Learning Biases and Weight-Sensitive Stress

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Innate learning biases have been proposed to explain the asymmetries of phonological typology (Moreton 2008). Previous experiments have tested such learning biases for quality-sensitive stress (stress attracted to higher sonority) in English and French speakers learning artificial languages (Carpenter 2010). However, this research has only tested learners who already speak stress languages (movable stress, as in English vs. fixed stress, as in French), and has only looked at quality-sensitive stress, a very rare type. In addition, has not compared the phonological typology of quality-sensitive versus quantity-sensitive stress, a far more common type. The present study addresses these gaps in speakers of a tone language, Mandarin. An artificial grammar learning paradigm (Esper 1925) was adopted in three experiments, all using disyllabic words. Participants in each experiment were asked to try to learn training items from their assigned artificial languages. Then they were presented with new items and asked to judge which were grammatical in the trained language. Experiment 1 tested quality-sensitive stress systems: training and test items were open syllable contrasting two low vowels [ɑ, æ] and two high vowels [i, u]. Stress in the hypothesized natural and unnatural versions was attracted by low vowels and high vowels respectively; a control language had fixed stress system, with stress always on the first syllable. Results showed that learning was biased in the opposite direction from typological data: participants more easily learned the language with stress assignment on high vowels over low vowels. Experiment 2 tested quantity-sensitive stress systems: test items were closed syllables contrasting four vowels. Stress in the hypothesized natural and unnatural versions was attracted by heavy syllables and light syllables respectively. This time the results were consistent with typology, with a learning advantage for the language with stress on heavy syllables rather than light syllables. Experiment 3 crossed quality-sensitive and quantity-sensitive stress systems, testing four artificial languages. In Experiment 3, when the two types of stress systems were crossed neither quality-sensitivity nor quantity-sensitivity had main effects on learning, but they interacted significantly in a way inconsistent with typology: the language with natural stress in terms of both quality-sensitivity and quantity-sensitivity was the most poorly learned of the four languages. Our study thus shows that the typologically common quantity-sensitive stress pattern is easier to learn a typologically consistent way than the rarer quality-sensitive stress, even for speakers of a tone language. Moreover, it also seems that the overall complexity of a stress system matter, since overlapping two “natural” stress systems actually hurt learning. It is unknown whether this last surprising result also holds for artificial language learners who already speak a stress language.

Table 1. Experiment 1: Quality-sensitive stress (accuracy rate)

Language types	Mean	SD	df	t
Natural	0.52	0.01	38	-2.15*
Unnatual	0.59	0.01		

Note. SD= Standard deviation

* p< .05, ** p< .01

Table 2. Experiment 2: Quantity-sensitive stress (accuracy rate)

Language types	Mean	SD	df	t
Natural	0.61	0.01	28	2.33*
Unnatual	0.51	0.01		

Note. SD= Standard deviation

* p< .05, ** p< .01

Table 3. Experiment 3: Crossing quality-sensitive stress and quantity-sensitive stress (accuracy rate)

		Quanity-sensitive stress	
		Natural	Unnatural
Quality-sensitive stress	Natural	0.55 (SD=0.01)	0.61 (SD=0.02)
	Unnatural	0.63 (SD=0.01)	0.57 (SD=0.01)

Note. SD= Standard deviation

Table 4. Experiment 3: Crossing quality-sensitive stress and quantity-sensitive stress

Source	df	F
Quality-sensitive stress	1	0.283
Quantity-sensitive stress	1	0.003
Interaction	1	4.534*

* p< .05, ** p< .01

References

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