A LONGITUDINAL STUDY OF THE ACQUISITION OF ENGLISH STRESS[1]

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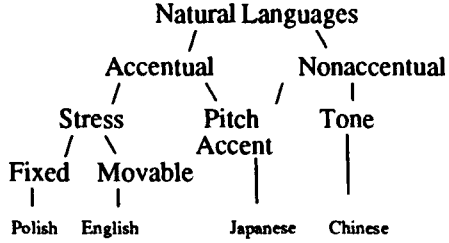
1.0 Introduction

For some time now I have been investigating the acquisition of second language stress systems in an attempt to get an idea of what the representations and processes involved in interlanguage phonology are. The study that I discuss today differs in two respects from my previous studies. One, it is a longitudinal study, and two, it involves different first languages. Ideally, it might have been better to change only one of the factors, but these are the subjects who were available to me for a longitudinal study. As a result, this paper has more to say about the influence of the first language type on second language acquisition than on patterns of development over time, because, as we shall see, the performance didn't change very much over time.

2.0 A Taxonomy of Stress Systems

There are several different types of stress systems found in natural languages. One taxonomy is shown in # 1:

1.



There are languages like English that use pitch to signal stress accent, and languages like Chinese that use pitch phonemically. Languages like Japanese appear to have characteristics of both types.

In previous studies I looked at native speakers of Polish and Hungarian (essentially fixed stress languages) acquiring English stress. Polish usually stresses the penultimate syllable and Hungarian usually stresses the initial syllable. I also looked at native speakers of Spanish (a movable stress language) acquiring English stress. These studies had been conducted assuming the metrical parameters proposed by Dresher and Kaye (1990), shown in (2).

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[1] This paper was read at the Canadian Association of Applied Linguistics. Calgary, May 1994.

2. P1: The word-tree is strong on the [Left/Right].
P2: Feet are [Binary/Unbounded].
P3: Feet are built from the [Left/Right].
P4: Feet are strong on the [Left/Right].
P5: Feet are quantity-sensitive (QS) [Yes/No].
P6: Feet are QS to the [Rime/Nucleus].
P8: It is extrametrical on the [Left/Right].
P8A: There is an extrametrical syllable [No/Yes].

The differences between the languages are shown in (3).

3.

	Spanish	Polish	Hungarian	English
P1 (word tree)	right	right	left	right
P2 (foot type)	binary	binary	binary	binary
P3 (built from)	left	left	left	left
P4 (strong on)	right	right	left	right
P5 (QI/QS)	QS	QI	QS	QS
P6 (sensitive to)	rime	NA	nucleus	rime
P8 (extrametrical)	yes	no	no	yes
P8A (extramet. on)	right	NA	NA	right

From these tables, it can be seen that while there may be parametric differences between the languages studied, the same kinds of representations were being constructed in the first and second languages, that is, representations of stress.

In this paper, I hope to expand my data base by looking at native speakers of a Tone language (Chinese) and a Pitch Accent language (Japanese). As shown above, it has been argued that these languages are not stress languages, and therefore subjects who have these languages as their L1's may have very different kinds of representations. Furthermore, they would have to acquire a new way of representing prominence in their second language. I will argue that we see these subjects treating English stress as a lexical phenomenon.

3.0 Research Design

The basic research design used in my earlier studies forms the basis of this study as well. Subjects perform both production and perception tasks related to stress assignment. First they had to read a list of words out loud (see # 5 on the handout). (Departing from my earlier studies, I did not have the subjects engage in any sentence level tasks, as they were not found to perform significantly differently on these tasks.) Stress placement was transcribed on these words. Then the subjects listened to the same words they produced as they were read out loud on a tape recorder by a native English speaker. After a training session, the subjects had to mark which syllable they perceived stress to be on.

3.1 The Subjects

In this study I gathered data from ten subjects in November of 1993. Only four subjects were able to be reassessed in March of 1994. The subject profiles are given in # 4:

4.

	Age	L1	L2 Level (out of 6)
Subject #1	19	Cantonese	5
Subject #2	19	Japanese	6
Subject #3	32	Mandarin	6
Subject #4	21	Mandarin	3

3.2 The Test Items

The words that the subjects had to produce and perceive are given in # 5 of the handout:

5.

Class One	Class Two	Class Three	Class Seven
aroma	agenda	cinema	hurricane
Manitoba	consensus	javelin	baritone
arena	appendix	venison	antelope
Minnesota	veranda	America	candidate
horizon	synopsis	cabinet	matador

Class Four	Class Five	Class Six
maintain	collapse	astonish
appear	elect	edit
erase	observe	cancel
decide	adapt	consider
achieve	convince	interpret

The following (shown in # 6) are the defining characteristics of the classes of words (ignoring some phonological details that are not relevant to our discussion):

6.

Class One:	Noun, penultimate stress due to heavy penult (tense vowel)
Class Two:	Noun, penultimate stress due to heavy penult (branching rhyme)
Class Three:	Noun, antepenultimate stress due to lack of heavy syllables
Class Seven:	Noun, antepenultimate stress due to stress retraction (secondary stress)
Class Four:	Verb, final stress due to heavy final syllable (tense vowel)
Class Five:	Verb, final stress due to heavy final syllable (branching rhyme)
Class Six:	Verb, penultimate stress due to lack of heavy syllables

One of the ways to get a picture of the interlanguage grammar is to look at the errors that the subjects make in their production and perception of the stress patterns of these word classes. In other words, native speakers of English have knowledge of these word classes and therefore it is something that non-native speakers have to acquire. In my previous studies, it was a robust finding that the perception tasks were significantly different (and significantly more accurate) than the production tasks. I.e., the subjects were better at perceiving stress accurately than they were at producing stress accurately.

4.0 The Results

The following chart, shown in # 7, gives a profile of the numbers of errors that the subjects made:

7.

	Perception		Production	
	T1	T2	T1	T2
Subject 1	19	22	10	9
Subject 2	0	1	11	9
Subject 3	15	13	10	10
Subject 4	10	22	10	9
	44	58	41	37
Mean	11	14.5	10.25	9.25

T-tests did not reveal any significant differences in the mean numbers of errors[2]. The closest to significance was the change in production from T1 to T2.

One of the first things to note is that for three of the four subjects, the perception scores are worse than the production scores (this is true of the means as well). We also note that from Time 1 (November) to Time 2 (March) the perception scores actually got worse. The production scores did improve but not significantly.

If we break the above chart down into errors by class, the picture shown in # 8 emerges:

[2] T1 Prod/T1 Perc: .8734; T2 Perc/T2 Prod: .3714; T1 Perc/ T2 Perc: .3295; T1 Prod/T2 Prod: .0917.

8.

		Perception		Production	
		T1	T2	T1	T2
Subject 1	C1	2	3	2	2
	C2	3	4	1	0
	C3	4	4	1	0
	C7	2	2	2	3
	C4	2	1	1	1
	C5	4	5	2	2
	C6	2	3	1	1
Subject 2	C1	0	1	1	1
	C2	0	0	0	0
	C3	0	0	2	1
	C7	0	0	4	2
	C4	0	0	0	1
	C5	0	0	3	3
	C6	0	0	1	1
Subject 3	C1	3	1	2	2
	C2	2	2	1	2
	C3	3	1	2	0
	C7	2	4	1	1
	C4	1	1	0	1
	C5	2	2	3	3
	C6	2	2	1	1
Subject 4	C1	2	1	2	2
	C2	0	4	0	1
	C3	4	2	0	0
	C7	2	5	3	1
	C4	1	4	2	2
	C5	0	3	3	2
	C6	1	3	0	0

Clearly, the differences between word classes were minimal, as were the differences between performance at T1 and T2. In an attempt to see whether the subjects were treating different word classes differently, I combined the production and perception errors to see if class differences would emerge from this view. The result is shown in # 9:

9.

		T1	T2
Subject 1	Class 1	4	5
	Class 2	4	4
	Class 3	5	4
	Class 7	4	5
	Class 4	3	2
	Class 5	6	7
	Class 6	3	4
Subject 2	Class 1	1	2
	Class 2	0	0
	Class 3	2	1
	Class 7	4	2
	Class 4	0	1
	Class 5	3	3
	Class 6	1	1
Subject 3	Class 1	5	3
	Class 2	3	4
	Class 3	5	1
	Class 7	3	5
	Class 4	1	2
	Class 5	5	5
	Class 6	3	3
Subject 4	Class 1	4	3
	Class 2	0	5
	Class 3	4	2
	Class 7	5	6
	Class 4	3	6
	Class 5	3	5
	Class 6	1	3

Again, we note that for each subject, there was very little difference between word classes and very little change from T1 to T2. This can be seen more clearly when we present the data as shown in # 10:

10.

	Time 1						
	C1	C2	C3	C7	C4	C5	C6
Subject 1	4	4	5	4	3	6	3
Subject 2	1	0	2	4	0	3	1
Subject 3	5	3	5	3	1	5	3
Subject 4	4	0	4	5	3	3	1
Mean	3.5	1.75	4	4	1.75	4.25	2
Ranking	C5 > C3, C7 > C1 > C6 > C2, C4						

	Time 2						
	C1	C2	C3	C7	C4	C5	C6
Subject 1	5	4	4	5	2	7	4
Subject 2	2	0	1	2	1	3	1
Subject 3	3	4	1	5	2	5	3
Subject 4	3	5	2	6	6	5	3
Mean	3.25	3.25	2	4.5	2.75	4.25	2.75
Ranking	C7 > C5 > C1, C2 > C4,C6 > C3						

The differences between mean number of errors between T1 and T2 is summarized in # 11:

11.

C1	-.25
C2	+1.5
C3	-2
C7	+.5
C4	+1
C5	same
C6	+.75

Obviously, the changes are very small.

One of the characteristics that I had found previously in the interlanguage grammars of the Hungarian, Polish, and Spanish subjects was that they treated different grammatical categories differently when it came to stress assignment. For example, they treated English nouns and verbs differently. This analysis of the current subjects is shown in # 12:

12.

	Nouns				Verbs			
	Perception		Production		Perception		Production	
	T1	T2	T1	T2	T1	T2	T1	T2
Subject 1	11	13	6	5	8	9	4	4
Subject 2	0	1	7	4	0	0	4	5
Subject 3	10	8	6	5	5	5	4	5
Subject 4	8	12	5	5	2	10	5	4
Total	29	34	24	19	15	24	17	18
Mean	7.25	8.5	6	4.75	3.75	6	4.25	4.5

T-Tests revealed a significant difference in the means of Nouns versus Verbs in Perception at time 2. Perception at T1 and Production at T2 approached significance[3]. So, the subjects were getting better at perceiving stress on verbs.

The picture that is emerging from all of these (non) results is that the subjects in this study did not seem to be acquiring the principles of English stress assignment with regard to such things as the influence of syllable structure or grammatical category on stress assignment. They seem to be treating stress as a purely lexical phenomenon; something that has to be memorized as part of the phonological representation of a word. This analysis is supported when we look at the patterns of change from T1 to T2 by lexical item and see how many items stayed the same (whether right or wrong), how many became more nativelike, and how many got worse. This pattern is shown in # 13:

13.

	Perception			Production		
	Same	Better	Worse	Same	Better	Worse
Subject # 1	24	4	7	32	2	1
Subject # 2	34	0	1	27	5	3
Subject # 3	29	4	1	24	5	4
Subject # 4	16	3	15	30	3	1
Total (/138)	103	11	24	113	15	9
Mean (/35)	25.75	2.75	6	28.25	3.8	2.3
Mean %	74	8	17	80.7	10.9	6.6

[3] N T1 Perc/V T1 Perc: .0773; N T2 Perc/V T2 Perc: .0305; N T1 Pro/V T1 Prod: .0689; N T2 Pro/V T2 Pro: .6376.

In both perception and production, the vast majority of the lexical items (for all subjects) did not change their stress from T1 to T2. On the production task, more lexical items did become more nativelike (3.8) than became less nativelike (2.3). However, on the perception task, more items became less nativelike (6) than became more nativelike (2.75). Overall, their perception of English stress was getting worse (though the overall picture is largely influenced by subject # 4, the same pattern (to a lesser degree) is found in subject # 1).

At first blush, this seemed perplexing. Subjects 1 and 4 are native speakers of Chinese, a tone language. These subjects, I thought, should be very sensitive to differences in pitch, as pitch is phonemic in their first language. But I don't think this is necessarily the case. If we turn it around, then we should argue that because English speakers have movable stress in their L1, and that English stress is manifested (partially) by an increase in pitch, that English speakers should be sensitive to differences in tone in Chinese. Anecdotally at least (though see Juffs, 1989; Leather, 1990) English speakers have a hard time learning to perceive different Chinese tones. It seems likely that the difference between linguistic versus non-linguistic processing is crucial. Obviously, English speakers have the ability to distinguish differences in pitch when they are presented as non-linguistic stimuli (e.g. musical notes) but they are not accustomed to doing this when processing linguistic forms. Conversely, my initial expectation that Chinese speakers should be good at perceiving pitch differences in English was probably not taking into account the linguistic processing of English forms. The subjects would probably do quite well on nonlinguistic tests of pitch discrimination.

The fact that pitch is phonemic in the L1 may shed some light on what is going on. When we think of other aspects of a phonemic representation, say that in Japanese /l/ and /r/ are not phonemic, this is often something that affects cross-linguistic transfer. The learner's initial assumption is that things that are phonemic in the L1 will be phonemic in the L2. This could be what is going on with pitch in these subjects. If pitch (manifested as tone) in the L1 is stored as part of the lexical entry, then the subjects may well be assuming that English pitch (manifested as stress) is also stored as part of the lexical entry.

The Japanese subject seems to be much more successful in his perception of English stress. In terms of his production, he did not appear to be significantly different from the Chinese-speaking subjects. Beckman (1986) has argued that Japanese lacks lexical stress altogether, and that it is really a Restricted Tone language. This is contrary to the taxonomy of Hiraguchi shown back in #1 on the handout. Archangeli and Pulleyblank (1988?) suggest that Japanese has in the lexical entry certain High tones linked to the word. I would argue that these distinctions are not crucial to the discussion here in that they all argue for some mechanism to lexically mark accent (either via stress or tone). The Japanese subject in this study appears to be consistent with this analysis in that he seems to be treating English stress as a lexical phenomenon.

5.0 Conclusion

Taken on its own, this paper may seem to be somewhat of a collection of non-results. The subjects didn't change their stress patterns a lot over time and didn't appear to be basing their stress assignment on things like grammatical category or syllable weight. However, when contrasted with the studies that have been done on native speakers of Polish, Spanish and Hungarian (other Stress Accent Languages) we can see that we actually are learning something about the influence

of the L1 when it's a Nonaccentual Language. The subjects in this case appear to be treating stress as a lexical phenomenon. Subjects whose L1's are Accentual languages were transferring their L1 principles and parameters of metrical structure (e.g. quantity-sensitivity, extrametricality). Subjects whose L1's were Nonaccentual languages appear to be transferring quite different things.

This seems to be analogous to Carroll's (1989) study of the acquisition of gender by French Immersion students. She argued that non-native speakers of French were representing gender in a manner which was fundamentally different from native speakers. At times this could produce behaviour that was almost indistinguishable from native speakers but the representation was thought to be different. In Archibald (in press) I argued that this suggests that adult L2 learners can reset existing parameters but may not be able to trigger new structures. This appears to be parallel to what learners from a Nonaccentual language are doing when they are trying to learn an Accentual language. Often they are getting the stress correct on the English words, but they seem to be doing it in a way that is very different from native speakers.

An interesting question is, of course, what kind of evidence would be useful in informing the subjects that their hypotheses were incorrect about English stress assignment, and whether they could ever set up a representational system like that of native speakers, but that goes beyond the scope of this paper.

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