

THE POTENTIAL EFFECT OF NON-TONE MARKING ON HOMOGRAPH PROCESSING IN SHONA: A PRELIMINARY EXPLORATION

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This article explores how non-tone marking in Shona orthography results in ambiguous lexical items. It further investigates how this non-tone marking may result in processing difficulties for speakers when reading in single word contexts. The focus is on how the speaker arrives at the correct reading in view of multiple readings and meanings. This preliminary study explores what non-tone marking may cost in terms of cognitive resources when reading in single word contexts. Three models are discussed to give an insight into how single Shona word processing, which is highly ambiguous without tone marking, could be made as efficient as possible. The analysis and discussion of the article is based on the Exhaustive, Integration and the Selective accounts to explore how the readers deal with the potential processing and reading difficulties when they encounter these highly ambiguous lexical items.

Keywords

Zero tone marking, Shona, language processing, lexical ambiguity, Shona orthography

INTRODUCTION

As most other southern Bantu languages, Shona, spoken as a native language by about 10 million people in Zimbabwe (Gordon, 2005), has two phonemes of tone, namely, H(igh) and L(ow), with a maximum of one tone per vowel or syllable (Fortune, 1980; Mkanganwi, 1990). At the present moment, tone marking is not widely practiced in Shona. However, it is now a common practice to mark tones in dictionary making since it aids pronunciation (Chimhundu, 1996, 2001; Mangoya, 2009; Mabaso, 2009). Although tonal distinctions are generally not represented, using Bird's (1999) classification, languages like Shona which are not written with tone marks, still have a tonal orthography, but with complete under-representation; what we refer to as zero tone marking. It has been argued that it is not necessary to mark tone in Shona because the ambiguity that could potentially arise is easily dealt with by context (Fortune, 1972). As demonstrated by Bird (1999), in Dschang from Cameroon, tone marking can actually reduce reading fluency and does not help resolve tonally ambiguous words. However, when reading Shona texts speakers frequently encounter ambiguous words and phrases because of the use of a zero tone marking orthography in this language.

On the other hand, other tone languages, for instance Asian tone languages, mark tone orthographically. So when the speakers of languages like Thai and Chinese learn to read, they also have to learn to identify and read the different tones as part of the different words. In Asian tone languages, when learning to read single words, tones are learnt explicitly by learning to associate them with different segments and their meanings. Learning to read in these languages is therefore a three-step level, unlike the two-step level in Shona and other southern Bantu languages whereby only the pronunciation and meaning component are learnt. Tones are acquired implicitly via the spoken mode. Central Thai has five phonologically distinct tones, expressed on a single syllable such that a syllable consisting of the same segments can have totally different meanings depending on the tone, e.g., /nà:/ (*low*) ‘name’, /ná:/ (*high*) ‘aunt’, /nǎ:/ (*rising*) ‘thick’, /nâ:/ (*falling*) ‘face’, /nā:/ (*mid*) ‘field’. Speakers learn the tone and the word simultaneously. The tonal inventory of Thai comprises of level tones and dynamic tones. The low, high and mid tones in central Thai are classified as static, whereas the rising and falling tones are classified as contour tones (Abramson, 1978).

Tone marking in the orthography of languages such as Thai trains the speakers to identify the tones and helps in the disambiguation of single words. Unlike in Shona where tone is not marked orthographically, Thai reading in single word contexts is guided by the presence of both segmental and suprasegmental information. In Chinese, of all the phonetic radicals, 36% give clear information about a character’s pronunciation, 48% give partial information and 16% give no useful information (Yin, 1991). According to Nagy and Anderson (1998), reading is fundamentally metalinguistic especially during the early stages. Metalinguistic awareness is the ability to identify and reflect on the structural features of language. Using a metalinguistic approach, reading tone languages in single word contexts involves being aware of the basic units of spoken language (phonemes and tonemes), the basic units of the writing system (letters), and mapping the two (Cossu, Shankweiler, Liberman, Katz & Tola, 1986; Goswami & Bryant, 1992). Any lack of one to one mapping causes some level of cognitive overload that has to be compensated for by using other strategies.

STONE IN SHONA

As already highlighted in the preceding section, tone languages use variations of pitch at the syllable level to distinguish lexical meanings of different words (Yip, 2002). In Shona, tone contrasts of syllables in words are vital in bringing out the meaning of words. At the disyllabic level there are two contrastive tones. These are abstract sets of pitches, which comprise a phonemic High (H) in a given environment that contrasts with another abstract set which comprises a second phonemic tone, commonly referred to as a phonemic Low (L). In nouns, these combine to form four combinations HH, LL, LH and HL, as shown in (1) and (2) below. Tone also plays a very significant role in stabilised or copula constructions in Shona (Carter, 1956; Pongweni, 1980). Lexical and phrase structures in Shona, except for suprasegmental marking alone, are homophonous. However, acoustic analyses of the disyllabic and multisyllabic words indicate that what may appear to be homophonous at the surface (segmental level) is actually not homophonous at the suprasegmental level (tonal level), for instance, *vanopara* ‘they offend’ HLLL; *vanopara* ‘the ones who offend’ LHLL; *vanopara* ‘they scrape’ HLHH; *vanopara* ‘the ones who scrape’ LHHH and *ambuya* ‘grandmother’ LHL, *ambuya* ‘mother in law’ LHH. It is perfectly normal to have lexical words and grammatical structures with sequences that suggest that they are homophonous, but the non-overt tones, which accompany them, are distinctive as well as distinguishing.

- (1) *guru* ‘hole’ (LL) vs. *guru* ‘polygamous union’ (LL)
- (2) *guru* ‘big’ (HH) vs. *guru* ‘beef stripe’ (LH)

The segmental homograph in which structural distinctiveness is only achieved through suprasegmental assignment has been likened to how English distinguishes word class assignment by stress like ‘*récord* vs. to *reçord*’ (Jefferies, 1990). However, the grammatical distinctions in the two languages are not the same, and how these are signalled acoustically is different. In order to look at precisely how words are knit together into different types of linked and identifiable phrases, one needs to look not only at the segmentally marked structures, but also at their suprasegmental patterning. This is particularly true in Shona, in which a number of lexical and grammatical structures without suprasegmental markers (as they would appear in print, for example) can be ambiguous, even in context. Within the verb phrase, main verbs, relatives, participials and consecutive phrases are segmentally homophonous but are distinguished through tone placement. Although context accounts for most of these potentially ambiguous situations, some may prove not so easy to resolve.

As already noted, Shona practices zero tone marking despite the fact that tone marking would demonstrate the way words are pronounced. Jefferies (1990) observes that the Language Committee agreed with the position of not marking tone in Shona. Fortune (1972:36), for example, notes that:

Although Shona is a tone language and conveys many distinctions purely by contrasting tone patterns on words which are otherwise the same, tone is not represented in the written language. The context is almost always a sufficient guide to suggest which tone pattern would be used in speech.

Bird (1999) supports this argument in a review of experimental work on African tone orthography. He notes that full tone marking is not optimal since the high tone density, which results from tone marking, imposes a great cognitive load on readers. This in turn makes it difficult to use the information conveyed by the tone marks effectively. Zero tone marking therefore reduces the process of diacritic overload. However, it is important to note that as much as the zero tone marking system minimises the cognitive load by reducing the diacritic load, its total absence militates against this objective as it also results in increased cognitive overload.

Mkanganwi (1990:8) observes that in print especially

the wisdom of the decision not to mark for tone can be questioned on the grounds that vernacular orthographies without markings for tone can be unclear and/or confusing in many cases. It seems clear that Shona and Ndebele sacrificed tone at the altar of alphabetic economy...

When we read single Shona words without a context, we are confronted with a number of options as to which reading is the appropriate one. Since Shona is a tone language, which does not mark tones orthographically, this means that there are a number of meanings and pronunciations that are activated due to zero tone marking that compete for processing for the final output reading. Our goal in this article is not to debate whether we should introduce phonemic tone marking, various reduced tone marking schemes or whether Shona orthography should continue in its current form (zero tone marking). Rather our goal is to investigate how tone marking could be introduced in the Shona orthographic system. In order

to read words or understand phrases in languages that have the same segmental components (consonants and vowels), but different non-overtly marked suprasegmentals in the form of tone, speakers have to use some strategy to access the meaning and pronunciations of these different lexical items.

SINGLE WORD READING

In Shona there are two main types of homographs (words that are spelt in the same way but pronounced differently). These homographs, as already demonstrated, are ambiguous without a context. Homographs can be divided into two groups. The one group is homophonic homographs, meaning words with different semantic representations connected to a single orthographic and phonological representation (Pacht & Rayner, 1993) as in (1) *guru* ‘hole’ LL vs. *guru* ‘polygamous union’ LL. The other group of homographs is heterophonic homographs, and these are linked to a single orthographic representation (in Shona due to zero tone marking) but have different semantic and phonological representations associated with a single orthographic representation in spoken language or in their underlying representations. However, with this last group of homographs there is a one-to-one linking between the semantic and phonological representations (2) *guru* ‘big’ HH vs. *guru* ‘beef tripe’ LH. Reading these words is challenging in situations where there is no prior context to aid in the disambiguation of the homophonic homographs and heterophonic homographs.

For the purpose of this preliminary report we will focus on the heterophonic homographs – known henceforth simply as homographs. When readers are presented with homographs the question is: how does this affect lexical access? Do all the possible meanings associated with the homograph get activated (exhaustive lexical access) or is only the dominant meaning activated (selective lexical access)? It is the aim of this article to consider different ways in which reading, in these potentially ambiguous situations without tone marking, could be made as efficient as possible. We will focus on the Exhaustive, Selective and Integration processing accounts to explain the possible ways that the final output is produced in single word contexts.

EXHAUSTIVE PROCESSING MODEL

The exhaustive model explanation of lexical ambiguity states that even without a prior context preceding the ambiguous word, lexical access is exhaustive (i.e., all meanings are accessed) and also independent of context (Pacht & Rayner, 1993). This means that for both the balanced homographs (with two meanings equally common) and biased homographs (with a highly dominant meaning) all the meanings are initially accessed by the readers. This means, therefore, that balanced homographs such as *nyora* ‘write’ HH, *nyora* LL ‘traditional face marks’; *chema* ‘cry’ HH, *chema* ‘bereavement donation’ HL ‘; *rima* ‘dark night’ HH, *rima* ‘farm’ HL; *nzara* ‘nails’ LH, *nzara* ‘hunger’ LL are accessed and compete to be read out without a context. This is also true for the biased homographs such as *vana* ‘it is children’ HH, *vana* ‘children’ LH; *doro* ‘beer’ HH, *doro* ‘wetland’ LH; *mbira* ‘hand piano’ LL, *mbira* ‘small wild animal’ HL. If both meanings and pronunciations of the homograph are accessed, it is likely to result in an increased cognitive processing load, hesitations and errors, and, hence, more time is taken to read such kinds of words in comparison to non-ambiguous lexical items.

Currently there are no frequency lists in Shona to adjudicate between the frequency of balanced and dominant homographs. However, our intuitions as native speakers favour that there are more biased homographs than balanced homographs. However, the efficacy of this position stands to be investigated in follow-up studies. Balanced homographs are possibly more difficult to process than biased homographs. On the one hand, in the case of dominant homographs, both meanings are likely equally activated and accessed; hence, more time is needed in selecting the correct one. On the other hand, biased homographs may be quickly processed since the more dominant meaning may be accessed first, and, hence, less time is needed to process them. This would be in line with the observed results by Rayner and Duffy (1986) that it takes longer to process balanced homographs since the two meanings are equally common compared to biased homographs. It should be noted though that the former was sentence processing with a neutral context. Pacht and Rayner (1993) note that, in the case of balanced homographs, readers are forced to make a choice between the two possible interpretations and take more time to differentiate. At the same time, the dominant meaning of the biased homograph is accessed at a faster rate than the subordinate meaning. Subordinate homographs for the later explanation can actually be treated as functionally different words since a biased context is necessary for the subordinate meaning to cause processing difficulties.

INTEGRATION MODEL

This alternative account posits that all the semantic representations of the homograph are exhaustively accessed. However, frequency is the main selection criterion. For balanced homographs, both meanings are available for integration at about the same time and therefore both must be integrated. This account predicts processing difficulties for balanced homographs in Shona speakers. When presented with two balanced homographs, for example *nzara* ‘nails’ LH and *nzara* ‘hunger’ LL, the Shona speakers are predicted to encounter processing difficulties which are likely to be manifested in longer reading times, hesitations and errors because of the competing meanings. In biased homographs such as *mbira* ‘hand piano’ LL and *mbira* ‘wild animal’ HL, after accessing the most frequent and dominant meaning, which is ‘hand piano’, the accessing of the subordinate meaning is aborted. We propose that this is likely to result in shorter reading times since the processing load is smaller due to more efficient processing.

In the case of biased homographs, therefore, the dominant meaning is the only one available for selection, to such an extent that it alone is integrated. However, treating the accessing of the meaning based only on frequency of use is likely to create almost different lexical items. This means that the subordinate meaning is treated as an independent lexical item that will only be instantiated when there is a context. This would support the observation by the Language Committee of Zimbabwe that context resolves most of the ambiguous situations, but in a different manner. This would suggest that even without a context the words are not truly ambiguous since many factors, for instance frequency, affect the final output. When presented with the homograph *ambuya*, the semantic representation of ‘grandmother’ LHL is likely to be accessed almost all the time first before the one of ‘mother-in-law’ LHH. Since ‘grandmother’ is something that is learnt earlier in the life of a child than ‘mother-in-law’. Even in terms of usage, unlike ‘grandmother’ the term ‘mother-in-law’ refers to a special relationship that comes as a result of growing up and marrying. According to the integration model, then, it seems that though words are not marked for tone in Shona, they may prove not to be very ambiguous since this is resolved via frequency and the lexical item which is always

read in its default or more common meaning; hence, presumably incurring a lesser processing load.

SELECTIVE ACCESS MODEL

Another way of interpreting the above models is to point to a third model, the selective model, of which only the dominant meaning is accessed in no context situations. In the case of biased homographs, the meaning that is accessed is the same in most cases, whereas for balanced homographs the meaning that is accessed varies from one occasion to another. This model of selective access suggests that for biased homographs, for example, *mbira* ‘hand piano’ LL and *mbira* ‘small wild animal’ HL, the semantic representation of ‘hand piano’ is likely to be always accessed and selected for output more than that of a ‘small wild animal’. However, this form of lexical access is likely to cause a lot of reading errors in single word contexts since it is not only the dominant meaning that appears in print. Still, it also means that since the dominant meaning is almost always accessed as opposed to the subordinate meaning, there will be shorter reading times since there are no competing lexical items. As for balanced homographs, for example, *nzara* ‘nails’ LH and *nzara* ‘hunger’ LL, the meaning that is accessed for final production would change depending on occasion, with the meaning ‘hunger’ or ‘nails’ being primed depending on the state of mind of the speaker at the time of reading. The selective account will probably generate faster reading times in comparison to other models. However, the fast reading times will come at a cost due to the seemingly random selection process and, hence, a lot of errors in the final output. This pure selective access model has not been well supported by empirical findings from previous studies (Serenio, Pacht & Rayner, 1992). Selective processing of a homograph’s meaning has been argued to only occur when a preceding context is biased towards the dominant meaning of a homograph. This biased context therefore inhibits the processing of the other meaning (see, for example, Paul, Kellas, Martin, & Clark, 1992; Tabossi, 1991).

DISCUSSION

In this article we presented three processing models to account for how native Shona speakers may process potentially ambiguous lexical items due to zero tone marking. We presented three models in this exploratory study because currently there are no known experimental lexical access studies on languages that practice zero tone marking. The aim was to show the different possible ways that the speakers access the correct semantic representation as quickly as possible. The adjudication of these models will be addressed in follow-up experimental studies. Carefully designed single word reading studies in neutral contexts will aid in evaluating which of the three models can best account for the data on how reading is made as efficient as possible in zero tone marked languages. However, so far, we believe that the Integration model is the best approach to account for lexical access in Shona. According to the Integration access model, like in the Exhaustive model, all meanings are accessed. This is true for most parallel processing models since we do not believe that lexical access occurs in single thread fashion as purported in the Selective access model. However, as highlighted in the discussion of the Integration model, frequency is the main selection criteria. The presentation of a homograph without a context is likely to cause immediate automatic semantic activation of multiple meanings of the homograph. This automatic semantic activation of multiple meanings has also been reported upon regarding the presentation of a

homograph at the sentential level (Onifer, & Swinney, 1981; Seidenberg, Tanenhaus, Leiman, & Bienkowski, 1982).

Although we have highlighted the similarities between the Integration and Exhaustive models (i.e., exhaustive access of all meanings), the Exhaustive model has a weakness of non-determinate behaviour. The parallel activation of meanings without anything to regulate which meaning is produced in the final output can produce different results on different presentations of the same homographs, especially with the balanced homographs. However, with the Integration model, word frequency acts as a regulator after the exhaustive access of all multiple semantic representations. On the one hand, regulating the final output through frequency, as is the case with the Integration model, also has the weakness of inhibiting the final output of the correct representation in those instances where the correct meaning is the subordinate meaning or less frequent meaning. It has been argued that dominance and context affect the activation of multiple meanings of homographs (Tabossi & Zardon, 1993). However, recent results seem to favour the position that if a word is a homograph, all the semantic representations are accessed independent of the frequency and dominance of the lexical items (Tanenhaus, Leiman & Seidenberg, 1979; Conklin & Maurer, 2005).

In this report we treated the three models as though they are mutually exclusive. However, as we have already demonstrated there is some overlapping, for instance, between the Exhaustive model and the Integration model. There are many factors that are involved that result in exhaustive, integration or selective accessing of available meanings of the homographs. Whether exhaustive, integration or selective access is instantiated depends on the level of proficiency of the reader and also the frequency of the different meanings of the different homographs. Other factors that may also affect how fast or with how much difficulty the reader processes these words are the relative dominance and/or subordination of the meanings of the words.

One of the goals of this study was also to provoke our thoughts on whether the orthography of a tone language such as Shona should include tone marking (Mkanganwi, 1990). It has already been pointed out that in some Asian languages, tone marking guides reading in single and multiword contexts. In Chinese, for example, it has been shown that the element responsible for pronunciation (phonetic radicals) gives clear information about a character's pronunciation in about 36% of the situations, whereas 48% give partial information and 16% do not provide useful information (Yin, 1991). In turn, it was demonstrated that tone marking can actually reduce reading fluency and does not always help resolve tonally ambiguous words in Dschang spoken in Cameroon (Bird, 1999). It is clear therefore that it is neither a matter of all or nothing, nor is it our intention to be prescriptive on whether all tone languages should include phonemic tone marking, some form of marking or to continue with zero tone marking. However, it seems that some form of marking would go a long way in easing the challenge of reading ambiguous lexical items like the ones present in Shona due to zero tone marking. As argued earlier, there is a high cognitive load involved in reading words with a high density of tone marking like in Dschang, as much as there is a high cognitive load in Shona due to zero tone marking. Whatever decision is taken, it should take into account which combination of tone orthography and tone-teaching method is best, taking into account the language's tone system and sociolinguistic setting.

Ultimately the argument should not be one of either zero (non-) tone marking or all tone marking, but finding a balance between the two. A failure to do so, especially in the context of single word reading, causes a high cognitive load if the tone teaching method is not

revised. One possibility of introducing phonemic marking is slower reading rates, hesitations and reading errors as the reader focuses too much on the markings. In the end it might seem like a futile exercise since the objective of introducing tone markings is to reduce the cognitive load that comes with non-tone marking. However, the most important issue would be to counteract the possible effects of a dense orthography because of tone marking by proper teaching, with the hope of improving the learning of tones, by learning how to pronounce words in single word contexts. Currently, the formal language, especially the written language as used in government documents, textbooks, magazines and newspapers, still practices non-tone marking. Tone markings are a relatively new grammatical phenomenon in dictionary making and also other Shona language and grammar texts. It should be noted that Fortune's (1972) view has since fallen out of favour at least with regard to all latest dictionary making projects, which now include tone marking since it is considered helpful to users for pronouncing words (Chimhundu, 1996, 2001; Mangoya, 2009). It is important to note that even the tone marking for dictionaries initially faced resistance from selected target users. These users argued that introducing tone marking would only serve to confuse the users (Mabaso, 2009). This thought was entrenched in the belief that target users like teachers and children were not familiar with the new tone marking system. This has led educators to concentrate on teaching the meaning of words instead of tone marking since it is only part of selected texts. However, teaching only word meaning is not enough to resolve the ambiguity posed by non-tone marking in single word contexts. This implicit way of teaching tone via meanings in formal contexts has been attributed to how speakers of Shona process tone differently than in languages in which tone is marked and taught explicitly (Kadyamusuma, 2012).

CONCLUSION

It is possible that during reading selective, integration or exhaustive access may be taking place depending on the conditions. Selective access is instantiated by context of the dominant meaning of a biased homograph or one meaning of a balanced homograph. It seems that the decision not to include tone markings in Shona has permutations for processing and how these words are read. This short discussion has, on the one hand, demonstrated that more cognitive resources are likely to be used when reading single words without a context in case of balanced homographs. On the other hand, not marking tone in Shona in the case of biased homographs is not likely to cause too much processing difficulties since one meaning is stronger and hence more quickly accessed. However, we suggest that as demonstrated by this preliminary discussion it is necessary to conduct a single word reading experiment in Shona. This will help to validate the preliminary findings discussed in this paper and to test the impact of non-tone marking in Shona and other Bantu languages in comparison to Asian languages. As there are few descriptive and theoretical studies on the cognitive processes involved in reading in the context of Shona and African (Bantu) languages, this research recommends more studies on this subject.

REFERENCES

- ABRAMSON, AS. 1978. Static and dynamic acoustic cues in distinctive tones. *Language and Speech*, 21: 319-325.
- BIRD, S. 1999. When Marking Tone reduces Fluency: An Orthography Experiment in Cameroon. *Language and Speech*, 42 (1):83-115.

- CARTER, H. 1956. Stabilization in the Manyika dialect of the Shona group. *Africa: Journal of the International African Institute*, 26(4):398-405.
- CHIMHUNDU, H (Ed). 1996. *Duramazwi reChiShona*. Harare: College Press
- CHIMHUNDU, H (Ed). 2001. *Duramazwi Guru reChiShona*. Harare: College Press.
- CONKLIN, K. & G MAUNER. 2005. In Cohen, J, KT McAlister, K Rolstad & J MacSwan (Eds), *Proceedings of the 4th international symposium on bilingualism*, Somerville, MA: Cascadilla Press. 552-569.
- COSSU, G, D SHANKWEILER, I LIBERMAN, L KATZ & G TOLA. 1986. Awareness of phonological segments and reading ability in Italian children. *Applied Psycholinguistics*, 9:1-16.
- FORTUNE, G. 1972. *A guide to Shona spelling*. Rhodesia: Longman.
- FORTUNE, G. 1980. *Shona grammatical constructions*. Harare: Mercury press.
- GORDON, RJ. 2005. *Ethnologue: Languages of the world, fifteenth edition*: Dallas SIL International. Available <http://www.ethnologue.com>.
- GOSWAMI, U & P BRYANT. 1992. Rhyme, analogy, and children's reading. In Gough, PB, LC Ehri, & R Treiman (Eds), *Reading acquisition*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- JEFFERIES, A. 1990. *Beyond tone: Functions of pitch in Shona*. Doctoral dissertation, University of Florida.
- KADYAMUSUMA, MR. 2012. Effect of linguistic experience on the discrimination of Shona lexical tone. *Southern African Linguistics and Applied Language Studies*, 30(4):469-485.
- MABASO, P. 2009. The compilation of a Shona Children's Dictionary: Challenges and solutions. *Lexikos Supplement*, 19(2009):112-119.
- MANGOYA, E. 2009. Target users' expectations versus the actual compilation of a Shona Children's Dictionary. *Lexikos Supplement*, 19 (2009):120-133.
- MKANGANWI, KG. 1990. Orthographic problems and decisions: The Zimbabwean experience. Research report. Harare: University of Zimbabwe: Department of Linguistics. 1-10.
- MYERS, SP. 1987. *Tone and the structure of words in Shona*. Doctoral dissertation, University of Massachusetts.
- NAGY, WE & RC ANDERSON. 1998. Metalinguistic awareness and literacy acquisition in different languages. In Wagner, D, R. Venezky & B. Street (Eds), *Literacy: An international handbook*. New York: Garland.
- ONIFER, W & D SWINNEY. 1981. Accessing lexical ambiguity during sentence comprehension: Effects of frequency of meaning and contextual bias. *Memory and Cognition*, 9: 225-236.
- PACHT, JM & K RAYNER. 1993. The processing of homophonic homographs during reading: Evidence from eye movement studies. *Journal of Psycholinguistic Research*, 22 (1993):251-271.

- PAUL, ST, G KELLAS, M MARTIN & MB CLARK. 1992. Influence of contextual features on the activation of ambiguous word meanings. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 15(1992):779-790.
- PONGWENI, A. 1980. Tonal substitution in the stabilization construction in Karanga. *African studies*, 39(2):197-280.
- RAYNER, K & SA DUFFY. 1986. Lexical complexity and fixation times in reading: Effects of word frequency, verb complexity, and lexical ambiguity. *Memory and Cognition*, 14(1986):191-201.
- SEIDENBERG, M, M TANENHAUS, J LEIMAN & M BIENKOWSKI. 1982. Automatic access of meanings of ambiguous words in context: some limitations of knowledge-based processing. *Cognitive Psychology*, 14(1982):489-537.
- SERENO, SC, J PACTH & K RAYNER. 1992. The effect of meaning frequency on processing lexically ambiguous words: Evidence from eye fixations. *Psychological Science*, 3(1992):296-300.
- TABOSSI, P & F ZARDON. 1993. Processing ambiguous words in context. *Journal of Memory and Language*, 32:359-372.
- TANENHAUS, M, J LEIMAN & M SEIDENBERG. 1979. Evidence for multiple stages in the processing of ambiguous words in syntactic contexts. *Journal of Verbal Learning and Verbal Behavior*, 18(1979):427-440.
- YIN, W. 1991. On reading Chinese characters – An experimental and neuropsychological study. Unpublished dissertation, University of London.
- YIP, M. 2002. *Tone*. New York: Cambridge University Press.

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