

QUALITATIVE ANALYSIS OF THE SINGAPORE-ADAPTED COMPETING SENTENCES TEST PERFORMANCE FOR SINGAPOREAN CHILDREN FROM 7 TO 9 YEARS OLD

Co-Investigator: Nurul Jannah Alias
Principal Investigator: Dr. Jenny Loo

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Background

Competing Sentences Test

- **Competing Sentences Test (CST)**
 - Dichotic Listening Task (DLT)
 - Measures binaural separation ability (Farah, Brown, & Keith, 2013)
 - Part of CAPD Test Battery
- **Speech-based test → Language and Accent appropriate CST material**
 - Linguistically loaded dichotic task, accent effects
(Bent & Atagi, 2015; Mukari, Keith, Tharpe, & Johnson, 2006; Newton & Ridgway, 2016; Rosenberg, 1998)
 - Singapore Standard English (SSE) =/= American English

SG_CST



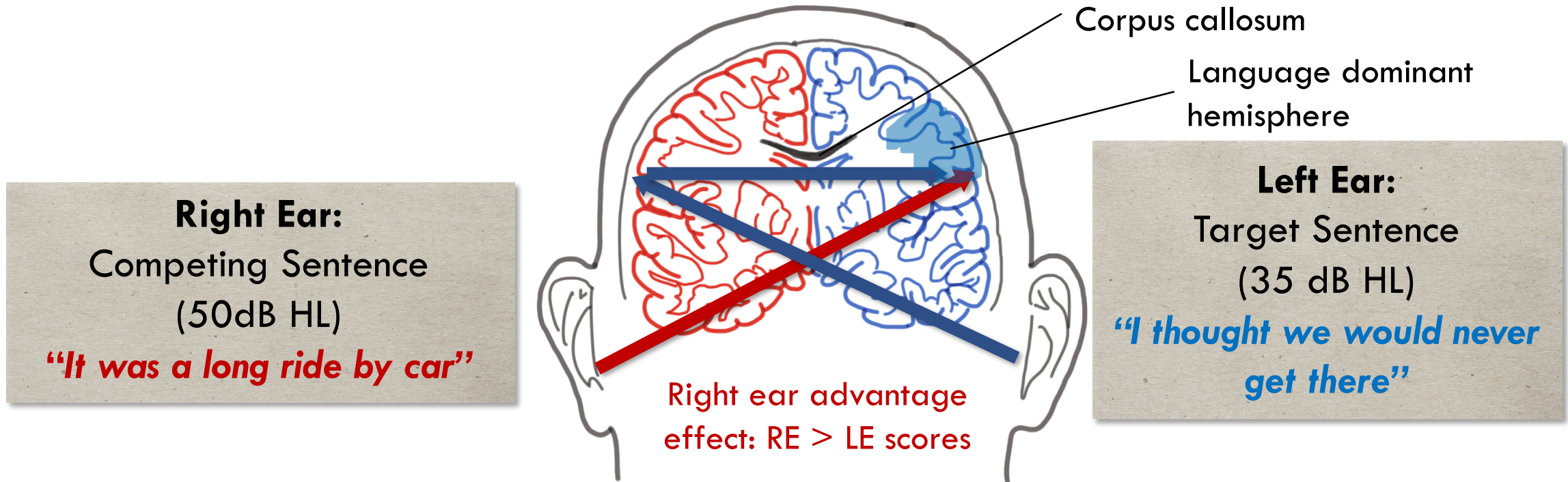
Preliminary CST performance study (diotic presentation):
SG_CST > US_CST on N=21 local Singaporean children (Ding, 2015)

US_CST



Background

Competing Sentences Test



Competing Sentence List					D. Right	D. Left
Target	I thought	we would <i>she will</i>	never	get there		7.5
Competing	It was	a long	ride	by car		

Introduction

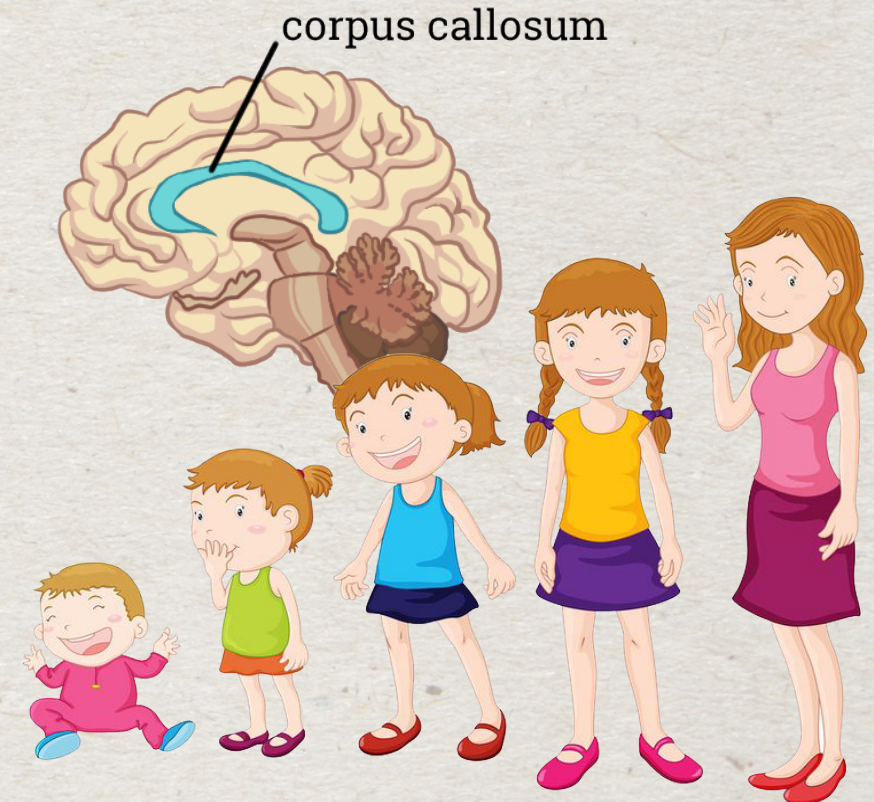
Normative Data

- CST is a norm-referenced test

- Clinical interpretation based on age-based normative data (Muskiek, Bellis & Chermak, 2005; Tomlin & Rance, 2016)
- Age groups to take into account ongoing neural maturation that is most apparent in childhood (**corpus callosum**) (Luders, Thompson and Toga, 2010)
- Trend of decreasing REA with age

Age (years)	Left ear	Right ear	REA
7;0 – 7;11	35	80	45
8;0 – 8;11	39	82	43
9;0 – 9;11	74	90	16
10;0 – 10;11	85	90	15
11;0 – 11;11	90	90	0
≥ 12	90	90	0

CST cut-off scores based on normative data from the US population (T. J Bellis, 2003)



Introduction

Aims and Hypothesis of Study

Aims Of Study:

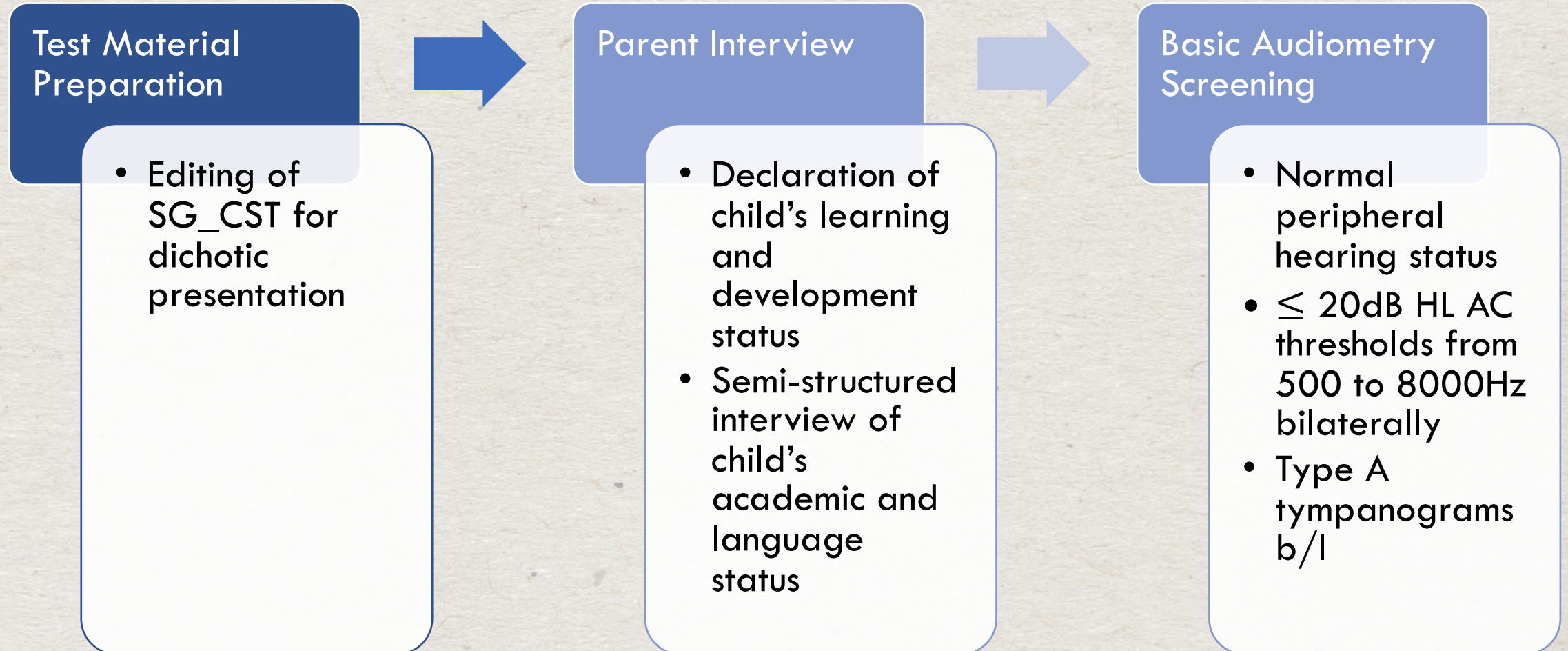
- To explore the suitability of using the Singapore adapted Competing Sentences Test (SG_CST) on local Singaporean children between 7 to 12 years old as part of the battery of tests used in the assessment of Central Auditory Processing Disorder (CAPD).
- If deemed appropriate, normative data would be obtained on a group of Singaporean children from 7 to 12 years old for the SG_CST test.

Hypotheses:

1. Local Singaporean children will perform better in the SG_CST as compared to the US_CST.
2. Left ear scores are expected to improve with age, showing a REA trend that diminishes with increasing age.

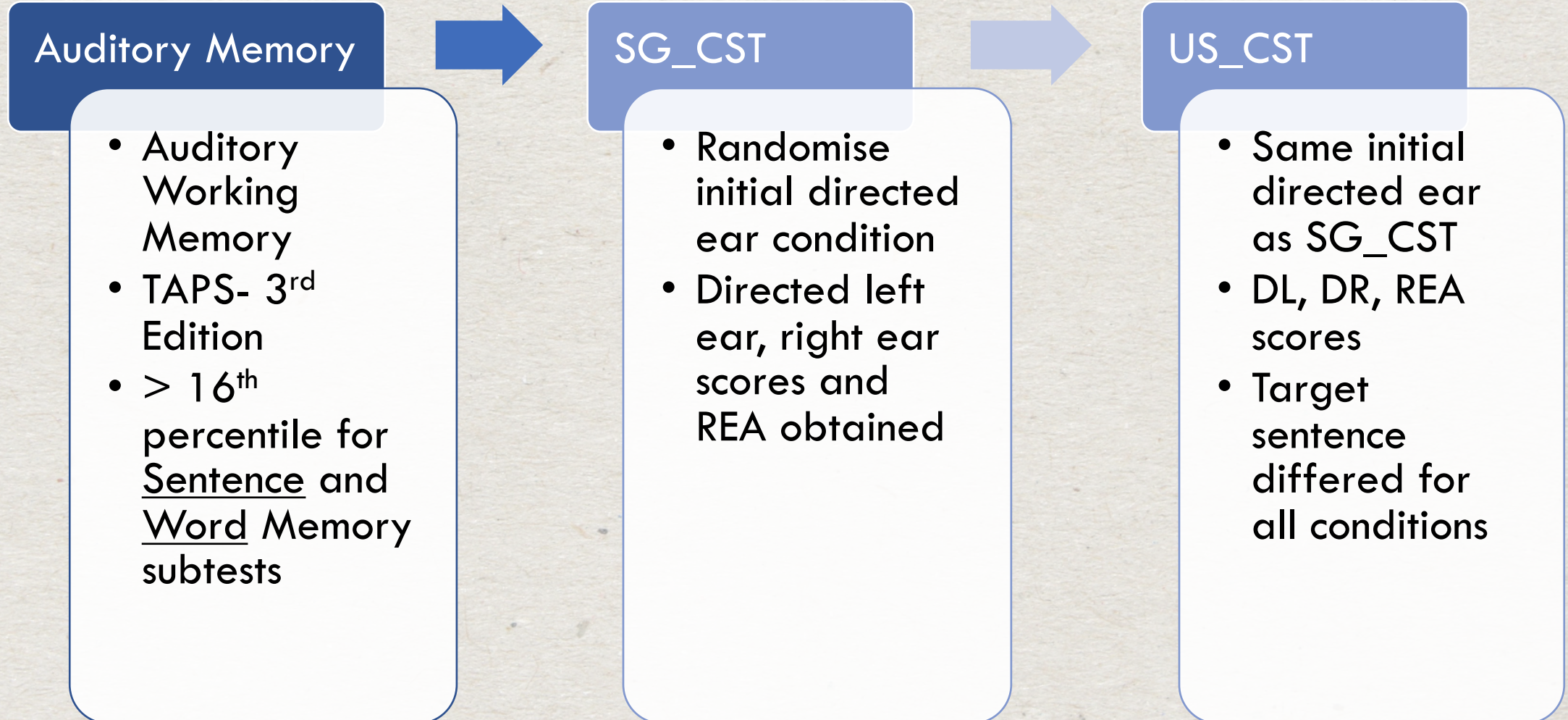
Methodology

Procedures done



Methodology

Procedures done



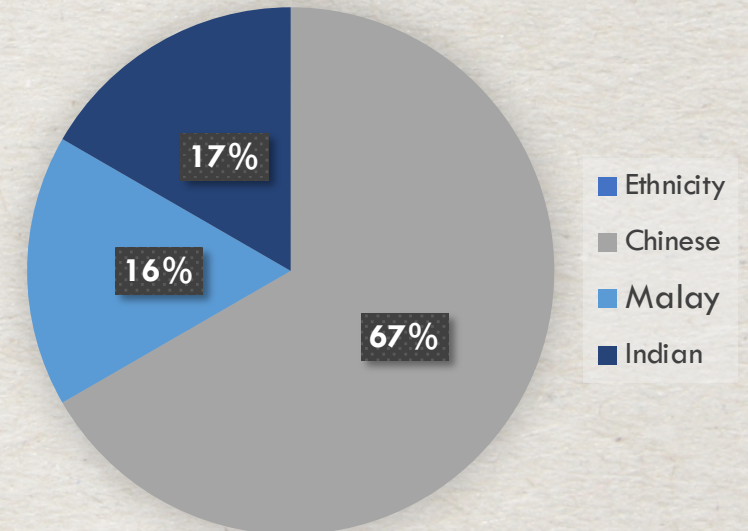
Results

Subject Demographics

- **N=6** local Singaporean children enrolled in MOE-registered primary schools, from 7 to 8 years old, with a mix of Chinese, Indian and Malay ethnicity individuals
- Word of mouth recruitment method

Subject No.	Age (Years: Months)	Gender	Ethnicity	L1	L2
001	8:11	F	Chinese	English	Mandarin
004	8:10	M	Chinese	English	Mandarin
002	8:3	M	Indian	English	Malay
003	7:10	M	Malay	English	Malay
005	7:2	M	Chinese	English	Mandarin
006	7:2	F	Chinese	English	Mandarin

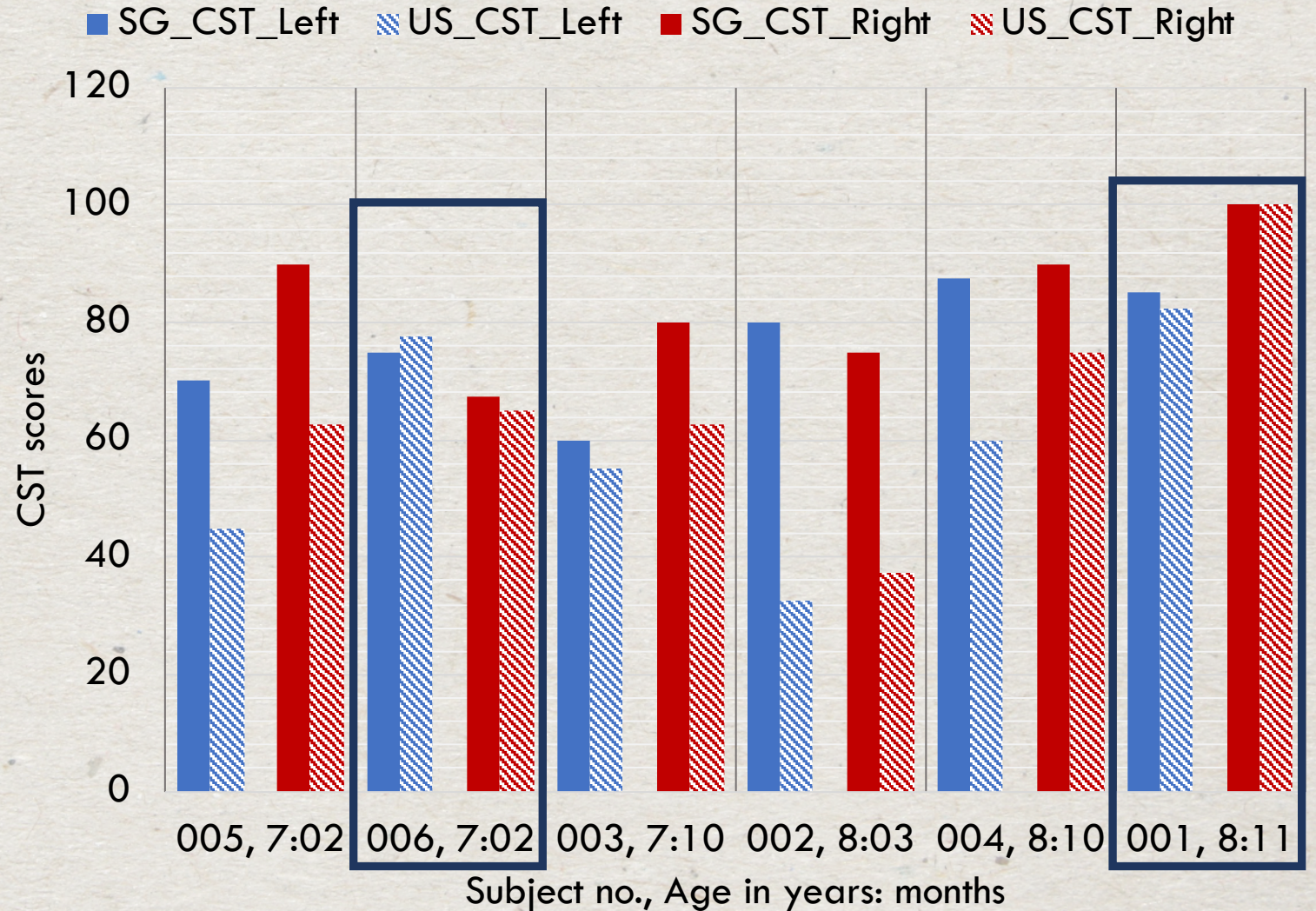
Ethnicities of Subjects



Results

Individual CST Scores

- Overall, local Singaporean children from 7 to 9 years old performed better in the SG_CST than US_CST task



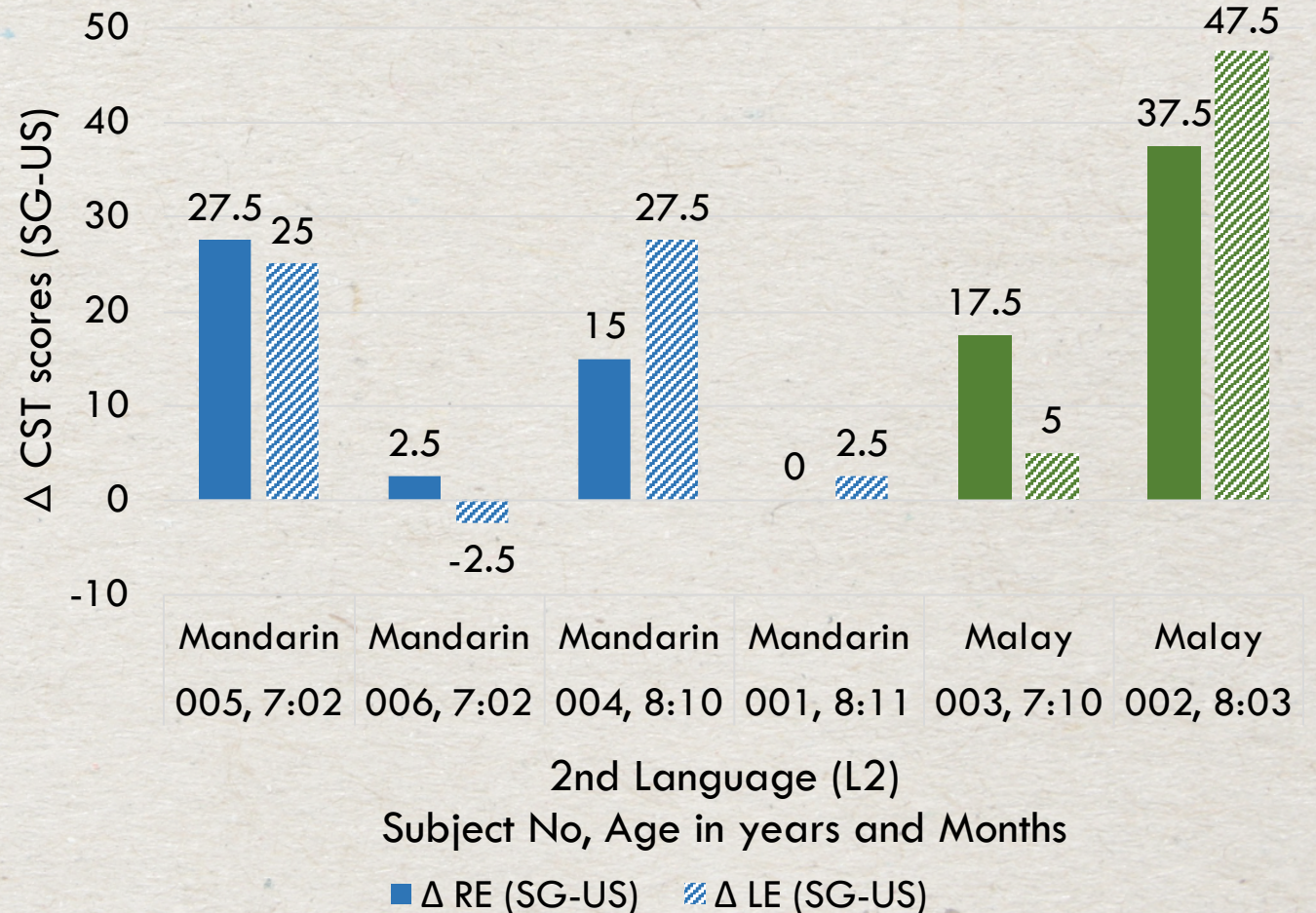
Results

Difference in CST (Δ CST) performance in relation to 2nd Language (L2)

- Difference in CST (Δ CST) performance highly variable

$$\Delta\text{CST} = \text{SG_CST} - \text{US_CST}$$

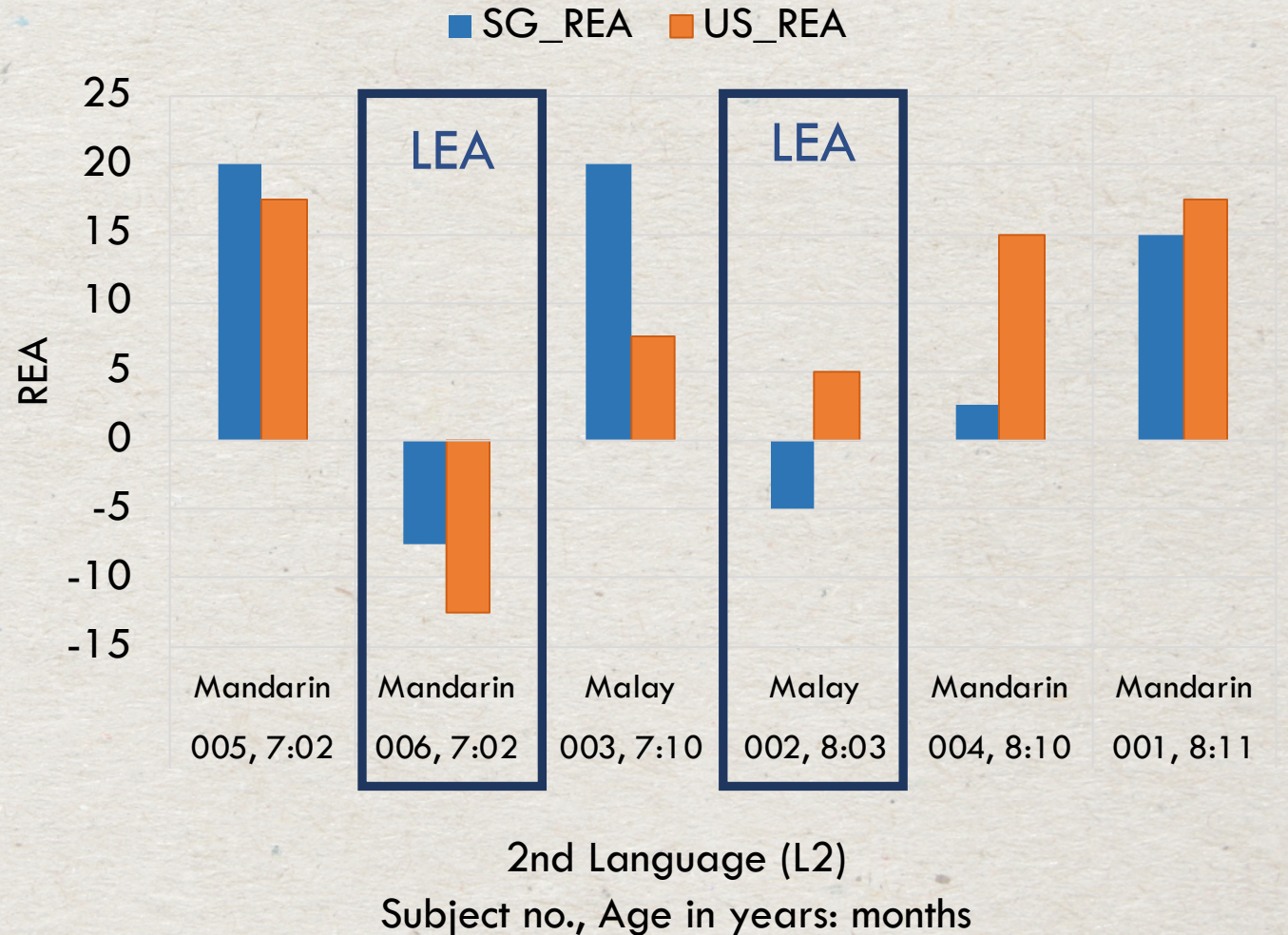
- No clear correlation between change in performance and L2



Results

Right Ear Advantage (REA) scores with increasing age

- No clear trend of decreasing REA with increasing age
- No clear correlation between L2 (Mandarin vs Malay) and degree of REA
- LEA observed in some subjects (Subject no. 006, Subject no. 002)



Individual Case Studies

Subject No. 006

Profile	Female, 7;2 years old, Chinese ethnicity, L2: Mandarin		
Language and Academic Bg	Doing well in school Reported to perform better in Mandarin (MTL) subject than in English (L1)		
Screening Results	Basic Audiometry: Pass, AM Word: 99 th Percentile, AM Sentence: 84 th Percentile		
CST scores	SG_CST	Directed Left	75
		Directed Right	67.5
		REA	- 7.5
	US_CST	Directed Left	77.5
		Directed Right	65
		REA	-12.5

Individual Case Studies

Subject No. 002

Profile	Male, 8;3 years old, Indian ethnicity, L2: Malay		
Language and Academic Bg	Below average - average student Dominant language is Malay language(L2), only started using English language (L1) when enrolled in school		
Screening Results	Basic Audiometry: Pass, AM Word: 99 th Percentile, AM Sentence: 63 th Percentile		
CST scores	SG_CST	Directed Left	80
		Directed Right	75
		REA	- 5
	US_CST	Directed Left	32.5
		Directed Right	37.5
		REA	5

Discussion

1. **SG_CST > US_CST**

- Local children performed better in the SG_CST than US_CST, confirming known effects of accent on speech-based tests

2. **Variable difference in CST (Δ CST) performance and REA (SG_REA, US_REA)**

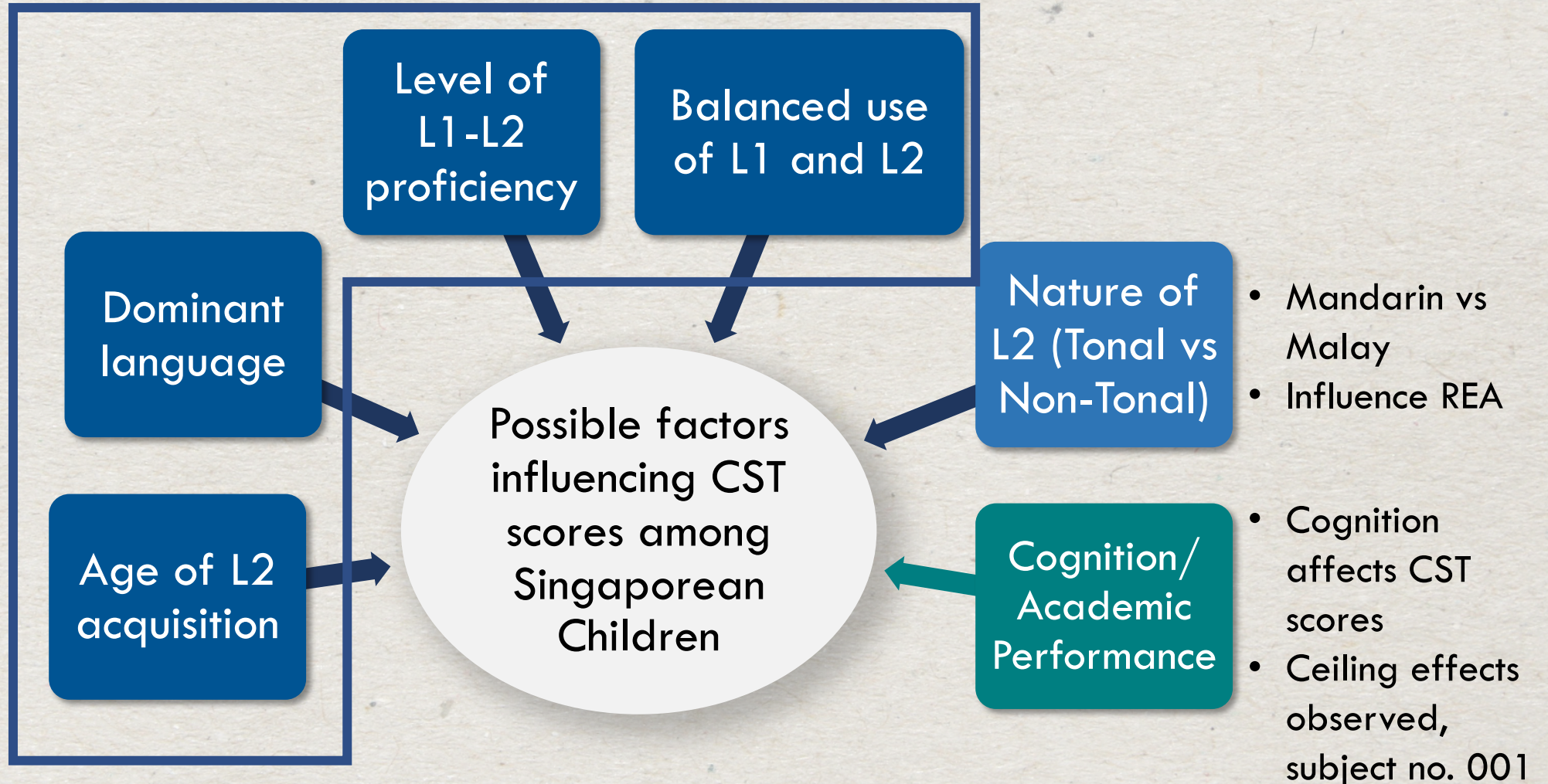
- Suggests presence of probable confounds influencing degree of change/ improvement when switched to SG_CST
 - Child's linguistic profile \rightarrow Linguistic variability expected in Singapore
 - Child's cognitive level

3. **Performance of CST among multilinguals varies from monolinguals**

4. **Did not proceed with normative data development**

Discussion

Suggested linguistic and Cognitive Parameters affecting CST scores



Study Limitations

- **Limited sample size**, no statistical analysis was done to compare the difference between SG_CST and US_CST scores
- **Narrow age range** (7 to 8 years old), limited study of the relation between REA and age as a surrogate measure of corpus callosum development
- **Lack of objective measures** of child's language and academic performance. Relied on semi-structured interview from parents and/or guardians

Future Studies

- Larger sample size
- Comprehensive screening battery of tests, assessment of:
 - Linguistic profile parameters
 - Academic and cognitive level screening
 - Auditory memory and attention screening tests
- Normative data

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Thank you!

Q & A

