MORPHOLOGICAL STRUCTURE OF MALAY: USING PSYCHOLINGUISTIC ANALYSES OF RATED FAMILIARITY

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0 Introduction

Psycholinguistic databases, listing properties of English words such as frequency and concreteness, have proved useful for the design of language assessment tools and experimental investigations of cognitive processes. These databases are now widely available for several other languages, including French, German, Dutch and Spanish, thereby facilitating work on bilingualism and cross-linguistic research. In this paper, we describe *how* and *why* we are developing a psycholinguistic database for Malay, which takes into account the relationship between morphological structure and rated word familiarity.

We started the database by asking 35 Malaysian first language speakers of Malay to rate a corpus of 4,328 words, comprising stem and affixed forms, on a 7-point familiarity scale. From this main database, we then extracted the mean ratings for 36 stem verbs and compared them to the mean ratings of their affixed forms: *teR-, meN-, di-, beR-,-kan, meN-…-kan* and *di-…-kan.* Our results provide support for several predictable patterns: stems are rated as more familiar than affixed forms, active forms are rated as more familiar than passive forms, and informal forms are rated as more familiar than formal forms. The utility of these kinds of analyses and the main psycholinguistic database is then illustrated with particular reference to the design of spelling and reading tests in Malay, and empirical studies of written language processing.

1 Psycholinguistic Analyses of Writing Scripts

Words have many properties that can be quantified and stored in a psycholinguistic database, e.g., frequency, number of syllables, number of letters, number of phonemes, and type of morpheme. These databases are useful for the development of clinical and educational assessments as well as for the design of psycholinguistic experiments. By manipulating one property of a word with precision, while holding the others relatively constant, the clinician or researcher can make a more accurate assessment of a person's language processing skills.

For English, and many other alphabetic scripts, psycholinguistic databases have already provided the foundation for reliable diagnostic tools and coherent models of cognitive processing. The importance of calibrating word properties has led to computerized compilations, e.g., Coltheart's (1981) *M.R.C. Psycholinguistic Database* for English, and the Max Planck Institute's *CELEX Lexical Database* for Dutch, English, French and German (Center for Lexical Information 1995). Before these computerized

Mark Alves, Paul Sidwell & David Gil, eds. *SEALSVIII: papers from the 8th meeting of the Southeast Asian Linguistics Society (1998).* Canberra, Pacific Linguistics, 2007, pp.109-119.

resources became available, databases comprised a large number of printed pages which required painstaking word-matching by hand. Carroll, Davis and Richman's (1971) detailed work is a good example. These authors assembled a sizeable corpus of 5,088,721 English words, with different affixed forms listed separately. The resulting 805 pages of text, entitled *The American Heritage Word Frequency Book,* lists objective word frequencies for 86,741 different forms from 1,045 published materials. Other more modest databases, such as Toglia and Battig's (1978) *Handbook of Semantic Word Norms*, have been compiled using subjective 7-point ratings, rather than objective word counts, for a range of word properties including concreteness, number of associations, and familiarity.

Although databases utilizing subjective ratings are often smaller in size and they are not founded on word counts from printed matter, they can incorporate a broader range of properties that are salient for cognitive processing, such as imageability, and they retain the scaling used by a specific sample of readers. In a recent study of Chinese character processing, Rickard Liow, Tng and Lee (1999) used Toglia and Battig's method to calibrate semantic and phonetic regularity for Mandarin across subject pools from China, Singapore and Taiwan. Their results suggested that empirical research on the processing of Chinese characters demands more precision than has been observed to date, and that ratings are best obtained from *local* subject pools.

Given some of the advantages of subjective ratings, we reasoned that Toglia and Battig's method of scaling word properties would be a good starting point for a psycholinguistic database of the Malay language. In what follows, we describe *how* and *why* we collected and analyzed *familiarity* ratings.

2 Towards a Psycholinguistic Database for Malay

Malay languages belong to the Austronesian family and are used by more than 100 million people in South East Asia. Their respective standard forms are amongst the national languages for Indonesia, Malaysia, Singapore and Brunei, and there are also a large number of colloquial versions of Malay spoken throughout the region. The standard, or *formal* version[1] of Malay, is more commonly used for writing. Compared to English, formal Malay is very heavily inflected and the relationship between the orthography and phonology is much more predictable, both in the Arabic script and the more common Romanized script.

Despite the widespread use of informal and formal Malay and the potential for interesting cross-linguistic studies, no psycholinguistic database is yet available. Inevitably this has limited the development of standardized language assessment tools and the scope of empirical research on cognitive processing in Malay. For undergraduate projects, some pioneering students at the National University of Singapore gauged familiarity for 530 words (see Pereira, Rickard Liow & Mohd Saniff, 1992) and a search of the international literature yielded just *one* psycholinguistic study of Malay language processing published in English. This was a Stroop experiment conducted by Baluch and Abdullah-Darlan (1991) which compared reading in the Arabic and Romanised forms of the script. The scarcity of psycholinguistic research papers published in English on the Malay language suggests a brief review of the script would be useful here.

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[1] We have sometimes used the terms standard and formal interchangeably but recognize that there are formal and informal forms of particular words within standard Malay.

3 The Malay Writing Script

Both forms of the Malay writing script are alphabetic, but they are used in different domains. The Arabic form (Jawi) is now used almost exclusively for the teachings of Islam, whilst the newer Romanized form (Rumi) is used for all other kinds of education and almost all types of printed materials. For this reason, and because comparisons with English are more feasible, we restricted our study to the Romanized form.

Orthography and Phonology. We noted earlier that the relationship between Malay orthography and phonology is more predictable (or regular) than it is for English. In Singapore and Malaysia, the grapheme-phoneme (letter- to- sound) correspondence is perfect for non-loan words with the exception of the letter 'e', which carries two phonological forms in standard Malay (but only one Indonesia). Although the grapheme-phoneme mappings are sometimes different from those in English (e.g., 'c' sounds like 'ch' in church), the same set of vowels and consonants are in use (except the letter 'x' which is found in foreign words).

Unlike English, there are only three diphthongs in Malay (*ai*, *au* and *oi*) and most syllables are very short. Possible syllable structures include *v, vc, vcc, ccv, cv, cvv, cvc, cvcc*, and *ccvc,* but when the vowels 'a' and 'i' or 'a' and 'u' are adjacent in a closed syllable, they are pronounced with a syllable boundary between them, e.g., *lain* (other) and *laut* (sea) are both two syllable words.

Morphology. We also noted earlier that affixation is more common in Malay than in English. At least nine prefixes (*meN*[2]*-, beR-, teR-, di-, peN-, peR-, se-, ke-, and mempeR-*), three suffixes (*-kan, -i, -an*), four infixes (*-el-, -er-, -em-, and -in-*) and thirteen circumfixes (*meN-…-kan, di-…-kan, meN-…-i, di-…-i, beR-…-an, beR-…-kan, peN-…-an, peR-…-an, ke-…-an, mempeR-…-kan, dipeR-…-kan, mempeR-…-i,* and *dipeR-…-i*) are widely used. Like affixation, reduplication[3] is also common in Malay, and so the nature of the morphology makes the number of letters and syllables per word much higher than in English: average word length is about seven letters, with about three syllables, but some words are much longer. For example, the 18-letter, 8-syllable word *membahagi-bahagikan* (to divide into smaller parts!) comprises a prefix, a reduplicated stem, and a suffix. See Karim, Onn, Musa and Mahmood (1996) for further details. Each of these affixes serves at least one semantic function depending on the word class (noun, adjective or verb) of the stem, and the word class often changes after affixation. For example, when the prefix *beR-* is attached to a noun *payung* 'umbrella', the resulting affixed word *berpayung* is a verb 'using the umbrella'.

This kind of morphological structure suggests that the meaning of a relatively unfamiliar affixed word such as *menderas* 'move quickly can usually be predicted by putting the meanings of its more familiar stem, *deras* 'quick' and its affix together, and conversely, the meaning of a relatively unfamiliar stem such as *sarap* 'have breakfast'can be predicted by splitting the more familiar affixed word *sarapan* 'breakfast' into its stem and affix. However, exceptions occur when the meaning of a stem or affixed form cannot

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[2] Depending on the initial letter of the stem to which the affix is attached, there may be morphological assimilation, e.g., *meN + buka = membuka*. In some instances, the initial letter of the stem word is dropped after affixation, e.g., *peN + tari = penari*. For more details on morphological assimilation, refer to Koh (1978).

[3] Reduplication is used to express indefinite plurality, intensity and repetition. Refer to Heah (1989), for more details.

be deduced by adding or subtracting the meanings of the components, e.g., *salin* 'to change' and *bersalin* 'to give birth'.

These patterns, and the exceptions, strongly suggest that the relationship between familiarity and morphology in Malay is likely to be particularly important for the development of language assessment tools and empirical research (see Lee, 2000). For this reason, we decided to start developing a psycholinguistic database by focusing on familiarity and morphology. In thispaper, we describe how we collected mean familiarity ratings from a large, representative sample (N=4,328) of stem and affixed words, and then for illustrative purposes, we analysed the subset of 36 stems which carried the greatest number of different inflectional forms.

4 Method

Using Toglia and Battig's methodology (Ibid.), a 7-point familiarity rating scale was constructed in questionnaire form, in which 1 = very unfamiliar and 7 = very familiar. All the Malay words were typed in lower case and order of presentation in the list was randomised.

Participants. Thirty-five Malaysian first language speakers of Malay between the ages of 18 and 39 participated in this study and were paid RM 50.00 (USD $14) each for their help.

Materials. To ensure that the participants would have been exposed to most of the words at some time, a corpus of 4,328 different lemma were compiled from the Primary 1 to Primary 3 textbooks used in Malaysian schools plus and from a Malay-English dictionary (Kamus Harian Federal, Daud 1945) that is used by Primary 4 pupils to lower Secondary school level (i.e., vocabulary of 6 – 14 year olds). In the final corpus, 2,510 items were stem words, 1,625 were stem words with affixes, 123 were reduplicated words, and 70 were reduplicated words with affixes. Word length ranged from two to eighteen letters (mean = 6.924; s.d. = 2.237), and from one to eight syllables (mean = 2.77; s.d.= 0.869).

Procedure. Participants were asked to rate each of the 4,328 words in the corpus on the 7-point familiarity scale using the following instructions (written in Malay) which are similar to those of Toglia and Battig:

> For every individual, there are words that are frequently encountered and experienced in daily life. The aim of this experiment is to collect ratings on the following list of words according to their familiarity. For words that you frequently encounter or experience, a high rating should be given. Conversely, for words that you seldom encounter or experience, a low rating should be given. Circle one of the numbers given on the 7-point scale to indicate your own familiarity with the words given in the list. If you do not recognize a given word, you are required to cancel it out. Please try to use all 7 numbers on the scale whilst giving your familiarity ratings. Do not limit yourself to using only 3 and 4, or 1 and 7. There are no correct answers in this familiarity rating task.

5 Results

For each of the 4,328 words, the ratings given by all 35 subjects were pooled together, and means and standard deviations were calculated. A subset of 116 mean ratings, comprising the 36 stem verbs with their affixed forms, was then extracted to enable a more detailed

analysis of the relationship between inflectional morphology and rated familiarity. The rank order of these stems and affixed forms is shown in Table 1.

Table 1: *Rated Familiarity of Stem and Affixed Forms in Descending Order*

Type	Characteristics	Mean	Std. Deviation
Stem	Stem	5.900	.7270
-kan	Suffix; Informal; Active	5.129	.3795
teR-	Prefix	5.100	.3932
meN-	Prefix; Transitive; Active	4.973	.3777
di-	Prefix; Passive	4.847	.2662
beR-	Prefix; Intransitive	4.837	.8830
di-…-kan	Circumfix; Formal; Passive	4.697	.2214
meN-…-kan	Circumfix; Formal; Active	4.664	.1816

Overall, the stems, e.g., *buat* 'make', ranked higher in familiarity than their affixed forms *membuat* 'make', and within the affixed forms, active forms, e.g., *menghantar* 'deliver', ranked higher than passive forms *dihantar* 'to be delivered', transitive forms, e.g., *mengejar* 'chase' ranked higher than intransitive *berkejar* 'rush', and informal forms, e.g., *ingatkan* 'to remember', ranked higher than formal *mengingkatkan* 'to remember'.

Paired comparisons between stems at the individual word level and their respective affixed forms yielded the results shown in Table 2. In general, stems were rated as significantly more familiar than their corresponding affixed forms.

Table 2: *Comparison of 36 stem verbs and their respective affixed forms*

		Prefix				Suffix	Circumfix	
Affixed form is		Trans Active	Intrans	Passive	Inconsistent [4]	Informal active	Formal Active	Formal Passive
Word	Stem (S)	meN-(A)	beR- (B)	di-(C)	teR- (D)	-kan (E)	meN-…-kan (F)	di-…-kan (G)
ada (have)	6.63		5.32*** [5]				4.85***	4.70***
bakar (burn)	5.90	5.12**		4.76***	5.32**			
balas (answer)	5.79	5.18*	5.09**	4.64***				
balik (return)	6.88		4.47***		5.26***	4.97***		
balut (wrap)	5.43	4.76*	4.90*	4.65				
bawa (bring)	6.48	5.09***		4.68***		4.97***		
beli (buy)	6.76	5.53***		5.12**		5.63***	4.76***	

[4] *teR-* has an inconsistent effect such that when it is added to an intransitive or transitive stem, the verb retains its base form but when it is added to a stem, the form can become either active or passive.

[5] * indicates the two variables are significantly different at .05 level, ** significance at .01 level, and *** significance at 0.001 level.

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Word	Stem (S)	meN- (A)	beR- (B)	di- (C)	teR- (D)	-kan (E)	meN-…-kan (F)	di-…-kan (G)
belit (coil around)	4.59	4.50	5.24*		4.32			
benam (soak)	3.37	4.06**	3.29		4.29***			
beri (give)	5.50	5.12		4.85		5.37	4.71*	4.67*
buang (throw)	6.40	5.35***		5.00***	5.09***			
buat (make)	6.32	5.35**		5.52***		5.40**	4.53***	
buka (open)	6.43	5.00***		5.15***	5.65***	5.44**		
celup (dip)	5.32	4.29**	2.97***	4.27***				
dapat (get)	6.56	4.82***			4.97***		4.71***	
Word	Stem (S)	meN- (A)	beR- (B)	di- (C)	teR- (D)	-kan (E)	meN-…-kan (F)	di-…-kan (G)
fikir (think)	6.12		5.97		5.26**		4.48***	
hantar (deliver)	6.38	5.09***		4.73***				4.41***
hias (decorate)	5.38	5.06		4.74*			4.36***	
hirau (care)	4.33					4.21	4.62	
ingat (remember)	6.29				5.56**	5.62**	4.82***	
jadi (happen)	6.29				5.18***	4.85***	4.38***	4.85***
jahit (sew)	5.68	5.21*		4.74***		4.91**		
kejar (chase)	5.88	5.12*	4.76***	4.74***				
Word	Stem (S)	meN- (A)	beR- (B)	di- (C)	teR- (D)	-kan (E)	meN-…-kan (F)	di-…-kan (G)
letak (put)	6.15				4.97***	5.24***	4.59***	4.41***
lipat (fold)	6.21		5.41**	5.00***				4.50***
main (play)	6.32		5.77				4.62***	4.61***
masuk (enter)	6.71				4.97***	5.61***	5.03***	4.82***
perlu (need)	5.53					4.91*	4.79**	4.94*
pulang (return)	5.50					4.94	4.59***	
sedia (prepare)	5.85		5.62			4.79***	4.97***	5.06**
serah (submit)	5.50		4.94		5.21		4.68**	
siap (complete)	6.45					5.47***	4.65***	
Word	Stem (S)	meN-(A)	beR- (B)	di-(C)	teR- (D)	-kan (E)	meN-…-kan (F)	di-…-kan (G)
siram (water)	5.29	4.62**	3.30***	4.63*				
susun (arrange)	5.59	5.21	4.97	4.91*		4.76**		

tukar (change)	6.15		5.53**	4.88***		5.24***	4.47***	
tutup (close)	6.44		4.68***	5.09***	5.35***			
Mean	5.900	5.130	5.100	4.973	4.847	4.837	4.697	4.664
Std. Dev.	0.727	0.38	0.393	0.378	0.266	0.883	0.221	0.182
N	36	18	14	19	19	17	10	19
Min	3.37	4.21	4.29	4.06	4.27	2.97	4.41	4.36
Max	6.88	5.63	5.65	5.53	5.52	5.97	5.06	5.03

In addition to the single verb analyses shown in Table 2, four pairs of comparisons amongst the affixed forms were of interest: *meN-* (active prefix) and *di-* (passive prefix), *meN-* (transitive prefix) and *beR-* (intransitive prefix), *-kan* (informal suffix) and *meN-…-kan* (formal circumfix) and *di-…-kan* (passive circumfix) and *meN-…-kan* (active circumfix). Each affixed form in a pair differs from the other form in terms of one characteristic, for example, *meN-...-kan* is active and formal whilst *-kan* is active but informal.

As Table 3 shows, only two of these overall pairwise comparisons showed statistically significant differences in their familiarity ratings: words with the prefix *meN-* (active form) were rated significantly more familiar than those with the prefix *di-* (passive form), and words with the suffix *-kan* (informal form) were rated more familiar than those with the circumfix *meN-…-kan* (formal form). Without a larger sample of affixed words, we cannot be sure whether the other two pairwise comparisons would yield significant differences, but our preliminary data suggest that while *meN-* (transitive form) might be rated as more familiar than *beR-* (intransitive form), the addition of the *–kan* suffix to make the circumfixes *meN-...-kan* and *di-…-kan* seems to negate the difference between the active and passive forms.

Table 3: *Overall comparison of affixes (paired t-tests)*

Mean familiarity ratings for affixed pair		**Characteristics**	**N**	**t**	**p**
meN- 4.718	beR- 4.315	Transitive / intransitive	8	1.6	.154
meN- 5.069	di- 4.821	Active / passive	16	4.533	.001
-kan 5.175	meN-…-kan 4.685	Informal / formal	13	4.274	.001
meN-..-kan 4.743	di-…-kan 4.758	Active / passive	8	-.190	.855

6 Discussion

The purpose of this study was to describe how and why we are developing a psycholinguistic database for Malay. Recall that we collected mean familiarity ratings on 4,328 words from 35 first language speakers. From this main database, we then extracted the mean familiarity ratings for 36 stem verbs and compared these to a series of affixed

forms: *teR-, meN-, di-, beR-, -kan, meN-…-kan and di-…-kan*. Our results suggest that there is a relationship between familiarity and morphology: stems are rated as more familiar than affixed forms, active forms are rated as more familiar than passive forms, and informal forms are rated as more familiar than formal forms. Now we will illustrate the utility of the detailed analyses, and the main database, with particular reference to our current work on standardized language assessments and cognitive models of reading.

6.1 *Standardized Language Assessments*

With the aid of our familiarity ratings, Lee developed spelling and reading tests for children attending primary schools in West Malaysia (Lee, 2000; Lee & Rickard Liow, 1999).

Malay Spelling Test. For literacy tests in English, lists of items are usually ordered roughly in terms of frequency and they include regular and irregular words. For Lee's test, the spelling list was initially ordered using our familiarity ratings, and it included words with the letter 'e' (to test the child's knowledge of the single irregular grapheme-phoneme correspondence) and some words which re-syllabify after affixation (to test the child's knowledge of morphological processes).

Malay Reading Tests. Lee has also used the familiarity ratings to devise single word and text-based reading tests. The single-word reading test was developed along the same lines as the Malay Spelling Test (described above) and her text-based test is similar to the (English Ibid.) Neale Analysis of Reading Ability (NARA). The NARA, which is used to assess reading rate, reading accuracy and reading comprehension, comprises a series of passages that are graded in terms of word frequency and sentence complexity. Likewise, Lee varied the level of difficulty in the passages by controlling the type of inflectional morphemes and their familiarity ratings such that the difficult passages have more complex morphological structures (more affixation and reduplication), and the words are generally less familiar. Given that the Romanized script is almost totally regular, we think that reading accuracy may be relatively easy to attain in Malay compared to English, whereas comprehension of complex morphological structures will be a major obstacle to independent reading for children, especially those with limited aural exposure to formal Malay.

Lee also developed standardized versions of these spelling and reading tests for 7- to 9-year-olds, with separate norms for Malaysian children from Chinese- and Malay-first-language backgrounds. Without a psycholinguistic database, these kinds of language assessment tools, and many others that await development, e.g., tests of receptive and expressive vocabulary, could not have been designed with any confidence[6].

6.2 *Cognitive Models of Reading*

Dual route models of reading (e.g., Morton, 1979; Morton and Patterson, 1980; Coltheart, Curtis, Atkins and Haller, 1993) provide a coherent account of the cognitive processing of the English alphabetic script by skilled unilingual readers. However, there are two kinds of evidence to suggest that these models may not be applicable to other alphabetic scripts,

[6] Since the 8th SEALS conference, Tye & Rickard Liow (submitted) have used the familiarity ratings to investigate language representation with case studies of Malay-speaking dysphasic adults.

especially those with more regular orthography-phonology or more regular orthography-morphology relationships.

First, Wimmer and Goswami (1994) found that children reading German (can and do) make greater use of the non-lexical route than children reading English. Second, no reading models (including the dual route type) can yet account for the visual search strategies we have observed in biscriptal bilingual (Malay-English) readers, e.g., Green, Rickard Liow, Tng and Zielinski (1996), and Rickard Liow, Green & Tam (1999).

Rickard Liow and Wee (1999) predicted that these different visual search strategies might be attributable to skilled readers' sensitivity to higher level psycholinguistic variables such as inflectional morphology which is well contrasted between the English and Malay scripts despite their graphemic similarity. They designed a cross-linguistic experiment to investigate affixation and lexicality using two paradigms: *visual search* to look at prefix versus stem position effects directly, and *lexical decision* to strengthen the links with previous research on unilingual English readers. The results showed support for our hypothesis that top-down processing reflects knowledge of morphological structure, especially in skilled readers of Malay.

For this kind of cross-linguistic research, it is important to control (or manipulate) word properties such as familiarity and number of letters, across the two languages. The corpus we described above was drawn from school textbooks only and it proved insufficient for these experiments. However, using the same principles, Rickard Liow and Wee were able to collect familiarity ratings from Malay-English bilinguals on sets of eight-letter stem and affixed words in the two languages. The raw familiarity ratings cannot be used directly for selecting words (because a rating of '1' on the English scale may not be the same as a value of '1' on the Malay rating scale) so we first centile-ranked the words in each language, and then matched their ranks. Clearly a psycholinguistic database for Malay can increase the validity and reliability of empirical studies of reading by enabling greater precision in the selection of experimental stimuli.

To summarize, there are many descriptive books on the Malay language, for example, Hassan (1974), Koh (1978), and Karim et. al. (1996), but none provide a suitable resource that can form the foundation for empirical work. In this paper, we have argued that a psycholinguistic database is crucial for the design of clinical and educational assessments and for extending cognitive models of language processing hitherto based on unilingual English-speaking populations. The corpus we have documented here, together with its implications, is limited in that we calibrated only familiarity and inflectional morphology for a small sample of words. However, we have shown *how* and *why* a database for Malay can and should be developed.

Acknowledgements

The first author collected these familiarity ratings as a foundation for her Masters thesis on children's reading and spelling skills in Malay. We are grateful to the National University of Singapore for scholarship support, to the staff and students of Universiti Kebangsaan Malaysia (Kuala Lumpur), Sekolah Menengah Kebangsaan King Edward (Taiping, Perak), and Sekolah Menengah Kebangsaan St. George (Taiping, Perak), for their help with data collection, and to Nurai'sha Bte Hassan for her involvement at the SEALS conference.

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References

Bahasa Malaysia Tahun 1, 2, 3. *Kurikulum Bersepadu Sekolah Rendah*. 1995. Kuala Lumpur, Malaysia: Dewan Bahasa dan Pustaka & Pustaka Cipta.

Baluch, B. & Abdullah-Darlan, K. 1991. On processing the Roman and Arabic orthographies of Malay: Some implications from the Stroop colour-word test. *Psychological Reports*, 69, 2, (Oct) 562-569.

Carroll, J.B., Davies, P. & Richman, B. 1971. *The American Heritage Word Frequency Book*. Boston: Houghton Mifflin.

Centre for Lexical Information. 1995. *The Celex Lexical Database Release 2*. Nijmegen, The Netherlands: Max Planck Institute for Psycholinguistics.

Coltheart, M. 1981. The Medical Research Council Psycholinguistic Database. *Quarterly Journal of Experimental Psychology: Human Experimental Psychology*, 33A, 497-505.

Coltheart, M., Curtis, B., Atkins, P., & Haller, M. 1993. Models of reading aloud: Dual route and parallel distributed approaches. *Psychological Review*, 100, 589-608.

Daud, M.S. 1995. *Kamus Harian Federal*. Kuala Lumpur, Malaysia: Federal Publications.

Green, D.W., Rickard Liow S.J., Tng, S.K. & Zielinski, S. 1996. Are visual search procedures adapted to the nature of the script? *British Journal of Psychology*, 87, 311-326.

Hassan, A. 1974. *The Morphology of Malay*. Kuala Lumpur: Dewan Bahasa dan Pustaka.

Heah, C.L-H. 1989. *The Influence of English on the Lexical Expansion of Bahasa Malaysia*. Kuala Lumpur: Dewan Bahasa dan Pustaka.

Karim, N.S., Onn, F.M., Musa, H.H., & Mahmood, A.H. 1996. *Tatabahasa Dewan. (Edisi Baharu)*. Kuala Lumpur, Malaysia: Dewan Bahasa dan Pustaka.

Koh, B.B. 1978. *The Teaching of Malay Affixes*. Siri Pengarajan Fajar Bakti. Kuala Lumpur, Malaysia: Penerbit Fajar Bakti.

Kucera, H. & Francis, W.N. 1967. *Computational Analysis of Present-Day American English*. Providence, Rhode Island: Brown University Press.

Lee, L.C. 2000. *Development of Literacy Skills in the Malay Language: Comparison of L1 (Malay) and L2 (Chinese) children in Malaysia*. Masters Thesis, National University of Singapore.

Lee, L.C. & Rickard Liow, S.J. 1999. *Malay Standardised Reading and Spelling Tests*. Paper presented at the SHA(S) & NUS Joint Workshop on Malay Language Acquisition. National University of Singapore. (Jan).

Morton, J. 1979. Word Recognition. In J. Morton and J. Marshall (eds), *Psycholinguistics Series*, Vol. 2. London: Elek.

Morton, J. & Patterson, K. 1980. A new attempt at an interpretation, or, an attempt at a new interpretation. In M. Coltheart, K. Patterson and J.C. Marshall (eds), *Deep Dyslexia*. London: Routledge and Kegan Paul.

Neale, M.D. 1989. *Neale Analysis of Reading Ability*. (Revised British Edition). Great Britain: NFER-NELSON.

Pereira, V., Rickard Liow, S.J. & Mohd Saniff, S. 1992. Familiarity Ratings for 530 Malay Words. *Working Paper No. 42. Department of Social Work and Psychology*, National University of Singapore, Singapore.

Rickard Liow, S.J., Green, D.W. & Tam, L-J, M-M. 1999. The development of visual search strategies in Malay-English and Chinese-English biscriptals. *International Journal of Bilingualism*, 3, 333-349.

Rickard Liow, S.J., Tng, S.K. & Lee, C.L. 1999. Chinese characters: Semantic and phonetic regularity norms for China, Singapore and Taiwan. *Behaviour Research Methods, Instruments & Computers*, 31, 155-177.

Rickard Liow, S.J. & Wee, M-L., O. 1999. *Reading Strategies of Skilled Bilingual Biscriptals*. Paper presented at the SHA(S) & NUS Joint Workshop on Malay Language Acquisition. National University of Singapore. (Jan.)

Toglia, M.P. & Battig, W.F. 1978. *Handbook of Semantic Word Norms*. Hillsdale, New Jersey: Lawrence Erlbaum.

Tye, W.P. & Rickard Liow, S.J. (submitted). *Malay language processing: Evidence from case studies of dysphasia*. Paper submitted for the International Symposium of Linguistics & Speech-Hearing Sciences, to be held in Kuala Lumpur (Oct, 2002).

Wimmer, H. & Goswami, U. 1994. The influence of orthographic consistency on reading development: Word recognition in English and German children. *Cognition* 51: 91-103.