Language Survival, Popular Literacy, and Tone Marking

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ABSTRACT

Previously nonliterary indigenous languages are disappearing quickly. We argue that popular literacy gives those languages a chance for survival. Popular literacy requires economically successful publishing industries that produce economically accessible reading materials – books, newspapers, comic books – and an orthography that speakers find easy to use when reading and writing. Evidence from an experiment carried out with speakers of Kom, a language of Cameroon, suggests that tone marking makes written sentences harder to perceive, harder to say, and harder to say correctly. Comparative research using the methodology described here should help us answer important questions, like whether or not these effects vary with the number of tones in a language, or with the linguistic function of tones.

Introduction

Since Pike's (1948) seminal work on tone languages, designers of orthographies have grappled with the tone problem: Does marking tone in writing previously nonwritten languages help or hinder native speakers who learn to read those languages?

The argument *for* marking tone rests on the claim that it disambiguates otherwise minimal pairs and thus facilitates literacy. The argument *against* marking tone rests on the claim that it adds a cumbersome layer of effort to writing and thus hinders the production of texts. We know that native speakers of all written languages use context to disambiguate homophone pairs that have a single written form (like "wind," which can be read as [waind] or [w-nd] in English, depending on context). Native speakers of modern Hebrew write their language without marking any vowels and depend on context a great deal. There are many other examples. If native speakers naturally *depend* on context, rather than *resort* to it when they don't have enough orthographic information, then marking tone might produce too much information and actually slow readers down. (See Bird 1996, 1997 for a full treatment of the issues.)

This may seem like a terribly esoteric problem, but there is actually a lot at stake: most of the world's tone languages are spoken by populations with no written literary tradition. As Michael Krauss has pointed out (1992), at the rate things are going, most nonliterary languages will vanish within 100 years. And conversely: Without popular literacy, even many of the currently vigorous small languages – languages with just a few thousand speakers – will be extinct in a century.

Fostering popular literacy is among the few things that anthropologists and linguists can do to help speakers of indigenous languages keep those languages alive. Popular literacy, as distinct from schooled literacy, requires economically successful publishing industries that produce economically accessible books, newspapers, and comic books – not just grammars, bibles, and educational texts.[1] Anything that hinders popular literacy, we argue, is inimical to the survival of a small language . . . so, if marking tone turns people away from the effort required to become literate in a language, and if the language is at risk, then marking tone, irrespective of its intellectual appeal, should be abandoned.

We return to this in the Discussion section. First we present some background on the problem and the results of our effort to test, experimentally, whether marking tone hinders or helps people read Kom, a previously nonliterary language of Cameroon.

Method The Background

Our method is based on the pioneering effort of Udo Essien (1977) in his study of tone in Efik, a member of the Benue-Congo family of languages. Efik is spoken by about 360,000 people, mostly in Nigeria (Grimes 1992). Essien created 14 sentences that could be ambiguous in Efik, depending on the tones. For example, depending on the tone, *nnyin imama ubom ɛsiɛ* could be read to mean "we like its size" or "we like his canoe."

Essien presented groups of four (of the 14) sentences three times to 15 college-educated, native speakers of Efik. All the informants were unschooled in reading or writing Efik, but were highly schooled in reading and writing English. Thus, participants in Essien's experiment controlled the technology of literacy but had not learned to apply that technology to their first language, Efik.

On the first pass, Essien presented the sentences on cards without any tones marked. Next, he presented participants with all possible variations of each sentence, with every tone marked. In other words, if a sentence could have two possible readings, depending on tones, then both readings were presented with all the tones marked. If it could have three readings, then all three readings were presented, with all tones marked. Finally, Essien presented all possible variations of each sentence with tones marked on just the nouns and verbs.

Essien timed his participants on how long they took to study each sentence before vocalizing it, and how long they actually took to vocalize it. From here on, we will refer to these quantities as *perception time* and *vocalization time*. It took Essien's 15 Efik speakers 14.50 seconds of perception time, on average, to begin vocalizing sentences that had tone marked on every syllable. It took them 12.25 seconds in perception time, on average, before vocalizing sentences with no tones marked. Sentences that had tone marked only on nouns and verbs required 9.5 seconds of perception time. Fully marked sentences took 8.5 seconds in vocalization time; unmarked sentences took 7.25 seconds; and sentences with tones only on nouns and verbs took 6.5 seconds. This result argued for a middle ground between what Bird (1996) calls the "zero option" (no tone marking) and full marking of tones.

However, Essien also graded the participants on whether they read each tone-marked sentence correctly. Since the sentences were selected especially for their ambiguity, he graded any sensible reading of an unmarked sentence as correct. Of the sentences that were marked, less than 30% were read correctly, irrespective of whether the sentences had all tones marked or just noun- and verb-tones marked.

Overall, then, Essien discovered that too much information (full marking) *and* not enough information (no marking) about tone slowed native speakers down, while marking nouns and verbs helped them perceive and vocalize written sentences. On the other hand, both full and partial marking of tone made it more difficult for educated native speakers of Efik to read sentences correctly.

Essien's experiment stimulated us to test his findings on Kom, but we felt that we could improve on his design. The 14 sentences that Essien chose for his experiment were short (5.1 words long, on average) and had built-in ambiguities based on differences in tone. Out of context, and juxtaposed against one another, such sentences are bound to cause readers a lot of difficulty – which was, of course, the object of the exercise.

To improve on Essien's work, we needed real examples of spontaneously written text in a tone language that, like Efik, has no written literary tradition of its own. As it happens, in 1989, Bernard had taught five bilingual Kom-English speakers to use a word processor and to write Kom. Mbeh (the second author here) was one of the five. The others were a Catholic priest, a lawyer recently graduated from the national university in Cameroon, and two primary school teachers.

One of the school teachers produced a text of 102 Kom proverbs. The others in the project produced free-flowing texts on themes in Kom life. Mbeh, who was studying medical anthropology, wrote about Kom medical practices; the lawyer wrote about Kom marriage contracts; the priest wrote about Kom religious practices; and the second school teacher wrote about scenes from her native village. In addition to the collection of proverbs, the group produced about 25,000 words of Kom text during the two-week session.

From this corpus of text, we randomly selected 50 sentences, including 12 of the 102 proverbs, that capture differences in writing styles and sentence structures in normal Kom discourse. We included some of the proverbs because they are scripted sentences that are repeated frequently in any society. We wanted to test whether proverbs, with and without tones marked, would be read faster than ordinary sentences.

Mbeh typed each sentence on two cards, once with the tones marked and once without. Kom can have as many as eight phonetic tones, but only two, low [-] and falling [^], have been selected by the Kom Language Development Committee for marking (Chia and Kimbi 1992). No modifications were made to the sentences, except that the

orthography was standardized. Some of the authors of the texts had used the [-], while others had used the [ü] for one of the high-mid vowels, for example.

We then had two sets of cards. One set had 50 tone-marked, spontaneously written sentences of greatly varying length (from 6–67 words each) representing greatly varying styles, and containing greatly varying content; a second set had exactly the same sentences but without the tones marked. There was one exception. One of our randomly selected sentences was a proverb that normally would not take any tone marks in Kom orthography. We should have selected another sentence but instead we decided not to mark the sentence artificially for tone (we now see this as an error). This proverb thus appears without tone marked in the set of 50 tone-marked sentences as well as in the set of 50 tone-unmarked sentences.[2]

A prototype experiment using these changes in Essien's design (Bernard et al. 1995) supported what Bird (1996) called "the zero-marking option." That is, we showed that marking tone in Kom hindered a native speaker from reading sentences correctly.

Method The Second Experiment

With just one consultant (a man in his mid-40s who holds a Ph.D. in history from a U.S. university), we could not generalize to speakers of Kom, much less to speakers of other tone languages. We repeated the experiment with 13 additional speakers of Kom. In the prototype experiment, the consultant read the pack of tone-unmarked sentences on one day and then the pack of tone-marked sentences the next day. In our second experiment, we mixed the two packs of sentence cards (tone unmarked and tone marked) into a single pack of 100 sentences and numbered the sentences from 1 to 100. All 13 participants saw the 100 sentences in the same order.

The test was administered by Mbeh in and around Njinikom, in the heart of Kom country,[3] during the spring and summer of 1994. There were 127,000 speakers of Kom at the last census in 1982 (Grimes 1992). All 13 participants could read and write English. All but one could also read Kom, and 9 of the 13 could write Kom, using one of several competing orthographies in the region. Six participants, in fact, were either teachers of Kom or had taught Kom before.

Participants in our experiment were people who were willing and ready to participate, and who represented wide variation in age, education, and professional backgrounds. There are 7 women and 6 men, ranging in age from 10–62 and in education from 4–18 years (that is, from primary school to university level). Their occupations include one pupil, three students, two farmers, three teachers one Catholic catechist, one retired police officer, and three unemployed persons. We discuss later the implications of nonrandom sampling for interpreting the experimental results reported here.

At the beginning of each interview we explained that we were studying the role of tones in the reading of indigenous languages by native speakers. We reminded participants about how tones function in Kom and showed them how to read the two tones (low and falling) in tone-marked sentences. We also briefed them on the special characters [-], [-], [ˊ] and the digraphs [gh], [ny], [oe], [ae], [ue] used in writing Kom (the [ˊ] represents the glottal stop). This introductory lesson was given only to participants who had not received formal training in reading Kom. After the introduction, we gave participants eight sentences for practice: four with tones marked and four without tones marked. Finally, participants were given time to ask questions before the test began. The introductory exercise took about 15 minutes, on average.

Participants were asked to pick up each card, look at the sentence written on it, and read it to themselves. They were told to take whatever time they needed and to read each sentence aloud only after they had figured out how to read it correctly. Perception time was measured in the field with a digital stop watch as the time between an informant’s initial look at the sentence and initial vocalization. Vocalization time was measured with a digital stop watch from tape recordings as the time between an informant’s initial and final words.

The experiment took from 45–120 minutes per participant. There was always a break after the first 50 sentences, but in three cases the experiment had to be administered in two parts across two consecutive days. Some participants

complained that the experiment took too long, but all said that they enjoyed the experience. One participant said that the exercise had stimulated her to consider learning to read and write Kom more seriously.

Analysis: The Variables

Two of the dependent variables (perception time and vocalization time) and one of the independent variables (the number of words in each sentence) are measured in their natural logarithms because these yield homoscedastic residuals. These variables are represented as LP, LV, and LW respectively. The third dependent variable, CORRECT, is binary, and measures whether the participant correctly read each sentence aloud (1=yes, 0=no).[4]

The independent variable TONE refers to whether or not tone is marked in each sentence (1=yes, 0=no); INFORM$ is a character variable indicating the identity of each participant; PROVERB measures whether a sentence is a proverb (1=yes, 0=no); and SEQ is the sequence number, from 1–100, of the sentences read by participants. We use this last variable to test for learning effects in the experiment.

We coded ten other variables: AGE is the informant's age in year.CERTIF is the number of years of schooling for each informant; LTONE is whether an informant had learned to read with tones (1=yes and 0=no); OUT is whether the person had spent time outside of Kom country (1=yes and 0=no); SEX is the sex of each informant; WRITE is whether or not the informant knows how to write Kom (1=yes and 0=no); TEACH is whether or not the informant teaches others to write Kom (1=yes and 0=no); TRAINING is whether the informant had received any training in reading and writing Kom (1=yes and 0=no); READ is whether the informant reads Kom (1=yes, 0=no); and READFREQ is how often the person claimed to read materials in Kom (an ordinal scale coded 0, 1, 2, 3).

AGE exhibited no effect in any subsequent analysis. CERTIF exhibits limited effects in subseqent analyses. All other variables (LTONE, OUT, SEX, WRITE, TEACH, TRAINING, READ, and READFREQ) form a single scale, called LIT, of functional literacy (Cronbach's alpha=.80) measured as factor scores.

Analysis: The Models

Tables 1 and 2 show OLS regression solutions for perception time and vocalization time models, respectively.[5] Analysis of both sets of residuals show approximately normal, homoscedastic residuals with no significant autocorrelation. Incorporating the informant variable (INFORM$) effectively corrected for the autocorrelation built into the data by presenting 13 informants 100 sentences in identical order. Condition indexes revealed the absence of multicollinearity disturbances. Neither the learning variable SEQ (p=.062), nor AGE (p=.081) showed any measurable direct effects on perception time. There were no measurable direct effects on vocalization time from SEQ (p=.062), AGE (p=.875), CERTIF (p=.955), or LIT (p=.182) showed . We infer that these variables contribute nothing of importance to perception or vocalization times. Schooling experience (CERTIF) speeds perception time slightly, but otherwise exhibits no effects. Functional literacy skills (LIT), by contrast, slow perception time slightly, but otherwise exhibit no direct effects.[6]

We used logistic regression for the binary dependent variable CORRECT to address directly the question: What is the likelihood of saying a sentence correctly? The results are shown in Table 3.[7]

Summary test statistics (Hosmer-Lemeshow, Pearson, and Deviance) test the null hypothesis, and confirm, that observed values (1/0) correspond well with predicted values (in the range 1,0) (Hosmer & Lemeshow 1989). Examination of diagnostic statistics revealed no cases with high leverage or poor fit that distort model coefficients. A log-likelihood post-hoc test for direct effects of AGE, CERTIF, LIT, SEQ, and TONE and interaction effects of TONE*LW and TONE*SEQ yielded a probability of 0.199. We infer that adding these variables to the model contributes nothing of importance.

Table 1, 2, and 3, and Figure 1 Here

Table 1

Multiple Regression with Perception Time

as the Dependent Variable

Dep Var:LP N:1300 Multiple R: 0.763 Squared multiple R: 0.583
Coefficient P
CONSTANT 2.245 .000
LW 0.474 .000
INFORM$ .000
INFORM$ 1 3.183
INFORM$ 2 -0.184
INFORM$ 3 -0.640
INFORM$ 4 0.589
INFORM$ 5 -2.202
INFORM$ 6 0.368
INFORM$ 7 -0.659
INFORM$ 8 0.565
INFORM$ 9 0.190
INFORM$ 10 -0.256
INFORM$ 11 0.455
INFORM$ 12 -0.137
LIT 0.455 .000
CERTIF -0.137 .000
PROVERB -1.699 .000
PROVERB*LIT -0.131 .004

PROVERB*LW 0.722 .000
TONE 1.081 .000
TONE*SEQ -0.009 .000
TONE*LW -0.212 .003

Table 2

Multiple Regression with Vocalization Time

as the Dependent Variable

Dep Var:LV N: 1297 Multiple R: 0.914 Squared multiple R: 0.835
Coefficient P
CONSTANT -1.291 .000
LW 1.212 .000
LP 0.095 .000
INFORM$ .000
INFORM$ 1 -0.092
INFORM$ 2 0.247
INFORM$ 3 -0.450
INFORM$ 4 -0.280
INFORM$ 5 -0.192
INFORM$ 6 0.060
INFORM$ 7 -0.211
INFORM$ 8 -0.108
INFORM$ 9 0.036

INFORM$ 10	-0.126
INFORM$ 11	-0.002
INFORM$ 12	0.492
PROVERB	-1.095 .000
PROVERB*LIT	-0.056 .028
PROVERB*LW	0.361 .000
TONE	0.480 .000
TONE*LW	-0.111 .005
TONE*SEQ	-0.003 .000

Table 3

Logistic Regression: Likelihood Of Saying Sentence Correctly

95.0 % bounds			
Parameter	Odds Ratio	Upper	Lower
2 LP	0.572	0.713	0.459
3 LV	0.082	0.128	0.052
4 LW	16.599	30.995	8.890
5 INFORM$	2.026	3.377	1.215
6 INFORM$	0.341	0.648	0.179
7 INFORM$	0.388	0.719	0.209

8 INFORM$ 0.643 1.119 0.369
9 INFORM$ 0.947 1.582 0.567
10 INFORM$ 1.206 2.011 0.724
11 INFORM$ 0.546 1.281 0.233
12 INFORM$ 1.389 2.336 0.825
13 INFORM$ 3.577 6.967 1.836
14 INFORM$ 5.303 11.031 2.549
15 INFORM$ 0.609 1.010 0.367
16 INFORM$ 1.324 2.468 0.710
17 PROVERB 45.452 948.374 2.178
18 PROVERB*LIT 1.664 2.429 1.140
19 PROVERB*LW 0.159 0.612 0.041
Log Likelihood of constants only model = LL(0) = -762.525
2*[LL(N)-LL(0)] = 540.385 with 18 df Chi-sq p-value = 0.000
McFadden's Rho-Squared = 0.354
Statistic p-value df
Hosmer-Lemeshow 7.075 0.529 8.000
Pearson 1181.625 0.971 1276.000
Deviance 984.665 1.000 1276.000

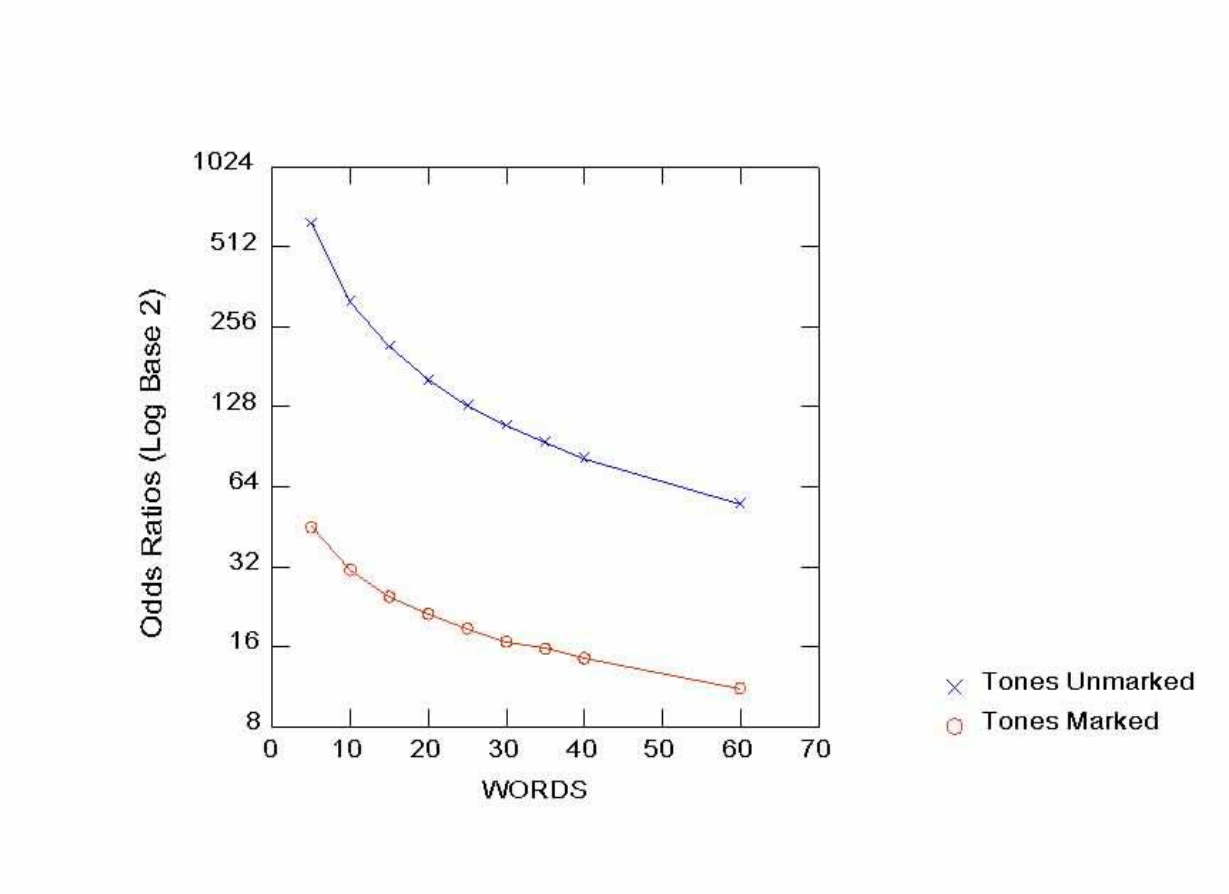

Figure 1. Odds Ratios of Saying the Sentence Correctly for Sentences of Various Lengths, Marked with Tones or Not

Tables 1, 2 and 3 show that, as we should expect, individuals vary enormously in their capacity to perceive sentences quickly, say them quickly, and say them right. Still, *over and above variability attributable solely to individuals*, the following relationships hold:

1) Longer sentences take longer to perceive and to vocalize, and sentences that take longer to perceive take still longer to vocalize.

2) Informants perceive and say proverbs more quickly than they do other sentences. They do so even more quickly to the extent that they report functional literacy skills (measured as each informant's factor score on LIT). However, the perception and vocalization speed advantage for proverbs falls as sentences grow longer.

3) Informants perceive and say sentences marked with tones less quickly than they do the same sentences unmarked for tone, but this penalty falls as sentences grow longer and falls slightly with repetition.

4) The longer it takes to perceive and say a sentence, the less likely it is that informants say it right.

5) Informants correctly say proverbs far more often than they correctly say other sentences. This effect is strengthened if informants report functional literacy skills, but the advantage built into proverbs falls as sentences grow longer.

6) The longer the sentence, the more likely that the informant will say it right. However, informants take longer to perceive and vocalize long sentences. The balance of direct effects (longer sentences increase the probability of saying it right) and indirect effects (longer sentences increase perception and vocalization times, which decrease the probability of saying it right) goes to the latter: the observed (zero-order) probability of saying a sentence correctly declines with sentence length.

7) Marking tone contributes nothing directly to a reader's ability to say a sentence correctly. However, like sentence length, marking tone contributes indirectly to a reader's inability to say a sentence correctly by increasing perception and vocalization times: Tone marking penalizes readers of even the shortest sentences and the penalty grows as the length of sentences grow.

Figure 1 presents the odds ratios for correctly saying sentences of different lengths unmarked and marked by tones, and thus highlights the practical difference tone marking makes. As sentence length grows, readers take longer to perceive and say the sentence whether tones are marked or not, and the odds of saying the sentence correctly fall. However, readers take less time to perceive and say sentences without tone marks. The odds of saying a sentence correctly is far higher for a sentence unmarked for tones than for the same sentence marked by tones. Indeed, the odds of correctly saying the longest sentences unmarked for tone (OR=54.995) are higher than the odds of saying correctly the shortest sentences marked with tones (OR=45.034).

In short, marking tone penalizes the reader. Fortunately for readers of tone-marked text (that is, readers who are penalized by the tone markings), as sentence length increases ─ as context widens ─ they are able to recover from this penalty.

Discussion: Orthographies and Language Survival

These findings are consistent with evaluations offered by informants in Africa and Latin America. For example, the teachers whom Mbeh trained in Kom literacy reported uniformly that they enjoyed learning to read and write their first language, but complained about having to mark tones, especially in writing the language. "I love this very much," said one of the teacher/students in Mbeh's course. "The only difficulty I'm facing is the tone," she continued. "It's a bit difficult to identify which tone is which ─ like to be able to know which one goes where" in writing, said another. The students in Mbeh's Kom literacy classes recognized low and high tone when reading the language, but had a lot of trouble putting tones in sentences that they wrote themselves. They would write sentences without tones and go through the sentences several times to decide where to put tones.

Speakers of Mezquital Ñähñu (in the state of Hidalgo, Mexico) and of Mazatec and Chinantec (in the state of Oaxaca, Mexico), as well as speakers of Kom (in Cameroon) have told us that in order to write their languages correctly, tone had to be marked. Unsure of their ability to do this, they avoided writing and sometimes said that their language could only be written by linguists or by native speakers who are trained by linguists.

Historical evidence on the evolution of orthographies in major world languages and evidence from our own work in Mexico indicates that full, adult literacy in previously nonliterary languages is supported neither by linguistic research on orthographies nor by bilingual education, but might be best supported by indigenous publishing. Asking native speakers of previously unwritten tone languages to adopt tone marking as part of their emerging orthographies may significantly hinder the development of indigenous literacy.

Finally, we note that much of the effort to develop orthographies for the world's nonliterary languages is in service to bilingual education. Bilingual education for indigenous children is widely used as a vehicle for transition to fluency and literacy in national languages and is often inimical to the survival of indigenous languages. Eskimo speakers, for example, are introduced to schooling via Yup'ik, but Yup'ik is abandoned after the third grade because the official purpose of the program is to "wean students away from the need for their own language" (Iutzi-Mitchell 1992:9).

And so it is in many parts of the world. If indigenous children come to school without strong competence in their national language (English, French, Spanish, etc.), they are often taught in their ancestral language as a transition to monolingualism in the national language.[8] We do not advocate abandoning bilingual education. Indigenous children everywhere must control their national language or they will never participate in their national economy and body politic. There is absolutely nothing to be said for avoiding full competence, including a high level of literacy, in a national language, just as there is nothing to be said for being poor.

We stress, however, that comparative experiments on marking tone ─ indeed, all work by linguists on orthographies ─ can be only marginally important for the survival of nonliterary languages in the absence of indigenous publishing

industries in those languages. Historically, orthographies of the world's major languages have become standardized in the context of publishing books – using any orthography that people will read – not in the context of linguistics or schooling. Books published in English just 200 years ago, for example, exhibit a lack of orthographic consistency in the shape of letters, in conventions for spelling, punctuation, and paragraphing that seems almost quaint today.

The process is ongoing. Not very long ago, publishers in the United States used the character in the word " dipus." Now the word is spelled "oedipus" and the diphthong is gone from American English orthography. The circumflex "o" in "r le" and the ç in "façade" are gone, too, but still appear in some British publications. The æ in "archæology" has become "ae," but early in this century the diphthong was dropped in U.S. government publications and many publishers now spell the word "archeology." Eventually, one spelling will emerge the winner and linguists will have had little or nothing to do with the outcome.[9] Nor will academics of any stripe adjudicate the correct spelling of the word "millennium," which appeared on the World Wide Web as "millennium" 41,814 times in June 1997 and as "millenium" 31,829 times (Newman 1997). Out of such orthographic *Sturm und Drang* are many standards made.

We do not deny the value of work by linguists on problems in orthography for tone languages. Watson (1991), for example, has focused on the seven Moru-Ma'di languages, which stretch across parts of Sudan, Zaire, and Uganda. His objective is to promote, wherever possible, standardization of orthographies across Nilo-Saharan (p:273). It is clear that the linguistic insights of such meticulous work are of value in their own right and will be duplicated neither by the free-for-all environment of the Internet nor the competitive environment of publishing.

Those insights, however, will not be decisive in the standardization of orthographies. But, we argue, if the objective is to help indigenous people vitalize and valorize their languages through the vehicle of literacy, then linguists would do well to help indigenous people start local publishing industries that will experiment in their own ways with orthographies that make sense.

In Oaxaca, Mexico, the Centro Editorial de Literatura Indígena, A.C. (CELIAC) has taught over 160 bilingual educators from six countries in Latin America to read and write their indigenous languages. At least a dozen of the Mexicans who have been through the program have produced books in Totonac, Ñähñu, Zapotec, Chinantec, and Mazatec (see Bernard 1985, 1997; Salinas Pedraza 1997; González Ventura 1997). Those books are for sale by the indigenous authors through CELIAC, which is run entirely by indigenous people. The corpora of texts produced at CELIAC are available for study by linguists who need large amounts of text in order to test theories about grammars. Furthermore, since the books are written on word processors, the texts are machine readable and can be used for the construction of simple word lists and key-word-in-context dictionaries.

Publishing does more than help us make dictionaries and acquire texts for studying grammars. It increases the archive of a culture, and it produces pride in the language. "The very existence of a book on a shelf", says Krauss, ". . . can be of crucial symbolic value" in the effort to preserve a dying language (1992:8 and see González Ventura 1997).

Conclusion

With Bird (1996) we advocate a program of sustained, comparative research to address the utility of tone marking for indigenous readers and writers. Variation in the number of tones in a language or in their linguistic function may influence how users respond to tone marking or its absence. Some tone languages have as few as two tones, others as many as six (or perhaps more). Some languages have only lexical tones, whereas others have lexical and grammatical tones. It may be that tone needs to be marked for grammatical functions but not for lexical functions, or vice versa. So far, we believe, the evidence is on the side of not marking tone. But only comparative experiments will illuminate the problem. In the meantime, languages – and the cultures they carry – are lost every year

Notes

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[1]. For exceptions, see Besnier [1995] on Tuvalu, and Scribner and Cole [1981] on Vai. In both cases, indigenous literacy traditions developed without the benefit of printing technology.

[2]. As it turns out, the results of the experiment are so strong that our mistake could not have made any difference. In replications of the experiment for other languages, though, we will not repeat the error.

[3]. Kom is a matrilineal kingdom in the Fundong Subdivision of North West Province of Cameroon. The language map of Cameroon is very complex. Some 236 African languages (mostly of the Bantu family) are spoken by 12 million Cameroonians. In addition to speaking one or more of these indigenous languages, about 3 million Cameroonians speak English and about 9 million speak French.

[4]. Of 1300 cases, 100 for each of 13 participants, there are 5 cases of missing data: 3 cases for the variable LV and 2 cases for the variable CORRECT. These cases of missing data resulted from gaps in the tape after pauses in the experiment. Cases with missing data are excluded from analyses reported here.

[5]. We used SYSTAT software to generate the output reported here (Steinberg and Colla 1991; Wilkinson 1992).

[6]. Note that scores for only 12 of the 13 informants are listed in Tables 1 and 2. The procedure of converting a *k*-category variable into binary variables for regression analysis produces *k*-1 new variables. The regression coefficient for each binary variable expresses the difference between any one of the *k*-1 variables and the reference group/person. SYSTAT automates the process and, by default, assigns the *k*th category as the reference group/person.

[7]. We used logistic regression to avoid the heteroscedasticity that arises when OLS regression is applied to binary variables (see Gujarati 1995 for a discussion of this issue). The logistic regression solution presented in Table 3 was solved with White's (1982) quasi-maximum likelihood estimation procedure to guard against erroneous standard errors generated by possible model misspecification.

[8]. There are indigenous voices against this practice. In Cameroon, and Emmanuel Chia and other linguists have advocated universal mother-tongue literacy for speakers of all 236 indigenous languages in the country (personal communication).

[9]. We are indebted to William H. Adams and Jerald Milanich for information about this example.