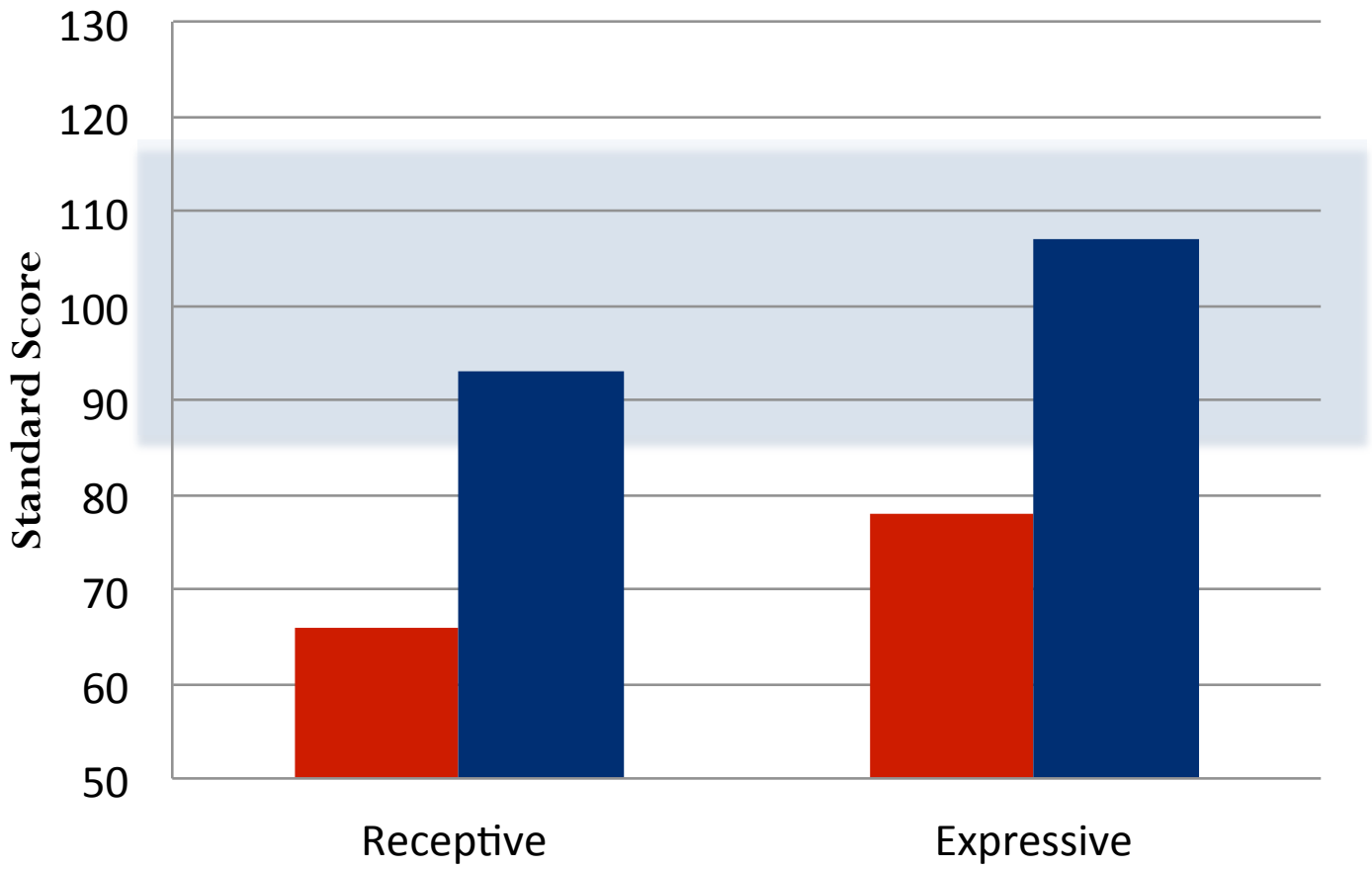
(King, Olson, Shaver & Blaiser, 2009)

Steven: Time 1



(King, Olson, Shaver & Blaiser, 2009)

Steven: Time 2



(King, Olson, Shaver & Blaiser, 2009)

Language Sample: Time 2

- Mommy going drive in mommy car and daddy going to drive in dad car
- Mommy gonna ride in the boat, and daddy gonna ride in the boat.
- Where the water?
- That daddy boat!
- Stay in the boat. Don't fall down in the ocean! That the ocean.
- Don't fall down
- They got wet!
- Don't fall in the ocean again!
- That a captain and that a captain
- There two captain
- That mommy boat and that daddy boat
- I think he going ni-night
- I think he not going ni-night. I think he going to bite!
- Now mommy going to eat the apple

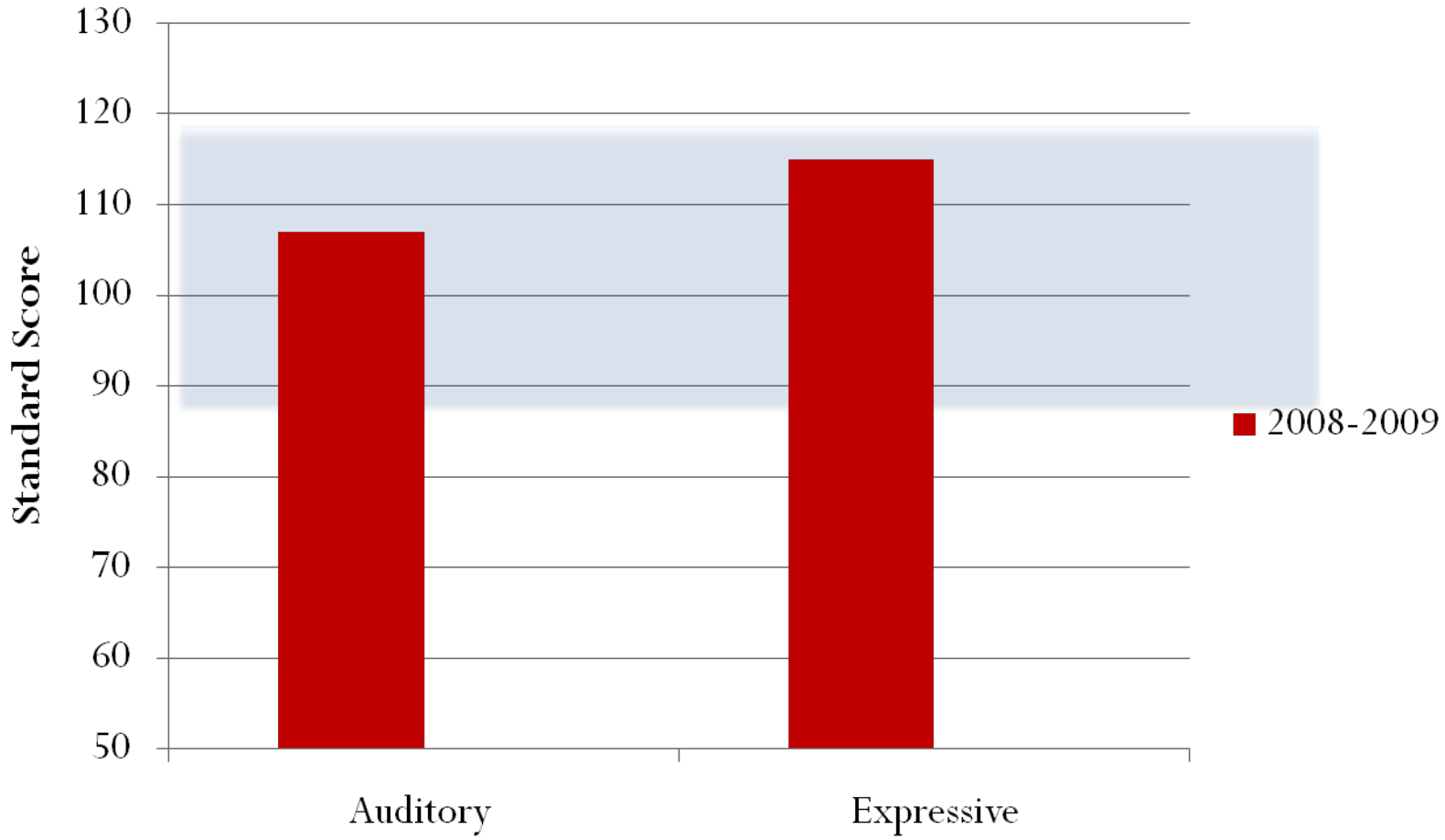
(King, Olson, Shaver & Blaiser, 2009)

Case Study #3: Zane

- Current Age: 4;9
- Diagnosis: Enlarged Vestibular Aqueduct Syndrome (EVAS), slight Mondini malformations bilaterally
- Significant Medical History: Identified at birth
- Hearing Loss: Bilateral sensorineural moderate to profound
- Bilaterally aided since infancy
- Age of Implantation: Right ear implanted in second year of study
- Treatment Duration: Since 2;0
- Bilingual: Cantonese and English

(King, Olson, Shaver & Blaiser, 2009)

Case Study: Zane



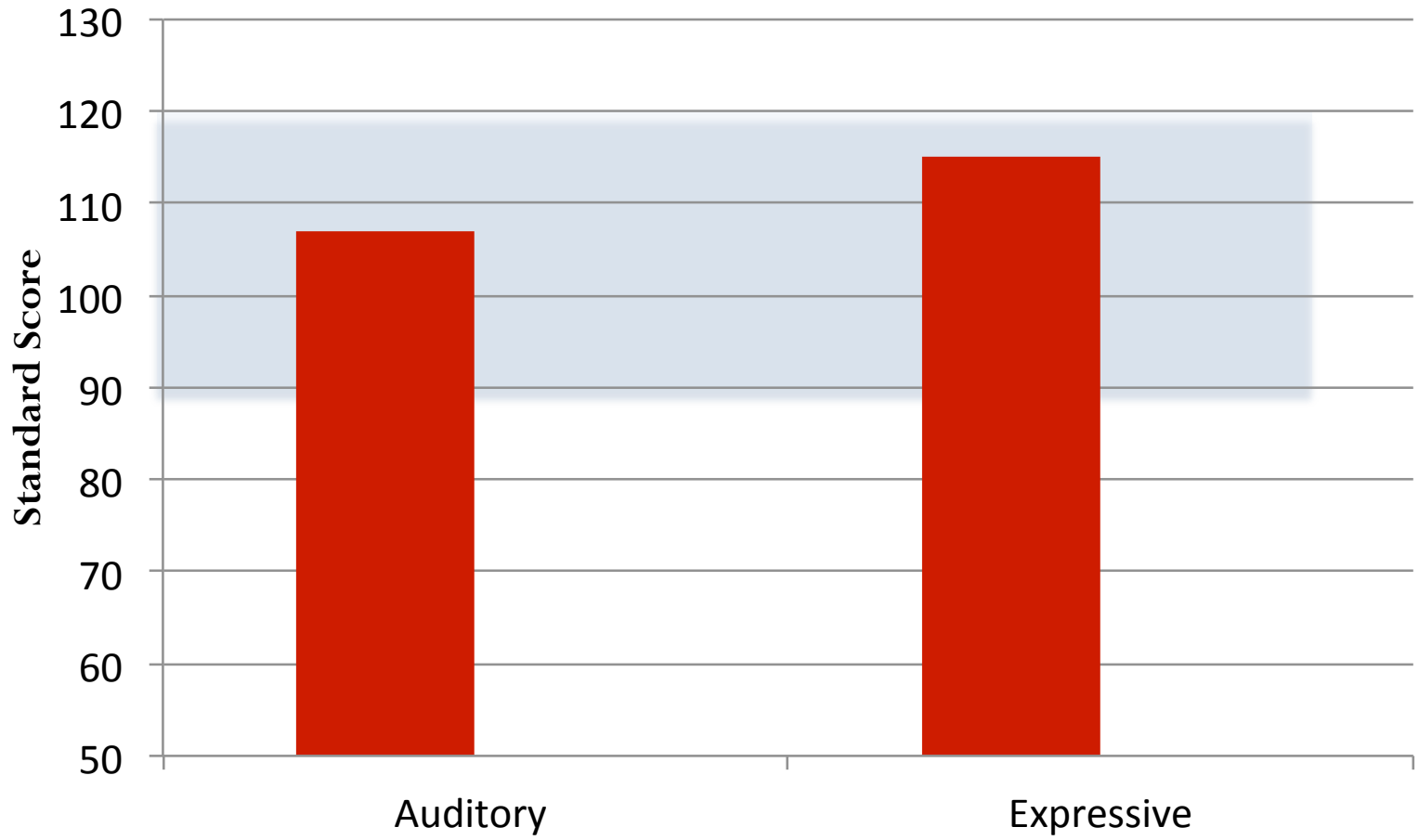
(King, Olson, Shaver & Blaiser, 2009)

Language Sample Zane: Time 1

- The car go in the garage
- He going to the hospital
- He going back to the hospital over here
- He have to go up to a parking spot
- He going back home now up the road
- He will go back up to the (unintelligible) and the he want to go back home
- he going to see the window
- Oh no! the car fall down.
- He will go back and try again
- He try to use the elevator
- He going back home because he want to play

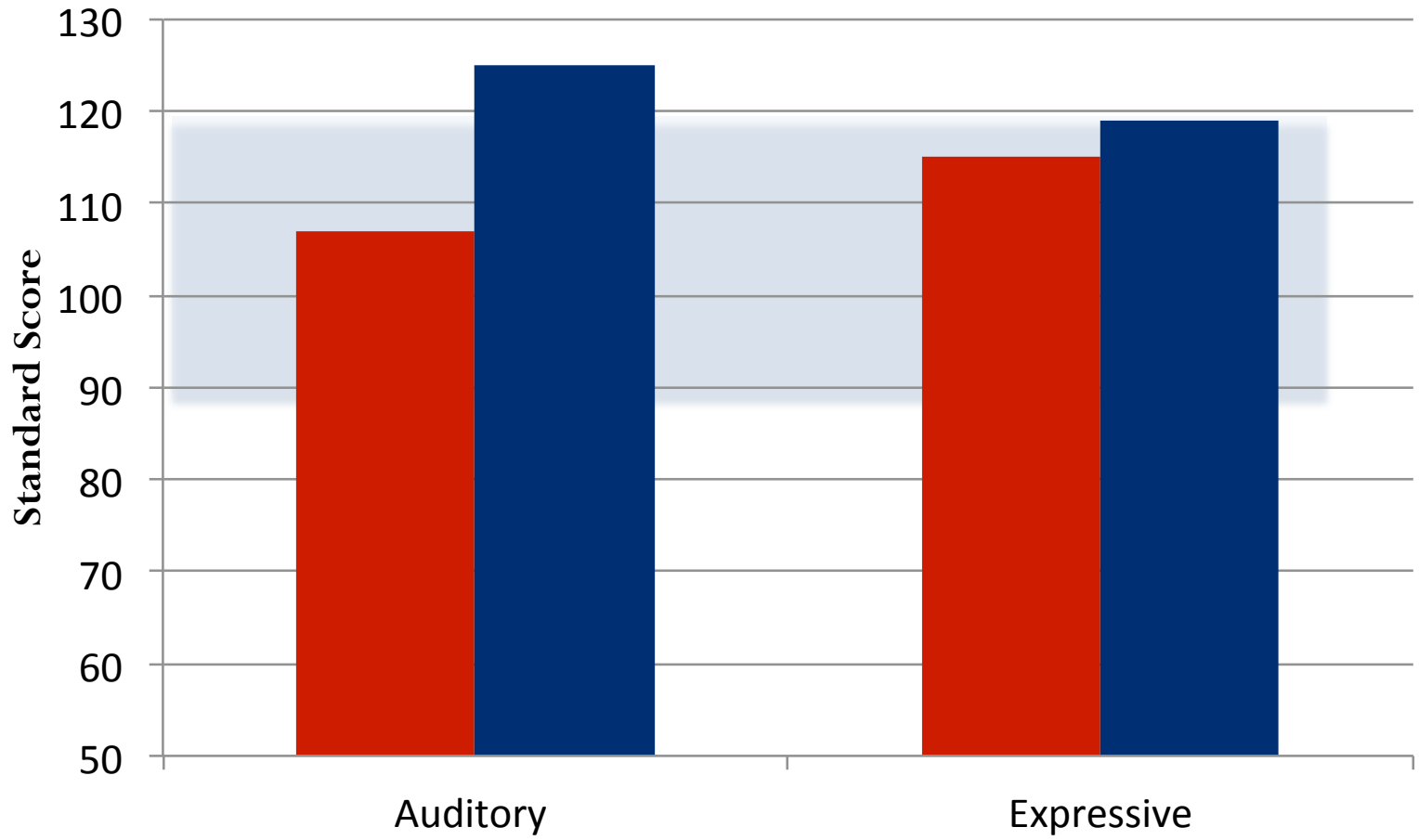
(King, Olson, Shaver & Blaiser, 2009)

Case Study: Zane



(King, Olson, Shaver & Blaiser, 2009)

Case Study: Zane
Time 2



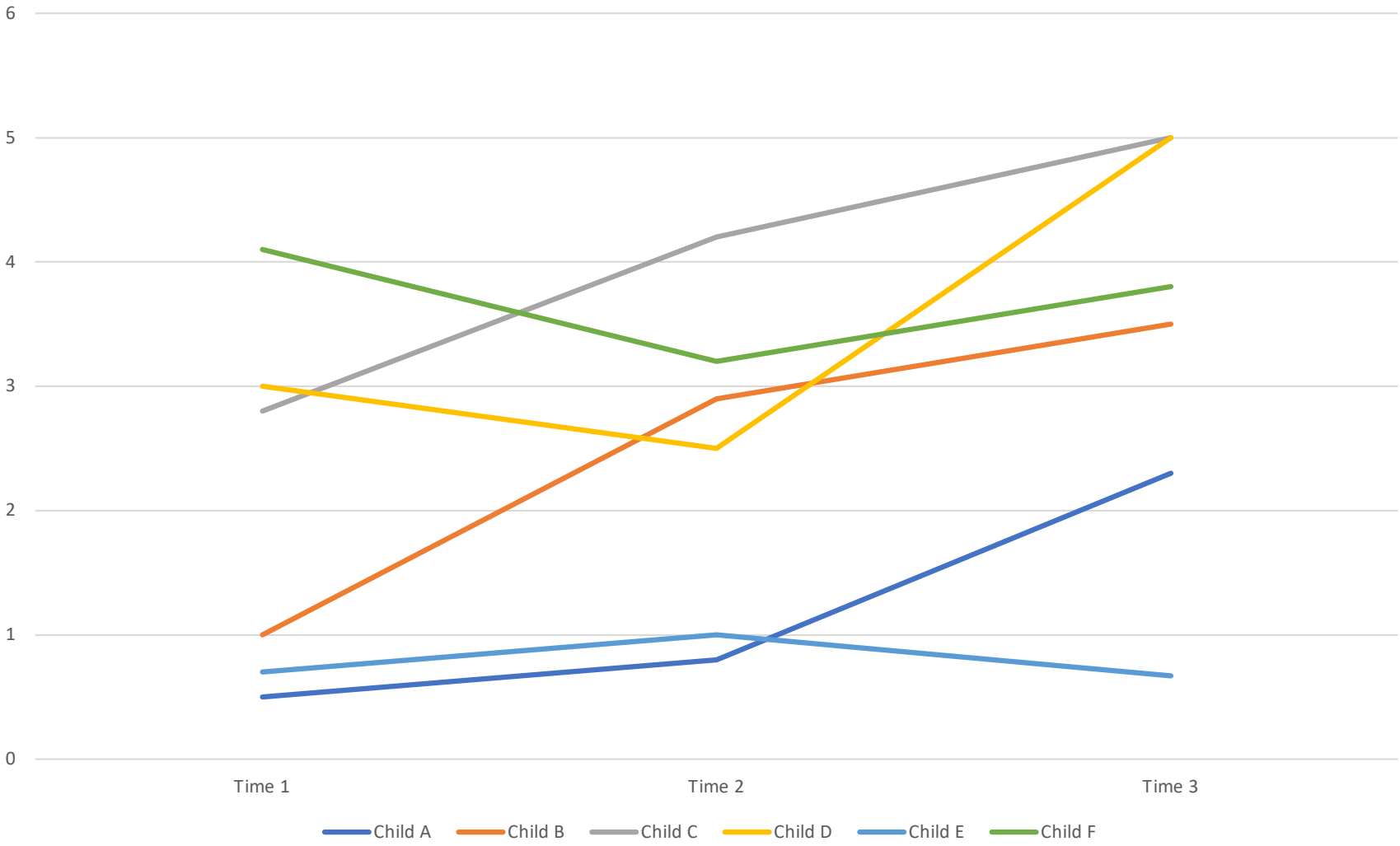
(King, Olson, Shaver & Blaiser, 2009)

Language Sample: Time 2

- Did the other group have four friends here?
- Do you know what, Sarah? I was sick September 20th.
- My birthday's coming up. How can I get to be five?
- I went to Chuckie Cheese's a long time ago but one of my friends came, Eric but another friend didn't come because he was not invited.
- Do you know what? Tomorrow on Tuesday I'm going to take my day off.
- Even, you know what? My dad was at work and I told him about the T-rex dinosaurs.
- My dinosaur name is Sarah 'cuz I like that name.
- Why we have to cut a hole in the dinosaur's mouth?
- Black is my favorite color because so you can see better and I'm wearing black strip shirt today.
- You know, there was a nice shark at Mall of America.
- Can you hear it Matt? It's liquid.
- I like ketchup with French fries but not other food.

(King, Olson, Shaver & Blaiser, 2009)

Data over time



Semantics


ball (1) bark (1) birdy (1) bite (1) cat (1) daddy (1) doctor (1) does (1) dog (3)
doggie (2) duck (1) eat (4) eating (1) hand (3) he (2) is (1)
kitty-cat (1) meow (1) mom (2) mommy (1) mouth (1) oink (1) pig (1) play (1) quack (1)
trees (1) vet (1) who (1) whole (1) yeah (6)


always (2) an (1) and (10) around (1) at (1) awa
y (1) back (2) bag (4) be (1) behind (1) bird (1) But (
3) can (7) cannonball (1) Cause (1) clasped (3) c
losely (1) come (2) did (1) does (1) door (1) ears (3) end (1) fish
(2) fit (2) for (2) four (1) Fred (2) get (2) giv
e (2) go (5) half (1) happening (1) have (2) He (1) heard (1)
here (2) hiding (1) how (2) hunters (1) hunting (2) I'll (1)
iceberg (1) in (3) Is (2) it (3) know (1) looked (1) many (1) march (1
) match (1) Meyer (2) need (2) new (2) nice (1) no (1) nop
e (1) not (2) now (1) odd (1) of (1) on (1) one (3) over (3)
penguins (3) place (1) play (1) rich (3) right (
3) rocks (1) run (1) said (1) she (3) sing (1) six (1) slap (1) sleep (1) splashing (1)

Assessment-Intervention

- Standardized assessments (though useful) may not provide enough information
- Children need *explicit* teaching of things that are implicit
- **Collaboration** is key
- **Repetition** is key
- Progress monitoring is essential

Why does this happen?

Parent gone

Distance

Parent gone

Routine

Distance

Parent gone

Peers

Routine

Distance

Parent gone

Noise

Peers

Routine

Distance

Parent gone

Competing attention

Noise

Peers

Routine

Distance

Parent gone

Competing attention

Noise

Behavior

Peers

Routine

Distance

Parent gone

Competing attention

Noise

Behavior

Peers

Visual attention

Routine

Distance

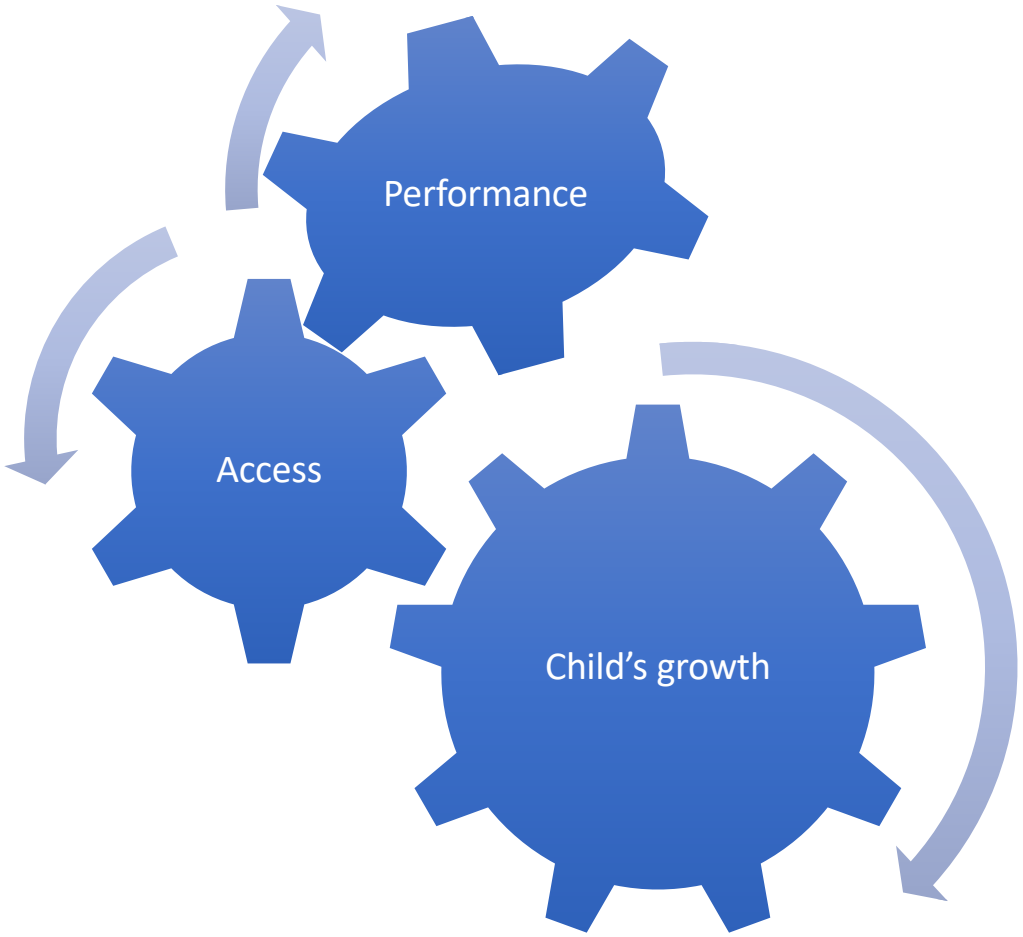
Parent gone

Collaboration

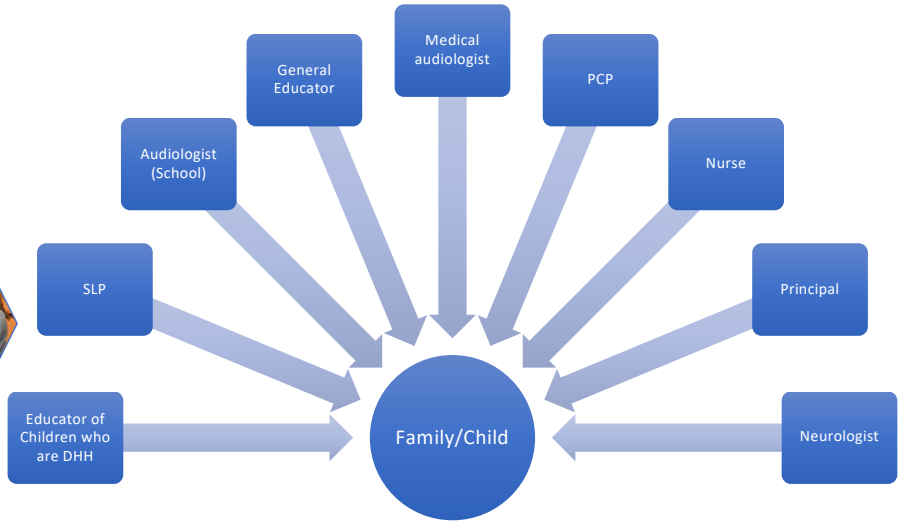
- Children are identified young, so aren’t able to give us feedback
- Parents need to understand their role – and be empowered

Today collaboration is more important than ever

Importance of collaboration for today's child who is DHH



Who are core collaborative team members for children who are D/HH?



SLPs can offer

- How child is performing in quiet
- How child performs with structure
- Individual time with parents/family members
- Multiple opportunities for practice
- Differential diagnosis about speech/language errors

AUDs can offer

- Programming changes
- Retention options
- Technology options
- Wear time information
- Speech perception results
- (Less) familiar intelligibility

Educators of the DHH can offer

- Classroom behavior
- Classroom rules & reinforcement strategies
- Generalization information
- Performance in noise (various settings)
- Performance with peers
- Performance in less structured environments

Assessment practices

- SLPs have existing tools to work with many children who are DHH
- Going beyond the score, developmental norms
  - Alternative models of assessment
  - Patterns in strengths and needs in assessments
  - Acoustic access
  - Collaboration

Thank you!

- Questions, comments, ideas?

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