Reference Data for the Madison Speech Assessment Protocol (MSAP):

A Database of 150 Participants 3-to-18 Years of Age with Typical Speech

Technical Report No. 18

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CONTENTS

Background 8

Method 9
Participants
Procedures
Organization and current number of SDCS signs

References 12

Key to Sources and Measurement Units/Abbreviations 13

Reference Data: Segmental

I. Vowels/Diphthongs

A. Competence
1a. Percentage of Non-Rhotic Vowels/Diphthongs Correct: Tabular 14
1b. Percentage of Non-Rhotic Vowels/Diphthongs Correct: Graphic 15
2a. Percentage of Rhotic Vowels/Diphthongs Correct: Tabular 16
2b. Percentage of Rhotic Vowels/Diphthongs Correct: Graphic 17
3a. Percentage of Phonemic Diphthongs Correct: Tabular 18
3b. Percentage of Phonemic Diphthongs Correct: Graphic 19
4a. Percentage of Vowels/Diphthongs Correct: Tabular 20
4b. Percentage of Vowels/Diphthongs Correct (AT): Graphic 21
4c. Percentage of Vowels/Diphthongs Correct (CSS): Graphic 22
5a. Percentage of Non-Rhotic Vowels/Diphthongs Correct-Revised: Tabular 23
5b. Percentage of Non-Rhotic Vowels/Diphthongs Correct-Revised: Graphic 24
6a. Percentage of Rhotic Vowels/Diphthongs Correct-Revised: Tabular 25
6b. Percentage of Rhotic Vowels/Diphthongs Correct-Revised: Graphic 26
7a. Percentage of Phonemic Diphthongs Correct-Revised: Tabular 27
7b. Percentage of Phonemic Diphthongs Correct-Revised: Graphic 28
8a. Percentage of Vowels/Diphthongs Correct-Revised: Tabular 29
8b. Percentage of Vowels/Diphthongs Correct-Revised (AT): Graphic 30
8c. Percentage of Vowels/Diphthongs Correct-Revised (CSS): Graphic 31
9a. Percentage of Relative Non-Rhotic Vowel/Diphthongs Distort: Tabular 32
9b. Percentage of Relative Non-Rhotic Vowel/Diphthongs Distort: Graphic 33

B. Precision
1. Reduced Vowel Space: Quadrilateral VSQI 34
2. Reduced Vowel Space: Quadrilateral VSQIL 35
3. Reduced Vowel Space: Distance from Center VSD 36
4. Reduced Vowel Space: Distance from Center VSDL 37
5. Reduced Vowel Space: /i, æ, ɑ/ Distance from Center VSD3 38
6. Reduced Vowel Space: /i, æ, ɑ/ Distance from Center VSD3L 39
7. Lengthened Vowels: Corners 40

8. Lengthened Vowels: Non-Rhotic Mids 41
9. Lengthened Vowels: Phonemic Diphthongs....42
10. Reduced Vowel Substitution Coefficients....43
11. Increased Distorted Vowel Substitutions....44
12. Less Precise Diphthongs (5 points)....45
13. Less Precise Diphthongs (3 points)....46
14. Distorted Rhotics: F3-F2....47
15. Distorted Rhotics: F3/F2....48
16. Reduced Pairwise Vowel Duration Variability....49

C. Stability
1. Less Stable Vowel Space: Quadrilateral VSQI 50
2. Less Stable Vowel Space: Quadrilateral VSQIL....51
3. Less Stable Vowel Space: Distance from Center VSD 52
4. Less Stable Vowel Space: Distance from Center VSDL....53
5. Less Stable Vowel Space: /i, æ, ɑ/ Distance from Center VSD3....54
6. Less Stable Vowel Space: /i, æ, ɑ/ Distance from Center VSD3L 55
7. Less Stable F1: /i/....56
8. Less Stable F1: /æ/....57
9. Less Stable F1: /ʊ/ 58
10. Less Stable F1: /ɑ/ 59
11. Less Stable F2: /i/....60
12. Less Stable F2: /æ/....61
13. Less Stable F2: /ʊ/ 62
14. Less Stable F2: /ɑ/ 63
15. Less Stable Vowel Duration: Corners....64
16. Less Stable Vowel Duration: Non-Rhotic Mids....65
17. Less Stable Vowel Duration: Phonemic Diphthongs....66
18. Less Stable Rhotic Distortions: F3-F2....67
19. Less Stable Rhotic Distortions: F3/F2....68
20. Less Stable Vowel Errors: Targets 69
21. Less Stable Vowel Errors: Types....70

II. Consonants

A. Competence
1a. Percentage of Consonants in Inventory: Tabular....71
1b. Percentage of Consonants in Inventory: Graphic 72
2a. Percentage of Consonants Correct: Tabular....73
2b. Percentage of Consonants Correct (AT): Graphic....74
2c. Percentage of Consonants Correct (CSS): Graphic 75
3a. Percentage of Consonants Correct-Revised: Tabular 76
3b. Percentage of Consonants Correct-Revised (AT): Graphic....77
3c. Percentage of Consonants Correct-Revised (CSS): Graphic 78
4a. SRT Total Percentage Consonants Correct-Revised: Tabular....79

4b. SRT Total Percentage Consonants Correct-Revised: Graphic 80
5a. Percentage Consonants Correct in Complex Words: Tabular.....81
5b. Percentage Consonants Correct in Complex Words: Graphic.....82
6a. Relative Omission Index: Tabular 83
6b. Relative Omission Index: Graphic.....84
7a. Relative Substitution Index: Tabular 85
7b. Relative Substitution Index: Graphic.....86
8a. Relative Distortion Index: Tabular.....87
8b. Relative Distortion Index: Graphic.....88

B. Precision

1. Nasal Emissions.....89
2. Reduced Percentage of Glides Correct 90
3. Increased Percentage of /j/ Deletions in Clusters 91
4. Lowered Sibilant Centroids: M1 at Midpoint.....92
5. Lowered Sibilant Centroids: Maximum M1.....93
6. Lengthened Cluster Durations: Relative Duration of Cluster.....94
7. Lengthened Cluster Durations: Relative Duration of First Consonant.....95
8. Lengthened Cluster Durations: Relative Duration of Second Consonant 96
9. Lengthened Cluster Durations: Percentage of S-F/F-S Cl Disruptions 97
10. Lengthened Cluster Durations: Relative Duration of S-F/F-S Cl Disruptions 98
11. Lengthened Cluster Durations: Relative Duration of Pause Disruptions 99
12. Lengthened Cluster Durations: Relative Duration of Addition Disruptions .100
13. SRT Transcoding 101

C. Stability

1. Less Stable Consonant Errors: Targets.....102
2. Less Stable Consonant Errors: Error Types.....103
3. Less Stable Sibilant Centroids: M1 at Midpoint.....104
4. Less Stable Sibilant Centroids: Maximum M1.....105

III. Vowels/Diphthongs & Consonants

A. Competence

1a. Intelligibility Index: Tabular.....106
1b. Intelligibility Index: Graphic 107
2a. Percentage of Structurally Correct Words: Tabular.....108
2b. Percentage of Structurally Correct Words: Graphic 109

B. Precision

1. Increased Percentage of Phoneme Distortions: Place.....110
2. Increased Percentage of Phoneme Distortions: Additions.....112
3. Increased Percentage of Phoneme Distortions: Duration 114
4. Increased Percentage of Phoneme Distortions: Force 116
5. Increased Percent of EMMA errors by type 118

C. Stability
1. Less Stable Whole Word Errors: Targets 119
2. Less Stable Whole Word Errors: Error Types 120
3. Less Stable Percentage of Phonemes Correct in Complex Words 121
4. Increased Percent of EMMA errors by token 122

Reference Data: Suprasegmental

IV. Phrasing

A. Competence
1a. Percentage of Appropriate Phrasing: Tabular 123
1b. Percentage of Appropriate Phrasing: Graphic 124

B. Precision
1. Increased Repetitions and Revisions: 2-4 Word Utterances.....125
2. Increased Repetitions and Revisions: 5-7 Word Utterances.....126
3. Increased Repetitions and Revisions: 8+ Word Utterances.....127
4. Increased Repetitions and Revisions: All Utterances 128
5. Increased Syll/Word Segregation: Percentage of Btwn/Within-Wd Pauses....129
6. Increased Syll/Word Segregation: Duration of Btwn/Within-Wd Pauses.....130
7. Increased Percentage of Inappropriate Pauses.....131
8. Increased Percentage of Pauses 132
9. Reduced Speech-Pause Duration Variability Ratio: 2-4 Word Utterances 133
10. Reduced Speech-Pause Duration Variability Ratio: 5-7 Word Utterances ...134
11. Reduced Speech-Pause Duration Variability Ratio: 8+ Word Utterances.....135
12. Reduced Speech-Pause Duration Variability Ratio: All Utterances.....136

V. Rate

A. Competence
1a. Percentage of Appropriate Rate: Tabular.....137
1b. Percentage of Appropriate Rate: Graphic.....138

B. Precision
1. Slower Speaking Rate: 2-4 Word Utterances 139
2. Slower Speaking Rate: 5-7 Word Utterances 140
3. Slower Speaking Rate: 8+ Word Utterances 141
4. Slower Speaking Rate: All Utterances.....142
5. Slower Articulation Rate: 2-4 Word Utterances.....143
6. Slower Articulation Rate: 5-7 Word Utterances.....144
7. Slower Articluation Rate: 8+ Word Utterances.....145
8. Slower Articulation Rate: All Utterances 146

C. Stability
1. Less Stable Speaking Rate: 2-4 Word Utterances 147
2. Less Stable Speaking Rate: 5-7 Word Utterances 148
3. Less Stable Speaking Rate: 8+ Word Utterances 149
4. Less Stable Speaking Rate: All Utterances.....150
5. Less Stable Articulation Rate: 2-4 Word Utterances.....151
6. Less Stable Articulation Rate: 5-7 Word Utterances.....152
7. Less Stable Articluation Rate: 8+ Word Utterances.....153
8. Less Stable Articulation Rate: All Utterances 154

VI. Stress

A. Competence
1a. Percentage of Appropriate Stress: Tabular 155
1b. Percentage of Appropriate Stress: Graphic.....156

B. Precision
1. Lexical Stress: Trochees 157
2. Lexical Stress: All.....158
3. Emphatic Stress.....159
4. Sentential Stress.....160

C. Stability
1. Less Stable Lexical Stress: Trochees.....161
2. Less Stable Lexical Stress: All 162
3. Less Stable Emphatic Stress 163
4. Less Stable Sentential Stress.....164

VII. Loudness

A. Competence
1a. Percentage of Appropriate Loudness: Tabular.....165
1b. Percentage of Appropriate Loudness: Graphic.....166

B. Precision
1. Vowels-Consonants Intensity Ratios: Vowels-Stops.....167
2. Vowels-Consonants Intensity Ratios: Vowels-Affric/Fricatives.....168
3. Vowels-Consonants Intensity Ratios: All.....169

C. Stability
1. Less Stable Vowels-Consonants Intensity Ratios: Vowels-Stops 170
2. Less Stable Vowels-Consonants Intensity Ratios: Vowels-Affric/Fric.....171
3. Less Stable Vowels-Consonants Intensity Ratios: All.....172

VIII. Pitch

A. Competence
1a. Percentage of Appropriate Pitch: Tabular....173
1b. Percentage of Appropriate Pitch: Graphic....174

B. Precision
1. Midpoint Fundamental Frequency Mean....175
2. Midpoint Fundamental Frequency Range....176

C. Stability
1. Less Stable Mean Midpoint Fundamental Frequency....177

IX. Laryngeal Quality

A. Competence
1a. Percentage of Appropriate Laryngeal Quality: Tabular....178
1b. Percentage of Appropriate Laryngeal Quality: Graphic....179

B. Precision
1. Percentage of Breathy Utterances....180
2. Percentage of Rough Utterances....181
3. Percentage of Strained Utterances....182
4. Percentage of Break/Shift/Tremulous Utterances....183

X. Resonance

A. Competence
1a. Percentage of Appropriate Resonance Quality: Tabular....184
1b. Percentage of Appropriate Resonance Quality: Graphic....185

B. Precision
1. Percentage of Nasal Utterances....186
2. Lowered /ɑ/ F1 (Nasal)....187
3. Percentage of Nasopharyngeal Utterances....188
4. Lowered /i/ F2 (Nasopharyngeal)....189
5. Lowered /u/ F2 (Nasopharyngeal)....190

C. Stability
1. Less Stable /ɑ/ F1 (Nasal)....191
2. Less Stable /i/ F2 (Nasopharyngeal)....192
3. Less Stable /u/ F2 (Nasopharyngeal)....193

Background

Phonology Project Technical Reports provide technical and substantive information on methods developed for a program of research in speech sound disorders of known and unknown origins. Primary goals of the Phonology Project are to identify etiologic origins, risk and protective factors, and diagnostic markers for eight subtypes of speech sound disorders of currently unknown origin (Shriberg, 2010).

The diagnostic framework used in all Phonology Project studies is termed the Speech Disorders Classification System (SDCS: Shriberg et al., 2010a). The SDCS includes a typologic nosology for research and practice in speech sound disorders, and an etiologic nosology for the eight putative subtypes of speech sound disorders of currently unknown origin. The assessment protocol used in all studies since approximately 2010 is termed the Madison Speech Assessment Protocol (MSAP). The MSAP data reduction methods include both perceptual and acoustic methods. Perceptual methods for narrow phonetic transcription of speech are based on extensions to the system described in *Clinical Phonetics* (Shriberg & Kent, 2003). Perceptual methods to code speakers' prosody and voice are based on extensions to the system described in *The Prosody-Voice Screening Profile* (PVSP: Shriberg, Kwiatkowski, & Rasmussen, 1990) and Phonology Project Technical Report No. 1 (Shriberg, Kwiatkowski, Rasmussen, Lof, & Miller, 1992). Acoustic methods and reliability findings for speech, prosody, and voice variables are described in Shriberg et al. (2010a; 2010b) and in the Phonology Project Laboratory Manual (PPLM; unpublished). Shriberg et al. (2010a) provides extensive information on the structure and content of the MSAP relevant for the present report and is not summarized in this report.

The goal of this technical report is to provide reference data for the 145 speech, prosody, and voice signs organized by the Ten Linguistic Domains Analytics (TLDA) shown in the table

in the following section. Shriberg et al. (2010a) provides a complete description of the rationale and content of the TLDA framework.

Method

Participants

Participants for the present reference database were recruited from a lower-income (71.4% free or reduced lunch as compared to statewide average of 34.2%) rural school district in Eastern Washington. The final 150 participants selected for the database include five females and five males from the following 15 age groups: 3;0-3;11, 4;0-4;11, 5;0-5;11, 6;0-6;11, 7;0-7;11, 8;0-8;11, 9;0-9;11, 10;0-10;11, 11;0-11;11, 12;0-12;11, 13;0-13;11, 14;0-14;11, 15;0-15;11, 16;0-16;11, and 17;0-17;11.

Inclusionary criteria for the database were monolingual American-English speaking home environment, hearing within normal limits, normal speech sound development (within 1 standard deviation of age mean on the Sounds in Words subtest of the *Goldman Fristoe Test of Articulation-2*: *GFTA-2*; Goldman & Fristoe, 2000), written classroom teacher (preschool-grade 6) or school counselor (grades 7-12) report, and written parental report documenting no concerns regarding academic progress and confirming the participant had never been referred or received special education services.

Procedures

All parents signed an informed consent form granting permission for their children to participate in the study and all participants over age 11 signed assent forms, both of which were approved by a University of Wisconsin-Madison institutional review board. Parents and teachers or counselors completed a short case history.

Participants were tested individually in a quiet room in the school. The MSAP and additional measures of oral and hand strength (findings not included in the present report) were administered to all participants. The MSAP includes a hearing screening at 25 dB HL for 1000, 2000, and 4000 Hz; the *GFTA-2*; an oral structure-function examination; and the remaining tests and tasks assessing speech and language. Responses to all speech tasks on the MSAP were recorded on a Marantz CDR420 HD/CD digital audio recorder with matching external Shure MX412DC cardioid condenser microphone. The audio samples were processed in Madison using the procedures described in the above citations.

The reference data in this report are presented without comment. A thorough analyses of trends between and among the variables of age, sex, and speech signs is beyond the scope of the present goal. An obvious constraint are sampling errors due to small cell sizes. Readers who plan to use the acoustic data are welcome to contact the authors for additional technical information.

Organization and current number of speech, prosody, and voice signs in the Speech Disorders Classification System (SDCS). Shriberg et al. (2010a) provides a complete description of the rationale and content of the Ten Linguistic Domains Analytics (TLDA) and the Competence, Precision, Stability Analytics (CPSA).[a]

	Competence, Precision, Stability Analytics (CPSA)						
	Competence		Precision		Stability		
Ten Linguistic Domains Analytics (TLDA)	Perceptual	Acoustic	Perceptual	Acoustic	Perceptual	Acoustic	Total
Segmental							
I. Vowels	9	0	0	16	4	16	45
II. Consonants	8	0	4	9	2	2	25
III. Vowels & Consonants	2	0	5	0	4	0	11
Total	19	0	9	25	10	18	81
Suprasegmental							
Prosody							
IV. Phrasing	1	0	6	6	0	0	13
V. Rate	1	0	0	8	0	8	17
VI. Stress	1	0	0	4	0	4	9
Voice							
VII. Loudness	1	0	0	3	0	3	7
VIII. Pitch	1	0	0	2	0	1	4
IX. Laryngeal Quality	1	0	4	0	0	0	5
X. Resonance	1	0	2	3	0	3	9
Total	7	0	12	26	0	19	64
Overall Total	26	0	21	51	10	37	145

[a] Data for 6 of the acoustic Laryngeal Quality variables are not included in this report due to as yet unresolved technical needs.

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Key to Sources and Measurement Units/Abbreviations

ALL = All available sources

AT = Articulation Test

CSS = Conversational Speech Sample

CWT = Challenging Words Task

EST = Emphatic Stress Task

LST = Lexical Stress Task

MWT = Multisyllabic Words Task

RSTR = Rhotics and Sibilants Task

SPT = Speech Phrases Task

SRT = Syllable Repetition Task

SVT = Sustained Vowel Task

VT1 = Vowel Task 1

VT2 = Vowel Task 2

VT3 = Vowel Task 3

VT12 = Vowel Tasks 1 & 2

count = count

Hertz = Hz

kiloHertz = kHz

milliseconds = ms

millisyllables = $\%_o$

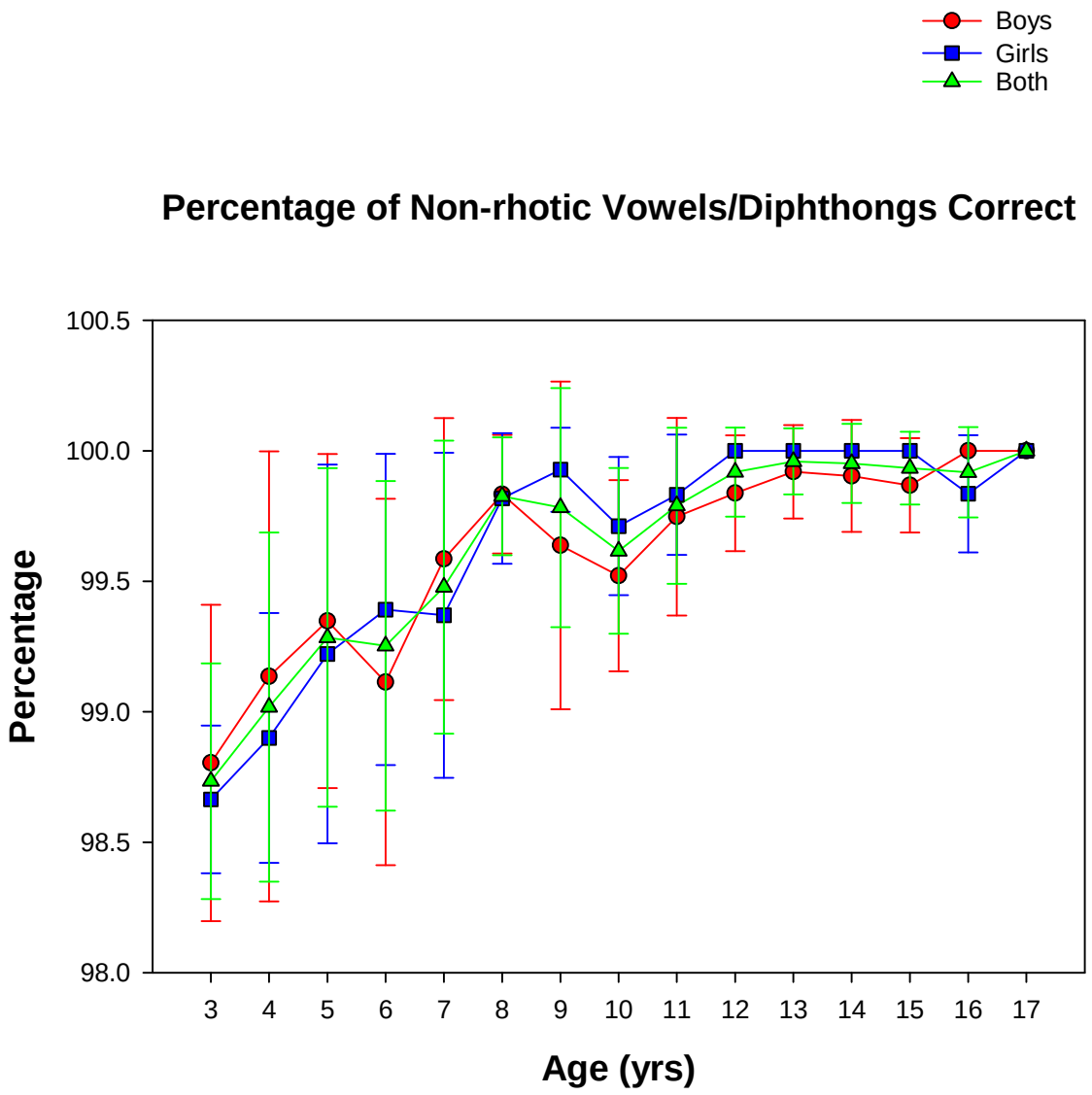
percentage = %

syllables/sec = syll/sec

unitless = u

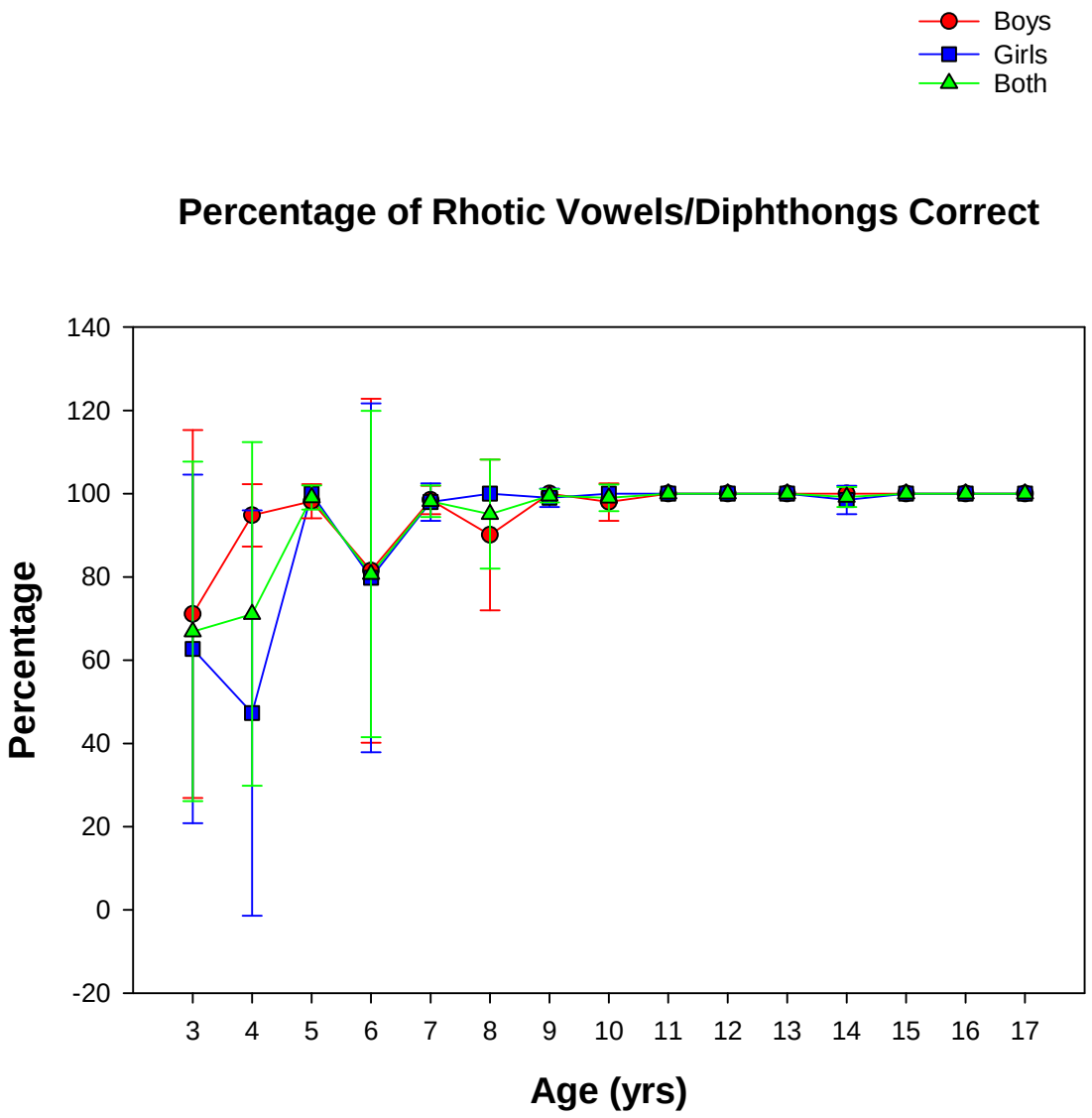
Percentage of Non-Rhotic Vowels/Diphthongs Correct (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	98.8	0.6	99.1	0.9	99.3	0.6	99.1	0.7	99.6	0.5	99.8	0.2	99.6	0.6	99.5	0.4	99.7	0.4	99.8	0.2	99.9	0.2	99.9	0.2	99.9	0.2	100.0	0.0	100.0	0.0
Female																														
CSS	98.7	0.3	98.9	0.5	99.2	0.7	99.4	0.6	99.4	0.6	99.8	0.3	99.9	0.2	99.7	0.3	99.8	0.2	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	99.8	0.2	100.0	0.0
Both																														
CSS	98.7	0.5	99.0	0.7	99.3	0.6	99.3	0.6	99.5	0.6	99.8	0.2	99.8	0.5	99.6	0.3	99.8	0.3	99.9	0.2	100.0	0.1	100.0	0.2	99.9	0.1	99.9	0.2	100.0	0.0


Boys
Girls
Both
Percentage of Non-rhotic Vowels/Diphthongs Correct
100.5
100.0
99.5
99.0
98.5
98.0
Percentage
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

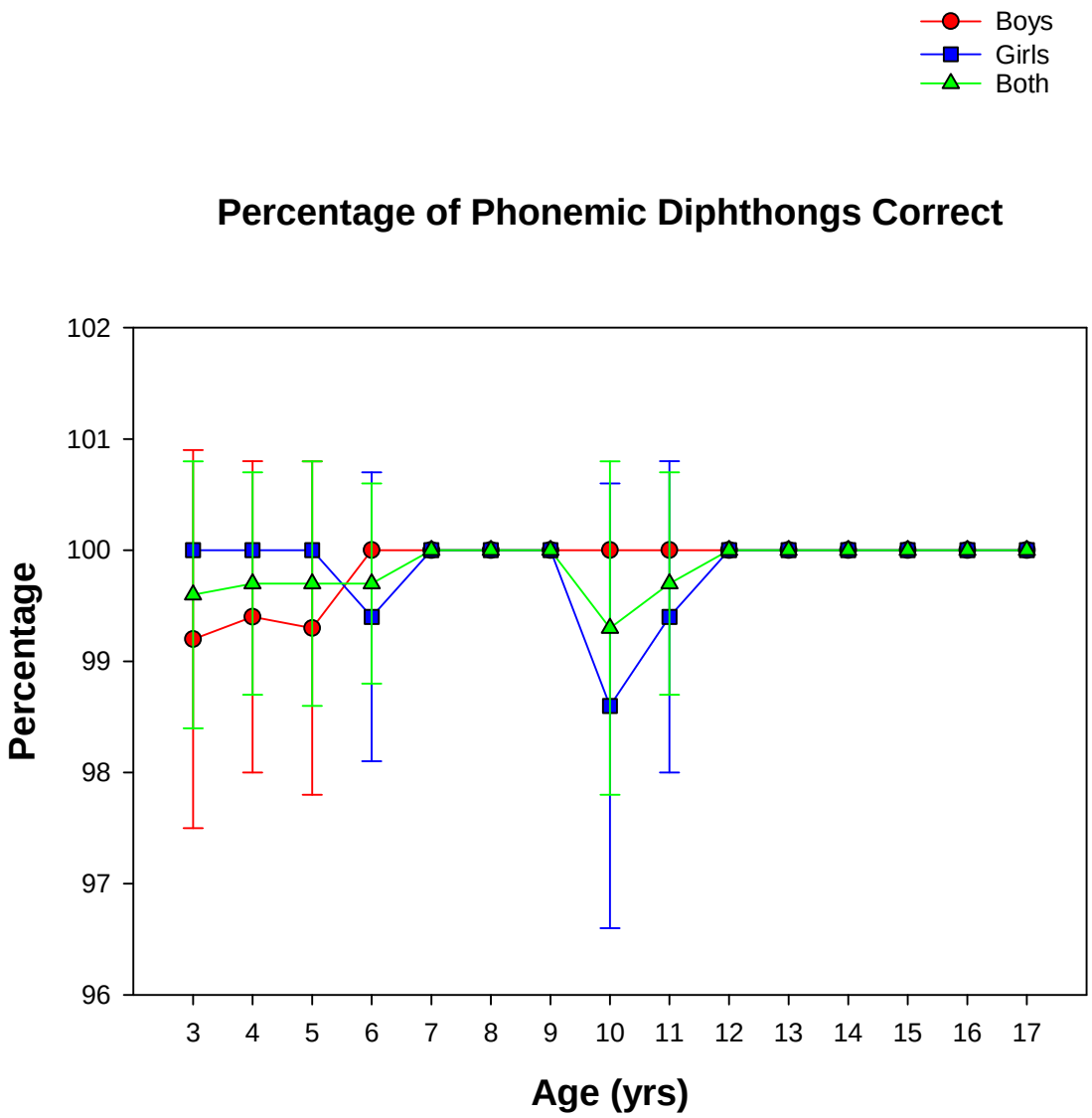
Percentage of Rhotic Vowels/Diphthongs Correct (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	71.1	44.2	94.8	7.5	98.2	4.1	81.5	41.3	98.5	3.4	90.1	18.1	100.0	0.0	98.0	4.5	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
Female																														
CSS	62.7	41.9	47.3	48.7	100.0	0.0	79.8	41.9	98.0	4.5	100.0	0.0	99.0	2.2	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	98.5	3.4	100.0	0.0	100.0	0.0	100.0	0.0
Both																														
CSS	66.9	40.8	71.1	41.3	99.1	2.9	80.7	39.2	98.2	3.8	95.1	13.1	99.5	1.6	99.0	3.2	100.0	0.0	100.0	0.0	100.0	0.0	99.2	2.4	100.0	0.0	100.0	0.0	100.0	0.0


Boys
Girls
Both
Percentage of Rhotic Vowels/Diphthongs Correct
Percentage
140
120
100
80
60
40
20
0
-20
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

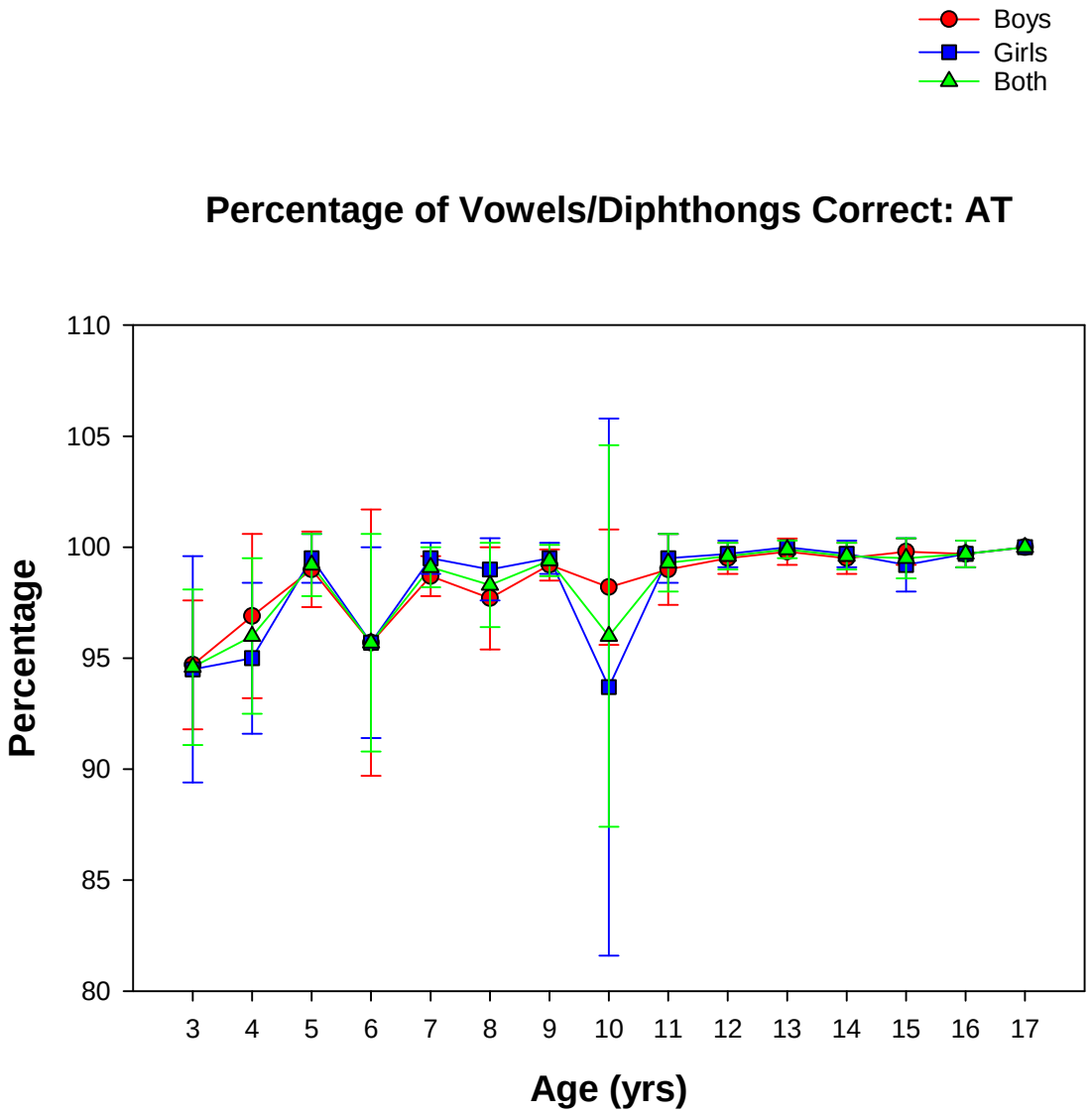
Percentage of Phonemic Diphthongs Correct (%)

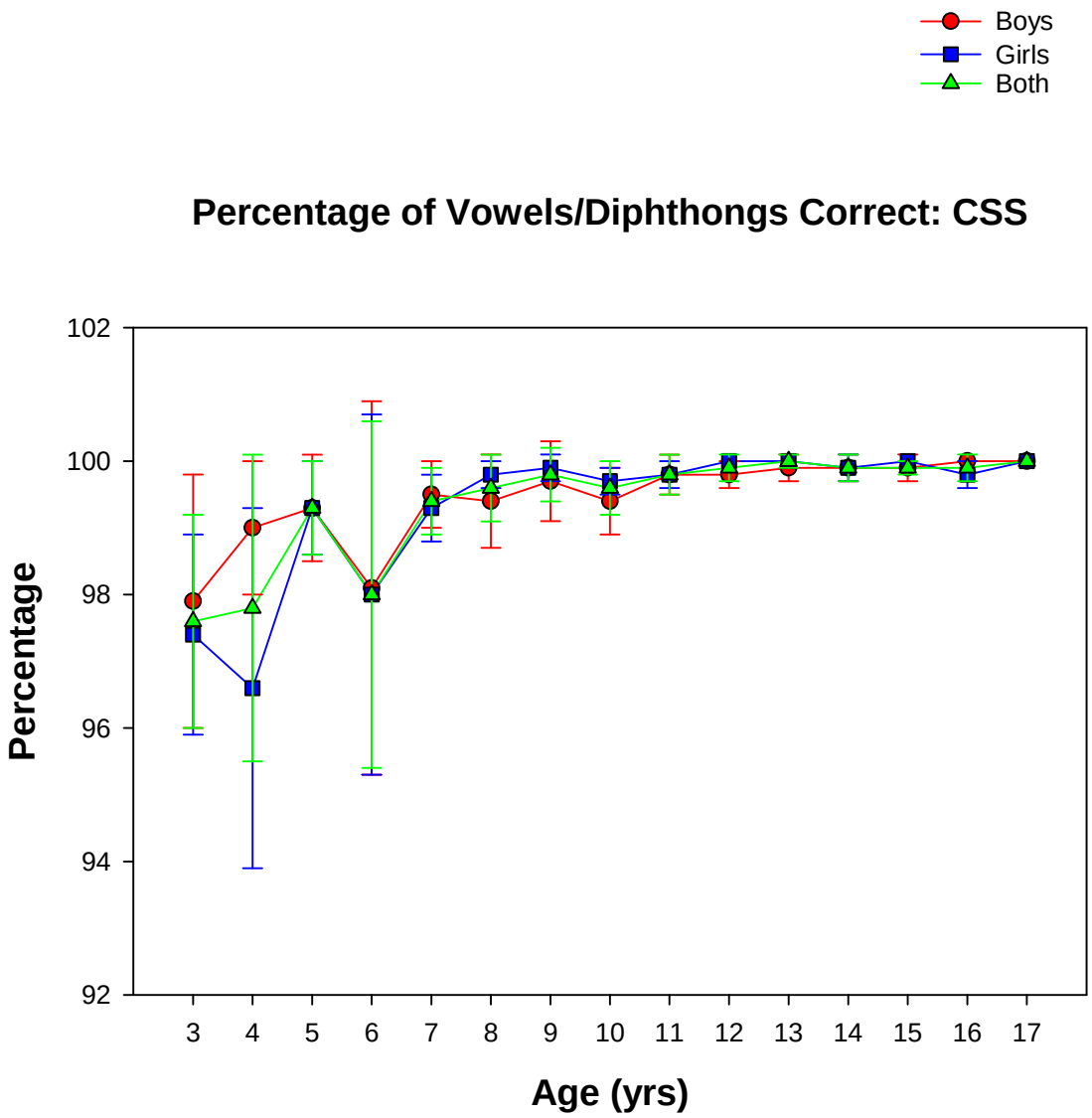
Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	99.2	1.7	99.4	1.4	99.3	1.5	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
Female																														
CSS	100.0	0.0	100.0	0.0	100.0	0.0	99.4	1.3	100.0	0.0	100.0	0.0	100.0	0.0	98.6	2.0	99.4	1.4	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
Both																														
CSS	99.6	1.2	99.7	1.0	99.7	1.1	99.7	0.9	100.0	0.0	100.0	0.0	100.0	0.0	99.3	1.5	99.7	1.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0


Boys
Girls
Both
Percentage of Phonemic Diphthongs Correct
Percentage
102
101
100
99
98
97
96
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

Percentage of Vowels/Diphthongs Correct (%)

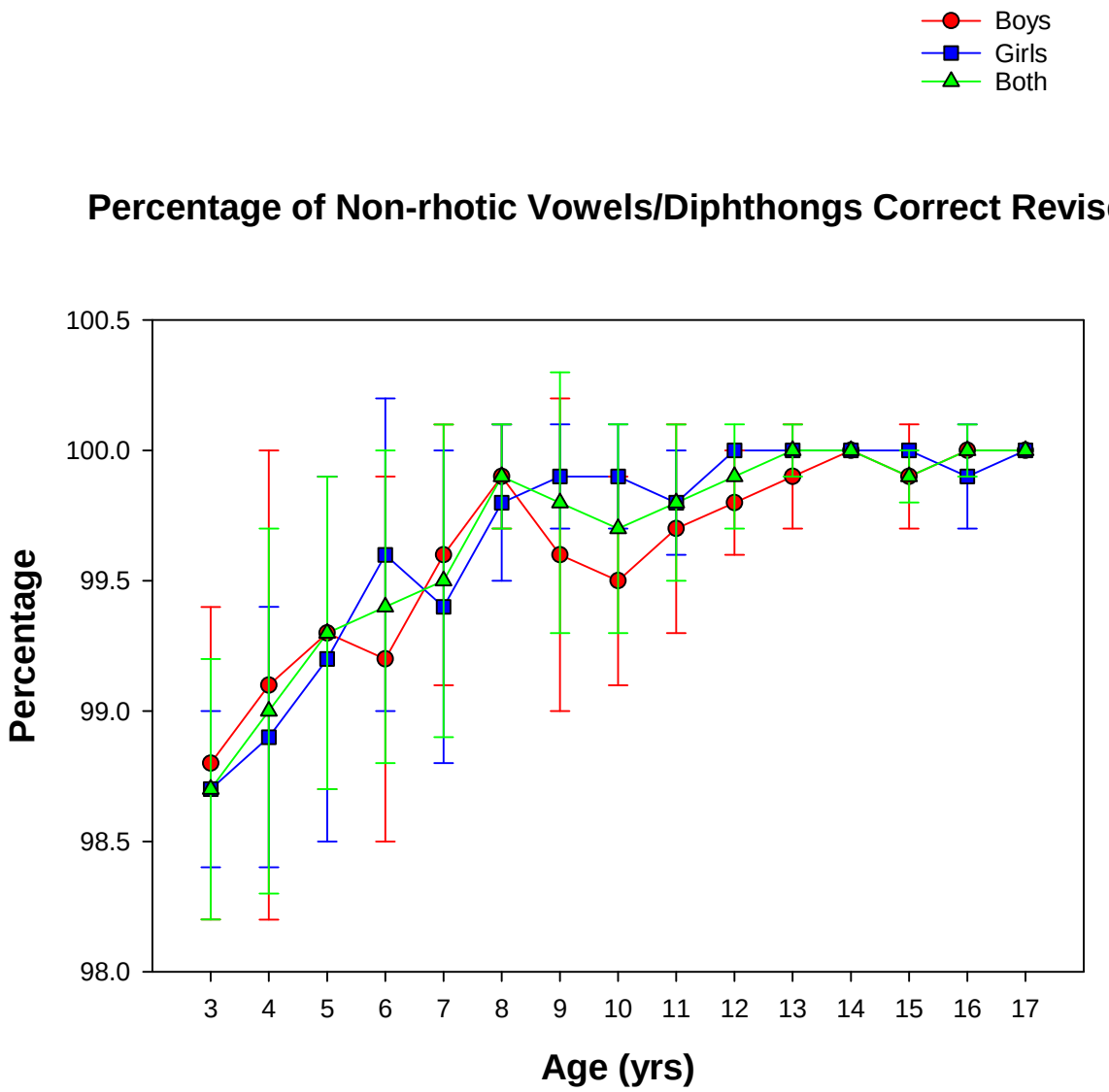
Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
AT	94.7	2.9	96.9	3.7	99.0	1.7	95.7	6.0	98.7	0.9	97.7	2.3	99.2	0.7	98.2	2.6	99.0	1.6	99.5	0.7	99.8	0.6	99.5	0.7	99.8	0.6	99.7	0.6	100.0	0.0
CSS	97.9	1.9	99.0	1.0	99.3	0.8	98.1	2.8	99.5	0.5	99.4	0.7	99.7	0.6	99.4	0.5	99.8	0.3	99.8	0.2	99.9	0.2	99.9	0.2	99.9	0.2	100.0	0.0	100.0	0.0
Female																														
AT	94.5	5.1	95.0	3.4	99.5	1.1	95.7	4.3	99.5	0.7	99.0	1.4	99.5	0.7	93.7	12.1	99.5	1.1	99.7	0.6	100.0	0.0	99.7	0.6	99.2	1.2	99.7	0.6	100.0	0.0
CSS	97.4	1.5	96.6	2.7	99.3	0.7	98.0	2.7	99.3	0.5	99.8	0.2	99.9	0.2	99.7	0.2	99.8	0.2	100.0	0.0	100.0	0.0	99.9	0.2	100.0	0.0	99.8	0.2	100.0	0.0
Both																														
AT	94.6	3.5	96.0	3.5	99.2	1.4	95.7	4.9	99.1	0.9	98.3	1.9	99.4	0.7	96.0	8.6	99.3	1.3	99.6	0.6	99.9	0.4	99.6	0.6	99.5	0.9	99.7	0.6	100.0	0.0
CSS	97.6	1.6	97.8	2.3	99.3	0.7	98.0	2.6	99.4	0.5	99.6	0.5	99.8	0.4	99.6	0.4	99.8	0.3	99.9	0.2	100.0	0.1	99.9	0.2	99.9	0.1	99.9	0.2	100.0	0.0


Boys
Girls
Both
Percentage of Vowels/Diphthongs Correct: AT
110
105
100
95
90
85
80
Percentage
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)


Boys
Girls
Both
Percentage of Vowels/Diphthongs Correct: CSS
102
100
98
96
94
92
Percentage
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

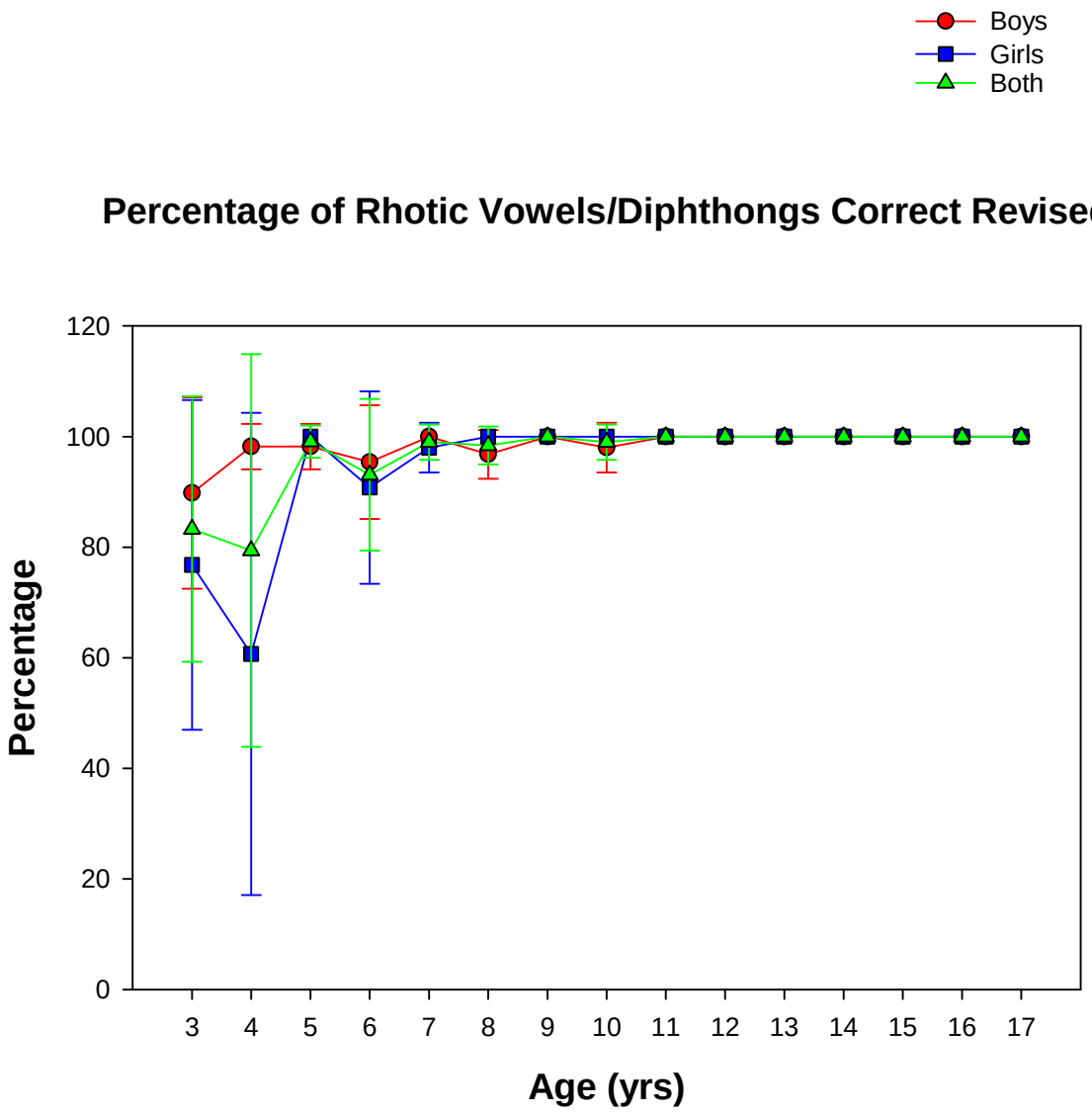
Percentage of Non-Rhotic Vowels/Diphthongs Correct-Revised (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	98.8	0.6	99.1	0.9	99.3	0.6	99.2	0.7	99.6	0.5	99.9	0.2	99.6	0.6	99.5	0.4	99.7	0.4	99.8	0.2	99.9	0.2	100.0	0.0	99.9	0.2	100.0	0.0	100.0	0.0
Female																														
CSS	98.7	0.3	98.9	0.5	99.2	0.7	99.6	0.6	99.4	0.6	99.8	0.3	99.9	0.2	99.9	0.2	99.8	0.2	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	99.9	0.2	100.0	0.0
Both																														
CSS	98.7	0.5	99.0	0.7	99.3	0.6	99.4	0.6	99.5	0.6	99.9	0.2	99.8	0.5	99.7	0.4	99.8	0.3	99.9	0.2	100.0	0.1	100.0	0.0	99.9	0.1	100.0	0.1	100.0	0.0


Boys
Girls
Both
Percentage of Non-rhotic Vowels/Diphthongs Correct Revised
100.5
100.0
99.5
99.0
98.5
98.0
Percentage
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

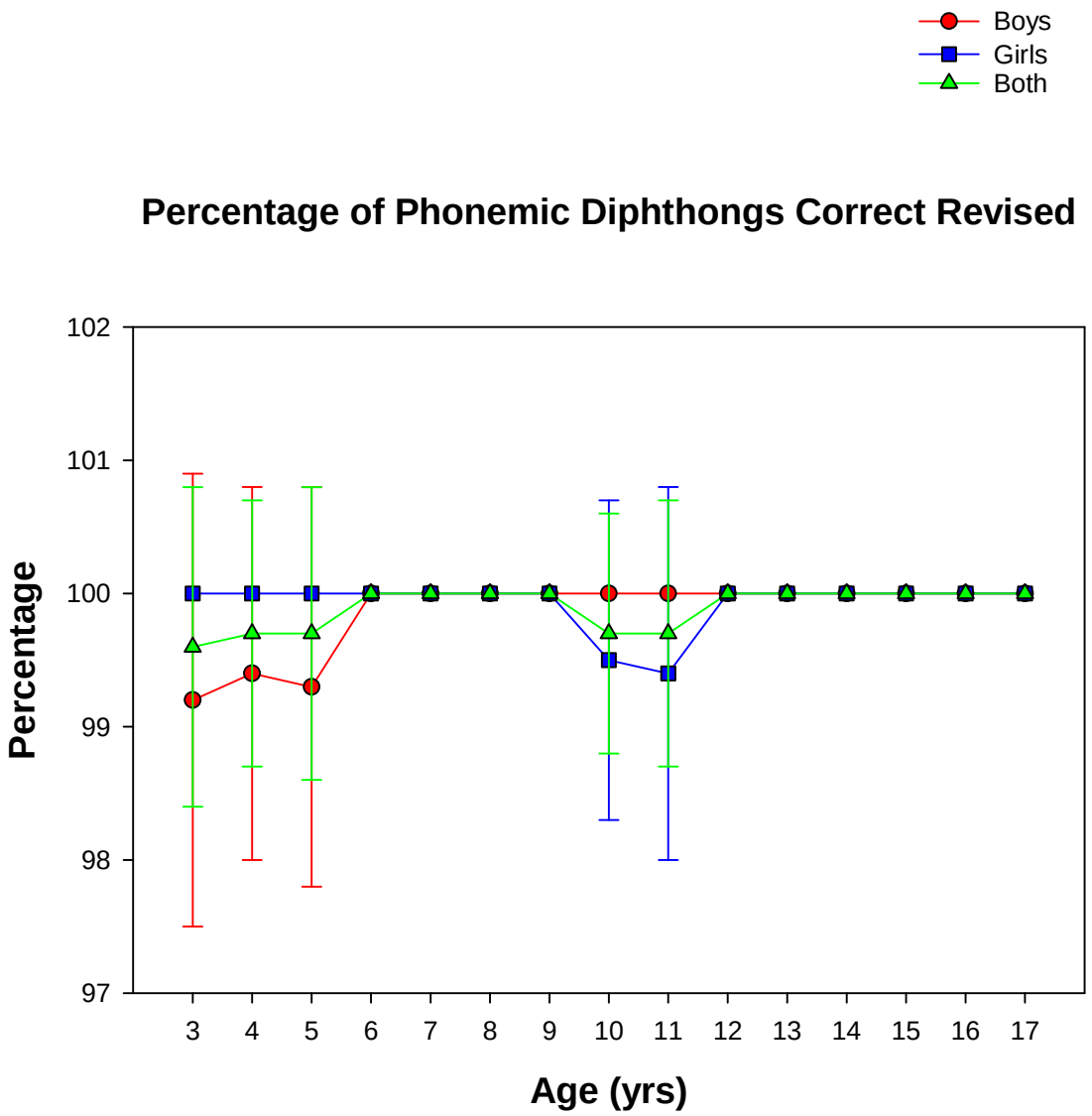
Percentage of Rhotic Vowels/Diphthongs Correct-Revised (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	89.8	17.3	98.2	4.1	98.2	4.1	95.4	10.3	100.0	0.0	96.8	4.4	100.0	0.0	98.0	4.5	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
Female																														
CSS	76.8	29.8	60.7	43.6	100.0	0.0	90.8	17.4	98.0	4.5	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
Both																														
CSS	83.3	24.0	79.4	35.5	99.1	2.9	93.1	13.7	99.0	3.2	98.4	3.4	100.0	0.0	99.0	3.2	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0


Boys
Girls
Both
Percentage of Rhotic Vowels/Diphthongs Correct Revised
120
100
80
60
40
20
0
Percentage
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

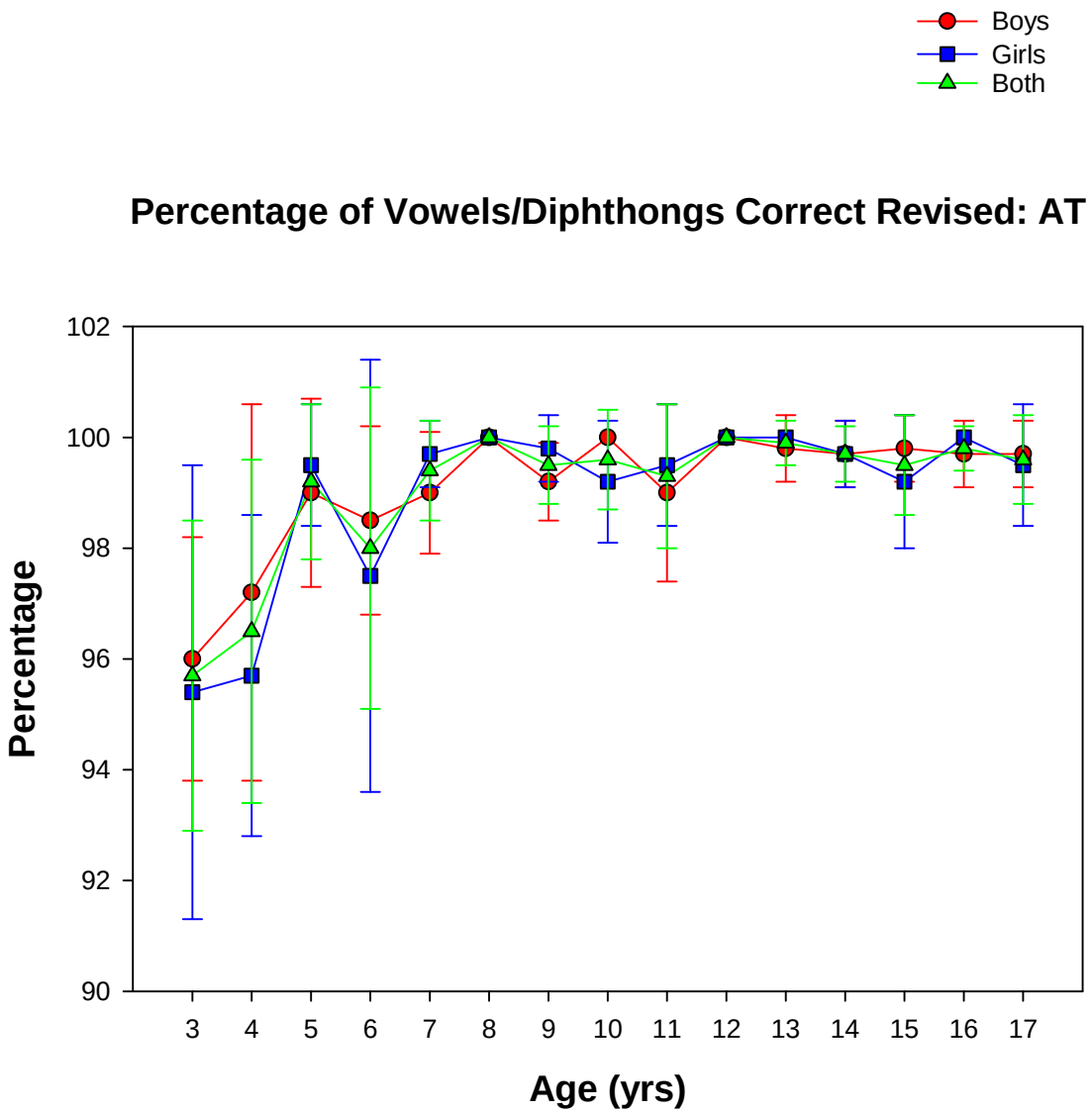
Percentage of Phonemic Diphthongs Correct-Revised (%)

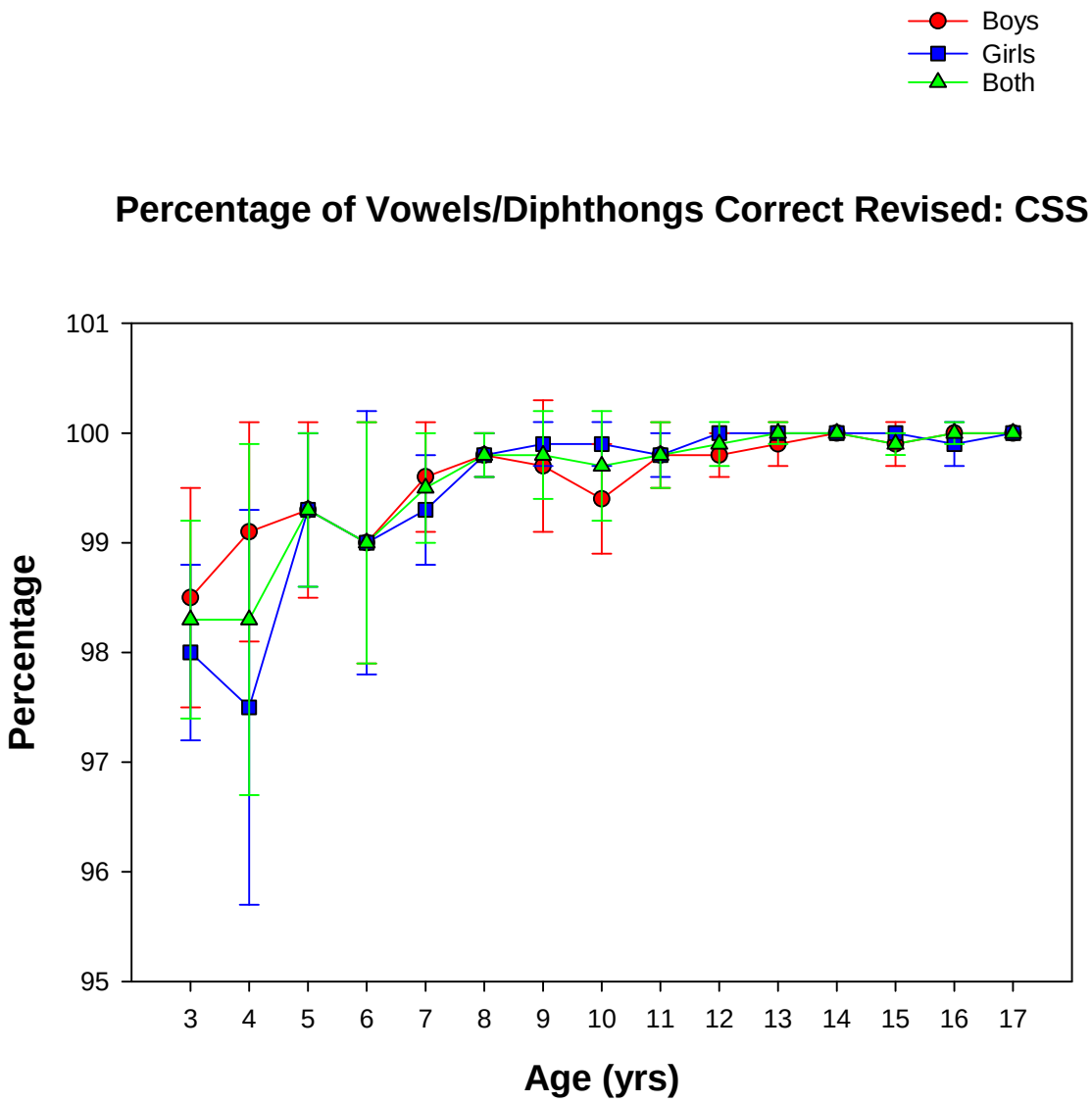
Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	99.2	1.7	99.4	1.4	99.3	1.5	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
Female																														
CSS	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	99.5	1.2	99.4	1.4	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
Both																														
CSS	99.6	1.2	99.7	1.0	99.7	1.1	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	99.7	0.9	99.7	1.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0


Boys
Girls
Both
Percentage of Phonemic Diphthongs Correct Revised
102
101
100
99
98
97
Percentage
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

Percentage of Vowels/Diphthongs Correct-Revised (%)

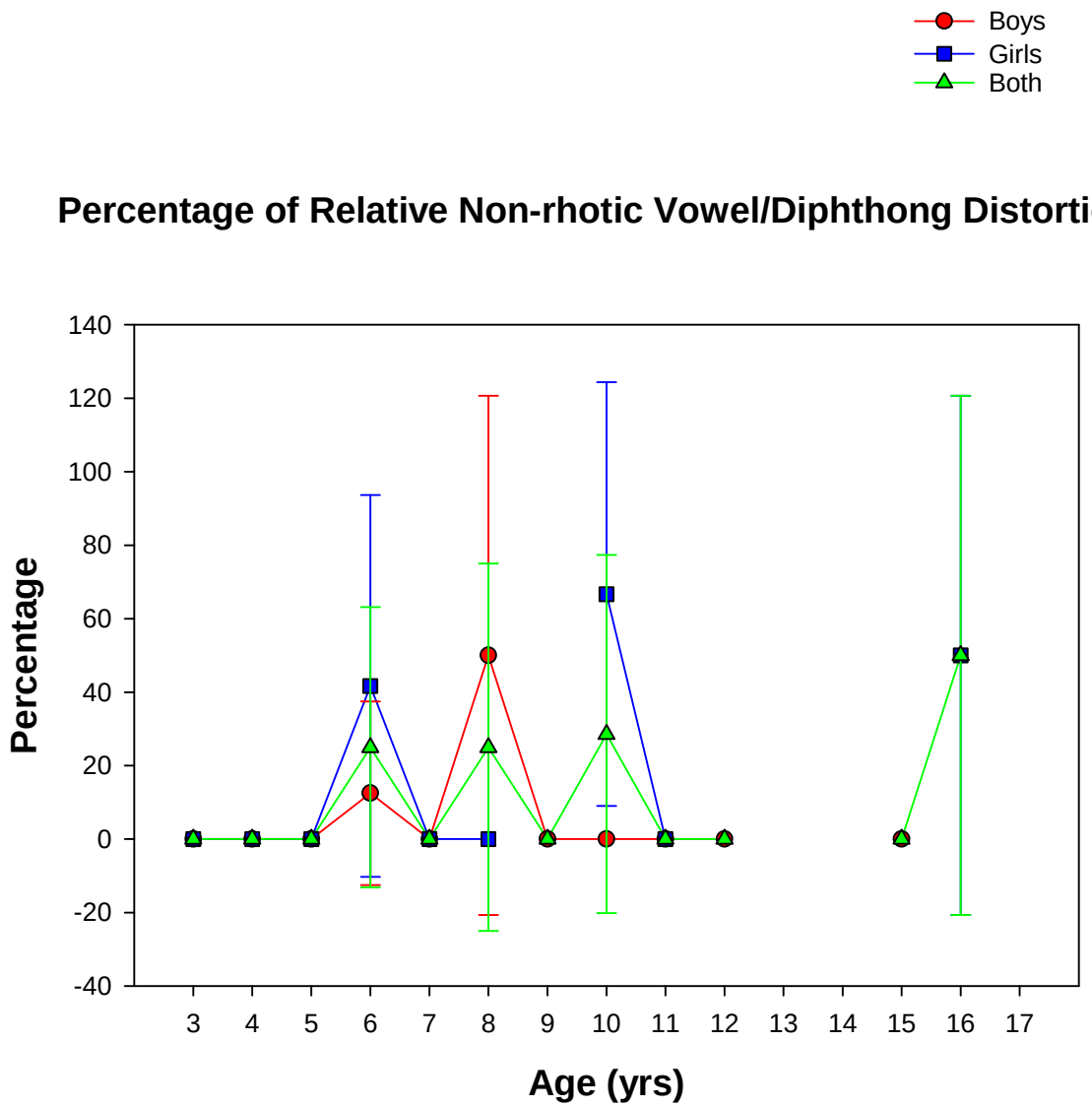
Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
AT	96.0	2.2	97.2	3.4	99.0	1.7	98.5	1.7	99.0	1.1	100.0	0.0	99.2	0.7	100.0	0.0	99.0	1.6	100.0	0.0	99.8	0.6	99.7	0.6	99.8	0.6	99.7	0.6	99.7	0.6
CSS	98.5	1.0	99.1	1.0	99.3	0.8	99.0	1.1	99.6	0.5	99.8	0.2	99.7	0.6	99.4	0.5	99.8	0.3	99.8	0.2	99.9	0.2	100.0	0.0	99.9	0.2	100.0	0.0	100.0	0.0
Female																														
AT	95.4	4.1	95.7	2.9	99.5	1.1	97.5	3.9	99.7	0.6	100.0	0.0	99.8	0.6	99.2	1.1	99.5	1.1	100.0	0.0	100.0	0.0	99.7	0.6	99.2	1.2	100.0	0.0	99.5	1.1
CSS	98.0	0.8	97.5	1.8	99.3	0.7	99.0	1.2	99.3	0.5	99.8	0.2	99.9	0.2	99.9	0.2	99.8	0.2	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	99.9	0.2	100.0	0.0
Both																														
AT	95.7	2.8	96.5	3.1	99.2	1.4	98.0	2.9	99.4	0.9	100.0	0.0	99.5	0.7	99.6	0.9	99.3	1.3	100.0	0.0	99.9	0.4	99.7	0.5	99.5	0.9	99.8	0.4	99.6	0.8
CSS	98.3	0.9	98.3	1.6	99.3	0.7	99.0	1.1	99.5	0.5	99.8	0.2	99.8	0.4	99.7	0.5	99.8	0.3	99.9	0.2	100.0	0.1	100.0	0.0	99.9	0.1	100.0	0.1	100.0	0.0


Boys
Girls
Both
Percentage of Vowels/Diphthongs Correct Revised: AT
102
100
98
96
94
92
90
Percentage
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)


Boys
Girls
Both
Percentage of Vowels/Diphthongs Correct Revised: CSS
101
100
99
98
97
96
95
Percentage
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

Percentage of Relative Non-Rhotic Vowel/Diphthongs Distortions (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	0.0	0.0	0.0	0.0	0.0	0.0	12.5	25.0	0.0	0.0	50.0	70.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	0.0	0.0	*	*	*	*
Female																														
CSS	0.0	0.0	0.0	0.0	0.0	0.0	41.7	52.0	0.0	0.0	0.0	0.0	*	*	66.7	57.7	0.0	0.0	*	*	*	*	*	*	*	*	50.0	70.7	*	*
Both																														
CSS	0.0	0.0	0.0	0.0	0.0	0.0	25.0	38.2	0.0	0.0	25.0	50.0	0.0	0.0	28.6	48.8	0.0	0.0	0.0	0.0	*	*	*	*	0.0	0.0	50.0	70.7	*	*


Boys
Girls
Both
Percentage of Relative Non-rhotic Vowel/Diphthong Distortions
140
120
100
80
60
40
20
0
-20
-40
Percentage
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

Reduced Vowel Space: Quadrilateral VSQI[a] (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	75528	19777	55597	28264	86238	16240	73869	33695	83012	30247	83104	25016	61467	10201	38774	9616	43333	13387	44798	9530	27919	17606	34489	11898	24108	6980	27313	8266	23265	4595
CSS	25015	17920	34079	11182	36424	24042	43087	13573	32103	11036	34834	5271	30346	7043	26741	11663	19080	11566	33953	14480	9198	3024	24716	5602	11529	7588	11779	4974	14437	6696
Female																														
VT1	65618	21762	99390	22727	61301	16235	94139	18897	53649	20822	66935	10287	67132	9660	69364	4067	70198	5951	48326	8566	43705	9994	50729	9211	35212	9850	47361	17829	50420	20183
CSS	34759	16151	44004	32110	41252	11163	25792	18084	24177	11291	31023	11776	33807	6006	36387	16599	33438	24468	23003	9769	17732	8797	22321	4489	22993	13449	22879	8482	18857	8991
Both																														
VT1	70573	20287	75060	33553	73770	20176	82878	28561	68330	28962	75019	19945	64300	9830	52370	17674	56766	17201	46562	8742	36689	15343	42609	13186	29660	9951	37337	16831	36843	19881
CSS	29887	16883	39042	23263	38838	17853	36602	16698	28140	11324	33140	8362	32076	6435	31564	14449	26259	19565	28478	12997	13465	7661	23518	4950	17898	12187	17329	8786	16892	7916

[a] All original cell values in this table were divided by 10.

Reduced Vowel Space: Quadrilateral VSQIL (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	0.44	0.12	0.35	0.17	0.53	0.07	0.48	0.26	0.51	0.18	0.53	0.13	0.40	0.05	0.28	0.08	0.36	0.12	0.34	0.09	0.25	0.16	0.34	0.09	0.29	0.08	0.29	0.11	0.26	0.05
CSS	0.14	0.09	0.24	0.06	0.23	0.14	0.29	0.09	0.23	0.07	0.25	0.05	0.23	0.06	0.22	0.09	0.17	0.08	0.28	0.09	0.10	0.03	0.23	0.02	0.15	0.09	0.16	0.09	0.13	0.04
Female																														
VT1	0.36	0.12	0.55	0.17	0.35	0.10	0.54	0.13	0.31	0.11	0.45	0.06	0.41	0.08	0.49	0.05	0.44	0.05	0.37	0.07	0.30	0.05	0.39	0.04	0.27	0.08	0.37	0.12	0.37	0.13
CSS	0.21	0.10	0.26	0.19	0.25	0.05	0.18	0.12	0.16	0.05	0.23	0.09	0.24	0.04	0.25	0.10	0.26	0.16	0.19	0.08	0.15	0.07	0.19	0.04	0.20	0.11	0.19	0.07	0.17	0.05
Both																														
VT1	0.40	0.12	0.44	0.19	0.44	0.12	0.50	0.20	0.41	0.18	0.49	0.10	0.41	0.06	0.37	0.13	0.40	0.10	0.35	0.08	0.28	0.10	0.36	0.07	0.28	0.07	0.33	0.11	0.32	0.11
CSS	0.17	0.10	0.25	0.13	0.24	0.10	0.25	0.11	0.19	0.07	0.24	0.06	0.24	0.05	0.24	0.09	0.21	0.13	0.23	0.10	0.12	0.06	0.21	0.04	0.18	0.10	0.18	0.08	0.15	0.05

Reduced Vowel Space: Distance from Center VSD (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	677.4	86.6	709.3	76.3	738.9	59.5	713.6	150.6	771.2	120.8	753.8	104.5	686.9	52.9	607.7	46.9	584.0	93.8	593.9	33.7	477.9	114.6	511.9	95.2	409.4	48.3	444.4	56.8	415.8	26.5
CSS	604.0	115.8	560.1	101.2	562.9	125.2	594.5	35.9	563.1	50.5	550.8	99.3	582.5	41.2	507.7	78.1	431.8	75.3	532.7	78.5	374.6	54.9	525.5	38.3	365.9	49.6	392.4	23.1	410.4	28.8
Female																														
VT1	632.6	130.9	867.5	55.0	592.9	57.9	815.2	78.8	619.9	64.4	675.8	49.1	689.8	41.2	693.2	24.9	679.4	30.3	553.3	34.7	589.3	40.0	589.5	60.3	507.9	51.6	570.1	91.8	629.2	112.1
CSS	595.6	86.9	635.8	77.9	651.1	114.4	510.1	115.9	532.8	85.1	533.0	62.7	548.7	71.9	567.9	118.4	549.4	157.0	469.2	92.7	485.3	50.4	471.1	43.8	467.2	129.0	442.1	39.2	470.1	78.2
Both																														
VT1	655.0	107.3	779.6	104.9	665.9	94.8	758.7	128.6	695.5	121.2	714.8	87.3	688.4	44.7	645.7	58.0	631.7	82.7	573.6	38.7	539.8	95.8	550.7	85.6	458.7	70.1	507.2	97.8	522.5	136.2
CSS	599.8	96.6	598.0	94.0	607.0	122.3	562.8	80.5	548.0	67.9	542.9	80.6	565.6	58.0	537.8	99.7	490.6	131.6	501.0	87.7	429.9	76.6	498.3	48.2	422.2	110.0	417.3	40.1	443.6	66.0

Reduced Vowel Space: Distance from Center VSDL (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	0.54	0.08	0.62	0.11	0.60	0.07	0.55	0.11	0.59	0.09	0.60	0.06	0.52	0.03	0.47	0.05	0.50	0.06	0.52	0.05	0.42	0.12	0.49	0.06	0.49	0.08	0.48	0.07	0.41	0.04
CSS	0.41	0.12	0.45	0.02	0.44	0.09	0.44	0.03	0.42	0.04	0.41	0.05	0.45	0.07	0.39	0.05	0.39	0.08	0.47	0.07	0.29	0.03	0.41	0.04	0.33	0.04	0.39	0.07	0.36	0.02
Female																														
VT1	0.50	0.09	0.65	0.08	0.55	0.07	0.58	0.06	0.51	0.06	0.56	0.04	0.53	0.04	0.56	0.07	0.56	0.03	0.50	0.04	0.50	0.02	0.51	0.04	0.47	0.06	0.50	0.10	0.48	0.06
CSS	0.39	0.07	0.49	0.05	0.47	0.07	0.39	0.11	0.41	0.07	0.41	0.07	0.46	0.04	0.44	0.09	0.41	0.10	0.38	0.07	0.37	0.04	0.40	0.03	0.40	0.08	0.38	0.07	0.39	0.03
Both																														
VT1	0.52	0.08	0.63	0.09	0.57	0.07	0.57	0.08	0.55	0.08	0.58	0.05	0.52	0.03	0.50	0.07	0.53	0.06	0.51	0.05	0.46	0.08	0.50	0.05	0.48	0.07	0.48	0.08	0.45	0.06
CSS	0.40	0.09	0.47	0.04	0.45	0.08	0.42	0.07	0.41	0.05	0.41	0.06	0.45	0.06	0.42	0.07	0.40	0.08	0.42	0.08	0.33	0.06	0.40	0.04	0.37	0.07	0.38	0.06	0.38	0.03

Reduced Vowel Space: /i, æ, ɑ/ Distance from Center VSD3 (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	596.1	64.6	713.9	73.1	703.3	72.4	700.4	137.6	797.6	63.6	760.9	83.0	730.8	53.8	672.3	38.8	620.8	64.8	649.4	38.3	541.0	114.1	564.3	93.8	435.0	52.6	479.9	54.4	449.4	38.8
CSS	580.1	159.0	534.4	122.2	571.4	134.7	561.2	62.0	593.4	40.2	539.5	115.7	610.8	44.9	514.6	70.4	475.0	79.7	532.5	82.5	362.8	46.7	561.5	36.2	367.1	35.7	395.0	30.6	437.3	32.1
Female																														
VT1	588.4	579.8	863.0	50.8	535.3	47.1	840.2	74.9	675.9	45.0	677.0	28.7	736.5	36.4	711.5	35.7	703.7	40.0	584.8	26.4	656.5	67.6	607.9	73.1	555.0	48.5	602.4	77.2	674.9	97.1
CSS	113.3	60.2	646.8	76.6	593.6	138.2	496.7	108.8	586.1	105.3	512.5	45.2	560.7	88.8	578.4	124.5	529.3	149.9	478.0	85.3	510.5	37.8	473.2	38.4	459.5	127.5	453.0	34.0	499.6	119.9
Both																														
VT1	592.3	87.1	780.2	99.0	619.3	105.6	762.6	130.4	736.7	82.6	718.9	73.4	733.6	43.4	689.7	40.7	662.2	67.0	617.1	46.0	605.2	104.3	586.1	82.5	495.0	79.2	541.2	90.2	562.1	137.8
CSS	580.0	113.3	590.6	113.0	582.5	129.2	529.0	90.1	589.8	105.3	526.0	84.0	585.7	71.4	546.5	101.1	502.2	116.8	505.2	84.2	436.6	87.6	517.3	58.3	413.3	100.8	424.0	43.2	468.5	89.0

Reduced Vowel Space: /i , æ , ɑ/ Distance from Center VSD3L (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	0.48	0.07	0.59	0.11	0.54	0.05	0.50	0.08	0.57	0.07	0.59	0.03	0.50	0.03	0.47	0.07	0.50	0.07	0.53	0.07	0.42	0.11	0.51	0.07	0.46	0.07	0.49	0.07	0.40	0.04
CSS	0.37	0.12	0.44	0.03	0.44	0.09	0.42	0.05	0.43	0.04	0.38	0.07	0.43	0.03	0.37	0.04	0.38	0.07	0.45	0.08	0.27	0.03	0.41	0.05	0.32	0.04	0.37	0.09	0.35	0.05
Female																														
VT1	0.43	0.07	0.63	0.06	0.48	0.06	0.57	0.03	0.51	0.06	0.54	0.03	0.52	0.04	0.55	0.09	0.53	0.02	0.48	0.03	0.49	0.02	0.50	0.03	0.45	0.05	0.49	0.10	0.48	0.07
CSS	0.36	0.03	0.48	0.03	0.43	0.08	0.36	0.10	0.45	0.08	0.39	0.06	0.44	0.03	0.44	0.11	0.36	0.09	0.36	0.05	0.37	0.02	0.38	0.03	0.38	0.07	0.34	0.03	0.37	0.06
Both																														
VT1	0.46	0.07	0.61	0.09	0.51	0.06	0.53	0.07	0.54	0.07	0.57	0.04	0.51	0.03	0.50	0.09	0.52	0.05	0.50	0.06	0.46	0.08	0.51	0.05	0.45	0.06	0.49	0.08	0.44	0.07
CSS	0.37	0.09	0.46	0.04	0.43	0.08	0.39	0.08	0.44	0.06	0.38	0.06	0.44	0.03	0.41	0.09	0.37	0.08	0.40	0.08	0.32	0.06	0.39	0.04	0.35	0.06	0.36	0.07	0.36	0.05

Lengthened Vowels: Corners (ms)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	161.6	26.1	151.3	13.9	174.4	35.9	166.8	31.3	185.3	22.8	130.5	15.8	176.7	36.4	181.6	17.6	195.0	22.1	180.6	30.0	187.1	18.8	178.5	27.4	177.2	47.0	157.1	22.4	166.9	22.7
CSS	151.0	37.4	161.0	42.3	147.3	27.2	102.2	7.4	140.9	16.8	100.7	13.7	122.2	18.3	103.7	16.1	128.2	33.6	99.7	21.3	107.8	27.5	105.4	13.1	107.5	9.2	82.5	4.5	111.7	12.3
Female																														
VT1	161.0	35.3	153.2	34.0	167.2	31.4	162.5	33.3	200.4	25.7	191.6	32.7	184.8	21.0	186.7	28.8	167.8	17.9	155.9	31.3	192.6	4.5	178.6	8.1	175.7	25.4	152.0	21.0	162.1	21.2
CSS	151.2	22.6	148.1	58.2	148.6	25.9	141.3	62.5	133.0	19.6	118.0	21.3	114.2	11.9	104.0	17.2	105.5	16.9	97.3	14.1	113.7	23.3	95.0	19.8	96.7	11.4	89.1	20.1	103.0	16.2
Both																														
VT1	161.3	29.3	152.2	24.5	170.8	32.0	164.6	30.6	192.8	24.3	161.0	40.3	180.8	28.3	184.1	22.6	181.4	23.7	168.2	31.7	189.8	13.2	178.6	19.0	176.4	35.6	154.6	20.6	164.5	20.9
CSS	151.1	29.1	154.5	48.4	148.0	25.1	121.8	46.7	137.0	17.7	109.3	19.2	118.2	15.1	103.9	15.7	116.9	27.8	98.5	17.1	110.8	24.2	100.2	16.8	102.1	11.3	85.8	14.2	107.4	14.3

Lengthened Vowels: Non-Rhotic Mids (ms)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT2	159.7	18.6	140.3	24.9	149.0	21.5	155.2	23.5	158.3	11.4	122.6	16.0	154.7	18.2	168.3	17.0	181.3	21.5	174.9	31.6	166.2	26.9	177.1	18.0	165.1	40.5	164.5	20.7	146.9	11.4
CSS	128.4	11.8	144.0	37.4	125.6	17.3	99.1	17.4	120.8	10.2	95.2	16.1	107.0	17.4	77.7	10.7	96.7	12.9	81.2	17.4	89.9	22.9	89.8	12.8	93.7	8.5	70.0	9.7	86.1	12.0
Female																														
VT2	153.6	36.8	153.5	23.1	144.1	31.0	156.9	35.7	164.5	30.8	181.9	26.1	163.4	32.4	170.4	17.6	156.4	19.4	147.2	16.5	170.9	14.2	179.9	10.2	170.0	24.8	143.1	15.6	148.7	17.9
CSS	126.9	5.2	127.9	45.9	121.6	16.4	111.5	27.5	115.4	9.5	86.8	14.5	96.8	14.3	80.3	8.0	97.3	4.8	77.7	15.2	92.7	9.2	71.7	11.0	88.5	7.1	76.7	14.3	75.9	6.9
Both																														
VT2	156.6	27.7	146.9	23.7	146.5	25.3	156.1	28.5	161.4	22.1	152.3	37.3	159.0	25.2	169.4	16.3	168.9	23.4	161.1	27.9	168.5	20.4	178.5	13.9	167.5	31.8	153.8	20.6	147.8	14.2
CSS	127.6	8.7	136.0	40.3	123.6	16.0	105.3	22.6	118.1	9.7	91.0	15.1	101.9	15.9	79.0	9.0	97.0	9.2	79.5	15.5	91.3	16.5	80.7	14.8	91.1	7.9	73.4	12.1	81.0	10.7

Lengthened Vowels: Phonemic Diphthongs (ms)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT2	231.8	52.3	212.5	46.9	233.6	12.5	242.4	33.6	242.6	19.1	190.9	36.7	236.4	23.1	246.1	23.6	268.5	23.5	238.8	41.6	236.3	36.6	248.1	24.4	219.4	46.1	232.5	22.8	200.6	31.0
CSS	158.4	19.7	173.5	47.1	162.1	25.6	148.3	42.1	168.0	27.3	135.9	56.2	129.8	24.4	119.2	12.7	144.6	25.3	108.3	16.5	122.1	25.2	140.1	32.6	106.6	14.9	106.1	27.5	114.1	23.7
Female																														
VT2	301.1	87.2	233.2	44.7	253.7	49.6	243.7	46.6	247.4	45.0	266.2	32.3	248.9	30.3	241.3	36.4	243.2	29.1	237.4	9.3	241.0	16.0	255.7	10.9	241.1	31.6	213.3	11.6	212.8	33.6
CSS	154.2	24.5	134.4	48.0	148.3	30.4	147.4	28.4	154.0	16.8	127.5	28.5	140.0	27.3	119.4	14.1	136.8	22.3	96.5	20.2	125.4	7.0	102.5	25.1	113.0	17.2	94.3	15.1	109.7	31.2
Both																														
VT2	266.4	77.0	222.8	44.5	243.7	35.7	243.1	38.3	245.0	32.7	228.5	51.4	242.6	26.2	243.7	29.1	255.8	28.2	238.1	28.4	238.6	26.7	251.9	18.3	230.3	39.0	222.9	19.8	206.7	31.2
CSS	156.3	21.1	154.0	49.3	155.2	27.4	147.8	33.9	161.0	22.6	131.7	42.3	134.9	25.0	119.3	12.6	140.7	22.8	102.4	18.5	123.8	17.5	121.3	33.8	109.8	15.5	100.0	21.8	111.9	26.3

Reduced Vowel Substitution Coefficients (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
ALL	0.04	0.03	0.05	0.02	0.03	0.03	0.06	0.01	0.06	*	0.15	*	0.11	*	0.11	0.10	0.06	*	0.06	0.00	*	*	0.06	0.00	*	*	*	*	*	*
Female																														
ALL	0.18	0.19	0.13	0.14	0.10	0.06	0.05	0.02	0.10	*	0.06	*	*	*	0.06	0.00	0.13	0.11	*	*	*	*	0.06	0.00	*	*	0.06	*	*	*
Both																														
ALL	0.12	0.15	0.09	0.11	0.06	0.05	0.06	0.01	0.08	0.03	0.11	0.06	0.11	*	0.10	0.08	0.11	0.09	0.06	0.00	*	*	0.06	0.00	*	*	0.06	*	*	*

Increased Distorted Vowel Substitutions (count)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT12	0.8	1.3	0.0	0.0	0.6	0.9	0.0	0.0	0.4	0.9	0.0	0.0	0.8	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Female																														
VT12	3.2	3.0	0.6	1.3	0.8	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Both																														
VT12	2.0	2.5	0.3	0.9	0.7	1.1	0.0	0.0	0.2	0.6	0.0	0.0	0.4	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Less Precise Diphthongs (5 points)[a] (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT2	12386	3570	10690	7899	12468	5908	10350	3205	8987	2596	7293	5203	8718	3254	6750	2179	7978	5153	7290	2348	6525	2934	4993	1327	3309	713	3581	466	4924	1645
Female																														
VT2	14207	3020	17695	1962	14026	5799	10537	4301	7369	2501	5745	1895	10683	4187	9801	5054	7541	4709	6672	3073	6425	1557	9351	5037	6473	2127	7202	5203	6311	1818
Both																														
VT2	13297	3262	14192	6563	13247	5580	10443	3578	8178	2550	6519	3781	9700	3684	8276	4006	7760	4659	6981	2599	6475	2215	7172	4164	4891	2240	5392	3971	5618	1791

[a] All original cell values in this table were divided by 10.

Less Precise Diphthongs (3 points) [a] (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT2	4812	1750	5180	2492	5989	3442	5426	1374	5355	1618	3279	1131	4873	871	3325	773	4130	1113	2901	691	2513	1024	2791	1888	1865	297	1845	690	1977	404
Female																														
VT2	7779	3674	7893	1652	6780	2109	5430	4641	3684	1495	3062	4985	4584	1835	4749	3690	4767	3337	3629	2057	2493	238	3943	1911	2593	650	2301	1151	3752	715
Both																														
VT2	6296	3131	6537	2453	6385	2723	5428	3226	4519	1712	3171	8322	4729	1363	4037	2623	4449	2369	3265	1497	2503	7010	3367	1891	2229	6123	2073	926	2864	1084

[a] All original cell values in this table were divided by 10.

Distorted Rhotics: F3-F2 (Hz)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT2	1145.4	431.5	540.7	244.3	635.4	67.2	644.3	570.1	521.2	59.8	602.3	459.5	479.1	173.4	325.2	77.7	426.2	46.8	279.3	67.4	340.4	98.7	262.4	104.4	293.2	24.4	260.0	38.6	361.9	93.1
RSTR	*	*	*	*	*	*	742.2	737.3	509.3	122.5	489.0	313.2	499.9	170.5	368.4	87.8	323.7	35.0	364.1	25.7	383.9	86.2	311.7	40.4	332.4	32.5	359.5	50.8	343.8	49.4
CSS	1171.3	520.5	658.4	70.6	617.8	157.8	792.0	612.8	657.8	228.0	654.9	209.0	763.4	402.7	407.6	49.9	619.0	73.4	419.1	115.9	479.9	147.3	379.5	78.0	651.3	245.1	383.4	106.7	505.1	141.9
Female																														
VT2	1168.3	690.3	959.1	502.0	719.2	286.8	961.9	1246.8	667.5	342.9	300.9	63.3	336.0	123.4	357.3	39.4	353.0	58.3	342.5	73.8	383.1	95.9	343.7	85.3	335.8	97.2	596.8	687.7	366.1	34.2
RSTR	*	*	*	*	*	*	885.4	1001.3	530.3	159.0	359.7	79.8	441.4	126.3	378.5	35.5	380.8	36.6	407.6	31.1	388.5	45.6	348.6	23.6	355.6	63.0	425.4	108.3	303.3	48.4
CSS	976.9	499.6	517.8	118.2	634.4	140.8	759.9	299.3	547.6	64.8	546.2	55.1	544.8	106.4	482.9	118.3	566.1	142.0	507.0	114.0	548.0	165.2	371.0	41.4	438.6	62.0	453.1	48.2	561.9	135.3
Both																														
VT2	1155.6	521.5	749.9	432.6	681.9	211.6	785.4	879.4	594.4	244.5	451.6	347.6	399.6	156.7	341.3	60.5	389.6	63.1	310.9	74.5	361.8	94.4	303.1	99.6	314.5	70.5	428.4	492.3	364.0	66.1
RSTR	*	*	*	*	*	*	813.8	832.4	521.0	135.6	424.4	226.0	470.7	144.8	373.4	63.4	352.2	45.2	385.9	35.3	386.2	65.1	330.2	36.8	344.0	48.8	392.5	87.0	323.5	50.8
CSS	1074.1	491.7	605.7	110.2	627.0	139.0	775.9	455.0	596.6	158.0	600.6	153.0	654.1	300.6	449.4	97.5	592.6	110.1	463.1	117.8	513.9	151.8	375.3	59.1	545.0	202.4	418.2	86.3	533.5	134.1

Distorted Rhotics: F3/F2 (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT2	1.6	0.3	1.3	0.1	1.4	0.1	1.4	0.3	1.3	0.0	1.3	0.2	1.3	0.1	1.2	0.1	1.3	0.0	1.2	0.1	1.2	0.1	1.2	0.1	1.2	0.0	1.2	0.0	1.2	0.1
RSTR	*	*	*	*	*	*	1.4	0.5	1.3	0.1	1.3	0.2	1.3	0.1	1.2	0.0	1.2	0.0	1.2	0.0	1.2	0.0	1.2	0.0	1.2	0.0	1.2	0.0	1.2	0.0
CSS	1.7	0.5	1.4	0.0	1.4	0.1	1.5	0.4	1.4	0.1	1.4	0.1	1.4	0.3	1.2	0.0	1.4	0.0	1.3	0.1	1.3	0.1	1.3	0.1	1.4	0.1	1.2	0.1	1.3	0.1
Female																														
VT2	1.7	0.5	1.6	0.5	1.4	0.3	1.7	1.1	1.3	0.2	1.2	0.0	1.2	0.1	1.2	0.0	1.2	0.0	1.2	0.0	1.2	0.1	1.2	0.0	1.2	0.0	1.4	0.4	1.2	0.1
RSTR	*	*	*	*	*	*	1.6	0.9	1.3	0.1	1.2	0.1	1.3	0.1	1.2	0.0	1.2	0.0	1.2	0.0	1.2	0.0	1.2	0.0	1.2	0.0	1.3	0.1	1.2	0.0
CSS	1.5	0.3	1.3	0.1	1.3	0.1	1.4	0.3	1.3	0.1	1.3	0.0	1.3	0.1	1.3	0.1	1.3	0.1	1.3	0.1	1.3	0.1	1.2	0.1	1.3	0.1	1.3	0.0	1.3	0.1
Both																														
VT2	1.7	0.4	1.4	0.4	1.4	0.2	1.5	0.8	1.3	0.1	1.2	0.2	1.2	0.1	1.2	0.1	1.2	0.1	1.2	0.0	1.2	0.0	1.2	0.1	1.2	0.0	1.3	0.3	1.2	0.1
RSTR	*	*	*	*	*	*	1.5	0.7	1.3	0.1	1.2	0.1	1.3	0.1	1.2	0.0	1.2	0.0	1.2	0.0	1.2	0.0	1.2	0.0	1.2	0.0	1.3	0.1	1.2	0.0
CSS	1.6	0.4	1.3	0.1	1.3	0.1	1.5	0.3	1.3	0.1	1.3	0.1	1.4	0.2	1.3	0.1	1.3	0.1	1.3	0.1	1.3	0.1	1.2	0.1	1.3	0.1	1.3	0.0	1.3	0.1

Reduced Pairwise Vowel Duration Variability (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	51.2	7.9	63.7	7.4	50.2	5.3	59.4	11.9	51.6	8.5	52.8	7.2	48.7	7.9	57.4	8.2	60.3	9.1	52.2	4.6	52.7	4.1	61.0	6.7	56.0	5.4	52.8	3.4	54.3	8.0
Female																														
CSS	47.2	10.4	50.4	8.6	55.1	9.6	54.3	5.2	46.9	6.5	49.2	6.0	48.9	6.2	57.4	5.1	53.9	4.2	53.2	4.7	57.3	6.3	55.9	8.3	49.8	5.2	51.7	9.5	51.4	6.4
Both																														
CSS	49.2	9.0	57.0	10.3	52.7	7.8	56.9	9.1	49.3	7.5	51.0	6.6	48.8	6.7	57.4	6.4	57.1	7.5	52.7	4.4	55.0	5.6	58.5	7.6	52.9	6.0	52.2	6.7	52.8	7.0

Less Stable Vowel Space: Quadrilateral VSQI (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	78.3	10.8	54.5	23.6	76.9	3.8	74.8	22.8	80.2	11.8	85.4	5.3	83.4	4.9	56.8	46.7	86.2	10.2	82.3	8.7	78.2	13.5	88.0	6.7	86.4	4.0	85.6	4.7	81.7	3.1
CSS	19.7	37.6	45.5	32.1	39.2	31.0	53.3	41.1	56.4	15.9	66.4	11.7	49.2	13.7	50.1	49.2	56.9	9.5	57.2	17.9	34.1	25.7	50.5	43.0	44.4	50.4	37.4	12.8	37.7	49.0
Female																														
VT1	79.5	6.3	58.6	36.4	69.5	10.6	85.8	9.8	81.0	8.4	85.7	5.6	85.4	3.8	89.0	2.1	87.2	3.5	87.8	2.3	82.2	5.0	90.5	3.4	83.7	4.0	85.3	3.3	78.7	15.7
CSS	34.8	20.1	62.3	26.6	51.0	32.2	26.2	47.7	39.8	19.9	43.8	29.2	43.2	23.0	41.3	34.9	50.1	41.8	49.8	17.6	28.1	24.9	54.2	26.2	42.6	16.3	66.3	5.6	27.7	19.8
Both																														
VT1	78.9	8.4	56.3	27.9	73.2	8.5	79.7	18.2	80.6	9.7	85.5	5.1	84.4	4.3	71.1	37.2	86.7	7.2	85.1	6.7	80.4	9.3	89.2	5.2	85.0	4.0	85.5	3.9	80.2	10.8
CSS	27.3	29.5	53.0	29.3	45.1	30.4	43.1	42.6	48.1	19.1	56.4	23.1	46.2	18.1	45.7	40.5	53.5	28.8	53.5	17.2	31.1	24.1	52.3	33.6	43.4	33.0	53.4	17.6	32.2	33.5

Less Stable Vowel Space: Quadrilateral VSQIL (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	80.6	9.6	39.6	31.2	76.9	6.3	71.4	29.4	79.0	8.7	83.2	5.5	79.8	6.8	42.8	69.0	85.0	9.0	82.9	8.5	80.2	10.5	85.7	8.5	85.5	4.9	84.6	5.5	80.7	5.2
CSS	18.0	31.7	45.9	29.3	41.0	30.6	55.9	38.1	54.8	19.6	67.5	14.3	51.1	15.8	54.6	40.3	61.7	10.8	57.8	15.0	37.2	23.9	52.4	34.8	49.9	46.6	2.8	81.2	28.3	55.0
Female																														
VT1	78.3	6.3	52.4	42.0	69.3	10.8	85.8	8.1	80.9	7.6	83.1	8.1	83.4	4.1	89.8	1.6	86.0	3.0	88.4	3.4	85.0	3.7	90.0	3.6	83.6	2.5	84.2	5.0	77.8	15.8
CSS	39.7	19.1	64.0	27.2	54.5	29.4	15.7	61.6	36.3	19.5	48.8	24.5	42.0	23.5	42.9	36.3	48.6	44.0	50.9	16.3	30.1	28.9	54.4	22.8	44.1	14.2	64.6	6.2	27.3	22.4
Both																														
VT1	79.5	7.8	45.3	34.5	73.1	9.2	77.8	22.7	80.0	7.8	83.1	6.5	81.6	5.7	63.7	54.8	85.5	6.4	85.6	6.7	82.8	7.4	87.9	6.6	84.6	3.8	84.4	5.0	79.3	11.2
CSS	28.8	27.2	54.0	28.2	47.7	29.2	40.8	48.5	45.6	20.9	59.2	20.6	46.5	19.5	48.7	36.7	55.1	31.0	54.4	15.2	33.7	25.3	53.4	27.8	46.7	30.4	53.0	17.4	27.8	37.2

Less Stable Vowel Space: Distance from Center VSD (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	67.0	9.4	55.0	10.9	61.3	4.4	55.8	14.4	56.1	3.9	54.5	2.4	50.6	4.1	40.5	6.0	47.4	4.2	51.9	6.2	43.2	10.8	44.5	4.8	51.6	11.5	49.8	9.0	51.4	4.0
CSS	46.0	16.4	57.0	8.0	55.2	9.7	57.8	12.3	57.0	6.2	50.5	6.1	50.8	12.8	46.8	9.6	43.7	8.6	53.0	10.4	45.9	9.5	39.2	7.5	44.3	3.4	46.6	4.4	49.2	10.9
Female																														
VT1	64.9	11.4	54.7	9.2	66.0	10.1	56.3	1.5	53.5	7.3	50.5	3.6	56.6	6.6	52.3	5.3	57.0	3.3	54.1	4.6	45.7	17.8	54.7	2.5	52.0	4.6	52.7	5.3	49.6	6.6
CSS	44.0	11.9	55.5	7.1	57.5	8.5	45.9	1.8	47.1	11.8	53.2	8.4	50.9	4.8	51.8	6.0	39.8	11.7	47.0	17.0	43.0	11.4	44.9	11.9	49.0	6.8	45.6	11.5	47.0	9.4
Both																														
VT1	65.9	9.9	54.8	9.5	63.6	7.8	56.0	10.2	54.8	5.7	52.5	3.6	53.6	6.1	45.7	8.2	52.2	6.2	53.0	5.3	44.6	14.3	49.6	6.5	51.8	8.3	51.2	7.2	50.5	5.2
CSS	45.0	13.6	56.3	7.2	56.4	8.7	53.4	11.2	52.1	10.3	51.7	6.8	50.9	9.1	49.3	8.0	41.7	9.9	50.0	13.7	44.4	10.0	42.1	9.8	46.9	5.8	46.1	8.2	48.0	9.5

Less Stable Vowel Space: Distance from Center VSDL (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	74.3	6.8	76.0	5.7	75.7	6.5	78.6	5.3	73.7	7.4	73.7	8.1	77.3	5.9	66.3	11.8	69.3	4.8	76.5	6.3	70.0	9.4	68.1	5.6	73.5	9.1	69.7	3.7	71.4	4.4
CSS	53.3	18.3	68.1	5.8	59.5	10.2	67.2	13.8	65.0	7.7	62.2	4.6	65.8	8.1	69.0	10.3	58.4	9.6	66.5	8.2	58.4	9.4	59.2	16.7	62.3	3.0	61.5	3.1	61.5	2.8
Female																														
VT1	74.9	5.4	71.1	5.2	79.0	5.1	76.0	9.8	75.8	14.1	72.5	5.3	77.2	4.8	76.2	5.6	82.7	5.7	80.0	4.5	66.5	19.7	80.4	6.2	78.7	2.5	76.0	3.1	71.0	5.2
CSS	52.1	8.7	66.2	11.4	70.0	8.3	58.1	5.9	51.8	12.6	63.9	9.3	65.7	9.1	64.1	6.0	56.7	14.7	68.9	6.6	56.3	4.9	64.1	8.4	62.0	8.4	60.7	8.4	62.2	11.9
Both																														
VT1	74.6	5.8	73.8	5.8	77.4	5.8	77.5	7.2	74.8	10.6	73.1	6.5	77.2	5.1	70.7	10.4	76.0	8.6	78.2	5.5	68.0	15.2	74.3	8.5	76.1	6.9	72.8	4.6	71.2	4.5
CSS	52.7	13.5	67.1	8.6	64.8	10.4	63.8	11.9	58.4	12.1	62.9	6.6	65.8	8.1	66.6	8.4	57.5	11.7	67.7	7.1	57.4	7.1	61.7	12.7	62.1	6.2	61.1	6.0	61.9	8.6

Less Stable Vowel Space: /i, æ, ɑ/ Distance from Center VSD3 (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	56.1	10.2	52.8	13.6	55.3	10.0	57.4	15.9	59.3	3.4	54.3	2.0	53.9	4.6	43.6	9.5	46.6	9.6	54.2	2.2	50.1	6.0	48.4	6.3	51.4	4.9	49.7	4.4	54.6	2.5
CSS	52.6	21.3	60.5	14.5	59.0	4.3	45.3	12.6	60.2	7.1	44.5	6.2	54.1	11.7	45.0	7.3	44.4	8.6	55.7	12.2	45.7	10.2	47.7	10.4	39.9	5.1	44.9	1.2	51.7	18.0
Female																														
VT1	55.3	1.7	52.7	5.4	59.4	14.8	58.1	2.2	55.8	4.4	48.8	4.6	57.3	2.6	51.3	6.4	55.9	1.3	53.0	2.6	50.2	14.6	54.1	2.1	54.3	3.4	54.7	3.5	57.7	6.3
CSS	51.9	8.0	56.5	5.4	48.3	9.9	45.4	7.7	49.0	13.0	45.5	6.6	50.7	12.9	54.3	12.0	48.1	19.3	49.5	10.6	46.1	7.2	47.0	9.9	54.7	10.6	48.8	4.3	49.6	8.2
Both																														
VT1	55.7	6.9	52.8	10.2	57.4	12.1	57.7	11.3	57.6	4.1	51.5	4.4	55.6	4.0	47.0	8.8	51.2	8.1	53.6	2.4	50.1	11.0	51.2	5.3	52.8	4.3	52.2	4.5	56.1	4.8
CSS	52.2	15.2	58.8	10.5	53.6	9.1	45.4	9.9	54.6	11.5	45.0	6.1	52.4	11.8	49.6	10.6	46.2	14.2	52.6	11.3	45.9	8.3	47.2	9.6	47.3	11.1	46.7	3.5	50.6	13.2

Less Stable Vowel Space: /i, æ, ɑ/ Distance from Center VSD3L (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	57.1	5.7	58.3	4.6	61.5	6.9	64.8	10.0	62.4	6.0	61.7	3.6	64.0	7.0	54.3	10.6	56.4	4.6	64.3	1.6	57.8	4.9	62.0	3.9	55.0	10.8	60.4	4.1	61.1	1.2
CSS	58.2	15.2	63.8	11.2	59.7	8.7	55.3	6.0	65.9	9.0	50.6	10.9	64.5	9.5	59.7	8.3	48.5	8.2	59.1	5.6	49.4	15.0	54.8	9.0	51.8	5.7	53.0	8.5	55.9	8.4
Female																														
VT1	58.0	3.2	59.9	1.7	60.6	5.1	66.9	3.4	63.3	4.7	59.2	3.4	65.6	3.2	63.7	0.9	62.7	2.9	64.0	3.8	51.5	20.4	63.8	2.9	59.4	2.9	64.0	2.1	64.0	3.5
CSS	55.1	6.7	59.6	9.1	58.6	3.2	45.5	14.1	56.5	13.6	56.1	9.0	59.9	7.4	55.9	3.6	52.9	14.3	59.1	3.5	51.9	3.6	59.3	9.2	61.3	7.5	54.5	5.2	61.8	4.3
Both																														
VT1	57.6	4.4	59.0	3.5	61.1	5.7	65.8	7.4	62.9	5.1	60.5	3.6	64.8	5.2	58.5	9.0	59.6	4.9	64.2	2.8	54.3	15.1	62.9	3.4	57.2	7.8	62.2	3.6	62.5	2.9
CSS	56.6	11.2	61.7	9.9	59.2	6.2	50.4	11.4	61.2	11.9	53.3	9.9	62.2	8.4	57.8	6.3	50.7	11.3	59.1	4.4	50.6	10.4	57.1	8.9	56.5	8.0	53.8	6.7	58.9	7.0

Less Stable F1: /i/ (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	83.0	11.1	83.0	1.0	86.9	9.5	88.3	10.3	81.7	12.3	84.1	7.5	89.9	5.8	86.7	5.6	81.9	14.5	94.0	5.0	93.8	6.0	91.4	2.5	88.3	3.3	88.9	5.2	88.5	3.4
CSS	82.1	17.5	84.8	7.8	80.6	12.6	81.6	7.4	87.5	6.7	84.8	5.5	89.4	9.9	92.4	6.2	85.5	5.3	86.6	5.3	91.4	6.3	92.9	1.9	91.4	3.8	88.4	10.5	78.7	8.7
Female																														
VT1	86.8	6.7	79.6	9.6	90.4	10.9	91.2	3.9	90.6	3.5	84.5	6.2	87.9	6.2	91.4	6.2	90.5	7.2	91.5	4.4	65.8	46.5	93.7	3.4	89.4	3.4	91.5	9.1	87.4	6.7
CSS	85.5	6.1	85.2	9.5	88.3	7.1	84.6	16.0	87.1	11.3	93.4	6.6	89.8	6.1	83.4	5.0	86.8	5.6	89.1	2.6	81.0	5.7	90.8	6.7	91.3	7.5	89.1	5.7	90.3	5.8
Both																														
VT1	84.9	8.9	81.3	6.7	88.7	9.8	89.9	7.0	86.1	9.7	84.3	6.5	88.9	5.7	89.1	6.1	86.2	11.7	92.8	4.6	78.2	36.2	92.6	3.0	88.9	3.2	90.2	7.1	87.9	5.0
CSS	84.0	11.7	85.0	8.2	84.5	10.5	83.1	11.9	87.3	8.8	89.1	7.3	89.6	7.7	87.9	7.1	86.1	5.2	87.9	4.1	86.2	7.9	91.8	4.8	91.4	5.6	88.7	8.0	84.5	9.3

Less Stable F1: /æ/ (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	84.7	16.4	94.9	2.9	89.9	4.6	92.9	2.5	91.7	9.1	93.8	1.3	94.0	3.3	93.1	3.7	93.7	4.1	93.7	2.2	90.1	4.6	96.8	2.6	93.7	2.6	95.5	1.7	91.9	2.9
CSS	85.1	11.2	75.0	22.8	69.6	14.5	75.5	17.2	83.1	11.6	83.8	8.1	72.4	17.5	88.4	5.8	82.7	5.4	83.9	13.1	85.8	12.2	77.2	28.2	89.5	6.0	78.0	7.8	84.1	13.0
Female																														
VT1	87.2	5.1	91.2	6.2	91.5	6.5	92.0	7.0	92.9	3.3	94.5	2.7	94.3	1.7	93.7	3.6	94.3	2.7	94.0	1.6	92.8	2.6	94.8	2.5	93.1	2.9	93.7	3.0	92.9	5.4
CSS	71.2	10.5	84.0	8.7	75.3	16.7	83.5	16.7	80.8	15.6	78.9	8.9	84.0	16.2	76.3	18.7	85.6	16.1	79.8	6.9	80.4	11.0	85.9	9.4	76.6	17.1	86.3	1.7	81.7	17.0
Both																														
VT1	86.0	11.5	93.0	4.9	90.7	5.4	92.5	4.7	92.3	6.5	94.2	2.0	94.2	2.5	93.4	3.5	94.0	3.3	93.8	1.8	91.4	3.8	95.8	2.6	93.4	2.6	94.6	2.5	92.4	4.1
CSS	78.2	12.6	79.5	16.9	72.5	15.0	79.5	16.5	81.9	13.0	81.3	8.4	78.2	17.0	82.4	14.5	84.2	11.4	81.8	10.1	83.1	11.3	81.5	20.3	83.0	13.9	82.1	6.9	83.1	14.0

Less Stable F1: /ʊ/ (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	86.4	5.4	90.4	4.1	85.4	10.3	93.0	4.7	88.7	5.1	91.0	6.0	93.7	6.0	93.8	3.4	96.1	4.0	94.4	1.2	92.4	6.2	92.4	7.3	86.4	3.3	93.7	1.5	88.1	5.3
CSS	94.0	6.2	83.4	4.4	83.8	11.8	91.3	4.9	94.6	6.4	92.6	4.2	87.1	12.6	86.9	8.2	93.2	6.4	88.3	8.2	91.6	5.0	88.5	3.7	89.2	5.5	83.0	11.7	90.6	4.4
Female																														
VT1	86.0	6.4	87.2	7.9	86.7	4.8	90.0	9.3	96.0	2.7	87.7	7.5	89.1	9.8	91.5	6.0	92.7	2.3	94.6	2.7	94.8	0.5	93.0	4.9	94.4	3.9	92.9	4.4	86.2	12.0
CSS	81.9	10.3	87.5	3.6	86.4	7.8	89.8	3.9	88.8	7.4	84.1	11.4	84.2	16.3	94.3	5.8	85.3	2.1	92.3	5.6	90.1	7.1	89.5	5.4	86.9	7.5	85.4	17.0	75.4	12.7
Both																														
VT1	86.2	5.6	88.8	6.1	86.0	7.6	91.6	6.8	92.4	5.4	89.5	6.5	91.4	8.1	92.6	4.7	94.4	3.6	94.5	2.0	93.6	4.3	92.7	5.9	90.4	5.4	93.3	3.1	87.2	8.8
CSS	87.1	10.4	84.9	4.4	85.1	9.4	90.7	4.2	91.7	7.2	88.8	8.8	85.3	14.1	91.1	7.6	89.7	6.3	90.3	6.9	90.9	5.7	89.0	4.2	87.9	6.4	84.2	13.8	82.2	12.3

Less Stable F1: /ɑ/ (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	91.1	5.8	91.1	7.4	79.8	14.8	92.9	2.2	88.4	9.1	95.1	2.2	90.9	11.4	93.9	3.4	91.6	1.7	95.6	2.6	92.0	5.2	96.6	1.9	94.4	2.9	96.1	1.5	92.3	2.9
CSS	73.2	17.7	78.4	22.6	74.0	17.4	88.7	8.5	80.6	15.7	85.1	4.3	81.3	13.3	86.4	6.3	81.8	8.0	90.5	3.1	89.7	7.9	93.2	4.4	91.0	6.3	90.8	2.8	87.4	7.5
Female																														
VT1	88.1	15.2	83.0	15.7	93.8	3.3	84.3	4.2	89.8	5.2	93.7	1.6	94.2	1.3	97.4	2.0	94.2	3.0	95.2	1.2	90.8	3.3	96.0	3.5	96.1	0.8	93.5	3.9	92.2	4.8
CSS	81.2	15.9	85.0	11.2	91.8	8.5	88.3	10.9	68.2	22.8	80.6	15.5	89.3	3.2	81.3	6.7	84.1	5.9	87.8	9.6	81.2	12.8	84.5	5.6	87.5	5.2	87.7	3.0	91.7	9.2
Both																														
VT1	89.8	10.3	87.5	11.7	86.8	12.5	89.1	5.5	89.1	7.0	94.4	2.0	92.5	7.8	95.4	3.3	93.0	2.7	95.4	1.9	91.4	4.1	96.3	2.8	95.2	2.2	94.8	3.1	92.2	3.7
CSS	76.8	16.4	81.7	17.2	82.0	16.3	88.5	9.2	74.4	19.6	82.9	11.0	85.3	10.0	83.8	6.7	83.1	6.5	89.2	6.9	85.0	11.2	88.9	6.6	89.2	5.8	89.2	3.2	89.5	8.3

Less Stable F2: /i/ (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	92.0	3.4	69.9	21.7	90.5	4.0	85.9	20.9	97.3	1.1	96.3	1.4	97.1	1.0	75.2	31.4	98.1	0.9	97.8	1.2	96.8	2.8	97.7	1.0	97.4	0.9	96.8	1.4	97.6	1.0
CSS	85.5	14.9	90.5	8.6	97.4	1.2	91.9	5.8	93.6	5.7	95.6	2.6	89.4	9.7	91.8	6.0	93.2	2.9	94.7	1.3	92.4	6.2	95.1	2.5	85.1	13.7	91.6	4.4	92.0	5.7
Female																														
VT1	95.2	2.8	73.1	29.0	90.5	3.8	79.0	38.4	96.9	1.7	97.2	1.4	97.5	1.2	97.2	0.6	97.3	2.1	96.2	1.7	97.8	1.4	98.4	0.5	97.5	1.4	98.5	0.9	97.8	0.9
CSS	87.1	11.0	89.6	7.4	90.0	3.8	87.8	11.5	91.9	2.4	88.7	10.3	92.5	6.4	87.2	9.6	89.6	10.6	92.1	7.1	88.5	6.5	90.0	6.9	91.1	3.6	93.5	5.7	92.4	6.2
Both																														
VT1	93.6	3.4	71.5	24.2	90.5	3.7	82.1	30.3	97.1	1.4	96.7	1.4	97.3	1.0	86.2	23.9	97.7	1.6	97.0	1.6	97.3	2.0	98.0	0.8	97.5	1.1	97.7	1.4	97.7	0.9
CSS	86.4	12.0	90.0	7.6	93.7	4.7	89.9	8.9	92.8	4.2	92.1	8.0	91.0	7.9	89.5	7.9	91.4	7.6	93.4	5.0	90.4	6.3	92.6	5.6	88.1	10.0	92.5	4.9	92.2	5.6

Less Stable F2: /æ/ (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	94.5	4.5	96.4	1.3	90.9	7.5	94.5	2.0	92.6	3.9	94.1	2.7	96.8	1.4	95.4	2.8	96.3	2.2	97.5	1.4	96.4	2.0	97.3	1.1	96.8	0.7	97.4	0.6	95.8	1.6
CSS	84.8	12.3	91.2	5.6	92.3	4.9	94.8	3.2	82.3	4.0	92.4	1.5	87.3	5.0	93.5	3.3	92.7	2.3	84.6	9.8	88.1	5.4	90.5	8.5	90.9	4.1	90.1	2.3	84.4	9.2
Female																														
VT1	94.7	2.7	94.6	3.0	94.8	3.6	94.4	2.8	97.3	1.2	97.2	0.5	96.8	1.0	95.5	1.1	97.4	0.6	97.7	0.6	96.5	2.1	96.4	0.7	97.0	1.0	97.3	1.3	96.2	0.8
CSS	91.0	8.7	91.8	6.0	86.1	10.1	89.2	9.7	93.2	5.6	91.4	1.9	89.5	5.0	84.7	7.1	92.6	5.7	88.6	5.3	89.7	3.9	94.6	3.3	90.8	7.6	88.5	5.5	91.4	2.8
Both																														
VT1	94.6	3.5	95.5	2.4	92.9	5.9	94.5	2.2	95.0	3.7	95.7	2.5	96.8	1.2	95.4	2.0	96.8	1.7	97.6	1.0	96.5	1.9	96.8	1.0	96.9	0.8	97.4	0.9	96.0	1.2
CSS	87.9	10.5	91.5	5.5	89.2	8.2	92.0	7.4	87.7	7.3	91.9	1.7	88.4	4.9	89.1	7.0	92.6	4.1	86.6	7.7	88.9	4.5	92.6	6.5	90.8	5.7	89.3	4.1	87.5	7.7

Less Stable F2: /ʊ/ (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	92.5	5.1	91.0	5.2	87.8	8.0	91.2	1.5	88.2	4.1	89.9	6.8	87.2	2.9	94.1	4.2	94.4	3.5	90.4	6.2	95.3	1.1	95.5	2.5	96.1	3.3	95.4	2.1	95.7	1.8
CSS	64.6	5.2	74.5	10.2	87.2	14.8	85.8	9.8	84.0	7.7	85.7	12.0	86.6	8.1	84.6	8.2	89.3	7.9	75.3	12.5	77.5	7.1	76.7	13.7	85.7	13.4	79.1	12.5	79.7	8.8
Female																														
VT1	86.2	12.2	83.5	10.5	83.9	7.9	92.1	3.2	91.8	4.1	90.8	5.0	90.4	1.9	92.5	4.1	91.9	3.6	95.6	2.2	95.6	1.3	94.3	1.9	94.1	3.2	92.5	5.5	93.8	4.2
CSS	77.3	14.9	86.5	7.7	83.6	16.5	75.6	6.3	87.5	7.5	79.4	10.0	75.4	10.2	79.7	7.1	69.9	17.3	87.9	9.5	75.7	13.7	78.2	11.9	65.7	14.4	84.3	6.8	74.8	11.0
Both																														
VT1	89.3	9.4	87.3	8.8	85.8	7.7	91.6	2.3	90.0	4.3	90.3	5.7	88.8	2.9	93.3	4.0	93.2	3.6	93.0	5.2	95.4	1.2	94.9	2.2	95.1	3.2	93.9	4.2	94.7	3.2
CSS	71.9	12.9	79.0	10.7	85.4	14.7	81.4	9.5	85.7	7.4	82.9	11.0	79.6	10.6	81.8	7.6	80.7	15.7	81.6	12.4	76.7	9.8	77.4	12.1	74.6	16.8	81.7	9.9	77.0	9.8

Less Stable F2: /ɑ/ (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	94.4	2.6	93.4	4.2	91.6	5.5	92.7	3.9	93.7	1.6	94.8	2.7	87.7	12.0	94.2	3.0	95.9	0.7	94.3	2.0	95.2	1.4	97.4	1.1	97.5	0.9	97.7	0.5	94.9	2.5
CSS	90.4	3.0	93.1	4.2	90.6	5.8	89.3	3.2	92.2	4.7	89.6	8.6	83.9	7.5	85.9	19.2	87.1	8.8	93.6	3.5	89.3	8.5	92.0	4.5	92.0	5.3	92.2	5.5	84.7	7.9
Female																														
VT1	94.7	2.7	89.2	3.6	93.4	5.9	95.1	2.3	95.2	2.8	94.9	2.2	95.1	3.9	96.4	1.7	94.9	1.6	94.1	3.5	95.8	1.6	95.6	2.5	95.7	1.0	97.4	0.5	94.0	3.1
CSS	92.2	3.4	90.9	6.1	89.9	6.7	90.2	7.3	76.0	22.6	88.9	8.3	90.7	4.4	82.8	13.6	91.2	4.5	91.9	4.7	85.5	3.7	88.7	3.8	93.1	5.9	88.7	4.0	87.6	8.3
Both																														
VT1	94.5	2.5	91.6	4.3	92.5	5.5	93.8	3.3	94.4	2.3	94.8	2.3	91.4	9.2	95.2	2.6	95.4	1.3	94.2	2.7	95.5	1.4	96.4	2.1	96.6	1.3	97.6	0.5	94.4	2.7
CSS	91.2	3.1	92.0	5.0	90.3	5.8	89.7	5.3	84.1	17.6	89.2	7.9	87.3	6.8	84.3	15.7	89.4	6.6	92.7	4.0	87.2	6.2	90.3	4.3	92.6	5.3	90.5	4.9	86.1	7.8

Less Stable Vowel Duration: Corners (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT1	68.9	11.8	71.0	9.1	76.7	4.3	78.9	11.1	79.7	7.3	77.3	5.7	81.9	3.6	81.4	2.3	83.5	3.4	85.3	2.9	85.8	4.3	85.8	4.7	89.0	3.0	85.1	6.8	86.0	4.2
CSS	36.4	31.8	43.3	21.0	28.3	31.1	57.4	10.2	28.2	9.5	53.3	4.2	48.1	7.6	32.1	21.1	26.9	15.1	31.3	19.8	41.0	12.5	46.5	3.5	38.7	17.7	45.3	9.5	36.4	11.2
Female																														
VT1	68.3	7.0	71.7	6.7	67.7	9.3	76.5	10.7	82.1	6.5	82.7	2.7	81.1	5.3	80.3	4.2	85.1	2.0	83.1	5.0	87.7	3.8	83.7	4.1	88.5	2.7	85.0	3.4	83.8	4.7
CSS	43.2	18.5	50.8	8.3	39.5	14.1	34.4	12.2	40.2	17.8	39.8	8.7	51.3	4.9	32.9	16.5	45.2	5.5	30.3	16.3	42.8	7.7	29.4	17.1	51.3	6.5	33.5	23.6	32.6	13.3
Both																														
VT1	68.6	9.2	71.3	7.5	72.2	8.3	77.7	10.3	80.9	6.6	80.0	5.1	81.5	4.3	80.8	3.2	84.3	2.8	84.2	4.0	86.8	3.9	84.7	4.3	88.8	2.7	85.0	5.1	88.1	2.6
CSS	39.8	24.8	46.1	16.9	33.9	23.5	45.9	16.1	34.2	14.9	46.6	9.6	49.7	6.3	32.5	17.9	36.0	14.4	30.8	17.1	41.9	9.8	38.0	14.7	45.0	14.2	39.4	18.1	40.2	8.2

Less Stable Vowel Duration: Non-Rhotic Mids (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT2	63.0	8.0	72.7	4.2	62.0	8.4	66.6	8.3	67.7	3.6	68.8	5.6	70.4	5.5	76.6	3.1	75.8	5.5	82.6	4.0	78.2	4.0	81.7	2.7	80.0	5.2	77.4	7.5	78.4	3.9
CSS	51.3	5.1	33.5	8.7	35.9	25.1	46.9	8.9	39.0	5.4	44.2	13.3	50.9	5.5	32.8	20.3	41.8	7.4	42.7	9.7	38.4	14.5	39.0	4.4	37.0	10.9	36.4	13.7	44.9	5.7
Female																														
VT2	53.9	15.9	68.7	4.1	58.0	6.7	67.4	9.1	69.7	4.9	74.7	4.7	73.8	5.1	75.2	2.9	75.6	1.3	74.6	2.6	80.7	2.9	81.6	2.7	77.1	5.4	78.3	1.7	74.6	4.9
CSS	49.5	6.3	39.1	23.4	30.7	25.3	37.0	14.0	46.9	12.7	45.3	8.8	44.5	13.4	42.1	5.1	30.2	13.2	38.1	12.0	42.0	5.0	30.4	24.4	42.1	8.9	41.5	15.8	45.2	14.4
Both																														
VT2	58.5	12.8	70.7	4.4	60.0	7.5	67.0	8.2	68.7	4.2	71.8	5.8	72.1	5.3	75.9	3.0	75.7	3.7	78.6	5.3	79.4	3.5	81.7	2.6	78.6	5.2	77.4	7.5	76.5	4.6
CSS	50.4	5.5	36.3	16.9	33.3	23.9	41.9	12.2	42.9	10.1	44.8	10.6	47.4	10.6	37.4	14.8	36.0	11.8	40.4	10.6	40.2	10.4	34.7	17.1	39.5	9.8	36.4	13.7	45.1	10.3

Less Stable Vowel Duration: Phonemic Diphthongs (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT2	60.2	8.7	69.2	0.3	65.9	10.7	64.5	15.0	65.4	8.7	66.9	5.6	70.7	9.3	70.7	7.1	69.2	13.6	76.6	5.0	73.5	4.2	74.5	3.7	78.5	8.6	73.8	8.2	77.6	7.5
CSS	32.1	15.6	53.7	24.0	52.8	9.8	56.1	4.5	44.7	16.1	42.5	23.6	55.2	11.0	47.3	8.1	38.1	22.4	44.3	11.2	51.8	9.3	38.6	16.0	46.3	11.9	52.5	13.8	48.2	10.0
Female																														
VT2	44.0	12.8	70.2	8.7	53.0	14.3	68.4	14.7	70.2	3.1	68.4	5.0	69.4	8.0	69.2	12.3	67.2	10.2	64.5	6.4	78.5	5.7	71.1	3.9	74.7	7.5	72.4	7.7	68.6	5.0
CSS	42.4	12.1	65.1	12.0	50.8	9.3	46.2	13.1	53.9	23.6	55.1	17.7	49.1	13.0	58.8	18.2	50.5	16.1	54.2	16.0	47.5	10.4	50.4	31.7	51.0	13.7	49.5	21.9	51.5	4.8
Both																														
VT2	52.1	13.4	69.7	5.8	59.5	13.7	66.5	14.2	67.8	6.7	67.6	5.1	70.1	8.2	69.9	9.5	68.2	11.4	70.5	8.4	76.0	5.4	72.8	4.0	76.6	7.8	73.1	7.5	73.1	7.6
CSS	37.2	14.2	59.4	18.9	51.8	9.1	51.1	10.6	49.3	19.7	48.8	20.7	52.2	11.8	53.1	14.6	44.3	19.5	49.2	14.1	49.7	9.6	44.5	24.5	48.7	12.3	51.0	17.3	49.8	7.6

Less Stable Rhotic Distortions: F3-F2 (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT2	66.8	27.3	71.7	**22.2**	88.3	7.6	82.1	8.8	77.1	9.4	63.7	43.0	78.2	11.3	60.9	22.9	92.7	5.1	68.6	16.6	75.8	20.9	74.7	16.3	82.5	18.0	74.3	17.2	82.0	9.4
RSTR	*	*	*	*	*	*	56.5	32.7	65.8	22.3	67.8	12.7	59.2	34.9	81.0	7.1	76.9	7.1	84.2	3.1	78.4	7.1	86.2	3.9	80.2	2.2	87.1	4.4	80.2	5.7
CSS	77.5	1.6	88.1	6.9	81.4	8.8	75.3	10.4	69.6	14.7	52.3	45.7	57.7	15.3	64.5	14.7	36.8	10.6	79.7	15.5	55.7	16.3	69.1	28.0	39.1	25.3	78.5	13.9	70.5	24.3
Female																														
VT2	79.4	15.7	80.1	20.0	75.3	15.6	72.7	6.6	69.7	29.9	73.4	9.7	96.4	7.1	91.5	4.9	89.7	14.7	79.6	10.9	82.2	17.9	89.4	10.1	90.2	8.7	87.1	15.3	82.2	18.7
RSTR	*	*	*	*	*	*	80.2	10.0	74.5	9.1	76.7	12.3	62.0	39.7	83.1	1.6	83.3	0.7	83.5	8.4	82.1	4.8	88.5	3.5	77.8	2.2	82.5	7.8	80.6	3.3
CSS	60.7	3.8	80.6	2.0	67.6	3.0	60.7	13.8	65.9	11.1	61.0	3.5	45.8	27.9	76.3	8.4	70.4	18.4	61.4	15.8	70.6	24.3	68.1	12.7	75.6	11.6	70.4	17.2	32.3	36.2
Both																														
VT2	74.0	20.4	76.4	20.1	81.0	13.8	78.6	8.9	73.4	21.3	68.6	29.8	87.3	13.1	76.2	22.5	91.2	10.5	74.1	14.4	79.0	18.6	82.8	14.5	85.9	14.4	80.0	16.8	82.1	14.0
RSTR	*	*	*	*	*	*	68.4	26.0	70.6	15.8	72.3	12.7	60.6	35.3	82.0	5.0	80.1	5.8	83.9	6.0	80.3	6.1	87.3	3.7	79.0	2.4	84.8	6.4	80.4	4.4
CSS	66.3	9.2	85.1	6.4	74.5	9.6	69.1	13.4	67.6	12.1	57.3	26.9	52.4	21.2	70.4	12.8	57.8	23.0	69.5	17.5	63.1	20.7	68.6	20.5	57.3	26.7	74.9	15.0	51.4	35.4

Less Stable Rhotic Distortions: F3/F2 (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT2	91.1	11.9	93.3	7.1	97.1	3.2	95.2	2.0	92.5	1.8	87.6	17.1	93.4	5.8	92.3	6.7	98.2	0.9	95.1	2.9	94.7	4.6	95.8	2.9	97.4	2.6	96.1	2.4	96.9	2.1
RSTR	*	*	*	*	*	*	90.5	6.0	91.1	6.0	91.9	4.4	89.0	13.0	96.1	2.2	96.1	0.9	97.0	0.5	95.5	1.5	97.2	0.7	95.9	0.6	97.3	1.1	96.1	1.0
CSS	93.3	6.7	95.2	1.6	91.8	3.7	92.1	3.4	87.8	6.0	85.1	14.7	90.2	3.5	92.1	2.6	80.4	2.6	94.8	1.6	87.7	6.6	90.6	11.9	81.3	10.0	94.9	3.6	92.5	6.5
Female																														
VT2	89.5	9.2	93.4	4.6	94.1	3.0	96.0	1.2	89.7	13.3	96.6	1.0	99.1	0.9	98.3	1.1	98.2	2.3	96.6	1.4	96.6	2.8	98.2	1.6	98.2	1.3	97.5	2.2	96.0	5.2
RSTR	*	*	*	*	*	*	94.8	1.9	93.4	2.7	95.1	3.7	90.5	12.5	96.4	1.2	96.9	0.7	97.0	1.9	96.4	1.3	97.9	0.8	95.9	0.8	96.2	1.6	96.7	1.2
CSS	86.4	2.6	94.7	2.0	89.9	3.6	82.4	9.2	91.1	4.6	89.0	3.9	81.0	17.5	93.3	4.6	92.2	5.9	88.7	8.1	93.4	5.3	93.3	4.9	94.2	3.9	92.5	4.7	82.1	12.1
Both																														
VT2	90.2	9.5	93.4	5.4	95.4	3.3	95.5	1.7	91.1	9.1	92.1	12.4	96.3	4.9	95.3	5.5	98.2	1.7	96.0	2.5	95.6	3.7	97.1	2.5	97.8	2.0	96.8	2.3	96.4	3.8
RSTR	*	*	*	*	*	*	92.6	4.8	92.4	4.3	93.5	4.2	89.8	12.0	96.2	1.7	96.5	0.9	96.8	1.0	95.9	1.4	97.5	0.8	95.9	0.6	96.8	1.4	96.4	1.1
CSS	88.7	5.1	95.0	1.5	90.9	3.5	87.9	7.8	89.6	5.2	87.3	9.2	86.1	12.0	92.7	3.5	87.8	7.7	91.4	6.6	90.6	6.3	92.0	8.7	87.8	9.9	93.8	4.1	87.3	10.7

Less Stable Vowel Errors: Targets (%)

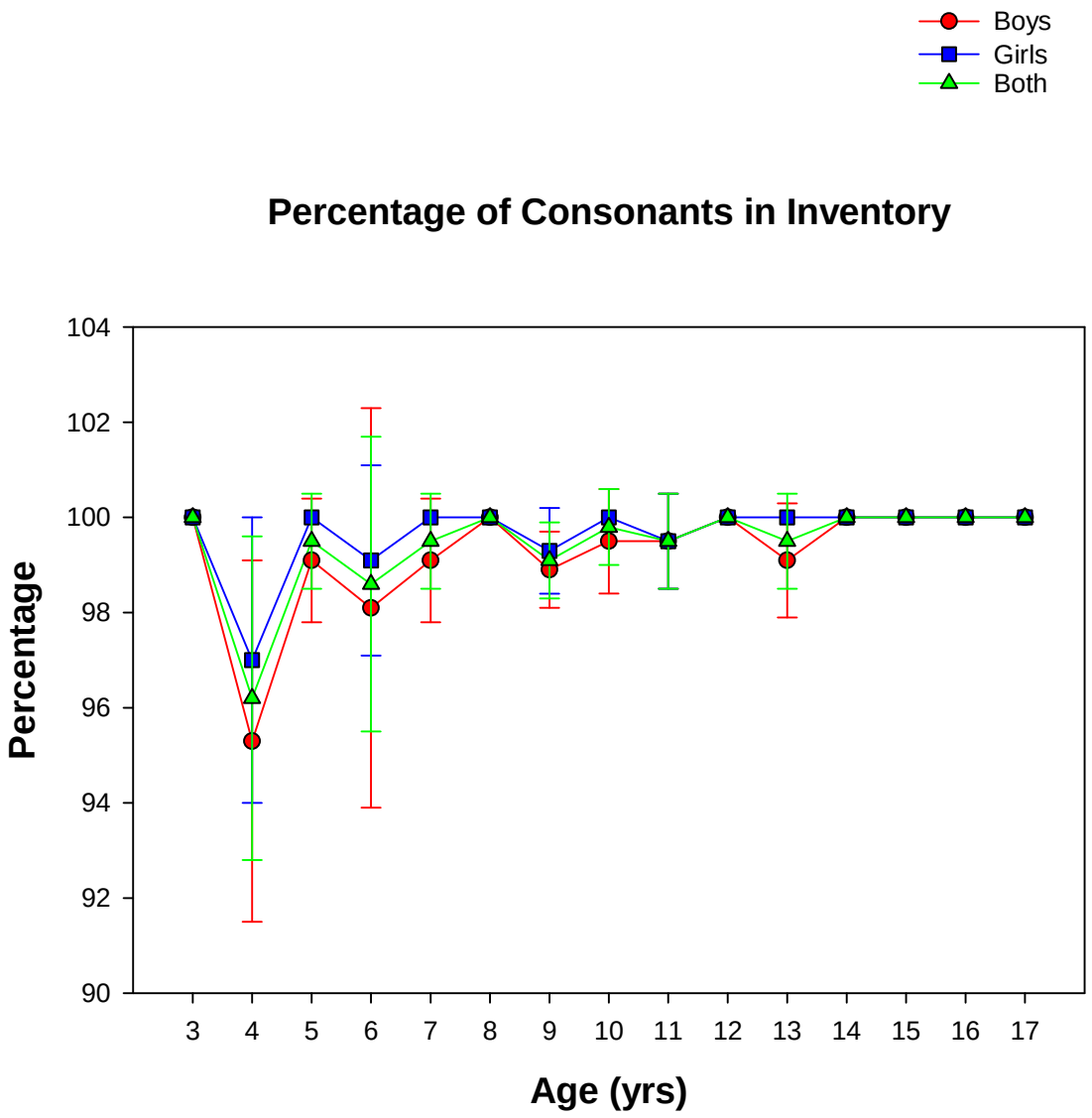
Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT12	33.0	0.0	**33.3**	*	41.7	*	41.7	11.8	75.0	35.4	*	*	33.3	0.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
CWT	73.0	*	75.2	5.9	69.6	6.6	52.2	29.9	72.8	2.8	70.3	7.5	73.0	*	74.3	0.0	63.7	*	*	*	61.8	12.2	*	*	61.1	*	*	*	67.7	9.3
MWT	85.5	*	59.8	26.1	65.9	18.2	80.8	9.4	*	*	85.8	*	85.5	*	78.9	9.3	*	*	*	*	*	*	81.4	*	*	*	*	*	*	*
VT3	39.3	*	*	*	*	*	36.7	*	*	*	33.3	*	*	*	*	*	33.3	*	75.0	35.4	75.0	35.4	*	*	66.7	47.1	100.0	0.0	*	*
CSS	*	*	*	*	*	*	33.3	*	*	*	*	*	39.3	*	*	*	*	*	*	*	*	*	33.3	*	*	*	*	*	55.6	38.5
Female																														
VT12	*	*	100.0	0.0	100.0	*	100.0	*	*	*	*	*	*	*	*	*	50.0	*	*	*	*	*	*	*	*	*	*	*	*	*
CWT	79.2	6.9	65.0	21.2	74.3	0.0	61.9	24.8	76.9	3.6	73.6	1.5	79.2	6.9	77.0	3.6	84.1	*	*	*	*	*	*	*	76.8	4.4	*	*	81.9	*
MWT	*	*	57.5	28.4	57.4	*	83.8	2.4	79.2	8.9	*	*	*	*	*	*	85.5	*	*	*	*	*	*	*	*	*	*	*	*	*
VT3	50.0	*	*	*	*	*	50.0	0.0	*	*	41.7	11.8	50.0	*	*	*	*	*	100.0	*	*	*	*	*	*	*	33.3	0.0	*	*
CSS	*	*	63.3	32.1	100.0	0.0	46.8	23.3	40.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	50.0	*	*	*	33.3	*
Both																														
VT12	33.0	0.0	77.8	38.5	70.8	41.2	61.1	34.7	75.0	35.4	*	*	33.3	0.0	*	*	50.0	*	*	*	*	*	*	*	*	*	*	*	*	*
CWT	77.1	6.0	69.5	16.4	72.0	4.7	58.7	23.9	75.1	3.7	72.1	5.0	77.1	6.0	76.1	3.1	73.9	14.4	*	*	61.8	12.2	*	*	72.9	8.6	*	*	72.4	10.5
MWT	85.5	*	58.6	25.3	63.8	15.4	81.8	7.5	79.2	8.9	85.8	*	85.5	*	78.9	9.3	85.5	*	*	*	*	*	81.4	*	*	*	*	*	*	*
VT3	50.0	*	*	*	*	*	45.6	7.7	*	*	38.9	9.6	50.0	*	*	*	33.3	*	83.3	28.9	75.0	35.4	33.3	*	*	*	66.7	38.5	*	*
CSS	39.3	*	63.3	32.1	100.0	0.0	43.4	20.2	40.0	*	*	*	39.3	*	*	*	*	*	*	*	*	*	*	*	61.1	34.7	*	*	50.0	33.3

Less Stable Vowel Errors: Error Types (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT12	**80.0**	**44.7**	**100.0**	*	100.0	*	100.0	0.0	100.0	0.0	*	*	100.0	0.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
CWT	50.1	13.9	100.0	0.0	68.8	44.2	26.3	10.0	55.6	38.5	83.3	33.3	100.0	*	100.0	0.0	100.0	*	*	*	100.0	0.0	*	*	100.0	*	*	*	100.0	0.0
MWT	15.0	10.0	13.3	16.3	25.8	35.8	5.8	11.7	*	*	100.0	*	0.0	*	8.3	11.8	*	*	*	*	*	*	0.0	*	*	*	*	*	*	*
VT3	*	*	*	*	*	*	83.3	*	*	*	100.0	*	*	*	*	*	100.0	*	100.0	*	100.0	0.0	100.0	*	100.0	0.0	100.0	0.0	100.0	0.0
CSS	100.0	0.0	*	*	*	*	100.0	*	*	*	*	*	33.3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Female																														
VT12	83.3	28.9	100.0	0.0	100.0	*	100.0	*	*	*	*	*	*	*	*	*	100.0	*	*	*	*	*	*	*	*	*	*	*	*	*
CWT	75.7	23.4	77.9	30.3	100.0	0.0	83.8	32.5	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	*	*	*	*	*	*	*	100.0	0.0	*	*	100.0	*
MWT	13.7	15.1	21.5	31.5	22.2	*	31.3	44.2	25.0	35.4	*	*	*	*	*	*	0.0	*	*	*	*	*	*	*	*	*	*	*	*	*
VT3	*	*	*	*	*	*	100.0	0.0	*	*	100.0	0.0	*	*	*	*	*	*	100.0	*	*	*	*	*	100.0	*	100.0	0.0	*	*
CSS	100.0	*	83.3	28.9	100.0	0.0	77.8	38.5	100.0	*	*	*	100.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	100.0	*
Both																														
VT12	81.3	37.2	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	*	*	100.0	0.0	*	*	100.0	*	*	*	*	*	*	*	*	*	*	*	*	*
CWT	64.3	23.0	87.7	24.4	84.4	31.3	64.6	39.2	81.0	32.5	92.6	22.2	100.0	0.0	100.0	0.0	100.0	0.0	*	*	100.0	0.0	*	*	100.0	0.0	*	*	100.0	0.0
MWT	14.4	12.1	17.4	23.6	24.9	29.3	14.3	25.4	25.0	35.4	100.0	*	0.0	*	8.3	11.8	0.0	*	*	*	*	*	0.0	*	*	*	*	*	*	*
VT3	*	*	*	*	*	*	94.4	9.6	*	*	100.0	0.0	100.0	*	*	*	100.0	*	100.0	0.0	100.0	0.0	100.0	*	100.0	0.0	100.0	0.0	100.0	0.0
CSS	100.0	0.0	83.3	28.9	100.0	0.0	83.3	33.3	100.0	*	*	*	33.3	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

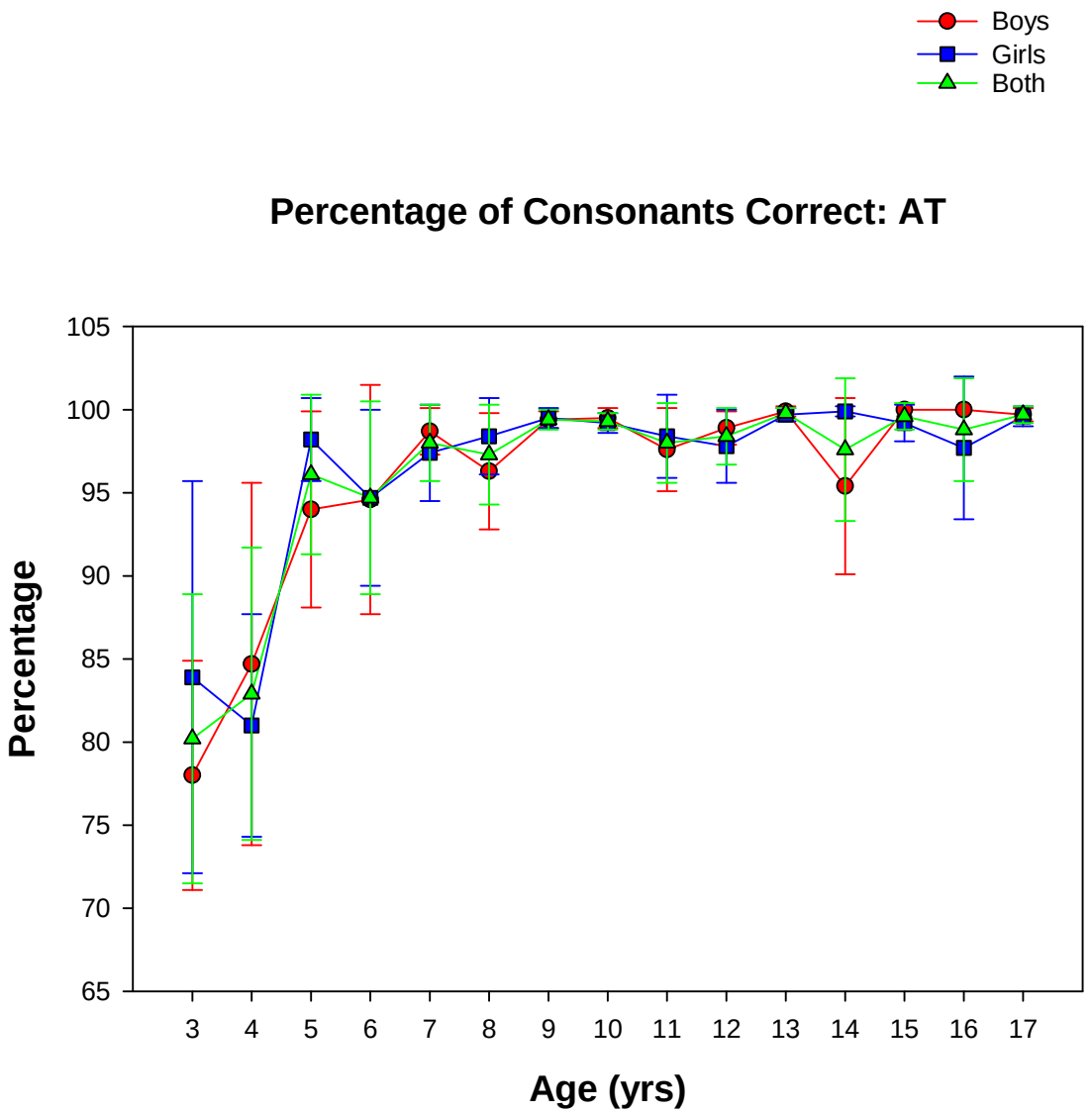
Percentage of Consonants in Inventory (%)

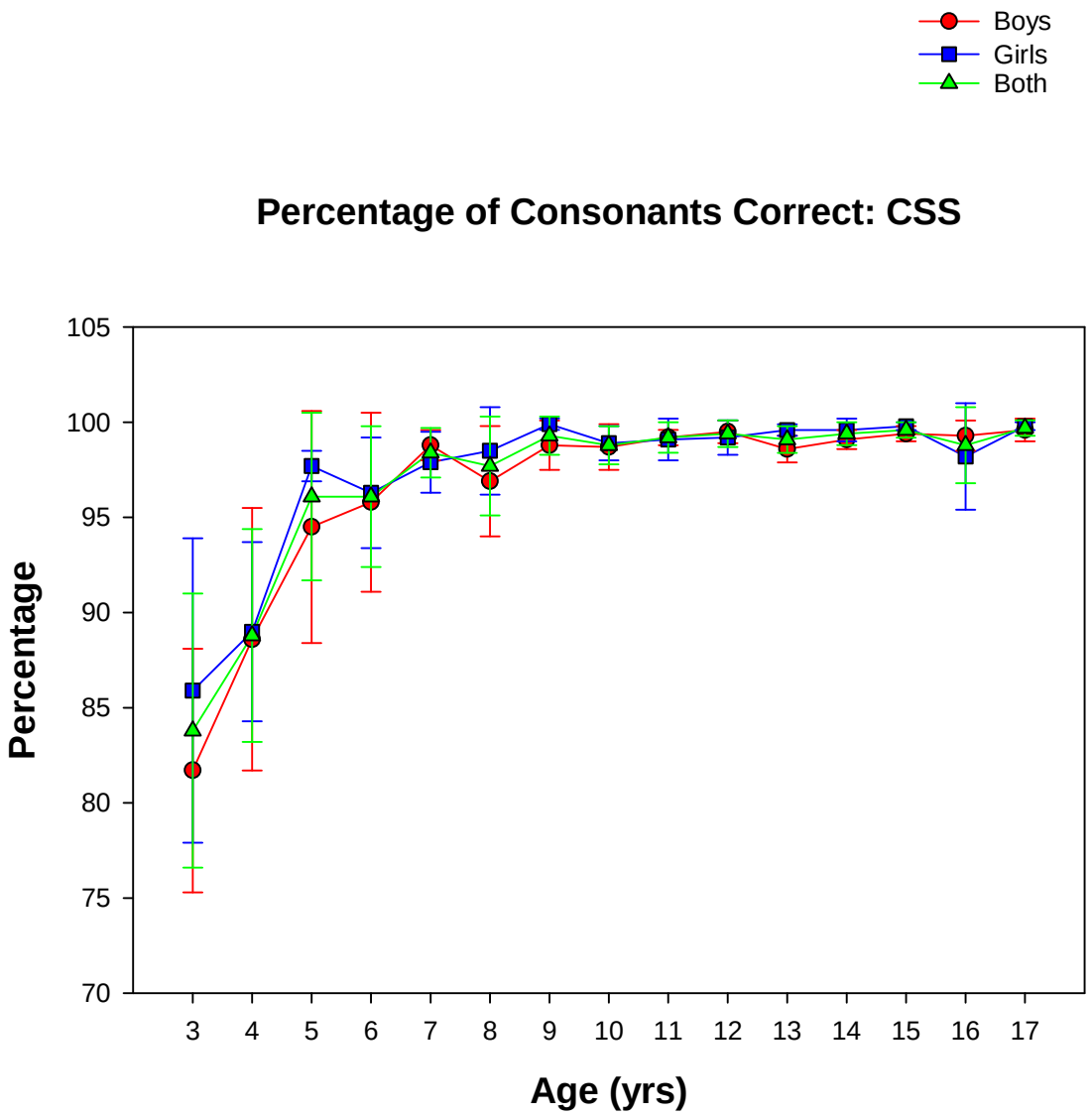
Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	100.0	0.0	95.3	3.8	99.1	1.3	98.1	4.2	99.1	1.3	100.0	0.0	98.9	0.8	99.5	1.1	99.5	1.0	100.0	0.0	99.1	1.2	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
Female																														
CSS	100.0	0.0	97.0	3.0	100.0	0.0	99.1	2.0	100.0	0.0	100.0	0.0	99.3	0.9	100.0	0.0	99.5	1.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
Both																														
CSS	100.0	0.0	96.2	3.4	99.5	1.0	98.6	3.1	99.5	1.0	100.0	0.0	99.1	0.8	99.8	0.8	99.5	1.0	100.0	0.0	99.5	1.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0


Boys
Girls
Both
Percentage of Consonants in Inventory
104
102
100
98
96
94
92
90
Percentage
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

Percentage of Consonants Correct (%)

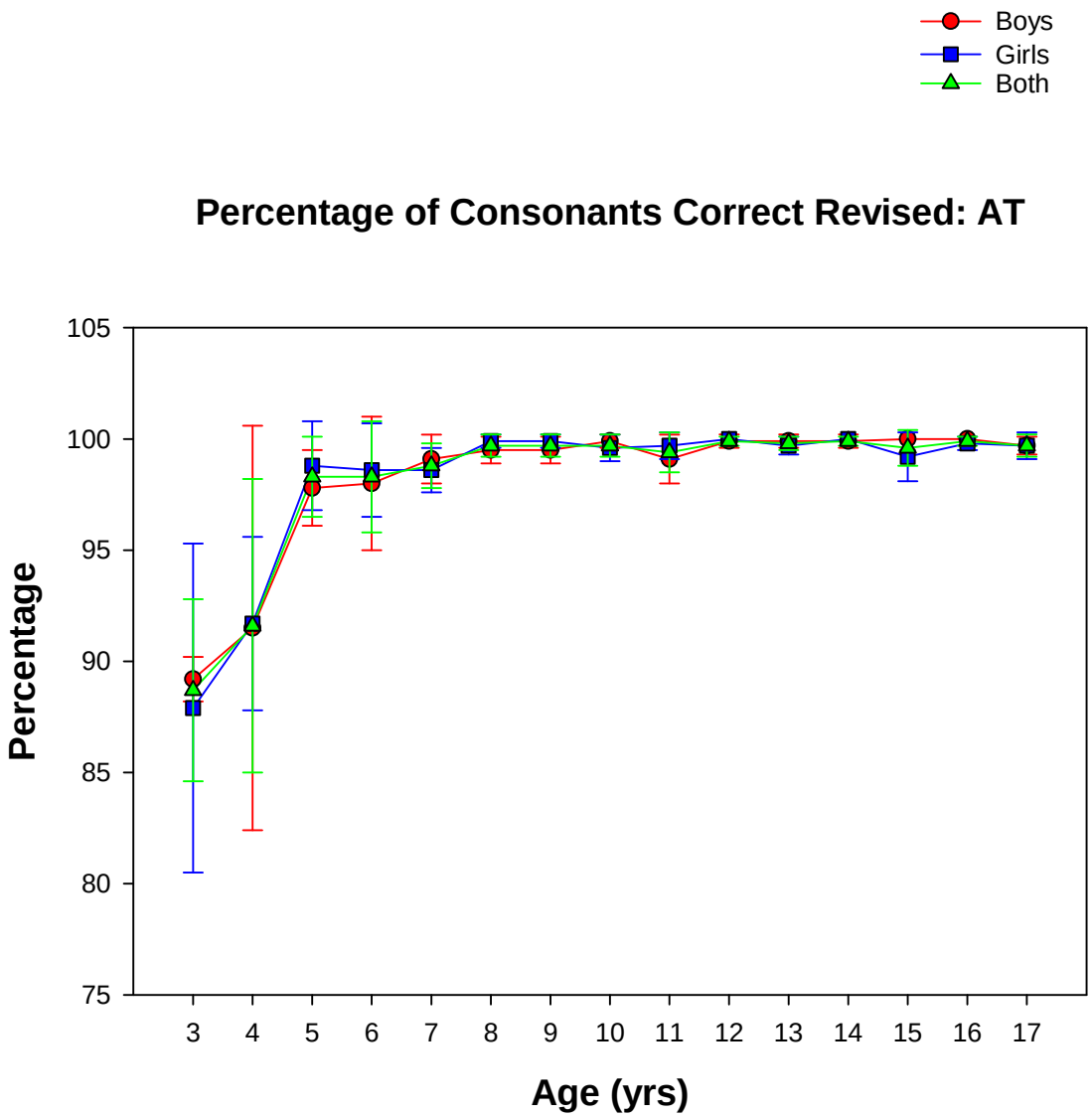
Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
AT	78.0	6.9	84.7	10.9	94.0	5.9	94.6	6.9	98.7	1.4	96.3	3.5	99.4	0.5	99.5	0.6	97.6	2.5	98.9	1.0	99.9	0.3	95.4	5.3	100.0	0.0	100.0	0.0	99.7	0.4
CSS	81.7	6.4	88.6	6.9	94.5	6.1	95.8	4.7	98.8	0.8	96.9	2.9	98.8	1.3	98.7	1.2	99.2	0.4	99.5	0.6	98.6	0.7	99.1	0.5	99.4	0.4	99.3	0.8	99.6	0.6
Female																														
AT	83.9	11.8	81.0	6.7	98.2	2.5	94.7	5.3	97.4	2.9	98.4	2.3	99.5	0.6	99.2	0.6	98.4	2.5	97.8	2.2	99.7	0.4	99.9	0.3	99.2	1.1	97.7	4.3	99.6	0.6
CSS	85.9	8.0	89.0	4.7	97.7	0.8	96.3	2.9	97.9	1.6	98.5	2.3	99.9	0.3	98.9	0.9	99.1	1.1	99.2	0.9	99.6	0.3	99.6	0.6	99.8	0.2	98.2	2.8	99.8	0.2
Both																														
AT	80.2	8.7	82.9	8.8	96.1	4.8	94.7	5.8	98.0	2.3	97.3	3.0	99.4	0.6	99.3	0.5	98.0	2.4	98.4	1.7	99.8	0.3	97.6	4.3	99.6	0.8	98.8	3.1	99.7	0.5
CSS	83.8	7.2	88.8	5.6	96.1	4.4	96.1	3.7	98.4	1.3	97.7	2.6	99.3	1.0	98.8	1.0	99.2	0.8	99.4	0.7	99.1	0.7	99.4	0.6	99.6	0.4	98.8	2.0	99.7	0.4

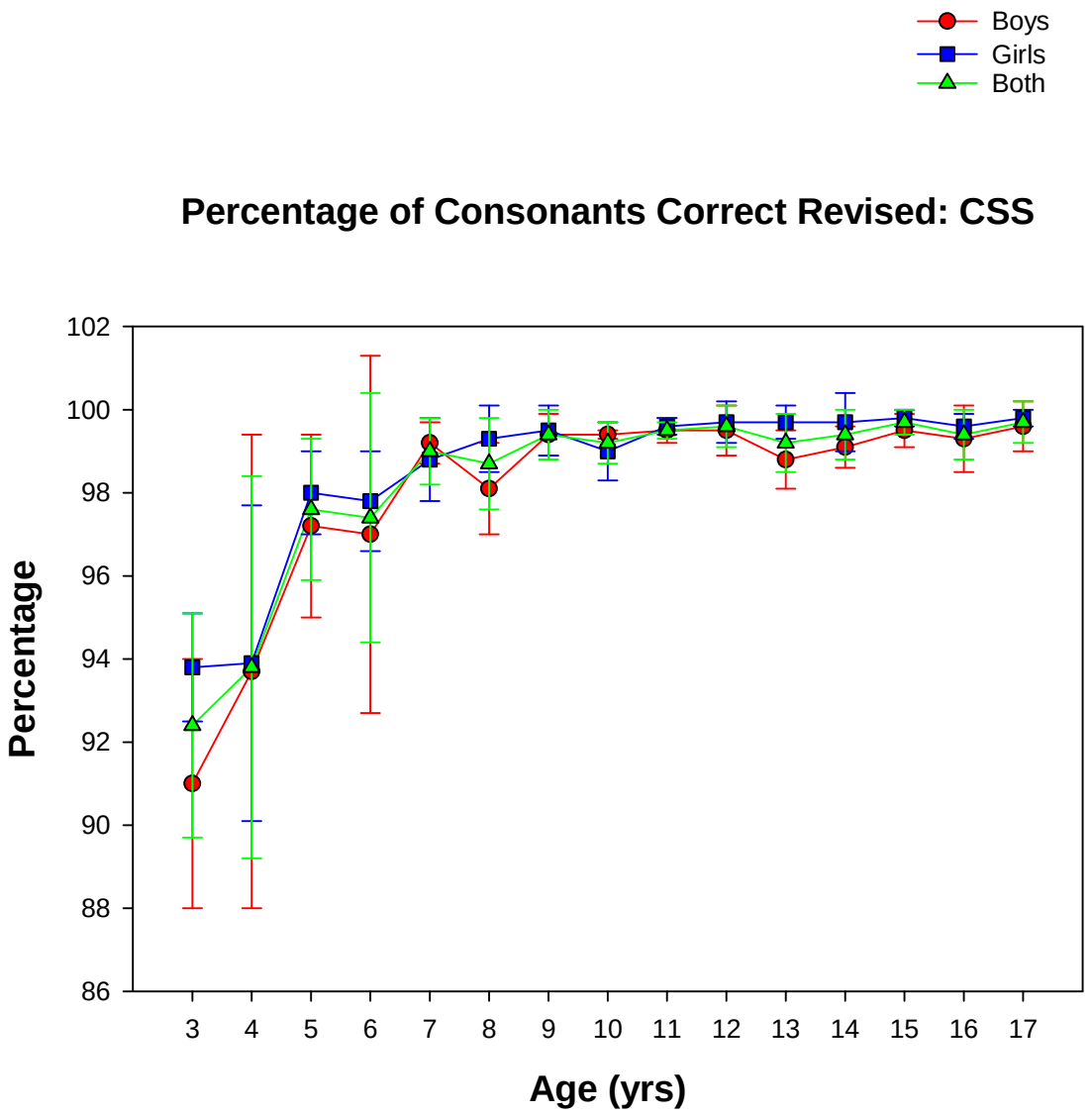

Boys
Girls
Both
Percentage of Consonants Correct: AT
105
100
95
90
85
80
75
70
65
Percentage
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)


Boys
Girls
Both
Percentage of Consonants Correct: CSS
105
100
95
90
85
80
75
70
Percentage
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

Percentage of Consonants Correct-Revised (%)

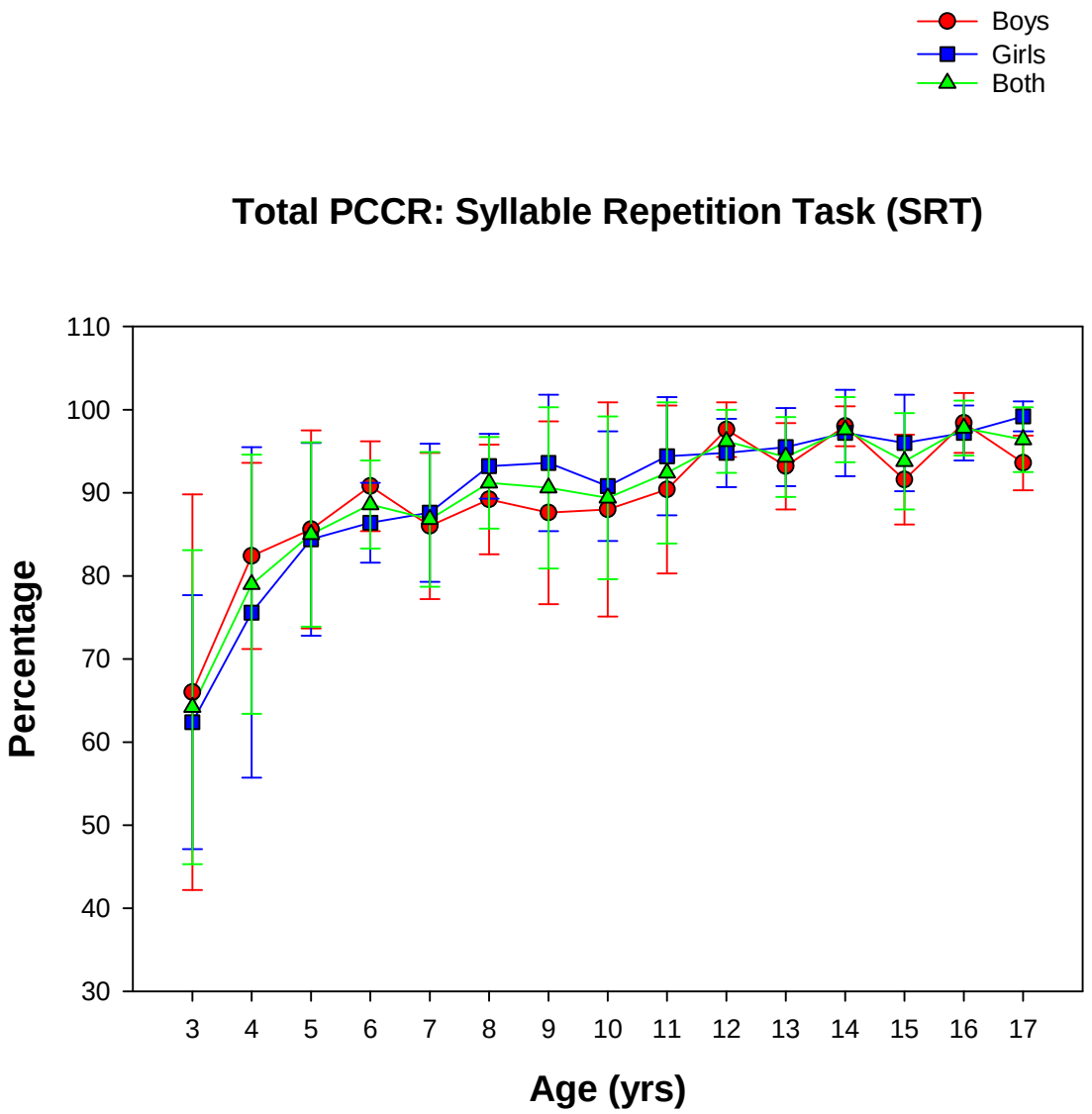
Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
AT	89.2	1.0	91.5	9.1	97.8	1.7	98.0	3.0	99.1	1.1	99.5	0.6	99.5	0.6	99.9	0.3	99.1	1.1	99.9	0.3	99.9	0.3	99.9	0.3	100.0	0.0	100.0	0.0	99.7	0.4
CSS	91.0	3.0	93.7	5.7	97.2	2.2	97.0	4.3	99.2	0.5	98.1	1.1	99.4	0.5	99.4	0.1	99.5	0.3	99.5	0.6	98.8	0.7	99.1	0.5	99.5	0.4	99.3	0.8	99.6	0.6
Female																														
AT	87.9	7.4	91.7	3.9	98.8	2.0	98.6	2.1	98.6	1.0	99.9	0.3	99.9	0.3	99.6	0.6	99.7	0.6	100.0	0.0	99.7	0.4	100.0	0.0	99.2	1.1	99.8	0.3	99.7	0.6
CSS	93.8	1.3	93.9	3.8	98.0	1.0	97.8	1.2	98.8	1.0	99.3	0.8	99.5	0.6	99.0	0.7	99.6	0.2	99.7	0.5	99.7	0.4	99.7	0.7	99.8	0.2	99.6	0.3	99.8	0.2
Both																														
AT	88.7	4.1	91.6	6.6	98.3	1.8	98.3	2.5	98.8	1.0	99.7	0.5	99.7	0.5	99.7	0.5	99.4	0.9	99.9	0.2	99.8	0.3	99.9	0.2	99.6	0.8	99.9	0.2	99.7	0.5
CSS	92.4	2.7	93.8	4.6	97.6	1.7	97.4	3.0	99.0	0.8	98.7	1.1	99.4	0.6	99.2	0.5	99.5	0.2	99.6	0.5	99.2	0.7	99.4	0.6	99.7	0.3	99.4	0.6	99.7	0.5


Boys
Girls
Both
Percentage of Consonants Correct Revised: AT
105
100
95
90
85
80
75
Percentage
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)


Boys
Girls
Both
Percentage of Consonants Correct Revised: CSS
Percentage
102
100
98
96
94
92
90
88
86
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

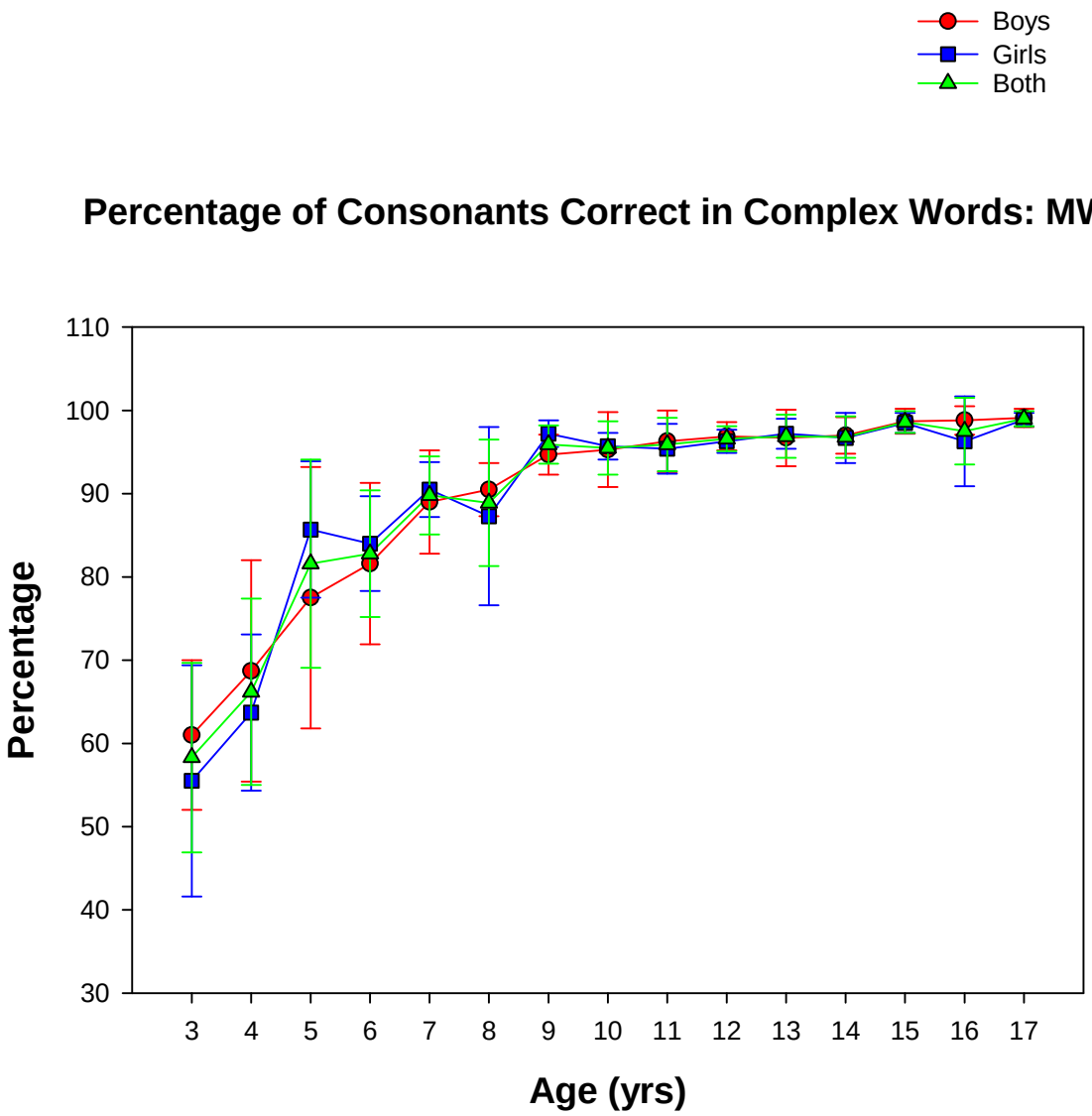
SRT Total Percentage Consonants Correct-Revised (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
SRT	66.0	23.8	82.4	11.2	85.6	11.9	90.8	5.4	86.0	8.8	89.2	6.6	87.6	11.0	88.0	12.9	90.4	10.1	97.6	3.3	93.2	5.2	98.0	2.4	91.6	5.4	98.4	3.6	93.6	3.3
Female																														
SRT	62.4	15.3	75.6	19.9	84.4	11.6	86.4	4.8	87.6	8.3	93.2	3.9	93.6	8.2	90.8	6.6	94.4	7.1	94.8	4.1	95.5	4.7	97.2	5.2	96.0	5.8	97.2	3.3	99.2	1.8
Both																														
SRT	64.2	18.9	79.0	15.6	85.0	11.1	88.6	5.3	86.8	8.1	91.2	5.5	90.6	9.7	89.4	9.8	92.4	8.5	96.2	3.8	94.3	4.8	97.6	3.9	93.8	5.8	97.8	3.3	96.4	3.9


Boys
Girls
Both
Total PCCR: Syllable Repetition Task (SRT)
Percentage
110
100
90
80
70
60
50
40
30
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

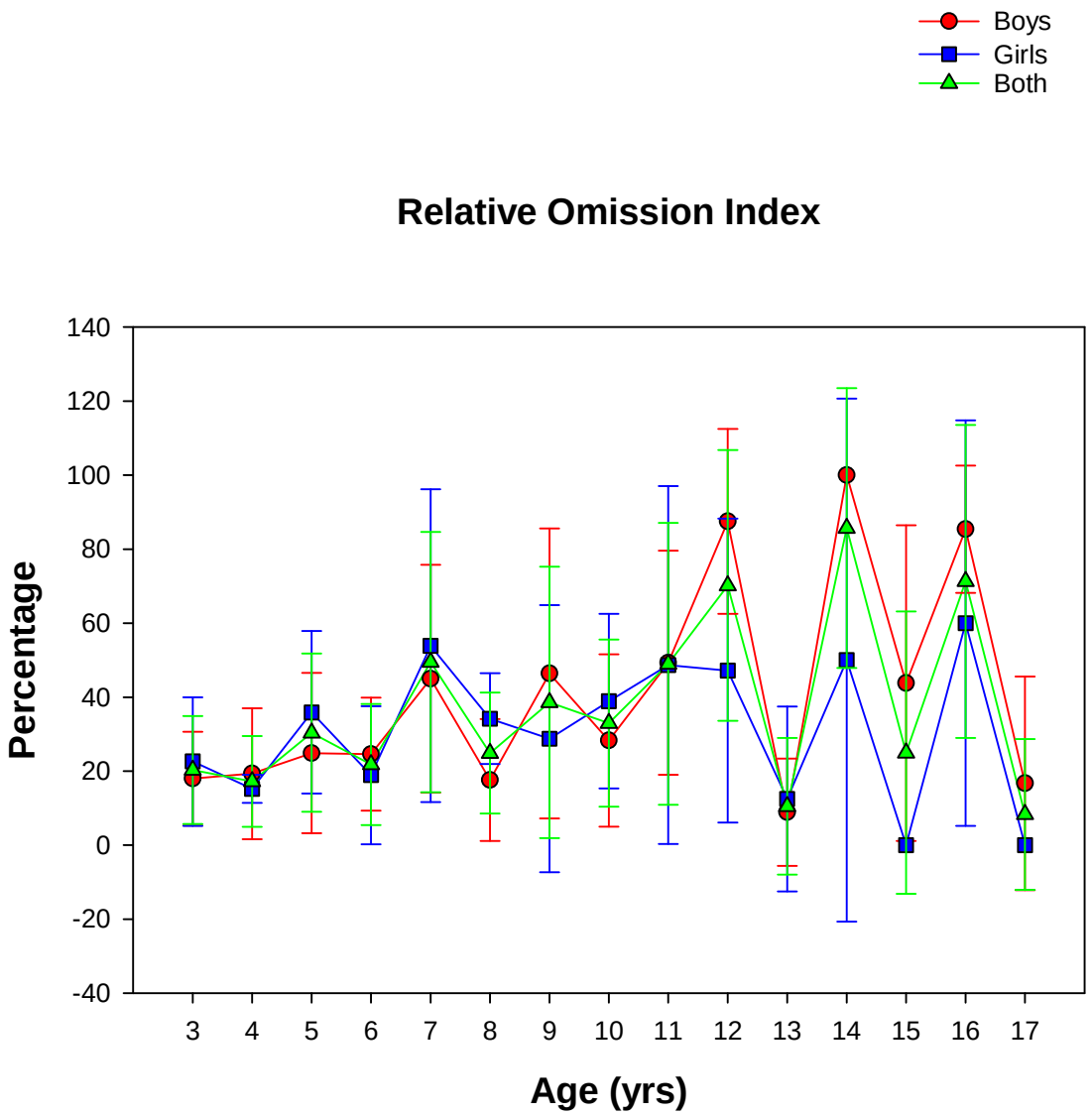
Percentage Consonants Correct in Complex Words (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
MWT	61.0	9.0	68.7	13.3	77.5	15.7	81.6	9.7	89.0	6.2	90.5	3.2	94.7	2.4	95.3	4.5	96.3	3.7	96.9	1.7	96.7	3.4	97.0	2.2	98.7	1.5	98.8	1.7	99.1	1.1
Female																														
MWT	55.5	13.9	63.7	9.4	85.7	8.2	84.0	5.7	90.5	3.3	87.3	10.7	97.2	1.6	95.7	1.6	95.4	3.0	96.3	1.4	97.2	1.8	96.7	3.0	98.5	1.2	96.3	5.4	98.9	0.8
Both																														
MWT	58.3	11.4	66.2	11.2	81.6	12.5	82.8	7.6	89.8	4.7	88.9	7.6	95.9	2.3	95.5	3.2	95.9	3.2	96.6	1.5	96.9	2.6	96.8	2.5	98.6	1.3	97.5	4.0	99.0	0.9


Boys
Girls
Both
Percentage Consonants Correct in Complex Words: MWT
Percentage
110
100
90
80
70
60
50
40
30
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

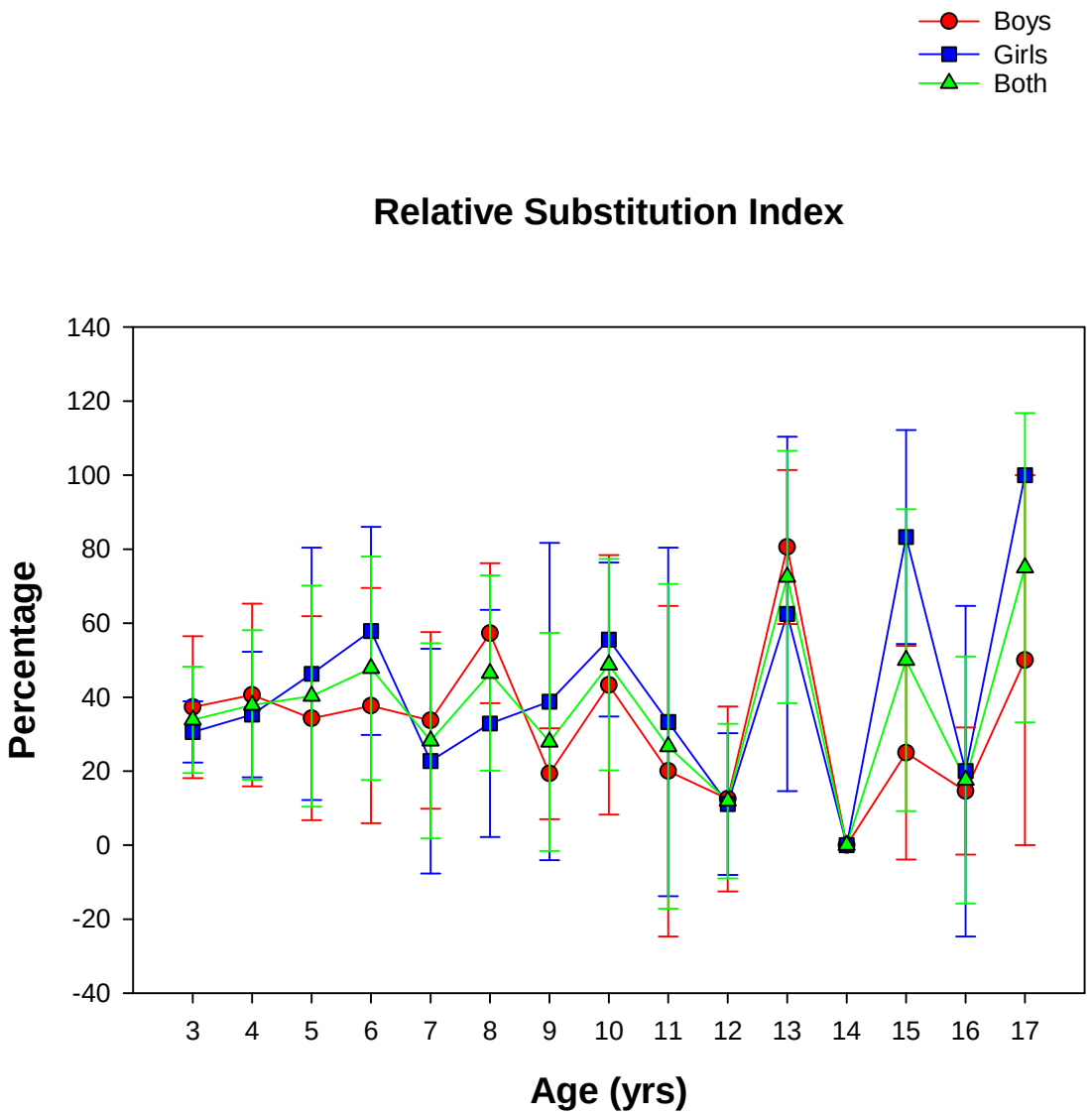
Relative Omission Index (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	18.0	12.7	19.3	17.7	24.9	21.7	24.6	15.3	45.0	30.8	17.6	16.5	46.4	39.2	28.3	23.3	49.3	30.3	87.5	25.0	8.9	14.5	100.0	0.0	43.8	42.7	85.4	17.2	16.7	28.9
Female																														
CSS	22.6	17.4	15.2	3.8	35.9	22.0	18.9	18.7	53.9	42.3	34.2	12.3	28.8	36.1	38.9	23.6	48.7	48.4	47.2	41.1	12.5	25.0	50.0	70.7	0.0	0.0	60.0	54.8	0.0	0.0
Both																														
CSS	20.3	14.6	17.2	12.3	30.4	21.4	21.8	16.4	49.5	35.2	24.9	16.4	38.6	36.7	33.0	22.6	49.0	38.1	70.2	36.6	10.5	18.5	85.7	37.8	25.0	38.2	71.3	42.3	8.3	20.4


Boys
Girls
Both
Relative Omission Index
Percentage
140
120
100
80
60
40
20
0
-20
-40
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

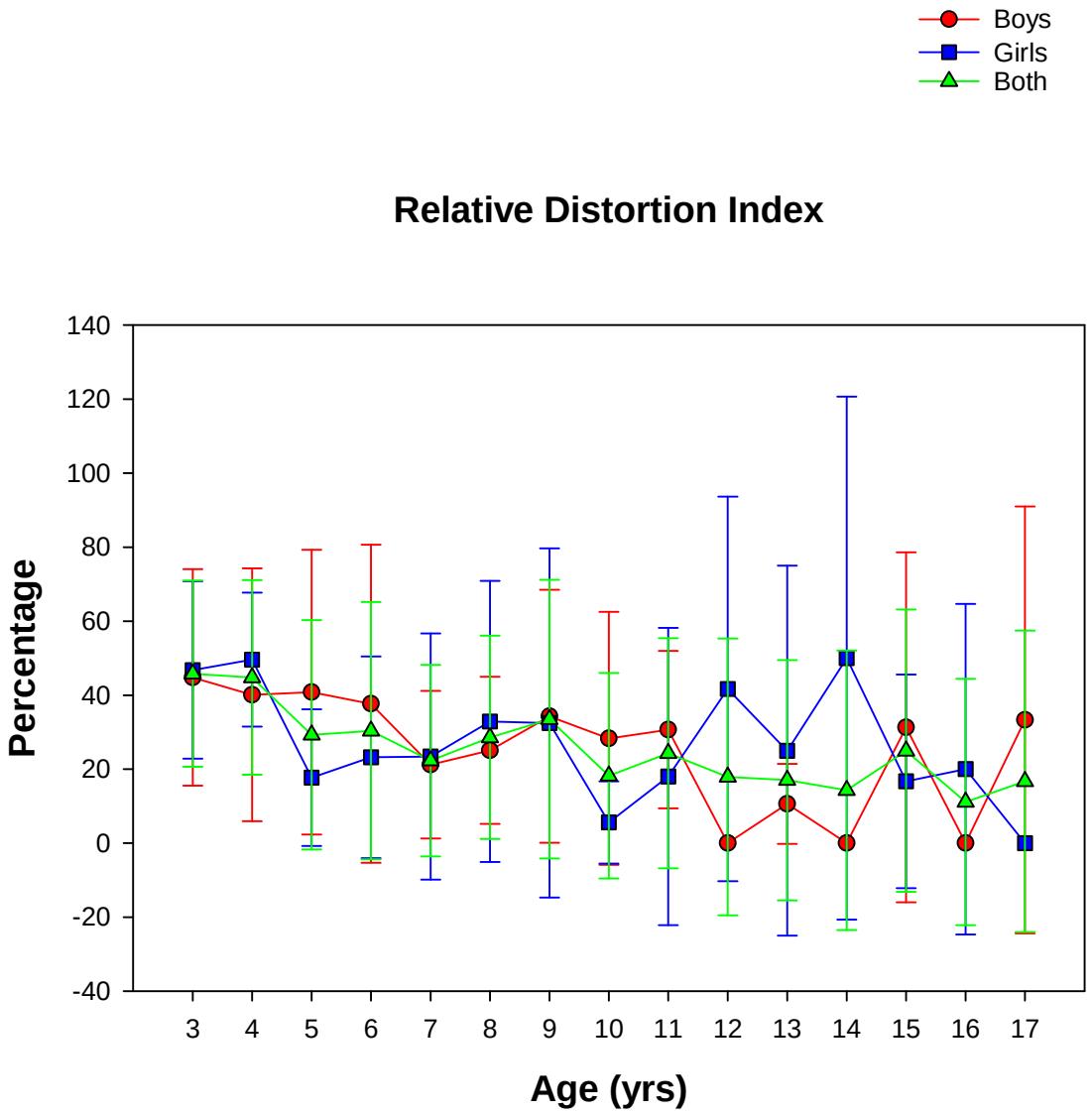
Relative Substitution Index (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	37.3	19.2	40.6	24.7	34.3	27.6	37.7	31.8	33.7	23.9	57.3	18.9	19.3	12.3	43.3	35.1	20.0	44.7	12.5	25.0	80.6	20.8	0.0	0.0	25.0	28.9	14.6	17.2	50.0	50.0
Female																														
CSS	30.6	8.3	35.3	17.0	46.3	34.1	57.9	28.1	22.7	30.4	32.9	30.7	38.8	42.9	55.6	20.8	33.3	47.1	11.1	19.2	62.5	47.9	0.0	0.0	83.3	28.9	20.0	44.7	100.0	0.0
Both																														
CSS	33.9	14.4	37.9	20.2	40.3	29.9	47.8	30.2	28.2	26.4	46.5	26.4	27.9	29.5	48.8	28.6	26.7	43.9	11.9	20.9	72.5	34.1	0.0	0.0	50.0	40.8	17.6	33.4	75.0	41.8


Boys
Girls
Both
Relative Substitution Index
Percentage
140
120
100
80
60
40
20
0
-20
-40
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

Relative Distortion Index (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	44.8	29.3	40.1	34.2	40.8	38.5	37.7	43.0	21.2	20.0	25.1	19.9	34.3	34.2	28.3	34.2	30.7	21.3	0.0	0.0	10.6	10.8	0.0	0.0	31.3	47.3	0.0	0.0	33.3	57.7
Female																														
CSS	46.8	24.0	49.6	18.1	17.7	18.5	23.2	27.3	23.4	33.3	32.9	38.0	32.5	47.2	5.6	11.1	18.0	40.2	41.7	52.0	25.0	50.0	50.0	70.7	16.7	28.9	20.0	44.7	0.0	0.0
Both																														
CSS	45.8	25.2	44.8	26.3	29.3	31.0	30.4	34.8	22.3	25.9	28.6	27.5	33.5	37.7	18.2	27.8	24.3	31.1	17.9	37.4	17.0	32.5	14.3	37.8	25.0	38.2	11.1	33.3	16.7	40.8


Boys
Girls
Both
Relative Distortion Index
Percentage
140
120
100
80
60
40
20
0
-20
-40
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

Nasal Emissions (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
MWT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AT	0.09	0.20	0.00	0.00	0.09	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSS	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Female																														
MWT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Both																														
MWT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AT	0.06	0.16	0.00	0.00	0.04	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSS	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Reduced Percentage of Glides Correct (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
MWT	20.0	44.7	70.0	44.7	50.0	0.0	70.0	27.4	60.0	41.8	80.0	27.4	100.0	0.0	90.0	22.4	70.0	27.4	84.0	8.9	92.0	17.9	96.0	8.9	92.0	11.0	100.0	0.0	100.0	0.0
SPT	64.3	27.4	85.7	14.3	85.7	10.1	80.0	16.3	85.7	20.2	96.7	7.5	91.4	12.8	97.1	6.4	94.3	7.8	100.0	0.0	100.0	0.0	100.0	0.0	97.1	6.4	100.0	0.0	97.1	6.4
AT	90.0	5.6	97.5	5.6	97.5	5.6	97.5	5.6	100.0	0.0	100.0	0.0	100.0	0.0	97.5	5.6	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
CSS	98.2	2.5	96.0	2.6	100.0	0.0	96.2	4.4	100.0	0.0	97.8	3.1	99.3	1.5	100.0	0.0	96.7	7.5	99.2	1.7	98.9	2.4	96.5	3.5	100.0	0.0	95.5	6.7	100.0	0.0
Female																														
MWT	40.0	22.4	70.0	27.4	90.0	22.4	60.0	22.4	80.0	27.4	90.0	22.4	90.0	22.4	100.0	0.0	90.0	22.4	88.0	11.0	88.0	11.0	80.0	24.5	96.0	8.9	92.0	11.0	96.0	8.9
SPT	65.7	16.3	82.9	12.0	71.4	26.7	89.3	10.7	94.3	7.8	94.3	12.8	97.1	6.4	94.3	7.8	100.0	0.0	94.3	7.8	97.1	6.4	100.0	0.0	97.1	6.4	100.0	0.0	100.0	0.0
AT	83.3	7.2	90.0	13.7	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	97.5	5.6	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
CSS	98.3	2.4	92.1	10.9	99.2	1.8	99.1	1.9	98.3	2.3	100.0	0.0	99.4	1.2	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
Both																														
MWT	30.0	35.0	70.0	35.0	70.0	25.8	65.0	24.2	70.0	35.0	85.0	24.2	95.0	15.8	95.0	15.8	80.0	25.8	97.1	6.0	90.0	14.1	88.0	19.3	94.0	9.7	96.0	8.4	98.0	6.3
SPT	65.1	20.3	84.3	12.5	78.6	20.5	84.6	13.9	90.5	14.3	95.5	9.9	94.3	10.0	95.7	6.9	97.1	6.0	86.0	9.7	98.6	4.5	100.0	0.0	97.1	6.0	100.0	0.0	98.6	4.5
AT	87.5	6.7	93.8	10.6	98.8	4.0	98.8	4.0	100.0	0.0	100.0	0.0	100.0	0.0	97.5	5.3	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
CSS	98.3	2.3	94.1	7.8	99.6	1.3	97.7	3.6	99.1	1.8	98.9	2.4	99.4	1.3	100.0	0.0	98.3	5.3	99.6	1.2	99.5	1.7	98.3	3.0	100.0	0.0	97.7	5.1	100.0	0.0

Increased Percentage of /j/ Deletions in Clusters (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
ALL	10.00	22.36	0.00	0.00	20.00	27.39	0.00	0.00	0.00	0.00	10.00	22.36	0.00	0.00	0.00	0.00	10.00	22.36	3.33	7.45	10.00	22.36	12.33	11.64	0.00	0.00	0.00	0.00	0.00	0.00
Female																														
ALL	37.50	47.87	13.33	29.81	0.00	0.00	10.00	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	13.69	10.00	13.36	10.67	15.35	4.00	8.94	6.67	14.91	5.00	11.18
Both																														
ALL	22.22	36.32	6.67	21.08	10.00	21.08	5.00	15.81	0.00	0.00	5.00	15.81	0.00	0.00	0.00	0.00	5.00	15.81	9.17	12.08	10.00	17.48	11.50	12.87	2.00	6.32	3.03	10.05	2.78	8.33

Lowered Sibilant Centroids: M1 at Midpoint (kHz)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
RST	*	*	*	*	*	*	7.49	0.48	7.24	0.73	7.19	0.61	7.15	0.19	6.61	0.46	6.74	0.49	6.66	0.61	6.44	0.39	6.66	0.64	5.93	0.34	6.46	0.43	6.48	0.32
MWT	6.42	0.62	6.81	0.40	6.83	0.68	7.01	0.66	6.93	0.70	6.82	0.78	6.78	0.09	6.51	0.70	6.45	0.48	6.63	0.66	6.43	0.82	6.81	0.60	5.91	0.26	6.26	0.67	6.27	0.71
AT	6.88	0.77	6.85	0.53	6.76	0.53	7.00	0.67	6.33	0.67	6.63	0.61	5.98	0.51	5.70	0.79	6.28	0.49	5.92	0.68	5.56	0.90	6.08	0.49	5.26	0.32	5.39	0.73	5.47	0.56
CSS	6.09	0.73	6.16	0.52	6.53	0.55	6.69	0.68	6.44	0.63	6.42	0.43	6.53	0.62	5.89	0.61	6.23	0.30	5.87	0.79	6.07	0.52	5.81	0.35	5.61	0.24	5.61	0.60	5.88	0.52
Female																														
RST	*	*	*	*	*	*	7.81	0.46	7.27	0.66	7.56	0.47	7.70	0.62	8.23	0.16	8.21	0.38	7.29	0.87	7.97	0.40	8.02	0.18	7.89	0.67	7.96	0.64	8.10	0.39
MWT	6.56	0.91	7.37	0.62	7.39	0.76	7.50	0.52	6.90	0.50	7.37	0.45	7.21	0.49	7.86	0.35	7.80	0.62	7.13	0.79	7.67	0.56	7.45	0.46	7.97	0.70	7.66	0.73	8.16	0.26
AT	6.96	0.50	7.34	0.45	7.28	0.36	7.15	0.56	6.93	0.24	6.87	0.76	6.51	1.06	7.30	0.28	7.10	0.38	6.63	0.71	7.07	0.70	6.96	0.22	6.50	0.46	6.78	0.40	6.58	0.65
CSS	6.80	0.41	6.56	0.41	7.16	0.61	6.84	0.20	6.98	0.76	6.74	0.07	6.91	0.93	7.28	0.44	7.26	0.50	6.46	0.53	7.46	0.59	6.85	0.17	6.64	0.67	7.20	0.71	7.34	0.49
Both																														
RST	*	*	*	*	*	*	7.65	0.47	7.26	0.65	7.37	0.55	7.42	0.52	7.42	0.91	7.48	0.88	6.98	0.78	7.20	0.89	7.34	0.84	6.91	1.15	7.14	0.94	7.38	0.92
MWT	6.49	0.74	7.09	0.57	7.11	0.74	7.25	0.62	6.92	0.57	7.09	0.67	6.99	0.40	7.18	0.88	7.12	0.88	6.88	0.73	7.05	0.93	7.13	0.61	6.94	1.19	6.90	0.98	7.32	1.10
AT	6.91	0.64	7.10	0.53	7.02	0.51	7.08	0.59	6.63	0.57	6.75	0.66	6.24	0.83	6.50	1.01	6.69	0.60	6.28	0.75	6.32	1.10	6.52	0.59	5.88	0.76	6.01	0.93	6.09	0.82
CSS	6.45	0.67	6.36	0.49	6.85	0.64	6.76	0.48	6.71	0.72	6.58	0.33	6.72	0.77	6.59	0.89	6.74	0.67	6.16	0.71	6.76	0.90	6.33	0.61	6.13	0.72	6.33	1.04	6.69	0.90

Lowered Sibilant Centroids: Maximum M1 (kHz)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
RST	*	*	*	*	*	*	7.90	0.55	7.71	0.65	7.53	0.55	7.55	0.23	**7.02**	**0.42**	7.21	0.43	7.05	0.57	6.75	0.41	7.10	0.66	6.30	0.31	6.86	0.48	6.82	0.38
MWT	6.94	0.68	7.39	0.42	7.32	0.79	7.54	0.82	7.59	0.64	7.37	0.68	7.24	0.19	6.95	0.84	7.11	0.33	7.04	0.58	7.01	0.85	7.27	0.72	6.34	0.30	6.81	0.59	6.60	0.73
AT	7.33	0.90	7.38	0.47	7.34	0.58	7.52	0.64	6.85	0.63	7.20	0.40	6.45	0.50	6.32	0.74	6.84	0.47	6.32	0.77	6.04	0.91	6.58	0.57	5.49	0.34	5.86	0.60	5.85	0.66
CSS	6.70	0.64	6.82	0.38	7.03	0.56	7.21	0.67	6.87	0.73	6.91	0.38	6.90	0.69	6.26	0.67	6.74	0.32	6.33	0.78	6.41	0.56	6.40	0.36	5.90	0.18	6.02	0.62	6.25	0.51
Female																														
RST	*	*	*	*	*	*	8.23	0.45	7.61	0.67	7.98	0.35	8.02	0.58	8.57	0.16	8.59	0.38	7.66	0.85	8.25	0.39	8.42	0.21	8.30	0.61	8.41	0.59	8.40	0.42
MWT	7.26	0.64	7.95	0.55	7.89	0.72	7.88	0.42	7.35	0.45	7.72	0.42	7.61	0.51	8.22	0.29	8.28	0.63	7.60	0.69	8.11	0.51	7.83	0.33	8.41	0.67	8.04	0.70	8.40	0.26
AT	7.77	0.72	7.81	0.33	7.54	0.34	7.61	0.57	7.28	0.24	7.41	0.47	6.93	0.98	7.77	0.18	7.44	0.52	7.00	0.62	7.37	0.67	7.30	0.27	6.99	0.54	7.22	0.44	6.94	0.50
CSS	7.36	0.56	7.14	0.33	7.47	0.63	7.31	0.23	7.44	0.73	7.15	0.22	7.32	0.99	7.60	0.48	7.69	0.54	6.80	0.47	7.87	0.63	7.26	0.25	7.02	0.64	7.54	0.71	7.70	0.50
Both																														
RST	*	*	*	*	*	*	8.06	0.51	7.66	0.62	7.75	0.50	7.78	0.48	7.79	0.87	7.90	0.82	7.35	0.75	7.50	0.87	7.76	0.84	7.30	1.15	7.56	0.95	7.70	0.92
MWT	7.10	0.65	7.67	0.55	7.61	0.77	7.71	0.64	7.47	0.54	7.55	0.56	7.42	0.41	7.58	0.89	7.70	0.78	7.32	0.67	7.56	0.88	7.55	0.60	7.38	1.20	7.37	0.88	7.60	1.06
AT	7.50	0.82	7.59	0.44	7.44	0.46	7.56	0.57	7.06	0.51	7.31	0.43	6.69	0.77	7.04	0.92	7.14	0.56	6.66	0.75	6.71	1.03	6.94	0.57	6.24	0.90	6.47	0.88	6.45	0.79
CSS	7.03	0.67	6.98	0.38	7.25	0.61	7.26	0.48	7.16	0.75	7.03	0.32	7.11	0.84	6.93	0.89	7.21	0.66	6.56	0.66	7.14	0.95	6.83	0.54	6.46	0.74	6.71	1.02	7.05	0.90

Lengthened Cluster Durations: Relative Duration of Cluster (ms)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
MWT	766.5	183.1	784.7	198.3	802.3	39.9	863.7	115.1	790.6	65.2	888.9	161.6	789.9	81.6	857.8	122.5	807.2	125.1	815.4	147.8	817.7	119.6	795.5	72.5	847.5	63.9	949.1	197.5	941.7	142.7
AT	743.5	78.4	734.1	186.0	742.5	135.3	773.9	91.1	742.0	58.7	907.2	136.9	654.7	162.0	763.9	120.9	801.5	118.5	765.5	82.3	827.5	251.3	810.1	138.1	730.8	130.6	785.4	116.8	845.1	135.0
CSS	885.0	150.0	730.4	180.9	733.6	156.7	829.5	119.6	817.0	141.7	834.4	179.2	859.4	179.3	728.0	55.8	784.0	226.7	872.5	279.9	668.5	59.2	792.2	49.5	877.8	158.8	796.9	54.5	820.0	74.8
Female																														
MWT	753.0	243.6	912.3	167.6	982.9	131.5	913.3	183.9	769.6	112.0	840.3	175.2	905.3	190.9	952.5	128.1	824.6	77.1	860.3	104.6	751.3	53.4	770.1	150.9	801.7	117.0	844.1	66.2	827.5	112.0
AT	931.8	160.4	710.3	177.4	700.6	156.9	668.2	113.5	650.1	55.4	866.6	186.0	764.0	194.4	861.6	206.4	684.7	81.6	808.8	171.5	614.1	40.3	720.3	85.2	665.9	66.9	749.1	64.5	818.7	146.3
CSS	865.5	202.5	856.7	83.1	833.1	83.0	733.9	82.6	725.1	104.1	861.4	174.3	822.9	97.7	873.5	76.8	937.9	267.2	867.9	237.2	782.9	134.3	820.3	186.5	677.8	94.1	805.0	151.6	740.3	100.4
Both																														
MWT	759.7	203.3	848.5	185.7	892.6	132.1	888.5	147.0	780.1	87.1	864.6	161.0	847.6	151.2	905.1	128.3	815.9	98.4	837.8	123.0	784.5	94.1	782.8	112.4	824.6	92.1	896.6	149.5	884.6	135.1
AT	814.1	142.7	722.2	171.8	721.5	139.9	721.0	111.9	696.1	72.4	886.9	155.5	709.4	178.3	812.8	167.6	743.1	114.0	787.1	128.9	720.8	203.6	765.2	118.0	698.3	103.7	767.3	89.4	831.9	133.5
CSS	875.2	168.3	793.5	148.5	783.3	129.3	781.7	109.2	771.1	126.8	847.9	167.3	841.1	137.4	800.7	99.4	860.9	247.3	870.2	244.6	725.7	114.9	806.2	129.5	777.8	162.0	801.0	107.5	780.1	93.4

Lengthened Cluster Durations: Relative Duration of First Consonant (% $_o$)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
MWT	429.52	141.64	400.29	151.14	413.48	73.01	428.24	85.71	420.21	75.51	448.05	87.19	402.28	45.64	446.97	73.77	414.96	43.62	461.64	85.82	437.91	77.94	425.57	43.71	407.68	24.52	490.81	108.22	460.27	46.47
AT	450.51	61.31	427.21	108.77	398.27	85.12	415.66	64.91	368.74	75.36	514.25	76.01	358.41	116.88	397.44	34.00	419.13	106.51	432.96	63.29	436.26	160.21	468.68	118.65	364.53	76.74	437.66	97.63	462.14	107.23
CSS	493.81	68.96	349.56	113.27	396.17	72.09	386.12	36.91	427.93	112.67	405.89	107.49	460.85	116.68	357.16	23.46	433.72	151.99	470.77	98.26	322.01	56.81	420.76	44.60	420.83	94.83	423.96	79.16	388.68	53.83
Female																														
MWT	357.13	166.37	471.94	153.38	473.60	139.21	451.26	101.09	399.32	88.99	405.83	105.05	467.40	92.14	474.71	76.78	429.29	43.33	454.86	58.78	401.98	40.15	410.96	100.91	410.22	77.13	424.55	49.01	433.77	65.11
AT	393.15	37.97	391.38	126.92	341.94	60.41	340.70	84.96	313.69	51.72	495.78	143.85	384.06	128.14	496.59	162.54	347.29	39.72	442.11	105.30	313.34	26.95	401.17	68.46	355.10	70.59	424.91	55.38	435.94	96.19
CSS	424.82	110.37	382.29	112.31	451.13	44.25	359.15	43.64	393.76	40.13	448.40	109.14	447.05	76.24	468.94	56.36	479.28	151.30	466.95	129.73	377.19	50.28	401.80	97.77	359.96	56.76	443.25	72.05	383.70	43.05
Both																														
MWT	393.32	150.58	436.12	148.44	443.54	109.48	439.75	89.19	409.76	78.58	426.94	93.69	434.84	76.66	460.84	72.47	422.12	41.68	458.25	69.44	419.94	61.44	418.27	73.72	408.95	53.97	460.69	89.52	445.55	55.90
AT	429.00	58.66	409.30	113.02	370.11	75.65	378.18	81.49	341.22	67.49	505.01	108.90	371.24	116.41	447.02	122.42	383.21	84.72	437.53	82.04	374.80	126.20	434.92	98.01	359.82	69.69	431.99	77.21	447.59	95.55
CSS	459.31	94.07	365.92	107.73	423.65	63.39	372.64	40.67	410.85	81.75	427.14	104.55	453.95	93.20	413.05	71.61	456.50	144.98	468.86	108.51	349.60	58.34	411.28	72.34	390.40	80.36	432.73	72.88	385.91	44.95

Lengthened Cluster Durations: Relative Duration of Second Consonant (% $_o$)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
MWT	351.80	64.80	364.64	87.91	383.06	49.24	399.90	33.26	339.12	69.97	405.32	68.77	383.29	44.59	403.23	53.32	378.98	90.51	345.67	69.35	365.19	69.56	361.73	30.13	426.28	52.85	416.82	84.77	501.29	84.89
AT	319.84	53.69	268.83	81.20	356.53	24.07	343.62	27.05	365.42	48.37	363.16	75.71	292.32	54.45	357.24	109.42	369.17	88.00	322.71	41.67	377.87	94.82	333.46	37.96	354.95	74.36	339.75	6.30	379.41	53.45
CSS	420.42	110.14	361.02	63.01	346.51	75.17	423.25	101.81	376.73	45.45	406.31	81.57	384.59	71.60	360.56	54.34	340.53	100.29	424.83	149.02	329.52	28.26	353.32	40.60	441.61	80.48	373.70	55.87	429.51	56.56
Female																														
MWT	408.71	105.42	383.94	68.00	509.91	36.64	418.07	93.80	367.49	66.22	415.70	75.21	429.03	99.45	467.08	62.83	388.25	63.97	403.09	69.97	336.27	61.44	350.26	58.58	388.33	57.34	411.32	43.74	382.43	58.27
AT	537.11	185.95	306.29	99.78	357.12	102.07	310.00	37.51	334.78	39.29	355.99	42.60	369.07	73.89	351.64	79.63	327.46	45.68	364.79	88.36	291.26	53.85	311.96	27.15	309.12	23.49	313.34	34.69	341.06	80.92
CSS	460.84	103.50	446.46	96.84	379.00	95.88	352.98	91.31	326.67	73.87	394.53	90.04	360.61	74.51	418.24	56.38	451.89	130.90	376.36	83.58	387.91	113.30	404.42	104.99	301.82	62.08	377.91	70.61	338.45	71.58
Both																														
MWT	380.25	87.78	374.29	74.79	446.49	78.38	408.99	67.04	353.30	65.95	410.51	68.16	406.16	76.55	435.15	64.43	383.62	74.05	374.38	72.32	350.73	63.72	355.99	44.33	407.31	55.70	414.32	66.08	435.25	91.24
AT	401.32	155.47	287.56	88.01	356.82	69.91	326.81	35.56	350.10	44.57	359.58	58.04	330.70	73.35	354.44	90.27	348.32	69.66	343.75	68.80	334.57	85.76	322.71	33.11	332.04	57.33	328.01	25.78	358.10	68.95
CSS	440.63	102.99	403.74	89.22	362.76	83.01	388.11	98.41	351.70	63.56	400.42	81.24	372.60	70.04	389.40	60.41	396.21	124.62	400.60	116.73	358.72	83.71	378.87	79.73	371.71	100.10	375.61	59.66	378.92	77.88

Lengthened Cluster Durations: Percentage of S-F/F-S Cluster Disruptions (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
MWT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AT	0.00	*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.33	29.81	0.00	0.00	0.00	0.00	0.00	0.00
CSS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	4.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Female																														
MWT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.33	32.49	0.00	0.00	0.00	0.00	20.00	44.72
CSS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.22	4.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Both																														
MWT																														
AT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	15.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.33	29.87	0.00	0.00	0.00	0.00	11.11	33.33
CSS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3.16	0.00	0.00	0.00	0.00	0.00	0.00	1.11	3.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Lengthened Cluster Durations: Relative Duration of S-F/F-S Cluster Disruptions (% o)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
MWT	8.7	3.1	10.6	5.9	9.0	2.4	11.0	4.1	9.2	1.8	11.7	3.8	12.1	4.7	7.4	2.6	13.0	3.4	6.7	0.9	14.4	3.9	10.3	5.1	13.4	2.4	14.9	9.8	18.5	3.0
AT	12.8	*	9.9	9.8	10.2	4.4	7.0	4.0	11.0	5.1	35.3	47.0	7.9	2.5	9.5	5.9	11.3	4.9	16.7	15.4	10.3	3.5	40.2	72.7	8.4	3.0	9.7	9.3	18.2	8.4
CSS	15.0	2.2	12.2	5.9	11.9	4.7	13.7	5.0	12.7	7.2	14.9	2.0	20.9	18.4	11.5	2.3	9.4	2.2	12.6	7.4	16.6	9.9	19.3	4.6	16.0	5.9	22.2	10.0	12.1	2.5
Female																														
MWT	16.4	6.1	8.7	5.4	12.0	4.2	8.8	4.8	12.9	3.4	18.7	6.9	10.3	2.8	11.0	5.6	11.8	2.1	12.9	2.7	13.3	3.0	11.8	2.5	13.8	4.1	9.0	3.5	13.6	4.9
AT	14.9	5.1	7.4	6.6	10.0	5.4	11.1	8.6	9.1	3.6	9.1	5.6	12.0	5.2	13.3	4.1	15.1	6.7	13.9	5.0	11.7	5.9	45.8	56.4	13.3	15.4	9.8	4.9	283.8	590.6
CSS	13.2	3.7	19.8	8.0	11.7	8.1	13.2	9.0	11.2	5.0	15.1	3.1	17.1	18.4	15.2	1.3	11.6	4.3	14.0	2.7	17.1	12.0	15.3	3.3	22.5	17.1	17.0	4.3	27.5	6.5
Both																														
MWT	12.0	5.9	9.7	5.4	10.5	3.6	9.9	4.4	11.2	3.3	15.2	6.4	11.2	3.8	9.2	4.5	12.4	2.7	9.8	3.8	13.8	3.3	11.0	3.9	13.6	3.2	11.9	7.6	16.1	4.6
AT	14.2	3.8	8.4	6.9	10.1	4.7	9.3	6.9	10.4	4.3	22.2	34.4	10.0	4.4	11.4	5.1	13.4	6.0	15.3	10.9	11.0	4.7	43.0	61.4	10.9	10.8	9.8	7.2	151.0	417.9
CSS	14.1	3.0	16.0	7.7	11.8	6.3	13.4	6.9	12.0	5.9	15.0	2.5	19.0	17.5	13.4	2.6	10.5	3.5	13.3	5.3	16.8	10.4	17.3	4.3	19.3	12.6	19.6	7.8	19.8	9.3

Lengthened Cluster Durations: Relative Duration of Pause Disruptions (% $_o$)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
MWT	0.00	0.00	0.00	0.00	0.00	0.00	6.11	13.67	0.00	0.00	14.34	20.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AT	0.00	0.00	21.56	48.22	0.00	0.00	0.00	0.00	0.00	0.00	9.69	21.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Female																														
MWT	0.00	0.00	38.33	85.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.88	75.75
CSS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Both																														
MWT	0.00	0.00	19.16	60.60	0.00	0.00	3.06	9.67	0.00	0.00	7.17	15.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AT	0.00	0.00	10.78	34.10	0.00	0.00	0.00	0.00	0.00	0.00	4.85	15.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.82	56.46
CSS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Lengthened Cluster Durations: Relative Duration of Addition Disruptions (% $_o$)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
MWT	8.23	18.14	0.0	0.0	22.81	51.01	8.62	19.28	21.59	48.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Female																														
MWT	0.00	0.00	0.00	0.00	0.00	0.00	21.02	19.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.43	9.91
AT	19.94	34.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Both																														
MWT	4.12	13.02	0.00	0.00	11.41	36.07	14.82	19.34	10.80	34.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.46	7.39
AT	7.48	21.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SRT Transcoding (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
SRT	94.4	9.6	86.7	10.1	95.6	4.6	93.3	7.2	91.1	6.3	94.4	5.6	97.8	5.0	94.4	7.9	95.6	6.1	98.9	2.5	95.6	4.6	100.0	0.0	98.9	2.5	100.0	0.0	97.8	3.0
Female																														
SRT	81.1	26.2	87.8	12.0	88.9	10.4	92.2	9.3	94.4	6.8	93.3	6.1	100.0	0.0	93.3	7.2	97.8	3.0	100.0	0.0	97.8	5.0	97.8	5.0	100.0	0.0	100.0	0.0	97.8	3.0
Both																														
SRT	87.8	19.9	87.2	10.5	92.2	8.4	92.8	7.9	92.8	6.4	93.9	5.5	98.9	3.5	93.9	7.1	96.7	4.7	99.4	1.8	96.7	4.7	98.9	3.5	99.4	1.8	100.0	0.0	97.8	2.9

Less Stable Consonant Errors: Targets (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
RSTR	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	64.4	*	*	*	*	*	*	*	*	*	*	*
CWT	49.6	30.2	65.2	7.8	53.0	2.4	71.8	8.7	71.0	*	87.1	*	*	*	*	*	*	*	*	*	*	*	*	*	84.3	4.1	*	*	*	*
MWT	46.7	8.4	54.9	8.4	79.1	*	58.7	3.9	51.1	9.5	69.8	5.3	61.7	0.8	57.8	14.7	54.1	5.9	*	*	73.9	*	60.6	5.5	*	*	*	*	63.3	1.6
CSS	63.5	16.1	78.3	9.4	50.8	16.5	72.0	39.5	26.7	*	62.6	32.4	0.0	*	0.0	*	100.0	*	100.0	*	66.9	27.1	100.0	0	100.0	*	70.0	42.4	100.0	*
Female																														
RSTR	*	*	*	*	*	*	*	*	*	*	50.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
CWT	75.3	4.4	70.1	6.2	61.7	5.8	59.1	*	85.1	2.6	69.7	*	87.1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
MWT	42.4	12.7	49.9	8.6	84.1	3.9	66.6	6.9	62.5	4.0	65.4	7.8	59.7	2.0	68.4	12.6	63.7	5.0	65.5	*	77.0	*	71.4	*	*	*	*	*	62.2	*
CSS	66.9	30.3	66.1	24.4	62.6	32.6	56.1	7.5	100.0	*	40.0	*	*	*	36.7	4.7	*	*	*	*	*	*	100.0	*	*	*	100.0	*	*	*
Both																														
RSTR	*	*	*	*	*	*	*	*	*	*	50.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
CWT	62.5	24.4	68.7	6.5	82.5	4.0	62.7	6.7	80.4	8.3	78.4	12.3	87.1	*	*	*	*	*	*	*	*	*	*	*	84.3	4.1	*	*	*	*
MWT	44.6	10.4	52.4	8.5	57.9	6.3	68.7	9.5	56.8	9.1	67.6	6.6	60.7	1.7	64.2	12.9	59.8	7.0	64.9	0.7	75.4	2.2	64.2	7.4	*	*	*	*	64.4	*
CSS	65.4	23.7	71.3	19.3	56.7	24.0	62.5	22.3	63.3	51.9	56.9	28.8	0.0	*	24.4	21.4	100.0	*	100.0	*	66.9	27.1	100.0	0.0	100.0	*	80.0	34.6	100.0	*

Less Stable Consonant Errors: Error Types (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
RSTR	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
CWT	32.5	27.7	92.0	11.3	55.6	*	60.0	37.1	100.0	*	100.0	*	*	*	*	*	*	*	*	*	*	*	*	*	100.0	0.0	*	*	*	*
MWT	28.5	13.9	27.1	20.2	27.3	7.7	23.0	18.4	3.2	6.4	41.7	50.0	50.0	70.7	12.5	17.7	6.3	8.8	100.0	*	50.0	*	77.8	31.4	*	*	*	*	100.0	*
CSS	87.0	10.8	86.2	2.5	90.8	15.9	92.2	11.0	33.3	*	100.0	0.0	0.0	*	0.0	*	100.0	*	100.0	*	100.0	0.0	100.0	0.0	100.0	*	100.0	0.0	100.0	*
Female																														
RSTR	*	*	*	*	*	*	*	*	*	*	100.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
CWT	60.7	37.4	69.7	33.7	50.0	70.7	100.0	*	50.0	70.7	100.0	*	100.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
MWT	27.6	9.4	16.3	11.4	27.8	40.8	19.7	20.5	26.0	28.9	8.3	16.7	50.0	70.7	66.7	57.7	33.3	57.7	0.0	*	0.0	*	22.2	*	*	*	*	*	0.0	*
CSS	80.1	24.2	80.6	16.7	100.0	0.0	83.3	28.9	100.0	*	0.0	*	*	*	100.0	0.0	*	*	*	*	*	*	100.0	*	*	*	100.0	*	*	*
Both																														
RSTR	*	*	*	*	*	*	*	*	*	*	100.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
CWT	46.6	34.4	76.1	29.9	51.9	50.1	70.0	36.3	66.7	57.7	100.0	0.0	100.0	*	*	*	*	*	*	*	*	*	*	*	100.0	0.0	*	*	*	*
MWT	28.0	11.2	21.7	16.4	27.6	29.2	21.4	18.4	14.6	22.9	25.0	38.8	50.0	57.7	45.0	51.2	22.5	43.7	50.0	70.7	25.0	35.4	59.3	39.0	*	*	*	*	50.0	70.7
CSS	83.2	18.7	83.0	12.2	95.4	11.2	86.9	21.7	66.7	47.1	75.0	50.0	0.0	*	66.7	57.7	100.0	*	100.0	*	100.0	0.0	100.0	0.0	100.0	*	100.0	0.0	100.0	*

Less Stable Sibilant Centroids: M1 at Midpoint (u)

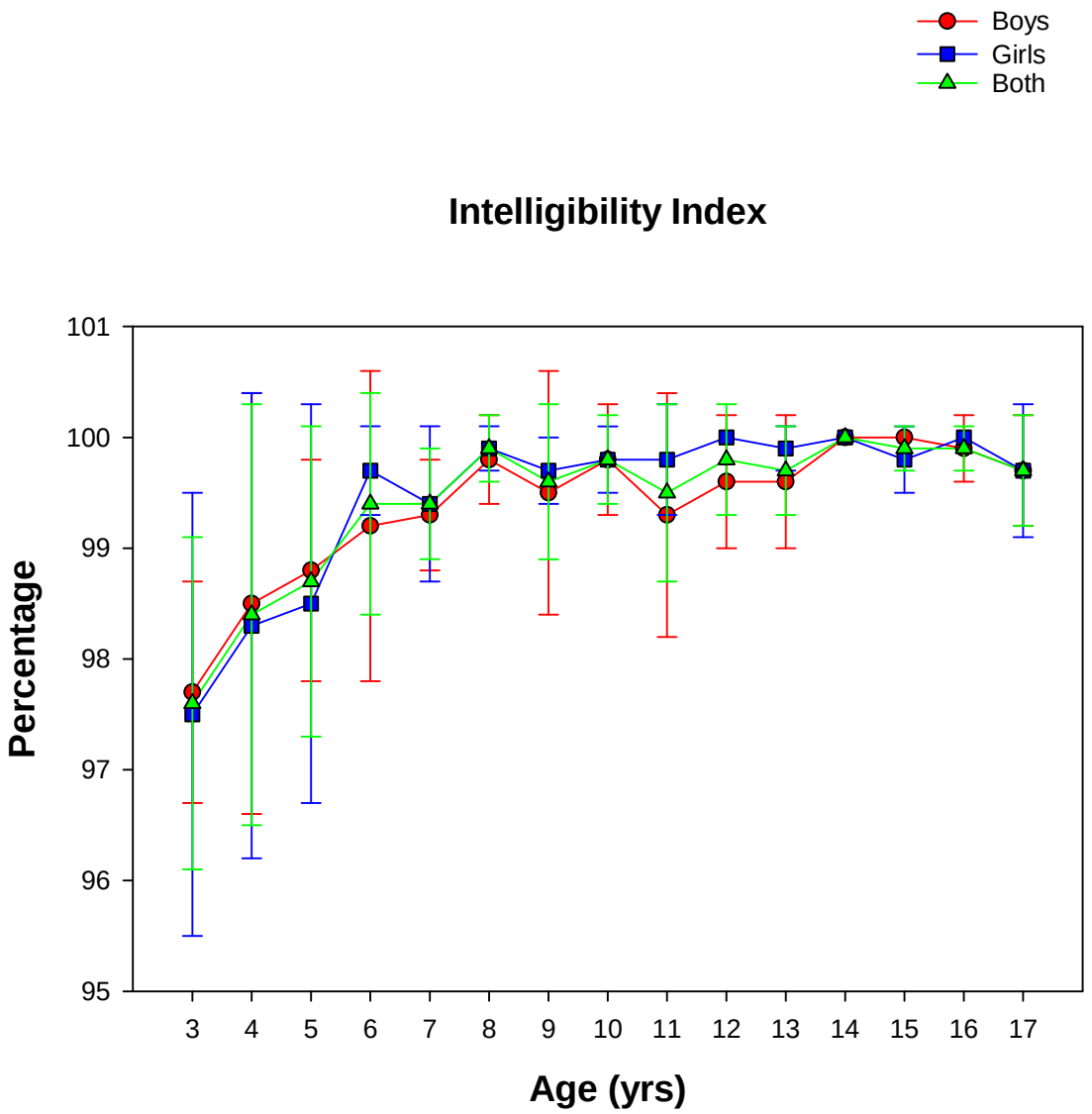
Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
RSTS	*	*	*	*	*	*	91.9	3.0	91.0	2.4	90.5	3.4	92.5	2.2	91.8	1.3	91.6	3.5	93.2	3.1	91.0	3.8	92.3	2.5	93.5	2.3	91.8	0.4	91.2	4.4
MWT	86.8	5.5	88.6	2.9	84.3	7.2	88.9	3.2	87.0	6.6	86.7	8.0	88.0	4.8	90.8	1.5	88.4	3.0	90.3	1.4	88.7	3.1	92.5	4.7	92.0	2.0	90.4	2.3	90.9	3.8
AT	79.7	7.2	79.1	13.6	85.2	2.9	86.8	3.2	85.3	4.9	80.6	6.8	83.3	2.3	85.0	5.8	86.3	3.3	85.9	4.3	82.0	6.6	83.9	1.6	89.1	3.3	85.9	4.4	82.0	4.5
CSS	71.7	9.3	68.1	10.6	79.1	9.8	81.4	6.6	81.3	7.2	76.7	9.9	83.8	2.9	83.3	4.6	83.5	4.9	89.0	2.7	85.6	2.4	83.9	5.9	89.7	4.2	84.3	4.3	85.9	3.0
Female																														
RSTS	*	*	*	*	*	*	92.8	3.6	91.5	3.6	92.3	1.9	92.8	3.3	93.5	1.3	94.5	1.9	93.6	1.9	95.0	0.9	93.8	2.3	93.4	2.6	94.0	1.5	93.9	1.6
MWT	84.3	7.6	89.0	6.2	89.6	3.4	88.5	3.5	88.0	3.2	88.9	4.9	91.6	2.3	92.0	3.2	89.3	3.3	87.5	3.5	91.0	2.6	92.1	2.8	93.1	1.9	91.3	3.5	93.3	3.1
AT	78.1	6.1	85.2	3.0	80.6	4.0	83.4	2.8	85.2	4.0	83.0	5.2	78.5	11.7	82.4	2.5	79.1	3.6	82.4	3.3	80.9	2.6	81.3	2.1	79.3	2.7	84.0	1.8	78.8	6.9
CSS	80.4	2.9	77.7	10.9	83.1	7.3	78.4	7.1	84.4	5.5	81.2	5.6	86.0	2.6	85.8	3.8	85.7	3.4	81.6	5.8	88.1	4.2	79.5	4.0	80.6	7.3	83.2	5.0	87.2	3.8
Both																														
RSTS	*	*	*	*	*	*	92.3	3.2	91.3	3.0	91.4	2.8	92.7	2.6	92.6	1.5	93.0	3.1	93.4	2.4	93.0	3.3	92.3	3.6	93.5	2.3	92.9	1.5	92.6	3.4
MWT	85.6	6.4	88.8	4.6	87.0	6.0	88.7	3.2	87.5	4.9	87.8	6.4	89.8	4.1	91.4	2.5	88.9	3.0	88.9	2.9	89.8	2.9	93.0	2.3	92.6	1.9	90.8	2.8	92.1	3.5
AT	79.1	6.4	82.2	9.8	82.9	4.1	85.1	3.4	85.2	4.2	81.8	5.9	80.9	8.4	83.7	4.4	82.7	5.0	84.2	4.1	81.4	4.7	82.6	2.2	84.2	5.9	84.9	3.3	80.4	5.7
CSS	76.1	8.0	72.9	11.3	81.1	8.4	79.9	6.6	82.8	6.2	79.0	7.9	84.9	2.8	84.5	4.2	84.6	4.2	85.3	5.8	86.9	3.5	81.7	5.3	85.2	7.4	83.7	4.4	86.6	3.3

Less Stable Sibilant Centroids: Maximum M1 (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
RSTS	*	*	*	*	*	*	92.4	2.9	92.0	1.4	92.9	2.3	92.7	1.4	92.5	0.8	91.7	4.4	93.6	2.1	91.5	2.9	94.2	1.9	94.8	1.6	93.6	1.0	92.5	4.4
MWT	87.2	6.6	91.0	3.7	87.0	5.4	90.0	3.5	91.7	3.5	89.4	7.1	90.0	3.9	91.1	1.3	88.9	4.0	91.9	2.6	90.0	2.9	93.9	2.2	93.7	2.2	92.2	1.2	90.7	3.3
AT	81.5	7.9	81.1	11.7	86.1	2.7	88.9	0.8	86.2	4.3	82.8	3.2	84.0	3.4	87.2	8.3	89.5	2.0	85.5	3.6	83.6	4.6	84.8	3.1	89.1	4.2	85.9	5.4	82.8	5.9
CSS	75.3	8.3	74.2	8.9	81.2	6.8	82.9	6.7	82.5	6.2	80.4	6.6	84.9	2.3	84.8	4.6	84.9	4.2	88.9	2.3	86.1	2.6	84.9	4.1	89.0	4.0	85.1	3.7	87.0	2.4
Female																														
RSTS	*	*	*	*	*	*	93.7	2.2	92.2	2.9	93.1	1.4	93.3	3.9	94.5	1.8	96.2	1.2	94.0	2.5	95.4	1.5	95.3	2.2	95.6	1.8	95.8	1.2	94.7	2.3
MWT	87.5	6.7	92.1	4.0	92.4	2.3	89.8	3.0	90.4	1.4	91.2	2.9	93.1	2.1	93.3	2.4	90.7	3.9	89.7	4.2	91.8	2.3	91.9	3.1	94.3	1.2	93.0	2.3	93.1	3.4
AT	89.5	3.6	88.2	2.8	81.3	4.1	85.0	2.3	85.9	4.1	83.7	4.1	80.8	8.8	83.7	2.7	81.1	3.5	82.7	3.1	81.9	2.0	83.6	2.2	80.3	3.7	83.9	2.1	79.8	7.7
CSS	84.0	4.9	81.6	9.4	84.6	7.2	80.2	6.4	87.0	6.0	82.7	5.5	87.9	4.8	87.4	3.1	87.4	5.0	83.0	5.9	88.4	3.6	81.9	5.7	81.8	6.4	86.3	4.7	88.3	4.6
Both																														
RSTS	*	*	*	*	*	*	93.1	2.5	92.1	2.2	93.0	1.8	93.0	2.8	93.5	1.7	94.0	3.9	93.8	2.2	93.4	3.0	94.7	2.0	95.2	1.7	94.7	1.5	93.6	3.5
MWT	87.3	6.3	91.6	3.7	89.7	4.9	89.9	3.1	91.0	2.6	90.3	5.2	91.5	3.4	92.2	2.2	89.8	3.8	90.8	3.5	90.9	2.6	92.9	2.7	94.0	1.7	92.6	1.8	91.9	3.4
AT	84.5	7.5	84.7	8.9	83.7	4.2	87.0	2.6	86.0	4.0	83.2	3.5	82.4	6.5	85.5	6.1	85.3	5.1	84.1	3.5	82.7	3.4	84.2	2.7	84.7	5.9	84.9	3.9	81.3	6.6
CSS	79.7	7.9	77.9	9.5	82.9	6.8	81.5	6.4	84.8	6.2	81.5	5.9	86.4	3.9	86.1	4.0	86.1	4.5	85.9	5.3	87.2	3.2	83.4	5.0	85.4	6.3	85.7	4.0	87.6	3.5

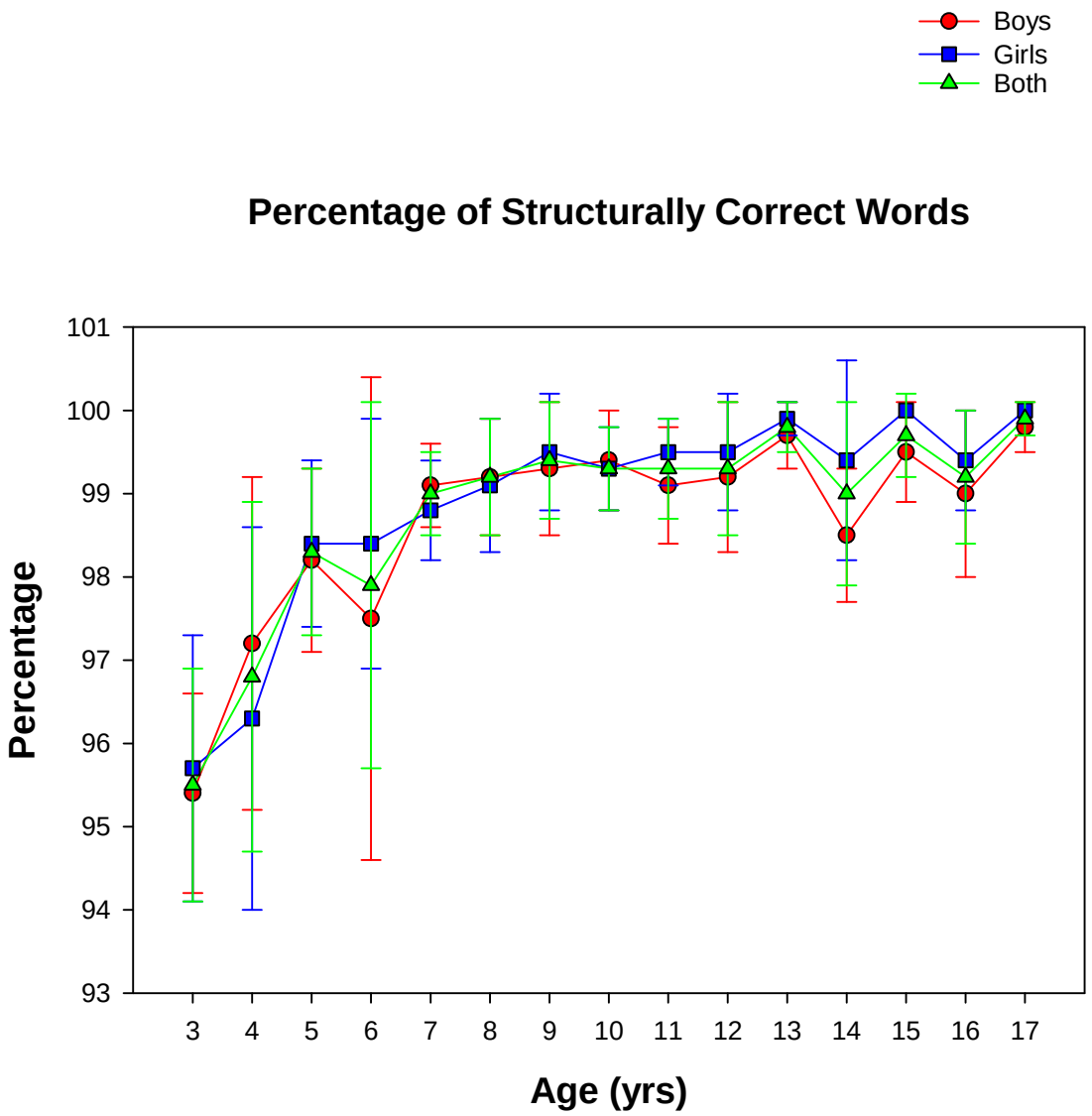
Intelligibility Index (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	97.7	1.0	98.5	1.9	98.8	1.0	99.2	1.4	99.3	0.5	99.8	0.4	99.5	1.1	99.8	0.5	99.3	1.1	99.6	0.6	99.6	0.6	100.0	0.0	100.0	0.0	99.9	0.3	99.7	0.5
Female																														
CSS	97.5	2.0	98.3	2.1	98.5	1.8	99.7	0.4	99.4	0.7	99.9	0.2	99.7	0.3	99.8	0.3	99.8	0.5	100.0	0.0	99.9	0.2	100.0	0.0	99.8	0.3	100.0	0.0	99.7	0.6
Both																														
CSS	97.6	1.5	98.4	1.9	98.7	1.4	99.4	1.0	99.4	0.5	99.9	0.3	99.6	0.7	99.8	0.4	99.5	0.8	99.8	0.5	99.7	0.4	100.0	0.0	99.9	0.2	99.9	0.2	99.7	0.5


Boys
Girls
Both
Intelligibility Index
Percentage
101
100
99
98
97
96
95
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

Percentage of Structurally Correct Words (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	95.4	1.2	97.2	2.0	98.2	1.1	97.5	2.9	99.1	0.5	99.2	0.7	99.3	0.8	99.4	0.6	99.1	0.7	99.2	0.9	99.7	0.4	98.5	0.8	99.5	0.6	99.0	1.0	99.8	0.3
Female																														
CSS	95.7	1.6	96.3	2.3	98.4	1.0	98.4	1.5	98.8	0.6	99.1	0.8	99.5	0.7	99.3	0.5	99.5	0.4	99.5	0.7	99.9	0.2	99.4	1.2	100.0	0.0	99.4	0.6	100.0	0.0
Both																														
CSS	95.5	1.4	96.8	2.1	98.3	1.0	97.9	2.2	99.0	0.5	99.2	0.7	99.4	0.7	99.3	0.5	99.3	0.6	99.3	0.8	99.8	0.3	99.0	1.1	99.7	0.5	99.2	0.8	99.9	0.2


Boys
Girls
Both
Percentage of Structurally Correct Words
Percentage
101
100
99
98
97
96
95
94
93
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

Increased Percentage of Phoneme Distortions: Place (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
RSTR	*	*	*	*	*	*	4.2	7.0	1.2	1.5	4.2	4.8	0.2	0.3	0.3	0.7	0.6	1.4	0.5	0.7	0.0	0.0	0.3	0.7	0.0	0.0	0.0	0.0	0.0	0.0
LST	6.8	4.1	3.5	2.3	0.8	1.8	1.7	1.7	0.8	1.1	2.2	2.5	0.2	0.3	0.3	0.4	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.0	0.0	0.2	0.4	0.2	0.3
CWT	8.1	6.1	7.0	5.8	5.1	3.9	2.1	3.1	2.4	1.7	2.0	1.9	1.2	1.2	0.1	0.2	0.3	0.6	*	*	0.0	0.0	*	*	0.0	0.0	*	*	0.0	0.0
MWT	7.0	4.8	6.5	5.9	3.0	4.0	1.3	0.9	0.6	0.7	1.4	1.2	0.2	0.5	0.1	0.2	0.3	0.5	0.2	0.3	0.4	0.3	0.5	0.6	0.0	0.0	0.0	0.0	0.0	0.0
EST	2.0	2.1	2.3	3.1	1.6	2.8	0.3	0.6	0.8	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VT3	*	*	*	*	*	*	4.7	2.9	3.8	1.8	3.0	4.5	0.8	1.0	0.8	0.9	0.7	1.0	0.7	0.9	0.8	1.1	0.8	0.6	0.4	0.6	0.0	0.0	0.3	0.0
AT	8.7	5.1	4.4	3.0	3.0	3.2	1.6	2.6	1.3	0.8	1.9	1.4	0.9	1.0	0.2	0.2	0.6	1.1	0.4	0.5	0.5	0.8	0.4	0.6	0.0	0.0	0.0	0.0	0.0	0.0
CSS	6.3	3.6	4.7	3.5	1.9	2.7	2.8	2.3	0.7	0.4	1.5	1.4	0.6	0.8	0.7	0.6	0.4	0.3	0.4	0.5	0.3	0.1	0.6	0.4	0.5	0.4	0.3	0.2	0.5	0.3
Female																														
RSTR	*	*	*	*	*	*	3.4	4.5	1.4	2.4	3.3	6.5	0.3	0.4	0.2	0.4	1.4	1.9	3.1	5.7	0.0	0.0	0.3	0.4	0.0	0.0	3.0	6.6	0.0	0.0
LST	3.8	3.0	4.4	2.2	0.8	1.1	1.8	2.4	0.2	0.3	0.3	0.7	0.0	0.0	0.0	0.0	0.2	0.3	0.5	0.7	0.2	0.3	0.2	0.3	0.2	0.3	1.0	1.3	0.3	0.4
CWT	4.6	3.3	4.6	1.8	1.0	1.4	1.4	2.0	0.6	0.5	0.3	0.4	0.4	0.4	0.1	0.2	2.1	3.6	*	*	0.0	0.0	*	*	0.2	0.2	*	*	0.3	0.6
MWT	5.2	6.1	2.6	0.8	0.6	0.7	0.8	0.8	1.3	1.4	3.4	5.3	0.3	0.5	0.1	0.2	0.8	1.1	0.5	0.8	0.1	0.3	0.1	0.3	0.2	0.3	1.5	3.4	0.0	0.0
EST	2.6	3.0	0.8	1.9	0.0	0.0	0.0	0.0	0.9	1.9	1.1	2.4	0.0	0.0	0.0	0.0	0.0	0.0	1.1	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VT3	*	*	*	*	*	*	2.8	3.6	1.2	2.5	3.5	3.4	0.3	0.3	1.3	1.5	1.4	1.9	2.6	3.7	0.0	0.0	1.2	1.0	0.2	0.3	3.2	5.4	0.2	0.3
AT	3.2	2.4	6.0	3.1	0.8	0.4	1.4	1.7	1.1	1.6	0.5	0.6	0.1	0.2	0.1	0.2	0.9	1.3	1.5	1.4	0.5	0.7	0.1	0.2	0.1	0.2	1.4	2.5	0.1	0.2
CSS	5.6	4.4	4.1	1.6	0.6	0.4	1.9	2.3	0.8	1.0	1.1	1.6	0.4	0.4	0.2	0.2	0.5	0.6	0.9	0.7	0.2	0.2	0.4	0.2	0.1	0.1	1.1	2.1	0.2	0.2

Increased Percentage of Phoneme Distortions: Place (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Both																														
RSTR	*	*	*	*	*	*	3.8	5.6	1.3	0.9	3.8	5.4	0.2	0.4	0.2	0.5	1.0	1.7	1.8	4.1	0.0	0.0	0.3	0.5	0.0	0.0	1.5	4.7	0.0	0.0
LST	5.3	3.7	3.9	2.2	0.8	1.4	1.7	1.9	0.5	0.8	1.2	2.0	0.1	0.2	0.2	0.3	0.2	0.3	0.3	0.5	0.2	0.3	0.2	0.3	0.1	0.2	0.6	1.0	0.2	0.4
CWT	6.3	5.0	5.8	4.2	3.1	3.5	1.7	2.5	1.5	1.5	1.1	1.5	0.8	0.9	0.1	0.2	1.2	2.6	*	*	0.0	0.0	*	*	0.1	0.2	*	*	0.1	0.4
MWT	6.1	5.2	4.5	4.5	1.8	3.0	1.0	0.8	1.0	1.1	2.4	3.8	0.3	0.4	0.1	0.2	0.6	0.8	0.3	0.6	0.2	0.3	0.3	0.5	0.1	0.2	0.8	2.4	0.0	0.0
EST	2.3	2.5	1.6	2.5	0.8	2.0	0.1	0.4	0.8	1.5	0.5	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VT3	*	*	*	*	*	*	3.8	3.2	2.5	2.5	3.2	3.8	0.6	0.7	1.0	1.2	1.0	1.5	1.6	2.7	0.4	0.8	0.0	0.0	0.3	0.5	1.6	4.0	0.2	0.2
AT	6.7	5.0	5.2	3.0	1.9	2.5	1.5	2.1	1.2	1.2	1.2	1.3	0.5	0.8	0.1	0.2	0.7	1.2	1.0	1.2	0.5	0.7	0.3	0.5	0.0	0.1	0.7	1.8	0.0	0.1
CSS	5.9	3.8	4.4	2.6	1.3	1.9	2.4	2.2	0.8	0.7	1.3	1.4	0.5	0.6	0.5	0.5	0.4	0.5	0.7	0.6	0.2	0.2	0.5	0.3	0.3	0.4	0.7	1.5	0.3	0.3

Increased Percentage of Phoneme Distortions: Additions (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
RSTR	*	*	*	*	*	*	0.6	0.7	0.8	1.1	0.3	0.4	0.6	1.0	1.1	1.6	0.6	0.7	0.3	0.7	0.0	0.0	0.0	0.0	0.2	0.3	0.2	0.3	0.0	0.0
LST	0.6	0.7	0.3	0.7	0.5	0.4	1.1	1.6	0.2	0.3	0.3	0.4	0.3	0.4	0.5	0.4	0.0	0.0	0.0	0.0	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CWT	0.8	0.4	0.3	0.4	0.3	0.4	0.2	0.2	0.4	1.0	0.1	0.2	0.0	0.0	0.0	0.0	0.1	0.2	*	*	0.0	0.0	*	*	0.0	0.0	*	*	0.0	0.0
MWT	3.6	1.5	3.0	2.2	3.3	2.7	3.1	1.1	1.1	0.7	1.4	0.8	1.2	0.8	0.3	0.3	0.4	0.4	0.6	0.4	0.5	0.6	0.4	0.8	0.3	0.3	0.1	0.3	0.1	0.3
EST	8.6	9.7	0.3	0.6	1.9	1.5	0.8	1.9	0.6	1.2	0.9	1.3	0.3	0.6	1.7	1.6	0.3	0.6	0.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.7	0.0	0.0
VT3	*	*	*	*	*	*	0.8	0.7	0.5	0.5	0.4	0.5	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AT	1.2	0.4	0.4	0.5	0.3	0.4	0.8	0.9	0.4	0.4	0.5	0.8	0.0	0.0	0.2	0.4	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CSS	0.6	0.3	0.8	0.6	0.6	0.5	0.4	0.3	0.3	0.3	0.3	0.4	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.0
Female																														
RSTR	*	*	*	*	*	*	0.3	0.4	0.6	0.7	0.3	0.4	0.2	0.3	0.9	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.7	0.0	0.0	0.0	0.0	0.0	0.0
LST	1.3	0.9	0.8	0.8	0.3	0.7	0.2	0.4	0.3	0.7	0.2	0.3	0.2	0.3	0.3	0.7	0.0	0.0	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CWT	0.7	0.7	0.3	0.2	0.0	0.0	0.1	0.2	0.3	0.4	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	*	*	0.1	0.2	*	*	0.0	0.0	*	*	0.0	0.0
MWT	4.1	2.8	7.5	4.1	3.1	1.8	3.1	1.1	1.4	1.2	0.7	0.6	0.3	0.5	0.6	0.4	0.3	0.3	0.5	0.8	0.4	0.8	0.5	0.8	0.2	0.3	0.2	0.3	0.0	0.0
EST	3.8	3.1	0.3	0.6	0.6	0.8	0.3	0.6	0.9	1.9	0.0	0.0	0.3	0.6	0.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VT3	*	*	*	*	*	*	0.6	0.6	0.1	0.2	0.1	0.2	0.3	0.4	0.1	0.2	0.0	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AT	1.8	1.4	1.4	1.4	0.5	0.6	0.9	0.8	0.4	0.5	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CSS	0.4	0.3	1.3	1.1	0.4	0.2	0.4	0.4	0.1	0.1	0.2	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.2	0.2	0.0	0.1	0.1	0.1	0.0	0.1

Increased Percentage of Phoneme Distortions: Additions (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Both																														
RSTR	*	*	*	*	*	*	0.5	0.5	0.7	0.8	0.3	0.4	0.4	0.8	1.0	1.4	0.3	0.5	0.2	0.5	0.0	0.0	0.2	0.5	0.1	0.2	0.1	0.2	0.0	0.0
LST	1.0	0.8	0.5	0.7	0.4	0.6	0.6	1.2	0.2	0.5	0.2	0.4	0.2	0.4	0.4	0.5	0.0	0.0	0.1	0.2	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CWT	0.7	0.5	0.3	0.3	0.1	0.3	0.1	0.2	0.4	0.7	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.1	*	*	0.0	0.1	*	*	0.0	0.0	*	*	0.0	0.0
MWT	3.8	2.1	5.2	3.9	3.2	2.1	3.1	1.1	1.3	0.9	1.1	0.8	0.8	0.8	0.5	0.4	0.4	0.3	0.5	0.6	0.4	0.7	0.4	0.7	0.3	0.3	0.2	0.3	0.1	0.2
EST	6.2	7.2	0.3	0.6	1.2	1.4	0.6	1.3	0.7	1.5	0.4	1.0	0.3	0.6	1.0	1.4	0.1	0.4	0.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.0	0.0
VT3	*	*	*	*	*	*	0.7	0.6	0.3	0.4	0.2	0.4	0.2	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AT	1.4	0.9	0.9	1.1	0.4	0.5	0.8	0.8	0.4	0.5	0.4	0.6	0.0	0.0	0.1	0.3	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CSS	0.5	0.3	1.0	0.9	0.5	0.4	0.4	0.4	0.2	0.2	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.2	0.0	0.1	0.1	0.1	0.0	0.1

Increased Percentage of Phoneme Distortions: Duration (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
RSTR	*	*	*	*	*	*	0.0	0.0	0.2	0.4	0.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.0	0.0	0.2	0.3	0.2	0.3	0.0	0.0	0.0	0.0
LST	0.2	0.4	0.0	0.0	0.0	0.0	0.3	0.7	0.2	0.3	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CWT	0.6	0.6	0.2	0.2	0.3	0.4	0.2	0.2	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.1	0.2	*	*	0.1	0.2	*	*	0.0	0.0	*	*	0.0	0.0
MWT	0.8	0.4	0.1	0.2	0.4	0.7	0.3	0.5	0.1	0.2	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.1	0.3	0.0	0.0	0.1	0.3
EST	0.3	0.6	0.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.2	1.8	0.0	0.0	5.6	2.8	0.0	0.0	7.8	3.2
VT3	*	*	*	*	*	*	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AT	0.6	0.5	0.2	0.2	0.3	0.5	0.3	0.4	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2	0.3	0.6	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2
CSS	0.8	0.8	0.5	0.3	0.8	0.5	0.6	0.7	0.9	0.3	0.5	0.7	0.5	0.3	0.6	0.7	0.5	0.4	0.1	0.1	0.5	0.6	0.6	0.4	0.5	0.3	0.1	0.2	0.4	0.2
Female																														
RSTR	*	*	*	*	*	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LST	0.5	0.7	0.0	0.0	0.6	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CWT	0.3	0.2	0.2	0.2	0.5	0.4	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	*	*	0.0	0.0	*	*	0.0	0.0	*	*	0.1	0.2
MWT	0.8	0.7	0.2	0.5	0.1	0.2	0.2	0.3	0.1	0.2	0.1	0.2	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3
EST	0.6	1.3	0.0	0.0	0.0	0.0	0.3	0.6	0.0	0.0	0.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7	1.8	0.0	0.0	5.6	2.8	0.0	0.0	6.4	4.4
VT3	*	*	*	*	*	*	0.0	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AT	1.4	2.4	0.0	0.0	0.7	0.5	0.1	0.2	0.2	0.2	0.1	0.2	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0
CSS	0.7	0.6	1.2	1.9	0.7	0.7	0.9	1.5	0.3	0.3	0.4	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.1	0.2	0.4	0.5	0.1	0.1	0.5	0.3	0.3	0.4	0.3	0.3

Increased Percentage of Phoneme Distortions: Duration (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Both																														
RSTR	*	*	*	*	*	*	0.0	0.0	0.1	0.3	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.1	0.2	0.1	0.2	0.0	0.0	0.0	0.0
LST	0.3	0.6	0.0	0.0	0.3	0.7	0.2	0.5	0.1	0.2	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CWT	0.4	0.5	0.2	0.2	0.4	0.4	0.1	0.2	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.1	*	*	0.0	0.1	*	*	0.0	0.0	*	*	0.0	0.1
MWT	0.8	0.6	0.2	0.4	0.3	0.5	0.3	0.4	0.1	0.2	0.1	0.2	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.1	0.2	0.0	0.0	0.1	0.2
EST	0.4	0.1	0.1	0.4	0.0	0.0	0.1	0.5	0.0	0.0	0.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.9	1.7	0.0	0.0	5.6	2.6	0.0	0.0	7.1	3.7
VT3	*	*	*	*	*	*	0.0	0.0	0.0	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AT	0.9	1.4	0.1	0.2	0.5	0.5	0.2	0.3	0.1	0.2	0.1	0.2	0.0	0.1	0.1	0.2	0.1	0.4	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.2
CSS	0.8	0.6	0.8	1.3	0.7	0.6	0.8	0.1	0.6	0.4	0.4	0.5	0.4	0.3	0.4	0.5	0.4	0.3	0.1	0.2	0.5	0.5	0.4	0.4	0.5	0.3	0.2	0.3	0.3	0.3

Increased Percentage of Phoneme Distortions: Force (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
RSTR	*	*	*	*	*	*	0.0	0.0	0.0	0.0	0.2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LST	0.8	1.2	0.0	0.0	0.3	0.6	0.3	0.6	0.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CWT	0.2	0.3	0.2	0.4	0.1	0.3	0.0	0.0	0.2	0.3	0.3	0.7	0.1	0.3	0.0	0.0	0.0	0.0	*	*	0.4	1.0	*	*	0.4	0.1	*	*	0.0	0.0
MWT	0.4	0.6	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.2	0.4	0.0	0.0	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VT3	*	*	*	*	*	*	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0
AT	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CSS	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Female																														
RSTR	*	*	*	*	*	*	0.2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CWT	0.9	0.6	0.0	0.0	0.0	0.0	0.6	1.0	0.1	0.3	0.6	1.0	0.2	0.3	0.0	0.0	0.4	0.7	*	*	0.2	0.7	*	*	0.0	0.0	*	*	0.0	0.0
MWT	0.0	0.0	0.0	0.0	0.5	0.8	0.0	0.0	0.2	0.4	0.3	0.8	0.2	0.4	0.0	0.0	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VT3	*	*	*	*	*	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CSS	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.3	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Increased Percentage of Phoneme Distortions: Force (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Both																														
RSTR	*	*	*	*	*	*	0.1	0.4	0.0	0.0	0.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LST	0.4	0.9	0.0	0.0	0.1	0.4	0.1	0.4	0.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CWT	0.5	0.6	0.1	0.2	0.1	0.2	0.3	0.7	0.2	0.3	0.4	0.8	0.1	0.3	0.0	0.0	0.2	0.5	*	*	0.2	0.7	*	*	0.2	0.7	*	*	0.0	0.0
MWT	0.2	0.5	0.1	0.3	0.3	0.6	0.0	0.0	0.1	0.3	0.3	0.6	0.2	0.4	0.0	0.0	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EST	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VT3	*	*	*	*	*	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0
AT	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CSS	0.1	0.1	0.1	0.2	0.0	0.1	0.0	0.1	0.2	0.4	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Increased Percent of EMMA errors by type (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CWT	30.4	15.6	12.7	16.7	8.7	11.7	12.3	8.1	8.1	11.6	1.7	3.7	0.0	0.0	0.0	0.0	1.4	3.2	*	*	0.0	0.0	*	*	0.0	0.0	*	*	1.7	3.7
MWT	40.1	9.3	26.2	14.7	29.2	18.4	27.2	6.5	18.2	9.8	13.1	4.4	10.0	5.2	3.8	3.8	6.2	5.2	3.6	2.0	7.3	8.3	3.6	5.9	2.7	2.5	1.0	2.2	0.9	0.2
AT	6.1	2.1	1.9	1.9	1.1	1.7	3.8	4.4	1.5	1.6	2.3	3.4	0.0	0.0	0.8	1.7	1.1	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.8
CSS	5.5	1.6	6.1	4.4	4.0	3.6	3.2	1.8	1.5	1.0	2.3	1.3	0.5	0.4	0.5	0.8	0.5	0.5	0.3	0.5	0.3	0.5	0.2	0.4	1.0	0.9	0.2	0.4	0.0	0.0
Female																														
CWT	25.5	20.2	28.7	25.1	3.3	4.6	6.5	10.8	6.4	6.5	1.7	3.7	0.0	0.0	1.7	3.7	0.0	0.0	*	*	1.5	3.4	*	*	0.0	0.0	*	*	0.0	0.0
MWT	46.5	13.6	47.4	13.6	24.6	11.4	24.8	8.7	13.1	8.4	9.3	3.5	3.8	3.8	5.4	4.4	3.8	2.7	5.5	5.0	5.5	5.9	3.6	8.1	1.8	2.4	2.8	2.5	0.9	2.0
AT	8.2	5.4	8.0	5.4	2.3	3.2	4.2	3.4	1.9	2.4	0.8	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CSS	3.6	1.2	5.1	2.5	2.8	0.7	3.7	2.6	1.0	1.0	1.1	2.0	1.0	1.1	1.2	0.7	0.3	0.5	0.2	0.4	0.6	0.8	0.9	0.7	0.2	0.4	0.4	0.5	0.2	0.4
Both																														
CWT	27.9	17.2	20.7	21.8	6.0	8.8	9.4	9.5	7.2	8.9	1.7	3.5	0.0	0.0	0.8	2.6	0.7	2.3	*	*	0.8	2.4	*	*	0.0	0.0	*	*	0.8	2.6
MWT	43.3	11.5	36.8	17.4	26.9	14.6	26.0	7.4	15.6	9.0	11.2	4.2	6.9	5.4	4.6	4.0	5.0	4.1	4.6	3.7	6.4	6.8	3.6	6.7	2.3	2.4	1.9	2.4	0.9	1.9
AT	6.7	3.5	4.9	5.0	1.7	2.5	4.0	3.7	1.7	1.9	1.5	2.5	0.0	0.0	0.4	1.2	0.6	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.6
CSS	4.5	1.7	5.6	3.4	3.4	2.5	3.5	2.1	1.3	0.9	1.7	1.7	0.7	0.8	0.9	0.8	0.4	0.5	0.3	0.4	0.4	0.7	0.6	0.7	0.6	0.8	0.3	0.4	0.1	0.3

Less Stable Whole Word Errors: Targets (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT12	**43.3**	**35.1**	**16.7**	*	41.7	*	25.0	35.4	61.1	34.7	*	*	33.3	0.0	*	*	*	*	*	*	100.0	*	*	*	*	*	*	*	*	*
RSTR	*	*	*	*	*	*	22.2	9.6	33.3	*	16.7	*	*	*	58.3	*	33.3	*	33.3	*	*	*	*	*	*	*	*	*	*	*
VT3	*	*	*	*	*	*	41.7	14.4	58.3	28.9	45.3	11.0	38.1	6.7	33.3	*	33.3	*	77.5	31.8	54.9	6.5	33.3	0.0	66.7	47.1	100.0	0.0	46.0	12.3
CSS	65.7	26.5	68.3	8.3	50.6	18.3	56.4	37.8	26.7	*	62.6	32.4	34.4	*	0.0	*	100.0	*	100.0	*	66.9	27.1	100.0	0.0	0.0	*	70.0	42.4	100.0	*
Female																														
VT12	37.8	9.0	72.2	48.1	100.0	*	75.0	*	*	*	*	*	*	*	*	*	50.0	*	*	*	*	*	*	*	*	*	33.3	*	*	*
RSTR	*	*	*	*	*	*	100.0	*	33.3	*	50.0	*	*	*	33.3	0.0	33.3	*	*	*	*	*	33.3	*	*	*	*	*	*	*
VT3	*	*	*	*	*	*	43.8	9.6	*	*	43.6	14.5	50.0	*	33.3	*	*	*	100.0	*	46.4	*	*	*	50.0	7.1	33.3	0.0	45.6	11.9
CSS	50.4	28.2	57.1	30.3	67.1	28.8	48.9	18.7	70.0	42.4	40.0	*	*	*	36.7	4.7	*	*	*	*	*	*	100.0	*	*	*	100.0	*	*	*
Both																														
VT12	40.9	25.6	58.3	48.1	70.8	41.2	50.0	50.0	61.1	34.7	*	*	33.3	0.0	*	*	50.0	*	*	*	100.0	*	*	*	*	*	33.3	*	*	*
RSTR	*	*	*	*	*	*	35.4	27.5	33.3	0.0	33.3	23.6	*	*	41.7	14.4	33.3	0.0	33.3	*	*	*	33.3	*	*	*	*	*	*	*
VT3	*	*	*	*	*	*	42.7	11.0	58.3	28.9	44.6	10.7	42.1	8.4	33.3	0.0	33.3	*	85.0	26.0	52.8	6.8	33.3	0.0	56.7	25.8	66.7	38.5	45.8	11.1
CSS	58.1	27.0	61.9	22.7	58.9	23.4	52.1	25.8	55.6	39.1	56.9	28.8	34.4	*	24.4	21.4	100.0	*	100.0	*	66.9	27.1	100.0	0.0	0.0	*	80.0	34.6	100.0	*

Less Stable Whole Word Errors: Error Types (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT12	**53.3**	**36.1**	**0.0**	*	100.0	*	50.0	70.7	100.0	0.0	*	*	100.0	0.0	*	*	*	*	*	*	100.0	*	*	*	*	*	*	*	*	*
RSTR	*	*	*	*	*	*	33.3	57.7	100.0	*	0.0	*	*	*	75.0	*	100.0	*	100.0	*	*	*	*	*	*	*	*	*	*	*
VT3	*	*	*	*	*	*	76.9	22.3	100.0	0.0	87.5	21.7	100.0	0.0	100.0	*	100.0	*	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
CSS	79.8	19.0	77.9	12.1	80.3	17.7	88.9	19.2	33.3	*	100.0	0.0	22.2	*	0.0	*	100.0	*	100.0	*	100.0	0.0	100.0	0.0	0.0	*	100.0	0.0	100.0	*
Female																														
VT12	69.0	24.7	66.7	57.7	100.0	*	100.0	*	*	*	*	*	*	*	*	*	100.0	*	*	*	*	*	*	*	*	*	100.0	*	*	*
RSTR	*	*	*	*	*	*	75.0	*	100.0	*	100.0	*	*	*	100.0	0.0	100.0	*	*	*	*	*	100.0	*	*	*	*	*	*	*
VT3	*	*	*	*	*	*	77.8	29.4	*	*	100.0	0.0	100.0	*	100.0	*	*	*	100.0	*	100.0	*	*	*	100.0	0.0	100.0	0.0	100.0	0.0
CSS	64.2	22.4	68.5	30.7	100.0	0.0	68.3	23.8	100.0	0.0	0.0	*	*	*	100.0	0.0	*	*	*	*	*	*	100.0	*	*	*	100.0	*	*	*
Both																														
VT12	60.3	30.8	50.0	57.7	100.0	0.0	66.7	57.7	100.0	0.0	*	*	100.0	0.0	*	*	100.0	*	*	*	100.0	*	*	*	*	*	100.0	*	*	*
RSTR	*	*	*	*	*	*	43.8	51.5	100.0	0.0	50.0	70.7	*	*	91.7	14.4	100.0	0.0	100.0	*	*	*	100.0	*	*	*	*	*	*	*
VT3	*	*	*	*	*	*	77.3	23.3	100.0	0.0	92.5	16.8	100.0	0.0	100.0	0.0	100.0	*	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
CSS	72.0	21.2	72.5	23.3	90.2	15.5	77.1	23.0	77.8	38.5	75.0	50.0	22.2	*	66.7	57.7	100.0	*	100.0	*	100.0	0.0	100.0	0.0	0.0	*	100.0	0.0	100.0	*

Less Stable Percentage of Phonemes Correct in Complex Words (%)

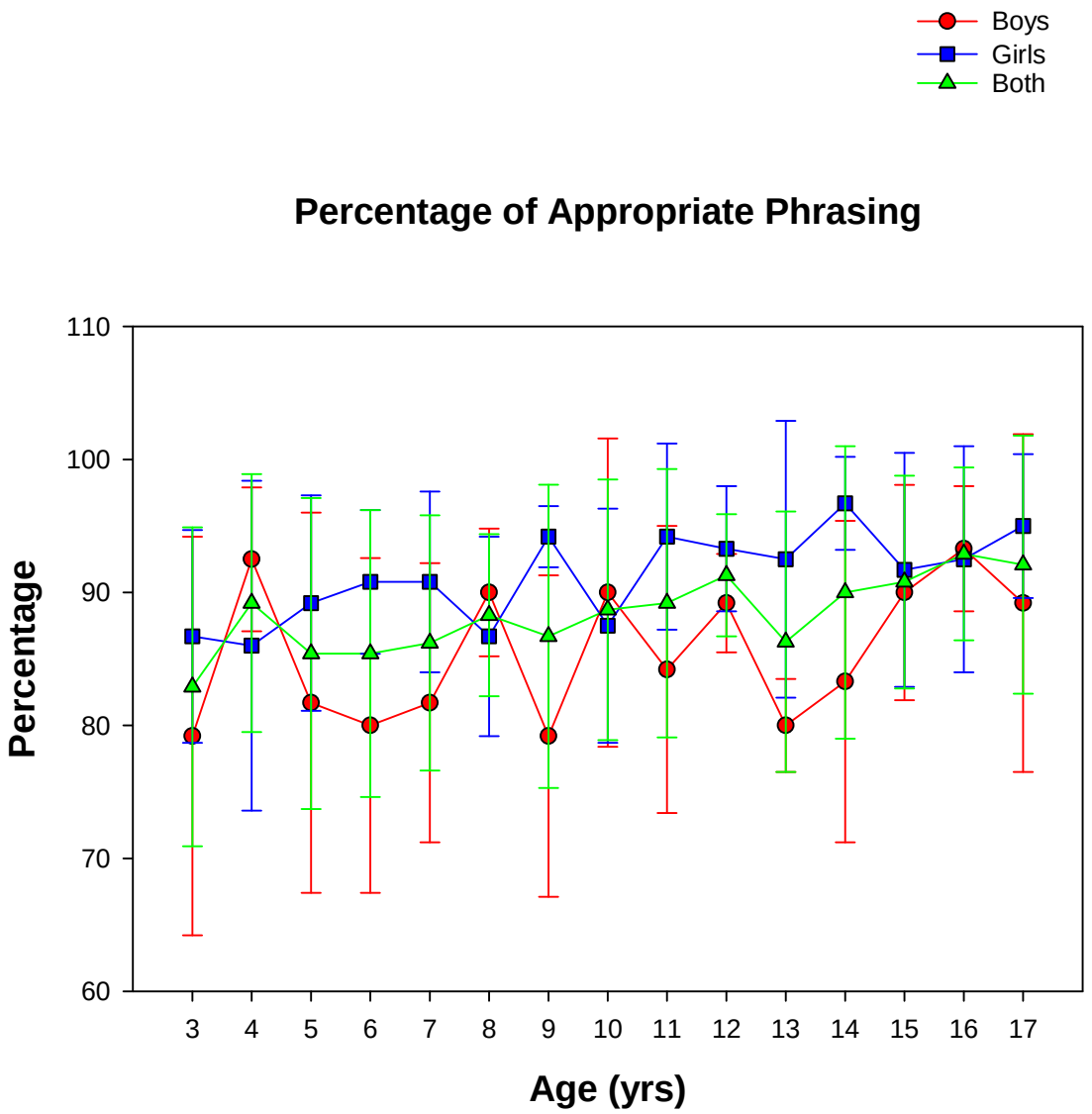
Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CWT	**40.2**	**23.9**	**85.3**	**4.7**	**73.2**	**19.7**	53.6	16.0	69.4	17.8	81.8	6.6	86.5	*	87.1	0.0	81.9	*	*	*	80.9	6.1	*	*	88.9	2.6	*	*	83.9	4.7
MWT	37.0	5.2	40.8	11.0	42.7	7.0	42.2	4.9	27.1	6.7	63.4	19.8	51.5	25.8	39.4	1.4	30.2	1.4	82.2	*	62.0	*	65.3	23.9	*	*	*	*	82.2	*
VT3	*	*	*	*	*	*	69.3	4.5	79.2	14.4	75.1	9.2	69.1	3.4	66.7	*	66.7	*	88.4	16.4	79.5	5.9	66.7	0.0	83.3	23.6	100.0	0.0	74.3	8.6
CSS	82.8	15.7	82.2	5.9	70.8	13.5	77.0	20.0	30.0	*	81.3	16.2	18.2	*	0.0	*	100.0	*	100.0	*	83.4	13.6	100.0	0.0	100.0	*	85.0	21.2	100.0	*
Female																														
CWT	68.6	12.6	70.7	21.9	77.1	16.7	79.0	16.2	79.8	20.4	86.7	0.9	90.9	3.4	88.5	1.8	92.0	*	*	*	*	*	*	*	88.4	2.2	*	*	91.0	*
MWT	34.0	8.2	35.2	12.5	45.0	20.9	45.4	8.0	48.9	11.4	36.9	8.9	54.9	36.3	67.5	22.6	47.1	24.1	32.7	*	38.5	*	46.8	*	*	*	*	*	31.1	*
VT3	*	*	*	*	*	*	68.7	11.3	*	*	71.5	6.8	75.0	*	66.7	*	*	*	100.0	*	73.2	*	*	*	75.0	3.6	66.7	0.0	72.8	6.0
CSS	73.5	25.7	76.7	17.5	86.2	13.4	64.1	13.7	85.0	21.2	20.0	*	*	*	68.3	2.4	*	*	*	*	*	*	100.0	*	*	*	100.0	*	*	*
Both																														
CWT	54.4	23.4	77.2	17.6	75.2	15.1	68.1	20.0	75.9	18.9	84.6	4.9	89.8	3.5	88.1	1.6	87.0	7.2	*	*	80.9	6.1	*	*	88.6	2.0	*	*	86.2	5.3
MWT	35.5	6.7	38.0	11.5	44.0	15.5	43.8	6.5	38.0	14.5	50.1	20.1	52.8	25.8	56.3	22.2	41.4	20.6	57.5	35.0	50.2	16.6	59.1	20.0	*	*	*	*	56.7	36.1
VT3	*	*	*	*	*	*	69.0	7.7	79.2	14.4	73.7	7.6	71.0	4.2	66.7	0.0	66.7	*	92.3	13.4	77.9	5.7	66.7	0.0	78.3	12.9	83.3	19.2	73.7	7.0
CSS	78.1	20.7	79.0	13.2	78.5	14.7	69.6	16.6	66.7	35.1	66.0	33.4	18.2	*	45.6	39.5	100.0	*	100.0	*	83.4	13.6	100.0	0.0	100.0	*	90.0	17.3	100.0	*

Increased Percent of EMMA errors by token (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CWT	**16.1**	**8.7**	8.9	14.1	3.3	4.6	8.9	6.6	3.9	5.4	0.6	1.2	0.0	0.0	0.0	0.0	0.6	1.2	*	*	0.0	0.0	*	*	0.0	0.0	*	*	0.6	1.2
MWT	40.1	9.3	26.2	14.7	29.2	18.4	27.2	6.5	18.2	9.8	13.1	4.4	10.0	5.2	3.8	3.8	6.2	5.2	3.6	2.0	7.3	8.3	3.6	5.9	2.7	2.5	1.0	2.2	0.9	2.0
AT	6.1	2.1	1.9	1.9	1.1	1.7	3.8	4.4	1.5	1.6	2.3	3.4	0.0	0.0	0.8	1.7	1.1	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.8
CSS	3.6	1.4	4.2	3.3	2.1	1.9	1.8	1.0	0.8	0.5	1.4	1.2	0.2	0.2	0.3	0.5	0.3	0.3	0.2	0.2	0.2	0.3	0.1	0.2	0.5	0.4	0.1	0.2	0.0	0.0
Female																														
CWT	18.9	19.1	20.6	20.1	1.1	1.5	2.2	3.6	2.2	2.3	0.6	1.2	0.0	0.0	0.6	1.2	0.0	0.0	*	*	0.6	1.2	*	*	0.0	0.0	*	*	0.0	0.0
MWT	46.5	13.6	47.4	13.6	24.6	11.4	24.8	8.7	13.1	8.4	9.3	3.5	3.8	3.8	5.4	4.4	3.8	2.7	5.5	5.0	5.5	5.9	3.6	8.1	1.8	2.4	2.8	2.5	0.9	2.0
AT	8.2	5.4	8.0	5.4	2.3	3.2	4.2	3.4	1.9	2.4	0.8	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CSS	2.1	0.7	3.8	2.7	1.4	0.4	1.8	1.3	0.6	0.5	0.6	1.0	0.5	0.5	0.7	0.5	0.2	0.2	0.1	0.2	0.3	0.4	0.6	0.6	0.1	0.3	0.2	0.3	0.1	0.2
Both																														
CWT	17.5	14.0	14.7	17.5	2.2	3.4	5.6	6.1	3.1	4.0	0.6	1.2	0.0	0.0	0.3	0.9	0.3	0.9	*	*	0.3	0.9	*	*	0.0	0.0	*	*	0.3	0.9
MWT	43.3	11.5	36.8	17.4	26.9	14.6	26.0	7.4	15.6	9.0	11.2	4.2	6.9	5.4	4.6	4.0	5.0	4.1	4.6	3.7	6.4	6.8	3.6	6.7	2.3	2.4	1.9	2.4	0.9	1.9
AT	6.9	3.5	4.9	5.0	1.7	2.5	4.0	3.7	1.7	1.9	1.5	2.5	0.0	0.0	0.4	1.2	0.6	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.6
CSS	2.9	1.3	4.0	2.8	1.8	1.4	1.8	1.1	0.7	0.5	1.0	1.1	0.4	0.4	0.5	0.5	0.2	0.2	0.1	0.2	0.2	0.3	0.4	0.5	0.3	0.4	0.2	0.3	0.0	0.2

Percentage of Appropriate Phrasing (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	79.2	15.0	92.5	5.4	81.7	14.3	80.0	12.6	81.7	10.5	90.0	4.8	79.2	12.1	90.0	11.6	84.2	10.8	89.2	3.7	80.0	3.5	83.3	12.1	90.0	8.1	93.3	4.7	89.2	12.7
Female																														
CSS	86.7	8.0	86.0	12.4	89.2	8.1	90.8	5.4	90.8	6.8	86.7	7.5	94.2	2.3	87.5	8.8	94.2	7.0	93.3	4.7	92.5	10.4	96.7	3.5	91.7	8.8	92.5	8.5	95.0	5.4
Both																														
CSS	82.9	12.0	89.2	9.7	85.4	11.7	85.4	10.8	86.2	9.6	88.3	6.1	86.7	11.4	88.7	9.8	89.2	10.1	91.3	4.6	86.3	9.8	90.0	11.0	90.8	8.0	92.9	6.5	92.1	9.7


Boys
Girls
Both
Percentage of Appropriate Phrasing
Percentage
110
100
90
80
70
60
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

Increased Repetitions and Revisions: 2-4 Word Utterances (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	10.00	14.91	0.00	0.00	0.00	0.00	4.00	8.94	3.33	7.45	2.22	4.97	10.00	22.36	2.50	5.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.67	14.91	0.00	0.00
Female																														
CSS	3.48	4.78	6.41	8.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Both																														
CSS	6.74	10.99	3.21	6.76	0.00	0.00	2.00	6.32	1.85	5.56	1.11	3.51	5.00	15.81	1.39	4.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.17	11.79	0.00	0.00

Increased Repetitions and Revisions: 5-7 Word Utterances (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	16.97	16.68	6.79	9.81	28.87	40.52	10.67	9.83	10.87	12.11	6.67	10.87	7.14	8.25	5.00	11.18	3.33	7.45	9.00	12.45	10.00	22.36	14.17	14.91	0.00	0.00	3.90	6.26	12.50	25.00
Female																														
CSS	14.04	13.99	5.00	11.18	2.22	4.97	2.86	6.39	8.48	14.44	9.56	9.28	6.67	14.91	5.00	11.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	8.94	4.00	8.94
Both																														
CSS	15.51	14.60	5.89	9.96	15.55	30.63	6.76	8.83	9.68	12.62	8.11	9.65	6.88	11.69	5.00	10.54	1.67	5.27	4.50	9.56	5.56	16.67	7.08	12.43	0.00	0.00	3.94	7.18	7.78	17.16

Increased Repetitions and Revisions: 8+ Word Utterances (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	40.56	31.65	20.86	18.23	28.00	18.50	35.66	18.77	29.24	24.39	13.28	8.19	28.48	19.89	12.71	9.53	20.96	14.44	13.99	4.61	31.01	14.28	22.97	11.94	10.79	10.41	8.49	9.48	18.85	21.65
Female																														
CSS	29.00	22.47	29.10	30.55	20.48	15.15	19.78	24.22	15.56	10.90	19.27	8.58	8.75	6.32	22.87	12.46	11.06	13.81	13.83	8.32	14.44	23.36	5.82	5.32	20.32	23.39	6.15	8.43	8.86	8.83
Both																														
CSS	34.78	26.58	24.98	24.11	24.24	16.42	27.72	22.08	22.40	19.22	16.27	8.51	18.61	17.37	17.79	11.75	16.01	14.30	13.91	6.35	22.73	20.23	14.39	12.56	15.55	17.79	7.43	8.65	13.30	15.57

Increased Repetitions and Revisions: All Utterances (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	20.83	15.02	7.50	5.43	18.45	14.51	21.67	14.62	18.33	10.46	9.68	4.35	20.05	11.23	8.79	7.67	14.71	10.12	11.50	4.96	19.94	5.50	17.74	7.63	7.57	7.87	8.49	5.87	14.68	21.20
Female																														
CSS	13.33	8.01	13.72	11.80	10.87	8.09	8.83	7.06	11.78	9.67	14.00	7.39	6.25	2.08	14.66	9.32	5.83	6.97	7.81	5.13	12.71	21.13	3.11	2.84	9.71	10.38	5.44	7.76	7.36	7.43
Both																														
CSS	17.08	12.02	10.61	9.26	14.66	11.77	15.25	12.77	15.06	10.10	11.84	6.16	13.15	10.53	11.72	8.62	10.27	9.43	9.65	5.14	16.33	15.05	10.42	9.43	8.64	8.76	7.10	6.62	10.61	14.52

Increased Syllable/Word Segregation: Percentage of Between/Within-Word Pauses (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
MWT	0.00	0.00	**0.15**	**0.23**	0.00	0.00	0.03	0.05	0.00	0.00	0.02	0.04	0.00	0.00	0.03	0.03	0.00	0.00	0.05	0.05	0.00	0.00	0.02	0.04	0.00	0.00	0.02	0.03	0.00	0.00
AT	0.00	0.00	0.02	0.03	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.03	0.00	0.00	0.02	0.02	0.00	0.00	0.01	0.01	0.00	0.00	0.03	0.02	0.00	0.00
CSS	0.29	0.22	0.52	0.23	0.72	0.41	0.85	0.53	0.62	0.22	0.58	0.38	0.61	0.20	0.90	0.33	0.75	0.32	1.27	0.55	1.12	0.60	1.48	0.79	1.23	0.38	0.94	0.41	0.97	0.65
Female																														
MWT	0.00	0.00	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.01	0.02	0.00	0.00	0.01	0.02	0.00	0.00	0.01	0.02	0.00	0.00	0.01	0.02	0.00	0.00
AT	0.00	0.00	0.01	0.01	0.00	0.00	0.02	0.02	0.00	0.00	0.02	0.02	0.00	0.00	0.03	0.03	0.00	0.00	0.02	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.02	0.02	0.00	0.01
CSS	0.22	0.06	0.69	0.46	0.58	0.48	0.58	0.35	0.78	0.28	0.59	0.06	0.74	0.33	0.92	0.31	0.51	0.26	0.82	0.29	1.20	0.50	0.95	0.41	0.71	0.33	0.98	0.19	0.64	0.33
Both																														
MWT	0.00	0.00	0.08	0.17	0.00	0.00	0.02	0.04	0.00	0.00	0.02	0.03	0.00	0.00	0.02	0.03	0.00	0.00	0.03	0.04	0.00	0.00	0.02	0.03	0.00	0.00	0.01	0.02	0.00	0.00
AT	0.00	0.00	0.02	0.02	0.00	0.00	0.02	0.02	0.00	0.00	0.01	0.02	0.00	0.00	0.02	0.03	0.00	0.00	0.02	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.02	0.02	0.00	0.01
CSS	0.25	0.16	0.60	0.36	0.65	0.43	0.72	0.45	0.70	0.25	0.59	0.25	0.68	0.27	0.91	0.30	0.63	0.30	1.05	0.48	1.16	0.52	1.21	0.66	0.97	0.44	0.96	0.31	0.79	0.49

Increased Syllable/Word Segregation: Duration of Between/Within-Word Pauses (ms)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
MWT	*	*	163.8	62.3	*	*	134.7	114.1	*	*	76.5	43.1	*	*	167.8	35.0	*	*	195.3	78.2	*	*	184.0	*	*	*	175.5	101.1	*	*
AT	*	*	205.6	41.4	*	*	222.8	110.8	*	*	62.0	*	*	*	235.0	*	*	*	149.0	27.9	*	*	169.0	43.8	*	*	180.2	48.7	*	*
CSS	595.9	146.0	639.8	228.4	609.6	167.1	511.1	137.5	705.2	206.1	444.9	75.4	847.4	172.9	581.6	180.2	470.7	147.3	747.4	195.9	441.5	40.4	527.3	167.8	556.1	137.7	540.9	84.1	524.6	151.6
Female																														
MWT	*	*	274.5	*	*	*	*	*	*	*	271.0	*	*	*	173.0	*	*	*	102.0	*	*	*	163.0	*	*	*	104.0	*	*	*
AT	*	*	219.0	63.7	*	*	157.3	37.4	*	*	143.6	16.6	*	*	155.5	37.9	*	*	217.3	58.9	*	*	206.5	79.9	*	*	220.0	35.4	294.0	*
CSS	842.5	453.0	628.9	430.1	649.7	257.4	778.1	672.1	716.6	323.9	426.1	157.1	638.9	181.1	577.7	224.3	543.7	114.5	541.9	191.1	447.9	94.1	488.8	90.9	667.9	333.4	581.8	179.5	510.8	96.0
Both																														
MWT	*	*	185.9	73.2	*	*	134.7	114.1	*	*	141.3	116.4	*	*	169.1	28.7	*	*	172.0	79.1	*	*	173.5	14.8	*	*	151.7	82.6	*	*
AT	*	*	212.3	48.6	*	*	190.0	82.2	*	*	127.3	39.2	*	*	175.4	50.4	*	*	188.0	57.7	*	*	187.8	56.9	*	*	193.5	45.8	294.0	*
CSS	688.4	295.1	634.4	324.7	629.6	205.7	644.6	478.5	710.9	256.0	435.5	116.6	743.1	199.9	579.9	191.8	507.2	130.2	644.7	212.2	444.7	68.4	508.0	128.9	612.0	247.6	561.3	133.9	517.7	119.8

Increased Percentage of Inappropriate Pauses (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	12.0	13.7	3.1	6.9	3.1	4.2	7.3	7.7	0.0	0.0	5.0	11.2	3.1	6.9	0.0	0.0	6.9	7.7	5.1	4.9	0.0	0.0	5.0	11.2	4.1	5.8	2.9	4.1	1.0	2.2
Female																														
CSS	9.7	13.6	16.5	17.2	2.1	4.6	7.5	12.6	8.2	14.4	3.5	4.9	0.0	0.0	5.0	11.2	12.7	13.1	6.6	6.7	1.0	2.2	0.0	0.0	0.0	0.0	4.3	6.4	0.0	0.0
Both																														
CSS	10.9	12.9	9.8	14.2	2.6	4.2	7.4	9.9	4.1	10.6	4.3	8.2	1.5	4.9	2.5	7.9	9.8	10.6	5.8	5.6	0.5	1.6	2.5	7.9	2.6	4.5	3.6	5.1	0.5	1.6

Increased Percentage of Pauses (%)																														
Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	10.0	6.8	13.9	6.5	14.1	4.3	12.5	1.2	10.3	3.8	9.2	3.7	9.7	5.5	12.3	4.2	13.3	2.1	12.5	5.0	12.0	4.8	15.0	5.3	12.2	3.9	11.9	2.4	10.0	4.6
Female																														
CSS	7.8	1.9	15.9	7.8	11.0	5.4	12.0	8.2	11.1	3.0	10.1	3.0	10.6	3.1	12.0	4.4	8.4	2.4	10.5	3.1	10.5	1.9	12.8	3.9	10.7	4.7	11.6	3.5	6.3	1.9
Both																														
CSS	8.9	4.9	14.9	6.8	12.5	4.9	12.3	5.5	10.7	3.2	9.7	3.2	10.2	4.3	12.2	4.1	10.9	3.3	11.5	4.1	11.2	3.5	13.9	4.5	11.5	4.2	11.7	2.8	8.2	3.9

Reduced Speech-Pause Duration Variability Ratio: 2-4 Word Utterances (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	1.12	0.82	1.23	0.47	0.31	*	0.29	0.41	0.84	*	*	*	1.17	*	1.03	0.26	1.52	1.05	*	*	1.30	*	0.79	0.66	*	*	0.25	*	0.68	*
Female																														
CSS	0.67	*	1.54	1.15	1.11	*	1.43	*	*	*	1.90	0.71	0.83	*	1.01	*	1.56	*	2.00	*	*	*	*	*	*	*	*	*	*	*
Both																														
CSS	0.97	0.64	1.34	0.73	0.71	0.57	0.67	0.72	0.84	*	1.90	0.71	1.00	0.24	1.02	0.18	1.53	0.74	2.00	*	1.30	*	0.79	0.66	*	*	0.25	*	0.68	*

Reduced Speech-Pause Duration Variability Ratio: 5-7 Word Utterances (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	0.99	*	1.47	1.06	0.79	0.56	0.58	0.04	0.96	0.86	1.32	0.54	1.19	0.35	0.87	0.64	1.09	0.51	0.80	0.38	0.74	*	1.90	1.09	0.93	0.03	1.18	0.29	1.17	*
Female																														
CSS	1.15	1.23	0.76	0.73	0.83	0.34	1.62	1.84	1.60	0.67	1.68	1.06	0.66	0.23	0.61	0.12	0.81	0.12	0.98	0.19	0.81	0.27	1.49	0.55	0.67	0.51	1.24	0.57	0.67	*
Both																														
CSS	1.10	0.87	1.15	0.95	0.81	0.40	1.10	1.22	1.28	0.79	1.47	0.68	0.92	0.39	0.76	0.48	0.98	0.39	0.89	0.29	0.78	0.20	1.70	0.83	0.77	0.39	1.20	0.38	0.92	0.35

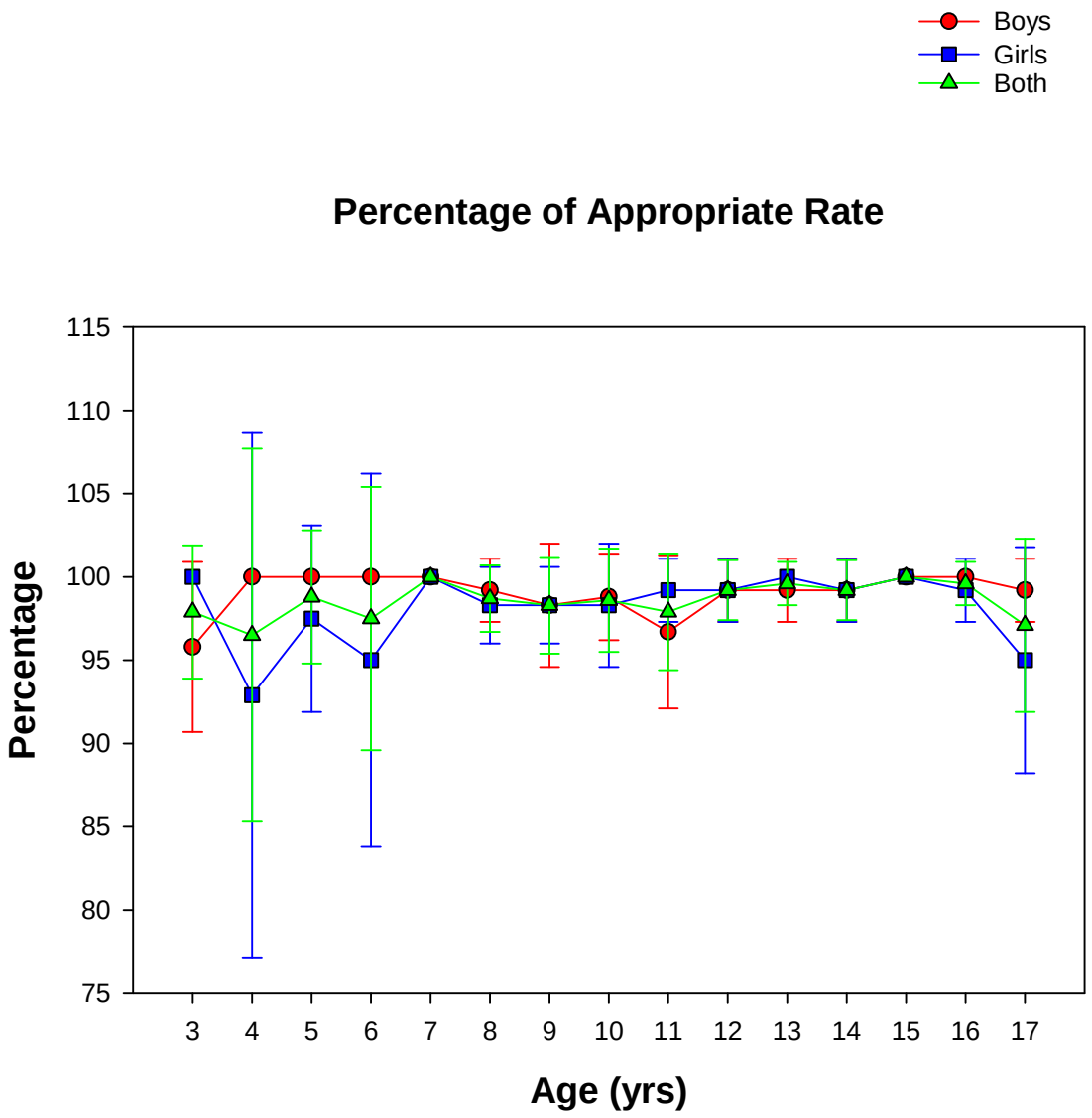
Reduced Speech-Pause Duration Variability Ratio: 8+ Word Utterances (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	1.08	1.08	1.30	0.16	1.34	0.46	1.14	0.45	0.81	0.24	1.46	1.10	0.71	0.15	0.93	0.28	0.93	0.23	1.05	0.18	0.74	0.25	1.03	0.36	0.94	0.33	0.93	0.51	0.99	0.33
Female																														
CSS	0.40	0.20	1.07	0.49	0.78	0.21	1.28	0.83	0.83	0.27	0.94	0.54	0.96	0.39	0.87	0.22	0.73	0.20	1.08	0.61	0.91	0.14	0.90	0.17	0.88	0.30	1.07	0.28	0.78	0.40
Both																														
CSS	0.74	0.79	1.17	0.38	1.06	0.45	1.21	0.63	0.82	0.24	1.20	0.86	0.83	0.31	0.90	0.24	0.83	0.23	1.07	0.43	0.83	0.21	0.96	0.27	0.91	0.30	0.99	0.41	0.87	0.36

Reduced Speech-Pause Duration Variability Ratio: All Utterances (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	0.74	0.46	1.43	0.32	1.06	0.31	1.04	0.29	0.89	0.22	1.10	0.24	0.71	0.14	0.90	0.16	0.93	0.26	1.07	0.17	0.73	0.23	1.05	0.37	0.91	0.35	0.85	0.28	1.02	0.27
Female																														
CSS	0.92	0.56	1.06	0.47	0.82	0.19	1.20	0.52	1.09	0.41	0.95	0.43	0.92	0.30	1.05	0.33	0.68	0.15	1.06	0.42	0.91	0.18	0.93	0.12	0.88	0.31	1.08	0.19	0.73	0.42
Both																														
CSS	0.83	0.49	1.25	0.43	0.94	0.27	1.12	0.41	0.99	0.33	1.02	0.34	0.82	0.25	0.98	0.26	0.80	0.24	1.07	0.30	0.82	0.22	0.99	0.27	0.90	0.31	0.95	0.26	0.86	0.37

Percentage of Appropriate Rate (%)																														
Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	95.8	5.1	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	99.2	1.9	98.3	3.7	98.8	2.6	96.7	4.6	99.2	1.9	99.2	1.9	99.2	1.9	100.0	0.0	100.0	0.0	99.2	1.9
Female																														
CSS	100.0	0.0	92.9	15.8	97.5	5.6	95.0	11.2	100.0	0.0	98.3	2.3	98.3	2.3	98.3	3.7	99.2	1.9	99.2	1.9	100.0	0.0	99.2	1.9	100.0	0.0	99.2	1.9	95.0	6.8
Both																														
CSS	97.9	4.0	96.5	11.2	98.8	4.0	97.5	7.9	100.0	0.0	98.7	2.0	98.3	2.9	98.6	3.1	97.9	3.5	99.2	1.8	99.6	1.3	99.2	1.8	100.0	0.0	99.6	1.3	97.1	5.2


Boys
Girls
Both
Percentage of Appropriate Rate
Percentage
115
110
105
100
95
90
85
80
75
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

Slower Speaking Rate: 2-4 Word Utterances (syll/sec)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	3.1	0.6	3.0	0.9	3.7	1.6	3.3	0.4	3.3	0.4	3.7	1.6	3.4	0.8	3.7	1.0	3.8	0.4	6.3	2.0	5.3	2.0	5.7	2.0	5.4	1.7	5.4	1.0	5.4	2.0
Female																														
CSS	3.0	0.6	3.2	0.7	4.2	0.5	3.6	1.3	3.7	0.9	3.9	2.0	4.2	1.2	5.5	2.7	5.0	0.5	3.9	0.8	2.9	1.4	4.6	1.5	4.6	1.8	6.5	1.9	5.1	1.9
Both																														
CSS	3.1	0.6	3.1	0.8	4.0	1.1	3.4	0.9	3.5	0.6	3.8	1.7	3.9	1.1	4.4	1.9	4.5	0.8	4.6	1.6	4.6	2.1	5.1	1.8	4.9	1.7	5.8	1.3	5.3	1.8

Slower Speaking Rate: 5-7 Word Utterances (syll/sec)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	3.8	0.7	2.7	0.7	4.3	1.3	4.3	1.0	3.4	0.5	4.1	0.9	4.2	0.7	4.2	2.3	3.8	0.9	4.7	1.6	4.7	1.2	3.5	1.6	5.6	0.7	5.7	1.0	5.1	0.9
Female																														
CSS	3.5	0.5	3.3	1.0	3.8	0.7	4.3	1.1	3.5	0.6	3.9	0.2	4.3	0.8	4.5	0.5	3.4	0.4	4.3	1.2	4.9	0.9	4.0	0.6	4.6	0.7	4.2	0.8	5.9	1.9
Both																														
CSS	3.7	0.6	3.0	0.9	4.0	1.0	4.0	1.0	3.4	0.5	4.0	0.7	4.3	0.7	4.3	1.6	3.6	0.7	4.5	1.4	4.8	1.0	3.7	1.2	5.0	0.9	5.0	1.2	5.5	1.5

Slower Speaking Rate: 8+ Word Utterances (syll/sec)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	3.1	1.1	2.0	0.8	3.0	0.4	2.8	0.8	3.1	0.3	3.8	0.6	3.3	0.3	3.9	0.8	3.8	0.5	3.5	0.5	4.3	0.7	3.7	0.6	4.3	0.3	4.5	0.8	4.8	0.9
Female																														
CSS	3.4	0.6	2.9	1.4	3.4	0.5	3.4	1.5	3.2	0.4	4.3	0.7	3.8	0.4	3.9	0.7	4.1	0.4	4.4	0.9	4.1	0.3	4.1	1.1	3.9	0.8	4.2	1.0	5.0	0.8
Both																														
CSS	3.2	0.8	2.5	1.2	3.2	0.5	3.1	1.2	3.2	0.3	4.1	0.7	3.5	0.4	3.9	0.7	4.0	0.4	3.9	0.8	4.2	0.6	3.9	0.9	4.1	0.6	4.4	0.8	4.9	0.8

Slower Speaking Rate: All Utterances (syll/sec)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	3.3	0.4	2.8	0.7	3.4	0.5	3.6	0.4	3.3	0.3	4.0	0.5	3.6	0.3	4.0	0.9	3.8	0.3	4.0	1.0	4.6	1.1	3.8	0.8	4.5	0.3	5.0	0.8	4.9	0.8
Female																														
CSS	3.3	0.5	3.2	0.9	3.7	0.5	3.7	1.0	3.3	0.4	4.1	0.6	4.0	0.5	4.2	0.5	4.3	0.4	4.3	0.5	4.2	0.4	4.2	0.9	4.3	0.6	4.5	0.7	5.1	0.7
Both																														
CSS	3.3	0.4	3.0	0.8	3.6	0.5	3.7	0.7	3.3	0.4	4.0	0.5	3.8	0.4	4.1	0.7	4.0	0.4	4.2	0.7	4.4	0.8	4.0	0.8	4.4	0.4	4.7	0.8	5.0	0.7

Slower Articulation Rate: 2-4 Word Utterances (syll/sec)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	3.4	0.7	3.5	0.9	3.8	1.6	3.6	0.1	3.5	0.4	4.1	1.2	3.4	0.8	4.0	0.9	4.9	1.0	6.3	2.0	5.4	2.0	6.2	1.6	5.4	1.7	5.6	0.9	5.5	1.9
Female																														
CSS	3.1	0.6	3.4	0.9	4.3	0.4	3.8	1.2	3.8	0.9	4.4	1.7	4.3	1.2	6.1	1.8	5.5	0.9	4.3	1.0	3.7	0.4	4.9	1.4	4.9	1.7	6.5	1.9	5.3	1.5
Both																														
CSS	3.3	0.7	3.5	0.8	4.0	1.1	3.7	0.8	3.6	0.6	4.3	1.4	3.9	1.1	4.8	1.6	5.2	0.9	4.9	1.5	4.9	1.8	5.5	1.6	5.1	1.6	5.9	1.2	5.4	1.6

Slower Articulation Rate: 5-7 Word Utterances (syll/sec)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	4.0	0.7	3.3	0.7	4.5	1.2	4.7	0.7	3.7	0.4	4.6	0.7	4.6	0.7	4.7	2.0	4.2	0.9	5.2	1.4	5.3	1.2	4.4	1.4	6.1	0.7	6.4	1.0	5.8	0.7
Female																														
CSS	3.7	0.7	3.7	0.9	4.0	0.5	4.6	1.0	3.8	0.6	4.2	0.3	5.0	0.8	5.0	0.6	3.9	0.4	5.2	0.9	5.0	0.8	4.9	0.8	5.1	0.6	4.6	0.8	6.1	1.8
Both																														
CSS	3.9	0.7	3.5	0.8	4.2	0.9	4.6	0.8	3.8	0.5	4.4	0.6	4.8	0.8	4.8	1.5	4.0	0.7	5.2	1.1	5.2	1.0	4.7	1.1	5.6	0.8	5.5	1.3	5.9	1.3

Slower Articulation Rate: 8+ Word Utterances (syll/sec)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	3.3	0.9	3.0	1.0	3.4	0.7	3.7	0.5	3.7	0.3	4.3	0.9	3.9	0.4	4.5	0.7	4.6	0.7	4.5	0.7	5.2	0.8	4.4	0.5	5.1	0.1	5.4	0.7	5.6	0.8
Female																														
CSS	3.6	0.6	3.6	1.2	4.1	0.4	4.1	1.2	3.8	0.4	4.7	0.7	4.6	0.8	4.6	0.4	4.6	0.3	4.9	0.8	4.8	0.5	4.9	1.0	4.7	0.7	5.1	0.8	5.3	0.8
Both																														
CSS	3.4	0.7	3.3	1.1	3.8	0.6	3.9	0.9	3.7	0.3	4.5	0.8	4.3	0.7	4.5	0.5	4.6	0.5	4.7	0.8	5.0	0.6	4.6	0.8	4.9	0.5	5.2	0.7	5.5	0.8

Slower Articulation Rate: All Utterances (syll/sec)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	3.5	0.5	3.3	0.8	3.7	0.5	4.1	0.4	3.7	0.3	4.5	0.6	4.0	0.4	4.5	0.9	4.5	0.6	4.8	0.9	5.3	1.0	4.6	0.8	5.2	0.3	5.8	0.8	5.5	0.6
Female																														
CSS	3.5	0.5	3.7	0.9	4.1	0.4	4.1	0.9	3.8	0.5	4.5	0.6	4.6	0.7	4.8	0.3	4.8	0.4	4.9	0.6	4.8	0.4	4.9	0.9	5.0	0.6	5.1	0.7	5.4	0.7
Both																														
CSS	3.5	0.5	3.5	0.8	3.9	0.4	4.1	0.7	3.7	0.4	4.5	0.6	4.3	0.7	4.6	0.6	4.6	0.5	4.8	0.7	5.0	0.8	4.8	0.8	5.1	0.4	5.4	0.8	5.5	0.6

Less Stable Speaking Rate: 1-4 Word Utterances (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	72.40	14.43	55.57	30.33	72.73	16.42	75.27	11.30	61.84	8.23	67.62	19.65	75.53	23.90	75.04	17.62	54.10	21.66	*	*	58.40	20.88	56.71	12.01	67.75	*	47.53	*	68.71	1.96
Female																														
CSS	73.85	14.06	68.91	19.03	26.26	38.14	77.64	22.45	65.94	*	76.04	17.42	79.91	20.49	76.50	*	78.28	7.50	69.26	23.68	*	*	87.07	7.13	56.45	36.44	79.11	*	55.12	1.90
Both																														
CSS	73.12	13.45	62.24	24.89	54.14	33.85	76.62	17.21	62.66	7.36	71.82	17.24	77.72	20.06	75.28	15.77	66.19	19.63	69.26	23.68	58.40	20.88	76.95	17.47	58.71	31.96	63.32	22.33	61.91	8.00

Less Stable Speaking Rate: 5-7 Word Utterances (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	80.56	11.56	73.25	9.38	65.24	13.93	70.40	15.66	60.24	8.02	73.55	16.03	54.01	20.51	63.47	23.47	72.14	28.06	70.40	12.98	81.17	19.18	64.39	25.36	49.75	10.87	67.22	9.10	58.76	17.55
Female																														
CSS	76.45	25.36	63.80	8.58	73.92	15.04	77.59	10.93	67.16	21.33	56.29	10.77	59.73	26.60	67.49	15.85	45.43	7.36	66.80	22.52	76.41	5.39	68.52	11.88	66.20	14.43	66.26	11.16	72.63	23.32
Both																														
CSS	78.28	19.40	68.52	9.83	70.06	14.38	74.00	13.29	63.70	15.63	65.88	15.96	57.58	23.09	65.77	17.71	64.51	26.53	68.60	17.44	79.13	14.15	66.46	18.80	58.89	14.96	66.83	9.37	64.70	19.76

Less Stable Speaking Rate: 8+ Word Utterances (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	90.51	5.86	88.28	11.31	65.11	15.56	73.03	8.20	67.23	11.22	68.54	3.68	64.45	12.42	74.99	15.76	73.62	14.56	64.87	13.10	73.26	3.42	71.01	3.82	71.57	9.58	75.84	5.94	72.21	6.18
Female																														
CSS	83.74	8.65	70.94	16.13	69.70	9.74	68.23	12.33	71.69	6.61	72.82	9.75	74.67	8.19	60.00	17.50	68.32	13.69	68.66	7.77	75.76	7.69	75.06	8.17	71.74	10.08	67.33	8.87	79.15	5.21
Both																														
CSS	87.12	7.58	76.72	16.18	67.40	12.47	70.36	10.37	69.46	9.00	70.68	7.30	69.56	11.29	67.50	17.58	70.97	13.62	66.77	10.35	74.51	5.76	73.04	6.38	71.65	9.27	71.97	8.30	76.06	6.42

Less Stable Speaking Rate: All Utterances (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	73.55	9.97	65.30	11.13	63.10	6.19	67.10	10.62	64.70	3.94	66.93	4.56	63.85	10.01	66.07	12.50	68.34	11.12	64.18	7.24	71.17	3.74	61.65	4.89	65.38	7.06	67.77	4.25	70.02	8.45
Female																														
CSS	74.62	13.91	62.07	14.41	67.11	12.04	66.43	10.19	67.95	7.38	66.27	8.93	70.12	4.40	60.94	12.62	70.78	6.75	64.41	9.63	74.38	5.21	72.84	5.98	62.43	8.06	67.53	9.82	71.95	8.67
Both																														
CSS	74.08	11.42	63.69	12.26	65.10	9.27	66.76	9.82	66.33	5.83	66.60	6.70	66.99	8.01	63.50	12.14	69.56	8.77	64.29	8.03	72.77	4.60	67.24	7.83	63.91	7.31	67.66	6.90	71.09	8.08

Less Stable Articulation Rate: 1-4 Word Utterances (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	73.17	12.25	75.40	12.19	77.18	13.15	80.91	2.33	66.49	8.87	72.56	16.01	79.15	18.47	76.87	19.05	81.90	10.19	*	*	67.52	7.08	57.29	7.30	67.75	*	61.58	*	72.91	3.99
Female																														
CSS	74.63	8.64	72.34	12.57	30.12	43.60	81.01	16.69	76.58	*	83.90	9.91	82.84	15.61	76.50	*	85.59	2.67	82.98	14.71	*	*	85.56	8.83	60.53	24.24	79.11	*	76.57	28.43
Both																														
CSS	73.90	10.02	73.87	11.78	58.35	35.01	80.97	11.88	68.51	8.91	78.23	13.43	81.00	15.43	76.81	17.04	83.75	6.91	82.98	14.71	67.52	7.08	76.14	16.45	61.98	21.24	70.34	12.39	74.74	16.71

Less Stable Articulation Rate: 5-7 Word Utterances (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	72.04	11.35	82.36	3.97	73.06	12.61	79.56	14.17	68.42	11.22	78.82	14.81	61.11	4.28	68.34	15.23	82.92	14.52	75.17	9.97	77.76	17.58	78.19	19.28	65.53	4.53	84.06	9.93	73.54	6.67
Female																														
CSS	80.25	10.20	73.86	11.70	76.92	8.67	81.43	8.70	78.60	18.48	68.90	13.55	72.32	17.09	66.01	10.52	69.18	14.10	80.22	12.82	83.33	10.06	82.82	12.73	73.04	9.21	80.69	6.95	81.00	16.50
Both																														
CSS	76.60	10.91	78.11	9.38	75.20	10.07	80.49	11.13	73.51	15.38	74.41	14.35	68.12	14.35	67.01	11.58	78.99	14.78	77.70	11.15	80.15	14.04	80.50	15.60	69.70	8.11	82.71	8.60	76.73	11.35

Less Stable Articulation Rate: 8+ Word Utterances (u)

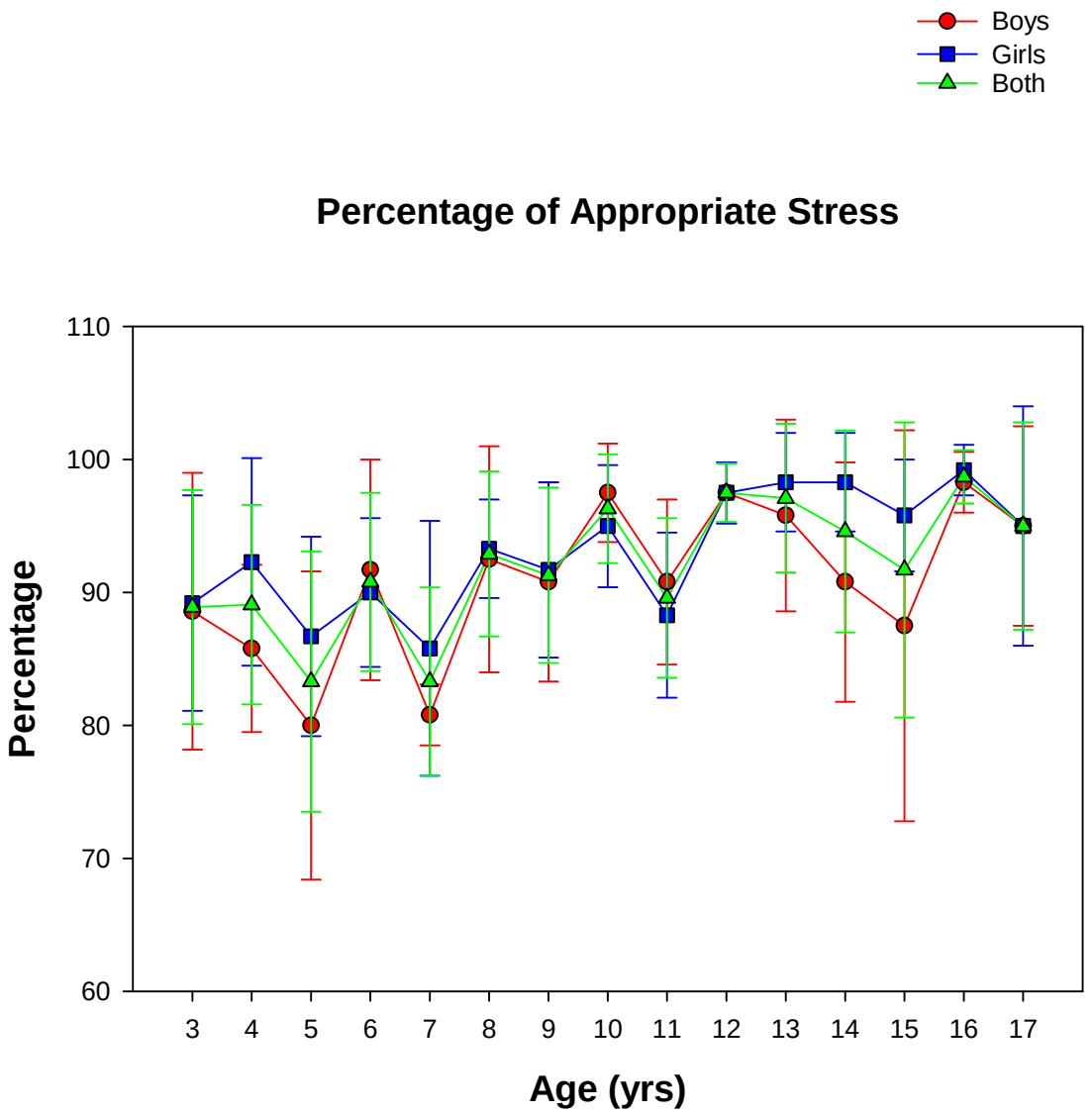
Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	78.10	0.38	86.63	7.83	78.97	9.84	82.95	8.87	79.71	8.76	78.14	8.39	76.95	6.42	82.33	7.32	80.86	7.67	77.20	13.52	80.25	5.39	75.16	3.71	84.37	4.16	86.63	3.21	83.71	3.53
Female																														
CSS	85.97	9.97	78.15	22.95	84.37	3.23	84.60	6.05	81.48	6.18	81.34	8.03	80.36	2.74	74.86	8.29	77.04	10.06	77.43	3.12	80.77	5.09	81.05	6.77	79.54	4.64	80.26	4.58	81.86	3.46
Both																														
CSS	82.04	7.64	80.98	18.64	81.67	7.47	83.87	6.97	80.59	7.21	79.74	7.93	78.65	4.99	78.59	8.36	78.95	8.67	77.31	9.25	80.51	4.95	78.11	6.01	81.96	4.87	83.73	4.96	82.68	3.41

Less Stable Articulation Rate: All Utterances (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	73.73	4.34	80.36	5.89	71.49	5.05	76.67	10.42	72.73	2.64	76.10	8.20	72.04	7.80	73.26	5.93	78.05	6.50	76.67	9.51	77.14	3.80	72.00	5.15	78.36	1.61	79.71	4.73	78.82	5.64
Female																														
CSS	77.04	6.90	70.82	9.41	75.46	11.37	76.57	4.64	78.08	7.58	75.14	7.73	78.23	2.55	71.53	6.94	77.93	8.08	74.41	7.28	79.97	2.80	81.48	6.92	71.68	6.11	77.95	6.99	77.55	6.58
Both																														
CSS	75.39	5.71	75.59	8.95	73.48	8.55	76.62	7.60	75.41	6.05	75.62	7.53	75.13	6.37	72.39	6.15	77.99	6.92	75.54	8.08	78.55	3.48	76.74	7.62	75.02	5.49	78.91	5.62	78.12	5.83

Percentage of Appropriate Stress (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	88.6	10.4	85.8	6.3	80.0	11.6	91.7	8.3	80.8	2.3	92.5	8.5	90.8	7.5	97.5	3.7	90.8	6.2	97.5	2.3	95.8	7.2	90.8	9.0	87.5	14.7	98.3	2.3	95.0	7.5
Female																														
CSS	89.2	8.1	92.3	7.8	86.7	7.5	90.0	5.6	85.8	9.6	93.3	3.7	91.7	6.6	95.0	4.6	88.3	6.2	97.5	2.3	98.3	3.7	98.3	3.7	95.8	4.2	99.2	1.9	95.0	9.0
Both																														
CSS	88.9	8.8	89.1	7.5	83.3	9.8	90.8	6.7	83.3	7.1	92.9	6.2	91.3	6.6	96.3	4.1	89.6	6.0	97.5	2.2	97.1	5.6	94.6	7.6	91.7	11.1	98.7	2.0	95.0	7.8


Boys
Girls
Both
Percentage of Appropriate Stress
Percentage
110
100
90
80
70
60
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

Lexical Stress: Trochees (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
LST	1.6	1.0	1.7	0.5	1.5	0.3	1.3	0.2	1.2	0.4	1.5	0.4	1.3	0.3	1.1	0.2	1.3	0.2	1.3	0.3	1.0	0.1	0.3	0.4	1.0	0.2	1.3	0.2	1.1	0.4
Female																														
LST	1.4	0.3	1.6	0.3	1.5	0.3	1.5	0.5	1.5	0.5	1.3	0.2	1.2	0.1	1.3	0.5	1.2	0.2	1.2	0.3	1.0	0.2	1.3	0.4	1.3	0.3	1.1	0.1	0.7	0.1
Both																														
LST	1.5	0.7	1.7	0.4	1.5	0.3	1.4	0.4	1.3	0.4	1.4	0.3	1.3	0.2	1.2	0.4	0.3	0.2	0.3	0.3	1.0	0.1	1.3	0.4	1.1	0.2	1.2	0.2	0.9	0.3

Lexical Stress: All (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
LST	1.6	1.0	1.7	0.5	1.5	0.3	1.3	0.2	1.2	0.4	1.5	0.4	1.3	0.3	1.1	0.2	1.3	0.2	1.3	0.3	1.0	0.1	1.3	0.3	1.0	0.2	1.3	0.2	1.2	0.3
Female																														
LST	1.4	0.3	1.6	0.3	1.5	0.3	1.5	0.5	1.5	0.5	1.3	0.2	1.2	0.1	1.3	0.5	1.2	0.2	1.2	0.3	1.0	0.2	1.3	0.4	1.3	0.3	1.1	0.1	0.8	0.1
Both																														
LST	1.5	0.7	1.7	0.4	1.5	0.3	1.4	0.4	1.3	0.4	1.4	0.3	1.3	0.2	1.2	0.4	1.3	0.2	1.3	0.3	1.0	0.1	1.3	0.4	1.1	0.2	1.2	0.2	1.0	0.3

Emphatic Stress (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
EST	1.1	0.1	1.3	0.1	1.6	0.2	1.3	0.1	1.4	0.1	1.4	0.2	1.5	0.1	1.5	0.1	1.6	0.1	1.5	0.1	1.6	0.1	1.5	0.2	1.4	0.2	1.5	0.2	1.6	0.2
Female																														
EST	1.3	0.2	1.4	0.1	1.4	0.2	1.5	0.1	1.4	0.2	1.4	0.1	1.6	0.1	1.7	0.2	1.6	0.1	1.7	0.1	1.4	0.1	1.4	0.2	1.5	0.1	1.5	0.1	1.6	0.2
Both																														
EST	1.3	0.2	1.3	0.1	1.5	0.2	1.4	0.1	1.4	0.1	1.4	0.1	1.5	0.1	1.6	0.2	1.6	0.1	1.6	0.1	1.5	0.1	1.5	0.2	1.5	0.2	1.5	0.1	1.6	0.2

Sentential Stress (u)																														
Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	1.1	0.3	1.6	0.8	1.4	0.2	1.4	0.3	1.1	0.2	1.4	0.4	1.2	0.4	1.6	0.2	1.6	0.4	1.4	0.3	1.4	0.3	1.6	0.4	1.7	0.5	1.3	0.2	1.2	0.3
Female																														
CSS	1.2	0.7	1.3	0.7	1.3	0.5	1.3	0.3	1.3	0.4	1.3	0.3	1.3	0.3	2.5	2.3	1.4	0.2	1.5	0.3	1.3	0.1	1.4	0.3	1.2	0.1	1.3	0.4	1.3	0.3
Both																														
CSS	1.2	0.5	1.4	0.7	1.3	0.3	1.3	0.3	1.2	0.3	1.3	0.3	1.3	0.3	2.1	1.6	1.5	0.3	1.5	0.3	1.4	0.2	1.5	0.4	1.4	0.4	1.3	0.3	1.3	0.3

Less Stable Lexical Stress: Trochees (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
LST	55.4	17.5	46.2	17.7	48.6	11.7	64.2	11.7	54.0	5.8	52.8	17.9	51.7	7.4	66.2	8.0	49.1	14.1	62.9	6.0	62.8	7.5	63.2	13.5	65.1	2.8	56.2	14.0	57.1	12.3
Female																														
LST	28.9	17.3	45.6	24.7	37.3	14.8	47.0	6.9	43.9	19.2	54.3	14.5	57.8	4.5	59.2	22.2	57.2	7.7	53.2	11.7	59.5	7.9	62.0	13.2	46.2	12.8	56.0	18.9	66.1	6.8
Both																														
LST	40.7	21.5	45.9	20.3	42.9	13.9	55.6	12.8	48.9	14.4	53.6	15.3	54.7	6.6	62.7	16.2	53.2	11.5	58.0	10.2	61.1	7.5	62.6	12.6	55.6	13.3	56.1	15.7	61.6	10.5

Less Stable Lexical Stress: All (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
LST	55.4	17.5	46.3	17.7	47.2	12.0	64.2	11.7	54.0	5.8	52.8	17.9	51.7	7.4	66.2	8.0	49.1	14.1	62.9	6.0	62.8	7.5	63.2	13.5	65.1	2.8	56.2	14.0	57.1	12.3
Female																														
LST	28.9	17.3	45.6	24.7	38.5	12.6	47.0	6.9	43.9	19.2	54.3	14.5	57.8	4.5	59.2	22.2	57.2	7.7	53.2	11.7	59.5	7.9	62.0	13.2	46.2	12.8	56.0	18.9	56.1	11.3
Both																														
LST	40.7	21.5	45.9	20.3	42.8	12.5	55.6	12.8	48.9	14.4	53.6	15.3	54.7	6.6	62.7	16.2	53.2	11.5	58.0	10.2	61.1	7.5	62.6	12.6	55.6	13.3	56.1	15.7	56.6	11.1

Less Stable Emphatic Stress (u)

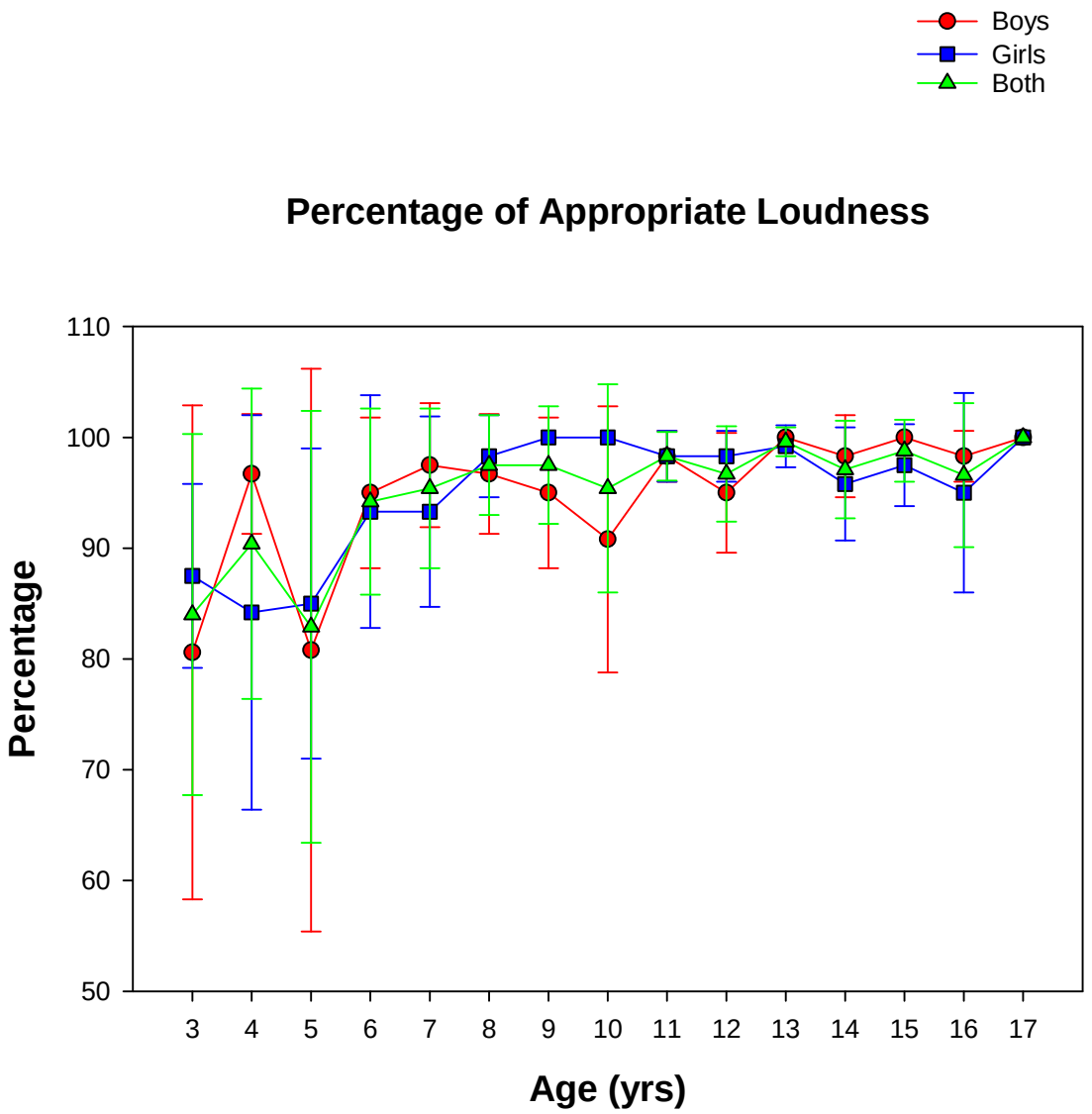
Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
EST	51.5	14.5	66.8	6.9	68.0	11.9	64.5	13.1	69.3	12.8	70.9	8.6	65.9	12.9	69.5	5.3	71.0	3.6	68.0	7.9	70.2	7.4	66.0	6.4	72.2	6.9	59.0	23.6	64.4	9.2
Female																														
EST	54.3	22.2	70.8	8.8	66.3	12.0	66.0	14.5	76.6	8.7	62.7	8.8	65.9	6.0	50.1	4.6	63.5	10.3	62.6	11.9	73.6	4.7	72.1	7.5	59.1	14.4	66.5	3.9	66.0	14.7
Both																														
EST	53.1	18.1	68.8	7.7	67.1	11.3	65.2	13.1	72.9	11.0	66.8	9.3	65.9	9.5	60.8	11.2	67.3	8.3	65.3	9.9	71.9	6.1	69.1	7.3	65.6	12.7	63.2	15.2	65.2	11.6

Less Stable Sentential Stress (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	33.6	23.9	35.8	26.0	30.7	14.9	37.8	19.3	31.4	30.1	34.7	12.0	48.0	17.7	44.1	13.4	54.5	10.9	34.9	19.7	46.6	19.7	49.0	18.5	50.5	22.1	48.5	11.8	58.5	14.9
Female																														
CSS	30.4	45.6	32.3	22.1	48.8	31.2	42.2	18.9	49.7	18.1	24.5	18.1	29.4	17.0	37.7	38.2	31.0	31.1	45.7	20.7	59.5	19.0	60.4	16.2	59.5	20.7	52.8	11.0	52.9	9.4
Both																														
CSS	32.0	34.4	34.0	22.9	39.7	24.9	40.0	18.2	40.5	25.3	29.6	15.5	38.7	19.1	41.3	25.4	42.7	25.2	40.3	19.8	53.0	19.5	54.7	17.5	56.1	20.2	50.7	11.0	55.7	12.1

Percentage of Appropriate Loudness (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	80.6	22.3	96.7	5.4	80.8	25.4	95.0	6.8	97.5	5.6	96.7	5.4	95.0	6.8	90.8	12.0	98.3	2.3	95.0	5.4	100.0	0.0	98.3	3.7	100.0	0.0	98.3	2.3	100.0	0.0
Female																														
CSS	87.5	8.3	84.2	17.8	85.0	14.0	93.3	10.5	93.3	8.6	98.3	3.7	100.0	0.0	100.0	0.0	98.3	2.3	98.3	2.3	99.2	1.9	95.8	5.1	97.5	3.7	95.0	9.0	100.0	0.0
Both																														
CSS	84.0	16.3	90.4	14.0	82.9	19.5	94.2	8.4	95.4	7.2	97.5	4.5	97.5	5.3	95.4	9.4	98.3	2.2	96.7	4.3	99.6	1.3	97.1	4.4	98.8	2.8	96.6	6.5	100.0	0.0


Boys
Girls
Both
Percentage of Appropriate Loudness
Percentage
110
100
90
80
70
60
50
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

Vowels-Consonants Intensity Ratios: Vowels-Stops (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT12	8.8	2.5	8.5	1.4	6.4	3.0	7.1	3.1	8.1	1.8	8.1	2.6	6.6	2.3	7.3	4.2	10.4	2.5	6.8	2.0	11.8	3.0	10.3	2.2	8.1	3.3	8.4	1.1	8.4	1.3
LST	12.8	4.5	12.0	2.3	9.3	2.6	10.3	6.0	12.1	1.0	11.2	3.1	9.9	1.8	*	*	11.6	2.6	*	*	10.7	2.0	11.1	2.6	12.8	3.8	*	*	9.9	3.9
AT	5.0	3.7	8.2	2.8	9.3	2.4	9.3	3.8	10.3	3.0	12.8	1.1	7.3	1.7	10.0	6.9	10.9	2.2	10.0	4.9	7.3	3.2	13.0	2.7	8.9	4.1	10.9	2.5	10.2	1.9
CSS	10.3	3.0	12.2	3.9	11.8	2.6	12.4	4.0	9.3	2.1	14.7	4.0	13.0	1.0	8.5	3.4	9.4	3.6	10.6	3.8	7.4	1.8	14.5	3.2	10.5	2.7	8.7	2.8	8.6	2.7
Female																														
VT12	7.1	0.3	7.5	1.3	7.7	2.8	7.6	1.9	7.0	2.2	8.9	1.5	9.4	1.3	8.5	3.9	9.2	1.1	7.7	2.2	8.3	2.3	10.4	1.8	7.5	1.7	9.3	1.1	7.7	3.7
LST	14.8	5.5	13.1	3.5	11.3	1.7	11.9	3.6	10.6	4.6	14.3	3.1	12.0	3.9	*	*	10.5	1.8	*	*	12.6	3.0	9.9	2.8	10.3	3.0	*	*	11.9	2.4
AT	8.4	6.6	10.4	1.6	12.0	5.9	9.2	3.3	5.2	5.7	8.9	4.6	11.7	5.0	10.6	5.3	6.8	4.5	9.9	2.0	9.6	4.9	13.1	3.5	8.6	4.7	11.1	4.6	10.7	3.0
CSS	10.5	2.7	44.0	4.9	11.5	2.6	9.6	2.5	10.6	4.1	14.3	4.2	11.2	2.4	11.7	3.5	10.9	1.8	11.6	2.5	10.3	1.3	13.2	3.4	9.7	3.6	8.4	3.3	8.6	2.0
Both																														
VT12	7.9	1.9	8.0	1.3	7.0	2.8	7.3	2.5	7.6	2.0	8.5	2.0	8.0	2.3	7.9	3.9	9.8	1.9	7.3	2.0	10.0	3.1	10.3	1.9	7.8	2.5	8.9	1.1	8.1	2.6
LST	13.9	4.8	12.6	2.9	10.3	2.3	11.1	4.7	11.3	3.2	12.7	3.4	10.9	3.1	*	*	11.1	2.2	*	*	11.6	2.6	10.5	2.7	11.5	3.5	*	*	10.9	3.2
AT	6.3	4.9	9.3	2.4	10.7	4.5	9.3	3.4	7.7	5.0	10.9	3.8	9.5	4.2	10.4	5.7	8.9	4.0	9.9	3.6	8.4	4.1	13.0	3.0	8.8	4.2	11.0	3.4	10.5	2.4
CSS	10.4	2.7	11.6	4.2	11.6	2.5	11.0	3.5	10.0	3.2	14.5	3.9	12.1	2.0	10.1	3.7	10.2	2.8	11.1	3.1	8.9	2.1	13.9	3.2	10.1	3.0	8.5	2.9	8.6	2.2

Vowels-Consonants Intensity Ratios: Vowels-Affricates/Fricatives (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
LST	10.0	4.1	11.4	2.6	4.4	2.0	8.9	2.3	5.6	4.4	11.0	3.0	7.0	3.8	*	*	7.5	2.9	*	*	7.0	2.5	3.2	3.0	7.2	3.2	*	*	5.3	2.6
AT	14.1	5.2	11.5	4.7	13.5	8.0	10.7	2.8	13.7	5.5	11.6	3.1	11.8	3.8	6.3	5.5	7.0	2.7	9.0	5.5	9.6	0.9	10.5	3.9	12.6	3.9	10.4	1.4	10.1	2.4
CSS	13.3	0.8	13.0	6.0	12.6	5.0	10.2	2.6	10.9	1.5	10.3	2.9	10.6	2.0	7.1	4.5	10.4	3.9	10.9	3.1	8.8	3.3	10.1	2.2	8.9	3.6	8.5	2.3	8.2	1.3
Female																														
LST	5.2	4.8	11.7	2.9	10.8	6.3	10.6	1.7	7.0	3.1	6.0	2.3	8.4	5.4	*	*	5.7	1.9	*	*	7.0	2.2	6.4	4.2	5.4	3.2	4.8	*	6.3	2.7
AT	14.9	6.7	11.7	4.1	12.9	3.9	10.2	4.5	10.8	2.5	9.4	2.4	9.1	4.2	9.8	3.6	10.8	2.1	11.9	4.2	9.3	3.2	12.7	0.7	12.0	1.4	11.5	5.2	10.2	2.4
CSS	13.4	7.5	11.7	5.9	13.6	2.5	9.8	2.6	9.4	0.6	7.6	2.8	10.2	3.8	10.1	4.1	10.1	2.2	10.4	2.1	8.4	2.6	10.7	3.0	9.0	2.7	9.0	3.4	10.7	1.8
Both																														
LST	7.6	4.9	11.5	2.6	7.3	5.3	9.7	2.1	6.3	3.7	8.5	3.6	7.7	4.5	*	*	6.6	2.5	*	*	7.0	2.2	4.8	3.8	6.3	3.2	4.8	*	5.8	2.6
AT	14.4	5.4	11.6	4.2	13.2	5.9	10.4	3.6	12.3	4.3	10.5	2.9	10.5	4.0	8.1	4.8	8.9	3.0	10.5	4.9	9.4	2.3	11.6	2.9	12.3	2.8	11.0	3.6	10.2	2.3
CSS	13.4	5.0	12.3	5.7	13.1	3.8	10.0	2.5	10.1	1.3	8.9	3.0	10.4	2.9	8.6	4.4	10.2	3.0	10.6	2.5	8.6	2.8	10.4	2.5	8.9	3.0	8.8	2.7	9.4	2.0

Vowels-Consonants Intensity Ratios: All (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT12	9.0	2.3	8.0	1.3	6.3	3.1	6.8	3.0	7.9	1.8	7.9	2.7	6.3	2.4	7.0	4.6	10.3	2.5	6.7	2.2	11.4	2.9	10.2	2.4	8.0	3.1	7.9	1.2	8.1	1.2
LST	10.9	4.0	12.1	2.1	6.2	3.9	10.1	4.0	9.4	1.2	11.4	2.3	8.2	2.8	*	*	10.2	2.5	*	*	9.1	1.8	10.7	1.6	11.0	4.1	*	*	8.7	3.9
AT	10.2	3.0	10.5	3.9	12.4	5.5	10.1	2.4	12.3	4.1	12.1	1.9	10.3	2.3	7.8	4.6	8.7	1.0	9.2	5.0	8.7	1.2	11.5	2.3	11.1	3.6	10.7	1.3	10.2	1.9
CSS	11.8	2.0	11.7	2.2	12.0	2.6	11.1	2.5	10.2	1.5	12.3	3.4	12.2	1.0	8.5	3.4	9.9	3.5	10.5	2.6	8.3	2.1	13.1	2.4	9.7	3.1	8.4	1.8	8.5	1.5
Female																														
VT12	6.5	0.5	7.4	1.2	7.7	2.7	7.5	2.4	6.8	2.0	8.5	1.5	8.9	1.3	8.5	3.7	8.7	1.3	7.9	2.4	8.1	2.2	10.3	1.8	7.6	1.8	9.3	1.2	7.5	4.0
LST	11.7	4.5	12.9	2.7	10.8	2.0	11.4	1.8	8.6	4.2	11.0	1.4	11.2	4.0	*	*	8.7	1.8	*	*	9.6	2.4	10.1	3.0	9.0	3.3	4.8	*	9.4	2.5
AT	12.8	6.5	11.7	3.0	12.9	4.5	9.6	1.8	8.5	1.6	8.9	2.5	10.2	4.3	10.2	4.3	9.1	2.6	11.1	2.5	10.1	3.0	12.9	1.6	10.8	1.6	11.4	4.2	10.5	1.8
CSS	10.8	3.2	11.5	4.6	12.5	1.8	9.8	2.2	9.7	2.1	10.9	1.9	10.8	3.1	11.0	2.5	10.2	1.5	11.0	2.1	9.9	1.8	12.0	2.8	9.3	3.1	9.0	3.1	10.3	1.6
Both																														
VT12	7.8	2.1	7.7	1.2	7.0	2.8	7.2	2.6	7.4	1.9	8.2	2.1	7.6	2.3	7.8	4.0	9.5	2.1	7.3	2.2	9.7	3.0	10.3	2.0	7.8	2.4	8.6	1.3	7.8	2.8
LST	11.3	4.0	12.5	2.3	8.5	3.8	10.8	3.0	9.0	3.0	11.2	1.8	9.7	3.6	*	*	9.4	2.2	*	*	9.6	2.4	10.4	2.3	10.0	3.6	4.8	*	9.0	3.1
AT	11.2	4.4	11.1	3.3	12.6	4.8	9.9	2.0	10.4	3.6	10.5	2.7	10.2	3.3	9.0	4.4	8.9	1.9	10.2	3.8	9.1	1.9	12.2	2.0	11.0	2.6	11.1	2.9	10.3	1.7
CSS	11.3	2.6	11.6	3.4	12.2	2.1	10.5	2.3	10.0	1.7	11.6	2.7	11.5	2.3	9.8	3.1	10.0	2.6	10.7	2.2	9.1	2.0	12.6	2.5	9.5	2.9	8.7	2.4	9.4	1.8

Less Stable Vowels-Consonants Intensity Ratios: Vowels-Stops (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT12	18.6	19.6	26.8	20.3	10.8	26.4	27.1	19.5	40.2	12.4	28.1	11.4	20.2	23.0	17.5	27.0	42.7	9.1	23.4	25.1	55.0	11.7	50.6	10.7	43.4	15.9	32.2	9.0	45.1	20.5
LST	50.9	40.2	57.5	23.3	43.6	37.1	49.0	41.3	61.0	20.7	27.1	22.1	62.7	8.0	*	*	64.6	17.7	*	*	60.7	19.2	52.5	27.7	72.0	27.8	*	*	62.6	8.7
AT	8.1	44.0	48.0	48.5	35.7	31.5	40.6	50.6	59.7	32.6	72.1	28.5	38.6	40.3	49.9	56.0	55.2	29.3	62.5	21.2	50.9	55.1	61.8	24.2	42.0	25.4	19.1	13.0	49.4	25.8
CSS	38.9	21.5	23.1	25.7	56.4	8.7	37.9	20.0	17.7	17.4	56.0	15.1	50.3	6.5	24.8	24.7	48.7	12.3	35.3	27.3	33.1	14.1	60.6	15.6	62.3	12.0	28.9	14.8	42.4	9.6
Female																														
VT12	21.9	8.7	24.6	12.9	37.8	4.8	24.1	24.1	13.8	29.2	39.3	9.2	32.9	9.7	49.6	8.6	42.3	6.4	38.4	14.7	31.5	17.0	47.6	15.3	18.7	6.1	35.4	7.5	31.9	28.5
LST	74.3	14.2	50.9	39.9	45.6	32.7	54.3	27.4	66.6	15.0	76.2	19.4	72.8	25.5	*	*	69.2	19.0	*	*	75.3	15.1	55.1	41.7	71.1	23.3	*	*	60.7	24.2
AT	80.2	0.6	49.0	34.5	71.2	21.9	69.0	41.7	52.0	*	53.4	48.6	28.4	42.3	28.4	32.9	54.3	25.3	47.8	28.1	63.4	21.6	54.2	31.1	37.6	18.8	68.0	19.4	41.7	26.2
CSS	39.6	11.7	37.3	46.5	37.9	19.8	39.4	24.1	32.6	39.8	66.1	9.4	26.9	24.6	36.9	28.6	58.1	7.3	42.4	15.1	45.2	22.0	60.0	10.7	43.5	24.2	32.2	29.7	37.1	22.3
Both																														
VT12	20.2	14.4	25.7	16.1	22.8	23.7	25.4	20.9	27.0	25.3	33.7	11.4	27.3	17.0	33.6	25.3	42.5	7.4	30.9	20.6	43.2	18.5	49.1	12.5	31.0	17.3	33.8	8.0	40.1	22.8
LST	63.9	29.3	54.2	31.0	44.6	33.0	51.7	33.2	63.8	17.3	51.6	32.5	67.7	18.6	*	*	66.9	17.5	*	*	68.0	18.0	53.8	33.4	71.5	24.2	*	*	61.6	17.2
AT	36.9	50.3	48.5	38.9	51.5	32.0	51.3	46.6	58.4	29.3	65.1	35.1	32.2	38.9	35.5	37.4	54.8	25.9	53.3	25.2	57.2	39.3	58.0	26.6	39.8	20.8	47.0	30.4	45.5	24.8
CSS	39.3	16.3	30.2	36.2	47.1	17.4	38.6	20.9	25.1	30.0	61.1	13.0	38.6	21.0	30.8	26.0	53.9	10.4	39.2	20.2	39.8	18.9	60.3	12.6	52.9	20.6	30.5	22.2	39.7	16.4

Less Stable Vowels-Consonants Intensity Ratios: Vowels-Affricates/Fricatives (u)

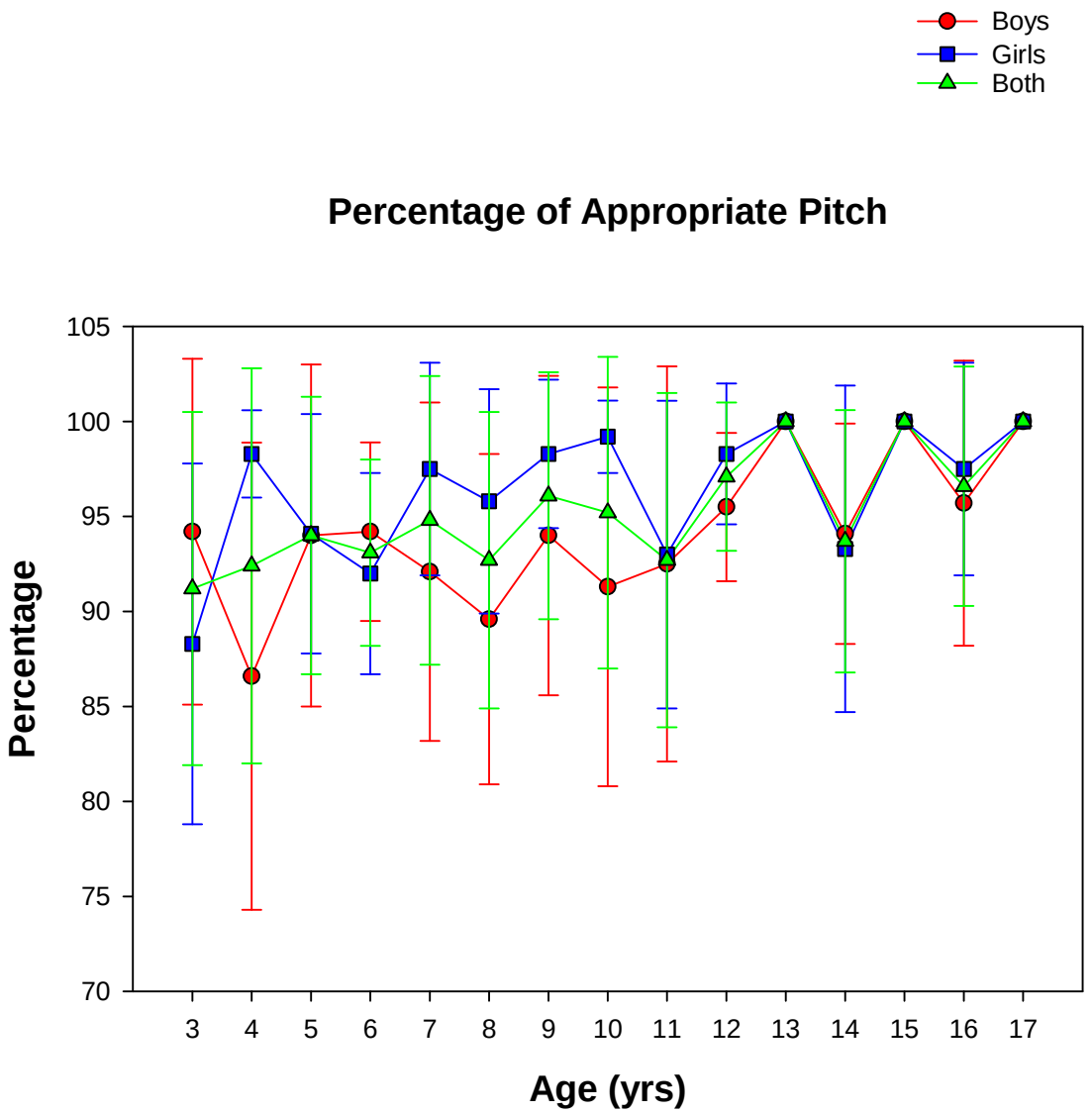
Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
LST	36.4	5.7	64.1	40.2	60.6	55.7	78.4	15.5	57.3	48.7	72.6	27.0	78.6	9.3	*	*	66.6	33.6	*	*	64.5	15.6	57.0	56.6	50.0	22.3	*	*	63.2	13.6
AT	46.5	42.3	52.8	36.3	58.1	12.5	64.8	21.9	50.4	37.8	58.9	22.5	46.6	22.3	77.8	13.3	52.2	22.6	42.0	44.5	39.0	25.1	76.1	10.3	84.5	14.2	71.4	12.6	61.9	24.2
CSS	63.5	18.3	56.0	27.5	39.4	26.5	25.0	21.5	40.5	13.8	19.0	29.9	23.8	19.2	33.3	17.3	48.0	11.1	46.7	23.6	20.8	35.1	25.7	32.4	32.0	33.1	25.2	33.8	44.2	20.3
Female																														
LST	36.1	67.4	43.1	18.3	60.3	26.2	38.6	22.9	64.1	29.4	63.8	37.5	73.6	24.7	*	*	76.9	17.2	*	*	61.4	47.5	41.4	29.5	57.8	43.3	*	*	67.4	30.0
AT	65.8	30.9	70.2	14.1	59.0	32.2	32.5	39.7	58.9	8.9	72.5	17.3	41.6	29.3	62.3	26.6	69.1	21.0	72.0	12.2	52.7	12.5	81.7	5.6	68.8	21.3	74.4	13.8	44.9	45.3
CSS	37.2	25.2	44.9	39.2	52.7	17.7	31.0	28.1	47.9	19.1	32.9	21.5	19.8	29.8	61.8	9.1	52.7	18.0	58.5	15.7	32.7	30.9	43.7	6.4	45.8	10.8	49.2	19.3	61.3	16.1
Both																														
LST	36.3	39.0	54.8	32.5	60.4	32.1	58.5	27.9	61.8	31.7	68.7	30.2	75.7	18.5	*	*	71.8	25.3	*	*	62.9	33.3	45.8	34.3	53.5	31.1	*	*	65.5	22.9
AT	52.0	37.9	61.5	27.5	58.6	24.0	48.7	34.7	54.6	26.3	64.9	20.4	44.4	24.0	69.0	22.0	61.6	22.2	57.0	34.6	45.1	20.6	78.9	8.3	76.6	19.0	72.9	12.4	53.4	35.4
CSS	51.8	24.4	50.5	32.5	46.0	22.4	28.0	23.8	43.8	15.7	25.2	26.0	21.8	23.7	47.5	19.9	50.6	14.7	52.6	19.9	26.1	31.8	34.7	24.0	38.9	24.3	35.9	29.5	52.7	19.5

Less Stable Vowels-Consonants Intensity Ratios: All (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT12	23.0	19.8	22.6	20.7	20.9	21.5	26.4	16.3	36.6	13.5	26.8	20.0	18.2	19.8	14.3	29.1	44.4	8.8	25.7	26.3	54.5	11.1	49.9	9.5	31.9	15.8	29.1	11.8	41.4	23.1
LST	10.9	4.0	12.1	2.1	6.2	3.9	10.1	4.0	9.4	1.2	11.4	2.3	8.2	2.8	*	*	10.2	2.5	*	*	9.1	1.8	10.7	1.6	10.0	3.6	*	*	8.7	3.9
AT	34.1	27.0	53.9	22.2	51.1	6.6	52.1	21.3	50.2	29.5	60.6	14.8	35.5	19.1	49.7	16.9	54.1	20.0	55.5	24.2	35.8	32.9	61.5	11.4	55.2	22.1	52.9	6.2	60.0	18.1
CSS	47.9	14.7	29.1	18.8	46.0	9.5	28.4	13.2	27.4	10.4	32.1	13.5	42.0	11.2	31.8	8.8	49.4	11.3	29.8	15.0	21.7	21.8	38.5	17.5	46.5	17.7	26.5	18.3	42.8	6.8
Female																														
VT12	14.2	7.7	25.9	12.1	39.4	4.1	34.7	15.6	20.3	25.3	35.7	7.3	30.5	10.2	50.9	8.3	39.8	8.6	27.0	27.4	33.3	17.0	48.3	15.5	20.5	3.2	33.2	10.1	29.1	31.6
LST	11.7	4.5	12.9	2.7	10.8	2.0	11.4	1.8	8.6	4.2	11.0	1.4	11.2	4.0	*	*	8.7	1.8	*	*	10.1	3.0	10.1	3.0	9.0	3.3	4.8	*	9.4	2.5
AT	57.6	34.1	63.1	13.1	55.9	36.2	35.4	20.6	51.0	23.3	47.7	24.1	33.3	30.4	38.5	28.2	46.8	31.4	62.5	16.6	43.7	20.6	70.2	7.3	50.2	25.0	66.1	12.7	45.5	23.2
CSS	39.5	13.1	47.6	18.5	41.5	16.0	38.9	16.5	28.7	16.6	42.2	14.4	25.3	24.0	31.6	31.8	54.1	11.0	47.7	10.9	43.0	14.1	49.5	7.5	45.0	18.2	42.9	21.4	51.9	10.3
Both																														
VT12	18.6	14.9	24.2	16.1	30.1	17.4	30.5	15.4	29.3	20.1	31.2	14.9	25.0	15.5	32.6	27.8	42.1	8.6	26.4	25.2	43.9	17.6	49.1	12.2	43.4	14.9	31.2	10.6	36.8	25.1
LST	11.3	4.0	12.5	2.3	8.5	3.8	10.8	3.0	9.0	3.0	11.2	1.8	9.7	3.6	*	*	9.4	2.2	*	*	9.6	2.4	10.4	2.3	11.0	4.1	4.8	*	9.0	3.1
AT	41.9	28.6	58.5	17.9	53.8	26.0	43.8	21.6	50.6	25.3	54.1	20.0	34.4	23.9	42.7	23.9	50.1	25.6	59.0	19.9	39.7	26.2	65.8	10.1	60.1	20.5	59.5	11.6	52.7	21.1
CSS	43.7	13.8	37.3	20.0	43.8	12.6	33.6	15.2	28.1	13.1	37.1	14.2	33.6	19.7	31.7	23.1	52.0	10.7	38.7	15.6	32.4	20.6	44.0	14.0	48.0	19.1	34.7	20.7	47.3	9.5

Percentage of Appropriate Pitch (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	94.2	9.1	86.6	12.3	94.0	9.0	94.2	4.7	92.1	8.9	89.6	8.7	94.0	8.4	91.3	10.5	92.5	10.4	95.5	3.9	100.0	0.0	94.1	5.8	100.0	0.0	95.7	7.5	100.0	0.0
Female																														
CSS	88.3	9.5	98.3	2.3	94.1	6.3	92.0	5.3	97.5	5.6	95.8	5.9	98.3	3.9	99.2	1.9	93.0	8.1	98.3	3.7	100.0	0.0	93.3	8.6	100.0	0.0	97.5	5.6	100.0	0.0
Both																														
CSS	91.2	9.3	92.4	10.4	94.0	7.3	93.1	4.9	94.8	7.6	92.7	7.8	96.1	6.5	95.2	8.2	92.7	8.8	97.1	3.9	100.0	0.0	93.7	6.9	100.0	0.0	96.6	6.3	100.0	0.0


Boys
Girls
Both
Percentage of Appropriate Pitch
Percentage
105
100
95
90
85
80
75
70
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

Midpoint Fundamental Frequency Mean (Hz)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT12	257.4	23.8	241.7	16.8	229.8	15.2	232.6	58.1	225.9	17.0	217.5	21.4	196.9	17.8	199.0	48.0	207.0	21.6	193.7	40.8	192.6	38.1	131.4	43.8	105.8	12.2	104.3	13.9	94.6	5.2
CSS	283.7	39.9	251.7	25.5	265.2	34.5	237.8	32.1	249.1	24.7	212.9	21.3	196.3	23.7	212.2	24.9	210.2	18.2	183.9	46.7	180.2	43.1	123.2	35.5	103.4	8.5	104.6	14.6	104.6	12.9
Female																														
VT12	237.4	30.8	253.4	22.5	239.0	11.9	231.2	32.7	232.5	18.0	209.0	16.6	220.1	27.9	222.3	11.0	200.9	14.9	205.2	10.6	211.6	11.3	192.0	14.7	197.2	10.8	204.9	30.4	196.3	18.4
CSS	255.9	40.6	273.9	52.8	261.6	32.1	227.7	39.7	230.9	24.8	220.0	15.3	221.7	31.2	228.6	12.9	210.5	16.3	192.2	14.5	197.6	22.1	165.1	29.2	182.1	21.9	190.4	24.2	181.5	8.2
Both																														
VT12	247.4	28.0	247.5	19.7	234.4	13.8	231.9	44.5	229.2	16.8	213.3	18.6	208.5	25.2	210.6	35.0	204.0	17.8	199.5	28.7	202.1	28.3	161.7	44.4	151.5	49.4	154.6	57.5	145.5	55.1
CSS	269.8	40.7	262.8	40.8	263.4	31.4	232.8	34.5	240.0	25.2	217.4	18.1	209.0	29.4	220.4	20.6	210.4	16.3	188.1	32.9	188.9	33.6	144.2	37.7	142.8	44.3	147.5	49.0	143.0	41.8

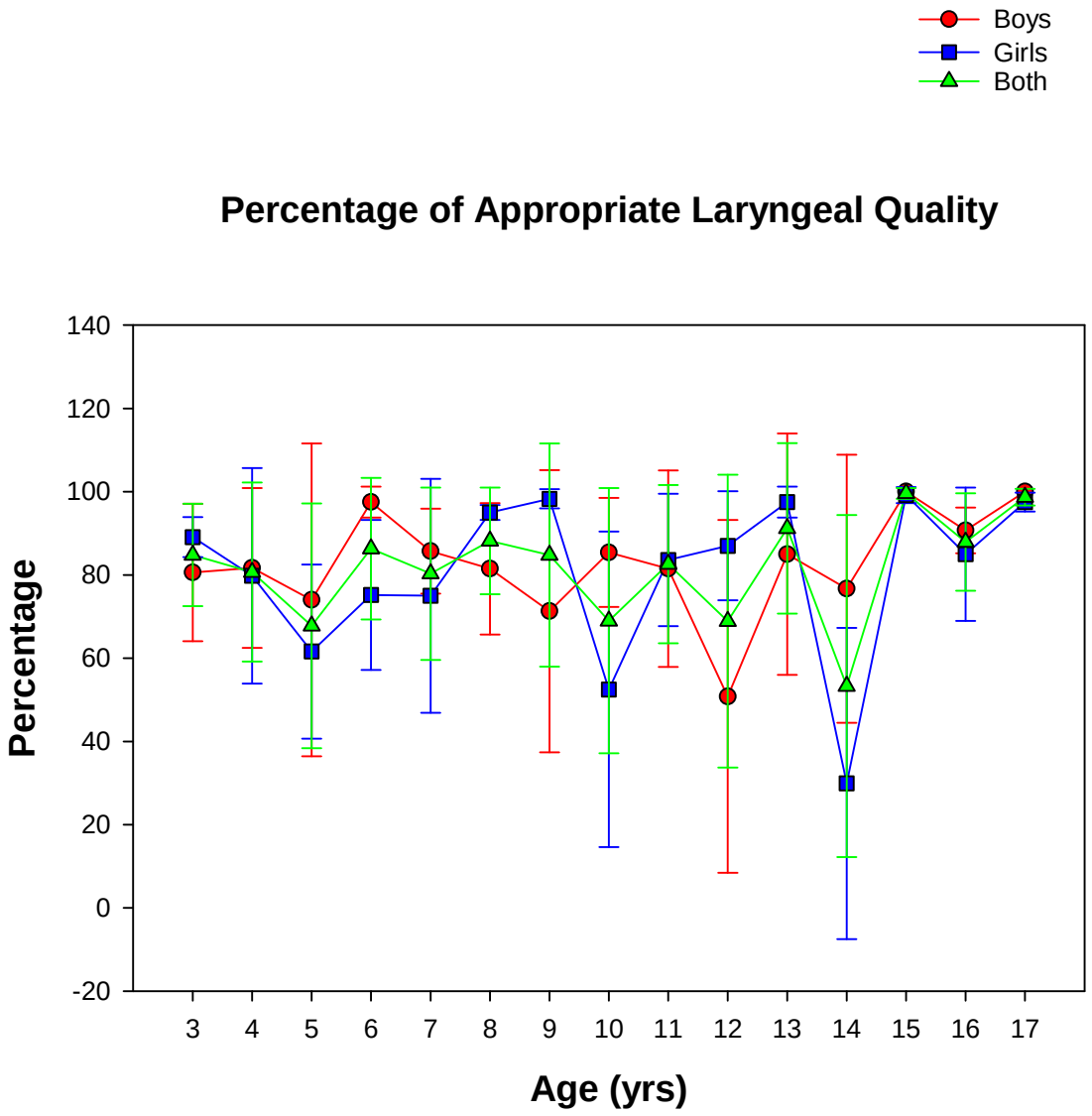
Midpoint Fundamental Frequency Range (Hz)																														
Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT12	176.2	53.2	165.4	73.0	98.5	44.6	117.5	51.0	126.7	90.8	123.7	81.7	107.7	48.4	109.4	53.1	72.5	33.6	54.5	20.3	108.6	70.1	58.1	44.4	41.8	49.0	62.6	56.5	29.3	19.3
CSS	432.1	141.1	270.2	87.1	317.9	101.7	255.4	138.4	262.5	99.8	217.5	20.0	190.0	39.2	272.0	88.0	181.7	60.0	202.8	71.4	233.6	52.4	134.8	35.6	160.0	79.9	129.6	29.8	159.9	59.5
Female																														
VT12	174.9	81.1	165.8	87.2	176.9	82.6	96.3	62.4	59.7	16.4	107.6	41.4	61.0	15.6	116.2	68.6	69.0	27.6	131.0	29.9	73.5	51.8	114.3	73.0	103.1	33.9	75.9	45.2	127.6	48.8
CSS	433.6	195.2	288.5	49.5	349.6	29.1	279.3	52.0	300.8	82.5	254.2	84.4	252.8	67.5	282.6	54.8	252.4	34.9	268.0	66.7	214.8	35.0	242.2	37.8	249.6	91.8	182.3	36.7	230.2	64.2
Both																														
VT12	175.5	64.7	165.6	75.8	137.7	75.0	106.9	54.9	93.2	71.0	115.6	61.6	84.3	41.9	112.8	57.9	70.7	29.1	92.8	46.9	91.1	61.0	86.2	64.2	72.4	51.2	69.2	48.7	78.4	62.5
CSS	432.9	160.6	279.4	67.5	333.7	72.5	267.4	99.4	281.6	88.7	235.9	61.0	221.4	61.7	277.3	69.3	217.1	59.4	235.4	73.6	224.2	43.2	188.5	66.3	204.8	93.9	155.9	42.0	195.1	69.2

Less Stable Mean Midpoint Fundamental Frequency (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT12	86.8	4.2	87.9	4.4	91.0	4.0	87.3	8.7	91.3	4.7	89.7	5.9	90.0	6.1	85.2	13.5	72.5	33.6	94.0	2.6	90.4	5.3	90.0	9.8	93.6	5.5	89.1	9.3	93.1	4.1
CSS	77.8	3.7	82.9	4.6	81.9	6.7	83.3	8.9	82.0	6.8	82.4	6.5	79.6	10.5	81.3	7.8	181.7	60.0	81.9	5.7	78.1	9.9	85.8	3.2	78.4	4.6	84.9	1.9	78.1	7.6
Female																														
VT12	84.3	6.5	88.5	6.9	87.0	6.3	91.2	6.1	95.0	1.1	91.0	2.6	94.3	0.8	91.4	4.7	69.0	27.6	89.3	3.2	93.6	4.1	85.7	9.9	89.9	4.0	89.2	10.2	87.1	5.8
CSS	67.9	8.3	80.9	4.0	75.1	5.1	79.0	8.1	81.3	1.8	83.4	3.5	84.0	4.2	82.5	5.2	244.8	46.2	77.6	5.5	82.8	6.9	68.6	9.6	71.9	5.8	82.6	7.3	75.8	7.5
Both																														
VT12	85.5	5.3	88.2	5.5	89.0	5.4	89.2	7.4	93.1	3.8	90.3	4.3	92.2	4.7	88.3	10.1	70.7	29.1	91.6	3.7	92.0	4.8	87.8	9.6	91.8	4.9	89.2	9.2	90.1	5.7
CSS	72.9	8.0	81.9	4.2	78.5	6.7	81.1	8.3	81.7	4.7	82.9	4.9	81.8	7.9	81.9	6.3	213.3	60.5	79.7	5.7	80.4	8.4	77.2	11.3	75.1	6.0	83.7	5.2	76.9	7.2

Percentage of Appropriate Laryngeal Quality (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	80.6	16.5	81.7	19.2	74.0	37.6	97.5	3.7	85.7	10.2	81.5	15.8	71.3	33.9	85.4	13.1	81.5	23.6	50.8	42.4	85.0	29.0	76.7	32.2	100.0	0.0	90.7	5.5	100.0	0.0
Female																														
CSS	89.1	4.8	79.8	25.9	61.6	20.9	75.2	18.0	75.0	28.1	95.0	1.8	98.3	2.3	52.5	37.9	83.6	15.9	87.0	13.1	97.5	3.7	29.9	37.4	99.2	1.9	85.0	16.0	97.5	2.3
Both																														
CSS	84.8	12.3	80.7	21.5	67.8	29.4	86.3	17.0	80.3	20.7	88.2	12.8	84.8	26.8	69.0	31.9	82.6	19.0	68.9	35.2	91.2	20.5	53.3	41.1	99.6	1.3	87.9	11.7	98.7	2.0


Boys
Girls
Both
Percentage of Appropriate Laryngeal Quality
Percentage
140
120
100
80
60
40
20
0
-20
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

Percentage of Breathy Utterances (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	1.7	2.3	0.8	1.9	4.2	5.1	0.0	0.0	3.4	5.4	2.7	4.0	0.8	1.9	1.7	3.7	0.0	0.0	20.8	37.6	0.0	0.0	0.8	1.9	0.0	0.0	0.0	0.0	0.0	0.0
Female																														
CSS	1.7	2.3	7.5	14.6	1.7	3.7	3.5	7.8	0.8	1.9	0.8	1.9	0.9	1.9	6.7	10.9	2.6	3.9	0.8	1.9	0.0	0.0	1.7	3.9	0.0	0.0	3.3	7.5	0.0	0.0
Both																														
CSS	1.7	2.2	4.2	10.4	2.9	4.4	1.7	5.5	2.1	4.1	1.7	3.1	0.9	1.8	4.2	8.1	1.3	2.9	10.8	27.2	0.0	0.0	1.3	2.9	0.0	0.0	1.7	5.3	0.0	0.0

Percentage of Rough Utterances (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	16.7	16.9	13.3	18.5	17.6	24.0	0.9	1.9	10.1	9.6	8.6	9.7	27.9	33.6	11.2	15.1	18.5	23.6	26.7	30.4	13.3	29.8	21.7	33.0	0.0	0.0	9.3	5.5	0.0	0.0
Female																														
CSS	8.4	5.2	12.7	20.5	34.2	23.1	19.6	14.0	21.7	21.5	2.5	2.3	0.0	0.0	36.7	28.3	12.9	12.7	11.4	12.3	2.5	3.7	64.5	33.4	0.8	1.9	11.7	17.3	2.5	2.3
Both																														
CSS	12.6	12.6	13.0	18.4	25.9	23.9	10.2	13.6	15.9	16.9	5.6	7.4	13.9	26.8	23.9	25.2	15.7	18.1	19.0	23.3	7.9	20.8	43.1	38.6	0.4	1.3	10.5	12.2	1.3	2.0

Percentage of Strained Utterances (%)

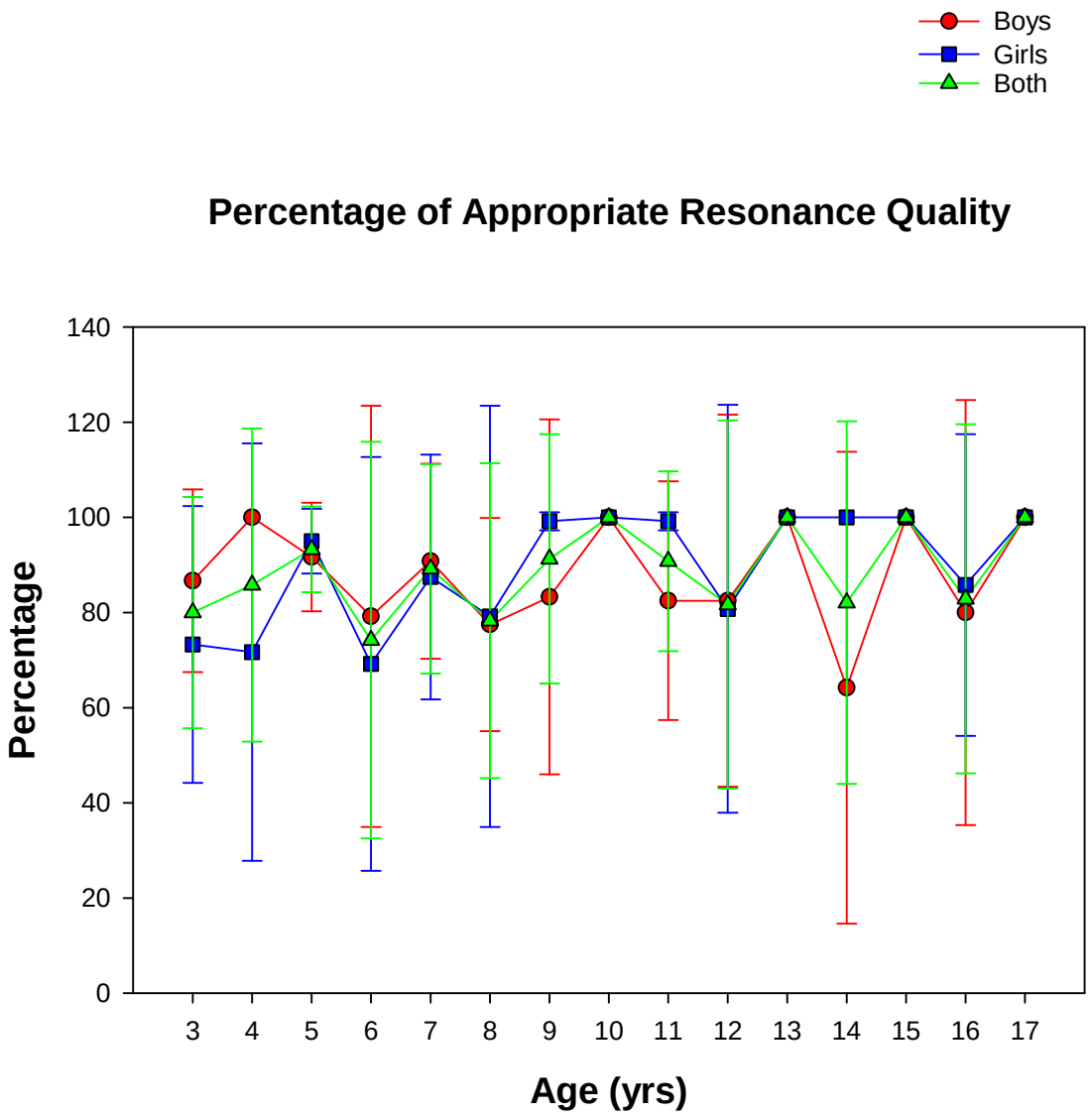
Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	0.0	0.0	0.0	0.0	4.2	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Female																														
CSS	0.0	0.0	0.0	0.0	0.0	0.0	0.9	1.9	2.5	5.6	0.0	0.0	0.0	0.0	2.5	5.6	0.0	0.0	0.8	1.9	0.0	0.0	3.9	6.5	0.0	0.0	0.0	0.0	0.0	0.0
Both																														
CSS	0.0	0.0	0.0	0.0	2.1	6.6	0.4	1.4	1.3	4.0	0.0	0.0	0.0	0.0	1.3	4.0	0.0	0.0	0.4	1.3	0.0	0.0	1.9	4.8	0.0	0.0	0.0	0.0	0.0	0.0

Percentage of Break/Shift/Tremulous Utterances (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	1.1	2.5	4.2	5.1	0.0	0.0	1.7	3.7	0.9	1.9	7.3	11.9	0.0	0.0	1.7	3.7	0.0	0.0	0.0	0.0	1.7	2.3	0.8	1.9	0.0	0.0	0.0	0.0	0.0	0.0
Female																														
CSS	0.0	0.0	0.0	0.0	0.0	0.0	0.9	2.0	0.0	0.0	1.7	2.3	0.8	1.9	0.8	1.9	0.9	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Both																														
CSS	0.6	1.8	2.1	4.0	0.0	0.0	1.3	2.9	0.4	1.4	4.5	8.6	0.4	1.3	1.3	2.8	1.4	1.4	0.0	0.0	0.8	1.8	0.4	1.3	0.0	0.0	0.0	0.0	0.0	0.0

Percentage of Appropriate Resonance Quality (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	86.7	19.2	100.0	0.0	91.7	11.4	79.2	44.3	90.8	20.5	77.5	22.4	83.3	37.3	100.0	0.0	82.5	25.1	82.5	39.1	100.0	0.0	64.2	49.6	100.0	0.0	80.0	44.7	100.0	0.0
Female																														
CSS	73.3	29.1	71.7	43.9	95.0	6.8	69.2	43.5	87.5	25.7	79.2	44.3	99.2	1.9	100.0	0.0	99.2	1.9	80.8	42.9	100.0	0.0	100.0	0.0	100.0	0.0	85.8	31.7	100.0	0.0
Both																														
CSS	80.0	24.3	85.8	32.9	93.3	9.0	74.2	41.7	89.2	22.0	78.3	33.1	91.3	26.2	100.0	0.0	90.8	18.9	81.7	38.7	100.0	0.0	82.1	38.1	100.0	0.0	82.9	36.7	100.0	0.0


Boys
Girls
Both
Percentage of Appropriate Resonance Quality
Percentage
140
120
100
80
60
40
20
0
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Age (yrs)

Percentage of Nasal Utterances (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.5	22.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	44.7	0.0	0.0
Female																														
CSS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.9	0.0	0.0	0.8	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Both																														
CSS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.3	19.0	0.4	1.3	0.0	0.0	0.4	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	31.6	0.0	0.0

Lowered /ɑ/ F1 (Nasal) (Hz)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT12	1204.6	79.9	1124.2	83.2	1141.4	145.1	1046.7	103.6	984.2	197.0	1103.2	160.0	964.9	86.6	888.9	98.1	875.4	35.3	919.0	58.2	738.5	174.8	778.2	30.5	792.3	117.1	785.8	35.9	710.5	48.7
SVT	1248.8	403.0	1128.5	117.0	1206.0	169.3	1033.5	167.2	999.2	178.8	1007.7	160.5	1059.4	138.5	777.9	111.7	783.6	123.1	866.7	52.3	796.8	143.1	752.1	74.9	654.6	140.7	681.9	43.4	706.2	138.0
CSS	834.0	116.6	919.2	132.8	964.8	225.0	964.8	123.9	809.5	156.5	905.0	126.1	806.7	100.1	796.9	88.0	746.5	148.9	805.8	85.3	689.0	94.5	708.0	31.9	677.5	63.4	673.3	63.4	585.8	88.0
Female																														
VT12	1200.9	100.5	1165.8	217.9	1259.8	104.5	1028.4	56.2	1085.4	136.1	1064.7	53.8	1012.1	121.4	964.6	48.2	1135.1	54.1	932.8	79.6	947.5	137.0	944.8	98.6	928.0	78.9	907.7	164.8	826.7	92.8
SVT	1292.0	144.8	1076.7	306.0	1076.6	238.0	1062.4	185.8	999.4	183.9	965.5	124.6	1051.0	174.0	966.0	121.7	861.4	260.2	875.5	81.4	846.7	24.8	896.3	93.9	723.4	56.1	820.9	71.2	757.8	49.0
CSS	802.4	118.9	1124.1	163.0	1101.0	216.9	967.5	198.6	933.1	58.4	851.8	121.7	997.8	117.5	916.3	85.6	855.5	121.6	806.4	42.6	789.6	115.9	815.4	87.3	777.9	51.8	766.3	102.5	732.0	99.3
Both																														
VT12	1202.7	85.6	1142.7	147.5	1200.6	134.5	1037.6	79.2	1034.8	168.3	1083.9	114.3	988.5	102.5	922.5	85.3	1005.2	143.4	925.9	66.2	843.0	184.5	861.5	111.6	860.1	118.2	846.7	129.5	768.6	92.9
SVT	1268.0	299.3	1102.6	220.1	1141.3	206.3	1048.0	167.3	999.3	171.0	988.9	138.5	1055.2	148.3	872.0	148.2	822.5	196.3	871.1	64.6	818.1	105.6	824.2	110.4	689.0	107.3	751.4	92.0	732.0	101.4
CSS	818.2	112.2	1021.7	176.9	1032.9	220.4	966.1	156.0	871.3	129.0	878.4	120.1	902.2	144.0	856.6	103.2	801.0	140.4	806.1	63.6	739.3	112.9	761.7	83.9	727.7	76.0	719.8	94.1	658.9	117.3

Percentage of Nasopharyngeal Utterances (%)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
CSS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Female																														
CSS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Both																														
CSS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Lowered /i/ F2 (Nasopharyngeal) (Hz)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT12	3095.8	131.1	2301.0	1123.5	3205.6	308.7	3047.4	653.9	3400.1	196.4	3374.8	232.9	3298.9	113.0	2773.0	570.8	2953.1	167.7	2938.3	81.3	2680.8	319.7	2639.0	228.1	2321.2	222.8	2401.4	166.6	2366.6	139.1
CSS	3027.4	525.6	2769.8	362.0	2877.0	363.8	2988.7	76.6	2935.8	92.6	3024.1	159.5	2950.2	185.9	2769.6	183.2	2618.5	94.9	2634.9	177.5	2365.9	150.7	2649.8	95.9	2121.6	219.1	2317.6	124.3	2299.8	133.1
Female																														
VT12	3144.7	368.2	3232.7	694.3	2853.1	193.4	3247.7	620.6	3204.2	99.9	3232.0	101.6	3255.9	149.6	3149.2	107.9	3189.1	143.2	2878.9	117.5	3023.3	206.2	2904.3	209.5	2792.8	134.0	2852.0	116.4	3004.1	161.1
CSS	3107.9	391.6	2982.7	246.0	3154.0	362.4	2675.6	353.8	2997.5	373.6	2833.6	126.4	2845.3	166.8	2786.8	232.0	2842.4	401.4	2728.4	157.3	2615.1	105.3	2544.9	105.6	2500.8	287.5	2683.7	182.5	2562.5	222.7
Both																														
VT12	3120.2	261.8	2766.9	1008.1	3029.4	305.8	3147.5	610.2	3302.1	179.5	3303.4	185.4	3277.4	127.0	2961.1	435.1	3071.1	192.6	2908.6	100.3	2871.1	303.6	2771.6	249.4	2557.0	303.0	2626.7	273.4	2685.3	364.7
CSS	3067.7	439.0	2876.3	312.6	3015.5	372.2	2832.1	292.3	2966.6	258.7	2928.9	168.8	2897.7	175.4	2778.2	197.3	2730.4	299.3	2681.6	165.7	2490.5	179.6	2597.3	110.0	2311.2	313.1	2500.7	242.7	2431.2	221.5

Lowered /ʊ/ F2 (Nasopharyngeal) (Hz)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT12	1649.5	195.9	1488.4	422.1	1593.5	170.8	1667.6	435.2	1709.8	357.5	1611.7	196.5	1731.3	132.4	1660.3	69.5	1690.3	277.1	1835.0	227.8	1621.4	227.1	1532.4	190.1	1483.4	153.3	1496.1	225.1	1436.1	112.4
CSS	1834.6	493.6	1702.7	211.7	1815.3	153.9	1768.3	247.2	1879.0	224.9	1824.6	171.8	2082.9	435.5	1799.4	278.7	2001.1	209.6	1855.3	174.5	1643.8	243.3	1527.8	187.6	1453.6	254.3	1655.8	160.1	1582.7	118.1
Female																														
VT12	1816.0	180.2	1589.3	383.7	1864.8	182.7	1691.5	305.2	2045.7	204.1	1702.6	165.1	1854.8	280.8	1604.7	285.9	1744.1	191.5	1667.9	124.8	1869.2	142.8	1590.9	225.3	1778.8	74.4	1595.4	161.4	1505.2	229.3
CSS	1760.1	440.0	1816.6	346.7	1805.9	360.0	1866.7	113.1	2130.3	106.3	1900.3	295.0	1814.6	240.8	1800.9	207.4	1541.8	270.0	1732.6	293.6	1913.0	207.8	1610.1	387.3	1714.1	256.1	1819.6	320.9	1772.8	311.4
Both																														
VT12	1732.7	198.0	1538.8	384.0	1729.1	219.7	1678.2	360.2	1877.7	326.6	1657.1	177.7	1793.0	217.0	1632.5	198.4	1717.2	226.3	1751.5	194.3	1745.3	221.4	1561.6	199.0	1631.1	192.7	1545.8	191.9	1470.6	174.1
CSS	1797.4	442.6	1759.7	277.4	1810.6	261.1	1805.2	202.9	2004.7	212.3	1858.2	221.3	1948.8	360.6	1800.2	231.6	1771.5	332.5	1794.0	236.7	1778.4	256.2	1568.9	290.2	1598.3	275.5	1737.7	254.2	1688.3	252.5

Less Stable /ɑ/ F1 (Nasal) (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT12	91.2	5.8	91.1	7.4	79.8	14.8	92.9	2.2	88.4	9.1	95.1	2.2	90.9	11.4	93.9	3.4	91.6	1.7	95.6	2.6	92.0	5.2	96.6	1.9	94.1	2.7	96.1	1.5	92.3	2.9
CSS	72.1	17.0	78.4	22.6	74.0	17.4	88.7	8.5	80.6	15.7	85.1	4.3	81.3	13.3	86.4	6.3	81.8	8.0	90.5	3.1	89.7	7.9	93.2	4.4	91.0	6.3	90.8	2.8	87.4	7.5
Female																														
VT12	88.1	15.2	83.0	15.7	93.8	3.3	84.3	4.2	89.8	5.2	93.7	1.6	94.2	1.3	97.4	2.0	94.2	3.0	95.2	1.2	90.8	3.3	96.0	3.5	96.1	0.8	93.5	3.9	92.2	4.8
CSS	83.0	14.3	85.0	11.2	91.8	8.5	88.3	10.9	68.2	22.8	80.6	15.5	89.3	3.2	81.3	6.7	84.1	5.9	87.8	9.6	80.4	11.7	84.5	5.6	87.5	5.2	87.7	3.0	91.7	9.2
Both																														
VT12	89.8	10.3	87.5	11.7	86.8	12.5	89.1	5.5	89.1	7.0	94.4	2.0	92.5	7.8	95.4	3.3	93.0	2.7	95.4	1.9	91.4	4.1	88.9	6.6	95.1	2.1	94.8	3.1	92.2	3.7
CSS	77.6	15.9	81.7	17.2	82.0	16.3	88.5	9.2	74.4	19.6	82.9	11.0	85.3	10.0	83.8	6.7	83.1	6.5	89.2	6.9	84.5	10.8	96.3	2.8	89.2	5.8	89.2	3.2	89.5	8.3

Less Stable /i/ F2 (Nasopharyngeal) (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT12	92.0	3.4	69.9	21.7	90.5	4.0	85.9	20.9	97.3	1.1	96.3	1.4	97.1	1.0	75.2	31.4	98.1	0.9	97.8	1.2	96.8	2.8	97.7	1.0	97.4	0.9	96.8	1.4	97.6	1.0
CSS	85.5	14.9	90.5	8.6	97.4	1.2	91.9	5.8	93.6	5.7	95.6	2.6	89.4	9.7	91.8	6.0	93.2	2.9	94.7	1.3	92.4	6.2	95.1	2.5	85.1	13.7	91.6	4.4	92.0	5.7
Female																														
VT12	95.2	2.8	73.1	29.0	90.5	3.8	79.0	38.4	96.9	1.7	97.2	1.4	97.5	1.2	97.2	0.6	97.3	2.1	96.2	1.7	97.8	1.4	98.4	0.5	97.5	1.4	98.5	0.9	97.8	0.9
CSS	87.1	11.0	89.6	7.4	90.0	3.8	87.8	11.5	91.9	2.4	88.7	10.3	92.5	6.4	86.4	9.5	89.6	10.6	92.1	7.1	88.5	6.5	90.0	6.9	91.1	3.6	93.5	5.7	92.4	6.2
Both																														
VT12	93.6	3.4	71.5	24.2	90.5	3.7	82.1	30.3	97.1	1.4	96.7	1.4	97.3	1.0	86.2	23.9	97.7	1.6	97.0	1.6	97.3	2.0	98.0	0.8	97.5	1.1	97.7	1.4	97.7	0.9
CSS	86.4	12.0	90.0	7.6	93.7	4.7	89.9	8.9	92.8	4.2	92.1	8.0	91.0	7.9	89.1	8.0	91.4	7.6	93.4	5.0	90.4	6.3	92.6	5.6	88.1	10.0	92.5	4.9	92.2	5.6

Less Stable /ʊ/ F2 (Nasopharyngeal) (u)

Source	3 Yrs		4 Yrs		5 Yrs		6 Yrs		7 Yrs		8 Yrs		9 Yrs		10 Yrs		11 Yrs		12 Yrs		13 Yrs		14 Yrs		15 Yrs		16 Yrs		17 Yrs	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Male																														
VT12	92.5	5.1	91.0	5.2	87.8	8.0	91.2	1.5	88.2	4.1	89.9	6.8	87.2	2.9	94.1	4.2	94.4	3.5	90.4	6.2	95.3	1.1	95.5	2.5	96.1	3.3	95.4	2.1	95.7	1.8
CSS	64.6	5.2	74.5	10.2	87.2	14.8	85.8	9.8	84.0	7.7	85.7	12.0	86.6	8.1	84.6	8.2	89.3	7.9	75.3	12.5	77.5	7.1	76.7	13.7	85.7	13.4	79.1	12.5	79.7	8.8
Female																														
VT12	86.2	12.2	83.5	10.5	83.9	7.9	92.1	3.2	91.8	4.1	90.8	5.0	90.4	1.9	92.5	4.1	91.9	3.6	95.6	2.2	95.6	1.3	94.3	1.9	94.1	3.2	92.5	5.5	93.8	4.2
CSS	77.3	14.9	86.5	7.7	83.6	16.5	75.6	6.3	87.5	7.5	79.4	10.0	75.4	10.2	79.7	7.1	69.9	17.3	87.9	9.5	75.7	13.7	78.2	11.9	65.7	14.4	84.3	6.8	74.8	11.0
Both																														
VT12	89.3	9.4	87.3	8.8	85.8	7.7	91.6	2.3	90.0	4.3	90.3	5.7	88.8	2.9	93.3	4.0	93.2	3.6	93.0	5.2	95.4	1.2	94.9	2.2	95.1	3.2	93.9	4.2	94.7	3.2
CSS	71.9	12.9	79.0	10.7	85.4	14.7	81.4	9.5	85.7	7.4	82.9	11.0	79.6	10.6	81.8	7.6	80.7	15.7	81.6	12.4	76.7	9.8	77.4	12.1	74.6	16.8	81.7	9.9	77.0	9.8