

**COMPARING THE TRENDS OF DEVELOPMENT IN  
L2 AND L1 MENTAL LEXICON  
ASSOCIATIONS, VOCABULARY SIZE, AND  
REACTION TIME**

**NEDA AKBARI**

**Doctoral Dissertation**

**February 2014**

**University of Canberra**

## **Acknowledgements**

My interest in the area of word associations goes back to the day that I was browsing through the journal of *Studies in Second Language Acquisition* looking for a topic for my Master's thesis. I accidentally found the article *Comparing the L1 and L2 mental lexicon: A depth of individual word knowledge model* by Dr. Brent Wolter (2001). This paper inspired me to conduct a small-scale study for my Master's degree and continue my studies at PhD level in the areas of word associations and retrieval.

I would like to extend my gratitude to my supervisory panel: Dr. Deborah Hill, Dr. Eleni Petraki, and Dr. Linda Li who provided direction to this research. The regular meetings and deep discussions offered a stimulating environment for the development of ideas. They always listened to my ideas and concerns, patiently read my chapter drafts, and provided constructive feedback. I would also like to thank Ms. Sue Prentice for her valuable editorial advice on academic writing, particularly on clarity, coherence, and clutter. I acknowledge also the contribution of Dr. Michael Harrington who kindly gave me access to the yes/no Lexical Decision Task and responded to my questions. I am also grateful to Prof. Paul Nation for providing me with the Word Family Lists. My thanks are also due to Prof. Tess Fitzpatrick who accepted the invitation to be on my supervisory panel as an external advisor and responded to my questions.

I would also like to thank the ACT schools which participated in this study, the school principals, teachers, and the students. Without their support and participation, this research would not have been possible. I also acknowledge the contribution of the ACT Education and Training Directorate which provided assistance in identifying second language students in the ACT.

A special thank you is due to my family. Without their encouragement and on-going support, the entire process of moving to another country and undertaking a PhD degree would not have been possible. I am also thankful to my husband and all my dear friends whose emotional support has always been with me.

## **Abstract**

Words are an important component of language in second language (L2) learning since words carry meaning, and the ability to communicate occurs through the meaning of words. The current study investigated the trend of development in the L2 mental lexicon (ML) from the three dimensions of associations, vocabulary size, and reaction time. The main purposes of this study were to determine whether the L2 ML had a similar trend of development to the first language (L1) ML if the L2 was learned in similar circumstances to the L1, and whether the L2 ML could resemble the L1 ML at some age.

The participants in this study comprised the immigrant children aged 6-17 undertaking mainstream education in the L2 (English). A Word Association Task and the yes/no Lexical Decision Task were utilised in order to elicit the word associations and measure the vocabulary size and reaction time respectively.

The findings of the present study revealed a relatively similar trend of development for the L2 and L1 ML with only slight discrepancies between them. The findings also demonstrated significant similarities between the L2 and L1 ML of students aged 15-17. These findings were discussed in the broader context of children's cognitive and linguistic development. The impact of age and the environment on language learning was also explained.

## Abbreviations

AoA	Age of Arrival
BNC	British National Corpus
CAE	Cambridge Certificate in Advanced English
cfg	correction for guessing formula
COCA	Corpus of Contemporary American English
DL1	Dutch as a First Language
DL2	Dutch as a Second Language
EFL	English as a Foreign Language
ESL	English as a Second Language
EVST	Eurocentres Vocabulary Size Test
IEC	Introductory English Centres
L1	First Language
L2	Second Language
LDT	Lexical Decision Task
LoE	Length of Education
LoR	Length of Residence
LPR	Language Proficiency Ratings
ML	Mental Lexicon
PPVT	Peabody Picture Vocabulary Test
SDT	Signal Detection Theory
SPSS	Statistical Package for Social Sciences
UWL	University Word List
VLT	Vocabulary Levels Test
VORST	Vocabulary Recognition Speed Test
WAT	Word Association Task
WFL	Word Family List

# Table of Contents

Chapter 1: Introduction.....	1
1.1. Overview.....	1
1.2. Rationale and research questions .....	2
1.3. Research design.....	4
1.4. Chapter overview.....	4
Chapter 2: Literature Review.....	7
2.1. Overview .....	7
2.2. Age and the environment for language learning.....	8
2.3. Mental lexicon and word associations .....	9
2.3.1. Word associations in child and adult L1 .....	11
2.3.2. Word associations in adult L2.....	20
2.3.3. Word associations in child L2 .....	38
2.4. Mental lexicon, vocabulary size, and reaction time .....	43
2.4.1. Vocabulary size and reaction time in child L2 and L1 .....	44
2.4.2. Vocabulary size and reaction time in adult L2 and L1.....	50
2.4.3. Correlation between vocabulary size and reaction time.....	56
2.5. Rationale for the current study.....	61
Chapter 3: Word Association Task and Lexical Decision Task .....	67
3.1. Word Association Task.....	68
3.1.1. Word Association Task purpose .....	69
3.1.2. Word Association Task development.....	71
3.1.3. Word Association Task construct.....	72
3.1.4. Word Association Task formats.....	76
3.1.5. Word Association Task in the current study .....	79
3.2. Yes/no Lexical Decision Task and its purpose.....	81
3.2.1. Yes/no Lexical Decision Task development .....	82
3.2.2. Other task formats.....	86
3.2.3. Yes/no Lexical Decision Task in the current study.....	92
Chapter 4: Research Methodology and Data Analysis.....	95
4.1. Research design .....	95
4.2. Ethical considerations.....	96
4.3. Participants.....	97
4.3.1. Selection of participants .....	97

4.3.2. Recruitment of participants .....	99
4.3.3. Language Proficiency Ratings .....	103
4.4. Data collection .....	104
4.4.1. Data elicitation method .....	104
4.4.2. Pilot study .....	108
4.5. Data processing .....	109
4.5.1. Scoring .....	109
4.5.2. Creating the database .....	111
4.5.3. Data screening .....	113
4.6. Descriptive and statistical analysis .....	114
4.6.1. Descriptive analysis .....	114
4.6.2. Statistical analysis .....	114
4.7. Summary .....	116
Chapter 5: Results .....	119
5.1. Overview .....	119
5.2. Research question 1 .....	120
5.2.1. Paradigmatic associations .....	120
5.2.2. Syntagmatic associations .....	121
5.2.3. Phonological associations .....	123
5.2.4. No-response items .....	124
5.2.5. Other responses .....	126
5.2.6. Vocabulary size .....	127
5.2.7. Reaction time .....	128
5.2.8. Correlation between vocabulary size and other dimensions of mental lexicon .....	131
5.2.9. Frequency and associations .....	132
5.2.10. Summary .....	141
5.3. Research question 2 .....	142
5.3.1. L2 and L1 students aged 6-7 .....	142
5.3.2. L2 and L1 students aged 11-12 .....	143
5.3.3. L2 and L1 students aged 15-17 .....	145
5.3.4. Length of residence in L2 country .....	147
5.3.5. Length of mainstream education in L2 .....	148
5.3.6. Age of arrival into L2 country .....	148
5.3.7. Summary .....	149

Chapter 6 - Discussion.....	151
6.1. Overview .....	151
6.2. Research question 1 .....	155
6.2.1. Trend of development for paradigmatic associations in L2 and L1 .....	155
6.2.2. Summary.....	161
6.2.3. Trend of development for syntagmatic associations in L2 and L1 .....	161
6.2.4. Summary.....	166
6.2.5. Trend of development for phonological associations in L2 and L1 .....	166
6.2.6. Summary.....	169
6.2.7. Trend of development for vocabulary size and reaction time in L2 and L1 .....	170
6.2.8. Summary.....	174
6.3. Research question 2 .....	175
6.3.1. L2 and L1 students aged 6-7.....	175
6.3.2. Summary.....	177
6.3.3. L2 and L1 students aged 11-12 .....	178
6.3.4. Summary.....	180
6.3.5. L2 and L1 students aged 15-17 .....	181
6.3.6. Summary.....	185
6.4. The impact of age and the environment on mental lexicon .....	185
Chapter 7: Conclusions.....	191
7.1. Overview of the present study .....	191
7.2. Contributions of the present study .....	193
7.3. Limitations of the present study.....	196
7.4. Summary .....	198
List of references.....	199
Appendices .....	207

## List of Tables

Table 3.1: Associated Words and Distracters for the Stimulus Word Sudden .....	77
Table 4.1: Summary of Participant Information.....	102
Table 4.2: Sample Excel Sheet for WAT – Participants’ Responses.....	112
Table 4.3: Sample Excel Sheet for WAT – Categories for Responses.....	112
Table 4.4: Sample Excel Sheet for WAT – Categories Converted to Numbers.....	112
Table 4.5: Sample Excel sheet for the yes/no LDT.....	113
Table 5.1: Median and Standard Deviation for Paradigmatic Associations in All Groups.....	120
Table 5.2: Significance of Difference for Paradigmatic Associations in All Groups.....	121
Table 5.3: Median and Standard Deviation for Syntagmatic Associations in All Groups.....	122
Table 5.4: Significance of Difference for Syntagmatic Associations in All Groups.....	123
Table 5.5: Median and Standard Deviation for Phonological Associations in All Groups.....	123
Table 5.6: Significance of Difference for Phonological Associations in All Groups.....	124
Table 5.7: Median and Standard Deviation for No-response Items in All Groups.....	125
Table 5.8: Significance of Difference for No-response Items in All Groups.....	126
Table 5.9: Median and Standard Deviation for Other Responses in All Groups.....	126
Table 5.10: Median and Standard Deviation for Vocabulary Size in All Groups.....	127
Table 5.11: Significance of Difference for Vocabulary Size in All Groups.....	128
Table 5.12: Median and Standard Deviation for Reaction Time in All Groups.....	129
Table 5.13: Significance of Difference for Reaction Time in All Groups.....	130
Table 5.14: Effect Size for Associations –L2 and L1 Students of All Ages.....	131
Table 5.15: Correlation between Vocabulary Size, Associations, and Reaction Time.....	132
Table 5.16: Frequency and Associations of L2 Students Aged 6-7.....	132
Table 5.17: Significance of Frequency Effect on Associations for L2 Students Aged 6-7.....	133
Table 5.18: Frequency and Associations of L1 Students Aged 6-7.....	134
Table 5.19: Significance of Frequency Effect on Associations for L1 Students Aged 6-7.....	135
Table 5.20: Frequency and Associations of L2 Students Aged 11-12.....	135
Table 5.21: Significance of Frequency Effect on Associations for L2 Students Aged 11-12.....	136
Table 5.22: Frequency and Associations of L1 Students Aged 11-12.....	137
Table 5.23: Significance of Frequency Effect on Associations for L1 Students Aged 11-12.....	138
Table 5.24: Frequency and Associations of L2 Students Aged 15-17.....	138
Table 5.25: Significance of Frequency Effect on Associations for L2 Students Aged 15-17.....	139



Table 5.26: Frequency and Associations of L1 Students Aged 15-17.....	140
Table 5.27: Significance of Frequency Effect on Associations for L1 Students Aged 15-17.....	141
Table 5.28: Median for Different Dimensions of L2 and L1 ML - Students Aged 6-7.....	142
Table 5.29: Significance of Difference for Different Dimensions of the L2 and L1 ML - Students Aged 6-7.....	143
Table 5.30: Median for Different Dimensions of L2 and L1 ML - Students Aged 11-12.....	144
Table 5.31: Significance of Difference for Different Dimensions of the L2 and L1 ML - Students Aged 11-12.....	145
Table 5.32: Median for Different Dimensions of L2 and L1 ML - Students Aged 15-17.....	145
Table 5.33: Significance of Difference for Different Dimensions of the L2 and L1 ML - Students Aged 15-17.....	146
Table 5.34: Effect Size for Different Dimensions of ML – L2 and L1 Students of All Ages.....	147
Table 5.35: Correlation between LoR in L2 Country, Associations, Vocabulary Size, and Reaction Time.....	148
Table 5.36: Correlation between LoE in L2, Associations, Vocabulary Size, and Reaction Time.....	148
Table 5.37: Correlation between AoA into L2 Country, Associations, Vocabulary Size, and Reaction Time.....	149

## List of Figures

Figure 3.1: Stimulus word banana in the network of associated words.....	79
Figure 3.2: Item alternatives in the yes/no LDT.....	81
Figure 4.1: Map of Canberra.....	100
Figure 5.1: Trend of development for paradigmatic associations.....	121
Figure 5.2: Trend of development for syntagmatic associations.....	122
Figure 5.3: Trend of development for phonological associations.....	124
Figure 5.4: Trend of development for no-response items.....	125
Figure 5.5: Trend of development for vocabulary size.....	128
Figure 5.6: Trend of development for reaction time.....	129
Figure 5.7: Frequency and associations of the L2 students aged 6-7.....	133
Figure 5.8: Frequency and associations of the L1 students aged 6-7.....	134
Figure 5.9: Frequency and associations of the L2 students aged 11-12.....	136
Figure 5.10: Frequency and associations of the L1 students aged 11-12.....	137
Figure 5.11: Frequency and associations of the L2 students aged 15-17.....	139
Figure 5.12: Frequency and associations of the L1 students aged 15-17.....	140
Figure 5.13: Comparison of the associations and no-response items of L2 and L1 students aged 6-7.....	143
Figure 5.14: Comparison of the associations, vocabulary size, and reaction time of L2 and L1 students aged 11-12.....	144
Figure 5.15: Comparison of the associations, vocabulary size, and reaction time of L2 and L1 students aged 15-17.....	146