


Phonological Acquisition and Ambient Language :  
A Corpus Based Cross-Linguistic Exploration

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Appendices

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# APPENDICES

Appendix 2.1	Phonetic Description of English Consonant Phonemes
Appendix 2.2	English Consonant Phonemes in Use in English Words
Appendix 2.3	Phonetic Description of English Vowel Phonemes
Appendix 2.4	English Diphthongs and Triphthongs
Appendix 2.5	One Syllable English Word Possibilities
Appendix 2.6	English Word Frequency Rankings In Various Corpora
Appendix 2.7	Phonetic Description of Finnish Consonant Phonemes
Appendix 2.8	Phonetic Description of Finnish Vowel Phonemes
Appendix 3.1	Background to Jakobson's Universalist Theory
Appendix 4.1	CHILDES English Child Data Files
Appendix 4.2	Oulu Child Data Guide
Appendix 5.1	Sample of AWK Programs Developed for English FUSE Processing
Appendix 5.2	U.K. Alvey Standard for Machine Readable Phonemic Transcription
Appendix 6.1	English Adult Homographs
Appendix 6.2	English Adult Homophones
Appendix 6.3	English Transcript Notation – Vowels
Appendix 6.4	English Transcript Notation – Consonants
Appendix 6.5	Helsinki Spoken Language Corpus – Transcription Codes
Appendix 6.6	Finnish Transcript Notation – Vowels
Appendix 6.7	Finnish Transcript Notation – Consonants

## APPENDICES (continued)

Appendix 7.1	English Adult Word Types Phoneme Frequencies
Appendix 7.2	English Adult WI Phoneme Frequency
Appendix 7.3	English Adult WI Minimal Pair Groups
Appendix 7.4a	English Adult WI FUSE – Count A
Appendix 7.4b	English Adult WI FUSE – Count B
Appendix 7.4c	English Adult WI FUSE – A and B Comparison
Appendix 7.5	Most Frequent Finnish Words Translated
Appendix 7.6	Finnish Adult Word Types Phoneme Frequencies
Appendix 7.7	Finnish Adult WI Phoneme Frequency
Appendix 7.8	Finnish Adult WI Minimal Pair Groups
Appendix 7.9a	Finnish Adult WI FUSE – Count A
Appendix 7.9c	Finnish Adult WI FUSE – A and B Comparison
Appendix 7.10	English Child – Group Phoneme Frequencies
Appendix 7.11	English Child – Group FUSE Rankings
Appendix 7.12	Finnish Child – Group Phoneme Frequencies
Appendix 7.13	Finnish Child – Group FUSE Rankings
Appendix 8.1	English Adult FUSE to Group Child Frequency Correlation
Appendix 8.2	Finnish Adult FUSE to Group Child Frequency Correlation
Appendix 8.3	English Adult FUSE to Group Child FUSE Correlation
Appendix 8.4	Finnish Adult FUSE to Group Child FUSE Correlation
Appendix 8.5	English Adult W.I Frequency to Group Child W.I. Frequency Correlation
Appendix 8.6	Finnish Adult W.I Frequency to Group Child W.I. Frequency Correlation
Appendix 8.7	Cross-Linguistic Adult Frequency Correlation
Appendix 8.8	Cross-Linguistic Adult FUSE Correlation
Appendix 8.9	Cross-Linguistic Group Child Frequency Correlation
Appendix 8.10	Cross-Linguistic Group Child FUSE Correlation

## APPENDICES (continued)

Appendix 8.11	English Adult To Finnish Child FUSE Correlation
Appendix 8.12	English Adult To Finnish Child Frequency Correlation
Appendix 8.13	Finnish Adult To English Child FUSE Correlation
Appendix 8.14	Finnish Adult To English Child Frequency Correlation
Appendix 9.1	Individual English Child Words
Appendix 9.2	English Child – Individual WI Phoneme Frequency
Appendix 9.3	English Child – Individual FUSE Rankings
Appendix 9.4	Individual Finnish Child Words
Appendix 9.5	Finnish Child – Individual WI Phoneme Frequency
Appendix 9.6	Finnish Child – Individual FUSE Rankings



Appendix 2.1 - Phonetic Description of English Consonant Phonemes

Phoneme	Manner of Articulation	Place of Articulation	Voiced/Voiceless
/b/	Plosive	Bilabial	Voiced
/p/	Plosive	Bilabial	Voiceless
/d/	Plosive	Alveolar	Voiced
/t/	Plosive	Alveolar	Voiceless
/g/	Plosive	Velar	Voiced
/k/	Plosive	Velar	Voiceless
/v/	Fricative	Labiodental	Voiced
/f/	Fricative	Labiodental;	Voiceless
/ð/	Fricative	Dental	Voiced
/θ/	Fricative	Dental	Voiceless
/z/	Fricative	Alveolar	Voiced
/s/	Fricative	Alveolar	Voiceless
/ʒ/	Fricative	Palato-Alveolar	Voiced
/ʃ/	Fricative	Palato-Alveolar	Voiceless
/h/	Fricative	Glottal	
/tʃ/	Affricate	Palato-Alveolar	Voiced
/dʒ/	Affricate	Palato-Alveolar	Voiceless
/m/	Nasal	Bilabial	Voiced
/n/	Nasal	Alveolar	Voiced
/ŋ/	Nasal	Velar	Voiced
/l/	Lateral	Alveolar	Voiced
/w/	Approximant	Bilabial	Voiced
/r/	Approximant	Palato-Alveolar	Voiced
/j/	Approximant	Palatal	Voiced

Appendix 2.2 - English Consonant Phonemes in Use In English Words

Phoneme	Orthographic Form of English Words		
	Word	Word	Word
	Initial	Medial	Final
	Position	Position	Position
/p/	part	paper	keep
/b/	but	about	job
/t/	team	letter	met
/d/	gather	together	big
/k/	coast	become	bespoke
/g/	gone	legacy	log
/f/	food	affect	if
/v/	view	revision	believe
/θ/	thing	birthday	earth
/ð/	the	father	smooth
/s/	sort	thesis	space
/z/	zoology	trousers	chose
/ʃ/	shirt	assure	ash
/ʒ/	X	unusual	garage
/h/	had	somehow	X
/tʃ/	chat	fortunate	touch
/dʒ/	just	object	arrange
/m/	man	element	am
/n/	need	renewal	rain
/ŋ/	limit	longer	king
/l/	lead	valley	tool
/w/	where	railway	watch
/r/	right	wiring	X
/j/	youth	volume	X
X = Not Applicable in that word position			

Appendix 2.3 - Phonetic Description of English Vowel Phonemes

Phoneme	Front / Central /	Open / Mid /	Rounded /	Long / Short
	<b>Back</b>	<b>Close</b>	<b>Unrounded</b>	
/i/	Front	Close	Unrounded	Long
/e/	Front	Mid	Unrounded	Short
/æ/	Front	Open	Unrounded	Short
/ɪ/	Central	Mid	Unrounded	Short
/ɜ/	Central	Mid	Unrounded	Long
/ʊ/	Central	Mid	Rounded	Short
/ə/	Central	Mid	Rounded	Short
/u/	Back	Close	Rounded	Long
/ʌ/	Back	Mid	Unrounded	Short
/ɔ/	Back	Mid	Rounded	Short
/ɑ/	Back	Open	Unrounded	Long
/ɒ/	Back	Open	Rounded	Short

Appendix 2.4 - English Diphthongs and Triphthongs

Phoneme	Example Word	
	Orthographic Form	Phonetic Notation
<b>Diphthongs</b>		
/ɪə/	here	/hɪə/
/eə/	hair	/heə/
/ʊə/	sure	/sʊə/
/eɪ/	may	/meɪ/
/aɪ/	my	/maɪ/
/ɔɪ/	boy	/bɔɪ/
/əʊ/	no/know	/nəʊ/
/aʊ/	now	/naʊ/
<b>Triphthongs</b>		
/eɪə/	layer	/leɪə/
/aɪə/	wire	/waɪə/
/ɔɪə/	royal	/rɔɪə/
/əʊə/	slower	/sləʊə/
/aʊə/	our/hour	/aʊə/



## Appendix 2.5 - One syllable English Word Possibilities

1. Nucleus only syllables (V) = 25

25 possibilities as 25 vowel phonemes.

2. Syllables with consonant onsets = 1750 possibilities

2a. Singleton consonant onsets (CV) = 575

23 possible different consonant onsets x 25 possible vowels

2b. Two consonant cluster onsets (CCV) = 975

39 possible different two consonant cluster onsets x 25 vowels

2c. Three consonant cluster onsets (CCCV) = 225

9 possible different three consonant cluster onsets x 25 vowels

3. Syllables with consonant codas = 1600

3a. Singleton consonant codas = 500

25 possible vowels x 20 possible different singleton consonant codas

3b. Two consonant cluster codas = 925

25 possible vowels x 37 possible different two consonant cluster codas

3c. Three consonant cluster onsets = 75

25 vowels x 3 possible different three consonant cluster consonant

3d. Four consonant cluster codas = 100

25 vowels x 4 possible different four consonant cluster codas

4. Syllables with consonant onsets and codas = 113,600

71 possible onsets x 25 possible vowels x 64 possible codas = 113,600.

Two syllable words, if all syllable combinations were pronounceable, would provide in excess of 25,000,000,000 (113,600 x 113,600) different word possibilities, and so on.

Appendix 2.6 - English Word Frequency Rankings in Various Corpora

	<b>Birmingham</b>	<b>Brown</b>	<b>LOB</b>	<b>London Lund</b>
<b>Word</b>	<b>Rank</b>	<b>Rank</b>	<b>Rank</b>	<b>Rank</b>
the	1	1	1	1
of	2	2	2	5
and	3	3	3	3
to	4	4	4	4
a	5	5	5	6
in	6	6	6	9
that	7	7	7	8
I	8	20	17	2
it	9	12	10	10
was	10	9	9	13
is	11	8	8	11
he	12	10	12	18
for	13	11	11	20
you	14	33	32	7
on	15	16	16	16
with	16	13	14	32
as	17	14	13	29
be	18	17	15	21
had	19	22	21	55
but	20	25	24	15
they	21	30	33	24
at	22	18	19	26
his	23	15	18	85
have	24	28	26	19
not	25	23	23	35
this	26	21	22	14
are	27	24	27	42
or	28	27	31	44
by	29	19	20	65
we	30	41	40	23
she	31	37	30	72
from	32	26	25	53
one	33	32	38	36
all	34	36	39	33
there	35	38	36	38
her	36	35	29	96
were	37	34	35	64
which	38	31	28	43
an	39	29	34	81

Appendix 2.6 - English Word Frequency Rankings in Various Corpora

	<b>Birmingham</b>	<b>Brown</b>	<b>LOB</b>	<b>London Lund</b>
<b>Word</b>	<b>Rank</b>	<b>Rank</b>	<b>Rank</b>	<b>Rank</b>
so	40	52	46	30
what	41	54	58	34
their	42	40	41	112
if	43	50	45	48
would	44	39	43	51
about	45	57	54	37
no	46	49	47	25
said	47	53	48	76
up	48	55	52	61
when	49	45	44	67
been	50	43	37	68

Appendix 2.7 - Phonetic Description of Finnish Consonant Phonemes

Phoneme	Manner of Articulation	Place of Articulation	Voiced/Voiceless
/p/	Plosive	Bilabial	Voiceless
/t/	Plosive	Apico-dental	Voiceless
/d/	Plosive	Apico-alveolar	Voiced
/k/	Plosive	Dorso-palatal	Voiceless
/s/	Fricative	Lamino-alveolar	Voiceless
/h/	Fricative	Ranging from bilabial to pharyngeal dependent on co-articulation.	Voiceless
/m/	Nasal	Bilabial	N/A
/n/	Nasal	Alveolar	N/A
/ŋ/	Nasal	Dorso-palatal	N/A
/l/	Liquid	Apico-alveolar	N/A
/r/	Liquid	Apico-alveolar trill	N/A
/j/	Semi-vowel	Dorso-palatal	N/A
/v/	Semi-vowel	Labio-dental	N/A
<b>Phonemes Present in Loan Words</b>			
/b/	Plosive	Bilabial	Voiced
/g/	Plosive	Velar	Voiced
/f/	Fricative	Labio-dental	Voiceless
/ʃ/	Fricative	Alveolar	Voiceless



Appendix 2.8 - Phonetic Description of Finnish Vowel Phonemes

Phoneme	Front / Back	Open / Mid / Close	Rounded / Unrounded	Long / Short	Orthographic Representation
/i/	Front	Close	Unrounded	short	i
/i:/	Front	Close	Unrounded	long	ii
/y/	Front	Close	Rounded	short	y
/y:/	Front	Close	Rounded	long	yy
/e/	Front	Mid	Unrounded	short	e
/e:/	Front	Mid	Unrounded	long	ee
/œ/	Front	Mid	Rounded	short	ö
/œ:/	Front	Mid	Rounded	long	öö
/æ/	Front	Open	Unrounded	short	ä
/æ:/	Front	Open	Unrounded	long	ää
/u/	Back	Close	Rounded	short	u
/u:/	Back	Close	Rounded	long	uu
/o/	Back	Mid	Rounded	short	o
/o:/	Back	Mid	Rounded	long	oo
/ɑ/	Back	Open	Unrounded	short	a
/ɑ:/	Back	Open	Unrounded	long	aa

### **Jakobson's Theory of Phonological Acquisition**

Believing that "it is possible to give a structural analysis of language in its making " (Jakobson 1968:7) Jakobson offered a structuralist account (sometimes referred to as the structuralist approach) of phonemic acquisition based upon a theory of phonemic feature contrasts or 'oppositions' that could be universally applied. He based his approach on the view that phonemes could be viewed as combinations of 'features', an approach now known as 'distinctive feature analysis', and he claimed that when children are learning their first language, they acquire these features rather than individual phonemes. He proposed that there is a general order of phonological development that applies to all children; the order being determined by oppositions of decreasing magnitude.

Jakobson had studied the frequency and distribution of phonemic features synchronically and from this he defined a minimal, or universal, set of distinctive features that every language contains. He observed correlations between the order in which various features of language were acquired and the distribution of those features across the world's languages and he believed that there must therefore be a relationship between the phonological universals and the phonological acquisition process itself. He set out to prove that the order of the phonemic acquisition process followed certain laws which were based upon the frequency of feature across the world's languages i.e. feature distribution determining the order of phonemic acquisition.

The basis of his theory is that the order of phonological acquisition, and incidentally, the order of phonological dissolution with aphasia, correlates to this matrix of distinctive features. From this premise Jakobson formulated a theory of the order of phonemic acquisition. It is these claims that the next section of this report sets out to explore.

Jakobson proposed that;

- Universal feature contrasts, those that are present in all languages, are acquired first and form the basis of a 'minimal' system.

## Appendix 3.1 Background to Jakobson's Universalist Theory

- Subsequent development can be described by the 'laws of irreversible solidarity'.
- There is no link between babbling and spoken language; the discontinuity hypothesis.

The first two of these principles is now discussed in detail.

### **Stage 1 - Universal Features and Phonemic Acquisition.**

Jakobson proposed that children initially acquire the universal features i.e. those can be observed in all the languages of the world. The order of acquisition of these universal features he predicted as being determined by rules of maximal contrast; the child would learn the maximally contrasting features first and then would continue learning to an order of ever decreasing contrastiveness until the universal features were acquired. The order of acquisition of subsequent phonemes Jakobson predicted to be determined by frequency of phonemes across the worlds languages. Both of these proposals are now discussed as features of stage one of the acquisition process, a stage referred to as the 'minimal systems' by Jakobson himself (1968:11).

### **Acquisition of Universal Features**

"Concurrences between the order of development in child language and the general laws which are brought to light by the synchronic study of the languages of the world" (Jakobson 1968:14).

Through his studies of the sounds of the worlds languages Jakobson had observed that certain features appeared to exist in all languages; namely all languages had at least one nasal and one oral phoneme and at least one labial and one dental phoneme. He therefore proposed that there was a universal set of distinctive features and that all of the worlds languages contained this 'minimal set'.

Jakobson went on to propose that there was a correlation between this universal set of feature contrasts and the acquisition of a phonemic system. He predicted that the universal feature contrasts would be the earliest elements in the acquisition process giving the child the minimal phonemic system for whatever language he would go on to acquire. Children at the first stage of phonemic acquisition would therefore be



### Appendix 3.1 Background to Jakobson's Universalist Theory

expected to sound the same the world over and to be equally equipped to acquire any language from the total range of languages.

Jakobson predicted that whilst the actual age of acquisition may vary from child to child the order of phonemic feature acquisition would follow a set pattern. He proposed that feature acquisition followed the principle of 'maximal contrast' with the most contrasting feature of open (sounds without any obstruction to the passage of air i.e. the vowels) and closed (sounds with obstruction at some point of the vocal tract i.e. the consonants) being acquired the earliest. Acquisition would then proceed along the lines of gradually decreasing contrast magnitude. Using this theory he predicted that the earliest sounds acquired by the child would therefore be;-

- 'a wide vowel', of which /ɑ/ affords the maximum opening

and

- 'a stop consonant', the maximum stops being the labials which 'obstruct the cavity completely' (Jakobson 1968:14).

The next feature, noted by Jakobson as 'The first opposition on the axis of simultaneity'(Jakobson 1968:15) is the opposition between those labial stops(most closed sounds) produced orally e.g. /b/ and /p/ and those produced nasally e.g. /m/.

The subsequent opposition predicted by Jakobson was labial vs. dental; in English the nasal /m/ would be opposed by the dental /n/ and the orals /b/ and /p/ would be opposed by the dentals /d/ and /t/.

The vocalic oppositions then commence with the opposition of the narrow vs. wide vowel, in English the /i/ vs. /a/. The second vocalic opposition comprises either;

- a narrow vowel to front narrow and back narrow vowels  
e.g. /i/ and /u/

or

- a narrow vowel to narrow and mid aperture vowels.  
e.g. /i/ and /e/



### Appendix 3.1 Background to Jakobson's Universalist Theory

All languages would be predicted to be acquired along these universal maximum to minimum oppositions.

#### Stage 1 - Subsequent Acquisition

"A rigid REGULARITY in the succession of his acquisitions, which constitute for the most part a strict and invariable temporal sequence.....The relative chronology of certain innovations remains always and everywhere the same"(Jakobson 1968:9/10).

Jakobson proposed that phonemic development subsequent to the minimal systems (discussed above) was governed by the frequency of phonemes across the world's languages. He proposed that those phonemes found most regularly in world languages would be acquired before the less frequently distributed (or most marked) sounds. According to this proposal phonemes that exist relatively rarely in the world's languages e.g. a second liquid, the sibilant /r/, nasal vowels and glottalised consonants, would be expected to be acquired last despite their possible relative frequency in the lexicon of the actual language being acquired.

This proposal can be exemplified by an example from English;

- the English phoneme /æ/ which is common in the English lexicon e.g. /kæt/, /mæt/, /pæk/ has been shown to be both;

a) relatively rare in languages of the world (Goodluck 1991:20)

and

b) acquired relatively late (despite it occurring frequently in the English-learning child's linguistic environment)

Jakobson believed that the rules described above applied not only to the acquisition of individual phonemes but to the acceptable groupings of phonemes into consonant clusters and into words of languages of the world. For example, Jakobson observed that the CV syllable is the phonemic pattern most widely distributed across the world's

### Appendix 3.1 Background to Jakobson's Universalist Theory

languages whereas consonant clusters are relatively rare in the world's languages. English, on the other hand, makes great use of consonant clusters, allowing clusters of two, three and four consonants and consonant clusters can be observed to be relatively common in English. Jakobson's rule would make the prediction that despite the frequency of consonant clusters in English it would be the CV pattern that was observed earliest in children's speech. He predicts therefore that consonant clusters would be acquired after singleton consonants.

Jakobson observed too a gradation in cluster frequency across those languages that allow consonant clusters which he predicted would impact the order of consonant cluster acquisition. For example, the consonant cluster /sr/ is seen more frequently in languages of the world than the cluster /st/. Despite the fact that the /st/ cluster is relatively more frequent in English than the /sr/ cluster the English child would be expected to produce the /sr/ cluster earlier than the /st/ the same as his equivalent from a language that did not permit the /st/ cluster.

#### **Revised Feature Specifications**

Whilst Jakobson did not elaborate or alter the basic theory outlined above he did refine his theory of distinctive features in two later writings (Jakobson & Halle, 1956 and Jakobson, Fant & Halle, 1963). His revised features led to some minor alterations to the predictions on language acquisition previously made and outlined above. The only alteration for stage 1, the minimal system, includes the definition of a core or elementary set of phonemes that can be observed in all languages of the world; this is [p, t, k] for consonants, and [i, a, u] for vowels. Often referred to as the 'primary triangle' (e.g. Ingram (1989:196) this predicts that these phonemes will appear at the earliest stage of acquisition. They are also the minimum requirement for all languages of the world as would be expected for universal features. Jakobson also divided his distinctive features into three general classes: sonority, protensity and tonality. He predicted that whilst the acquisition of features within a class would follow a pre-definable sequence there would be independence between the classes. For example,

### Appendix 3.1 Background to Jakobson's Universalist Theory

nasal vs. oral, an early sonority feature, may precede or follow the acquisition of labial vs. dental, the first tonality feature.

#### **Stage 2 - The Laws of Irreversible Solidarity.**

The "order of acquisition corresponds exactly to the general laws of IRREVERSIBLE SOLIDARITY(implication) which govern the synchrony of the languages of the world"(Jakobson 1968:11). From studies of the distribution of phonological features of the languages of the world, Jakobson had observed that not only are there universal feature contrasts that apply to all languages(stage 1 above) but that there also consistent asymmetries in the phonemic systems of the languages of the world e.g. in languages that have back consonants front consonants were also always present. It was as if the presence of one feature in a language implied the presence of another i.e. if a language has a back consonant it must also have a front consonant. Jakobson thus concluded that the presence of back consonants in a language presupposed, or implied(the rule of implicature), the presence of front consonants in that same language. The rule was irreversible; i.e. the presence of front consonants in a language does not imply the presence of back consonants in that same language.

Jakobson proposed that these implicational laws not only governed the phonemic systems of languages but they also governed the acquisition orders seen in children's developing phonological systems and being universal rules they were also predicted to apply to all of the worlds languages. Just as the law that states that the presence of back consonants in a language presupposes the presence of front (the presence of back consonants implies the presence of front consonants) the predicted order of acquisition would be for front consonants to precede back consonants in development.

The Laws of Irreversible Solidarity as defined by Jakobson(1968:11)\_ are now given;

1. "The acquisition of velar and palatal consonants implies the presence of labials and dentals" Jakobson(1968:11).



### Appendix 3.1 Background to Jakobson's Universalist Theory

2. "The child's acquisition of fricatives presupposes that of stops"  
Jakobson(1968:11)
3. "The acquisition by the child of affricates in distinctive opposition to the corresponding stops presupposes the acquisition of fricatives within the same series" Jakobson(1968:11).
4. "No horizontal(front-back) opposition in open vowels can be acquired by the child as long as he has not acquired the same opposition in close vowels" Jakobson(1968:11).
5. "The acquisition of front rounded vowels(secondary vowels..). presupposes the acquisition of primary vowels, i.e. back rounded and the corresponding front unrounded vowels.
6. "Oppositions which are relatively rare in the languages of the world are among the last acquired by the child".

#### **Stage 2 - Subsequent Acquisition**

According to Jakobson's theory subsequent acquisition would be determined by frequency of the phoneme across the world's languages with the most frequently distributed sounds being acquired before those that are less frequently distributed. The Laws of Irreversible Solidarity, based upon the frequency of presence of features across languages, makes predictions for the acquisition of phonemes in English as follows;

- The acquisition of front consonants (labials and dentals) before back consonants (velar and palatals) as according to the law of irreversible solidarity the existence of back consonants implies the existence of front consonants (Jakobson 1971:11)). We could deduce from this that Jakobson means that oppositions between front consonants will precede oppositions between back ones. Even with this assumption on Jakobson's intended meaning it is difficult to assess the exact prediction that Jakobson is making;

1. do all front oppositions occur before any back oppositions occur?



### Appendix 3.1 Background to Jakobson's Universalist Theory

or

2. do front oppositions complete before back oppositions commence?

or

3. do back oppositions commence after just one front opposition?

Assuming 3 then for English this law predicts that;

- a labial (/m/ or /p/ or /b/) vs. dental (/t/ or /d/ or /n/) opposition will be acquired before a palatal (/j/) vs. velar (/k/ or /g/ or /ŋ/) opposition.

We can categorise the approximants /w/ and /j/ and /r/ in terms of front to back and thus assume that Jakobson is predicting that /w/ as a bilabial should appear first, followed by the palato-alveolar approximant /r/ and then the palatal approximant /j/. However, with this assumption we are not relating the acquisition to oppositions as we have done for all the other predictions on acquisition order.

#### **General Criticisms of the Theory**

The main criticisms of Jakobson's theories centre around;

- The prediction of universality (and not idiosyncrasy) for order of feature acquisition
- The hypotheses that order of acquisition is determined by frequency in distribution across languages of the world and not according to the frequency of the phoneme in the particular language that the child hears or the frequency of the phoneme within the child's own lexicon.

Other criticisms include;

- Jakobson assumes that the basic unit of acquisition is the phoneme and that it is the contrasts between phonemes which determines the order of acquisition. More recent studies (e.g. Peters (1983) and Ferguson and Farwell (1975) cited in Stoel-Gammon &

### Appendix 3.1 Background to Jakobson's Universalist Theory

Dunn(1985:6)), however, seem to suggest that larger units than the phoneme might be acquired e.g. groups of phonemes, whole words or even phrases.

- The use of an inductive approach for studying child language acquisition.

Jakobson is commenting on the order of language acquisition processes however he does base his study on actual child language. He starts instead from a theory of phonological features based upon the structuralist approach which he then attempts to apply to the field of phonological acquisition.

- The suitability of the structuralist approach(with its emphasis on oppositions) as a valid way of approaching phonological acquisition.

A more general criticism of Jakobson's theory is based around its incompleteness; "an incomplete theory, or the outline of a theory"(Ingram 1989:197). Many of Jakobson laws are not fully defined and can be ambiguously interpreted e.g. where glides and liquids fit within the classification, whether the predictions on feature contrasts relate to the first or all contrasts becoming effective etc. These issues are explored further in section 4. Elaboration, alteration or often attachment to other theories (see 3.2 below) is often the only way that they can be rendered complete and testable.

Ingram comments on this; "even though it has attracted widespread attention, the theory has not been subject to rigorous development" (Ingram 1989:197).

With any evaluation of such an incomplete theory certain basic assumptions on the meaning of predictions must be made in order to have a measure to test against. Another general criticism already mentioned above is that Jakobson is "sometimes careless in the way he states his predictions" Ingram(1979:194). Although he states 'front consonants precede back consonants' as we are dealing with distinctive features we could assume from this he means that oppositions between front consonants will precede oppositions between back ones but we have no way of finitely assessing his full intentions.



Appendix 4.1 - CHILDES English Child Data Files

Name	Age	No. Children
Bates	0;10, 1;1, 1;8 and 2;4	32
Bernstein-Ratner	1;1 to 1;11	9
Bloom - 1973	1;4 to 2;10	1
Bloom - 1970	1;9 to 3;2	3
Bohannon	2;8 and 3;0	2
Braine		6
Brown	1;6 to 5;1	3
Carterette and Jones	First Grade to adult	54, 48, 48 and 24
Clark	2;2 to 3;2	1
Cruttenden	1;5 to 3;7	2
Demetras - Trevor	2;0 to 2;11	1
Demetras - Working Parents	2;1 to 2;9	3
Evans	First Grade	16
Fletcher	3, 5 and 7	72
Garvey	2;10 to 5;7	30
Gathercole	2;9 to 6;6	16
Gathercole / Burns	3;0 to 6;4	12
Gleason	2;1 to 5;2	24
Haggerty	2;7	1
Hall	4;6 to 5;0	39
Higginson	0;11 to 2;11	3
Howe	1;6 to 1;8 and 1;11 to 2;1	16
Korman	0;1:2 to 0;4 and adult	6
Kuczaj	2;4 to 4;1	1
MacWhinney	0;7 to 5;6 and 2;6 to 8;0	2
New England	1;2, 1;8 and 2;3 to 2;8	52
Peters / Wilson		1
Post	1;7 and 1;10	3
Sachs	1;1 to 5;1	1
Snow	2;3 to 3;9	1
Suppes	1;11 to 3;3	1
Van Houten	adult to 0;4, 0;8, 2;0 and 3;0	9
Van Kleeck	3;0 and adult	37
Warren-Leubecker	1;6 to 3;0 and 4;6 to 6;2	20
Wells	1;6 to 5;0	32
Wisconsin	1;6	48
	No. Samples	506

Appendix 4.2 - Oulu Child Data Guide

Name of Child	Age	Transcript Available?	Data File Number	Computer File No.
Harri 1	1.06	Typed Transcript		
Harri 1	1.10	Typed Transcript		
Harri 1	2.04	Typed Transcript		
Harri 1	2.10	Typed Transcript		
Harri 1	3.03	NO	1011	Merk01
Harri 1	3.09	NO		
Harri 1	4.04	NO	1012	Merk01
Harri 1	4.10	Typed Transcript x 2		
Harri 1	7.11	Typed Transcript		
Harri 1	9.00	Typed Transcript		
Harri 1	10.00	Typed Transcript		
Harri 1	12.00	Typed Transcript		
Harri 1	16.00	NO		
Ilpo	1.07	Typed Transcript		
Ilpo	1.10	Typed Transcript		
Ilpo	2.04	Typed Transcript		
Ilpo	2.07	Typed Transcript		
Ilpo	3.01	NO	1021	Merk02
Ilpo	3.10	NO		
Ilpo	4.40	NO	1022	Merk02
Ilpo	4.11	Typed Transcript x 2		
Ilpo	4.11	Typed Transcript x 2		
Ilpo	4.11	Typed Transcript x 2		
Ilpo	8.01	Typed Transcript		
Ilpo	9.02	Typed Transcript		
Ilpo	12.02	Typed Transcript		
Kirsti	1.04	Typed Transcript		
Kirsti	1.08	Typed Transcript		
Kirsti	2.09	Typed Transcript		
Kirsti	3.03	NO		
Kirsti	3.08	NO		
Kirsti	3.10	NO	2041	Merk03
Kirsti	4.04	NO	2042	Merk03
Kirsti	7.10	Typed Transcript		
Kirsti	8.10	Typed Transcript		
Kirsti	9.10	Typed Transcript		
Kirsti	11.10	Typed Transcript		
Kirsti	15.10	NO		
Kyosti	1.05	Typed Transcript		
Kyosti	1.08	Typed Transcript		
Kyosti	2.03	Typed Transcript		
Kyosti	2.07	Typed Transcript		
Kyosti	2.08	Typed Transcript		
Kyosti	2.09	Typed Transcript		
Kyosti	2.11	Typed Transcript		
Kyosti	3.01	NO		



Appendix 4.2 - Oulu Child Data Guide

Name of Child	Age	Transcript Available?	Data File Number	Computer File No.
Kyosti	3.03	NO		
Kyosti	3.04	NO		
Kyosti	3.05	NO		
Kyosti	3.06	NO	1051	Merk04
Kyosti	3.07	NO		
Kyosti	3.08	NO		
Kyosti	3.09	NO		
Kyosti	3.10	NO		
Kyosti	3.11	NO		
Kyosti	4.00	NO		
Kyosti	4.02	NO	1052	Merk04
Kyosti	5.03	Typed Transcript		
Kyosti	5.03	Typed Transcript		
Kyosti	5.03	Typed Transcript		
Mari	1.06	Typed Transcript		
Mari	2.02	Typed Transcript		
Mari	2.08	Typed Transcript		
Mari	3.04	NO	2061	Merk05
Mari	4.04	NO	2062	Merk05
Mari	8.01	Typed Transcript		
Mari	9.03	Typed Transcript		
Mari	12.00	Typed Transcript		
Mika	1.10	Typed Transcript		
Mika	2.04	Typed Transcript		
Mika	2.07	Typed Transcript		
Mika	2.10	Typed Transcript		
Mika	3.04	NO	1071	Merk06
Mika	3.10	Typed Transcript		
Mika	4.04	NO	1072	Merk06
Mika	8.05	Typed Transcript		
Mika	9.04	Typed Transcript		
Mika	10.04	Typed Transcript		
Riika	1.08	Typed Transcript		
Riika	1.11	Typed Transcript		
Riika	2.05	Typed Transcript		
Riika	2.08	Typed Transcript		
Riika	3.05	NO	2081	Merk07
Riika	4.05	NO	2082	Merk07
Riika	7.11	Typed Transcript		
Riika	9.00	Typed Transcript		
Riika	10.00	Typed Transcript		
Riika	12.00	Typed Transcript		

Appendix 4.2 - Oulu Child Data Guide

Name of Child	Age	Transcript Available?	Data File Number	Computer File No.
Saana	1.05	Typed Transcript		
Saana	2.02	Typed Transcript		
Saana	2.06	Typed Transcript		
Saana	3.07	NO	2091	Merk08
Saana	4.07	Typed Transcript	2092	Merk08
Saana	9.00	Typed Transcript		
Saana	10.00	Typed Transcript		
Sami	1.04	Typed Transcript		
Sami	1.10	Typed Transcript		
Sami	2.04	Typed Transcript		
Sami	2.10	Typed Transcript		
Sami	3.04	NO	1111	Merk09
Sami	4.04	NO	1112	Merk09
Sami	7.09	Typed Transcript		
Sami	8.10	Typed Transcript		
Sami	9.10	Typed Transcript		
Sami	11.10	Typed Transcript		
Sanna	1.06	Typed Transcript		
Sanna	1.08	Typed Transcript		
Sanna	2.02	Typed Transcript		
Sanna	2.07	Typed Transcript		
Sanna	3.07	NO	2121	Merk10
Sanna	4.00	NO	2122	Merk10
Sanna	5.01	Typed Transcript		
Sanna	8.00	Typed Transcript		
Sanna	9.02	Typed Transcript		
Sanna	10.02	Typed Transcript		
Sanna	12.02	Typed Transcript		
Teppo	1.04	Typed Transcript		
Teppo	1.09	Typed Transcript		
Teppo	2.03	Typed Transcript		
Teppo	2.07	Typed Transcript		
Teppo	3.07	NO	1131	Merk11
Teppo	4.06	Typed Transcript	1132	Merk11
Teppo	4.06	Typed Transcript		
Teppo	8.00	Typed Transcript		
Teppo	9.00	Typed Transcript		
Teppo	10.10	Typed Transcript		
Teppo	12.10	Typed Transcript		
Ulla	1.05	Typed Transcript		
Ulla	1.09	Typed Transcript		
Ulla	2.01	Typed Transcript		
Ulla	2.05	Typed Transcript		
Ulla	2.08	Typed Transcript		
Ulla	3.08	NO	2141	Merk12



Appendix 4.2 - Oulu Child Data Guide

Name of Child	Age	Transcript Available?	Data File Number	Computer File No.
Ulla	4.01	NO	2142	Merk12
Ulla	7.07	Typed Transcript		
Ulla	8.07	Typed Transcript		
Ulla	9.07	Typed Transcript		
Ulla	11.08	Typed Transcript		
		Typed Transcript		
Ville	1.05	Typed Transcript		
Ville	1.08	Typed Transcript		
Ville	1.11	Typed Transcript		
Ville	2.01	Typed Transcript		
Ville	2.02	Typed Transcript		
Ville	2.03	Typed Transcript		
Ville	2.04	Typed Transcript		
Ville	2.05	Typed Transcript		
Ville	2.06	Typed Transcript		
Ville	2.07	Typed Transcript		
Ville	2.08	Typed Transcript		
Ville	2.09	Typed Transcript		
Ville	2.11	Typed Transcript		
Ville	3.07	NO	1151	Merk13
Ville	4.05	NO	1152	Merk13
Ville	7.04	Typed Transcript		
Ville	8.05	Typed Transcript		
Ville	11.05	Typed Transcript		
Virpi	2.01	Typed Transcript		
Virpi	2.08	Typed Transcript		
Virpi	3.08	NO	2161	Merk14
Virpi	4.09	Typed Transcript		
Virpi	4.10	NO	2162	Merk14
Virpi	8.00	Typed Transcript		
Virpi	9.00	Typed Transcript		
Virpi	10.00	Typed Transcript		
Virpi	12.00	Typed Transcript		

## Appendix 5.1 - Sample of AWK Programs Developed for English FUSE Processing

1.1 Sort by phonemic transcription so that identical transcripts are counted as one 'word' and naturally occurring homophony can be detected.

```
cat Engdata.txt | sort | uniq -c | sort -nr > engphon.txt
```

1.2 Sort transcripts into words of same length and by word position

```
cat engphon.txt | gawk 'length($2)== 6' | sort +1 > engword5a.txt
cat engphon.txt | gawk 'length($2)== 6' | sort +1.2 > engword5b.txt
cat engphon.txt | gawk 'length($2)== 6' | sort +1.3 > engword5c.txt
cat engphon.txt | gawk 'length($2)== 6' | sort +1.4 > engword5d.txt
cat engphon.txt | gawk 'length($2)== 6' | sort +1.5 > engword5e.txt
```

1.3 Find Minimal Pairs(words of same length and only one phoneme different)

Run program 'Minimal.txt' against the word files.

The input number tells the position to ignore when looking for near duplicate forms i.e. the rest of the word is identical apart from this position.

```
cat engword2a.txt | gawk '{print $2; }' | minimal.txt 2 > hom2a.txt
cat engword2b.txt | gawk '{print $2; }' | minimal.txt 1 > hom2b.txt
```

```
cat engword3a.txt | gawk '{print $2; }' | minimal.txt 3 > hom3a.txt
cat engword3b.txt | gawk '{print $2; }' | minimal.txt 1 > hom3b.txt
cat engword3c.txt | gawk '{print $2; }' | minimal.txt 2 > hom3c.txt
```

```
cat engword4a.txt | gawk '{print $2; }' | minimal.txt 4 > hom4a.txt
cat engword4b.txt | gawk '{print $2; }' | minimal.txt 1 > hom4b.txt
cat engword4c.txt | gawk '{print $2; }' | minimal.txt 2 > hom4c.txt
cat engword4d.txt | gawk '{print $2; }' | minimal.txt 3 > hom4d.txt
```

```
cat engword5a.txt | gawk '{print $2; }' | minimal.txt 5 > hom5a.txt
cat engword5b.txt | gawk '{print $2; }' | minimal.txt 1 > hom5b.txt
cat engword5c.txt | gawk '{print $2; }' | minimal.txt 2 > hom5c.txt
cat engword5d.txt | gawk '{print $2; }' | minimal.txt 3 > hom5d.txt
cat engword5e.txt | gawk '{print $2; }' | minimal.txt 4 > hom5e.txt
```

```
cat engword6a.txt | gawk '{print $2; }' | minimal.txt 6 > hom6a.txt
cat engword6b.txt | gawk '{print $2; }' | minimal.txt 1 > hom6b.txt
cat engword6c.txt | gawk '{print $2; }' | minimal.txt 2 > hom6c.txt
cat engword6d.txt | gawk '{print $2; }' | minimal.txt 3 > hom6d.txt
cat engword6e.txt | gawk '{print $2; }' | minimal.txt 4 > hom6e.txt
cat engword6f.txt | gawk '{print $2; }' | minimal.txt 5 > hom6f.txt
```



## Appendix 5.1 - Sample of AWK Programs Developed for English FUSE Processing

### Program Minimal.Txt

```
#!/bin/sh
#
#
ign="$1"

shift

gawk 'BEGIN{i=0;}
{
apusana=substr($1,0,'$ign'-1) "x" substr ($1,'$ign'+1);
if (sana == apusana) {
    printf "%c, ", substr($1,'$ign',1);
    i++;
}
else{
printf "\t%i\t%s\n",++i ,sana;
sana=apusana ;
i=0;
printf "%c, ",substr($1,'$ign',1);
}
}
END{if (i!=0) {
    printf "\t%i\t%s\n",++i ,sana;
}
}
' "$@"
```

#### 1.4 Calculate the Functional Use.

If the count of near homophonous forms is >1 this indicates near homophony i.e. only one phoneme is different within the word.

From the near homophonous forms extract the phonemes involved in the near homophony and count them up producing a list of all phonemes involved in the near homophony sorted by most forms with most frequent near homophony first.

Program 'doubl.txt' checks to see that there are no duplicate phonemes indicating duplicate words.

Program 'reorder2.txt' provides the phonemes involved, a count of them and the near homophonous forms.

```
cat hom2a.txt | doubl.txt | reorder2.txt | gawk '{if($1 > 1){print;}}' | sort -nr >
fuse2a.txt
```

## Appendix 5.1 - Sample of AWK Programs Developed for English FUSE Processing

### Program Double

```
#!/bin/sh
#
#
gawk '{for(i=1;i<=(NF-2);i++){
    if ($i !~ $(i-1)){
        printf "%s ", $i;
    }
    else{
        apu++;
    }
}
printf"\t%s %s \n",$(NF-1)-apu,$NF;
apu=0;
}' "$@"
```

### Program Reorder2

```
#!/bin/sh
#
#
gawk '{if (NF>2){
    printf "%s ", $(NF-1);
    for (i=1;i<(NF-1);i++){
        printf "%s ", $i;
    }
    printf "%s \n", $NF;
}
}' "$@"
```

From this the individual phonemes are counted and sorted to give the most frequent phonemes involved in near homophony at that position in the word i.e. a total of the functional use made by the phonemes in the words of the language.

```
cat fuse2a.txt | gawk '{for (i=2;i<NF;i++){print $i;}}' | sort | uniq -c | sort -nr >
fusetot2a.txt
```

This process is repeated for all the word lengths.

```
cat hom2b.txt | doubl.txt | reorder2.txt | gawk '{if($1 > 1){print;}}' | sort -nr >
fuse2b.txt
cat fuse2b.txt | gawk '{for (i=2;i<NF;i++){print $i;}}' | sort | uniq -c | sort -nr >
fusetot2b.txt
```

In order to calculate the Word Initial FUSE rankings the fuse totals relating only to the first position of the words must be amalgamated together. Word Initial Fuse Total Files are always indicated with the 'b' suffix (indicating that the words were sorted by the second position and the first phoneme was ignored when looking for duplicates).

Appendix 5.2 - U.K. Alvey Standard for Machine Readable  
Phonemic Transcription

English Vowels		English Consonants	
Phoneme	ALVEY Notation	Phoneme	ALVEY Notation
/ɪ/	I	/p/	p
/e/	e	/b/	b
/æ/	&	/t/	t
/ʌ/	V	/d/	d
/ɒ/	0(zero)	/k/	k
/ʊ/	U	/g/	g
		/f/	f
/i/	i	/v/	v
/ɜ/	3	/θ/	T
/ɑ/	A	/ð/	D
/ɔ/	O	/s/	s
/u/	u	/z/	z
/ə/	@	/ʃ/	S
		/ʒ/	Z
		/h/	h
		/tʃ/	tS
		/dʒ/	dZ
		/m/	m
		/n/	n
		/ŋ/	N
		/l/	l
		/w/	w
		/r/	r
		/j/	j



Appendix 6.1 - English Adult - Homographs

Frequency	Word (orthographic)	MRC Database Transcriptions			
5006	A	eI	@		
4434	TO	tu	t@		
1060	DO	du	d@U		
468	AN	&n	@n		
394	GOOD	gUd	gUd		
220	DOES	dVz	d@Uz		
200	COS	k0s	k@z		
158	PUT	pUt	pVt		
123	USED	just	juzd		
59	SECOND	sek@nd	slk0nd		
51	SUBJECT	s@bdZekt	sVbdZlkt		
45	AM	&m	elem		
43	LIVE	laIv	llv		
34	PRESENT	preznt	prIzent		
27	REAL	reIAI	rl@l		
25	AUGUST	Og@st	OgVst		
18	CLOSE	kl@Us	kl@Uz		
18	MINUTE	mInIt	maInjut		
18	PRODUCE	pr@djus	pr0djus		
16	LIVES	laIvz	llvz		
15	ABSTRACT	&bstr&kt	@bstr&kt		
15	SEPARATE	sep@reIt	sepr@t		
14	COMMENT	k0ment	k0ment		
12	OBJECT	0bdZlkt	@bdZekt		
11	CONTACT	k@nt&kt	k0nt&kt		
11	GRADUATE	gr&djUIt	gr&dZU@t	gr&djUelt	gr&dZUelt
11	LEADING	ledIN	lidIN		
10	SUBJECTS	s@bdZekts	sVbdZlchts		
9	PROCESS	pr@Uses	pr@ses		
9	USES	jusIz	juzIz		
9	WIND	wInd	waInd		
8	APPROPRIATE	@pr@UprIt	@pr@UprI@t	@pr@UprIelt	
8	PUTS	pUts	pVts		
7	ROW	r@U	raU		
6	CONTRAST	k@ntr&st	k@ntrAst	k0ntr&st	k0ntrAst
6	ELABORATE	Il&b@rIt	Il&b@r@t	Il&b@reIt	
6	GRADUATES	gr&dZUelts	gr&dZU@ts		
6	WINDING	wIndIN	waIndIN		
5	BOW	b@U	baU		
5	CONDUCT	k@ndVkt	k0ndVkt		
5	CONTENT	k0ntent	k@ntent		
5	PRESENTS	prIzents	preznts		
5	SECONDS	sek@ndz	slk0ndz		



Appendix 6.1 - English Adult - Homographs

Frequency	Word (orthographic)	MRC Database Transcriptions		
4	ACCENTS	&ksents	&ks@nts	
4	ASSOCIATE	@s@USIIt	@s@USI@t	@s@USIelt
4	PERFECT	p@fekt	p3fikt	
4	RECORDS	rIkOdz	rekOdz	
3	COLLECT	k@lekt	k0lekt	
3	CONTRACT	k@ntr&kt	k0ntr&kt	
3	DOCUMENTS	d0kjUments	d0kjUm@nts	
3	LEAD	led	lid	
3	PROJECTS	pr0dZekts	pr@dZekts	
3	TEARS	te@z	tl@z	
2	ALLIES	&laIz	@laIz	
2	BOWING	baUIN	b@UIN	
2	CERTIFICATE	s@tIfIkelt	s@tIfIk@t	
2	CONTENTS	k0ntents	k@ntents	
2	POLISH	p0IIS	p@UIIS	
2	PROCESSES	pr@UsesIz	pr@sesIz	
2	PURPORT	p3p@t	p@pOt	
2	REPRESENT	reprIzent	,riprIzent	
2	REPRESENTED	,reprIzentId	,riprIzentId	

Appendix 6.2 English Adult - Homophones

Number of Word Forms	Word Type (MRC Transcript)	Orthographic Forms of Words		
3	A	AH	ARE	R
3	aI	AY	EYE	I
3	bi	B	BE	BEE
3	baI	BUY	BY	BYE
3	si	C	SEE	SEA
3	fju	FEW	PHEW	WHEW
3	fO	FOR	FORE	FOUR
3	@U	O	OH	OWE
3	reIn	RAIN	REIGN	REIN
3	De@	THEIR	THERE	THEY'RE
3	tu	TO	TOO	TWO
3	we@z	WARES	WEARS	WHERE'S
2	eI	A	EH	
2	&d	AD	ADD	
2	@laUd	ALoud	ALLOWED	
2	Ant	AREN'T	AUNT	
2	&s	AS	ASS	
2	et	ATE	EAT	
2	beI	BA	BAY	
2	beIld	BALED	BAILED	
2	be@	BARE	BEAR	
2	blu	BLEW	BLUE	
2	blOnd	BLOND	BLONDE	
2	bO	BOAR	BORE	
2	bOd	BOARD	BORED	
2	b@Uld	BOLD	BOWLED	
2	bOn	BORN	BORNE	
2	breIks	BRAKES	BREAKS	
2	kAt	CART	QUART	
2	kOt	CAUGHT	COURT	
2	kOz	CAUSE	CORES	
2	sel	CELL	SELL	
2	selz	CELLS	SELLS	
2	sent	CENT	SENT	
2	tSek	CHECK	CHEQUE	
2	S@Uz	CHOSE	SHOWS	
2	kIOz	CLAUSE	CLAWS	
2	kOs	COARSE	COURSE	
2	kVm	COME	CUM	



Appendix 6.2 English Adult - Homophones

Number of Word Forms	Word Type (MRC Transcript)	Orthographic Forms of Words	
2	k0mplIm@nt	COMPLEMENT	COMPLIMENT
2	k0mplIment	COMPLEMENT	COMPLIMENT
2	k@nekS@n	CONNECTION	CONNEXION
2	k@nekSn	CONNECTION	CONNEXION
2	kO	COR	CORE
2	kju	CUE	QUEUE
2	di	D	DE
2	dIz3t	DESERT	DESSERT
2	daI	DI	DIE
2	drAft	DRAFT	DRAUGHT
2	drO	DRAW	DRAWER
2	drOz	DRAWS	DRAWERS
2	3n	EARN	URN
2	fe@	FAIR	FARE
2	faInd	FIND	FINED
2	fOT	FORTH	FOURTH
2	fr&Nk	FRANC	FRANK
2	dZell	GAOL	JAIL
2	dZentIm@n	GENTLEMAN	GENTLEMEN
2	gest	GUESSED	GUEST
2	galz	GUYS	GUY'S
2	h@l@U	HALLO	HELLO
2	hI@	HEAR	HERE
2	hI@z	HEARS	HERE'S
2	haI@	HIGHER	HIRE
2	hu	HOO	WHO
2	aU@	HOUR	OUR
2	aU@z	HOURS	OURS
2	haUz	HOUSE	HOW'S
2	Its	ITS	IT'S
2	ki	KEY	QUAY
2	nju	KNEW	NEW
2	naIt	KNIGHT	NIGHT
2	naIts	KNIGHTS	NIGHTS
2	n@U	KNOW	NO
2	n@Un	KNOWN	NONE
2	n@Uz	KNOWS	NOSE
2	lAg@	LAGER	LAAGER
2	lO	LAW	LA

Appendix 6.2 English Adult - Homophones

Number of Word Forms	Word Type (MRC Transcript)	Orthographic Forms of Words	
2	led	LEAD	LED
2	lets	LETS	LET'S
2	l@Un	LOAN	LONE
2	luz	LOOS	LOSE
2	mO	MA	MORE
2	meId	MADE	MAID
2	mell	MAIL	MALE
2	mi	ME	MI
2	mit	MEAT	MEET
2	mit@	METER	METRE
2	mIsIz	MISSES	MRS
2	nis	NICE	NIECE
2	pAst	PASSED	PAST
2	pis	PEACE	PIECE
2	pe@	PEAR	PAIR
2	pe@z	PEARS	PAIRS
2	f@UnI	PHONEY	PHONY
2	pleIn	PLAIN	PLANE
2	pr&ktIs	PRACTICE	PRACTISE
2	prIns@pl	PRINCIPAL	PRINCIPLE
2	red	READ	RED
2	raIt	RIGHT	WRITE
2	rut	ROOT	ROUTE
2	ruts	ROOTS	ROUTES
2	r@Ut	ROTE	WROTE
2	sellz	SAILS	SALES
2	sO	SAW	SORE
2	sOz	SAWS	SORES
2	sin	SCENE	SEEN
2	siz	SEES	SEIZE
2	s@U	SEW	SO
2	Selks	SHAKES	SHEIKHS
2	salz	SIGHS	SIZE
2	saIt	SIGHT	SITE
2	saIn	SIGN	SIN
2	s@Ul	SOLE	SOUL
2	sVm	SOME	SUM
2	sVn	SON	SUN
2	steId	STAID	STAYED



Appendix 6.2 English Adult - Homophones

Number of Word Forms	Word Type (MRC Transcript)	Orthographic Forms of Words	
2	stlk	STAKE	STEAK
2	stOk	STALK	STORK
2	tell	TAIL	TALE
2	ti	TEA	T
2	De@z	THEIRS	THERE'S
2	Tru	THREW	THROUGH
2	Tr@Un	THRONE	THROWN
2	taIm	THYME	TIME
2	ju	U	YOU
2	weIst	WAIST	WASTE
2	welt	WAIT	WEIGHT
2	weltId	WAITED	WEIGHTED
2	weltIN	WAITING	WEIGHTING
2	wO	WAR	WORE
2	wOt	WATT	WHAT
2	welz	WAYS	WEIGHS
2	wik	WEAK	WEEK
2	we@	WEAR	WHERE
2	wI@	WEAR	WE'RE
2	weD@	WEATHER	WHETHER
2	wIskI	WHISKY	WHISKEY
2	huz	WHOSE	WHO'S
2	wal	WHY	Y
2	w@Unt	WONT	WON'T
2	wUd	WOOD	WOULD

Appendix 6.3 - English Transcript Notation - Vowels

Phoneme	MRC Transcript	FUSE Processing	Example	MRC	FUSE	
	Notation	Notation	Word	Transcript	Transcript	
				Notation	Notation	
ɪ	I	I	IT	It	It	
e	e	e	ANY	enI	enI	
æ	&	&	AND	&nd	&nd	
ʌ	V	V	UP	Vp	Vp	
ɒ	0(zero)	0	OF	0v	0v	
ʊ	U	U	GOOD	gUd	gUd	
i	i	i	EAST	ist	ist	
ɜ	3	3	EARTH	3T	3T	
ɑ	A	A	ART	At	At	
ɔ	O	O	AUTHOR	OT@	OT@	
u	u	u	YOU	ju	ju	
ə	@	@	ABOUT	@baUt	@baUt	
						Frequency
<b>Diphthongs &amp; Triphthongs</b>						<b>Non-Hapax</b>
						<b>Words</b>
ɪə	I@	1	HERE	hI@	h1	162
eə	e@	2	HAIR	he@	h2	79
ʊə	U@	4	SURE	SU@	S4	48
eɪ	eI	5	MAY	meI	m5	470
aɪ	aI	6	MY	maI	m6	378
ɔɪ	oI	7	BOY	boI	b7	40
əʊ	@U	8	NO	n@U	n8	281
aʊ	aU	9	NOW	naU	n9	91
eɪə	eI@	-	-	-	-	0
aɪə	aI@	H	WIRING	wal@rɪN	wHrɪN	49
ɔɪə	oI@	J	ROYAL	roI@l	rJl	1
əʊə	@U@	K	SLOWER	sl@U@	{K	3
aʊə	aU@	M	OURS	aU@z	Mz	9

Appendix 6.4 - English Transcript Notation - Consonants

Phoneme	MRC	FUSE	Example	MRC	FUSE			
	Transcript	Processing	(Word Initial)	Transcript	Transcript			
	Notation	Notation		Notation	Notation			
<b>Singleton Consonants</b>								
p	p	p	PACK	p&k	p&k			
b	b	b	BUY	baI	baI			
t	t	t	TERM	t3m	t3m			
d	d	d	GUESS	ges	ges			
k	k	k	COFFEE	k0fl	k0fl			
g	g	g	GATHER	g&D@	g&D@			
f	f	f	FUN	fVn	fVn			
v	v	v	VISIT	vlzIt	vlzIt			
θ	T	T	THEME	Tim	Tim			
ð	D	D	THAT	D&t	D&t			
s	s	s	SOME	sVm	sVm			
z	z	z	ZERO	zl@r@U	zl@r@U			
ʃ	S	S	SHOWN	S@Un	S@Un			
ʒ	Z	Z	GARAGE	g&rAZ	g&rAZ			
h	h	h	HAPPY	h&pI	h&pI			
tʃ	tS	C	CHAPEL	tS&p@I	tS&p@I			
dʒ	dZ	G	JOB	dZ0b	dZ0b			
m	m	m	MAGIC	m&dZIk	m&dZIk			
n	n	n	NEXT	nekst	nekst			
ŋ	N	N	TOUCHING	tVtSIN	tVtSIN			
l	l	l	LITTLE	lItI	lItI			
w	w	w	WORD	w3d	w3d			
r	r	r	READY	redI	redI			
j	j	j	young	jVN	jVN			
<b>Consonant Clusters</b>						<b>No.</b>	<b>TOTAL</b>	
						<b>WI</b>	<b>WW</b>	
pl	pl	l	PLAY	pleI	leI	23	68	91
kl	kl	E	CLEAR	klI@	El@	35	72	107
bl	bl	£	BLOCK	bl0k	£0k	22	68	90
gl	gl	\$	GLASS	glAs	\$As	4	11	15
fl	fl	%	FLOOR	flO	%O	23	9	32
sl	sl	{	SLIGHT	slalt	{alt	15	22	37
pr	pr	?	PRECISE	prIsals	?Isals	135	50	185
tr	tr	*	TRUST	trVst	*Vst	55	80	135
kr	kr	(	CROWD	kraUd	(aUd	34	30	64
br	br	)	BRAND	br&nd	)&nd	29	8	37
dr	dr	-	DRAUGHT	drAft	_Aft	41	14	55
gr	gr	+	GROOM	grum	+um	30	32	62
fr	fr	-	FROM	fr0m	-0m	13	9	22
θr	Tr	=	THREE	Tri	=I	4	0	4
ʃr	Sr					0	0	0



Appendix 6.4 - English Transcript Notation - Consonants

Phoneme	MRC	FUSE	Example	MRC	FUSE			
	Transcript	Processing	(Word Initial)	Transcript	Transcript			
	Notation	Notation		Notation	Notation			
<b>Consonant Clusters</b>						<b>No.</b>	<b>TOTAL</b>	
						<b>WI</b>	<b>WW</b>	
tw	tw	~	TWENTY	twentI	~entI	9	3	12
kw	kw	[	QUIET	kwaI@t	[aI@t	21	23	44
dw	dw					0	1	1
gw	gw					0	9	9
θw	Tw					0	2	2
sw	sw	:	SWEET	swit	:it	4	4	8
pj	pj	;	PURE	pjU@	;U@	1	9	10
tj	tj	'	TUNE	tjun`	un	6	10	16
kj	kj	<	CURIOUS	kjU@rI@s	<U@rI@s	7	18	25
bj	bj	>	BEAUTY	bjutI	>utI	3	8	11
dj	dj	,	DUTY	djutI	,utI	7	8	15
fj	fj	.	FEW	fju	.u	5	4	9
sj	sj					0	4	4
hj	hj	/	HUMOUR	hjum@	/um@	3	0	3
vj	vj	x	VIEW	vju	xu	2	6	8
mj	mj	~	MUSIC	mjuzIk	~uzIk	3	14	17
nj	nj	`	NEWS	njuz	`uz	4	14	18
lj	lj	a	LUMINOUS	ljumin@s	yumin@s	1	8	9
sk	sk	]	SCHOLAR	skOl@	]Ol@	22	46	68
sm	sm	}	SMART	smAt	}At	12	6	18
sn	sn	#	SNOW	sn@U	#@U	3	21	24
st	st	\	STABLE	stelbl	\eIbl	74	300+	374+
sp	sp	B	SPEAK	spik	Bik	33	74	107
sf	sf					0	7	7
spl	spl	P	SPLENDID	splendId	PendId	3	7	10
spr	spr	Q	SPRING	sprI9	QI9	4	5	9
spj	spj					0	0	0
str	str	R	STRENGTH	streNT	ReNT	24	25	49
stj	stj	W	STUDIO	stjudI@U	WudI@U	4	0	4
skl	skl					0	2	2
skr	skr	X	SCRIPT	skrIpt	XIpt	6	13	19
skw	skw	y	SQUARE	skwe@	ye@	1	0	1
skj	skj					0	3	3

## Appendix 6.5 - Helsinki Spoken Language Corpus Transcription Codes

### Helsingin puhekielen aineisto - Tarkelista

<u>List of Diacritics</u>	<u>Finnish Description</u>	
'*' = Proper Names	erisnimet	e.g. *s3uomem *maaseutupp3uolue *helsi?n?nikadu
'_' = Elision/2 words joined together and said as one	sidos sanojen välillä	e.g. ma_oon, sitt_o
'~' = Juncture/1 word made up of two/a compound	junktuuri	e.g. vapaa~aikana, kevy~empää h2uomi~ta
'=' = Emphasis/Stress	lausepaino, emfaasi	e.g. kansa=laiskoulu
'==' = Secondary Emphasis/ Stress	sivupaino	e.g. kakskyt==viis
'^' = Strong Start/Hard	luja aluke	e.g. ^ovi, ^auri?nko, ^;ei
'&' = Fusion of Phonemes	puristussupistuma	e.g. liik&e, menn&y
'7' = Laxness of Consonant	kons. höllyys	e.g. paikaltaa7n
';' = Half Length	puolipitkä kesto	e.g. m;äm, harrasta;NU, opettajako;rkeakoulu,
'+' = Short	ylilyhyet, siitymä-äänteet	e.g. s+e_oli, +j_ett;ä, saanu+p
'<' = Short	vajaalyhyt	e.g. jo<kkainen_oli, s3ie<llä tek;o<a, äsipu<alee
'>' = Aspiration	aspiraatio	e.g. p^arempien
'88' =		e.g. eaut88o
'66' =	edeltävä tavu	lumi66ukkoja
'""' = strong nasality	vahva nasaalisuus	j""o""o

## Appendix 6.5 - Helsinki Spoken Language Corpus Transcription Codes

### Diphthong Looseness - diftongien väljiysasteet

'1' = not rounded the number is not always used - numeroa ei aina merkitty	suppea ie yö uo	e.g. v1ielä;
'2' = not rounded	suppeaa väljempi	e.g. m2yös, p2uolesta
'3' = lax	melko väljä	e.g. v3ienys, v3uotta, p3yöra.
'4' = lax but unconstrained	väljää suppeampi	e.g. s4iell_on, s4uoraa
'5' = lax	väljä	e.g. s5yönyv
'"' = slightly constrained	vok.lievä suppeus	tapettu"a, ide"a, "et ks. s3n1b
'"' = slightly lax	vok. lievä väljiys	"eihäm, "ei ks. s3m2a
'?n' = ang phon./ŋ	äng-äänne	varsi?nki, o?n kiva
'?p' = bilabial tremulant	bilab tremulantti	!?puita ks. t3m2d
'?s' = sibilant	hankaushälinen sibil	t?supparina ks. s3m2b
'?d' = dental aspiration	dentaalispirantti	mei?dä?n, lapsuu?dessani ks. s3n1a
'%' = sonorant	sonanttisuus	%mm, %n ks. s3n1a
'\$' = schwaa phon./ə	schwaa-äänne	\$\$, \$\$ ks. s3n1b
'/' = interviewers comments	haast. kommentti	/Tuula: kenedyy/ ks. s3n3a
'!' = potentially unclear transcription	mahd. epätarkka transk.	onnistu!n!nun ks. s3n1a
'"' = ?glottal marker		va""a ks. s3m1c
'6' = phonetically back further ks. s3n3d		art.paikan takaisuus *he6lsi?n?nis
'8' = phonetically forward further ks. s1n1d		art.paikan etisyys tu8ossa, ka8l8lio?n
'^^' German u, saksalainen u	etuvokaalisuus	*enn_*em *ko *^^U ^^U ks. s3m3c
'_' underlined word – not a proper name alleviivattu sana, joka ei erisnimi X sanan alussa		
'.' lengthened phoneme merkitty "siiel")	venytetty äänne, s2i:el_o7n	ks. t2n3c (tekstissä)



## Appendix 6.5 - Helsinki Spoken Language Corpus Transcription Codes

In other cases the marks (diacritics) have been written the say way as in typed version. From computer access point of view these ways of marking should be known and at least the most common have been listed in the following.

Muissa tapauksissa merkit on kirjoitettu samalla tapaa kuin konekirjoitetussa versiossa. Tietokonehakujen kannalta tällaisetkin merkintätavat pitäisi tuntea, ja seuraavassa on yritetty listata ainakin yleisimmät niistä.

**CAPITALS** = Whispered words / Voiclessness, whispering  
(at the end of utterance or before the pause)

isot kirjaimet

- 1) soinnittomuus, kuiskaus (ilmauksen lopussa tai tauon edellä)  
viime hiihtoLOMALLA NYTTE. ks.
- 2) soinnillisuus tai puolisoinnillisuus  
partiojumalamBalvelus ks.

**Commas and Stops** = intonation markers

pilkku, piste ilmauksen raja (intonaation ja taukojen perusteella)

**Words started but not finished/Uncompleted utterance** = ‘-‘

Hyphen - tavuviiva

kesken jäänyt ilmaus: meil- , mahdollisim-, mahdollisestip poi-,  
pois, jos lippukunnaj jäsenet lähtee jonnekki kursseille tai - - .

Hyphen - katkoviiva

epäselvä, kuulumaton kohta = unclear, inaudible place

**Unclear what said/bits missing** = ‘()’

Elements in brackets elementtejä suluissa unclear epäselvä  
sillon\_ollu(+t) ks. s3m1b

**Missing** = (.p.) puuttuu

**Slow Start** = ‘...’

MH: ... \*vaasa?nkadulla;ki ks. s3m2b

**Two exclamation marks in brackets/kaksi huutomerkkiä suluissa** = a word after the exclamation marks in brackets means correction suggestion/proposal/sana huutomerkkien jäljessä sulkujen sisällä

(!!) tarkoittaa korjausehdotusta, esim. p (!!f)ritskuni?n?nask ks. s3m3a

**No special notation** - Ei mitään erityistä merkintätapaa:

lähteä >> lähtiä ( - no diacritic - ei tarketta)

Appendix 6.6 - Finnish Transcript Notation - Vowels

Phoneme	Helsinki Corpus	FUSE Processing	Example Words		
	Notation	Notation	Orthographic		
i	i	i	sitte	piha	
y	y	y	kyllä	tähäm	
e	e	e	että	se	
œ	ö		tämmönen	työ	
æ	ä	{	hänen	mä	
u	u	u	mutta	ku	
o	o	o	oli	tuliko	
a	a	a	vanhempi	ja	
					<b>Frequency</b>
<b>Long Vowels</b>					<b>Non-Hapax</b>
i	ii	I	siinä	niin	887
y	yy	Y	täytyy	kyyl	70
e	ee	E	yleensä	tulee	468
œ	öö	C	töölöössä	tyttöö	30
æ	ää	B	päällä	tää	519
u	uu	U	suurim	tuntuu	438
o	oo	O	ainoo	joo	150
a	aa	A	luokkaa	mukaa	887
ə	\$	\$	ti\$sti		16
					(in 11 words)
<b>Word Initial Diphthongs</b>					
ai	ai	1	aidan	aidattus	80
au	au	3	august	auto	19
æi	äi	4	äidin	äiti	12
ei	ei	5	eihän	eihä	42
eu	eu	6	eurooppaa	euroopasta	2
iæ	iä	7	iällä	iässä	3
oi	oi	8	oikee	oikeaa	49
ou	ou	9	oulunkylän	outo	5
ui	ui	Z	uimassa	uitiin	6
yœ	yö	X	yöks	yölla	10
yyæ	yyä	#	yyällän		1
<b>Word Initial Three Vowel Sequence (VVV)</b>					
aio	aio	2	aiotte	aiot	2

Appendix 6.7 - Finnish Transcript Notation - Consonants

Phoneme	Helsinki Corpus	FUSE Processing	Example Words	
	Notation	Notation	Orthographic	
p	p	p	paljo	
t	t	t	tuli	
d	d	d	syden	
k	k	k	ku	
s	s	s	se	
h	h	h	hei	
m	m	m	mä	
n	n	n	ne	
ŋ	nk/ng	Nk/N	nINku	
l	l	l	oli	
r	r	r	fosfori	
j	j	j	ja	
v	v	v	vAn	
b	b	b	bussilla	
g	g	g	gun	
f	f	f	professori	
<b>Two Consonant Clusters (CC)</b>				<b>Frequency</b>
				<b>WI</b>
fr	fr	F	frakki	2
gl	gl	G	glögi	1
gr	gr	H	groggi	2
kl	kl	J	klassista	5
kr	kr	K	kruunuhaassa	6
pl	pl	M	plyyssi	1
pr	pr	P	professori	6
sk	sk	Q	skandaali	2
sl	sl	&	slangia	1
st	st	S	stiplu	8
sv	sv	V	sveitsissä	2
tr	tr	W	tragedia	1
ts	ts	T	tsillon	29
<b>Three Consonant Cluster (CCC)</b>				
skr	skr	!	skrubu	2



Appendix 7.1 - English Adult Word Types Phoneme Frequencies

Position		WI	2	3	4	5	6	7	8	9	10	11	12	13	14	15	TOTAL
Code	Phoneme																
I	i	288	673	121	661	276	276	206	135	79	39	28	13	3	2		2800
t	t	149	48	423	342	233	238	143	99	57	39	23	5	1			1800
n	n	105	217	541	166	208	169	129	95	50	33	16	2				1731
@	ə	191	265	66	459	223	169	124	61	33	14	2	1	1			1609
s	s	317	50	453	202	207	117	114	45	39	21	11	6				1582
l	l	170	53	358	189	183	122	81	58	32	24	6	6			1	1283
k	k	323	115	345	91	129	69	50	30	7	10		4	2			1175
d	d	236	56	250	181	143	136	66		24	5	6	5				1108
r	r	267	26	165	103	131	71	36	25	8	4	2	1	1			840
z	z	4	10	202	135	160	104	83	49	33	14	11	4	1	1		811
m	m	203	72	280	35	68	54	17	15	6	3						753
è	e	71	379	39	152	70	26	10	5	1	1						754
p	p	200	57	228	120	43	13	13	6	2	2						684
&	æ	74	335	16	49	17	13	12	1		1						518
5	er	22	227	24	43	45	53	25	14	15	2						470
f	f	207	35	116	35	24	19	8	6		2	1					453
N	ŋ		5	90	28	157	61	39	32	23	6	3	3	1	1		449
b	b	180	29	94	28	30	19	20	7	7	1	3			1		419
0	ɒ	40	280	14	37	16	10	5		4							406
v	v	52	25	173	23	50	18	13	14	6	6		2	3			385
6	aɪ	18	215	12	57	38	23	10	3	1	1						378
S	ʃ	58	7	55	25	48	43	41	29	17	12	2					337
V	ʌ	42	232	8	21	20	5	1									329
i	i	20	212	12	44	23	13	2									326
8	əʊ	18	171	8	44	26	9	4	1								281
O	ɔ	43	140	7	41	13	9										253
g	g	69	45	78	27	22	2	4	2								249
u	u		137	3	16	35	24	7	9	3		1					235
w	w	160	3	16	30	12	2	1	3								227
G	dʒ	48	10	64	29	38	5	20	10	2		1					227
A	ɑ	37	119	4	29	5	5	5	1								205
3	ɜ	9	115	6	31	13	4										178
h	h	148	2	12	6	1	1	2		1							173
j	j	46		12	58	17	11	13	5		1						163
l	ɪə	2	46	19	45	10	22	11	4	2	1						162
C	tʃ	53	4	54	27	13	3	2	2	2							160

Appendix 7.1 - English Adult Word Types Phoneme Frequencies

		WI	2	3	4	5	6	7	8	9	10	11	12	13	14	15	TOTAL
?	pr	135															135
D	ð	21	3	25	1	2	3	2	65								122
U	u		45	3	13	29	9	7	2	1							109
T	θ	32	7	34	18	5	5	3	1								105
9	au	6	64	9	5	3	3	1									91
2	ea	5	49	2	9	9	3	1	1								79
\	st	74															74
*	tr	55															55
H	arə		29		13	5	2										49
4	uə		13	2	10	9	4		4	6							48
_	dr	41															41
7	ɔr	2	20	7	3	3	3	2									40
E	kl	35															35
(	kr	34															34
B	sp	33															33
+	gr	30			1												31
)	br	29															29
Z	ʒ			10	4	6		6									26
R	str	24															24
%	fl	23															23
l	pl	23															23
£	bl	22															22
]	sk	22															22
[	kw	21															21
{	sl	15															15
-	fr	14															14
}	sm	12															12
~	tw	9															9
M	auə	3	6														9
,	dj	7															7
<	kj	7															7
X	skr	6															6
'	tj	6															6
.	fj	4															4
\$	gl	4															4
`	nj	4															4

Appendix 7.1 - English Adult Word Types Phoneme Frequencies

		WI	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Code	Phoneme																TOTAL
Q	spr	4															4
W	stj	4															4
:	sw	4															4
=	θr	4															4
>	bj	3															3
/	hj	3															3
-	mj	3															3
#	sn	3															3
P	spl	3															3
K	əʊə		2		1												3
x	vj	2															2
ä	lj	1															1
:	pj	1															1
y	skw	1															1
J	ɔɪə		1														1
			11	11	205	978	1848	2695	3326	3826	4204	4423	4549	4613	4652	4660	
		11	194	773	869	847	631	500	378	219	126	64	39	8	4	1	4664
		0	11	205	978	1847	2694	3325	3825	4203	4422	4548	4612	4651	4659	4663	
Total Words		4664															



Appendix 7.2 - English Adult WI Phoneme Frequency

Phonemes Observed At Word Initial Position	FUSE Code	Frequency of Phoneme (no. different words it appears as WI phoneme)
k	k	323
s	s	317
ɪ	I	288
r	r	267
d	d	236
f	f	207
m	m	204
p	p	200
ə	@	191
b	b	180
l	l	170
w	w	160
t	t	149
h	h	148
pr	?	135
n	n	105
st	\	74
æ	&	74
e	e	71
g	g	69
ʃ	S	58
tr	*	55
tʃ	C'	53
v	v	52
dʒ	G	48
j	j	46
ɔ	O	43
ʌ	V	42
dr	-	41
ɒ	0	40
ɑ	A	37
kl	E	35

Appendix 7.2 - English Adult WI Phoneme Frequency

Phonemes Observed At Word Initial Position	FUSE Code	Frequency of Phoneme (no. different words it appears as WI phoneme)
kr	(	34
sp	B	33
θ	T	32
gr	+	30
br	)	29
str	R	24
fl	%	23
pl	!	23
bl	£	22
er	5	22
sk	l	22
ð	D	21
kw	[	21
i	i	20
ar	6	18
əʊ	8	18
sl	{	15
fr	-	14
sm	}	12
ʒ	3	9
tw	~	9
dj	,	7
kj	<	7
au	9	6
skr	X	6
tj	'	6
eə	2	5
fj	.	4
gl	\$	4
nj	`	4
spr	Q	4
stj	W	4

Appendix 7.2 - English Adult WI Phoneme Frequency

Phonemes Observed At Word Initial Position	FUSE Code	Frequency of Phoneme (no. different words it appears as WI phoneme)
sw	:	4
θr	=	4
z	z	4
auə	M	3
bj	>	3
hj	/	3
mj	¬	3
sn	#	3
spl	P	3
ɪə	l	2
vj	x	2
ɔɪ	7	2
lj	ä	1
pj	;	1
skw	y	1
arə	H	0
ɔɪə	J	0
ŋ	N	0
uə	4	0
ʒ	Z	0
ʊ	U	0
u	u	0
əuə	K	0



Appendix 7.3 - Adult English WI Minimal Pair Groups

Word Length of 2 Phonemes																	
16	fl	dʒ	st	b	d	h	l	n	p	dr	f	j	k	m	s	w	xO
16	kl	fl	br	tr	kj	dr	d	h	l	fj	nj	j	dj	t	bl	vj	xu
14	sn	pr	D	S	d	g	h	l	r	w	sl	bl	n	s	x8		
14	sp	C	S	b	d	h	j	k	p	r	skw	f	w	D	x2		
14	tr	fr	dʒ	S	d	h	k	p	v	w	b	m	t	s	xi		
13	fl	tr	sp	S	sk	dr	d	g	h	m	t	w	b	x6			
12	pl	D	st	b	d	h	j	k	m	p	s	w	x5				
8	&	5	9	A	I	O	i	e	xt								
8	kl	S	b	d	f	g	n	h	x1								
7	&	0	3	8	@	I	e	xn									
7	st	f	h	j	p	s	w	x3									
7	st	b	f	h	k	m	p	xA									
6	3	6	7	I	O	e	xl										
6	&	1	6	I	V	M	xz										
5	b	h	n	r	w	x9											
5	kw	d	f	w	h	xH											
5	kj	S	j	p	t	x4											
5	&	6	@	A	e	xm											
4	0	I	O	e	xf												
3	&	0	6	xd													
3	fl	l	p	xM													
2	l	sl	xK														
2	e	&	xs														
2	5	i	xC														
2	5	e	xdZ														
2	0	6	xv														
188																	
Word Length of 3 Phonemes																	
12	br	sp	kw	f	l	m	t	w	sl	n	r	s	x6t				
12	pl	gr	str	st	d	f	g	h	l	m	r	w	x5t				
11	kr	tr	b	l	p	s	t	v	sl	sm	kl	x&k					
11	kl	gr	Tr	pr	C	D	d	g	r	S	n	x8z					
11	kl	fl	br	T	kw	st	k	n	p	s	t	xIk					
10	spr	S	b	d	f	h	r	s	z	l	xed						
10	sp	spl	S	f	h	k	l	p	s	b	xIt						
10	tr	sp	S	d	g	h	l	n	w	sl	x0t						
10	br	S	T	kw	b	f	p	s	t	k	xOt						

Appendix 7.3 - Adult English WI Minimal Pair Groups

10	sn	tr	pr	d	g	h	s	t	w	sl	x6d								
9	C	S	st	f	h	p	t	w	D	x2z									
9	sw	b	d	g	j	l	m	s	w	xet									
9	gr	Tr	S	st	b	f	l	t	n	x8n									
9	kr	fr	pr	st	d	f	p	r	w	x5z									
9	kr	br	tr	C	dr	m	p	pl	r	x5n									
8	d	f	g	n	r	t	w	s	xVn										
8	S	st	d	f	h	m	r	w	xil										
8	fr	sp	S	f	h	l	n	w	xid										
8	tr	sw	str	f	h	m	n	s	xit										
8	fl	br	st	k	m	s	t	w	x5k										
8	pl	tr	D	S	h	k	n	s	xiz										
7	sk	f	h	j	p	r	t	xul											
7	st	sk	b	f	k	t	w	xll											
7	S	st	k	l	n	r	kl	x0k											
7	dZ	T	sk	g	s	t	w	xIn											
7	sp	b	f	h	s	t	w	xel											
7	br	spr	str	T	k	r	s	xIN											
7	fl	C	S	st	dr	p	t	x0p											
7	fl	C	D	f	h	r	s	x&t											
7	kl	skr	kw	b	k	m	s	xin											
7	kl	S	f	g	k	n	s	x5m											
7	kl	C	d	j	k	w	dr	xOz											
7	pl	sp	b	f	k	p	r	x5s											
7	pl	tr	D	l	m	st	p	x5d											
7	C	S	nj	j	h	l	vj	xuz											
6	f	l	m	n	w	s	x6n												
6	f	h	k	t	w	sm	xOl												
6	st	b	d	h	k	s	x8l												
6	C	S	nj	j	h	l	xuz												
6	pr	g	j	l	m	kl	xes												
6	tr	S	dr	p	r	sl	xlp												
6	br	sp	dZ	f	sm	kl	x8k												
6	kr	T	sk	dr	s	t	xim												
6	fl	g	l	r	s	w	x6z												
6	gl	b	h	l	m	s	x&d												
6	pl	D	f	k	m	r	x&n												
5	h	j	l	t	r	xVN													
5	f	h	j	m	r	xud													
5	st	h	k	p	sm	xAt													
5	kw	d	k	m	r	xld													



Appendix 7.3 - Adult English WI Minimal Pair Groups

5	skr	b	k	m	p	x&C													
5	S	st	g	k	w	xUd													
5	D	m	p	t	w	xen													
5	D	dZ	sk	f	t	x5l													
5	pr	m	n	v	tw	x6s													
5	Tr	k	n	r	v	x8t													
5	gr	D	g	s	w	x5v													
5	br	fr	p	w	b	xOd													
5	kr	br	d	n	t	x9n													
4	n	p	v	w	x3s														
4	d	l	m	p	xAk														
4	b	h	l	t	xUk														
4	dr	d	f	l	x6v														
4	dr	b	t	w	xOn														
4	sk	h	k	p	x8p														
4	st	r	t	kl	xVf														
4	st	f	w	sm	x6l														
4	T	m	k	s	xVm														
4	S	b	k	p	xVt														
4	str	st	l	s	xVk														
4	C	g	m	t	x&p														
4	C	d	k	sl	xip														
4	C	b	h	t	xlz														
4	sw	n	r	w	xIC														
4	fr	S	r	s	xut														
3	p	r	t	x6p															
3	m	t	s	xVC															
3	k	n	s	x3v															
3	g	p	w	x0S															
3	g	h	k	xAd															
3	f	k	s	xOs															
3	b	l	t	x3n															
3	st	t	w	xOk															
3	st	h	l	xAf															
3	st	f	w	xOm															
3	st	b	d	x9t															
3	T	h	w	x3d															
3	S	l	r	x8d															
3	S	d	h	x3t															
3	str	l	r	x0N															
3	dZ	s	tj	xun															



Appendix 7.3 - Adult English WI Minimal Pair Groups

3	dZ	b	s	x0b															
3	C	b	l	xAdZ															
3	sp	r	t	xiC															
3	sp	p	w	xik															
3	pr	j	m	xuv															
3	fr	pr	b	x0m															
3	tr	j	t	xuT															
3	kr	k	l	x0s															
3	kr	pr	t	x6m															
3	kr	pr	l	x9d															
3	&	8	e	xnd															
3	fl	d	kl	xVd															
3	kl	p	r	xVb															
3	kl	g	w	xld															
3	kl	tr	b	x&S															
3	kl	gl	p	xAs															
3	pl	b	f	xVs															
3	pl	dr	d	xVg															
2	n	p	xis																
2	n	f	xOT																
2	m	s	x9T																
2	m	s	x9D																
2	m	r	xVS																
2	l	w	xiv																
2	l	w	x6f																
2	k	h	x9z																
2	j	l	xus																
2	h	sl	xIm																
2	h	t	xHd																
2	h	r	xum																
2	h	r	x&N																
2	h	m	x9s																
2	h	j	x3z																
2	g	s	x0d																
2	g	m	x&s																
2	g	l	xlv																
2	f	t	x3m																
2	f	p	xUt																
2	f	p	xUl																
2	f	h	xAm																
2	d	l	x0g																

Appendix 7.3 - Adult English WI Minimal Pair Groups

2	d	h	x8m																
2	d	g	x0n																
2	b	p	xUS																
2	b	n	x7z																
2	sk	w	x0C																
2	st	p	x5dZ																
2	st	k	xAz																
2	S	t	x5p																
2	S	l	xVv																
2	S	sk	x2d																
2	str	l	x6k																
2	D	m	xIs																
2	C	v	x7s																
2	C	n	xek																
2	sp	b	x7l																
2	A	I	xts																
2	8	e	xv@																
2	6	V	xD@																
2	5	D	xem																
2	tj	kj	xub																
2	&	A	xsk																
2	fl	fr	xes																
685																			
<b>Word Length of 4 Phonemes</b>																			
8	gr	f	k	l	m	s	w	kl	x6nd										
7	b	f	g	h	k	s	t	x8ld											
7	tr	fr	sp	l	s	t	kl	xend											
7	pl	br	gr	st	h	l	s	x&nd											
6	b	f	k	s	w	kl	xIts												
6	sp	l	m	r	t	s	xent												
6	gr	b	f	p	r	s	x9nd												
6	br	str	T	k	r	w	xINz												
5	g	k	m	p	t	x8st													
5	f	k	l	v	p	xAst													
5	st	f	m	r	w	xilz													
5	T	dr	l	p	s	xINk													
5	T	sk	dr	r	s	ximz													
5	S	kw	d	p	w	xOt@													
5	gr	S	b	g	n	x8IN													
5	fl	tr	b	l	d	x6IN													

Appendix 7.3 - Adult English WI Minimal Pair Groups

4	l	n	r	s	x6ts														
4	h	p	s	t	xens														
4	g	r	s	w	xVnz														
4	b	r	t	w	xest														
4	b	f	t	w	x5st														
4	b	f	m	d	xelt														
4	st	k	l	t	x5bl														
4	T	kw	dr	w	xlrI														
4	S	dr	g	l	xlft														
4	str	m	s	bl	xits														
4	dZ	l	s	tw	xIst														
4	C	m	p	w	x6ld														
4	C	S	f	v	xerI														
4	pr	p	s	w	xItI														
4	tr	st	b	t	x&ks														
4	tr	dZ	d	m	xVst														
4	br	m	t	S	x5ks														
4	kr	S	st	h	x0ps														
4	kl	m	n	r	x1II														
4	pl	st	p	s	x5IN														
3	m	s	t	xIks															
3	l	s	w	x6nz															
3	l	p	w	x0ts															
3	k	m	s	xetl															
3	h	s	sl	x8II															
3	h	k	w	xVrI															
3	g	l	s	xets															
3	f	p	t	x&kt															
3	f	m	tw	xIdl															
3	f	m	s	xVnl															
3	b	r	s	x0ks															
3	b	l	w	x3nt															
3	b	f	w	x3st															
3	b	f	k	xlld															
3	dr	l	w	x6vz															
3	sk	f	r	xulz															
3	sk	b	s	xiIN															
3	sk	dr	h	xIlz															
3	st	k	p	xAts															
3	skr	m	s	xinz															
3	str	skr	w	xIpt															



Appendix 7.3 - Adult English WI Minimal Pair Groups

3	dZ	f	g	x0ll															
3	C	k	m	x&ps															
3	C	dr	f	xAm@															
3	C	str	r	x5ndZ															
3	pr	j	l	xist															
3	0	I	e	xnt@															
3	fr	b	T	x&Nk															
3	tr	g	p	x5nz															
3	br	l	r	x6t@															
3	kr	f	t	xiC@															
3	kr	b	l	xVnC															
3	fl	k	p	xlkt															
3	fl	D	h	x&ts															
3	sn	dZ	bl	x0bz															
3	kl	g	n	x5mz															
3	pl	g	h	x5ts															
2	w	t		xOks															
2	t	w		xOkt															
2	s	sl		x6dz															
2	s	t		xelz															
2	s	t		xVf@															
2	r	s		xuts															
2	n	bl		x0kt															
2	n	s		xidz															
2	m	t		x6lz															
2	m	r		x8dz															
2	m	p		xenl															
2	l	s		xenz															
2	l	r		x5t@															
2	l	m		x&t@															
2	k	w		xOlz															
2	k	s		xVmz															
2	k	m		x&rI															
2	k	l		x0st															
2	j	k		xAdz															
2	h	s		xevn															
2	g	w		xIgl															
2	g	p		xAdn															
2	g	l		xIvz															
2	f	w		xUII															
2	f	t		x3mz															

Appendix 7.3 - Adult English WI Minimal Pair Groups

2	f	s	x5ld																
2	f	r	xAD@																
2	f	p	x5nt																
2	f	n	xOml																
2	f	m	xOlt																
2	f	j	xel8																
2	d	w	x8nt																
2	d	s	ximd																
2	d	r	xIsk																
2	d	l	xevl																
2	d	k	xVzn																
2	b	w	x3dz																
2	b	t	x&gz																
2	b	l	xet@																
2	b	l	xUkt																
2	b	l	xUks																
2	b	l	xOdz																
2	b	k	x&r1																
2	b	f	xIg@																
2	dr	v	x6v@																
2	dr	l	xegz																
2	dr	l	xAft																
2	dr	g	xIvn																
2	st	bl	xVdI																
2	st	r	xedI																
2	st	r	xAt@																
2	st	n	x5Sn																
2	st	b	xVmp																
2	st	b	x8nz																
2	st	dr	x0pt																
2	kw	w	x3ks																
2	kw	s	x0rI																
2	T	d	x3tI																
2	S	s	xelf																
2	S	l	xVvd																
2	S	k	xAnt																
2	str	l	xenT																
2	str	l	x6k																
2	dZ	sm	x8ks																
2	dZ	p	x7nt																
2	D	b	x&tl																



Appendix 7.3 - Adult English WI Minimal Pair Groups

2	C	s	xIII																
2	C	m	x6n@																
2	C	d	xip@																
2	C	d	xAns																
2	C	dr	xVNk																
2	sp	w	xiks																
2	sp	kw	xik@																
2	pr	r	xlf3																
2	pr	h	xInt																
2	Tr	sm	x&St																
2	pj	S	x4II																
2	fr	t	x6dI																
2	gr	t	x5ps																
2	gr	n	x&nI																
2	gr	h	&m@																
2	tr	d	xVbl																
2	br	m	xVD@																
2	br	b	xOd@																
2	kr	l	x5zI																
2	kr	pr	x6st																
2	&	@	xl6z																
2	&	@	xl6d																
2	fl	k	x0pI																
2	gl	l	xVvz																
2	kl	n	xev@																
2	kl	n	xlr@																
2	pl	m	xex@																
2	dj	bj	xutI																
472																			
<b>Word Length of 5 Phonemes</b>																			
4	sw	S	st	dr	x0pIN														
4	fr	T	b	r	x&Nks														
4	tr	C	h	m	xitIN														
4	br	S	m	t	x5kIN														
3	g	l	s	xetIN															
3	f	l	r	x6tIN															
3	f	k	w	xIIN															
3	f	k	s	xOslz															
3	f	k	m	x6ndz															
3	d	f	s	xilIN															



Appendix 7.3 - Adult English WI Minimal Pair Groups

3	b	l	r	xidIN															
3	b	k	l	xUkIN															
3	T	dr	l	xINks															
3	S	k	w	xUdnt															
3	spr	l	w	xedIN															
3	spl	n	s	xItIN															
3	dZ	d	m	xentl															
3	sp	s	t	xelIN															
3	gr	p	s	x9ndz															
3	br	r	s	xININ															
2	t	w		xOkIN															
2	t	w		xHrIN															
2	r	sl		x6tll															
2	r	t		x6mIN															
2	p	sm		x8kIN															
2	p	s		x@pOt															
2	n	t		xekst															
2	m	w		xOnIN															
2	m	t		xenSn															
2	m	s		xVndI															
2	m	s		xIst@															
2	l	v		x6kIN															
2	l	t		x3nIN															
2	l	s		x&kIN															
2	l	m		xAkIN															
2	k	sl		xipIN															
2	k	p		xVtIN															
2	k	p		x@mIt															
2	k	n		x0IdZ															
2	k	m		x&rId															
2	k	m		x&rIdZ															
2	g	t		xests															
2	g	l		xIvIN															
2	f	v		x2rlz															
2	f	t		xiC@z															
2	f	n		xItId															
2	f	m		xVkIN															
2	f	m		xIkst															
2	f	m		xAst@															
2	d	w		x0l@z															
2	d	r		xisnt															





Appendix 7.3 - Adult English WI Minimal Pair Groups

<b>Word Length of 6 Phonemes</b>												
3	S	l	g	xlftId								
3	sp	s	t	xendIN								
3	gr	f	w	x6ndIN								
2	t	w	x5stId									
2	r	t	xIkIts									
2	r	s	xek@nd									
2	k	p	x@mISn									
2	h	l	x&ndId									
2	f	s	x9ndId									
2	f	n	xOm@II									
2	d	r	xIz3vd									
2	d	r	xIvIZn									
2	T	dr	xINkIN									
2	spl	t	xendId									
2	I	e	xkspOt									
2	dZ	f	xVNkSn									
2	@	I	xksept									
2	pr	s	x@p8zd									
2	kl	s	xInIkl									
2	kl	f	x&sIkl									
2	pl	sp	x&stIk									
45												
<b>Word Length of 7 Phonemes</b>												
2	kw	p	x0ItIz									
2	C	sm	x&t@rIN									
2	pr	r	xefr@ns									
2	pr	d	xIskr6b									
2	0	3	xnIstII									
2	pl	sp	x&stIks									
12												
<b>Word Length of 8 Phonemes</b>												
2	&	@	xbstr&kt									
2												
1610												



Appendix 7.4a - English Adult WI FUSE - Count A

Phoneme	FUSE Count	Rank		Phoneme	FUSE Count	Rank
s	95	1		æ	12	38.5
l	91	2		e	12	38.5
f	83	3.5		i	11	40.5
w	83	3.5		v	11	40.5
t	79	5		ə	9	42.5
b	75	6.5		sm	9	42.5
m	75	6.5		ɒ	7	44.5
k	72	8		aɪ	7	44.5
r	70	9		eɪ	5	46.5
h	65	10.5		ɑ	5	46.5
p	65	10.5		ʒ	4	52
d	55	12		əʊ	4	52
st	46	13		gl	4	52
ʃ	45	14		kj	4	52
n	43	15		ɔ	4	52
g	42	16		skr	4	52
tʃ	28	17		sw	4	52
dr	27	18		θr	4	52
pr	22	20		tw	4	52
sp	22	20		dj	3	58.5
tr	22	20		sn	3	58.5
j	21	22		spl	3	58.5
br	20	23		spr	3	58.5
kl	18	24.5		ɪə	2	64.5
pl	18	24.5		bj	2	64.5
ð	17	26		fj	2	64.5
θ	16	27		auə	2	64.5
bl	15	29.5		nj	2	64.5
fl	15	29.5		tj	2	64.5
dʒ	15	29.5		ʌ	2	64.5
str	15	29.5		vj	2	64.5
kr	14	32.5		ɔɪ	1	71.5
sk	14	32.5		au	1	71.5
fr	13	35.5		i	1	71.5
gr	13	35.5		pj	1	71.5
kw	13	35.5		skw	1	71.5
sl	13	35.5		z	1	71.5

Appendix 7.4b - English Adult WI FUSE - Count B MPG String Count

Phoneme	FUSE Count	Rank		Phoneme	FUSE Count	Rank
s	468	1		sm	40	42
w	430	2		ar	35	43
f	405	3		ə	34	44
l	403	4		nj	29	45.5
h	388	5		ɔ	29	45.5
t	366	6		ɑ	28	47
b	357	7		sn	27	48.5
k	346	8		θr	27	48.5
m	343	9		ʒ	26	50
p	326	10		er	25	52
r	325	11		kj	25	52
d	310	12		sw	25	52
ʃ	278	13		əʊ	23	54.5
st	237	14		vj	23	54.5
n	225	15		ɒ	21	56.5
g	212	16		i	21	56.5
kl	154	17		dj	20	58.5
tr	151	18		spr	20	58.5
j	141	19		fj	18	60.5
dr	139	20		skr	18	60.5
tʃ	133	21		ɪə	17	62.5
sp	126	22		auə	17	62.5
br	124	23		spl	15	64
ð	114	24		skw	14	65.5
fl	104	25		tw	14	65.5
pl	95	26		gl	13	67
pr	94	27		z	10	68
θ	82	28		au	8	69.5
sl	80	29		ʌ	8	69.5
dʒ	77	30		ɔɪ	6	71
gr	75	31		tj	5	72
kw	69	32.5		bj	4	73
sk	69	32.5		pj	2	74
fr	65	34.5				
kr	65	34.5				
str	62	36				
v	56	37				
e	46	38				
æ	44	39.5				
ɪ	44	39.5				
bl	41	41				



Appendix 7.4c - English Adult WI FUSE (A and B) Counts Together

Phoneme	TOTAL (Minimal Pair Strings)	RANK (B)	TOTAL (Count of 1)	RANK (A)	Rank Difference
s	468	1	95	1	0
w	430	2	83	3.5	-1.5
f	405	3	83	3.5	-0.5
l	403	4	91	2	2
h	388	5	65	10.5	-5.5
t	366	6	79	5	1
b	357	7	75	6.5	0.5
k	346	8	72	8	0
m	343	9	75	6.5	2.5
p	326	10	65	10.5	-0.5
r	325	11	70	9	2
d	310	12	55	12	0
ʃ	278	13	45	14	-1
st	237	14	46	13	1
n	225	15	43	15	0
g	212	16	42	16	0
kl	154	17	18	24.5	-7.5
tr	151	18	22	20	-2
j	141	19	21	22	-3
dr	139	20	27	18	2
tʃ	133	21	28	17	4
sp	126	22	22	20	2
br	124	23	20	23	0
ð	114	24	17	26	-2
fl	104	25	15	29.5	-4.5
pl	95	26	18	24.5	1.5
pr	94	27	22	20	7
θ	82	28	16	27	1
sl	80	29	13	35.5	-6.5
dʒ	77	30	15	29.5	0.5
gr	75	31	13	35.5	-4.5
sk	69	32.5	14	32.5	0
kw	69	32.5	13	35.5	-3
kr	65	34.5	14	32.5	2
fr	65	34.5	13	35.5	-1
str	62	36	15	29.5	6.5
v	56	37	11	40.5	-3.5
e	46	38	12	38.5	-0.5
æ	44	39.5	12	38.5	1
ɪ	44	39.5	11	40.5	-1



Appendix 7.4c - English Adult WI FUSE (A and B) Counts Together

Phoneme	TOTAL (Minimal Pair Strings)	RANK (B)		TOTAL (Count of 1)	RANK (A)	Rank Difference
bl	41	41		15	29.5	11.5
sm	40	42		9	42.5	-0.5
ar	35	43		7	44.5	-1.5
ə	34	44		9	42.5	1.5
ɔ	29	45.5		4	52	-6.5
nj	29	45.5		2	64.5	-19
ɑ	28	47		5	46.5	0.5
θr	27	48.5		4	52	-3.5
sn	27	48.5		3	58.5	-10
ʒ	26	50		4	52	-2
er	25	52		5	46.5	5.5
kj	25	52		4	52	0
sw	25	52		4	52	0
əʊ	23	54.5		4	52	2.5
vj	23	54.5		2	64.5	-10
ɒ	21	56.5		6	44.5	12
i	21	56.5		1	71.5	-15
dj	20	58.5		3	58.5	0
spr	20	58.5		3	58.5	0
skr	18	60.5		4	52	8.5
fj	18	60.5		2	64.5	-4
ɪə	17	62.5		2	64.5	-2
auə	17	62.5		2	64.5	-2
spl	15	64		3	58.5	5.5
tw	14	65.5		4	52	13.5
skw	14	65.5		1	71.5	-6
gl	13	67		4	52	15
z	10	68		1	71.5	-3.5
ʌ	8	69.5		2	64.5	5
au	8	69.5		1	71.5	-2
ɔɪ	6	71		1	71.5	-0.5
tj	5	72		2	64.5	7.5
bj	4	73		2	64.5	8.5
pj	2	74		1	71.5	2.5
		2775			2775	0

Appendix 7.5 - Most Frequent Finnish Words Translated

Rank	Adult Corpus Frequency	Finnish Word	English Translation
1	7652	ja	and
2	3683	oli	was
3	3340	se	it
4	2175	ku	when
5	1997	sitte	then
6	1710	ei	no
7	1653	mä	I
8	1591	että	that
9	1497	ni	so/yes
10	1416	ne	those
11	1374	et	that
12	1270	on	is
13	1109	niin	so/yes
14	1046	joo	yeah
15	981	sitä	that
16	970	sit	then
17	941	mutta	but
18	870	kyllä	yes
19	857	siinä	there
20	831	nyt	now
21	797	siellä	(over) there
22	786	mut	but
23	782	me	we
24	773	tai	or
25	763	niin	so/yes
26	688	aina	always
27	660	no	well
28	582	nii	so/yes
29	577	mitä	what
30	568	sitten	then
31	554	kun	when
32	520	joka	which/who/that
33	502	siis	so/that is
34	500	niitä	those/them
35	500	kaikki	all/everybody
36	491	tota	well
37	489	aika	quite
38	479	tuli	came
39	461	kyl	yes



Appendix 7.5 - Most Frequent Finnish Words Translated

Rank	Adult Corpus		
	Frequency	Finnish Word	English Translation
40	442	sen	it's (genitive)
41	441	minä	I/me
42	411	sillon	then
N/A	404	mm	mmm *
43	401	jos	if
44	393	niinku	like, you know
45	391	siitä	of that
46	387	paljo	a lot/much
47	380	nauraa	laugh
48	378	joku	someone
49	377	em	I don't
50	371	tää	this
51	354	ollu	has been
52	341	jo	already
53	339	tuota	that/well
54	333	te	you(plural)
55	319	se oli	it was
56	305	ihan	quite
57	305	sä	you(singular)
58	302	vielä	still, yet, more
59	292	s oli	it was
60	287	en	I don't
61	282	sinne	over there
62	274	ma	I/me
63	266	tässä	here
64	263	semmonen	that kind of
65	261	mitään	nothing
66	259	siel	(over) there
67	256	vähä	little
68	251	niim	so/yes
69	251	muuta	other (partitive)
70	249	joskus	someday/sometime
71	237	vaan	only
72	228	semmone	that kind of
73	227	siihen	in there
74	226	yleensä	usually
75	222	sillä	because
76	222	semmosta	that kind of
77	222	kai	probably/presumably



Appendix 7.5 - Most Frequent Finnish Words Translated

Rank	Adult Corpus		
	Frequency	Finnish Word	English Translation
78	214	naurahtaa	short laugh?
79	214	jotain	something
80	213	ehkä	maybe
81	212	tulee	comes
82	212	noin	approximately/in that way
83	204	sai	got (imp.)
84	202	hän	she/he
85	200	mitään	nothing
86	200	just	exactly
87	199	kanssa	with
88	198	täällä	here
89	196	jotka	who
90	194	nää	these
91	192	olla	to be
92	192	hyvin	very/well
93	190	vai	or
94	190	tämä	this
95	190	semmosia	that sort of (plural)
96	189	sieltä	from there
97	184	koko	whole/size
98	182	yks	one
99	181	taas	again
100	180	ettei	that

Appendix 7.6 - Finnish Adult Word Types Phoneme Frequencies

Phoneme	Position																				Total		
	WI	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		21	
t	1096	160	931	1291	930	897	712	357	298	188	99	71	47	29	11	10	4			1	1	7133	
i	200	1108	1190	735	926	749	632	562	258	177	121	63	38	26	9	5	6	2					6827
a	270	1815	207	599	860	607	561	519	291	248	197	116	81	46	23	18	6	4	4	2	1		6475
s	1036	261	664	816	579	819	458	363	309	170	121	78	45	16	13	5	3	2	2				5760
l	583	397	1130	839	494	631	444	239	204	97	65	55	28	13	10	7	5	3	2	1			5247
e	337	1205	570	737	874	392	367	252	169	166	85			17	15	5	2	1	1	1			5196
n	532	196	844	518	571	700	384	335	291	167	112	60	27	20	8	5	2	2					4774
k	1464	152	592	936	432	372	265	155	122	61	30	17	9	4	2	2							4615
o	384	1099	495	402	630	223	160	116	65	41	32	14	11	5	3		1	2					3683
m	975	87	473	493	322	387	235	138	78	55	25	11	5	2	1	1	1						3289
u	62	1079	432	266	454	142	221	134	87	89	50	16	16	3	5	2	1						3059
æ	11	693	86	375	380	310	246	237	80	92	57	39	33	19	6	1	4	4					2673
p	814	71	298	182	99	81	72	31	16	9	4	4	4	1	1								1687
h	517	162	575	213	59	57	36	21	17	4	4	3	1										1669
r	258	112	680	213	129	87	54	53	27	17	14	4	3	4	2	3							1660
v	682	35	255	209	111	153	60	58	45	8	14	6	4	2									1642
j	453	73	68	197	103	148	83	37	51	27	14	19	5	2	3	2	3	1					1289
y	186	394	149	100	167	66	72	38	21	14	7		1	2	1								1218
ɑ	15	176	22	118	176	137	107	60	43	12	11	3	1	3	2	1	1						888
ii	2	364	11	61	112	56	92	109	36	25	9	4	2	1									884
ŋ	0	27	130	39	122	193	61	46	44	14	18	5		1									700
æ	7	153	14	64	125	61	43	34	5	6	2	1	1										516
ee	5	25	47	84	162	42	37	31	15	9	4	34		1									496
d	9	44	135	180	5	28	7	19	15	11	8	8	23	1	1	1							495
uu	20	278	5	21	46	9	21	4	8	14	4	1											432
ø	1	40	70	26	66	13	15	17	10	15	2	2		1	1								279
oo	29	15	30	29	21	15	2	3	2	2	1	1											150
ai	81																						81
yy	2	40	1	6	12		6	1	1														69
f	17	1	13	14	3	4																	52
of	50																						50







Appendix 7.7 - Finnish Adult WI Phoneme Frequency

Phoneme	Frequency		Phoneme	Frequency
k	1464		ææ	7
t	1096		g	7
s	1036		kr	6
m	975		pr	6
p	814		ee	5
v	682		kl	5
l	583		ou	4
n	532		iæ	3
h	517		ii	2
j	453		yy	2
o	384		aio	2
e	337		br	2
a	270		eu	2
r	258		fr	2
ɪ	200		gr	2
y	186		sk	2
ai	81		skr	2
u	62		sv	2
oi	50		œ	1
ei	49		dr	1
ts	30		fl	1
oo	29		gl	1
uu	20		pl	1
au	19		sl	1
b	18		tr	1
f	17		ŋ	0
aa	15		œœ	0
æi	12		\$	0
yœ	12			
æi	11			
d	9			
st	8			
ui	8			

Appendix 7.8 - Adult Finnish Minimal Pair Groups

Word Length of 2 Phonemes										
9	Q	k	l	m	p	s	t	v	j	xa
8	7	E	O	e	h	m	o	r	xm	
8	A	E	I	k	m	n	p	s	xi	
7	O	a	e	l	m	o	r	xh		
7	h	j	m	n	p	s	t	xB		
7	h	j	k	m	n	t	s	xä		
7	T	h	k	m	n	s	t	xe		
7	T	b	m	n	p	s	t	xE		
7	P	R	j	k	m	s	t	xU		
7	1	E	O	X	e	n	o	xn		
6	2	O	m	n	o	e	xt			
6	m	p	s	t	v	j	xA			
6	g	j	k	m	s	t	xu			
6	8	E	O	U	e	o	xs			
6	5	j	k	n	s	t	xo			
5	e	k	n	o	s	xl				
5	5	O	k	o	y	xk				
5	1	5	O	e	o	xj				
4	j	k	n	s	xO					
4	O	a	e	o	xl					
3	k	m	s	xY						
3	O	e	o	xv						
3	O	e	o	xN						
2	m	s	x\$							
2	k	n	xy							
2	O	o	xp							
142										
Word Length of 3 Phonemes										
7	T	k	l	m	s	t	v	xai		
6	h	n	s	v	m	t	xei			
6	T	f	m	n	s	t	xon			
6	T	d	m	n	s	t	xen			
5	S	n	s	t	v	xoi				
4	l	s	t	v	xie					
4	k	m	s	t	xum					
4	k	m	n	s	xin					
4	k	l	n	t	xuo					
4	g	k	m	s	xun					
4	X	e	m	t	xtä					
4	V	p	s	v	xAn					
4	T	l	n	s	xco					
4	O	e	y	o	xli					
4	5	h	n	t	xjO					
4	5	X	e	y	xks					
3	n	s	v	xls						
3	n	s	v	xlm						
3	m	s	v	xek						
3	m	s	t	xua						

Appendix 7.8 - Adult Finnish Minimal Pair Groups

3	m	s	t	xiä																
3	m	p	t	xUt																
3	m	n	s	xis																
3	l	m	s	xöi																
3	k	m	s	xuv																
3	k	m	s	xul																
3	j	n	p	xäi																
3	j	k	m	xus																
3	h	k	t	xUs																
3	g	k	m	xuN																
3	T	s	t	xem																
3	T	n	s	xIn																
3	T	n	s	xIN																
3	P	n	s	xOn																
3	A	a	i	xha																
3	5	v	s	xom																
3	l	m	o	xta																
2	s	v		xAm																
2	s	t		xAs																
2	p	s		xia																
2	n	s		xoN																
2	n	s		xev																
2	n	s		xet																
2	n	s		xlv																
2	n	s		xlt																
2	n	s		xll																
2	n	s		xlj																
2	m	y		xhm																
2	m	t		xUn																
2	m	t		xUm																
2	m	t		xUN																
2	m	t		xEt																
2	m	s		xAt																
2	m	r		xEn																
2	l	t		xyö																
2	k	t		xas																
2	k	n		xäy																
2	k	m		xut																
2	k	m		xuk																
2	j	t		xos																
2	j	n		xBn																
2	h	t		xän																
2	h	t		xäm																
2	h	t		xäl																
2	h	t		xäN																
2	h	s		xeN																
2	h	m		xmm																
2	b	s		xel																
2	a	o		xsu																
2	a	o		xsU																



Appendix 7.8 - Adult Finnish Minimal Pair Groups

2	a	o	xho							
2	Z	o	xmA							
2	X	m	xnä							
2	U	e	xsl							
2	T	s	xit							
2	J	v	xot							
2	8	U	xsi							
2	5	y	xhä							
2	5	a	xla							
2	5	a	xjo							
2	3	9	xto							
2	3	9	xtO							
2	1	e	xnO							
2	1	e	xka							
231										
<b>Word Length of 4 Phonemes</b>										
5	n	p	s	t	v	xois				
5	m	n	r	s	t	xeki				
5	T	m	n	s	t	xoli				
4	m	n	s	t		xehä				
4	j	n	p	t		xäin				
4	j	k	s	t		xota				
4	7	X	Y	y		xllä				
4	2	O	e	i		xtte				
3	n	r	s			xltä				
3	m	p	s			xitB				
3	m	n	v			xäki				
3	m	n	s			xitä				
3	m	n	s			xeei				
3	k	t	v			xuon				
3	k	s	t			xais				
3	k	l	t			xUli				
3	j	s	t			xUri				
3	j	p	r			xaha				
3	h	s	v			xain				
3	b	s	v			xAri				
3	a	o	u			xlle				
3	U	e	m			xtta				
3	U	a	o			xsia				
3	T	s	v			xiel				
3	T	n	s			xeon				
3	T	n	s			xlnä				
3	8	e	u			xsko				
3	5	o	y			xlen				
3	3	A	e			xton				
2	t	v	xähä							
2	t	v	xapA							
2	s	v	xeis							
2	s	t	xuli							











Appendix 7.8 - Adult Finnish Minimal Pair Groups

2j	t	xolle							
2j	t	xolla							
2j	t	xohon							
2j	t	xohom							
2j	s	xaksa							
2j	s	xUria							
2j	n	xätti							
2j	n	xätin							
2j	m	xonot							
2j	m	xatkA							
2j	m	xaoli							
2j	m	xakso							
2j	k	xoulu							
2j	k	xoulU							
2i	o	xllat							
2h	s	xeNki							
2h	s	xattu							
2h	r	xetki							
2h	p	xinta							
2h	n	xäitä							
2h	m	xeidä							
2h	k	xeräs							
2h	k	xelle							
2e	u	xrkki							
2d	s	xisko							
2a	o	xllas							
2T	s	xitte							
2	5o	xollu							
2#	ä	xllän							
317									
<b>Word Length of 6 Phonemes</b>									
5T	k	m	s	t	xieltä				
4	m	p	t	v	xaikka				
4	h	j	n	p	xäissä				
4T	s	t	v	xiellä					
3	k	t	v	xaloja					
3	k	s	v	xoitti					
3	k	s	v	xoittA					
3	k	n	t	xäytti					
3j	t	v	xoivat						
3j	n	t	xoista						
3j	n	p	xoissa						
3h	m	t	xeiltä						
3h	m	t	xeillä						
3h	m	t	xeille						
3h	m	t	xeidän						
3h	m	t	xeidän						
3h	m	s	xeistä						
3h	k	v	xerran						





Appendix 7.8 - Adult Finnish Minimal Pair Groups

2 j	t	xuotIN							
2 j	t	xuosta							
2 j	t	xosson							
2 j	t	xollai							
2 j	s	xaksan							
2 j	s	xaksam							
2 j	p	xäivät							
2 j	n	xoilla							
2 j	n	xoihin							
2 j	k	xouluv							
2 j	k	xoulum							
2 j	k	xouluj							
2 j	k	xoulua							
2 h	s	xuomen							
2 h	p	xuolen							
2 h	p	xaNkki							
2 h	k	xeitti							
2 h	k	xeittB							
2 h	j	xaetti							
2 g	k	xanssa							
2 a	u	xseita							
2 a	e	xletti							
2 Z	o	xmassa							
2 U	e	xdelle							
2 T	s	xitten							
2 S	t	xiplas							
2 O	o	xnollu							
2 O	o	xnaina							
2 O	e	xtteks							
220									
<b>Word Length of 7 Phonemes</b>									
2 t,	v,	xalleja							
2 s,	v,	xieläki							
2 p,	s,	xotilas							
2 n,	s,	xItähän							
2 n,	p,	xelistä							
2 m,	t,	xentten							
2 m,	s,	xulloli							
2 m,	s,	xitähän							
2 m,	s,	xinulle							
2 m,	s,	xilloin							
2 k,	v,	xaikkei							
2 k,	s,	xorttia							
2 k,	m,	xunnoli							
2 k,	m,	xatkoja							
2 j,	t,	xuttuja							
2 j,	t,	xossoli							
2 j,	n,	xoitten							

Appendix 7.8 - Adult Finnish Minimal Pair Groups

2	j, n,	xauhoja							
2	j, k,	xouluja							
2	j, k,	xalassa							
2	h, m,	xeiloli							
2	h, j,	xaettIn							
2	e, o,	xnnollu							
2	U, e,	xdellEn							
2	3, o,	xttanEt							
50									
<b>Word Length of 8 Phonemes</b>									
2	s v	xieläkin							
2	n s	xehänoli							
2	m t	xeilloli							
2	m r	xatkasta							
2	l m	xuisteIE							
2	k t	xäydessä							
2	k s	xoitettI							
2	k n	xäytettI							
2	k m	xielestä							
2	k m	xielessä							
2	k l	xahdessa							
2	h v	xiljanen							
2	h s	xemmosia							
2	h r	xetkellä							
2	h k	xeitettI							
2	T s	xillohan							
2	T s	xemmonen							
2	T s	xUnnille							
36									
<b>Word Length of 9 Phonemes</b>									
3	k n t	xäytettIn							
2	k s	xoitettIn							
2	h k	xeitettIn							
2	T s	xemmossia							
9									
<b>Word Length of 10 Phonemes</b>									
2	i l	xlmeisesti							
1278									



Appendix 7.9a - Finnish Adult WI FUSE - Count A

Phoneme	Code	Word Length								TOTAL	RANK	
		2	3	4	5	6	7	8	9			10
s	s	14	39	35	44	30	8	7	2		179	1
m	m	14	30	22	44	29	8	5			152	2
t	t	9	27	29	40	31	4	2	1		143	3
k	k	12	14	24	34	25	6	7	3		125	4
n	n	11	24	27	22	15	4	2	1		106	5
v	v	2	11	22	26	15	3	2			81	6
j	j	8	4	7	25	19	7				70	7
p	p	5	4	17	25	11	2				64	8
h	h	4	9	4	12	14	2	4	1		50	9
l	l	2	6	7	14	8		2		1	40	10
o	o	12	6	11	3	3	2				37	11
ts	T	2	8	5	5	6		3	1		30	12
e	e	10	6	10	1		2				29	13
r	r	2	1	6	13	1		2			25	14
a	a	2	6	7	1	2					18	15
oo	O	11	1	2		3					17	16
ei		5	3	6	3	1					13	17
ee	E	4		1		3					8	19
uu	U		1	5	1					1	8	19
i	i	1	2	3		1	1				8	19
y	y		2	4			1				7	21.5
au		3	1	4	2						7	21.5
ai		1	2	3	1						6	23
yoæ	X			3	1	1					5	24.5
u	u	1	3	1							5	24.5
g	g	1	1	2							4	26.5
oi		8	1	2		1					4	26.5
aa	A		2	1							3	30
b	b										3	30
d	d	1	1	1							3	30
ou		9	1	1	1						3	30
ui	Z			1		2					3	30
iaæ		7		1	1		1				2	34.5
aio		2	1		1						2	34.5
pr	P	1		1							2	34.5
st	S	1	1								2	34.5
sk	Q		1			1					1	41.5
ii	I										1	41.5
br	R					1					1	41.5
fr	F			1							1	41.5
sv	V		1								1	41.5
yy	Y				1						1	41.5
æ	a	1									1	41.5
ææ	B		1								1	41.5
kl	J	1									1	41.5
f	f	1									1	41.5
											1274	

Appendix 7.9c - Finnish Adult WI FUSE (A and B) Counts Together

Phoneme	TOTAL	RANK	TOTAL	RANK	Rank
	(Minimal Pair Strings)	(B)	(A)		Difference
			(Count of 1)		
s	511	1	179	1	0
m	445	2	152	2	0
t	411	3	143	3	0
k	332	4	125	4	0
n	320	5	106	5	0
v	216	6	81	6	0
j	195	7	70	7	0
p	175	8	64	8	0
h	144	9	50	9	0
l	110	12	40	10	2
o	120	10	37	11	-1
ts	108	13	30	12	1
e	112	11	29	13	-2
r	71	15	25	14	1
a	47	16	18	15	1
oo	74	14	17	16	-2
ei	42	17	13	17	0
ee	32	18	8	19	-1
uu	22	20	8	19	1
i	19	23	8	19	4
y	24	19	7	21.5	-2.5
au	15	24.5	7	21.5	3
ai	21	21.5	6	23	-1.5
yæ	21	21.5	5	24.5	-3
u	12	29.5	5	24.5	5
g	15	24.5	4	26.5	-2
oi	13	27.5	4	26.5	1
aa	14	26	3	30	-4
b	12	29.5	3	30	-0.5
d	11	31.5	3	30	1.5
ou	6	39	3	30	9
ui	6	39	3	30	9
iaë	13	27.5	2	34.5	-7
oio	11	31.5	2	34.5	-3
pr	10	33	2	34.5	-1.5
st	7	36.5	2	34.5	2
sk	9	34	1	41.5	-7.5
ii	8	35	1	41.5	-6.5
br	7	36.5	1	41.5	-5
fr	4	42	1	41.5	0.5
sv	4	42	1	41.5	0.5
yy	4	42	1	41.5	0.5
æ	2	45	1	41.5	3.5
ææ	2	45	1	41.5	3.5
kl	2	45	1	41.5	3.5
f	6	39	1	41.5	-2.5
		1081		1081	0



Appendix 7.10 - English Child - Group Phoneme Frequencies

Code	Phoneme	Word Position								TOTAL
		Initial	2	3	4	5	6	7	8	
<b>Age 2</b>										
t	t	11	6	35	5	7		1		65
l	l	4	20	2	25	4				55
n	n	9	4	23	7	2	1			46
s	s	11	2	12	14	2	1			42
k	k	17		20	3	1				41
d	d	11		16	5	1				33
&	æ	2	23	4	1		1			31
b	b	27		3						30
m	m	15	2	13						30
o	o	2	24		1	2				29
@	ə	4	4		16		1			25
p	p	10	1	11	2					24
i	i	2	22							24
h	h	20			2					22
l	l	4	3	8		5	2			22
5	er	2	15	1	1	1				20
V	ʌ	1	18			1				20
e	e	2	15	1						18
z	z		1	6	3	7		1		18
g	g	8	1	5			2			16
6	ai	5	9		2					16
8	əu	2	11		1		1			15
A	ɑ	4	10							14
O	ɔ	2	11		1					14
w	w	12	1							13
r	r	9		3		1				13
G	dʒ	8		5						13
N	ŋ			4	1	3	2			10
S	ʃ	2		5	1	1				9
3	ʒ		6							9
D	ð	7		1						8
C	tʃ	3		4	1					8
9	au	1	7							8
u	u		8							8



Appendix 7.10 - English Child - Group Phoneme Frequencies

Code	Phoneme	Word Position								TOTAL
		Initial	2	3	4	5	6	7	8	
<b>Age 2 (continued)</b>										
f	f	5	2							7
2	eə		7							7
U	u		7							7
(	kr	5	1							6
v	v		1	5						6
E	kl	4								4
j	j	4								4
\	st	2		2						4
)	br	3								3
*	tr	3								3
T	θ	2		1						3
:	sw	2								2
_	dr	2								2
B	sp	2								2
l	pl	1	1							2
l	sk	1		1						2
1	iə		2							2
K	bl			1		1				2
%	fl	1								1
`	nj	1								1
P	spl	1								1
7	ɔɪ				1					1
+	gr				1					1
M	auə		1							1
			4	10	64	162	217	245	254	
<b>TOTAL</b>		<b>256</b>	<b>6</b>	<b>54</b>	<b>98</b>	<b>55</b>	<b>28</b>	<b>9</b>	<b>2</b>	
<b>Age 3</b>										
l	ɪ	6	37	6	48	13				110
t	t	22	5	38	17	8	1	1		92
n	n	11	14	50	8	5				88
d	d	23		35	15	4	1			78
&	æ	7	48				1			56
k	k	18	1	29	4	1				53
m	m	22	2	20		2				46
s	s	14	1	16	8	4	2			45

Appendix 7.10 - English Child - Group Phoneme Frequencies

Code	Phoneme	Word Position								TOTAL
		Initial	2	3	4	5	6	7	8	
Age 3 (continued)										
z	z		2	23	6	13	1			45
@	ə	5	4	3	26	2	1			41
l	l	11	4	18	3	3				39
0	ɒ	4	33		1					38
b	b	31	1	4						36
V	ʌ	3	32	1						36
p	p	18	2	11	3					34
w	w	32	1		1					34
e	e	4	27	1	1					33
5	eɪ	3	25	2	1	1				32
8	əʊ	5	24		3					32
6	aɪ	5	22		4					31
i	i	1	26		1		2			30
h	h	28								28
g	g	10	2	11	1	1				25
N	ŋ			6	3	12	2			23
r	r	15	1	6		1				23
A	ɑ	3	15		2					20
f	f	16	2	1						19
S	ʃ	7		9		1				17
u	u		15		1	1				17
D	ð	13	1	1	1					16
O	ɔ	2	13		1					16
U	ʊ		13		1					14
\	st	5		7						12
v	v	1	3	8						12
9	aʊ	2	6	2						10
C	tʃ	5	1	4						10
2	eə		8		1					9
*	tr	8		1						9
-	dr	6		2						8
G	dʒ	3		2	1	1	1			8
j	j	7			1					8
T	θ	3		2	2	1				8
3	ʒ		5		1					6

Appendix 7.10 - English Child - Group Phoneme Frequencies

Code	Phoneme	Word Position								TOTAL
		Initial	2	3	4	5	6	7	8	
<b>Age 3 (continued)</b>										
7	ɔɪ		4							4
#	sn	2		2						4
K	bl	3		1						4
1	ɪə		3							3
(	kr	3								3
{	sl	3								3
\$	gl	2								2
)	br	2								2
:	sw	2								2
?	pr	1	1							2
+	gr	1			1					2
4	ʊə		1							1
'	tj	1								1
-	fr	1								1
.	fj	1								1
[	kw	1								1
]	sk			1						1
`	nj	1								1
}	sm	1								1
B	sp			1						1
Z	ʒ					1				1
		404	5	5	85	244	336	399	410	1388
				80	159	92	63	11	1	
<b>Age 5</b>										
l	l	29	10	61	112	10		2	1	186
n	n	24	21	82	7	20	5	3		117
l	ɪ	11	93	17	1	20	4	1		43
t	t	33	11	73	1	14	4	2	2	96
d	d	34	2	60		5	10	1		76
@	ə	12	12	7	49	12	10	1	1	81
m	m	44	4	49	1	3	2			55
k	k	32	2	52	4	6		2		64
Z	ʒ		6	37	19	24	6	5	1	92
p	p	35	4	27	9	7	1	3		47



Appendix 7.10 - English Child - Group Phoneme Frequencies

Code	Phoneme	Word Position								
		Initial	2	3	4	5	6	7	8	9
<b>Age 5 (continued)</b>										
s	s	36	2	33	2	4	3	1	3	46
i	i	5	41		27	2	4			33
V	ʌ	8	63	1	3	2	2			8
e	e	12	56	1			1			2
5	eɪ	5	51	2	6	3				11
&	æ	8	55	1	2	1				4
N	ŋ		1	18	9	31	4	1		63
b	b	52	1	10						10
0	ɒ	3	50	2	2		2			6
6	aɪ	6	45		6	2				8
8	əʊ	5	36	1	4	4	4			13
h	h	48		2	1					3
r	r	34	4	8	1	4				13
w	w	43	1	2	4					6
f	f	27	4	5		1	3			9
O	ɔ	5	30	1	3		1			5
U	ʊ		13		25	1				26
A	ɑ	5	27		1					1
\	st	12		15	3	1				19
g	g	15	2	13		1				14
u	u		28		1	1	1			3
T	θ	8		4	15	1				20
S	ʃ	13	2	5	3	4				12
9	aʊ	2	16	4						4
G	dʒ	13		7		1	1			9
D	ð	16	2	2				1		3
2	eə	3	14		1	2				3
v	v	2	5	10	3					13
K	əʊə	7		4	6					10
3	ɜ	1	15							0
C	tʃ	4	2	9						9
*	tr	11	1	2						2
j	j	12			1	1				2
R	str	2		1	11					12

Appendix 7.10 - English Child - Group Phoneme Frequencies

Code	Phoneme	Word Position									
		Initial	2	3	4	5	6	7	8	9	
<b>Age 5 (continued)</b>											
1	ɪə	2	8		1		2			3	
l	pl	5		1	4					5	
-	fr	8		1						1	
\$	gl	4		5						5	
_	dr	7			2					2	
)	br	8								0	
E	kl	5	1	2						2	
H	aɪə	2	3		3					3	
M	aU@	2			5					5	
7	ɔɪ		4	2						2	
%	fl	6								0	
?	pr	6								0	
B	sp	5		1						1	
X	skr	6								0	
]	sk	3		2						2	
4	ʊə		1	2	1					3	
(	kr	2	1							0	
'	tj	1		1						1	
:	sw	2								0	
[	kw	2								0	
{	sl	2								0	
+	gr	1			1					1	
y	skw	2								0	
z	z				2					2	
.	fj	1								0	
'	nj	1								0	
~	tw	1								0	
>	bj	1								0	
		762	10	11	116	400	574	692	739	754	3286

Appendix 7.11- English Child - Group FUSE Rankings

Age 2		Word Length				TOTAL	RANK
Phoneme	Code	1	2	3	4		
b	b		2	6		8	2
h	h		3	5		8	2
t	t		4	3	1	8	2
k	k		1	3	1	5	4.5
m	m		4	1		5	4.5
ð	D		3	1		4	7
g	g		1	2	1	4	7
s	s		2	2		4	7
aɪ	6	1	2			3	12.5
kl	E			3		3	12.5
f	f		1	1	1	3	12.5
j	j		3			3	12.5
n	n		2	1		3	12.5
p	p		1	1	1	3	12.5
r	r			2	1	3	12.5
w	w		2	1		3	12.5
pl	!		1	1		2	21.5
br	)			2		2	21.5
st	\		1	1		2	21.5
ɑ	A	1	1			2	21.5
tʃ	C		1	1		2	21.5
d	d		1	1		2	21.5
e	e		2			2	21.5
dʒ	G		1	1		2	21.5
ɪ	I		2			2	21.5
l	l			2		2	21.5
ei	5	1				1	32
æ	&		1			1	32
tr	*		1			1	32
sw	:			1		1	32
ə	@	1				1	32
dr	-			1		1	32
nj	·		1			1	32
ɒ	0		1			1	32
əʊ	8	1				1	32
aʊ	9		1			1	32
i	i		1			1	32
		5	47	43	6	101	703



Appendix 7.11- English Child - Group FUSE Rankings

Age 3		Word Length					TOTAL	RANK
Phoneme	Code	1	2	3	4	5		
w	w		5	7		1	13	1
b	b		4	7	1		12	2
h	h		5	5	1		11	3
ð	D		5	5			10	5
d	d		4	5	1		10	5
m	m		4	4	1	1	10	5
tr	*		4	2	1	1	8	7
f	f		3	2	2		7	10
g	g		1	4	2		7	10
k	k		1	5		1	7	10
s	s		4	2		1	7	10
t	t		3	4			7	10
j	j		3	3			6	13.5
n	n		2	4			6	13.5
p	p			3	2		5	15.5
r	r			4	1		5	15.5
dr	_		1	2	1		4	18.5
l	l			2	1	1	4	18.5
ʃ	S		2	2			4	18.5
ai	6		1 3				4	18.5
pl	l		1	2			3	22.5
æ	&		2	1			3	22.5
st	\		1	1	1		3	22.5
tʃ	C		1	2			3	22.5
sl	{			2			2	28
ɒ	0		2				2	28
kl	E		1	1			2	28
ɪ	I		2				2	28
əʊə	K		1	1			2	28
əʊ	8		1 1				2	28
ɑ	A		1	1			2	28
sn	#			1			1	38.5
ei	5	1					1	38.5
br	)			1			1	38.5

Appendix 7.11- English Child - Group FUSE Rankings

Age 3	(cont.)								
		Word Length						TOTAL	RANK
Phoneme	Code	1	2	3	4	5			
fr	-			1				1	38.5
fj	.		1					1	38.5
sw	:			1				1	38.5
pr	?			1				1	38.5
ə	@	1						1	38.5
nj	`		1					1	38.5
sm	}			1				1	38.5
au	9		1					1	38.5
dʒ	G				1			1	38.5
i	i		1					1	38.5
o	O		1					1	38.5
		6	73	92	20	11		187	1035

Appendix 7.11- English Child - Group FUSE Rankings

Age 5		Word Length					TOTAL	RANK
Phoneme	Code	1	2	3	4	5		
b	b		3	14	3		20	1
m	m		4	11	4	1	20	2.5
t	t		4	9	6	1	20	2.5
h	h		9	8	1		18	4
k	k		4	11	2		17	5.5
w	w		6	10	1		17	5.5
r	r			11	5	1	17	7
s	s		4	9	2		15	8
ð	D		5	8			13	9.5
d	d		4	7	2		13	9.5
f	f		1	6	5		12	12
n	n		2	9	1		12	12
p	p			9	3		12	12
l	l		1	8	1		10	14
g	g		1	6	2		9	16
j	j		3	5	1		9	16
ʃ	S		2	7			9	16
st	\		2	4	2		8	18
ar	6	1	4	1			6	19
θ	T			1	4		5	20.5
tr	*		5				5	20.5
br	)			4			4	24.5
dʒ	G		1	3			4	24.5
eɪ	5	1	2	1			4	24.5
ɪ	I		4				4	24.5
pl	!		2	1	1		4	24.5
əʊə	K		1	2	1	1	5	24.5
dr	_		1	1	1		3	31.5
fl	%		2	1			3	31.5
fr	-			2	1		3	31.5
kl	E			3			3	31.5
sk	l			2	1		3	31.5
skr	X		1	2			3	31.5
æ	&		3				3	31.5



Appendix 7.11- English Child - Group FUSE Rankings

5 (continued)		Word Length					TOTAL	RANK
Phoneme	Code	1	2	3	4	5		
ɒ	O		3				3	31.5
aʊə	M	1	1				2	42.5
e	e		2				2	42.5
gl	\$			2			2	42.5
i	i		2				2	42.5
kw	[		1	1			2	42.5
pr	?			2			2	42.5
skw	y		2				2	42.5
sp	B			2			2	42.5
tj	tj/			2			2	42.5
tʃ	C		1	1			2	42.5
ɑ	A	1		1			2	42.5
ɔ	O	1	1				2	42.5
əʊ	8	1	1				2	42.5
ʌ	V		1	1			2	42.5
3	3	1					1	56
arə	H		1				1	56
aʊ	9		1				1	56
eə	2	1					1	56
fj	.		1				1	56
gr	gr			1			1	56
ɪə	1	1					1	56
nj	`		1				1	56
sl	{			1			1	56
str	R			1			1	56
sw	:			1			1	56
v	v			1			1	56
ə	@	1					1	56
		11	102	196	54	9	357	

Appendix 7.12 - Finnish Child - Group Phoneme Frequencies

		Word Position															TOTAL
Code	Phoneme	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
<b>Age 2</b>																	
a	a	24	106	13	32	53	38	17	22	11	7	8	2	1			334
n	n	30	12	69	46	52	41	17	27	10	5	5	3	1	1		319
t	t	79	18	76	49	16	22	24	13	5	4	1					307
i	i	16	67	59	29	45	31	24	15	8	4	5		2			305
k	k	77	7	59	58	27	22	7	3	2	6		1				269
l	l	38	15	64	48	24	19	10	5	10	2		1				236
e	e	6	70	17	30	37	12	15	11	7	4	2					211
s	s	43	11	35	41	15	18	9	6	6	3	3	1				191
o	o	25	45	34	16	31	6	8	8	2	1	1					177
u	u	4	80	15	15	27	5	7	2	2	1						158
ä	æ	2	48	5	30	31	8	4	4	3	2	1		1			139
p	p	87	7	13	16	6	5	5									139
m	m	51	7	24	24	3	5	2	1								117
r	r	10		32	15	11	12	6	5	1	1		1				94
A	aa	4	11	3	10	11	4	7	3	2	1	1					57
v	v	26	1	3	11		3				1						45
h	h	15	4	15	5	2	1				1						43
j	j	20	4	3	5	2	4	1	1	1	1						42
y	y	3	19	3	2	5		2		1							35
B	ææ		16	1	7	6	2	1	1								34
ö	œ		3	8	3	7	3	3									27
l	ll	1	9		4	5	3	3									25
E	ee		1		9	2	3	1	1				1				18
d	d		2	6	7			1									16
U	uu	1	5		3	3	1	1	2								16
N	η		3	4			1	1									9
Y	yy		4		1	2											7
O	oo		2		2		1										5
3	au	4															4
f	f	1	1				1		1								4
g	g			2	1	1											4
1	ai	3															3
4	æi	3															3
b	b	3															3
5	ei	2															2
W	tr	2															2
		580	3	3	18	62	157	310	404	450	510	537	554	571	576		
				15	44	95	153	94	46	60	27	17	17	5	4		



Appendix 7.12 - Finnish Child - Group Phoneme Frequencies

		Word Position															TOTAL
Code	Phoneme	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Age 3																	
a	a	16	108	15	40	60	37	36	25	13	7	8	4	3			372
t	t	86	13	53	63	32	28	26	22	13	9	3	2	1			351
i	i	12	66	62	41	28	50	33	13	10	4	2			1		322
n	n	29	8	39	33	40	55	38	26	16	10	4	3				301
k	k	87	7	59	53	28	23	10	5	5	4	2					283
s	s	52	19	34	37	26	24	19	10	6	1	2					230
l	l	25	20	68	40	25	17	9	5	6	5	2	1	1			224
o	o	25	63	34	16	34	17	5	6	4	4	2					210
e	e	16	66	19	35	30	5	6	13	9	2	4	1		1		207
u	u	3	72	16	30	22	9	6	5	3		1					167
ä	æ		49	3	25	36	8	11	5	4	1						142
m	m	54	6	32	19	9	2										122
p	p	63	1	21	17	6	4	4									116
r	r	19	5	36	15	10	8	2	4	1				1			101
h	h	21	7	28	8	4	5	4									77
v	v	28	6	10	6	1	2	1	2		1						57
y	y	9	16	7	1	7	2	3	2	4	1						52
A	aa		5	5	7	14	8	5	1	2	1		1				49
j	j	14	2	3	16	2	2		2	1	2		1				45
l	ll		10		9	5	1	1	2								28
ö	œ		6	8	2	6	3					1					26
B	ææ		9	1	4	4	3	2	2								25
N	ŋ		7	6	4	3	3		1		1						25
d	d		2	10	5			3									20
E	ee		1		7	5	1										14
U	uu	1	6	1	2	2	1										13
3	au	7															7
O	oo		3	2		1											6
1	ai	4															4
Z	ui	4															4
5	ei	3															3
W	tr	3															3
4	æi	2															2
f	f	2															2
g	g			1					1								2
b	b			1													1
Y	yy					1											1
			2	2	13	50	144	266	361	433	488	532	554	572	579	583	
		585		11	37	94	122	95	72	55	44	22	18	7	4	2	



Appendix 7.12 - Finnish Child - Group Phoneme Frequencies

		Word Position																TOTAL	
Code		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
Phoneme																			
Age 5																			
a	a	30	139	29	54	83	49	56	34	11	14	12	8		3				522
i	i	22	98	106	52	67	61	28	35	14	12	5		3	1				504
t	t	109	28	79	87	59	52	45	18	7	8	2	1	1					496
n	n	30	14	80	54	51	71	36	23	32	10	9	4	1	1	2			418
k	k	107	18	68	86	30	22	17	13	11	8	3	1	2					386
l	l	57	31	78	51	33	47	29	13	15	4	4	3						365
s	s	72	20	40	68	32	37	32	13	15	7	3	2	1	1		1	1	345
e	e	16	98	40	47	55	23	13	19	8	5		1	2		1			328
u	u	6	115	27	29	44	7	7	8	5	5	4			1		1		259
o	o	36	57	54	33	37	7	4	6	4	2	2		1					243
ä	æ	6	66	7	30	48	19	11	12	6	3	2	2	3	1				216
m	m	69	3	31	31	10	3	2	4	1	1								155
p	p	82	2	19	19	9	6	4	1	3									145
r	r	17	10	55	18	12	9	4	5	1	4		1						136
v	v	53	5	10	16	3	5	1			1								94
h	h	32	6	40	8	5	1	1											93
A	aa		20	4	10	24	10	8	7		3	1	3						90
j	j	30	9	2	17	4	8	1	1			4		2					78
y	y	6	14	10	3	9	4	5	1	3			1						56
l	ll		18		4	4	2	3	3	1	1					1			37
B	ææ	4	7	1	3	5	5	1	3										29
d	d		4	11	12			1	1										29
N	ŋ		5	6	2	1	4	4	3	2	1	1							29
ö	œ		9	5	2	9	2	1		1									29
E	ee	2	5		7	4	2	2	4	1									27
U	uu	1	11	1	3	2	3	1											22
3	au	14																	14
O	oo		2		2	2	2	1											9
Y	yy		4		1	3													8
1	ai	5																	5
5	ei	3																	3
8	oi	2																	2
g	g			2															2
Z	ui	2																	2
4	æi	1																	1
9	ou	1																	1
b	b	1																	1
f	f				1														1
M	pl	1																	1
R	br	1																	1
S	st	1																	1
W	tr	1																	1
			1	1	15	70	175	359	502	593	679	731	768	793	804	812	816	818	
		820		14	55	105	184	143	91	86	52	37	25	11	8	4	2	1	

Appendix 7.13 - Finnish Child - Group FUSE Rankings

Phoneme	Code	Word Length						TOTAL	RANK
		1	2	3	4	5	6		
<b>Age 2</b>									
s	s		2	2	2	4		10	1
m	m		1		3	5		9	2.5
t	t			5	1	3		9	2.5
p	p		1	1	2	2	1	7	4
n	n		1	2	3			6	5
k	k					3	1	4	6
l	l			1			2	3	7.5
v	v			1	1	1		3	7.5
j	j				1	1		2	9
aa	A			1				1	12.5
b	b			1				1	12.5
e	e		1					1	12.5
i	i			1				1	12.5
o	o		1					1	12.5
r	r				1			1	12.5
		0	7	15	14	19	4	59	120
<b>Age 3</b>									
n	n		2	1	2			5	1
m	m		1		3	1		5	2
s	s		1		2	1		4	3.5
t	t			1	2	2		5	3.5
o	o		1		1			2	5.5
p	p				2	1		3	5.5
ai	l	1						1	11
ei	5	1						1	11
e	e		1					1	11
i	i			1				1	11
j	j		1					1	11
r	r				1			1	11
uu	U			1				1	11
v	v				1	1		2	11
ui	Z				1			1	11
		2	7	4	15	6		34	

Appendix 7.13 - Finnish Child - Group FUSE Rankings

Phoneme	Code	Word Length							TOTAL	RANK
		1	2	3	4	5	6	7		
<b>Age 5</b>										
s	s		2	2	4	3		2	13	1
m	m		1		2	4		2	9	2
t	t			3	2	3			8	3
n	n		1	1	2				4	4.5
v	v			2	1	1			4	4.5
j	j		1		2				3	8
k	k		2			1			3	8
l	l			1	1	1			3	8
o	o		1		2				3	8
p	p			1	1	1			3	8
e	e		1	1					2	11
ai	l			1					1	14.5
au	3				1				1	14.5
a	a				1				1	14.5
h	h			1					1	14.5
i	i			1					1	14.5
uu	U			1					1	14.5
		0	9	15	19	14		4	61	



Appendix 8.1 English Adult FUSE to Group Child Frequency Correlation

	Adult	Children Aged 2			Children Aged 3			Children Aged 5		
	Rank	Rank	D*D	D	Rank	D*D	D	Rank	D*D	D
<b>Phoneme</b>										
s	1	7	36	-6	11	100	-10	5	16	-4
l	2	20.5	342.25	-18.5	13.5	132.25	-11.5	11	81	-9
w	3.5	5	2.25	-1.5	1	6.25	2.5	4	0.25	-0.5
f	3.5	16	156.25	-12.5	9	30.25	-5.5	12	72.25	-8.5
t	5	7	4	-2	5.5	0.25	-0.5	9	16	-4
b	6.5	1	30.25	5.5	2	20.25	4.5	1	30.25	5.5
m	6.5	4	6.25	2.5	5.5	1	1	3	12.25	3.5
k	8	3	25	5	7.5	0.25	0.5	10	4	-2
r	9	10.5	2.25	-1.5	10	1	-1	7.5	2.25	1.5
h	10.5	2	72.25	8.5	3	56.25	7.5	2	72.25	8.5
p	10.5	9	2.25	1.5	7.5	9	3	6	20.25	4.5
d	12	7	25	5	4	64	8	7.5	20.25	4.5
st	13	33	400	-20	24	121	-11	19.5	42.25	-6.5
ʃ	14	33	361	-19	18	16	-4	16.5	6.25	-2.5
n	15	10.5	20.25	4.5	13.5	2.25	1.5	13	4	2
g	16	12.5	12.25	3.5	15	1	1	15	1	1
tʃ	17	25	64	-8	24	49	-7	42.5	650.3	-26
dr	18	33	225	-15	20.5	6.25	-2.5	29.5	132.3	-12
tr	20	25	25	-5	16	16	4	22.5	6.25	-2.5
pr	20	62	1764	-42	49.5	870.25	-29.5	32.5	156.3	-13
sp	20	33	169	-13	66	2116	-46	71	2601	-51
j	22	20.5	2.25	1.5	18	16	4	19.5	6.25	2.5
br	23	25	4	-2	41.5	342.25	-18.5	26	9	-3
pl	24.5	43	342.25	-18.5	28	12.25	-3.5	38	182.3	-14
kl	24.5	20.5	16	4	34	90.25	-9.5	38	182.3	-14
ð	26	14	144	12	12	196	14	14	144	12
θ	27	33	36	-6	34	49	-7	26	1	1
dʒ	29.5	12.5	289	17	34	20.25	-4.5	16.5	169	13
fl	29.5	43	182.25	-13.5	66	1332.3	-36.5	32.5	9	-3
str	29.5	62	1056.25	-32.5	66	1332.3	-36.5	52	506.3	-23
bl	29.5	62	1056.25	-32.5	34	20.25	-4.5	71	1722	-42
sk	32.5	43	110.25	-10.5	66	1122.3	-33.5	45	156.3	-13
kr	32.5	16	272.25	16.5	34	2.25	-1.5	52	380.3	-20

Appendix 8.1 English Adult FUSE to Group Child Frequency Correlation

	Adult	Children Aged 2			Children Aged 3			Children Aged 5		
	Rank	Rank	D*D	D	Rank	D*D	D	Rank	D*D	D
<b>Phoneme</b>										
fr	35.5	62	702.25	-26.5	49.5	196	-14	26	90.25	9.5
sl	35.5	62	702.25	-26.5	34	2.25	1.5	52	272.3	-17
kw	35.5	62	702.25	-26.5	49.5	196	-14	52	272.3	-17
gr	35.5	62	702.25	-26.5	49.5	196	-14	61	650.3	-26
e	38.5	33	30.25	5.5	28	110.25	10.5	19.5	361	19
æ	38.5	33	30.25	5.5	18	420.25	20.5	26	156.3	12.5
ɪ	40.5	20.5	400	20	20.5	400	20	22.5	324	18
v	40.5	62	462.25	-21.5	49.5	81	-9	52	132.3	-12
ə	42.5	20.5	484	22	24	342.25	18.5	19.5	529	23
sm	42.5	62	380.25	-19.5	49.5	49	-7	71	812.3	-29
ai	44.5	16	812.25	28.5	24	420.25	20.5	32.5	144	12
ɒ	44.5	33	132.25	11.5	28	272.25	16.5	45	0.25	-0.5
ɑ	46.5	20.5	676	26	34	156.25	12.5	38	72.25	8.5
ei	46.5	33	182.25	13.5	34	156.25	12.5	38	72.25	8.5
skr	52	62	100	-10	66	196	-14	32.5	380.3	19.5
əʊ	52	33	361	19	24	784	28	38	196	14
ɔ	52	33	361	19	41.5	110.25	10.5	38	196	14
gl	52	62	100	-10	41.5	110.25	10.5	42.5	90.25	9.5
sw	52	33	361	19	41.5	110.25	10.5	52	0	0
ʒ	52	62	100	-10	66	196	-14	61	81	-9
tw	52	62	100	-10	66	196	-14	61	81	-9
θr	52	62	100	-10	66	196	-14	71	361	-19
kj	52	62	100	-10	66	196	-14	71	361	-19
sn	58.5	62	12.25	-3.5	41.5	289	17	71	156.3	-13
spl	58.5	43	240.25	15.5	66	56.25	-7.5	71	156.3	-13
dj	58.5	62	12.25	-3.5	66	56.25	-7.5	71	156.3	-13
spr	58.5	62	12.25	-3.5	66	56.25	-7.5	71	156.3	-13
ʌ	64.5	43	462.25	21.5	34	930.25	30.5	26	1482	38.5
ɪə	64.5	62	6.25	2.5	66	2.25	-1.5	52	156.3	12.5
auə	64.5	62	6.25	2.5	66	2.25	-1.5	52	156.3	12.5
nj	64.5	43	462.25	21.5	49.5	225	15	61	12.25	3.5







Appendix 8.2 Finnish Adult FUSE to Group Child Frequency Correlation

Phoneme	Adult		Children Aged 2			Children Aged 3			Children Aged 5		
	Rank		Rank	D*D	D	Rank	D*D	D	Rank	D*D	D
s	1		5	16	-4	5	16	-4	4	9	-3
m	2		4	4	-2	4	4	-2	5	9	-3
t	3		2	1	1	2	1	1	1	4	2
k	4		3	1	1	1	9	3	2	4	2
n	5		7	4	-2	6	1	-1	11	36	-6
v	6		8	4	-2	7	1	-1	7	1	-1
j	7		11	16	-4	14	49	-7	12	25	-5
p	8		1	49	7	3	25	5	3	25	5
h	9		13	16	-4	10	1	-1	9	0	0
l	10		6	16	4	8.5	2.25	1.5	6	16	4
o	11		9	4	2	8.5	6.25	2.5	8	9	3
ts	12		39	729	-27	37.5	650.25	-25.5	41.5	870.25	-29.5
e	13		15	4	-2	12.5	0.25	0.5	15	4	-2
r	14		14	0	0	11	9	3	14	0	0
a	15		10	25	5	12.5	6.25	2.5	10	25	5
oo	16		39	529	-23	37.5	462.25	-21.5	41.5	650.25	-25.5
ei	17		24	49	-7	21	16	-4	22	25	-5
i	19		12	49	7	15	16	4	13	36	6
ee	19		39	400	-20	37.5	342.25	-18.5	24	25	-5
uu	19		27	64	-8	25	36	-6	29.5	110.25	-10.5
au	21.5		17	20.25	4.5	17	20.25	4.5	16	30.25	5.5
y	21.5		20.5	1	1	16	30.25	5.5	18	12.25	3.5
ai	23		20.5	6.25	2.5	18.5	20.25	4.5	20	9	3
u	24.5		17	56.25	7.5	21	12.25	3.5	18	42.25	6.5
yœ	24.5		39	210.25	-14.5	37.5	169	-13	41.5	289	-17
oi	26.5		39	156.25	-12.5	37.5	121	-11	24	6.25	2.5
g	26.5		39	156.25	-12.5	37.5	121	-11	41.5	225	-15
ui	30		39	81	-9	18.5	132.25	11.5	24	36	6
b	30		20.5	90.25	9.5	37.5	56.25	-7.5	29.5	0.25	0.5
ou	30		39	81	-9	37.5	56.25	-7.5	29.5	0.25	0.5
aa	30		17	169	13	37.5	56.25	-7.5	41.5	132.25	-11.5
d	30		39	81	-9	37.5	56.25	-7.5	41.5	132.25	-11.5
st	34.5		39	20.25	-4.5	37.5	9	-3	29.5	25	5
aio	34.5		39	20.25	-4.5	37.5	9	-3	41.5	49	-7
iæ	34.5		39	20.25	-4.5	37.5	9	-3	41.5	49	-7

Appendix 8.2 Finnish Adult FUSE to Group Child Frequency Correlation

	Adult	Children Aged 2			Children Aged 3			Children Aged 5		
	Rank	Rank	D*D	D	Rank	D*D	D	Rank	D*D	D
<b>Phoneme</b>										
pr	34.5	39	20.25	-4.5	37.5	9	-3	41.5	49	-7
æ	41.5	24	306.25	17.5	37.5	16	4	18	552.25	23.5
ææ	41.5	39	6.25	2.5	37.5	16	4	21	420.25	20.5
br	41.5	39	6.25	2.5	37.5	16	4	29.5	144	12
f	41.5	27	210.25	14.5	23.5	324	18	41.5	0	0
ii	41.5	27	210.25	14.5	37.5	16	4	41.5	0	0
fr	41.5	39	6.25	2.5	37.5	16	4	41.5	0	0
kl	41.5	39	6.25	2.5	37.5	16	4	41.5	0	0
sk	41.5	39	6.25	2.5	37.5	16	4	41.5	0	0
sv	41.5	39	6.25	2.5	37.5	16	4	41.5	0	0
yy	41.5	39	6.25	2.5	37.5	16	4	41.5	0	0
tr	48	24	576	24	21	729	27	29.5	342.25	18.5
æi	48	20.5	756.25	27.5	23.5	600.25	24.5	29.5	342.25	18.5
pl	48	39	81	9	37.5	110.25	10.5	29.5	342.25	18.5
	1225	1225	5353.50	0	1225	4448.5	0	1225	5114	0
		6*1326	32121			26691			30684	
			117600			117600			117600	
		E83/E84	0.2731			0.227			0.2609	
		1-fraction	0.73			0.77			0.74	



Appendix 8.3 English Adult FUSE to Group Child FUSE Correlation

Phoneme	Adult	Children Aged 2			Children Aged 3			Children Aged 5		
	Rank	Rank	D*D	D	Rank	D*D	D	Rank	D*D	D
s	1	7	36	-6	10	81	-9	8	49	-7
l	2	21.5	380.25	-19.5	18.5	272.25	-16.5	14	144	-12
w	3.5	12.5	81	-9	1	6.25	2.5	5.5	4	-2
f	3.5	12.5	81	-9	10	42.25	-6.5	12	72.25	-8.5
t	5	2	9	3	10	25	-5	2.5	6.25	2.5
b	6.5	2	20.25	4.5	2	20.25	4.5	1	30.25	5.5
m	6.5	4.5	4	2	5	2.25	1.5	2.5	16	4
k	8	4.5	12.25	3.5	10	4	-2	5.5	6.25	2.5
r	9	12.5	12.25	-3.5	15.5	42.25	-6.5	7	4	2
h	10.5	2	72.25	8.5	3	56.25	7.5	4	42.25	6.5
p	10.5	12.5	4	-2	15.5	25	-5	12	2.25	-1.5
d	12	21.5	90.25	-9.5	5	49	7	9.5	6.25	2.5
st	13	21.5	72.25	-8.5	22.5	90.25	-9.5	18	25	-5
ʃ	14	57.5	1892.25	-43.5	18.5	20.25	-4.5	16	4	-2
n	15	12.5	6.25	2.5	13.5	2.25	1.5	12	9	3
g	16	7	81	9	10	36	6	16	0	0
tʃ	17	21.5	20.25	-4.5	22.5	30.25	-5.5	42.5	650.25	-25.5
dr	18	32	196	-14	18.5	0.25	-0.5	31.5	182.25	-13.5
tr	20	32	144	-12	7	169	13	20.5	0.25	-0.5
pr	20	57.5	1406.25	-37.5	38.5	342.25	-18.5	42.5	506.25	-22.5
sp	20	57.5	1406.25	-37.5	61	1681	-41	42.5	506.25	-22.5
j	22	12.5	90.25	9.5	13.5	72.25	8.5	16	36	6
br	23	21.5	2.25	1.5	38.5	240.25	-15.5	24.5	2.25	-1.5
pl	24.5	21.5	9	3	22.5	4	2	24.5	0	0
kl	24.5	12.5	144	12	28	12.25	-3.5	31.5	49	-7
ð	26	7	361	19	5	441	21	9.5	272.25	16.5
θ	27	57.5	930.25	-30.5	61	1156	-34	20.5	42.25	6.5
dʒ	29.5	21.5	64	8	38.5	81	-9	24.5	25	5
fl	29.5	57.5	784	-28	61	992.25	-31.5	31.5	4	-2
str	29.5	57.5	784	-28	61	992.25	-31.5	54.5	625	-25
bl	29.5	57.5	784	-28	61	992.25	-31.5	68.5	1521	-39
sk	32.5	57.5	625	-25	61	812.25	-28.5	31.5	1	1
kr	32.5	57.5	625	-25	61	812.25	-28.5	68.5	1296	-36
sl	35.5	57.5	484	-22	28	56.25	7.5	54.5	361	-19
fr	35.5	57.5	484	-22	38.5	9	-3	31.5	16	4
kw	35.5	57.5	484	-22	61	650.25	-25.5	42.5	49	-7
gr	35.5	57.5	484	-22	61	650.25	-25.5	68.5	1089	-33
æ	38.5	32	42.25	6.5	22.5	256	16	31.5	49	7
e	38.5	21.5	289	17	61	506.25	-22.5	42.5	16	-4
ɪ	40.5	21.5	361	19	28	156.25	12.5	24.5	256	16
v	40.5	57.5	289	-17	61	420.25	-20.5	68.5	784	-28
ɔ	42.5	32	110.25	10.5	38.5	16	4	54.5	144	-12
sm	42.5	57.5	225	-15	38.5	16	4	68.5	676	-26
ai	44.5	12.5	1024	32	18.5	676	26	19	650.25	25.5
ɒ	44.5	32	156.25	12.5	28	272.25	16.5	31.5	169	13



Appendix 8.3 English Adult FUSE to Group Child FUSE Correlation

Phoneme	Adult	Children Aged 2			Children Aged 3			Children Aged 5		
	Rank	Rank	D*D	D	Rank	D*D	D	Rank	D*D	D
a	46.5	21.5	625	25	28	342.25	18.5	42.5	16	4
er	46.5	32	210.25	14.5	38.5	64	8	24.5	484	22
əʊ	52	32	400	20	28	576	24	42.5	90.25	9.5
ɔ	52	57.5	30.25	-5.5	38.5	182.25	13.5	42.5	90.25	9.5
sw	52	32	400	20	38.5	182.25	13.5	54.5	6.25	-2.5
skr	52	57.5	30.25	-5.5	61	81	-9	31.5	420.25	20.5
gl	52	57.5	30.25	-5.5	61	81	-9	42.5	90.25	9.5
θr	52	57.5	30.25	-5.5	61	81	-9	68.5	272.25	-16.5
kj	52	57.5	30.25	-5.5	61	81	-9	68.5	272.25	-16.5
tw	52	57.5	30.25	-5.5	61	81	-9	68.5	272.25	-16.5
ʒ	52	57.5	30.25	-5.5	61	81	-9	68.5	272.25	-16.5
sn	58.5	57.5	1	1	38.5	400	20	68.5	100	-10
dj	58.5	57.5	1	1	61	6.25	-2.5	68.5	100	-10
spl	58.5	57.5	1	1	61	6.25	-2.5	68.5	100	-10
spr	58.5	57.5	1	1	61	6.25	-2.5	68.5	100	-10
nj	64.5	32	1056.25	32.5	38.5	676	26	54.5	100	10
fj	64.5	57.5	49	7	38.5	676	26	54.5	100	10
ʌ	64.5	57.5	49	7	61	12.25	3.5	42.5	484	22
auə	64.5	57.5	49	7	61	12.25	3.5	42.5	484	22
tj	64.5	57.5	49	7	61	12.25	3.5	42.5	484	22
ɪə	64.5	57.5	49	7	61	12.25	3.5	54.5	100	10
vj	64.5	57.5	49	7	61	12.25	3.5	68.5	16	-4
bj	64.5	57.5	49	7	61	12.25	3.5	68.5	16	-4
i	71.5	32	1560.25	39.5	38.5	1089	33	42.5	841	29
au	71.5	32	1560.25	39.5	38.5	1089	33	54.5	289	17
skw	71.5	57.5	196	14	61	110.25	10.5	42.5	841	29
pj	71.5	57.5	196	14	61	110.25	10.5	68.5	9	3
z	71.5	57.5	196	14	61	110.25	10.5	68.5	9	3
ɔɪ	71.5	57.5	196	14	61	110.25	10.5	68.5	9	3
əʊə	76	57.5	342.25	18.5	28	2304	48	24.5	2652.3	51.5
arə	76	57.5	342.25	18.5	61	225	15	54.5	462.25	21.5
eə	76	57.5	342.25	18.5	61	225	15	54.5	462.25	21.5
summing	3003	3003	23844	0	2987	22340	16	3003	20444	0
		6*total	143064			134040			122664	
			456456			456456			456456	
			0.31			0.29			0.27	
		1-fraction	0.69			0.71			0.73	

Appendix 8.4 Finnish Adult FUSE to Group Child FUSE Correlation

Phoneme	Adult	Children Aged 2			Children Aged 3			Children Aged 5		
	Rank	Rank	D*D	D	Rank	D*D	D	Rank	D*D	D
s	1	1	0	0	3.5	6.25	-2.5	1	0	0
m	2	2.5	0.25	-0.5	2	0	0	2	0	0
t	3	2.5	0.25	0.5	3.5	0.25	-0.5	3	0	0
k	4	6	4	-2	31	729	-27	8	16	-4
n	5	5	0	0	1	16	4	4.5	0.25	0.5
v	6	7.5	2.25	-1.5	11	25	-5	4.5	2.25	1.5
j	7	9	4	-2	11	16	-4	8	1	-1
p	8	4	16	4	5.5	6.25	2.5	8	0	0
h	9	31	484	-22	31	484	-22	14.5	30.25	-5.5
l	10	7.5	6.25	2.5	31	441	-21	8	4	2
o	11	12.5	2.25	-1.5	5.5	30.25	5.5	8	9	3
ts	12	31	361	-19	31	361	-19	32	400	-20
e	13	12.5	0.25	0.5	11	4	2	11	4	2
r	14	12.5	2.25	1.5	11	9	3	32	324	-18
a	15	31	256	-16	31	256	-16	14.5	0.25	0.5
oo	16	31	225	-15	31	225	-15	32	256	-16
ei	17	31	196	-14	11	36	6	32	225	-15
uu	19	31	144	-12	11	64	8	14.5	20.25	4.5
ee	19	31	144	-12	31	144	-12	32	169	-13
i	19	31	144	-12	31	144	-12	32	169	-13
au	21.5	31	90.25	-9.5	31	90.25	-9.5	14.5	49	7
y	21.5	31	90.25	-9.5	31	90.25	-9.5	32	110.25	-10.5
ai	23	31	64	-8	11	144	12	14.5	72.25	8.5
yœ	24.5	31	42.25	-6.5	31	42.25	-6.5	32	56.25	-7.5
u	24.5	31	42.25	-6.5	31	42.25	-6.5	32	56.25	-7.5
g	26.5	31	20.25	-4.5	31	20.25	-4.5	32	30.25	-5.5
oi	26.5	31	20.25	-4.5	31	20.25	-4.5	32	30.25	-5.5
aa	30	12.5	306.25	17.5	31	1	-1	32	4	-2
b	30	12.5	306.25	17.5	31	1	-1	32	4	-2
ui	30	31	1	-1	11	361	19	32	4	-2
d	30	31	1	-1	31	1	-1	32	4	-2
ou	30	31	1	-1	31	1	-1	32	4	-2
iæ	34.5	31	12.25	3.5	31	12.25	3.5	32	6.25	2.5



Appendix 8.4 Finnish Adult FUSE to Group Child FUSE Correlation

Phoneme	Adult	Children Aged 2			Children Aged 3			Children Aged 5		
	Rank	Rank	D*D	D	Rank	D*D	D	Rank	D*D	D
aio	34.5	31	12.25	3.5	31	12.25	3.5	32	6.25	2.5
pr	34.5	31	12.25	3.5	31	12.25	3.5	32	6.25	2.5
st	34.5	31	12.25	3.5	31	12.25	3.5	32	6.25	2.5
ii	41.5	12.5	841	29	11	930.3	31	14.5	729	27
sk	41.5	31	110.25	10.5	31	110.3	11	32	90.25	9.5
br	41.5	31	110.25	10.5	31	110.3	11	32	90.25	9.5
f	41.5	31	110.25	10.5	31	110.3	11	32	90.25	9.5
fr	41.5	31	110.25	10.5	31	110.3	11	32	90.25	9.5
sv	41.5	31	110.25	10.5	31	110.3	11	32	90.25	9.5
yy	41.5	31	110.25	10.5	31	110.3	11	32	90.25	9.5
kl	41.5	31	110.25	10.5	31	110.3	11	32	90.25	9.5
æ	41.5	31	110.25	10.5	31	110.3	11	32	90.25	9.5
ææ	41.5	31	110.25	10.5	31	110.3	11	32	90.25	9.5
	1081	1081	4859.00	0	1081	5783	0	1081	3621	0
			29154			34698			21726	
			97290			97290			97290	
			0.30			0.36			0.22	
			0.70			0.64			0.78	



Appendix 8.5 English Adult W.I. Frequency to Group Child W.I. Frequency Correlation

	Adult	Children Aged 2			Children Aged 3			Children Aged 5		
	Rank	Rank	D*D	D	Rank	D*D	D	Rank	D*D	D
<b>Phoneme</b>										
k	1	3	4	-2	7.5	42.25	-6.5	10	81	-9
s	2	7	25	-5	11	81	-9	5	9	-3
i	3	20.5	306.25	-17.5	20.5	306.25	-17.5	22.5	380.25	-19.5
r	4	10.5	42.25	-6.5	10	36	-6	7.5	12.25	-3.5
d	5	7	4	-2	4	1	1	7.5	6.25	-2.5
f	6	16	100	-10	9	9	-3	12	36	-6
m	7	4	9	3	5.5	2.25	1.5	3	16	4
p	8	9	1	-1	7.5	0.25	0.5	6	4	2
ə	9	20.5	132.25	-11.5	24	225	-15	19.5	110.25	-10.5
b	10	1	81	9	2	64	8	1	81	9
l	11	20.5	90.25	-9.5	13.5	6.25	-2.5	11	0	0
w	12	5	49	7	1	121	11	4	64	8
t	13	7	36	6	5.5	56.25	7.5	9	16	4
h	14	2	144	12	3	121	11	2	144	12
pr	15	64	2401	-49	49.5	1190.25	-34.5	32.5	306.25	-17.5
n	16	10.5	30.25	5.5	13.5	6.25	2.5	13	9	3
st	17.5	33	240.25	-15.5	24	42.25	-6.5	19.5	4	-2
æ	17.5	33	240.25	-15.5	18	0.25	-0.5	26	72.25	-8.5
e	19	33	196	-14	28	81	-9	19.5	0.25	-0.5
g	20	12.5	56.25	7.5	15	25	5	15	25	5
ʃ	21	33	144	-12	18	9	3	16.5	20.25	4.5
tr	22	25	9	-3	16	36	6	22.5	0.25	-0.5
tʃ	23	25	4	-2	24	1	-1	42.5	380.25	-19.5
v	24	64	1600	-40	49.5	650.25	-25.5	52	784	-28
dʒ	25	12.5	156.25	12.5	34	81	-9	16.5	72.25	8.5
j	26	20.5	30.25	5.5	18	64	8	19.5	42.25	6.5
ɔ	27.5	33	30.25	-5.5	41.5	196	-14	38	110.25	-10.5
ʌ	27.5	43	240.25	-15.5	34	42.25	-6.5	26	2.25	1.5
dr	29.5	33	12.25	-3.5	20.5	81	9	29.5	0	0
ɒ	29.5	33	12.25	-3.5	28	2.25	1.5	45	240.25	-15.5
ɑ	31	20.5	110.25	10.5	34	9	-3	38	49	-7
kl	32	20.5	132.25	11.5	34	4	-2	38	36	-6
kr	33	16	289	17	34	1	-1	52	361	-19
sp	34	33	1	1	68	1156	-34	73	1521	-39
θ	35	33	4	2	34	1	1	26	81	9

Appendix 8.5 English Adult W.I. Frequency to Group Child W.I. Frequency Correlation

Phoneme	Adult	Children Aged 2			Children Aged 3			Children Aged 5		
	Rank	Rank	D*D	D	Rank	D*D	D	Rank	D*D	D
gr	36	64	784	-28	49.5	182.25	-13.5	61	625	-25
br	37	25	144	12	41.5	20.25	-4.5	26	121	11
str	38	64	676	-26	68	900	-30	52	196	-14
fl	39.5	43	12.25	-3.5	68	812.25	-28.5	32.5	49	7
pl	39.5	43	12.25	-3.5	28	132.25	11.5	38	2.25	1.5
er	42	33	81	9	34	64	8	38	16	4
sk	42	43	1	-1	68	676	-26	45	9	-3
bl	42	64	484	-22	34	64	8	73	961	-31
ð	44.5	14	930.25	30.5	12	1056.25	32.5	14	930.25	30.5
kw	44.5	64	380.25	-19.5	49.5	25	-5	52	56.25	-7.5
i	46	33	169	13	49.5	12.25	-3.5	38	64	8
ai	47.5	16	992.25	31.5	24	552.25	23.5	32.5	225	15
əu	47.5	33	210.25	14.5	24	552.25	23.5	38	90.25	9.5
sl	49	64	225	-15	34	225	15	52	9	-3
fr	50	64	196	-14	49.5	0.25	0.5	26	576	24
sm	51	64	169	-13	49.5	2.25	1.5	73	484	-22
ʒ	52.5	64	132.25	-11.5	68	240.25	-15.5	61	72.25	-8.5
tw	52.5	64	132.25	-11.5	68	240.25	-15.5	61	72.25	-8.5
kj	54.5	64	90.25	-9.5	68	182.25	-13.5	73	342.25	-18.5
dj	54.5	64	90.25	-9.5	68	182.25	-13.5	73	342.25	-18.5
au	57	43	196	14	41.5	240.25	15.5	52	25	5
skr	57	64	49	-7	68	121	-11	32.5	600.25	24.5
tj	57	64	49	-7	49.5	56.25	7.5	61	16	-4
eə	59	64	25	-5	68	81	-9	45	196	14
sw	63.5	33	930.25	30.5	41.5	484	22	52	132.25	11.5
nj	63.5	43	420.25	20.5	49.5	196	14	61	6.25	2.5
gl	63.5	64	0.25	-0.5	41.5	484	22	42.5	441	21
fj	63.5	64	0.25	-0.5	49.5	196	14	61	6.25	2.5
θr	63.5	64	0.25	-0.5	68	20.25	-4.5	73	90.25	-9.5
spr	63.5	64	0.25	-0.5	68	20.25	-4.5	73	90.25	-9.5
z	63.5	64	0.25	-0.5	68	20.25	-4.5	73	90.25	-9.5
stj	63.5	64	0.25	-0.5	68	20.25	-4.5	73	90.25	-9.5
spl	70.5	43	756.25	27.5	68	6.25	2.5	73	6.25	-2.5
auə	70.5	64	42.25	6.5	68	6.25	2.5	52	342.25	18.5



Appendix 8.5 English Adult W.I. Frequency to Group Child W.I. Frequency Correlation

	Adult	Children Aged 2			Children Aged 3			Children Aged 5		
	Rank	Rank	D*D	D	Rank	D*D	D	Rank	D*D	D
<b>Phoneme</b>										
bj	70.5	64	42.25	6.5	68	6.25	2.5	61	90.25	9.5
sn	70.5	64	42.25	6.5	41.5	841	29	73	6.25	-2.5
hj	70.5	64	42.25	6.5	68	6.25	2.5	73	6.25	-2.5
mj	70.5	64	42.25	6.5	68	6.25	2.5	73	6.25	-2.5
ɪə	75	64	121	11	68	49	7	52	529	23
vj	75	64	121	11	68	49	7	73	4	2
ɔɪ	75	64	121	11	68	49	7	73	4	2
skw	78	64	196	14	68	100	10	52	676	26
pj	78	64	196	14	68	100	10	73	25	5
lj	78	64	196	14	68	100	10	73	25	5
əʊə	80.5	64	272.25	16.5	68	156.25	12.5	29.5	2601	51
aɪə	80.5	64	272.25	16.5	68	156.25	12.5	52	812.25	28.5
summing	3321	3321	17008.5	0	3321	14443	0	3321	17238	0
		6*total	102051			86658			103425	
			531360			531360			531360	
		E83/E84	0.19			0.16			0.19	
		1-fraction	0.81			0.84			0.81	



Appendix 8.6 Finnish Adult W.I. Frequency to Group Child W.I. Frequency Correlation

Phoneme	Adult	Children Aged 2			Children Aged 3			Children Aged 5		
	Rank	Rank	D*D	D	Rank	D*D	D	Rank	D*D	D
k	1	3	4	-2	1	0	0	2	1	-1
t	2	2	0	0	2	0	0	1	1	1
s	3	5	4	-2	5	4	-2	4	1	-1
m	4	4	0	0	4	0	0	5	1	-1
p	5	1	16	4	3	4	2	3	4	2
v	6	8	4	-2	7	1	-1	7	1	-1
l	7	6	1	1	8.5	2.25	-1.5	6	1	1
n	8	7	1	1	6	4	2	11	9	-3
h	9	13	16	-4	10	1	-1	9	0	0
j	10	11	1	-1	14	16	-4	12	4	-2
o	11	9	4	2	8.5	6.25	2.5	8	9	3
e	12	15	9	-3	12.5	0.25	-0.5	15	9	-3
a	13	10	9	3	12.5	0.25	0.5	10	9	3
r	14	14	0	0	11	9	3	14	0	0
i	15	12	9	3	15	0	0	13	4	2
y	16	20.5	20.25	-4.5	16	0	0	18	4	-2
ai	17	20.5	12.25	-3.5	18.5	2.25	-1.5	20	9	-3
u	18	17	1	1	21	9	-3	18	0	0
oi	19	43.5	600.25	-25	42	529	-23	24	25	-5
ei	20	24	16	-4	21	1	-1	22	4	-2
ts	21	43.5	506.25	-23	42	441	-21	46	625	-25
oo	22	43.5	462.25	-22	42	400	-20	46	576	-24
uu	23	27	16	-4	25	4	-2	29.5	42.25	-6.5
au	24	17	49	7	17	49	7	16	64	8
b	25	20.5	20.25	4.5	42	289	-17	29.5	20.25	-4.5
f	26	27	1	-1	23.5	6.25	2.5	46	400	-20
aa	27	17	100	10	42	225	-15	46	361	-19
æi	28.5	20.5	64	8	23.5	25	5	29.5	1	-1
yœ	28.5	43.5	225	-15	42	182.25	-14	46	306.25	-18
æ	30	24	36	6	42	144	-12	18	144	12
d	31	43.5	156.25	-13	42	121	-11	46	225	-15
ui	32.5	43.5	121	-11	18.5	196	14	24	72.25	8.5
st	32.5	43.5	121	-11	42	90.25	-9.5	29.5	9	3
ææ	34.5	43.5	81	-9	42	56.25	-7.5	21	182.25	13.5
g	34.5	43.5	81	-9	42	56.25	-7.5	46	132.25	-12
kr	36.5	43.5	49	-7	42	30.25	-5.5	46	90.25	-9.5
pr	36.5	43.5	49	-7	42	30.25	-5.5	46	90.25	-9.5

Appendix 8.6 Finnish Adult W.I. Frequency to Group Child W.I. Frequency Correlation

Phoneme	Adult	Children Aged 2			Children Aged 3			Children Aged 5		
	Rank	Rank	D*D	D	Rank	D*D	D	Rank	D*D	D
ee	38.5	43.5	25	-5	42	12.25	-3.5	24	210.25	14.5
kl	38.5	43.5	25	-5	42	12.25	-3.5	46	56.25	-7.5
ou	40	43.5	12.25	-3.5	42	4	-2	29.5	110.25	10.5
iã	41	43.5	6.25	-2.5	42	1	-1	46	25	-5
br	46.5	43.5	9	3	42	20.25	4.5	29.5	289	17
ii	46.5	27	380.25	19.5	42	20.25	4.5	46	0.25	0.5
aio	46.5	43.5	9	3	42	20.25	4.5	46	0.25	0.5
eu	46.5	43.5	9	3	42	20.25	4.5	46	0.25	0.5
skr	46.5	43.5	9	3	42	20.25	4.5	46	0.25	0.5
fr	46.5	43.5	9	3	42	20.25	4.5	46	0.25	0.5
gr	46.5	43.5	9	3	42	20.25	4.5	46	0.25	0.5
sk	46.5	43.5	9	3	42	20.25	4.5	46	0.25	0.5
sv	46.5	43.5	9	3	42	20.25	4.5	46	0.25	0.5
yy	46.5	43.5	9	3	42	20.25	4.5	46	0.25	0.5
tr	55	24	961	31	21	1156	34	29.5	650.25	25.5
pl	55	43.5	132.25	11.5	42	169	13	29.5	650.25	25.5
sl	55	43.5	132.25	11.5	42	169	13	46	81	9
dr	55	43.5	132.25	11.5	42	169	13	46	81	9
gl	55	43.5	132.25	11.5	42	169	13	46	81	9
fl	55	43.5	132.25	11.5	42	169	13	46	81	9
œ	55	43.5	132.25	11.5	42	169	13	46	81	9
	1711	1711	5150	0	1711	5337	0	1711	5835.5	0
	rho formula									
	numerator		30900			32022			35013	
	denominator		205320			205320			205320	
	fractional part		0.15			0.156			0.1705	
			0.85			0.84			0.83	



Appendix 8.7 Cross-Linguistic Adult Frequency Correlation

Phoneme	English Adult Rank	Finnish Adult Rank	D*D	D
k	1	1	0	0
t	13	2	121	11
s	2	3	1	-1
m	7	4	9	3
p	8	5	9	3
v	24	6	324	18
l	11	7	16	4
n	16	8	64	8
h	14	9	25	5
j	26	10	256	16
o	89	11	6084	78
e	19	12	49	7
a	31	13	324	18
r	4	14	100	-10
i	46	15	961	31
y	89	16	5329	73
ai	47.5	17	930.25	30.5
u	89	18	5041	71
oi	89	19	4900	70
ei	42	20	484	22
ts	89	21	4624	68
oo	89	22	4489	67
uu	89	23	4356	66
au	57	24	1089	33
b	10	25	225	-15
f	6	26	400	-20
aa	89	27	3844	62
æi	89	28.5	3660.25	60.5
yæ	89	28.5	3660.25	60.5
æ	17.5	30	156.25	-12.5
d	5	31	676	-26
st	17.5	32.5	225	-15
ui	89	32.5	3192.25	56.5
g	20	34.5	210.25	-14.5
ææ	89	34.5	2970.25	54.5



Appendix 8.7 Cross-Linguistic Adult Frequency Correlation

Phoneme	English Adult Rank	Finnish Adult Rank	D*D	D
pr	15	36.5	462.25	-21.5
kr	33	36.5	12.25	-3.5
kl	32	38.5	42.25	-6.5
ee	89	38.5	2550.25	50.5
ou	89	40	2401	49
iæ	89	41	2304	48
i	3	46.5	1892.25	-43.5
gr	36	46.5	110.25	-10.5
br	37	46.5	90.25	-9.5
sk	42	46.5	20.25	-4.5
fr	50	46.5	12.25	3.5
skr	57	46.5	110.25	10.5
aio	89	46.5	1806.25	42.5
sv	89	46.5	1806.25	42.5
yy	89	46.5	1806.25	42.5
eu	89	46.5	1806.25	42.5
tr	22	55	1089	-33
dr	29.5	55	650.25	-25.5
fl	39.5	55	240.25	-15.5
pl	39.5	55	240.25	-15.5
sl	49	55	36	-6
gl	63.5	55	72.25	8.5
œ	89	55	1156	34
ə	9	79	4900	-70
w	12	79	4489	-67
ʃ	21	79	3364	-58
tʃ	23	79	3136	-56
dʒ	25	79	2916	-54
ɔ	27.5	79	2652.25	-51.5
ʌ	27.5	79	2652.25	-51.5
ɒ	29.5	79	2450.25	-49.5
sp	34	79	2025	-45
θ	35	79	1936	-44
str	38	79	1681	-41
bl	42	79	1369	-37

Appendix 8.7 Cross-Linguistic Adult Frequency Correlation

Phoneme	English Adult Rank	Finnish Adult Rank	D*D	D
ð	44.5	79	1190.25	-34.5
kw	44.5	79	1190.25	-34.5
əʊ	47.5	79	992.25	-31.5
sm	51	79	784	-28
ʒ	52.5	79	702.25	-26.5
tw	52.5	79	702.25	-26.5
dj	54.5	79	600.25	-24.5
kj	54.5	79	600.25	-24.5
tj	57	79	484	-22
eə	59	79	400	-20
nj	63.5	79	240.25	-15.5
fj	63.5	79	240.25	-15.5
spr	63.5	79	240.25	-15.5
stj	63.5	79	240.25	-15.5
sw	63.5	79	240.25	-15.5
θr	63.5	79	240.25	-15.5
z	63.5	79	240.25	-15.5
auə	70.5	79	72.25	-8.5
bj	70.5	79	72.25	-8.5
hj	70.5	79	72.25	-8.5
mj	70.5	79	72.25	-8.5
sn	70.5	79	72.25	-8.5
spl	70.5	79	72.25	-8.5
ɔɪ	75	79	16	-4
ɪə	75	79	16	-4
pj	78	79	1	-1
skw	78	79	1	-1
ə	89	79	100	10
vj	75	79	16	-4
lj	78	79	1	-1
	5029	5029	123004	0
	numerator		738024	
	denominator		999900	
	fractional part		0.74	
	rho		0.26	

Appendix 8.8 Cross-Linguistic Adult FUSE Correlation

Phoneme	English Adult Rank	Finnish Adult Rank	D*D	D
s	1	1	0	0
l	2	10	64	-8
f	3.5	41.5	1444	-38
w	3.5	68.5	4225	-65
t	5	3	4	2
m	6.5	2	20.25	4.5
b	6.5	30	552.25	-23.5
k	8	4	16	4
r	9	14	25	-5
p	10.5	8	6.25	2.5
h	10.5	9	2.25	1.5
d	12	30	324	-18
st	13	34.5	462.25	-21.5
ʃ	14	68.5	2970.25	-54.5
n	15	5	100	10
g	16	26.5	110.25	-10.5
tʃ	17	12	25	5
dr	18	68.5	2550.25	-50.5
pr	20	34.5	210.25	-14.5
tr	20	68.5	2352.25	-48.5
sp	20	68.5	2352.25	-48.5
j	22	7	225	15
br	23	41.5	342.25	-18.5
kl	24.5	41.5	289	-17
pl	24.5	68.5	1936	-44
ð	26	68.5	1806.25	-42.5
θ	27	68.5	1722.25	-41.5
fl	29.5	68.5	1521	-39
dʒ	29.5	68.5	1521	-39
str	29.5	68.5	1521	-39
bl	29.5	68.5	1521	-39
sk	32.5	41.5	81	-9
kr	32.5	68.5	1296	-36
fr	35.5	41.5	36	-6



Appendix 8.8 Cross-Linguistic Adult FUSE Correlation

Phoneme	English Adult	Finnish Adult		
	Rank	Rank	D*D	D
gr	35.5	68.5	1089	-33
sl	35.5	68.5	1089	-33
kw	35.5	68.5	1089	-33
e	38.5	13	650.25	25.5
æ	38.5	41.5	9	-3
v	40.5	6	1190.25	34.5
ɪ	40.5	41.5	1	-1
ə	42.5	68.5	676	-26
sm	42.5	68.5	676	-26
ai	44.5	23	462.25	21.5
ɒ	44.5	68.5	576	-24
ɑ	46.5	15	992.25	31.5
er	46.5	17	870.25	29.5
skr	52	68.5	272.25	-16.5
gl	52	68.5	272.25	-16.5
ɔ	52	68.5	272.25	-16.5
əʊ	52	68.5	272.25	-16.5
ʒ	52	68.5	272.25	-16.5
tw	52	68.5	272.25	-16.5
kj	52	68.5	272.25	-16.5
sw	52	68.5	272.25	-16.5
θr	52	68.5	272.25	-16.5
dj	58.5	68.5	100	-10
spr	58.5	68.5	100	-10
sn	58.5	68.5	100	-10
spl	58.5	68.5	100	-10
ʌ	64.5	68.5	16	-4
tj	64.5	68.5	16	-4
fj	64.5	68.5	16	-4
nj	64.5	68.5	16	-4
auə	64.5	68.5	16	-4
bj	64.5	68.5	16	-4
ɪə	64.5	68.5	16	-4
vj	64.5	68.5	16	-4

Appendix 8.8 Cross-Linguistic Adult FUSE Correlation

Phoneme	English Adult Rank	Finnish Adult Rank	D*D	D
i	71.5	19	2756.25	52.5
au	71.5	21.5	2500	50
z	71.5	68.5	9	3
ɔɪ	71.5	68.5	9	3
pj	71.5	68.5	9	3
skw	71.5	68.5	9	3
o	82.5	11	5112.25	71.5
oo	82.5	16	4422.25	66.5
uu	82.5	19	4032.25	63.5
ee	82.5	19	4032.25	63.5
y	82.5	21.5	3721	61
u	82.5	24.5	3364	58
yœ	82.5	24.5	3364	58
oi	82.5	26.5	3136	56
aa	82.5	30	2756.25	52.5
ui	82.5	30	2756.25	52.5
ou	82.5	30	2756.25	52.5
iæ	82.5	34.5	2304	48
aio	82.5	34.5	2304	48
ææ	82.5	41.5	1681	41
sv	82.5	41.5	1681	41
yy	82.5	41.5	1681	41
summing	4095	4095	98378	0
	numerator	590268		
	denominator	728910		
	fractional part	0.81		
		0.19		

Appendix 8.9 Cross-Linguistic Group Child Frequency Correlation

	English Children	Finnish Children	D*D	D
	Aged 2 - Rank	Aged 2 - Rank		
Phoneme				
p	9	1	64	8
t	7	2	25	5
k	3	3	0	0
m	4	4	0	0
s	7	5	4	2
l	20.5	6	210.25	14.5
n	10.5	7	12.25	3.5
v	50	8	1764	42
o	50	9	1681	41
a	20.5	10	110.25	10.5
j	20.5	11	90.25	9.5
ɪ	20.5	12	72.25	8.5
h	2	13	121	-11
r	10.5	14	12.25	-3.5
e	33	15	324	18
aʊ	43	17	676	26
u	50	17	1089	33
ɑɑ	50	17	1089	33
b	1	20.5	380.25	-19.5
aɪ	16	20.5	20.25	-4.5
æi	50	20.5	870.25	29.5
y	50	20.5	870.25	29.5
tr	25	24	1	1
eɪ	33	24	81	9
æ	33	24	81	9
f	16	27	121	-11
i	33	27	36	6
uu	50	27	529	23
w	5	41	1296	-36
d	7	41	1156	-34
g	12.5	41	812.25	-28.5
dʒ	12.5	41	812.25	-28.5
ð	14	41	729	-27
kr	16	41	625	-25



Appendix 8.9 Cross-Linguistic Group Child Frequency Correlation

	English Children	Finnish Children	D*D	D
	Aged 2. Continued	Aged 2. Continued		
Phoneme				
ə	20.5	41	420.25	-20.5
kl	20.5	41	420.25	-20.5
br	25	41	256	-16
tʃ	25	41	256	-16
ɒ	33	41	64	-8
əʊ	33	41	64	-8
dr	33	41	64	-8
st	33	41	64	-8
ɔ	33	41	64	-8
ʃ	33	41	64	-8
sp	33	41	64	-8
sw	33	41	64	-8
θ	33	41	64	-8
pl	43	41	4	2
fl	43	41	4	2
nj	43	41	4	2
sk	43	41	4	2
spl	43	41	4	2
ʌ	43	41	4	2
	1431	1431	17718	0
	numerator	106305		
	denominator	148824		
	fractional part	0.71		
		0.29		

Appendix 8.9 Cross-Linguistic Group Child Frequency Correlation

	English Children	Finnish Children	D*D	D
	Aged 3 - Rank	Aged 3 - Rank		
Phoneme				
k	7.5	1	42.25	6.5
t	5.5	2	12.25	3.5
p	7.5	3	20.25	4.5
m	5.5	4	2.25	1.5
s	11	5	36	6
n	13.5	6	56.25	7.5
v	49.5	7	1806.3	42.5
l	13.5	8.5	25	5
o	57.5	8.5	2401	49
h	3	10	49	-7
r	10	11	1	-1
e	28	12.5	240.25	15.5
a	34	12.5	462.25	21.5
j	18	14	16	4
i	49.5	15	1190.3	34.5
y	57.5	16	1722.3	41.5
au	41.5	17	600.25	24.5
ar	24	18.5	30.25	5.5
ui	57.5	18.5	1521	39
tr	16	21	25	-5
eɪ	34	21	169	13
u	57.5	21	1332.3	36.5
f	9	23.5	210.25	-14.5
æi	57.5	23.5	1156	34
uu	57.5	25	1056.3	32.5
w	1	43	1764	-42
b	2	43	1681	-41
d	4	43	1521	-39
ð	12	43	961	-31
g	15	43	784	-28
æ	18	43	625	-25
ʃ	18	43	625	-25
dr	20.5	43	506.25	-22.5
ii	20.5	43	506.25	-22.5
st	24	43	361	-19

Appendix 8.9 Cross-Linguistic Group Child Frequency Correlation

	English Children	Finnish Children	D*D	D
	Aged 3 Continued	Aged 3 Continued		
Phoneme				
tʃ	24	43	361	-19
ə	24	43	361	-19
əʊ	24	43	361	-19
pl	28	43	225	-15
ɒ	28	43	225	-15
bl	34	43	81	-9
dʒ	34	43	81	-9
kl	34	43	81	-9
kr	34	43	81	-9
sl	34	43	81	-9
θ	34	43	81	-9
ʌ	34	43	81	-9
br	41.5	43	2.25	-1.5
gl	41.5	43	2.25	-1.5
sn	41.5	43	2.25	-1.5
sw	41.5	43	2.25	-1.5
ɔ	41.5	43	2.25	-1.5
fj	49.5	43	42.25	6.5
fr	49.5	43	42.25	6.5
gr	49.5	43	42.25	6.5
kw	49.5	43	42.25	6.5
nj	49.5	43	42.25	6.5
pr	49.5	43	42.25	6.5
sm	49.5	43	42.25	6.5
tj	49.5	43	42.25	6.5
	1830	1830	25967	0
	numerator	155799		
	denominator	215940		
	fractional part	0.72		
	rho	0.28		



Appendix 8.9 Cross-Linguistic Group Child Frequency Correlation

	English Children	Finnish Children		
	Aged 5 - Rank	Aged 5 - Rank	D*D	D
Phoneme				
t	9	1	64	8
k	10	2	64	8
p	6	3	9	3
s	5	4	1	1
m	3	5	4	-2
l	11	6	25	5
v	52	7	2025	45
o	69.5	8	3782.3	61.5
h	2	9	49	-7
a	38	10	784	28
n	13	11	4	2
j	19.5	12	56.25	7.5
i	38	13	625	25
r	7.5	14	42.25	-6.5
e	19.5	15	20.25	4.5
aʊ	52	16	1296	36
æ	26	18	64	8
u	69.5	18	2652.3	51.5
y	69.5	18	2652.3	51.5
aɪ	32.5	20	156.25	12.5
ææ	69.5	21	2352.3	48.5
eɪ	38	22	256	16
ee	69.5	24	2070.3	45.5
oi	69.5	24	2070.3	45.5
ui	69.5	24	2070.3	45.5
b	1	29.5	812.25	-28.5
st	19.5	29.5	100	-10
tr	22.5	29.5	49	-7
br	26	29.5	12.25	-3.5
pl	38	29.5	72.25	8.5
ou	69.5	29.5	1600	40
æi	69.5	29.5	1600	40
uu	69.5	29.5	1600	40
w	4	54	2500	-50
d	7.5	54	2162.3	-46.5

Appendix 8.9 Cross-Linguistic Group Child Frequency Correlation

	English Children	Finnish Children		
	Aged 5 - Continued	Aged 5 - Continued	D*D	D
Phoneme				
f	12	54	1764	-42
ð	14	54	1600	-40
g	15	54	1521	-39
dʒ	16.5	54	1406.3	-37.5
ʃ	16.5	54	1406.3	-37.5
ə	19.5	54	1190.3	-34.5
r	22.5	54	992.25	-31.5
fr	26	54	784	-28
θ	26	54	784	-28
ʌ	26	54	784	-28
dr	29.5	54	600.25	-24.5
əʊə	29.5	54	600.25	-24.5
fl	32.5	54	462.25	-21.5
pr	32.5	54	462.25	-21.5
skr	32.5	54	462.25	-21.5
kl	38	54	256	-16
ɔ	38	54	256	-16
əʊ	38	54	256	-16
gl	42.5	54	132.25	-11.5
tʃ	42.5	54	132.25	-11.5
eə	45	54	81	-9
sk	45	54	81	-9
ɒ	45	54	81	-9
aɪə	52	54	4	-2
ɪə	52	54	4	-2
kr	52	54	4	-2
kw	52	54	4	-2
skw	52	54	4	-2
sl	52	54	4	-2
str	52	54	4	-2
sw	52	54	4	-2
auə	52	54	4	-2
ʒ	61	54	49	7
bj	61	54	49	7
fj	61	54	49	7
gr	61	54	49	7

Appendix 8.9 Cross-Linguistic Group Child Frequency Correlation

	English Children	Finnish Children		
	Aged 5 - Continued	Aged 5 - Continued	D*D	D
Phoneme				
nj	61	54	49	7
tj	61	54	49	7
tw	61	54	49	7
	2775	2775	50177	0
	numerator	301059		
	denominator	388944		
	fractional part	0.77		
		0.23		



Appendix 8.10 Cross-Linguistic Group Child FUSE Correlation

	English Children	Finnish Children	D*D	D
	Aged 2 - Rank	Aged 2 - Rank		
Phoneme				
s	7	1	36	6
t	2	2.5	0.25	-0.5
m	4.5	2.5	4	2
p	12.5	4	72.25	8.5
n	12.5	5	56.25	7.5
k	4.5	6	2.25	-1.5
l	21.5	7.5	196	14
v	39	7.5	992.25	31.5
j	12.5	9	12.25	3.5
b	2	12.5	110.25	-10.5
r	12.5	12.5	0	0
e	21.5	12.5	81	9
ɪ	21.5	12.5	81	9
o	39	12.5	702.25	26.5
ɑɑ	39	12.5	702.25	26.5
h	2	28	676	-26
ð	7	28	441	-21
g	7	28	441	-21
aɪ	12.5	28	240.25	-15.5
f	12.5	28	240.25	-15.5
kl	12.5	28	240.25	-15.5
w	12.5	28	240.25	-15.5
br	21.5	28	42.25	-6.5
d	21.5	28	42.25	-6.5
dʒ	21.5	28	42.25	-6.5
st	21.5	28	42.25	-6.5
tʃ	21.5	28	42.25	-6.5
ɑ	21.5	28	42.25	-6.5
au	32	28	16	4
eɪ	32	28	16	4
i	32	28	16	4
nj	32	28	16	4
sw	32	28	16	4
tr	32	28	16	4

Appendix 8.10 Cross-Linguistic Group Child FUSE Correlation

	English Children	Finnish Children	D*D	D
	Aged 2 - Continued	Aged 2 - Continued		
Phoneme				
æ	32	28	16	4
ɒ	32	28	16	4
ə	32	28	16	4
əʊ	32	28	16	4
pl	21.5	28	42.25	-6.5
dr	32	28	16	4
	820	820	6039	0
	rho formula			
	numerator	36234		
	denominator	63960		
	fractional part	0.57		
	rho	0.43		

Appendix 8.10 Cross-Linguistic Group Child FUSE Correlation

	English Children	Finnish Children	D*D	D
	Aged 3 - Rank	Aged 3 - Rank		
Phoneme				
n	13.5	1	156.25	12.5
m	5	2	9	3
s	10	3.5	42.25	6.5
t	10	3.5	42.25	6.5
p	15.5	5.5	100	10
o	48	5.5	1806.25	42.5
j	13.5	11	6.25	2.5
r	15.5	11	20.25	4.5
ai	18.5	11	56.25	7.5
i	28	11	289	17
ei	38.5	11	756.25	27.5
e	48	11	1369	37
v	48	11	1369	37
uu	48	11	1369	37
ui	48	11	1369	37
w	1	33	1024	-32
b	2	33	961	-31
h	3	33	900	-30
ö	5	33	784	-28
d	5	33	784	-28
tr	7	33	676	-26
f	10	33	529	-23
g	10	33	529	-23
k	10	33	529	-23
dr	18.5	33	210.25	-14.5
l	18.5	33	210.25	-14.5
ʃ	18.5	33	210.25	-14.5
pl	22.5	33	110.25	-10.5
æ	22.5	33	110.25	-10.5
st	22.5	33	110.25	-10.5
tʃ	22.5	33	110.25	-10.5
kl	28	33	25	-5
sl	28	33	25	-5
a	28	33	25	-5



Appendix 8.10 Cross-Linguistic Group Child FUSE Correlation

	English Children	Finnish Children	D*D	D
	Aged 3 - Continued	Aged 3 - Continued		
Phoneme				
ɒ	28	33	25	-5
əʊ	28	33	25	-5
əʊə	28	33	25	-5
aʊ	38.5	33	30.25	5.5
br	38.5	33	30.25	5.5
dʒ	38.5	33	30.25	5.5
fj	38.5	33	30.25	5.5
fr	38.5	33	30.25	5.5
i	38.5	33	30.25	5.5
nj	38.5	33	30.25	5.5
pr	38.5	33	30.25	5.5
sm	38.5	33	30.25	5.5
sn	38.5	33	30.25	5.5
sw	38.5	33	30.25	5.5
ɔ	38.5	33	30.25	5.5
ə	38.5	33	30.25	5.5
	1275	1275	17091	0
	rho formula			
	numerator	102546		
	denominator	124950		
	fractional part	0.82		
	rho	0.18		

Appendix 8.10 Cross-Linguistic Group Child FUSE Correlation

	English Children	Finnish Children	D*D	D
Phoneme	Aged 5 - Rank	Aged 5 - Rank		
s	8	1	49	7
m	2.5	2	0.25	0.5
t	2.5	3	0.25	-0.5
n	12	4.5	56.25	7.5
v	56	4.5	2652.25	51.5
k	5.5	8	6.25	-2.5
p	12	8	16	4
l	14	8	36	6
j	16	8	64	8
o	64	8	3136	56
e	42.5	11	992.25	31.5
ai	19	14.5	20.25	4.5
i	24.5	14.5	100	10
a	42.5	14.5	784	28
au	56	14.5	1722.25	41.5
h	64	14.5	2450.25	49.5
uu	64	14.5	2450.25	49.5
b	1	41.5	1640.25	-40.5
h	4	41.5	1406.25	-37.5
w	5.5	41.5	1296	-36
r	7	41.5	1190.25	-34.5
ð	9.5	41.5	1024	-32
d	9.5	41.5	1024	-32
f	12	41.5	870.25	-29.5
g	16	41.5	650.25	-25.5
ʃ	16	41.5	650.25	-25.5
st	18	41.5	552.25	-23.5
θ	20.5	41.5	441	-21
tr	20.5	41.5	441	-21
br	24.5	41.5	289	-17
dʒ	24.5	41.5	289	-17
er	24.5	41.5	289	-17
pl	24.5	41.5	289	-17
əʊə	24.5	41.5	289	-17
dr	31.5	41.5	100	-10

Appendix 8.10 Cross-Linguistic Group Child FUSE Correlation

	English Children	Finnish Children	D*D	D
Phoneme	Aged 5 - Continued	Aged 5 - Continued		
fl	31.5	41.5	100	-10
fr	31.5	41.5	100	-10
kl	31.5	41.5	100	-10
sk	31.5	41.5	100	-10
skr	31.5	41.5	100	-10
æ	31.5	41.5	100	-10
ɒ	31.5	41.5	100	-10
auə	42.5	41.5	1	1
gl	42.5	41.5	1	1
i	42.5	41.5	1	1
kw	42.5	41.5	1	1
pr	42.5	41.5	1	1
skw	42.5	41.5	1	1
sp	42.5	41.5	1	1
tj	42.5	41.5	1	1
tʃ	42.5	41.5	1	1
ɔ	42.5	41.5	1	1
əʊ	42.5	41.5	1	1
ʌ	42.5	41.5	1	1
ʒ	56	41.5	210.25	14.5
arə	56	41.5	210.25	14.5
eə	56	41.5	210.25	14.5
fj	56	41.5	210.25	14.5
gr	56	41.5	210.25	14.5
ɪə	56	41.5	210.25	14.5
nj	56	41.5	210.25	14.5
sl	56	41.5	210.25	14.5
str	56	41.5	210.25	14.5
sw	56	41.5	210.25	14.5
ə	56	41.5	210.25	14.5
	2145	2145	30291	0
	numerator	181746		
	denominator	274560		
	fractional part	0.66		
	rho	0.34		



Appendix 8.11 English Adult to Finnish Child FUSE

Phoneme	English Adult Rank	Finnish Children Aged 2 - Rank	D*D	D
s	1	1	0	0
l	2	7.5	30.25	-5.5
f	3.5	46	1806.25	-42.5
w	3.5	46	1806.25	-42.5
t	5	2.5	6.25	2.5
m	6.5	2.5	16	4
b	6.5	12.5	36	-6
k	8	6	4	2
r	9	12.5	12.25	-3.5
p	10.5	4	42.25	6.5
h	10.5	46	1260.25	-35.5
d	12	46	1156	-34
st	13	46	1089	-33
ʃ	14	46	1024	-32
n	15	5	100	10
g	16	46	900	-30
tʃ	17	46	841	-29
dr	18	46	784	-28
tr	20	46	676	-26
pr	20	46	676	-26
sp	20	46	676	-26
j	22	9	169	13
br	23	46	529	-23
kl	24.5	46	462.25	-21.5
pl	24.5	46	462.25	-21.5
ð	26	46	400	-20
θ	27	46	361	-19
dʒ	29.5	46	272.25	-16.5
bl	29.5	46	272.25	-16.5
fl	29.5	46	272.25	-16.5
str	29.5	46	272.25	-16.5
kr	32.5	46	182.25	-13.5
sk	32.5	46	182.25	-13.5
fr	35.5	46	110.25	-10.5

Appendix 8.11 English Adult to Finnish Child FUSE

gr	35.5	46	110.25	-10.5
kw	35.5	46	110.25	-10.5
sl	35.5	46	110.25	-10.5
e	38.5	12.5	676	26
æ	38.5	46	56.25	-7.5
v	40.5	7.5	1089	33
ɪ	40.5	12.5	784	28
ə	42.5	46	12.25	-3.5
sm	42.5	46	12.25	-3.5
ai	44.5	46	2.25	-1.5
ɒ	44.5	46	2.25	-1.5
ei	46.5	46	0.25	0.5
ɑ	46.5	46	0.25	0.5
sw	52	46	36	6
əʊ	52	46	36	6
ʒ	52	46	36	6
gl	52	46	36	6
kj	52	46	36	6
skr	52	46	36	6
θr	52	46	36	6
tw	52	46	36	6
ɔ	52	46	36	6
dj	58.5	46	156.25	12.5
sn	58.5	46	156.25	12.5
spl	58.5	46	156.25	12.5
spr	58.5	46	156.25	12.5
nj	64.5	46	342.25	18.5
vj	64.5	46	342.25	18.5
auə	64.5	46	342.25	18.5
bj	64.5	46	342.25	18.5
fj	64.5	46	342.25	18.5
ɪə	64.5	46	342.25	18.5
tj	64.5	46	342.25	18.5
ʌ	64.5	46	342.25	18.5
au	71.5	46	650.25	25.5
i	71.5	46	650.25	25.5
pj	71.5	46	650.25	25.5

Appendix 8.11 English Adult to Finnish Child FUSE

skw	71.5	46	650.25	25.5
z	71.5	46	650.25	25.5
ɔɪ	71.5	46	650.25	25.5
ɑɑ	75.5	12.5	3969	63
o	75.5	12.5	3969	63
summing	2926	2926	35381	0
		numerator	212286	
		denominator	438900	
		fractional part	0.48	
			0.52	
<b>Phoneme</b>	<b>English Adult</b>	<b>Finnish Child</b>		
	<b>Rank</b>	<b>Aged 3</b>	<b>D*D</b>	<b>D</b>
s	1	3.5	6.25	-2.5
l	2	46.5	1980.25	-44.5
f	3.5	46.5	1849	-43
w	3.5	46.5	1849	-43
t	5	3.5	2.25	1.5
b	6.5	46.5	1600	-40
m	6.5	2	20.25	4.5
k	8	46.5	1482.25	-38.5
r	9	11	4	-2
h	10.5	46.5	1296	-36
p	10.5	5.5	25	5
d	12	46.5	1190.25	-34.5
st	13	46.5	1122.25	-33.5
ʃ	14	46.5	1056.25	-32.5
n	15	1	196	14
g	16	46.5	930.25	-30.5
tʃ	17	46.5	870.25	-29.5
dr	18	46.5	812.25	-28.5
pr	20	46.5	702.25	-26.5
sp	20	46.5	702.25	-26.5
tr	20	46.5	702.25	-26.5
j	22	11	121	11



Appendix 8.11 English Adult to Finnish Child FUSE

br	23	46.5	552.25	-23.5
kl	24.5	46.5	484	-22
pl	24.5	46.5	484	-22
ð	26	46.5	420.25	-20.5
θ	27	46.5	380.25	-19.5
bl	29.5	46.5	289	-17
dʒ	29.5	46.5	289	-17
fl	29.5	46.5	289	-17
str	29.5	46.5	289	-17
kr	32.5	46.5	196	-14
sk	32.5	46.5	196	-14
fr	35.5	46.5	121	-11
gr	35.5	46.5	121	-11
kw	35.5	46.5	121	-11
sl	35.5	46.5	121	-11
e	38.5	11	756.25	27.5
æ	38.5	46.5	64	-8
ɪ	40.5	11	870.25	29.5
v	40.5	11	870.25	29.5
sm	42.5	46.5	16	-4
ə	42.5	46.5	16	-4
aɪ	44.5	11	1122.25	33.5
ɒ	44.5	46.5	4	-2
eɪ	46.5	11	1260.25	35.5
ɑ	46.5	46.5	0	0
ʒ	52	46.5	30.25	5.5
gl	52	46.5	30.25	5.5
kj	52	46.5	30.25	5.5
skr	52	46.5	30.25	5.5
sw	52	46.5	30.25	5.5
θr	52	46.5	30.25	5.5
tw	52	46.5	30.25	5.5
ɔ	52	46.5	30.25	5.5
əʊ	52	46.5	30.25	5.5
dʒ	58.5	46.5	144	12
sn	58.5	46.5	144	12
spl	58.5	46.5	144	12

Appendix 8.11 English Adult to Finnish Child FUSE

spr	58.5	46.5	144	12
vj	64.5	46.5	324	18
auə	64.5	46.5	324	18
bj	64.5	46.5	324	18
fj	64.5	46.5	324	18
rə	64.5	46.5	324	18
nj	64.5	46.5	324	18
tj	64.5	46.5	324	18
ʌ	64.5	46.5	324	18
au	71.5	46.5	625	25
i	71.5	46.5	625	25
pj	71.5	46.5	625	25
skw	71.5	46.5	625	25
z	71.5	46.5	625	25
ɔɪ	71.5	46.5	625	25
o	76	5.5	4970.25	70.5
ui	76	11	4225	65
uu	76	11	4225	65
summing	3003	3003	48462	0
		numerator	290772	
		denominator	456456	
		fractional part	0.64	
			0.36	
<b>Phoneme</b>	<b>English Adult</b>	<b>Finnish Children</b>		
	<b>Rank</b>	<b>Aged 5</b>	<b>D*D</b>	<b>D</b>
s	1	1	0	0
m	6.5	2	20.25	4.5
t	5	3	4	2
n	15	4.5	110.25	10.5
v	40.5	4.5	1296	36
l	2	8	36	-6
k	8	8	0	0
p	10.5	8	6.25	2.5
j	22	8	196	14

Appendix 8.11 English Adult to Finnish Child FUSE

o	75.5	8	4556.25	67.5
e	38.5	11	756.25	27.5
h	10.5	14.5	16	-4
i	40.5	14.5	676	26
ai	44.5	14.5	900	30
a	46.5	14.5	1024	32
au	71.5	14.5	3249	57
uu	75.5	14.5	3721	61
f	3.5	47	1892.25	-43.5
w	3.5	47	1892.25	-43.5
b	6.5	47	1640.25	-40.5
r	9	47	1444	-38
d	12	47	1225	-35
st	13	47	1156	-34
ʃ	14	47	1089	-33
g	16	47	961	-31
tʃ	17	47	900	-30
dr	18	47	841	-29
pr	20	47	729	-27
sp	20	47	729	-27
tr	20	47	729	-27
br	23	47	576	-24
kl	24.5	47	506.25	-22.5
pl	24.5	47	506.25	-22.5
ð	26	47	441	-21
θ	27	47	400	-20
bl	29.5	47	306.25	-17.5
dʒ	29.5	47	306.25	-17.5
fl	29.5	47	306.25	-17.5
str	29.5	47	306.25	-17.5
kr	32.5	47	210.25	-14.5
sk	32.5	47	210.25	-14.5
fr	35.5	47	132.25	-11.5
gr	35.5	47	132.25	-11.5
kw	35.5	47	132.25	-11.5
sl	35.5	47	132.25	-11.5
æ	38.5	47	72.25	-8.5



Appendix 8.11 English Adult to Finnish Child FUSE

sm	42.5	47	20.25	-4.5
ə	42.5	47	20.25	-4.5
ɒ	44.5	47	6.25	-2.5
eɪ	46.5	47	0.25	-0.5
ʒ	52	47	25	5
gl	52	47	25	5
kj	52	47	25	5
skr	52	47	25	5
sw	52	47	25	5
θr	52	47	25	5
tw	52	47	25	5
ɔ	52	47	25	5
əʊ	52	47	25	5
dj	58.5	47	132.25	11.5
sn	58.5	47	132.25	11.5
spl	58.5	47	132.25	11.5
spr	58.5	47	132.25	11.5
vj	64.5	47	306.25	17.5
auə	64.5	47	306.25	17.5
bj	64.5	47	306.25	17.5
fj	64.5	47	306.25	17.5
ɪə	64.5	47	306.25	17.5
nj	64.5	47	306.25	17.5
tj	64.5	47	306.25	17.5
ʌ	64.5	47	306.25	17.5
i	71.5	47	600.25	24.5
pj	71.5	47	600.25	24.5
skw	71.5	47	600.25	24.5
z	71.5	47	600.25	24.5
ɔɪ	71.5	47	600.25	24.5
summing	2926	2926	42723.5	0
		numerator	256341	
		denominator	438900	
		fractional part	0.58	
			0.42	

Appendix 8.12 English Adult to Finnish Child Frequency

	English Adult	Finnish Child	D*D	D
	Freq. Rank	Freq. Aged 2		
Phoneme				
k	1	3	4	-2
s	2	5	9	-3
r	3	12	81	-9
r	4	14	100	-10
d	5	57	2704	-52
f	6	27	441	-21
m	7	4	9	3
p	8	1	49	7
ə	9	57	2304	-48
b	10	20.5	110.25	-10.5
l	11	6	25	5
w	12	57	2025	-45
t	13	2	121	11
h	14	13	1	1
pr	15	57	1764	-42
n	16	7	81	9
æ	17.5	24	42.25	-6.5
st	17.5	57	1560.25	-39.5
e	19	15	16	4
g	20	57	1369	-37
ʃ	21	57	1296	-36
tr	22	24	4	-2
tʃ	23	57	1156	-34
v	24	8	256	16
dʒ	25	57	1024	-32
j	26	11	225	15
ɔ	27.5	57	870.25	-29.5
ʌ	27.5	57	870.25	-29.5
dr	29.5	57	756.25	-27.5
ɒ	29.5	57	756.25	-27.5
ɑ	31	10	441	21
kl	32	57	625	-25
kr	33	57	576	-24
sp	34	57	529	-23

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Appendix 8.12 English Adult to Finnish Child Frequency

sn	70.5	57	182.25	13.5
spl	70.5	57	182.25	13.5
vj	75	57	324	18
rə	75	57	324	18
ɔɪ	75	57	324	18
lj	78	57	441	21
pj	78	57	441	21
skw	78	57	441	21
o	82.5	9	5402.25	73.5
ɑɑ	82.5	17	4290.25	65.5
u	82.5	17	4290.25	65.5
æi	82.5	20.5	3844	62
y	82.5	20.5	3844	62
uu	82.5	27	3080.25	55.5
	3655	3655	57049.5	0
		numerator	342297	
		denominator	614040	
		fractional part	0.56	
			0.44	
<b>Phoneme</b>	<b>English Adult</b>	<b>Finnish Child</b>	<b>D*D</b>	<b>D</b>
	<b>Freq. Rank</b>	<b>Freq. Aged 3</b>		
k	1	1	0	0
s	2	5	9	-3
ɪ	3	54	2601	-51
r	4	11	49	-7
d	5	54	2401	-49
f	6	23.5	306.25	-17.5
m	7	4	9	3
p	8	3	25	5
ə	9	54	2025	-45
b	10	54	1936	-44
l	11	8.5	6.25	2.5
w	12	54	1764	-42
t	13	2	121	11

Appendix 8.12 English Adult to Finnish Child Frequency

h	14	10	16	4
pr	15	54	1521	-39
n	16	6	100	10
æ	17.5	54	1332.25	-36.5
st	17.5	54	1332.25	-36.5
e	19	12.5	42.25	6.5
g	20	54	1156	-34
ʃ	21	54	1089	-33
tr	22	21	1	1
tʃ	23	54	961	-31
v	24	7	289	17
dʒ	25	54	841	-29
j	26	14	144	12
ɔ	27.5	54	702.25	-26.5
ʌ	27.5	54	702.25	-26.5
dr	29.5	54	600.25	-24.5
ɒ	29.5	54	600.25	-24.5
ɑ	31	12.5	342.25	18.5
kl	32	54	484	-22
kr	33	54	441	-21
sp	34	54	400	-20
θ	35	54	361	-19
gr	36	54	324	-18
br	37	54	289	-17
str	38	54	256	-16
fl	39.5	54	210.25	-14.5
pl	39.5	54	210.25	-14.5
er	42	21	441	21
bl	42	54	144	-12
sk	42	54	144	-12
ð	44.5	54	90.25	-9.5
kw	44.5	54	90.25	-9.5
i	46	15	961	31
aɪ	47.5	18.5	841	29
əʊ	47.5	54	42.25	-6.5
sl	49	54	25	-5
fr	50	54	16	-4

Appendix 8.12 English Adult to Finnish Child Frequency

sm	51	54	9	-3
3	52.5	54	2.25	-1.5
tw	52.5	54	2.25	-1.5
dj	54.5	54	0.25	0.5
kj	54.5	54	0.25	0.5
au	57	17	1600	40
skr	57	54	9	3
tj	57	54	9	3
eə	59	54	25	5
fj	63.5	54	90.25	9.5
gl	63.5	54	90.25	9.5
nj	63.5	54	90.25	9.5
spr	63.5	54	90.25	9.5
stj	63.5	54	90.25	9.5
sw	63.5	54	90.25	9.5
θr	63.5	54	90.25	9.5
z	63.5	54	90.25	9.5
auə	70.5	54	272.25	16.5
bj	70.5	54	272.25	16.5
hj	70.5	54	272.25	16.5
mj	70.5	54	272.25	16.5
sn	70.5	54	272.25	16.5
spl	70.5	54	272.25	16.5
vj	75	54	441	21
ɪə	75	54	441	21
ɔɪ	75	54	441	21
o	79.5	8.5	5041	71
y	79.5	16	4032.25	63.5
ui	79.5	18.5	3721	61
u	79.5	21	3422.25	58.5
æi	79.5	23.5	3136	56
uu	79.5	25	2970.25	54.5
	3403	3403	56453	0
			338718	
			551286	
			0.61	
			0.39	



Appendix 8.12 English Adult to Finnish Child Frequency

Phoneme	English Adult	Finnish Child	D*D	D
	Freq. Rank	Freq. Aged 5		
k	1	2	1	-1
s	2	4	4	-2
ɪ	3	62	3481	-59
r	4	14	100	-10
d	5	62	3249	-57
f	6	62	3136	-56
m	7	5	4	2
p	8	3	25	5
ə	9	62	2809	-53
b	10	29.5	380.25	-19.5
l	11	6	25	5
w	12	62	2500	-50
t	13	1	144	12
h	14	9	25	5
pr	15	62	2209	-47
n	16	11	25	5
st	17.5	29.5	144	-12
æ	17.5	62	1980.25	-44.5
e	19	15	16	4
g	20	62	1764	-42
ʃ	21	62	1681	-41
tr	22	29.5	56.25	-7.5
tʃ	23	62	1521	-39
v	24	7	289	17
dʒ	25	62	1369	-37
j	26	12	196	14
ɔ	27.5	62	1190.25	-34.5
ʌ	27.5	62	1190.25	-34.5
dr	29.5	62	1056.25	-32.5
ɒ	29.5	62	1056.25	-32.5
ɑ	31	10	441	21
kl	32	62	900	-30
kr	33	62	841	-29
sp	34	62	784	-28

Appendix 8.12 English Adult to Finnish Child Frequency

θ	35	62	729	-27
gr	36	62	676	-26
br	37	29.5	56.25	7.5
str	38	62	576	-24
pl	39.5	29.5	100	10
fl	39.5	62	506.25	-22.5
er	42	22	400	20
bl	42	62	400	-20
sk	42	62	400	-20
ð	44.5	62	306.25	-17.5
kw	44.5	62	306.25	-17.5
i	46	13	1089	33
ar	47.5	20	756.25	27.5
əʊ	47.5	62	210.25	-14.5
sl	49	62	169	-13
fr	50	62	144	-12
sm	51	62	121	-11
ʒ	52.5	62	90.25	-9.5
tw	52.5	62	90.25	-9.5
dj	54.5	62	56.25	-7.5
kj	54.5	62	56.25	-7.5
au	57	16	1681	41
skr	57	62	25	-5
tj	57	62	25	-5
eə	59	62	9	-3
fj	63.5	62	2.25	1.5
gl	63.5	62	2.25	1.5
nj	63.5	62	2.25	1.5
spr	63.5	62	2.25	1.5
stj	63.5	62	2.25	1.5
sw	63.5	62	2.25	1.5
θr	63.5	62	2.25	1.5
z	63.5	62	2.25	1.5
auə	70.5	62	72.25	8.5
bj	70.5	62	72.25	8.5
hj	70.5	62	72.25	8.5
mj	70.5	62	72.25	8.5

Appendix 8.12 English Adult to Finnish Child Frequency

sn	70.5	62	72.25	8.5
spl	70.5	62	72.25	8.5
vj	75	62	169	13
ɪə	75	62	169	13
ɔɪ	75	62	169	13
lj	78	62	256	16
pj	78	62	256	16
skw	78	62	256	16
o	85	8	5929	77
u	85	18	4489	67
y	85	18	4489	67
æ	85	18	4489	67
ææ	85	21	4096	64
ee	85	24	3721	61
oi	85	24	3721	61
ui	85	24	3721	61
uu	85	29.5	3080.25	55.5
æi	85	29.5	3080.25	55.5
ou	85	29.5	3080.25	55.5
	4095	4095	89193.5	0
			535161	
			728910	
			0.73	
			0.27	



## Appendix 8.13 Finnish Adult to English Child FUSE

	Finnish Adult	English Children	D*D	D
		Aged 2 - Rank		
Phoneme				
t	3	2	1	1
h	9	2	49	7
b	30	2	784	28
m	2	4.5	6.25	-2.5
k	4	4.5	0.25	-0.5
s	1	7	36	-6
g	26.5	7	380.25	19.5
ð	53	7	2116	46
n	5	12.5	56.25	-7.5
j	7	12.5	30.25	-5.5
p	8	12.5	20.25	-4.5
r	14	12.5	2.25	1.5
ai	23	12.5	110.25	10.5
f	41.5	12.5	841	29
kl	41.5	12.5	841	29
w	53	12.5	1640.25	40.5
l	10	21.5	132.25	-11.5
e	13	21.5	72.25	-8.5
a	15	21.5	42.25	-6.5
d	30	21.5	72.25	8.5
st	34.5	21.5	169	13
br	41.5	21.5	400	20
r	41.5	21.5	400	20
dʒ	53	21.5	992.25	31.5
pl	53	21.5	992.25	31.5
tʃ	53	21.5	992.25	31.5
eɪ	17	32	225	-15
i	19	32	169	-13
au	21.5	32	110.25	-10.5
dr	53	32	441	21
nj	53	32	441	21
sw	53	32	441	21
tr	53	32	441	21
æ	53	32	441	21

Appendix 8.13 Finnish Adult to English Child FUSE

	Finnish Adult	English Children	D*D	D
		Aged 2 - Rank		
Phoneme				
ɒ	53	32	441	21
ə	53	32	441	21
əʊ	53	32	441	21
v	6	48.5	1806.25	-42.5
o	11	48.5	1406.25	-37.5
ɑɑ	30	48.5	342.25	-18.5
ts	12	48.5	1332.25	-36.5
oo	16	48.5	1056.25	-32.5
ee	19	48.5	870.25	-29.5
uu	19	48.5	870.25	-29.5
y	21.5	48.5	729	-27
u	24.5	48.5	576	-24
yœ	24.5	48.5	576	-24
oi	26.5	48.5	484	-22
ou	30	48.5	342.25	-18.5
ui	30	48.5	342.25	-18.5
aio	34.5	48.5	196	-14
iaæ	34.5	48.5	196	-14
pr	34.5	48.5	196	-14
fr	41.5	48.5	49	-7
æ	41.5	48.5	49	-7
ææ	41.5	48.5	49	-7
sk	41.5	48.5	49	-7
sv	41.5	48.5	49	-7
yy	41.5	48.5	49	-7
	1770	1770	26826.5	0
			160959	
			205320	
			0.783942	
			0.22	

Appendix 8.13 Finnish Adult to English Child FUSE

	Finnish Adult	English Children	D*D	D
		Aged 3 - Rank		
Phoneme				
s	1	10	81	-9
m	2	5	9	-3
t	3	10	49	-7
k	4	10	36	-6
n	5	13.5	72.25	-8.5
v	6	55.5	2450.25	-49.5
j	7	13.5	42.25	-6.5
p	8	15.5	56.25	-7.5
h	9	3	36	6
l	10	18.5	72.25	-8.5
o	11	55.5	1980.25	-44.5
ts	12	55.5	1892.25	-43.5
e	13	55.5	1806.25	-42.5
r	14	15.5	2.25	-1.5
a	15	28	169	-13
oo	16	55.5	1560.25	-39.5
er	17	38.5	462.25	-21.5
i	19	38.5	380.25	-19.5
ee	19	55.5	1332.25	-36.5
uu	19	55.5	1332.25	-36.5
au	21.5	38.5	289	-17
y	21.5	55.5	1156	-34
ai	23	18.5	20.25	4.5
u	24.5	55.5	961	-31
yœ	24.5	55.5	961	-31
g	26.5	10	272.25	16.5
oi	26.5	55.5	841	-29
b	30	2	784	28
d	30	5	625	25
aa	30	55.5	650.25	-25.5
ou	30	55.5	650.25	-25.5
ui	30	55.5	650.25	-25.5
st	34.5	22.5	144	12
pr	34.5	38.5	16	-4



Appendix 8.13 Finnish Adult to English Child FUSE

	Finnish Adult	English Children	D*D	D
Phoneme		Aged 3 - Rank		
cio	34.5	55.5	441	-21
iæ	34.5	55.5	441	-21
f	41.5	10	992.25	31.5
æ	41.5	22.5	361	19
r	41.5	28	182.25	13.5
kl	41.5	28	182.25	13.5
br	41.5	38.5	9	3
fr	41.5	38.5	9	3
sk	41.5	55.5	196	-14
ææ	41.5	55.5	196	-14
sv	41.5	55.5	196	-14
yy	41.5	55.5	196	-14
w	56	1	3025	55
ð	56	5	2601	51
tr	56	7	2401	49
dr	56	18.5	1406.25	37.5
ʃ	56	18.5	1406.25	37.5
pl	56	22.5	1122.25	33.5
tʃ	56	22.5	1122.25	33.5
ɒ	56	28	784	28
sl	56	28	784	28
əʊə	56	28	784	28
əʊ	56	28	784	28
dʒ	56	38.5	306.25	17.5
nj	56	38.5	306.25	17.5
sw	56	38.5	306.25	17.5
ə	56	38.5	306.25	17.5
fj	56	38.5	306.25	17.5
sm	56	38.5	306.25	17.5
sn	56	38.5	306.25	17.5
ɔ	56	38.5	306.25	17.5
	2145	2145	43913.5	0
			263481	
			274560	
			0.959648	
			0.04	

Appendix 8.13 Finnish Adult to English Child FUSE

	Finnish Adult	English Children	D*D	D
		Aged 5 - Rank		
Phoneme				
s	1	8	49	-7
m	2	2.5	0.25	-0.5
t	3	2.5	0.25	0.5
k	4	5.5	2.25	-1.5
n	5	12	49	-7
v	6	56	2500	-50
j	7	16	81	-9
p	8	12	16	-4
h	9	4	25	5
l	10	14	16	-4
o	11	71.5	3660.25	-60.5
ts	12	71.5	3540.25	-59.5
e	13	42.5	870.25	-29.5
r	14	7	49	7
a	15	42.5	756.25	-27.5
oo	16	71.5	3080.25	-55.5
er	17	24.5	56.25	-7.5
i	19	42.5	552.25	-23.5
ee	19	71.5	2756.25	-52.5
uu	19	71.5	2756.25	-52.5
au	21.5	56	1190.25	-34.5
y	21.5	71.5	2500	-50
ar	23	19	16	4
u	24.5	71.5	2209	-47
yœ	24.5	71.5	2209	-47
g	26.5	16	110.25	10.5
oi	26.5	71.5	2025	-45
b	30	1	841	29
d	30	9.5	420.25	20.5
aa	30	71.5	1722.25	-41.5
ou	30	71.5	1722.25	-41.5
ui	30	71.5	1722.25	-41.5
st	34.5	18	272.25	16.5
pr	34.5	42.5	64	-8



Appendix 8.13 Finnish Adult to English Child FUSE

	Finnish Adult	English Children	D*D	D
		Aged 5 - Rank		
Phoneme				
aio	34.5	71.5	1369	-37
iaē	34.5	71.5	1369	-37
f	41.5	12	870.25	29.5
br	41.5	24.5	289	17
r	41.5	24.5	289	17
kl	41.5	31.5	100	10
æ	41.5	31.5	100	10
sk	41.5	31.5	100	10
fr	41.5	71.5	900	-30
ææ	41.5	71.5	900	-30
sv	41.5	71.5	900	-30
yy	41.5	71.5	900	-30
w	63.5	5.5	3364	58
ð	63.5	9.5	2916	54
ʃ	63.5	16	2256.25	47.5
θ	63.5	20.5	1849	43
tr	63.5	20.5	1849	43
dʒ	63.5	24.5	1521	39
pl	63.5	24.5	1521	39
əʊə	63.5	24.5	1521	39
dr	63.5	31.5	1024	32
fl	63.5	31.5	1024	32
fr	63.5	31.5	1024	32
skr	63.5	31.5	1024	32
ɒ	63.5	31.5	1024	32
tʃ	63.5	42.5	441	21
auə	63.5	42.5	441	21
gl	63.5	42.5	441	21
kw	63.5	42.5	441	21
skw	63.5	42.5	441	21
sp	63.5	42.5	441	21
tj	63.5	42.5	441	21
ɔ	63.5	42.5	441	21
əʊ	63.5	42.5	441	21



Appendix 8.13 Finnish Adult to English Child FUSE

	Finnish Adult	English Children	D*D	D
		Aged 5 - Rank		
Phoneme				
ʌ	63.5	42.5	441	21
aɪə	63.5	56	56.25	7.5
eə	63.5	56	56.25	7.5
gr	63.5	56	56.25	7.5
nj	63.5	56	56.25	7.5
sw	63.5	56	56.25	7.5
ɪə	63.5	56	56.25	7.5
fj	63.5	56	56.25	7.5
sl	63.5	56	56.25	7.5
str	63.5	56	56.25	7.5
ə	63.5	56	56.25	7.5
'3	63.5	56	56.25	7.5
	3240	3240	72872	0
			437232	
			511920	
			0.85	
			0.15	

Appendix 8.14 Finnish Adult to English Child Frequency

	Finnish Adult	English Children -		
	Rank	Aged 2 Rank	D*D	D
Phoneme				
b	25	1	576	24
h	9	2	49	7
k	1	3	4	-2
m	4	4	0	0
w	66	5	3721	61
t	2	7	25	-5
s	3	7	16	-4
d	31	7	576	24
p	5	9	16	-4
n	8	10.5	6.25	-2.5
r	14	10.5	12.25	3.5
g	34.5	12.5	484	22
dʒ	66	12.5	2862.25	53.5
ð	66	14	2704	52
ai	17	16	1	1
f	26	16	100	10
kr	36.5	16	420.25	20.5
l	7	20.5	182.25	-13.5
j	10	20.5	110.25	-10.5
a	13	20.5	56.25	-7.5
kl	38.5	20.5	324	18
ɪ	46.5	20.5	676	26
ə	66	20.5	2070.25	45.5
br	46.5	25	462.25	21.5
tr	55	25	900	30
tʃ	66	25	1681	41
e	12	33	441	-21
i	15	33	324	-18
ei	20	33	169	-13
æ	30	33	9	-3
st	32.5	33	0.25	-0.5
dr	55	33	484	22
ɒ	66	33	1089	33
ɔ	66	33	1089	33

Appendix 8.14 Finnish Adult to English Child Frequency

	Finnish Adult	English Children -		
	Rank	Aged 2 Rank	D*D	D
Phoneme				
əʊ	66	33	1089	33
ʃ	66	33	1089	33
sp	66	33	1089	33
sw	66	33	1089	33
θ	66	33	1089	33
au	24	43	361	-19
sk	46.5	43	12.25	3.5
fl	55	43	144	12
pl	55	43	144	12
ŋj	66	43	529	23
ʌ	66	43	529	23
spl	66	43	529	23
v	6	60	2916	-54
o	11	60	2401	-49
y	16	60	1936	-44
u	18	60	1764	-42
oi	19	60	1681	-41
ts	21	60	1521	-39
oo	22	60	1444	-38
uu	23	60	1369	-37
ɑɑ	27	60	1089	-33
æi	28.5	60	992.25	-31.5
yœ	28.5	60	992.25	-31.5
ui	32.5	60	756.25	-27.5
ææ	34.5	60	650.25	-25.5
pr	36.5	60	552.25	-23.5
ee	38.5	60	462.25	-21.5
ou	40	60	400	-20
iæ	41	60	361	-19
ɑio	46.5	60	182.25	-13.5
fr	46.5	60	182.25	-13.5
gr	46.5	60	182.25	-13.5
skr	46.5	60	182.25	-13.5
sv	46.5	60	182.25	-13.5



Appendix 8.14 Finnish Adult to English Child Frequency

	Finnish Adult	English Children -		
	Rank	Aged 2 Rank	D*D	D
Phoneme				
sl	55	60	25	-5
œ	55	60	25	-5
			2553	2521
				51582.5
		numerator	309495	
		denominator	388944	
		fractional part	0.80	
			0.20	
	Finnish Adult	English Child		
		Aged 3	D*D	D
Phoneme				
k	1	7.5	42.25	-6.5
t	2	5.5	12.25	-3.5
s	3	11	64	-8
m	4	5.5	2.25	-1.5
p	5	7.5	6.25	-2.5
v	6	49.5	1892.25	-43.5
l	7	13.5	42.25	-6.5
n	8	13.5	30.25	-5.5
h	9	3	36	6
j	10	18	64	-8
o	11	67	3136	-56
e	12	28	256	-16
a	13	67	2916	-54
r	14	10	16	4
i	15	49.5	1190.25	-34.5
y	16	67	2601	-51
ai	17	24	49	-7
u	18	67	2401	-49
oi	19	67	2304	-48
ei	20	34	196	-14
ts	21	67	2116	-46

Appendix 8.14 Finnish Adult to English Child Frequency

	Finnish Adult	English Child		
		Aged 3	D*D	D
Phoneme				
oo	22	67	2025	-45
uu	23	67	1936	-44
au	24	41.5	306.25	-17.5
b	25	2	529	23
f	26	9	289	17
aa	27	67	1600	-40
æi	28.5	67	1482.25	-38.5
yœ	28.5	67	1482.25	-38.5
æ	30	18	144	12
d	31	4	729	27
st	32.5	24	72.25	8.5
ui	32.5	67	1190.25	-34.5
g	34.5	15	380.25	19.5
ææ	34.5	67	1056.25	-32.5
kr	36.5	34	6.25	2.5
pr	36.5	49.5	169	-13
kl	38.5	34	20.25	4.5
ee	38.5	67	812.25	-28.5
ou	40	67	729	-27
iæ	41	67	676	-26
r	46.5	20.5	676	26
br	46.5	41.5	25	5
fr	46.5	49.5	9	-3
gr	46.5	49.5	9	-3
aio	46.5	67	420.25	-20.5
sk	46.5	67	420.25	-20.5
skr	46.5	67	420.25	-20.5
sv	46.5	67	420.25	-20.5
yy	46.5	67	420.25	-20.5
eu	46.5	67	420.25	-20.5
dr	55	20.5	1190.25	34.5
pl	55	28	729	27
sl	55	34	441	21
gl	55	41.5	182.25	13.5

Appendix 8.14 Finnish Adult to English Child Frequency

	Finnish Adult	English Child		
		Aged 3	D*D	D
Phoneme				
fl	55	67	144	-12
tr	55	67	144	-12
œ	55	67	144	-12
w	69	1	4624	68
ð	69	12	3249	57
ʃ	69	18	2601	51
tʃ	69	24	2025	45
ə	69	24	2025	45
əʊ	69	24	2025	45
ɒ	69	28	1681	41
dʒ	69	34	1225	35
θ	69	34	1225	35
ʌ	69	34	1225	35
sw	69	41.5	756.25	27.5
ɔ	69	41.5	756.25	27.5
nj	69	49.5	380.25	19.5
tr	69	16	2809	53
bl	69	34	1225	35
a	69	34	1225	35
sn	69	41.5	756.25	27.5
fj	69	49.5	380.25	19.5
kw	69	49.5	380.25	19.5
sm	69	49.5	380.25	19.5
tj	69	49.5	380.25	19.5
	3160	3160	72556.5	0
		numerator	435339	
		demominator	492960	
		fractional part	0.88	
			0.12	



Appendix 8.14 Finnish Adult to English Child Frequency

Phoneme	Finnish Adult	English Child		
		Aged 5	D*D	D
k	1	10	81	-9
t	2	9	49	-7
s	3	5	4	-2
m	4	3	1	1
p	5	6	1	-1
v	6	52	2116	-46
l	7	11	16	-4
n	8	13	25	-5
h	9	2	49	7
j	10	19.5	90.25	-9.5
o	11	76.5	4290.25	-65.5
e	12	19.5	56.25	-7.5
a	13	38	625	-25
r	14	7.5	42.25	6.5
i	15	38	529	-23
y	16	76.5	3660.25	-60.5
ai	17	32.5	240.25	-15.5
u	18	76.5	3422.25	-58.5
oi	19	76.5	3306.25	-57.5
ei	20	38	324	-18
ts	21	76.5	3080.25	-55.5
oo	22	76.5	2970.25	-54.5
uu	23	76.5	2862.25	-53.5
au	24	76.5	2756.25	-52.5
b	25	1	576	24
f	26	12	196	14
aa	27	76.5	2450.25	-49.5
æi	28.5	76.5	2304	-48
yœ	28.5	76.5	2304	-48
æ	30	76.5	2162.25	-46.5
d	31	7.5	552.25	23.5
st	32.5	19.5	169	13
ui	32.5	76.5	1936	-44
g	34.5	15	380.25	19.5

Appendix 8.14 Finnish Adult to English Child Frequency

Phoneme	Finnish Adult	English Child		
		Aged 5	D*D	D
ææ	34.5	76.5	1764	-42
pr	36.5	32.5	16	4
kr	36.5	52	240.25	-15.5
kl	38.5	38	0.25	0.5
ee	38.5	76.5	1444	-38
ou	40	76.5	1332.25	-36.5
iæ	41	76.5	1260.25	-35.5
i	46.5	22.5	576	24
br	46.5	26	420.25	20.5
fr	46.5	26	420.25	20.5
skr	46.5	32.5	196	14
sk	46.5	45	2.25	1.5
gr	46.5	61	210.25	-14.5
cio	46.5	76.5	900	-30
sv	46.5	76.5	900	-30
yy	46.5	76.5	900	-30
eu	46.5	76.5	900	-30
fl	55	32.5	506.25	22.5
pl	55	38	289	17
gl	55	42.5	156.25	12.5
sl	55	52	9	3
dr	55	76.5	462.25	-21.5
tr	55	76.5	462.25	-21.5
œ	55	76.5	462.25	-21.5
w	73.5	4	4830.25	69.5
ð	73.5	14	3540.25	59.5
ʃ	73.5	16.5	3249	57
dʒ	73.5	16.5	3249	57
ə	73.5	19.5	2916	54
tr	73.5	22.5	2601	51
æ	73.5	26	2256.25	47.5
θ	73.5	26	2256.25	47.5
ʌ	73.5	26	2256.25	47.5
dr	73.5	29.5	1936	44

Appendix 8.14 Finnish Adult to English Child Frequency

Phoneme	Finnish Adult	English Child		
		Aged 5	D*D	D
əʊə	73.5	29.5	1936	44
ɔ	73.5	38	1260.25	35.5
əʊ	73.5	38	1260.25	35.5
tʃ	73.5	42.5	961	31
eə	73.5	45	812.25	28.5
ɒ	73.5	45	812.25	28.5
aɪə	73.5	52	462.25	21.5
ɪə	73.5	52	462.25	21.5
au	73.5	52	462.25	21.5
auə	73.5	52	462.25	21.5
kw	73.5	52	462.25	21.5
skw	73.5	52	462.25	21.5
str	73.5	52	462.25	21.5
sw	73.5	52	462.25	21.5
ʒ	73.5	61	156.25	12.5
bj	73.5	61	156.25	12.5
fj	73.5	61	156.25	12.5
nj	73.5	61	156.25	12.5
tj	73.5	61	156.25	12.5
tw	73.5	61	156.25	12.5
	3916	3916	98224	0
		numerator	589344	
		denominator	681384	
		fractional part	0.86	
			0.14	



Appendix 9.1 - Individual English Child Words

Ben's Most Frequent Words					
Aged 2		Aged 3		Aged 5	
Frequency	Word	Frequency	Word	Frequency	Word
20	a	36	I	17	I
16	I'm	19	you	17	it
15	my	18	it	13	can
13	want	16	mummy	13	the
12	I	15	in	13	you
11	mummy	14	want	12	look
9	it	12	the	11	a
9	beer	11	can	11	and
8	you	11	on	10	like
8	cars	11	there	10	to
7	that	10	do	9	mummy
7	racing	10	to	9	they
7	its	9	a	8	can't
7	down	9	and	8	is
6	not	8	go	8	them
6	jumping	7	i'm	8	what
5	have	7	is	8	yes
5	chair	6	get	6	do
5	birthday	5	can't	6	don't
4	sweet	5	four	6	got
4	play	5	like	6	i'm
4	oh	5	not	6	my
4	now	5	one	6	on
4	is	5	reverse	6	up
4	car	5	see	5	have
3	yes	5	they	5	lemon
3	whats	5	this	5	some
3	up	5	up	5	that
3	to	4	bend	5	trousers
3	off	4	my	4	he
3	mum	4	now	4	in
3	hurt	4	own	4	it's
3	happy	4	play	4	me
3	gargoyle	4	that	4	please
3	cakes	4	will	4	straight
3	bit	3	car	4	that's
3	because	3	come	4	there
2	yeh	3	did	4	why

Appendix 9.1 - Individual English Child Words

Betty's Most Frequent Words					
Aged 2		Aged 3		Aged 5	
Frequency	Word	Frequency	Word	Frequency	Word
20	mummy	26	you	42	I
18	betty	20	I	28	you
13	no	18	want	23	it
12	oh	12	in	21	the
11	see	12	my	20	mummy
9	joanne	8	i'm	18	a
9	saw	8	the	18	to
8	potty	8	your	17	not
7	broken	7	a	16	i'm
7	cream	7	baby	15	going
7	ice	7	look	14	got
7	jump	7	mummy	13	no
7	that's	7	on	13	that
6	ah	7	this	11	don't
6	clip	6	do	11	my
6	hair	6	for	10	there
5	joanne's	6	go	9	want
5	look	6	got	8	and
5	mum	6	hannah	8	get
5	yes	6	it	8	look
4	betty's	6	yes	8	yes
4	gog	5	baby's	7	like
4	horsey	5	bedroom	7	see
4	it	5	done	7	this
4	tea	5	going	6	can
3	a	5	hot	6	mice
3	better	5	it's	6	mine
3	book	5	no	6	oh
3	daddy	5	not	6	three
3	er	5	off	5	are
3	flower	5	out	5	blind
3	like	5	to	5	do
3	now	4	and	5	go
3	ooh	4	get	5	hannah
3	see+saw	4	have	5	have
2	car	4	mine	5	i've
2	catch	4	oh	5	is
2	don't	4	up	5	it's

Appendix 9.1 - Individual English Child Words

Elspeth's Most Frequent Words					
Aged 2		Aged 3		Aged 5	
Frequency	Word	Frequency	Word	Frequency	Word
11	mummy	29	that	49	i
8	mum	19	one	26	that
8	no	15	i	22	she
6	cars	10	the	22	to
6	some	8	a	22	what
4	boots	8	elspeth	21	you
4	coat	8	it	18	and
4	you	7	going	17	look
3	ball	7	shoe	15	isn't
3	bouncing	6	you	14	a
3	down	5	hammy	13	got
3	get	5	want	13	this
3	here	4	he	11	is
3	i	4	in	11	it
3	leave	4	just	11	mum
3	play	4	my	11	no
3	toddy	4	round	10	want
2	ah	4	to	9	can
2	birds	3	corner	9	oh
2	do	3	got	9	twenty
1	alison	3	it's	8	at
1	are	3	nice	8	five
1	daddy	3	no	8	yes
1	daw	3	some	7	in
1	dogs	3	tony	7	like
1	drink	3	yes	7	that's
1	for	2	all	7	there
1	found	2	am	7	they
1	georgy	2	and	6	can't
1	georgy's	2	big	6	have
1	golly	2	brophy	6	hey
1	golly's	2	butter	6	i'm
1	gone	2	can	6	me
1	in	2	dish	6	one
1	it	2	doing	6	won't
1	jane	2	five	6	yellow
1	la	2	get	5	are
1	lesso	2	go	5	colour



Appendix 9.1 - Individual English Child Words

Geoffrey's Most Frequent Words					
Aged 2		Aged 3		Aged 5	
Frequency	Word	Frequency	Word	Frequency	Word
9	mum	29	i	36	i
7	mummy	12	you	21	no
7	no	10	can	20	it
7	want	10	do	20	to
6	a	10	have	19	the
5	bunny	10	in	15	you
5	you	8	me	14	peter
4	are	8	that	13	um
4	i	7	no	12	here
3	all	7	want	12	on
3	here	6	are	11	and
3	mm	6	don't	11	car
3	oh	6	mummy	11	read
3	rachael	6	they	11	want
3	sorry	5	a	10	jane
3	uh	5	catherine	10	oh
2	ah	5	help	10	this
2	be	5	of	9	one
2	bed	5	play	9	that
2	biscuit	5	why	8	can
2	go	4	can't	8	have
2	look	4	here	8	says
2	mine	4	it	8	they
2	that	4	oh	7	go
2	there	4	them	7	he
1	ahhh	4	there	7	page
1	alright	4	these	7	there
1	biki	4	this	6	a
1	chips	4	we	6	do
1	come	4	will	6	look
1	daddy	3	any	6	now
1	daddy's	3	both	6	toast
1	drink	3	chair	6	two
1	feet	3	dad	5	fish
1	hello	3	doing	5	in
1	it	3	get	5	know
1	like	3	gone	5	pat
1	on	3	like	5	was
1	one	3	mum	5	with
1	ow	3	playdough	4	don't
1	peep	3	please	4	i'll
1	peep+bo	3	to	4	italian
1	rachel	3	two	4	my
1	three	3	what	4	not
1	to	3	with	4	of
1	truck	2	day	4	three
1	two	2	drink	4	what

Appendix 9.1 - Individual English Child Words

Jason's Most Frequent Words					
Aged 2		Aged 3		Aged 5	
Frequency	Word	Frequency	Word	Frequency	Word
14	off	13	oh	47	i
10	broke	12	birthday	40	it
6	toot	12	mm	33	you
5	no	11	my	28	to
5	school	11	pink	26	mum
4	burn	9	that	25	the
4	hot	8	no	22	this
3	beans	8	there	20	is
3	mm	7	car	20	that
3	oh	7	daddy	19	got
3	up	7	ooh	19	look
3	yes	6	happy	17	have
2	chair	5	mummy	17	in
2	do	4	crash	17	it's
2	ga	4	fay	16	a
2	hat	4	off	16	no
2	it	4	orange	16	one
2	look	4	pen	15	don't
2	there	4	yes	13	know
2	this	3	fish	13	my
1	a	3	garage	12	can
1	again	3	in	12	going
1	aw	3	is	11	do
1	bee	3	like	11	off
1	book	3	rat	11	on
1	break	3	that's	10	and
1	bubble	2	ball	10	mm
1	cat	2	dougy's	10	think
1	eh	2	fay's	10	why
1	er	2	frog	9	now
1	here	2	gone	9	want
1	ma	2	got	9	what
1	mine	2	gravy	8	for
1	mumma	2	here	8	go
1	mummy	2	him	8	i'll
1	not	2	i	8	oh
1	on	2	mummy's	7	like
1	peas	2	now	7	take



Appendix 9.2 - English Child - Individual WI Phoneme Frequency

Ben Aged 2			Ben Aged 3			Ben Aged 5		
Code	Frequency	Rank	Code	Frequency	Rank	Code	Frequency	Rank
k	13	1	h	12	1.5	s	15	1
h	11	2	w	12	1.5	D	14	2
b	8	3.5	m	11	3	h	13	4
w	8	3.5	t	9	4	l	13	4
m	7	5.5	D	8	5.5	w	13	4
n	7	5.5	k	8	5.5	b	12	6
D	6	7.5	l	7	7	d	9	8.5
r	6	7.5	*	6	9.5	n	9	8.5
d	5	10	d	6	9.5	p	9	8.5
g	5	10	I	6	9.5	t	9	8.5
t	5	10	s	6	9.5	k	8	11
I	4	13	f	5	13.5	f	7	13.5
j	4	13	g	5	13.5	g	7	13.5
s	4	13	j	5	13.5	m	7	13.5
6	3	17	n	5	13.5	r	7	13.5
(	3	17	0	4	18	@	6	16.5
@	3	17	6	4	18	I	6	16.5
A	3	17	@	4	18	8	5	19.5
p	3	17	b	4	18	*	5	19.5
0	2	21.5	r	4	18	j	5	19.5
!	2	21.5	&	3	22.5	S	5	19.5
B	2	21.5	\	3	22.5	_	4	22
G	2	21.5	_	3	22.5	0	3	24
5	1	30.5	S	3	22.5	6	3	24
8	1	30.5	8	2	28	!	3	24
9	1	30.5	#	2	28	&	2	31
)	1	30.5	\$	2	28	\	2	31
*	1	30.5	{	2	28	A	2	31
:	1	30.5	E/kl	2	28	E/kl	2	31
_	1	30.5	p	2	28	G	2	31
C	1	30.5	V	2	28	i	2	31
E/kl	1	30.5	5	1	36	M	2	31
l	1	30.5	!	1	36	O	2	31
O	1	30.5	(	1	36	T	2	31
S	1	30.5	A	1	36	v	2	31
			C	1	36	V	2	31
			e	1	36	5	1	42.5
			G	1	36	9	1	42.5



Appendix 9.2 - English Child - Individual WI Phoneme Frequency

Ben Aged 2 Continued			Ben Aged 3 Continued			Ben Aged 5 Continued		
Code	Frequency	Rank	Code	Frequency	Rank	Code	Frequency	Rank
T	1	30.5	T	1	36	-	1	42.5
V	1	30.5	v	1	36	%	1	42.5
						)	1	42.5
37	130	703				.	1	42.5
			40	166	820	?	1	42.5
						]`	1	42.5
						B	1	42.5
						C	1	42.5
						K/bl	1	42.5
						48	231	1176
Betty Aged 2			Betty Aged 3			Betty Aged 5		
Code	Frequency	Rank	Code	Frequency	Rank	Code	Frequency	Rank
m	8	1	b	16	1	w	28	1
h	7	2	w	15	2	h	19	2.5
b	6	3.5	h	14	3	m	19	2.5
s	6	3.5	m	10	4	b	15	4
w	5	5	d	9	5	s	14	5
d	4	8	p	8	6	k	12	6.5
G	4	8	D	7	7	l	12	6.5
j	4	8	j	6	8.5	D	10	8.5
n	4	8	k	6	8.5	r	10	8.5
t	4	8	g	5	10.5	d	9	11
D	3	13.5	l	5	10.5	g	9	11
E/kl	3	13.5	6	4	15	t	9	11
f	3	13.5	&	4	15	f	8	13
k	3	13.5	f	4	15	\	6	15.5
l	3	13.5	I	4	15	I	6	15.5
p	3	13.5	n	4	15	j	6	15.5
6	2	20.5	r	4	15	p	6	15.5
(	2	20.5	t	4	15	&	5	18.5
)	2	20.5	0	3	20	S	5	18.5
\	2	20.5	5	3	20	6	4	23
g	2	20.5	S	3	20	@	4	23
i	2	20.5	8	2	25	e	4	23

Appendix 9.2 - English Child - Individual WI Phoneme Frequency

Betty Aged 2 Continued			Betty Aged 3 Continued			Betty Aged 5 Continued		
Code	Frequency	Rank	Code	Frequency	Rank	Code	Frequency	Rank
I	2	20.5	!	2	25	K/bl	4	23
r	2	20.5	)	2	25	n	4	23
5	1	32	@	2	25	O	4	23
8	1	32	\	2	25	V	4	23
9	1	32	s	2	25	0	3	28
l	1	32	V	2	25	8	3	28
%	1	32	9	1	34.5	-	3	28
&	1	32	.	1	34.5	5	2	34
*	1	32	?	1	34.5	9	2	34
:	1	32	-	1	34.5	)	2	34
@	1	32	`	1	34.5	*	2	34
_	1	32	}	1	34.5	?	2	34
`	1	32	A	1	34.5	A	2	34
A	1	32	E/kl	1	34.5	G	2	34
C	1	32	K/bl	1	34.5	H	2	34
e	1	32	O	1	34.5	X	2	34
V	1	32	T	1	34.5	-	1	42.5
			v	1	34.5	!	1	42.5
39	101	780				B	1	42.5
			40	164	820	C	1	42.5
						E/kl	1	42.5
						i	1	42.5
						M	1	42.5
						T	1	42.5
						46	271	1081
Elspeth Aged 2			Elspeth Aged 3			Elspeth Aged 5		
Code	Frequency	Rank	Code	Frequency	Rank	Code	Frequency	Rank
m	7	1	w	14	1	w	21	1
b	6	2.5	s	10	2	h	16	2
d	6	2.5	m	9	3	s	15	3
g	4	4	t	8	4	d	14	4.5
G	3	6	D	7	5.5	n	14	4.5
k	3	6	h	7	5.5	b	13	6
t	3	6	d	6	7.5	D	12	7
D	2	10	f	6	7.5	k	11	8

Appendix 9.2 - English Child - Individual WI Phoneme Frequency

Elspeth Aged 2			Elspeth Aged 3			Elspeth Aged 5		
Continued			Continued			Continued		
Code	Frequency	Rank	Code	Frequency	Rank	Code	Frequency	Rank
f	2	10	b	5	10.5	l	9	10
I	2	10	g	5	10.5	m	9	10
j	2	10	I	5	10.5	r	9	10
l	2	10	p	5	10.5	f	8	13
6	1	18	k	4	13.5	j	8	13
8	1	18	n	4	13.5	p	8	13
!	1	18	&	3	16	g	6	16
&	1	18	C	3	16	I	6	16
\	1	18	S	3	16	t	6	16
	1	18	0	2	22.5	6	5	18.5
A	1	18	6	2	22.5	G	5	18.5
h	1	18	8	2	22.5	5	4	21.5
n	1	18	@	2	22.5	@	4	21.5
s	1	18	A	2	22.5	\	4	21.5
w	1	18	e	2	22.5	S	4	21.5
			G	2	22.5	0	3	26.5
23	53	276	j	2	22.5	)	3	26.5
			l	2	22.5	?	3	26.5
			V	2	22.5	]	3	26.5
			5	1	32.5	A	3	26.5
			9	1	32.5	i	3	26.5
			'	1	32.5	8	2	34
			[	1	32.5	-	2	34
			_	1	32.5	!	2	34
			{	1	32.5	%	2	34
			i	1	32.5	&	2	34
			O	1	32.5	:	2	34
						e	2	34
						T	2	34
						V	2	34
						3	1	45
			r	1	32.5	9	1	45
			T	1	32.5	\$	1	45
				134		(	1	45
						*	1	45
						[	1	45
						_	1	45
						~	1	45



Appendix 9.2 - English Child - Individual WI Phoneme Frequency

Elspeth Aged 2 Continued			Elspeth Aged 3 Continued			Elspeth Aged 5 Continued		
Code	Frequency	Rank	Code	Frequency	Rank	Code	Frequency	Rank
						>	1	45
						C	1	45
						K/bl	1	45
						O	1	45
						R	1	45
							260	
Geoffrey Aged 2			Geoffrey Aged 3			Geoffrey Aged 5		
Code	Frequency	Rank	Code	Frequency	Rank	Code	Frequency	Rank
b	4	1.5	w	14	1	m	18	1
w	4	1.5	D	10	2	b	17	2
m	3	3	d	9	3	w	16	3
*	2	8	b	7	4.5	k	12	4.5
C	2	8	h	7	4.5	s	12	4.5
d	2	8	g	6	7.5	d	11	7.5
D	2	8	k	6	7.5	D	11	7.5
h	2	8	m	6	7.5	h	11	7.5
j	2	8	r	6	7.5	p	11	7.5
l	2	8	I	5	10	f	10	10.5
O	2	8	n	4	11.5	r	10	10.5
t	2	8	s	4	11.5	t	9	12
0	1	20.5	6	3	14.5	g	8	14
5	1	20.5	!	3	14.5	I	8	14
6	1	20.5	p	3	14.5	l	8	14
8	1	20.5	t	3	14.5	G	6	16
@	1	20.5	0	2	21	*	5	17.5
_	1	20.5	8	2	21	n	5	17.5
A	1	20.5	&	2	21	6	4	20
f	1	20.5	*	2	21	\	4	20
g	1	20.5	@	2	21	j	4	20
I	1	20.5	e	2	21	!	3	24
k	1	20.5	j	2	21	\$	3	24
n	1	20.5	K/bl	2	21	&	3	24
p	1	20.5	l	2	21	)	3	24
r	1	20.5	5	1	29	O	3	24
s	1	20.5	\	1	29	0	2	31.5
V	1	20.5	_	1	29	8	2	31.5
			A	1	29	-	2	31.5
			C	1	29	B	2	31.5
	45							

Appendix 9.2 - English Child - Individual WI Phoneme Frequency

Geoffrey Aged 2			Geoffrey Aged 3			Geoffrey Aged 5		
Continued			Continued			Continued		
Code	Frequency	Rank	Code	Frequency	Rank	Code	Frequency	Rank
			S	1	29	e	2	31.5
			V	1	29	E/kl	2	31.5
						S	2	31.5
			32	121		T	2	31.5
						V	2	31.5
						X	2	31.5
						2	1	42.5
						5	1	42.5
						9	1	42.5
						%	1	42.5
						(	1	42.5
						@	1	42.5
						-	1	42.5
						+	1	42.5
						A	1	42.5
						M	1	42.5
						v	1	42.5
						y	1	42.5
						48	247	
Jason Aged 2			Jason Aged 3			Jason Aged 5		
Code	Frequency	Rank	Code	Frequency	Rank	Code	Frequency	Rank
b	6	1	d	8	1.5	b	24	1
m	4	2	w	8	1.5	h	23	2.5
h	3	3.5	D	5	4.5	w	23	2.5
p	3	3.5	h	5	4.5	m	20	4
o	2	7.5	n	5	4.5	l	17	5
)	2	7.5	p	5	4.5	t	15	6
@	2	7.5	b	4	9	D	13	7
D	2	7.5	f	4	9	d	12	8
n	2	7.5	m	4	9	k	11	9
t	2	7.5	r	4	9	n	9	10.5
5	1	17	t	4	9	s	9	10.5
8	1	17	o	3	13	I	8	13.5
l	1	17	g	3	13	j	8	13.5
C	1	17	k	3	13	p	8	13.5
d	1	17	8	2	17.5	S	8	13.5
e	1	17	(	2	17.5	@	7	16.5



Appendix 9.2 - English Child - Individual WI Phoneme Frequency

Jason Aged 2 Continued			Jason Aged 3 Continued			Jason Aged 5 - Continued		
Code	Frequency	Rank	Code	Frequency	Rank	Code	Frequency	Rank
I	1	17	:	2	17.5	r	7	16.5
j	1	17	I	2	17.5	f	6	18.5
k	1	17	j	2	17.5	g	6	18.5
l	1	17	l	2	17.5	&	5	20.5
S	1	17	5	1	24.5	*	5	20.5
T	1	17	6	1	24.5	6	4	24
V	1	17	-	1	24.5	-	4	24
			!	1	24.5	)	4	24
23	41	276	@	1	24.5	e	4	24
			\	1	24.5	T	4	24
			+	1	24.5	0	3	30
			V	1	24.5	8	3	30
						\	3	30
			28	85	406	C	3	30
						G	3	30
						O	3	30
						V	3	30
						1	2	37
						2	2	37
						%	2	37
						{	2	37
						A	2	37
						K/bl	2	37
						X	2	37
						5	1	46
						9	1	46
						'	1	46
						!	1	46
						[	1	46
						]	1	46
						_	1	46
						B	1	46
						i	1	46
						R	1	46
						y	1	46
							310	



Appendix 9.3 - English Child - Individual WI FUSE Rankings

Children Aged 2	Ben Aged 2		Betty Age 2		Elspeth Aged 2		Geoffrey Aged 2		Jason Aged 2		TOTAL (for phoneme)	Rank
	2b	3b	Total	2b	3b	Total	2b	3b	2b	3b		
	Code	2b	3b	Total	2b	3b	Total	2b	3b	Total		
D	3	1	4	1	2	0	1	1		0	7	1
O	1		1		0	0	1	1	1	2	4	4.5
b		1	1	1	1	1	1			0	4	4.5
g	1	1	2	1	2	0	0	0		0	4	4.5
h		1	1	2	3	0	0	0		0	4	4.5
j	3		3	1	1	0	0	0		0	4	4.5
k		1	1	3	3	0	0	0		0	4	4.5
3			0		0	1	0	0		2	3	12
4			0		0	1	1	1		0	3	12
9	1		1	1	1	0	1	1		0	3	12
A	1		1		0	0	1	1	1	1	3	12
M			0	3	3	0	0	0		0	3	12
nj			0	2	3	0	0	0		0	3	12
s	1	1	2		1	0	0	0		0	3	12
S			0	2	3	0	0	0		0	3	12
t	3		3		0	0	0	0		0	3	12
2			0		0	0	1	1	1	1	2	22.5
5			0		0	0	1	1		1	2	22.5
&			0	1	1	1		0		0	2	22.5
C	1		1	1	1	0	0	0		0	2	22.5
I	2		2			0	0	0		0	2	22.5
i			0	1	1	0	0	0	1	1	2	22.5
kj			0	1	2	0	0	0		0	2	22.5

Appendix 9.3 - English Child - Individual WI FUSE Rankings

Aged 2 - Continued		Ben Aged 2		Betty Age 2		Elspeth Aged 2		Geoffrey Aged 2		Jason Aged 2		TOTAL	Rank
Code	2b	3b	Total	2b	3b	Total	2b	3b	Total	2b	3b	Total (for phoneme)	
m	2		2			0			0			2	22.5
n	1	1	2			0			0			2	22.5
T			0	2		2			0			2	22.5
w	1	1	2			0			0			2	22.5
z			0	1	1	2			0			2	22.5
l			0			0		1	1			1	34
6	1		1			0			0			1	34
8			0			0		1	1			1	34
@			0			0			0		1	1	34
bl			0			0			0		1	1	34
d			0			0	1		0			1	34
fj			0			0			0	1		1	34
G			0	1		1			0			1	34
O			0	1		1			0			1	34
r	1	1	2			0			0			2	34
Tr			0	1		1			0			1	34

Appendix 9.3 - English Child - Individual WI FUSE Rankings

Children Aged 3		Ben Aged 3			Betty Aged 3			Elspeth Aged 3			Geoffrey Age 3			Jason Aged 3			SUM		Rank	
Code	2b	3b	Total	2b	3b	Total	2b	3b	5b	Total	2b	3b	Total	2b	3b	Total				
0	2		2	1		1	1	2		3	3	4	7	3		3			14	1
1			0			0	1	2		3	4	2	6	4	1	5			13	2
h	3	2	5	4	3	7				0			0			0			12	3
3			0			0	4	1	1	6	2	2	4	2		4			10	4
2			0			0	1	1		2	3	1	4	3	1	4			9	6
b	1		1	2	4	6	1			1	1	1	1	1		0			9	6
j		3	3	3	2	5	1			1	1		0			0			9	6
4			0			0	2	1	1	4	2	2	4	2		4			8	9
6	1		1	1		1	1	2		3	3		3	3		0			8	9
D	2	1	3	2	1	3	1			1	1		0		1	1			8	9
8	2		2			0	2			2	2		2	2	1	1			7	11
&			0	1		1	2			2	1	1	2	1	1	1			6	13.5
d	2		2	1	1	2	1			1	1		1	1		0			6	13.5
g	1	2	3	1	2	3				0	0		0			0			6	13.5
I	2	3	5		1	1				0	0		0			0			6	13.5
5			0			0				0	1	2	3	1	1	2			5	16.5
9	1		1	1		1				0	2		2	2	1	1			5	16.5
7			0			0	1	1		2	2		2	2		0			4	21
m			0	2	2	4				0			0			0			4	21
r	2	1	3		1	1				0			0			0			4	21
s	1	1	2	1	1	2				0			0			0			4	21
tj	3	1	4			0				0			0			0			4	21



Appendix 9.3 - English Child - Individual WI FUSE Rankings

Code	Ben Aged 3			Betty Aged 3			Elspeth Aged 3			Geoffrey Age 3			Jason Aged 3			SUM	Rank
	2b	3b	Total	2b	3b	Total	2b	3b	Total	2b	3b	Total	2b	3b	Total		
V	2	2	4			0			0			0			0	4	21
w			0	2	2	4			0			0			0	4	21
A			0			0	1		1	1		1	1		1	3	28
bl			0			0		1	1	1		1	1		1	3	28
C			0			0	1	1	2	1		1	0		0	3	28
f	2		2	1		1			0			0			0	3	28
fj			0	1		1	2		2			0			0	3	28
i	3		3			0			0			0			0	3	28
n			0	2	1	3			0			0			0	3	28
@			0			0	1		1	1		1	0		0	2	37
bj			0			0		1	1	1		1	0		0	2	37
br			0		1	1			0			0			0	2	37
dj			0			0			1	1		1	1		1	2	37
dr		1	1		1	1			0			0			0	2	37
H,	1		1						0			0		1	1	2	37
I			0	2		2			0			0			0	2	37
k			0		1	1		1	1	0		0			0	2	37
M	1	1	2			0			0			0			0	2	37
P			0		2	2			0			0			0	2	37
sm		1	1		1	1			0			0			0	2	37
fl			0			0	1		1	1		0			0	1	50.5
fr			0			0		1	1	0		0			0	1	50.5
kj		1	1			0			0			0			0	1	50.5
kl			0	1	1	1			0			0			0	1	50.5

Appendix 9.3 - English Child - Individual WI FUSE Rankings

Code	Ben Aged 3			Betty Aged 3			Elsbeth Aged 3			Geoffrey Age 3			Jason Aged 3			SUM	Rank	
	2b	3b	Total	2b	3b	Total	2b	3b	5b	Total	2b	3b	Total	2b	3b			Total
kw		1	1			0				0						0	1	50.5
nj			0	1		1				0						0	1	50.5
pj	1		1			0				0						0	1	50.5
pl			0		1	1				0						0	1	50.5
pr		1	1			0				0						0	1	50.5
skw		1	1			0				0						0	1	50.5
spr		1	1			0				0						0	1	50.5
st			0	1		1				0						0	1	50.5
sw	1		1			0				0						0	1	50.5
t			0	1		1				0						0	1	50.5

Appendix 9.3 - English Child - Individual WI FUSE Rankings

Children Aged 5	Ben 5			Betty Age 5			Elspeth Aged 5			Geoffrey Age 5			Jason Aged 5		
	2b	3b	Total	2b	3b	4b	Total	2b	3b	4b	Total	2b	3b	4b	Total
D	3	4	7	3	2		5	2		1	2	2	5	1	8
0	2		2	3			3	4	5	1	10	1	3		4
1			0				0	3	6		9	4	5	1	9
2			0				0	7	2		9	3	5		8
b	1	3	4	2	2	1	5	3			3	2	1		3
3			0				0	2	4		6	3	3		6
5			0				0	2	3	1	6	1	4	1	6
6	1		1	2			2	2	3		5	1	1		2
7			0				0	1	3		4	4	2		6
g	1	3	4	1	3		4		1		1	1			1
4			0				0	3	2	1	6	2	1		3
8	1		1				0	4			4	2	1	1	4
9	1		1	1			1	2	2		4	2	1		3
s	2	1	3	2	4		6				0				0
w			0	3	5	1	9				0				0
&	1		1	2			2	1	1	1	3	1	1		2
d	1		1	3	1	1	5	1		1	2				0
f	1	1	2	1	1	1	2		2		2	2			2
j		2	2	2	3		5				0	1			1
k			0	2	5		7				0	1			1
m	1		1	3	2	2	7				0				0
h	1		1	3	1		4	1			1	1			1
V	3	4	7			0	0				0				0



Appendix 9.3 - English Child - Individual WI FUSE Rankings

Code	Ben 5		Betty Age 5			Elspeth Aged 5			Geoffrey Age 5			Jason Aged 5			Total Rank	
	2b	3b	Total	2b	3b	4b	Total	2b	3b	4b	Total	2b	3b	4b		
@			0				0	3				3	1	3	9	27
A			0				0	3				3	2	2	8	27
dr			0		1		1		1	2	3	3	1		6	27
H,	3		3	1		1	1		1			1	1		6	27
I			0	4		1	4		1			1		1	7	27
i	2	1	3	1			1	1		1		1	1		7	27
r	3	1	4		2		2								6	27
bj			0				0		3			2	3	1	6	33.5
bl			0		1	1	1	3	2	1	1	1	1	2	7	33.5
br			0				1	2	1		3	1	2		5	33.5
dj			0				0	1	1		2	1	1		6	33.5
e			0				0	1	1		2	1	1		5	33.5
n	1		1	2	2		4								5	33.6
C		1	1	1		1	1	1	1	2		0	2		4	40
ff	1		1				0	1			1	2	1	1	5	40
fl	1		1				0	1			1	2	1		4	40
l	2	1	3		1		1			0		0			4	40
M	1	3	4				0			0		0			4	40
pr		3	3		1		1			0		0			4	40
t			0	2	1	1	4			0		0			4	40
fr			0				0	1		1	1	1	1		3	45.5
S			0	2	1		3			0		0			3	45.5
st			0	2	1		3			0		0			3	45.5
sw	1	2	3				0			0		0			3	45.5
G			0				0	1		1	1	1	1	1	3	51.5

Appendix 9.3 - English Child - Individual WI FUSE Rankings

Code	Ben 5		Betty Age 5			Elspeth Aged 5			Geoffrey Age 5			Jason Aged 5			Total Rank	
	2b	3b	Total	2b	3b	4b	Total	2b	3b	4b	Total	2b	3b	4b		
gl			0			1	1				1		1		3	51.5
gr			0			1	1				1		1		2	51.5
kw		2	2				0				0				2	51.5
p			0			1	2				0				2	51.5
pj	1	1	2				0				0				2	51.5
tj	2		2				0				0				2	51.5
tr			0				2				0				2	51.5
kr			0				0				0			1	1	58
O			0				1				0				1	58
pl			0				1				0				1	58
tw		1	1				0				0				1	58

Appendix 9.4 - Individual Finnish Child Words

Harri's Most Frequent Words							
Aged 2		Aged 3		Aged 5		Aged 7	
Frequency	Word Form	Frequency	Word Form	Frequency	Word Form	Frequency	Word Form
30	on	13	en	18	niin	30	se
20	joo	13	ei	17	se	25	ja
17	en	11	auto	14	ei	19	sitte
10	olen	9	on	9	kun	15	on
9	auto	6	oli	9	on	14	niin
7	ei	6	miau	8	en	10	siellä
4	tiedäkään	5	tämä	7	ja	10	ko
4	papan	5	olen	5	eNkä	9	ne
4	oli	5	kuormaauto	4	lännen	8	siinä
3	tämmöinen	4	tässä	4	minä	6	mennee
3	tulipalo	4	täällä	4	tiedä	6	että
3	reNNas	4	sakarini	3	eikä	4	semmonen
3	ole	4	mitään	3	kissa	4	mää
3	minä	3	se	3	kumi	4	joku
3	minun	3	sakari	3	menee	3	sitä
3	mikkihiiri	3	ole	3	mikä	3	siihen
3	aNkkoja	3	mustalaisten	3	mitä	3	rikki
3	aNkka	3	kuormaautoja	3	siksi	3	pittää
2	tässä	3	hilu	3	uusi	3	pakkoon
2	traktori	3	autoja	3	viinirypäleitä	3	om
2	siellä	2	tuon	2	äiti	3	niitä
2	rikki	2	tehdään	2	auto	3	nää
2	pois	2	ruiskutti	2	autoa	3	kaikkia
2	peräkärri	2	rämä	2	autotallissa	3	ei
2	perunaa	2	muistan	2	et	2	yks
2	pattereijakaan	2	mitäs	2	hännästä	2	tuli
2	palloa	2	minä	2	hernekeittoa	2	tehhään
2	pallo	2	mersu	2	jänis	2	tämäkö
2	nukke	2	kun	2	joku	2	tämä
2	meni	2	kanssa	2	juna	2	tai
2	maastoauto	2	isä	2	kahdella	2	silmä
2	kuNkku	2	autotehdas	2	minulle	2	siellä
2	koskaan	2	au	2	ole	2	siel
2	katso	2	kuorma	2	oli	2	semmonej
2	kanssa	1	tuli	2	pimputellaan	2	säikähti
2	tämä	1	tulee	2	puhki	2	saa
1	vasaralla	1	traktori	2	puraisi	2	rannalla
1	täällä	1	tietä	2	ratin	2	potkas
1	tästä	1	tiedä	2	reikä	2	palloa
1	tänne	1	tästä	2	särkenyt	2	paljon
1	tämän	1	tämmöistäkö	2	siinä	2	opettaa
1	tämmöistä	1	tämmöisiä	2	sinne	2	no



Appendix 9.4 - Individual Finnish Child Words

Riikka's Most Frequent Words							
Aged 2		Aged 3		Aged 5		Aged 7	
Frequency	Word Form	Frequency	Word Form	Frequency	Word Form	Frequency	Word Form
19	isi	20	minä	15	ei	31	se
14	ei	11	ja	15	nIn	21	että
8	minä	9	se	15	se	20	sitten
6	jO	7	ei	12	on	24	on
6	tuo	6	haluan	11	että	10	me
5	tämä	6	kamelin	10	mikko	10	nin
4	itke	6	nIn	9	tule	7	ei
4	pane	6	tule	8	minä	7	ne
4	tähän	5	en	8	plp	6	kun
4	tule	5	milloin	7	en	6	minä
3	älä	5	tästä	7	hei	6	ni
3	en	5	vaikka	7	no		
3	isille	4	isi	7	oNko	6	yksi
3	korvAn	4	oNko	7	sitten	5	tai
3	kotIn	4	katso	6	oli	4	jos
3	siellä	3	kun	6	siellä	4	lähti
3	sinä	3	miten	5	kuin	4	mics
2	eikä	3	nämä	5	kun	4	palloa
2	kolmonen	3	puli	5	lasken	4	poika
2	näillä	3	rakennetAn	5	maNkka	4	talon
2	nyt	3	sitä	5	minun	4	voi
2	ole	3	sitten	5	mitä	3	ikkunan
2	olen	3	tEn	5	mitBn	3	jäi
2	on	3	tiedä	5	ne	3	joka
2	pitB	2	enB	5	olen	3	kaikki
2	se	2	jO	5	tuolta	3	ku
2	siksi	2	kameli	4	äiti	3	mut
2	sinne	2	meidän	4	Bnitä	3	näkkileipä
2	terve	2	möisen	4	jos		
2	tulen	2	myllyn	4	karhu	3	pallo
2	tuohon	2	nyt	4	koulu	3	pojat
1	alkerrassa	2	pihalle	4	miksi	3	sano
1	annan	2	pitBkö	4	osA	3	sellanen
1	antoi	2	puhU	4	sanoi	3	sen
1	autolla	2	puhu	4	semnoinen	3	slhe
1	enhän	2	taka	4	sen	3	sinne
1	että	2	takapihalle	4	tämä	3	sitä
1	halO	2	täm	4	tule	3	tuli
1	isin	2	tämmöisen	4	tuosta	3	vaikka
1	itse	2	tUli	3	aivan	3	vain
1	jänis	2	tUlimyllyn	3	ari	2	aijon

Appendix 9.4 - Individual Finnish Child Words

Sami's Most Frequent Words							
Aged 2		Aged 3		Aged 5		Aged 7	
Frequency	Word Form	Frequency	Word Form	Frequency	Word Form	Frequency	Word Form
96	tuo	36	tämä	30	on	15	ja
36	auto	34	on	21	ei	10	on
29	ajA	24	auto	20	en	8	sitte
27	on	18	se	11	niin	6	hän
25	ei	15	ei	11	se	6	no
24	äiti	10	sopiiko	10	minä	4	aina
15	soittA	9	voi	9	tässä	4	menne
15	takapeNkki	8	kuorma	8	tämä	3	hänen
10	nyt	8	nämä	7	mitä	3	jotaki
9	minne	7	kuormaauto	6	ajaa	3	lapsia
8	nIn	7	pupu	6	ja	3	mikko
7	anna	7	tähän	6	kun	3	näkkileipä
7	kBntY	7	tässä	6	saa	3	pojat
7	kYtIn	6	iso	6	sinä	3	potkasta
7	menE	6	minä	5	mutta	2	ei
6	missä	6	näin	5	no	2	että
5	juna	6	panna	5	olen	2	ikkuna
5	pannAn	5	hiekkaa	5	puhelin	2	istu
5	pois	5	minun	5	Sussu	2	joku
5	se	4	minulla	4	autolla	2	joskus
5	tuohon	4	pikku	4	eikä	2	kaikki
4	hakE	4	reNkaat	4	nyt	2	kInni
4	itkE	4	rikki	4	siitä	2	kuka
4	magnetofoni	4	tämmöinen	4	tämän	2	kuten
4	metsBn	4	tätä	3	auto	2	mics
4	nalle	3	ammuu	3	herneitä	2	potkase
4	nämä	3	kellarissa	3	korjaajan	2	rikki
4	pakOn	3	kilpa	3	kuin	2	se
4	sylln	3	lähti	3	mikä	2	sen
3	aja	3	missä	3	naulaan	2	talossa
3	itke	3	mitä	3	ole	2	tehdä
3	junA	3	miten	3	puhelin	2	tornitalon
3	kaksi	3	nyttien	3	siellä	2	yrityB
3	kirja	3	ole	3	vene	2	vähä
3	korjatAn	3	osaan	2	älä	2	syömässä
3	lähti	3	poliisi	2	ammun	1	ai
3	laukkA	3	poliisiauto	2	apina	1	aiko
3	laulA	3	siihen	2	autopaikka	1	ajatteliE
3	mahtU	3	tähänkin	2	heti	1	alapuolellaAn
3	meni	3	taunus	2	ihan	1	alla
3	mennBn	3	volkswagen	2	itse	1	Amuisin



Appendix 9.4 - Individual Finnish Child Words

Teppo's Most Frequent Words							
Aged 2		Aged 3		Aged 5		Aged 7	
Frequency	Word Form	Frequency	Word Form	Frequency	Word Form	Frequency	Word Form
16	se	45	on	18	minä	54	ja
14	on	35	tämä	15	on	45	se
12	en	31	ja	14	ei	23	ni
11	minä	17	se	14	odotapa	18	sitte
10	ja	16	minä	12	en	17	ne
10	niin	12	niin	10	se	17	no
9	näin	11	en	10	tuolla	17	tai
9	tiedä	11	mikä	9	no	15	me
9	tuo	11	mitä	9	yksi	14	on
7	tuommoinen	10	kivi	8	me	13	että
4	antaa	10	taitaa	8	tuo	13	sitä
4	ei	9	ai	7	oli	11	oli
4	kissa	9	olla	6	osaan	10	ei
4	liski	9	tuo	6	siellä	8	jos
4	menee	8	ei	5	minun	8	ku
4	minun	8	oli	5	mutta	8	mä
4	pommittaa	7	joo	5	olen	8	niin
4	sairastui	7	kvartsi	5	saat	8	sitten
4	tämmöinen	6	meidän	4	että	7	en
4	tuhmeliini	6	mutta	4	mitään	7	jo
4	tuonne	6	nämä	4	niin	7	kaikki
3	alla	6	olen	4	ole	6	opettaja
3	hyppeli	5	katsopa	4	osaa	5	nitä
3	lentokone	5	kyllä	4	tuota	5	sinä
3	mikä	5	ole	3	ja	5	tunnilla
3	minäpä	5	tässä	3	joo	5	tunti
3	opetukseen	5	tuolla	3	kaksi	5	vaikka
3	pantteri	5	tuolta	3	katsohan	4	jalaka
3	sammakko	4	missä	3	kilometri	4	jalakapalloa
3	tuki	4	muuta	3	kirja	4	palloa
3	tukiopetukseen	4	nimi	3	kun	4	sihen
3	tuolla	4	no	3	maailman	4	sinne
3	tuommoisessa	4	onko	3	meidän	4	syömässä
3	vettä	4	sodasta	3	minulla	4	tulle
2	äidille	4	tämäkin	3	missä	3	hakke
2	aina	4	tuosta	3	nähnyt	3	hän
2	äiti	3	aivan	3	nyt	3	iso
2	aivan	3	arvaa	3	oletko	3	istuu
2	autolla	3	enkusta	3	sitten	3	kyllä
2	ihana	3	forces	3	yhden	3	lähti



Appendix 9.4 - Individual Finnish Child Words

Virpi's Most Frequent Words							
Aged 2		Aged 3		Aged 5		Aged 7	
Frequency	Word Form	Frequency	Word Form	Frequency	Word Form	Frequency	Word Form
64	on	9	en	9	minä	111	nIn
40	tämä	9	minä	7	ja	96	ja
21	tuo	7	on	6	siellä	60	se
12	tässä	6	ei	5	niin	59	että
11	setä	6	ja	5	oli	42	ku
9	mikä	5	katso	4	en	41	mB
9	se	4	minun	4	mutta	41	on
8	tuon	4	olen	3	ei	35	sitte
7	ei	4	tuo	2	kaikkia	26	ei
7	mitä	3	asuu	2	kauan	26	oli
6	kun	3	hei	2	kun	24	me
6	ruokA	3	meidän	2	nuo	18	kun
6	tämäkin	3	nukkuu	2	olen	15	opettaja
6	täti	3	ole	2	on	14	vAn
6	tuolla	3	se	2	se	13	meillä
5	ja	3	tämä	2	vähän	13	sen
5	minä	3	tässä	1	aika	12	sitten
5	tekE	3	tuossa	1	äiti	12	yks
4	en	2	anun	1	anu	11	kirjo
4	hattu	2	asutaan	1	esteltiin	11	sano
4	hIri	2	juna	1	että	11	siellä
4	kalA	2	kissa	1	hametta	11	tai
4	minun	2	kohta	1	hilkkaa	10	jos
4	ole	2	kun	1	ihan	10	kauno
4	oli	2	leikkii	1	ihmisiä	10	sInä
4	pannAn	2	markon	1	ikkunat	10	vaikka
4	pB	2	me	1	iso	9	aina
4	sammakko	2	meillä	1	jäätelöitä	9	joutu
4	sillä	2	noin	1	joka	9	sitä
4	tällä	2	nuo	1	juonti	8	ihan
4	voi	2	olhavan	1	juontipaikka	8	semmonen
3	auto	2	säNky	1	kaikkea	7	kans
3	iso	2	tämän	1	katsomassa	7	mikko
3	jO	2	tuolia	1	käyty	7	siellä
3	nalle	1	äiti	1	ketään	6	jalalla
3	pikkuinen	1	alapuolella	1	kuin	6	kaks
3	poika	1	aukaiseen	1	limsaa	6	meijän
3	tämäkö	1	auriNko	1	lumikkia	6	missä
3	tiedä	1	eNkö	1	me	6	mitä
3	tuossa	1	että	1	melkein	6	ollAn

Appendix 9.5 - Finnish Child - Individual WI Phoneme Frequency

Harri		Harri		Harri	
Aged 2		Aged 3		Aged 5	
Frequency	Phoneme	Frequency	Phoneme	Frequency	Phoneme
2	au	16	k	25	k
1	ei	12	p	16	m
5	a	12	t	16	p
2	aa	10	m	11	s
1	e	8	s	9	j
3	h	7	o	8	o
2	i	6	r	8	t
2	j	5	i	7	l
13	k	4	n	6	r
4	l	3	au	4	au
8	m	3	h	4	e
2	n	2	a	3	a
5	o	2	j	3	h
21	p	1	ci	3	v
2	r	1	e	2	ei
5	s	1	l	2	n
15	t	1	tr	1	ä
1	v	94		1	i
2	tr			1	uu
96				1	y
				131	

Appendix 9.5 - Finnish Child - Individual WI Phoneme Frequency

Riikka Aged 2		Riikka Aged 3		Riikka Aged 5	
Frequency	Phoneme	Frequency	Phoneme	Frequency	Phoneme
1	au	24	t	49	t
2	ei	18	k	43	k
3	a	12	m	33	p
1	ä	11	p	32	s
3	e	10	n	30	m
1	h	9	s	21	v
5	i	7	l	20	l
3	j	7	o	19	o
13	k	5	e	13	n
4	l	4	j	12	i
9	m	3	h	12	j
7	n	3	r	8	h
6	o	2	ai	6	e
10	p	2	i	4	a
2	r	1	äi	4	ää
12	s	1	ei	4	r
21	t	1	v	4	y
4	v	1	y	3	ci
2	y	121		2	ai
109				2	au
				2	cc
				2	u
				1	äi
				1	oi
				1	pl
				328	



Appendix 9.5 - Finnish Child - Individual WI Phoneme Frequency

Sami Aged 2		Sami Aged 3		Sami Aged 5	
Frequency	Phoneme	Frequency	Phoneme	Frequency	Phoneme
1	ai	29	t	6	au
1	äi	26	p	34	t
1	ei	23	k	28	k
10	a	18	m	21	m
1	b	16	s	20	s
2	e	8	v	19	p
2	h	7	o	14	h
6	i	7	r	13	a
5	j	6	l	13	l
19	k	6	n	12	o
8	l	5	h	11	n
17	m	4	i	10	v
9	n	4	j	8	j
8	o	3	au	5	i
18	p	3	a	4	c
1	r	3	tr	3	ä
8	s	2	ei	2	ci
14	t	1	e	2	r
1	u	1	f	1	br
5	v	1	uu	1	st
1	y	1	u	1	y
138		1	y	1	ui
		1	ui	229	
		176			

Appendix 9.5 - Finnish Child - Individual WI Phoneme Frequency

Teppo Aged 2		Teppo Aged 3		Teppo Aged 5	
Frequency	Phoneme	Frequency	Phoneme	Frequency	Phoneme
2	ai	40	t	47	t
2	au	34	k	32	m
3	äi	27	m	29	k
1	ei	19	v	28	s
4	a	18	s	23	v
1	aa	16	p	20	l
2	e	13	n	18	o
1	f	13	o	16	n
2	h	11	e	15	p
3	i	10	h	9	a
9	j	10	j	8	h
21	k	9	a	7	c
14	l	9	l	6	j
19	m	5	y	6	r
9	n	3	ei	5	i
12	o	3	i	4	au
22	p	3	ui	4	y
2	r	2	ai	3	ai
17	s	2	äi	3	ei
26	t	2	u	2	ä
1	u	1	f	1	äi
9	v	1	r	1	oi
182				1	ou
		251		1	b
				1	tr
				1	ui
				291	

Appendix 9.5 - Finnish Child - Individual WI Phoneme Frequency

Virpi Aged 2		Virpi Aged 3		Virpi Aged 5	
Frequency	Phoneme	Frequency	Phoneme	Frequency	Phoneme
3	au	26	t	8	k
1	ei	15	k	8	m
5	a	14	s	8	p
1	aa	13	n	8	s
1	ä	9	m	7	n
2	b	7	o	6	o
3	e	7	p	6	t
7	h	4	a	5	j
7	i	4	v	4	i
1	ii	3	e	4	u
8	j	3	y	3	c
26	k	2	au	3	v
10	l	2	j	2	h
15	m	2	l	2	l
14	n	2	r	1	ai
12	o	1	äi	1	äi
35	p	1	ei	1	ei
5	r	1	h	1	oi
22	s	1	i	1	a
38	t	1	ui		
2	u	118		79	
1	uu				
9	v				
228					



Appendix 9.6 - Finnish Children - Individual WI FUSE Rankings

Transcript Code	Harri 2		Harri 3		Harri 5		Total Rank	Total Rank	Total	Total Rank	Total
	2b	Total Rank	2b	4b	Total Rank	2b					
e	1	1.5	1		3.5	1	2.5	1	3		
o	1	1.5	1		3.5	1	2.5	1	3		
s	0		1		3.5	1	2.5	1	2		
m	0				3.5	0	2.5	1	1		
n	0		1		3.5	1		0	1		
r	0			1	3.5	1		0	1		
t	0		1	1	3.5	1		0	1		
<b>Total By</b>	<b>2</b>			<b>6</b>		<b>4</b>		<b>12</b>			
<b>Word Length</b>											

Appendix 9.6 - Finnish Children - Individual WI FUSE Rankings

Code	Riikka 2		Riikka 3		Riikka 5			Total	Rank	Total
	2b	3b	2b	4b	2b	3b	4b			
s	1		1	1	1	1	3	2	1	11
m	1		1	1	1		2	2	2	9
n				1	1	1	1		3	4
t		1		1		1		1	2	4
e	1		1		1				1	3
o	1				1				1	3
l		1					1		1	2
S							2		2	2
v						1	1		2	2
h						1			1	1
p								1	1	1
Total By			8							42
Word Length								26		

Appendix 9.6 - Finnish Children - Individual WI FUSE Rankings

Transcript Code	Sami 2		Sami 3			Sami 5			Total	Rank	Total		
	2b	3b	4b	Total	Rank	2b	3b	4b				5b	
m				0	27.5	1		1	4.5	1	3	2	4
n	1	1		2	1	2		2	2		2	1	6
s	1			1	5.5			0	25.5	1	4	3	5
t		1		1	5.5	1	1	2	2		2	1	5
v		1		1	5.5	1	1	2	2		1	1	4
e	1			1	5.5			0	25.5	1	1		2
o	1			1	5.5			0	25.5	1	1	1	2
<b>Total</b>				7				7			14		28



Appendix 9.6 - Finnish Children - Individual WI FUSE Rankings

Code	Teppo 2			Teppo 3			Teppo 5			Total Rank	5b	4b	3b	4b	Total	Rank	Total
	2b	3b	4b	2b	3b	4b	2b	3b	4b								
s	1	1					1			1			2	3	2	7	
m	1						2			1			2	3	2	6	
n			1			1	6			3		1	1	2	5	6	
t		1			1		6		1	2		2	1	3	2	6	
o	1						6			1			1	2	5	4	
e	1						6			1				1	9.5	3	
j			1				6			1			1	1	9.5	3	
p							28			1			1	2	5	3	
k							6			0				1	9.5	2	
l							6			0				1	9.5	2	
3							28			0			1	1	9.5	1	
S							28			0		1		0	29	1	
v							28			0				1	9.5	1	
							12			12				21		45	

Appendix 9.6 - Finnish Children - Individual WI FUSE Rankings

Transcript Code	Virpi 2		Virpi 3		Virpi 5		Total	Rank	Total	Rank	Total
	2b	3b	2b	3b	2b	3b					
n	1	1	1	1	1	1	3	1	2	1.5	8
s	2	1	1	1	1	1	5	4.5	2	1.5	8
t		2		1	2	1	4	2	1	4.5	7
m			1	1	4	1	3	4	1	4.5	5
e	1			1	7.5	1	1	7.5	1	4.5	3
o	1			1	7.5	1	1	7.5	1	4.5	3
p	1	1			4		3	4	0	26	3
k			1		7.5		1	7.5	0	26	1
v			1		7.5		1	7.5	0	26	1
<b>Total By</b>						22	9		8		39
<b>Word Length</b>											