

Competing Sentences Test: Adapting it to to the Singapore Population Using Diotic Presentation – A Pilot Study

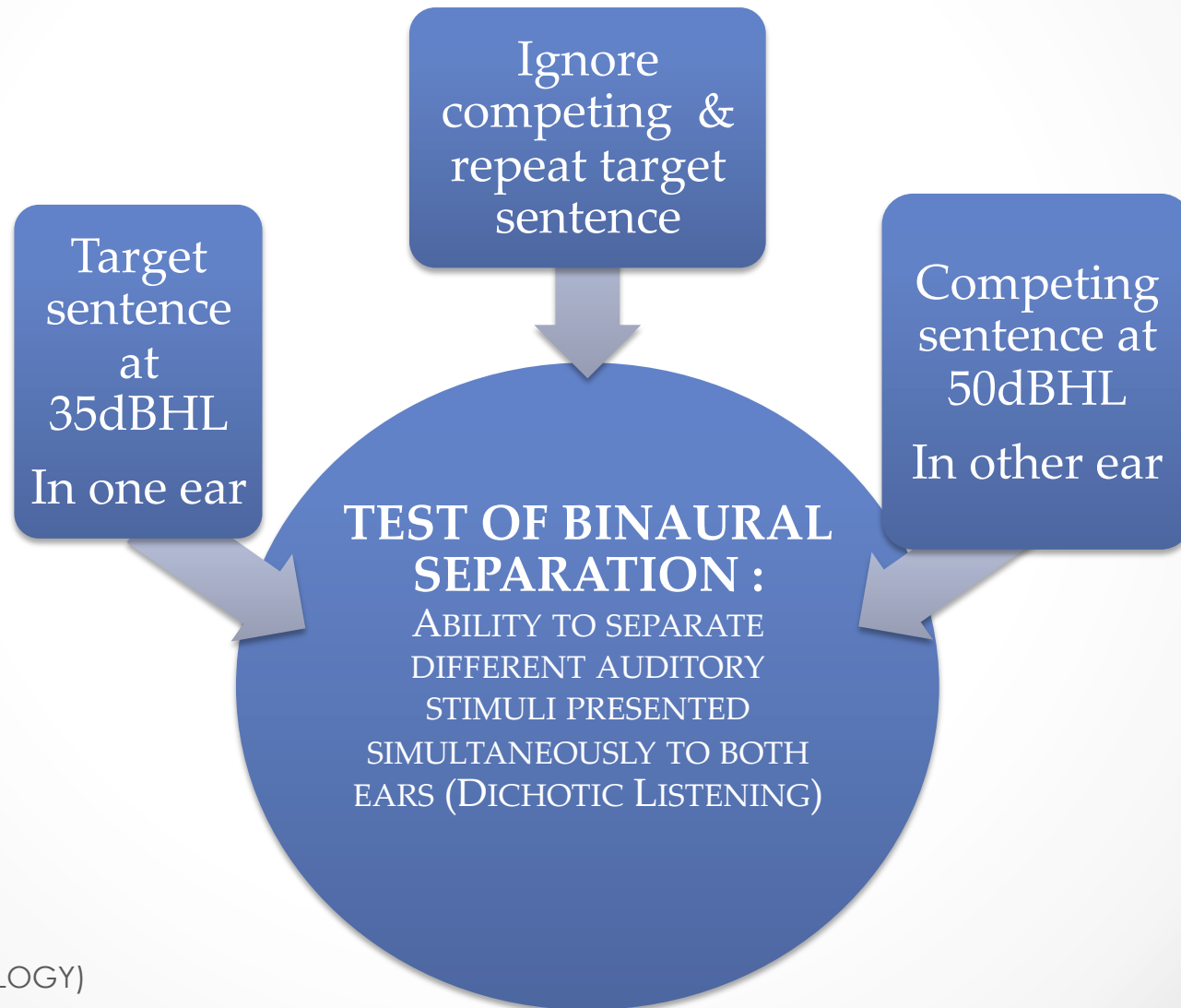


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Introduction

Competing Sentences Test (CST) (Willeford & Burleigh, 1994)




Agenda

1. Aim & Hypothesis
2. Background
3. Methodology
4. Results
5. Discussion & Clinical Implications
6. Future Study

1. Aim & Hypothesis

Aim: To record and adapt the Competing Sentences test (CS test) material to the Singapore test population



Hypothesis:
Singapore children will perform better on the adapted Singapore version of the CS test compared to the US version

2. Background

- **Both language background and language-related disorders significantly impact performance for CS test**, with its reasonably heavy linguistic as well as memory load (Loo, Bamiou & Rosen, 2013; Hull & Vaid, 2007)
- SCAN and SCAN-C (recorded in General American English) revealed that British school children performed much worse than US norms for most age groups and this resulted in a greater rate of over-diagnosis of listening difficulties (Dawes & Bishop, 2007; Marriage et al., 2001).
- Marriage et al. suggested that the **test material be recorded by a UK English speaker, with substitution of high error-rate target words, followed by normative data collection for the revised test material.**

2. Background

- **Singapore adopted English as first language in 1965. Education system is bilingual since 1985. Each child learns English and his/her own Mother Tongue.**
- **Singapore English has developed as independent type of English, with unique style of pronunciation, grammar, and usage common to all ethnic groups (Deterding, 2007)**
- **Phonetic and phonological features of Singapore English include distinct consonants and vowels as well as unique suprasegmental features such as rhythm, intonation, and stress placement.**
- **Supports premise that CS Test should be adapted to the local population using Singapore English**

Background summary



CS test (AUDiTEC) recorded in General American English and normed based on US population



Inappropriate for Singapore given CS test is a linguistically loaded task



Need to record and adapt CS test to Singapore test population to account for accent differences and word familiarity.

3. Methodology

Record CS test with Singaporean male speaker

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graph TD; A[Record CS test with Singaporean male speaker] --> B[Administer US CS test and SG CS test using diotic presentation to normal children to compare performance between 2 tests]; B --> C[Identify any high error-rate target words in SG CS test for re-recording or removal];
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Administer US CS test and SG CS test using diotic presentation to normal children to compare performance between 2 tests

Identify any high error-rate target words in SG CS test for re-recording or removal

Diotic presentation: Better delineation of accent and word familiarity effects without binaural separation ability needed in dichotic listening

Record Singapore CS test

Note: Parameters chosen to match that of original US CS test material

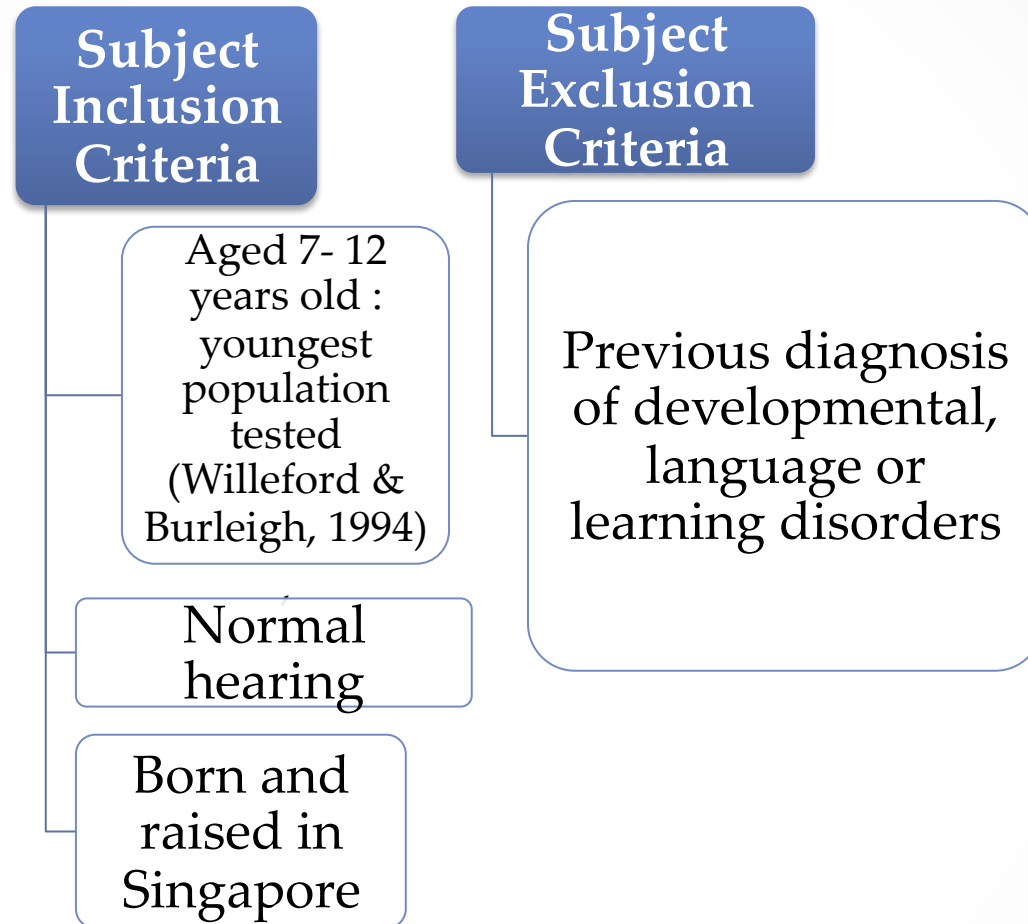
Audio recording of CST at Yong Siew Toh CoM with Singaporean male speaker

Edited using Pro Tools : Each dichotic sentence with equal onset and offset times

10 sec interval in between each sentence to serve as response time

Digital data equalized for overall intensity using calibration tone of 1 KHz

21 subjects recruited and met criteria



Note: Sample of 10 or fewer may suffice assessing clarity of instructions or item working, acceptability of formatting, or ease of administration (Hertzog, 2008). Yet another study advocated a sample size of 12 as a rule of thumb for pilot study (Julious, 2005)



Screening and Testing

Screening

- ✓ PTA (500, 1k, 2k and 4kHz)
- ✓ Tympanometry
- ✓ TAPS – 3 Memory
- ✓ TONI – 3 Intelligence
- ✓ CELF – 4 Core Language

Testing

- ➔ Listen and repeat CS test sentences at 60dBHL presented diotically
- ➔ Order of US vs. Spore CS test randomized
- ➔ Order of CS test version is reversed in follow-up visit

- ☑ Scoring of test results using Bellis Quadrant method (Bellis, 2003) and
 - ☑ Identification of high error-rate target words based on threshold of errors greater than 20% of subjects in both test and retest. Reliability of SCAN test on British schoolchildren: Specific items greater than 40% errors considered high rate (Marriage et al, 2001)
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4. Results

	N	25 th percentile	50 th percentile	75 th percentile
SG CS Test	21	583.75	592.50	596.25
US CS Test	21	560.00	581.25	590.00
Asymp. Sig. (2 tailed)	0.000			
Total score is 600				

Wilcoxon Signed Rank Test showed a decrease in scores of US_CST sentences compared to SG_CST sentences with a large effect size ($r = 0.59$) at significant

- confidence level ($p < 0.0005$)

4. Results

Sentence	Frequency of errors (%)	Type of error	Substituted with
You must <i>write</i> to her more often	19.0	Substitution	“try”, “tried”, “try to talk”
He’s off for <i>Easter</i> week	14.2	Substitution	“east-a”, “at least a”
I had a wonderful Christmas	14.2	Substitution	“have”, “got”

Responses to SG_CST sentences did not have any word error made by greater than 20% of subjects in both test and re-test

5. Discussion

Singaporean children were able to listen to and correctly repeat the new SG_CST significantly better than the US_CST

Mismatch of US accented input to Singapore listener's lexical representations lead to greater processing load and higher error rates (Menyuk, 1969)

5. Discussion

SG_CST did not have
high error-rate target
words



SG_CST deemed
appropriate for future
use for gathering of
normative data on
Singapore population
and as part of clinical
test battery

5. Discussion - Clinical Implications

→ CST being a speech based test and influenced by language, **different approaches can be taken to minimize influence of cultural diversity of subjects on administration of tests** (Semel et al, 2006).

1. Study found bulk of errors to be grammatical

☑ More liberal approach to scoring in clinical testing. Dialectal variations counted as correct if appropriate given language background (Semel et al, 2006)

2. Study shows benefit of practice trials using diotic or monotic presentation before dichotic testing

☑ To ensure adequate sentence recognition and familiarize them with task (Weihing & Samuel, 2014)



5. Discussion - Clinical Implications

→ Variations in scoring pose limitations to standardizing CS Test for clinical use (Musiek et al, 2011). Study demonstrates need for **standardized approach by clinicians.**

1. Scores dependent on quadrant separation
 - ☑ Use standardized method of separation

It was	a long	ride	by car
I thought	we would	never	get there

2. Four sentence pairs had zero errors. Linguistic content of some sentences are easier than others.

- ☑ Use standardized choice of sentences

6. Future Study

- Establish normative data using standardization sample representative of Singapore population (gender, race, ethnicity, socioeconomic status, residence, and parent education level)
- Standardization examiners to be trained in uniform administration and scoring of SG CS Test presented dichotically



Thank you

Dr Jenny Loo

Prof William Martin

Dr Jennifer Martin

Tan Kah Yee

Prof Jeffrey Weihing

Zhou Xiaodong

Conrad Chung

Huang Peh Linde

Participating children & parents

Class of MSc Audiology 2015

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Appendix: Other findings

1. Test-retest reliability of CS Test scores were adequate (SG_CST=0.458; US_CST= 0.751). Affected by wide test-retest interval (range 10 – 99 days) (Amos & Hughes, 1998); children's more variable performance compared to adults (Allen, Wightman, Kistler & Dolan, 1989); 2 hr screening in test 1; range restriction (Goodwin & Leech, 2006)
2. Variability of scores was largest for subjects aged seven years (n = 7). Possible that language/grammar of CST inappropriate (Hexamer & Bellis, 2000)
3. Highest number of word errors made by subjects aged seven years. Their CELF-4 scores are above the mean of 100. Possible that language/grammar of CST inappropriate. Maybe attention factor (not investigated).
4. Median scores increased with increasing age of subjects. Consistent with age-dependent morphological development within the brain (Yakovlev & Lecours, 1976). Need for age appropriate norms.

Appendix: Study Limitations

1. Subjects do not constitute random sampling of Singapore population. Largely recruited through poster and email to staff of NUH and NUS YLL SOM. Profile of subjects wrt memory, language and intelligence scores are expected to be similar or at higher levels of achievement compared to general population. Ethnicity did not include Malays nor Eurasians.
2. Sample sizes of each age band were not equivalent. No subjects aged eight years could be recruited.
3. 21 subjects not large enough sample size to investigate effects of age, memory, language or intelligence scores with CS Test scores. For 4 variables, need at least 60 subjects (Stevens, 1996)
4. Error rates for the individual words may be different when dichotic presentation mode is used. This could occur if a word recording was less than optimal and hence, difficult to perceive under more taxing conditions (dichotic presentation mode). That being said, the study as designed is an important first step in establishing this version of the competing sentence test.