A LONGITUDINAL CASE STUDY OF A HYPERLEXIC CHILD

Toni Elizabeth Hopper

Biology Certificate (TAFE); Diploma Medical Technology (A.I.M.S); Fellowship of A.I.M.S; Dip Ed (STC); MEd (Syd. U.); MACE

A thesis submitted for the degree of Doctor of Philosophy of the University of New England

September, 2003

Candidate's Certification

I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any other degree or qualification.

I certify that any help received in preparing this thesis, and all sources used, have been acknowledged in this thesis.



Signature

ACKNOWLEDGEMENTS

A number of people have provided encouragement, support and expert advice during the course of this project. I have been particularly fortunate to have had an excellent supervisor in Professor Brian Byrne. He has been unfailingly patient and given most generously of his time and advice. I am extremely grateful to him. He kept me on track. Dr. Bruce Stevenson gave much support, particularly at those times when Brian was away and he provided the security of knowing there was someone else I could contact. I would like to thank the following people: Max Coltheart, James Donnelly, Morton Ann Gernsbacher, Nancy Jackson, Kate Nation, Linda Siegel, Margaret Snowling and Richard Sparks who provided advice, material and answered my endless questions. I appreciate the help Carey Walker gave in helping to score some of the tests and in reading some of the draft.

The children who participated so enthusiastically as control groups made testing so much easier and I thank them for their participation. Of course there would not have been a project if ZA and his family had not been so interested and given so freely of their time. They are a truly inspirational family and it was a privilege to be involved with them during the course of the project and to follow ZA's development. ZA taught me a lot and I hope I have taught him a little. To my own long suffering family: John, Andrew and Tim, as well as my mother, thank you. It is done now!

TABLE OF CONTENTS

P	age
ACKNOWLEDGEMENTS	i
TABLE OF CONTENTS	ii
APPENDICES	ix
INDEX OF TABLES	x
INDEX OF FIGURES	хi
ABSTRACT	xii
CHAPTER 1: HYPERLEXIA	1
Advanced Decoding	2
Early cases of Advanced Decoding Prior to 1967	7 2
Other Early Cases of Probable Hyperlexia	7
Origin of the term hyperlexia	9
Incidence of hyperlexia	13
Features of hyperlexia	16
Early Onset	17
Developmental Delay	19
Neurological Investigation	21
EEG's	21
Brain Scans-CT's	22
MRI, PET scans	23
Prenatal Parinatal Postnatal Events	24

Aspects of Language and Cognitive Functioning	
Language delay	26
Apraxia	28
Echolalia	29
Prosodic irregularities	31
Cognitive Skills in Hyperlexia	31
IQ Measures	31
Quantifying the Discrepancies	35
Reading Quotient	36
Subgroups in Hyperlexia	38
Longitudinal Studies	45
Prognosis for children with hyperlexia	49
Hyperlexia and other disorders	54
Tourette disorder and PDD	54
Turner's Syndrome	55
Prada Willi	56
West Syndrome	56
Autism and Savant skills	57
Cases of Acquired hyperlexia	62
Hyperlexia in languages other than English	63
Familial linkages in hyperlexia	66
Dyslexia and hyperlexia	67
General Conclusions arising from the Literature Review	70

Studies of hyperlexia	71
Case Studies	71
Descriptive and/or Experimental Studies	75
Reviews of Hyperlexia	77
Criteria used to Define Hyperlexia	81
CHAPTER 2: ACQUISITION OF SKILLED READING	84
The Simple View of Reading	84
Word Recognition	86
The Dual Route Cascade Model (DRC)	86
Acquiring Decoding Skills	88
Phonemic Awareness	88
Letter Knowledge	91
Varieties of Phonological Awareness	92
Development of Word Recognition	94
Alternate Theories of Reading Acquisition	96
Knowledge Sources Theory	97
Precocious Reading	99
Privileged Access Theory	100

Comprehension	101
Vocabulary and Domain Knowledge	102
Inferencing	104
Working Memory	109
Comprehension Monitoring	113
Syntax and Semantics	114
Summary	117
CHAPTER 3: COMPONENTS OF READING IN HYPERLEXIA	119
Word Recognition in Hyperlexia	123
Nonword Reading	125
Real Word and Irregular Word Reading	128
Spelling Skills in Hyperlexia	129
Reading Rate in Hyperlexia	134
Comprehension in Hyperlexia	136
Comprehension of Single Words	137
Comprehension Beyond the Single Word	139
Central Coherence, TOM and Comprehension	144
In Hyperlexia.	
Hyperlexia and Working Memory	146
Syntax	149
Pragmatic Language Deficits in Hyperlexia	151
Prosodic Irregularities	152

Summary of Reading and Comprehension in Hyperlexia	153
CHAPTER 4: CASE STUDY	155
Developmental History	157
Measures of Reading and Comprehension	164
Standardized Measures of Reading	164
and Comprehension.	
Neale Analysis of Reading Ability	164
Woodcock Reading Mastery Tests –R	169
Reading Speed	172
Word Level Reading	174
Woodcock Reading Mastery Test-R	175
Decoding of Nonwords, Irregular Words	175
and Regular Words	
Contextual Facilitation	177
Test of Central Coherence – Homograph Test	178
Test of Word Reading Efficiency (TOWRE)	184
Orthographic Awareness	186
Spelling patterns	189
Orthographic Learning task	190
Regular Word Spelling	192

Phonemic Awareness	193
Phonemic Awareness Tasks	194
Spoonerisms	200
Lindemood Auditory Conceptualization Test	202
The Rosner Test of Auditory Analysis	203
(AAT & AAT-Nonce)	
Morphological Awareness	205
Morphological Relatedness Test (MRT)	206
Derivational Suffix Test (DST)	208
Exploring Comprehension Processes	210
Single Word Comprehension	211
Peabody Picture Vocabulary Test (PPVT-I	R) 211
The PALPA	213
The WORD-R Test (Elementary)	215
Test of Reading Comprehension (TORCH)	219
Tests of Inferential and Memory Skills	221
Access and Integration of Long-Term	224
Memory Knowledge	
Listening versus Reading Comprehension	228
Syntactic Processing Abilities	
Syntactic Judgment Tasks	232
Syntactic Comprehension Using Temporal Ter	rms 233
Test for the Reception of Grammar (TROG)	236

Articulation Rate (RAN)	239
Interim Summary	243
Surface Information Loss and Processing Shift in	244
Comprehension	
Cognitive Processing	248
Differential Ability Scales	249
Working Memory	250
Test of Memory and Learning (TOMAL)	250
NEPSY	251
Working Memory Task	252
CHAPTER 5: General Discussion and Conclusions	256
Summary of Results	256
Reading and Comprehension	256
Spoken Single Word Comprehension	258
Working Memory	258
Phonemic Awareness	259
Orthographic Skills	260
Morphological Awareness	260
Global Cognitive Skills	261
Discussion	
Learning to Read	261
Comprehension	265

Adequacy of Comprehension Measures	267
Limitations	269
Future Research Questions	270
REFERENCES	273
APPENDICES	299
Appendix 1 Nonwords, Irregular Words and Regular Words	299
Appendix 2 Contextual Facilitation	300
Appendix 3 Orthographic Choice	301
Appendix 4 Orthographic Choice Task	302
Appendix 5 Orthographic Choice Task Using Letter Strings	302
Appendix 6 Orthographic Learning	303
Appendix 7 Phonemic Awareness- Beginning sounds	306
- End sounds	307
- Rhyme	308
Appendix 8 Spoonerisms	309
Appendix 9 AAT-Nonce	309
Appendix 10 Morphological Relatedness Test (MRT)	310
Appendix 11 Derivational Suffix Test (DST)	311
Appendix 12 Test of Memory and Inferential Skills	315
Appendix 13 Access and Integration of long-Term Memory Knowledg	e 318
Appendix 14 Listening versus reading Comprehension	322
Appendix 15 Syntactic Judgment Task	324
Appendix 16 Syntactic Awareness task	325
Appendix 17 Syntactic Comprehension Using Temporal Terms	326
Appendix 18 The Frog Stories	328
Appendix 19 Working Memory Task	360

INDEX OF TABLES

Table 1	Characteristics of Two Hyperlexic Groups	42
Table 2	Case Studies of Hyperlexia	72
Table 3	Descriptive and/or Experimental Studies	75
Table 4	Reviews of Hyperlexia	80
Table 5	Criteria used to define Hyperlexia	82
Table 6	Neale Analysis of Reading Ability (ZA)	165
Table 7	Neale Analysis of Reading Ability (ZA,G2,G6)	168
Table 8	WRMT-R (ZA)	170
Table 9	WRMT-R (ZA, G2, G6)	172
Table 10	Reading Time – Randomized Passages	174
Table 11	Nonwords, Irregular Words, Regular Words	175
Table 12	Disambiguation of Homographs	180
Table 13	Total number of Homographs Disambiguated	182
	From Age 5;8 to 8;2 years	
Table 14	Effect of Position on Disambiguation of Homographs	183
Table 15	TOWRE - Form A	185
Table 16	TOWRE - Form B	185
Table 17	Matching Beginning sounds, End sounds and Rhyme	195
Table 18	Strip an Initial Sound (Digraphs)	199
Table 19	Lindemood Auditory Conceptualization Test	202
Table 20	AAT – Nonce	204
Table 21	The Morphological Relatedness Test (MRT)	207
Table 22	Derivational Suffix Test (DST)	209
Table 23	PPVT-R	212
Table 24	The WORD-R (ZA)	217
Table 25	The WORD-R (NM)	218
Table 26	TORCH	220
Table 27	Memory and Inferential Skills	223

Table 28	Access and Integration of Long Term Memory Knowledge	227
Table 29	Syntactic Comprehension using Temporal Terms	235
	(Age 6;2 years- ZA)	
Table 30	Syntactic Comprehension using Temporal Terms	235
	(Age 7 years- ZA)	
Table 31	TROG	238
Table 32	RAN – Grade 2, Grade 6 and ZA	242
Table 33	The Frog Stories (Grade 2, Grade 6 and ZA)	247
Table 34	TOMAL	251
Table 35	Working Memory	254
Index of F	figures	
n		60
Figure 1:	Reading Disorders (Nation, 1999)	69
Figure 2:	Dual Route Cascade Model (Coltheart et al, 2001)	87

ABSTRACT

This thesis is a longitudinal study of a hyperlexic child ZA, who is now 10 years 8 months old. ZA is an autistic child who initially presented with features which are typical of hyperlexia. Now at 10 years 8 months of age, he appears to be outgrowing the label hyperlexia, although he still exhibits some subtle comprehension deficits at both the word and text level.

The thesis traces the development of this child's decoding, comprehension and language skills over the last seven years. The data collected from a wide range of standardized and non standardized tests are presented. In spite of well developed decoding skills from a very early age, ZA had no detectable phonemic awareness when first tested. Even when phonemic awareness did develop it appeared to be driven by orthography rather than phonological analysis.

The dissociation between decoding and comprehension in cases of hyperlexia is more evident in some tests than others. Standardized comprehension tests suggest that ZA's comprehension was relatively well developed by the time he was in Grade 2 (92 months old). However, his poor scores when presented with sustained stretches of material indicate otherwise, and the adequacy of comprehension measures is discussed. Those skills which underlie successful comprehension were examined during the course of the study.

Two hypotheses attempt to explain how a child might learn to read without phonemic awareness: The Knowledge Sources Theory (ISRs) and privileged access theory.