

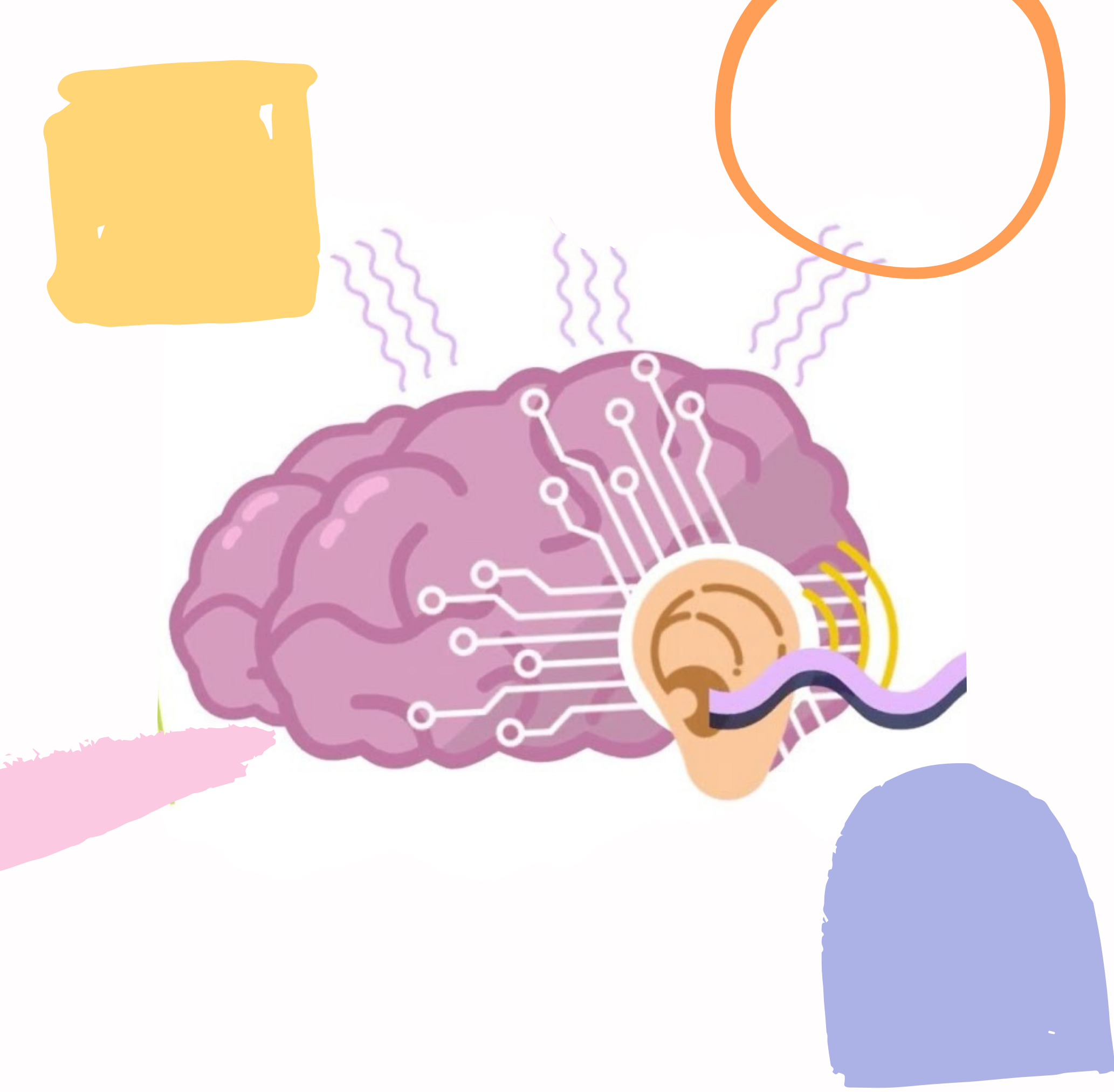
MSc Audiology Cohort 4 Presentation on 7 May 2021

COMORBIDITY PROFILING OF CHILDREN WITH AUDITORY PROCESSING DISORDER (APD) IN SINGAPORE

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Today's Agenda

- 1) Background
- 2) About the study
- 3) Methods
- 4) Results
- 5) Discussion

Background



What is APD?

- ✔ Brain-related hearing difficulty
 - Incapability of the central nervous system to utilize auditory information
 - Impairment of perceiving both non-speech sounds and speech sounds
- ✘ Deficits in peripheral hearing, language or higher-order cognition

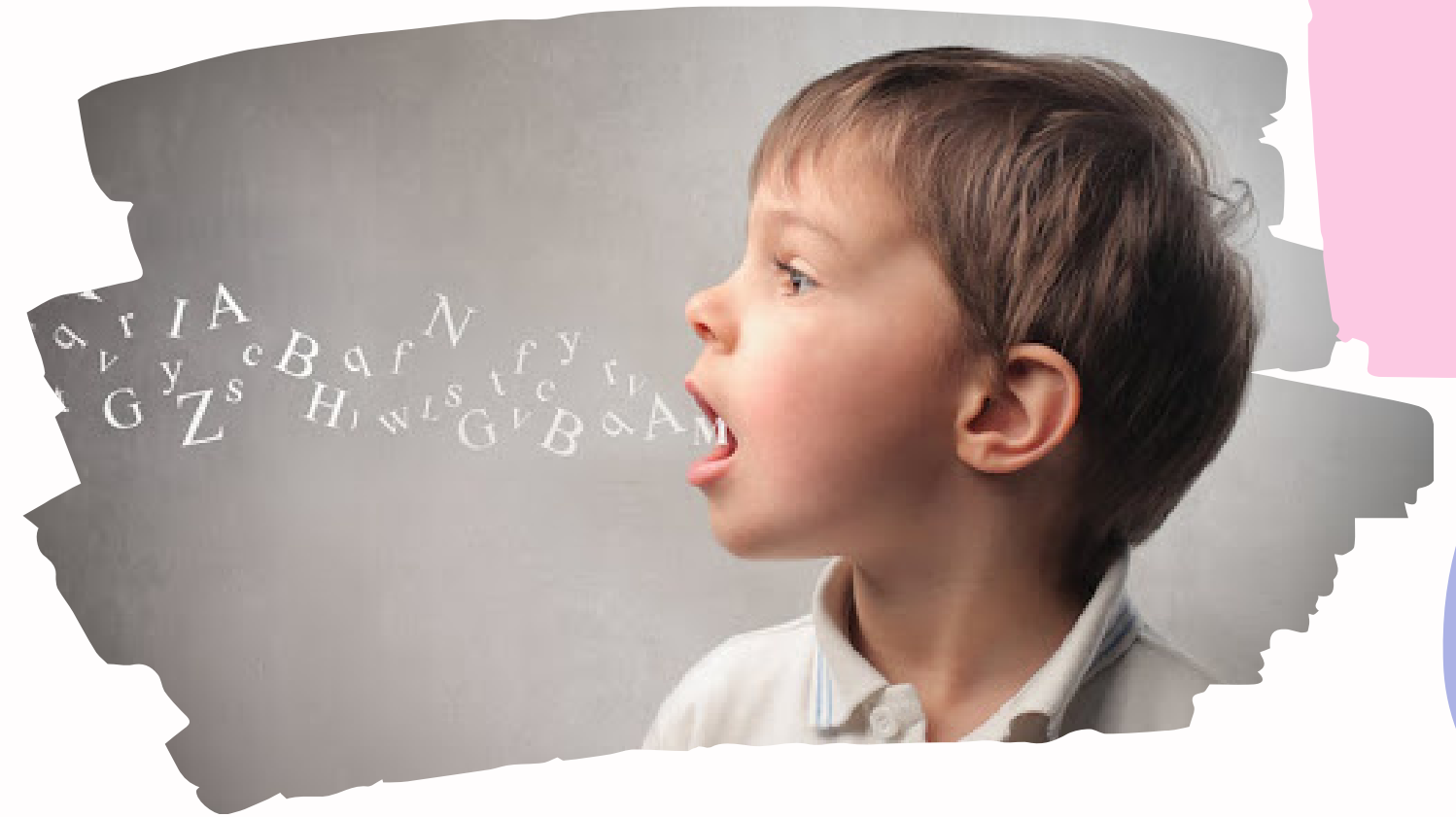
Background



- Poor performances in auditory processes (AP):
 - 1) Sound localization
 - 2) Temporal processing
 - 3) Auditory discrimination
 - 4) Auditory pattern recognition
- E.g. a school-aged child with APD may experience difficulties in:
 - 1) Spelling
 - 2) Reading
 - 3) Understanding verbal instructions in classroom
 - Academic difficulties

About the study

- Researches on APD in an Asian population is rare
- To examine the comorbid profile of children with APD who were referred for an APD assessment in NUH
 - Whether children with APD have other learning difficulties at the same time
 - Language impairment (LI) &
 - Specific reading disorders (SRD)
- To evaluate the performances of these children with comorbidities in the APD test battery

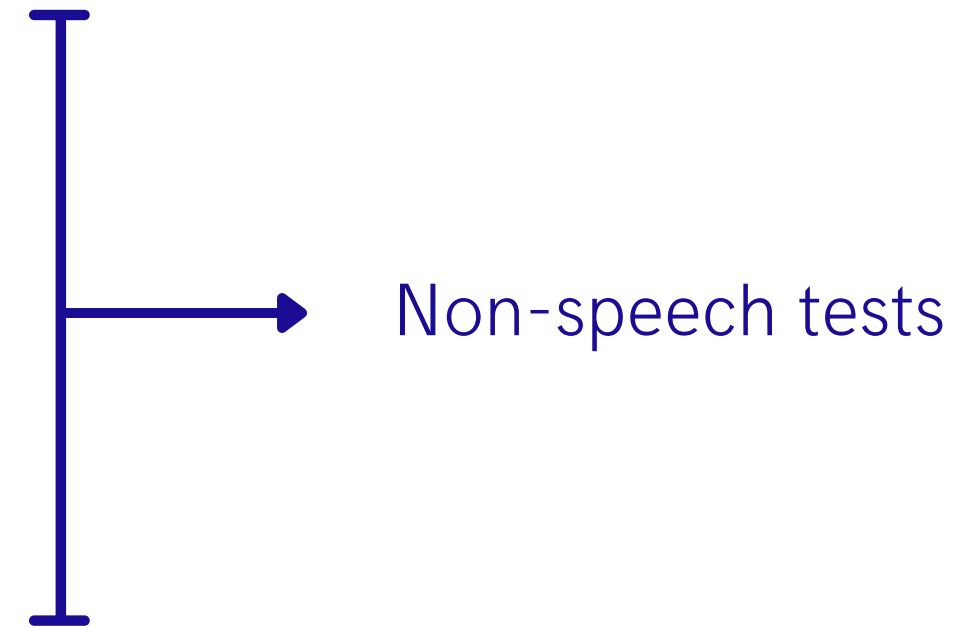


The APD test battery (5-8 tests)

- Dichotic Digit Test (DDT)
- Competing Sentence Test (CST)



- Frequency Pattern Test (with linguistic labelling) (FPT)
- Duration Pattern Test (DPT)
- Random Gap Detection Test (RGDT)
- Gap in Noise (GiN)
- Masking Level Difference at 500Hz (MLD500)



*Each test is testing different AP skills

Methods

- Retrospective study: medical records of children who completed an APD assessment in NUH between January 1, 2015 and December 31, 2019
- Retrieved information from an encrypted clinical patient log
- NUHS Research Office Centralized Trusted Third Party (CTTP) to assist the de-identification of encrypted data
- 373 subjects in total

Inclusion

- (a) Age between 7 and 12 years old;
- (b) Normal non-verbal intelligence;
- (c) Have undergone a basic hearing test (pure tone audiometry) and tympanometry
 - 298 subjects

Exclusion

- (a) Diagnosed with any developmental disorders other than LI/SRD, i.e. ASD, ADHD, GDD or other cognitive deficits; and
- (b) Did not undergo a complete test battery
 - 245 subjects included in the analysis

The 3 labels



Yes

- Failed the APD ax
- Clinically diagnosed with APD



No

- Passed the APD ax
- NOT clinically diagnosed with APD



Deficit but not labelled

- Failed some tests in the APD test battery
- Deficits in certain AP skills but not sufficient to be granted APD clinically

Results

Among the 245 subjects...



Yes

55 granted an APD diagnosis (APD population)



No

98 of the subjects not granted an APD diagnosis



Deficit but not labelled

92 of them were marked 'deficit but not labelled'

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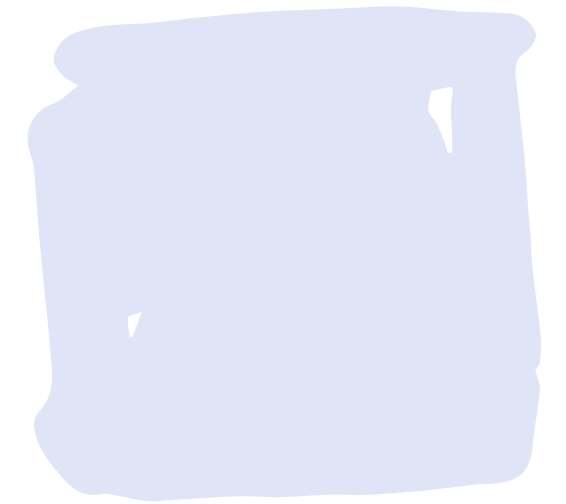
92 of them were marked
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The APD population (n=55)

- 30 (~55%) had comorbid LI
- 7 (~13%) had comorbid SRD
- 3 (~5%) had comorbid SID
- 15 (~27%) had no comorbidity

*Positive correlation between APD diagnosis and comorbid LI



Performances of the APD population in each test in the APD test battery

General results

- 1st most challenging: CST
 - All 55 (100%) showed either bilateral or unilateral deficit
- 2nd most challenging: DDT
 - 26 (~47%) showed either bilateral or unilateral deficit
- FPT (label), DPT and GiN: ~10 children in each test (~18%) showed either bilateral or monaural deficit
- MLD500: only 6 (~11%) showed either bilateral or monaural deficit
- RGDT: all obtained normal results

*Children in the APD population showed more difficulties in speech tests than non-speech tests

Discussion

APD label in children with comorbid LI/SRD is likely a secondary issue to LI/SRD

- Complexity and interconnection in human brain
 - AP, language processing & memory = highly inseparable (Witton, 2010)
 - Deficits in language processing affect AP
 - True AP deficits?
 - Current results show that speech tests are the most challenging tests
 - Hypothesis: AP deficits in children with comorbid LI/SRD are likely to be affected by language processing/general cognitive deficit





True AP deficits in those children with no comorbidity

- AP skills are not affected by any general developmental disorders
- Experience difficulties in speech tests
- Experience more difficulties in non-speech tests than the children with comorbid LI
 - more common for children with true AP deficits to present some form of temporal resolution/temporal processing deficits





● Multilingualism may possibly play a role in the children's performances in the APD assessment

- More than half of the APD population obtained normal results in DDT
 - Consistent with research findings: bilinguals perform better with higher accuracy in dichotic tests comparing to monolinguals (Mauk & Buonomano, 2004)
 - Strengthened efferent neural pathways and overall neural architecture of the brain due to bilingualism (Krizman et al., 2014)



- Good performances in FPT (label) and DPT tests
 - Not expected: language deficits and temporal processing deficits correlate (Goswami, 2018)
 - Language background can affect a person's temporal order perception (Bao et al., 2013)
 - Tonal language (Bao et al., 2013)



Thank you

Acknowledgement:

A/Prof Jenny Loo

Ms. Maureen Ding

Ms. Low Fang Yin

All lecturers and staff members in NUS MSc Audiology

My beloved family in Hong Kong

My lovely batch mates

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