論 文

Relevance of stem types in word stress judgment by L2 English learners : Real versus nonsense derivations

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1. Introduction

This article focuses on the nature of Japanese EFL learners' ability to judge word stress from the viewpoint of the distinction between derivations containing a real stem word and derivations containing a nonexistent, artificial stem. Research on the L1 speaker's word recognition has made frequent use of word frequency as a dimension with which to investigate the knowledge that they possess about word structure (e.g., Hay, 2000). Research has also demonstrated that L1 children's acquisition of morphological operations develops from regular inflection, compounding, derivation by neutral suffixes, through derivation by rhythmic suffixes.

Among others, research by Jarmulowicz (2000, 2002) is worth attention. She discusses whether or not suffix frequency is involved in the growth of children's ability to predict word stress in morphologically complex words. In her experiment targeted on two groups of 7-year-old and 9-year-old children with English as their L1, Jarmulowicz (2000, 2002) used a set of words composed of a real stem with one of the selected derivational suffixes and a nonsense stem with the same suffix and asked the children where in the given words they judged primary stress to fall. The variables were age (7 years vs. 9 years), suffix type (rhythmic vs. neutral), and stem type (real vs. nonsense). Among these, the distinction between the two stem types actually was intended to control for word frequency or word familiarity — the nonsense derivations represented words of zero familiarity. The results showed that the children's performance was consistently better on the suffixes which occur frequently in the children's literature corpus compiled for the experiment than on the other suffixes which appear in the same corpus at a considerably lower frequency. The older group produced a greater number of correct judgments than the younger group did, and both age groups had greater difficulty in dealing with the rhythmic suffixes than the neutral suffixes. The most common type of error was to leave the location of the primary stress in the stem word unchanged. This tendency was observed for both real and nonsense derivations. Thus, Jarmulowicz's conclusion was that children of these ages do not distinguish the two suffix types and generalize the rules for neutral suffixes to rhythmic derivations. "Starting with the most frequent rhythmic suffix (via the principle of productivity), there is a period in which children inconsistently produce rhythmic derivations as either [+cyclic] or [-cyclic] (i.e., producing them with correct and incorrect stress)" (Jarmulowicz, 2000, p. 165). This suggests that children learn to use stress rules beyond the simple memorization of individual words together with their particular stress contours. Thus, suffix frequency seems to play a significant role in L1 English learners acquiring word stress assignment for suffixed derivations.

Let us narrow down our focus on how learners judge word stress for rhythmic derivations. The specific questions we tackle in the subsequent sections are (i) whether or not learners show any differences in their performance on word stress judgment in regard to lexical familiarity, namely, the distinction between real derivations and nonsense derivations and (ii) whether or not frequency effects can be found in relation to the formation of learners' suffix knowledge with respect to word stress.

2. Data collection

2.1 Participants

The participants were 30 Japanese university students, all of whom were female students learning English as a foreign language in instructed settings. They were in the second year of their undergraduate program for a BA degree with a concentration in language and communication studies. None of them had resided in an English-speaking country prior to the time when they participated in this experiment.

2.2 Material

As was stated above, the present experiment made use of the distinction between real words and nonexistent words. Nonsense derivations represent words of zero familiarity. The stimuli for this study were a set of twelve derivations. The word list was adapted from the Appendix B of Jarmulowicz's (2002) study, some words having been replaced with those from the high school English text book word list (Sugiura, 2000) in order to secure words familiar enough to be recognized by the participants. The entire set was made up of three subsets consisting of items containing a particular suffix for each set: *-tion, -ic,* and *-ity.* These three classes were further broken down into two types consisting of a real stem and a nonsense stem, respectively. All the nonsense words were adopted from Jarmulowicz (2002). In addition, the frequencies of the three suffixes were checked against a database derived from Adam Kilgarriff's British National Corpus (BNC) word frequency list (Kilgarriff, 1998). Table 1 shows the words used as the stimuli for the present analysis.

Table 1: Real and nonsense derivations used as stimuli

Suffix	Real	Nonsense
-tion	*education*	*ebbation*
	graduation	*krandition*
	information	*trebitition*
	collection	*ordronition*
-ity	*diversity*	*onalarity*
	electricity	*atavility*
	possibility	*kloripity*
	authority	*rupidity*
-ic	*atomic*	*atrilic*
	economic	*raslekaric*
	historic	*tespetic*
	realistic	*ubratimic*

Table 2: The frequencies of *-tion*, *-ity*, and *-ic* in the BNC

Suffix	Frequency
-tion	643,373
-ity	417,017
-ic	247,671

The search results in Table 2 show that *-tion* derivations evidently outnumber *-ic* and *-ity* derivations.

2.3 Procedure

The order of stimulus words was randomized on a spreadsheet software program, and hyphens were inserted between syllables to indicate syllable boundaries. All syllables in each word were numbered from left to right. Each of the participants received an answer sheet with the 12 derivations printed on it. For each item, they were instructed to indicate the syllable which they judged to have primary stress and the syllable which they judged to have secondary stress. In addition, they were instructed to choose the number for an absence of secondary stress when they judged the presented word as having primary stress only.

3. Findings and discussion

The data in Tables 3 and 4 show the descriptive statistics of the data obtained from the participants. The numbers of correct judgments, their individual proportions, and the mean proportions for primary stress and secondary stress are reported.

Table 3: The results for the real derivations

Suffix	Real	Primary (*N*=30)			Secondary (*N*=30)		
		# of correct judgments	Rate	*M* (*SD*)	# of correct judgments	Rate	*M* (*SD*)
-*tion*	*education*	28	.93		6	.20	
	graduation	27	.90	.93	7	.23	.32
	information	29	.97	(.03)	6	.20	(.21)
	collection	27	.90		19	.63	
-*ity*	*diversity*	29	.97		17	.57	
	electricity	19	.63	.80	3	.10	.37
	possibility	22	.73	(.15)	10	.33	(.20)
	authority	26	.87		14	.47	
-*ic*	*atomic*	10	.33		22	.73	
	economic	20	.67	.59	10	.33	.44
	historic	17	.57	(.22)	25	.83	(.34)
	realistic	26	.87		3	.10	
M		23.3	.78		11.8	.39	
SD		5.9	.20		7.5	.25	

Table 4: The results for the nonsense derivations

Suffix	Nonsense	Primary (*N*=30)			Secondary (*N*=30)		
		# of correct judgments	Rate	*M* (*SD*)	# of correct judgments	Rate	*M* (*SD*)
-*tion*	*ebbation*	26	.87		19	.63	
	krandition	15	.50	.67	19	.63	.40
	trebitition	19	.63	(.15)	6	.20	(.27)
	ordronition	20	.67		4	.13	
-*ity*	*onalarity*	18	.60		3	.10	
	atavility	25	.83	.69	4	.13	.37
	kloripity	23	.77	(.13)	20	.67	(.29)
	rupidity	17	.57		17	.57	
-*ic*	*atrilic*	22	.73		25	.83	
	raslekaric	14	.47	.61	5	.17	.44
	tespetic	13	.43	(.16)	20	.67	(.36)
	ubratimic	21	.70		3	.10	
M		19.4	.65		12.1	.40	
SD		4.2	.14		8.5	.28	

Let us discuss the data on primary stress first. The mean rates of correct judgments are high across both the real derivations and the nonsense derivations. The participants yielded mean rates of .78 on the real derivations and .65 on the nonsense derivations. For the former type, the highest mean rate was obtained for the *-tion* group (.90), and the *-ity* group (.80) and the *-ic* group (.59) followed in descending order. For the latter type, the highest mean rate was obtained for the *-ity* group. The *-tion* group showed a slightly lower score (.67); the *-ic* group showed an even lower score (.61), which is close to the *-ic* group's score from the real derivations. Mann-Whitney's *U*-test was performed on the difference between these two stem types. The results, as summarized in Table 5, confirmed statistical significance at $p<.05$ ($U=107$, $p=.045$).

Table 5: Mann-Whitney's *U*-test (primary stress between real and nonsense derivations)

Real	Nonsense	*U*	*p* (two-tailed)
12	12	107	.04490

Second, we examine the data on the secondary-stress judgments. Apparently, there was not much difference between the two stem types. The mean scores of .40 and .41 were obtained for the real derivations and the nonsense derivations. For the former type, the highest mean rate (.44) was obtained for the *-ic* group but nonetheless remained below .50. The participants produced a better score for the *-ity* derivations (.37) than for the *-tion* derivations (.32). For the nonsense derivations, the participants exhibited the highest mean rate on the *-ic* group (.44). The rates for the *-tion* group and the *-ity* group were much lower (*-tion*: .40, *-ity*: .37). The data underwent Mann-Whitney's *U*-test. Table 6 displays the result, which did not confirm significance ($U=74$, $p=.91$).

Table 6: Mann-Whitney's *U*-test (secondary stress between real and nonsense derivations)

Real	Nonsense	*U*	*p* (two-tailed)
12	12	74.0	.9076

Furthermore, a one-way ANOVA was performed on the obtained results to determine whether or not the differences among the three suffix groups were statistically significant. As a result, no statistical significance was found.

Table 7: One-way ANOVA on the suffix groups (N=48)

	SS	df	MS	F	p
Between groups	319.292	2	159.646	2.550	.089
Within groups	2817.375	45	62.608		
Total	3136.667	47			

Despite the failure to obtain statistical significance of the differences between the three suffix groups, we find a number of features the participants generated about the individual words. Recall first that of the 24 items used as the stimuli for the experiment, 11 items had primary stress only and therefore carried no secondary stress.

The real derivations: *atómic, históric, divérsity,* and *authórity;*
The nonsense derivations: *atrílic, tespétic, ebbátion, krandítion, kleripity,* and *rupídity.*

Dividing the responses into two according to the stated distinction, let us have a closer look at the participants' responses. Table 8 presents the data on the derivations with primary stress only; Table 9 presents the data on the derivations with both primary stress and secondary stress.

Table 8: The results for the derivations with primary stress only (N=11)

Derivation	Real/ Nonsense	Secondary stress	Primary (N=30) # of correct judgments	Rate	M (SD)	Secondary (N=30) # of correct judgments	Rate	M (SD)
ebbation	N	No	26	.87		19	.63	
krandition	N	No	15	.50		19	.63	
kloripity	N	No	23	.77	.64	20	.67	.67
rupidity	N	No	17	.57	(.17)	17	.57	(.09)
atrilic	N	No	22	.73		25	.83	
tespetic	N	No	13	.43		20	.67	
collection	R	No	27	.90		19	.63	
diversity	R	No	29	.97		17	.57	
authority	R	No	26	.87	.73 (.27)	14	.47	.65 (.14)
atomic	R	No	10	.33		22	.73	
historic	R	No	17	.57		25	.83	
Total			225			198		
M			20.45	.68		19.73	.66	
SD			6.36	.21		3.32	.11	

The participants exhibited similar mean correct judgment rates across the four dimensions (Primary: .73 [Real], .64 [Nonsense]; Secondary: .65 [Real], .67 [Nonsense]). Mann-Whitney's *U* -test showed no statistical significance on the differences in the following pairs:

1. Primary-real vs. Primary-nonsense: (U=10.0, p=.429)
2. Secondary-real vs. Secondary-nonsense: (U=13.0, p=.792)
3. Primary-real vs. Secondary-real: (U=16.5, p=.421)
4. Primary-nonsense vs. Secondary-nonsense: (U=16.5, p=.818)

Table 9: The results for the derivations with both primary stress and secondary stress (N=13)

Derivation	Real/ Nonsense	Secondary stress	Primary (N=30) # of correct judgments	Rate	*M* (*SD*)	Secondary (N=30) # of correct judgments	Rate	*M* (*SD*)
trebitition	N	Yes	19	.63	.65 (.12)	6	.20	.14 (.04)
ordronition	N	Yes	20	.67		4	.13	
onalarity	N	Yes	18	.60		3	.10	
atavility	N	Yes	25	.83		4	.13	
raslekaric	N	Yes	14	.47		5	.17	
ubratimic	N	Yes	21	.70		3	.10	
education	R	Yes	28	.93	.81 (.13)	6	.20	.21 (.10)
graduation	R	Yes	27	.90		7	.23	
information	R	Yes	29	.97		6	.20	
electricity	R	Yes	19	.63		3	.10	
possibility	R	Yes	22	.73		10	.33	
economic	R	Yes	20	.67		10	.33	
realistic	R	Yes	26	.87		3	.10	
Total			288			70		
M			22.15	.74		5.38	.18	
SD			4.49	.15		2.47	.08	

On the contrary, the results on the participants' performance on the derivations with both primary stress and secondary stress showed a striking contrast to the other set. Noticeable differences were found between (1) the real derivations and the nonsense derivations for primary stress, (2) the real derivations and the nonsense derivations for primary stress and for secondary stress, (3) primary stress and secondary stress for the real derivations, and (4) primary stress and secondary stress for the nonsense derivations. Nonetheless, statistical significance was not confirmed on the differences in the stem-type, as the results of Mann-Whitney's *U*-tests on the four pairs indicate.

1. Primary-real vs. Primary-nonsense: (U=7.0, p=.051)
2. Secondary-real vs. Secondary-nonsense: (U=11.0, p=.181)
3. Primary-real vs. Secondary-real: (U=0.0, p=.004)
4. Primary-nonsense vs. Secondary-nonsense: (U=0.0, p=.002)

5. Conclusion

The present study has centered around the question of how suffix frequency is involved in the growth of the learner's knowledge on stress placement. Though L1 acquisition research has suggested that real derivations are advantageous over nonsense derivations, the experiment conducted in the present analysis offered evidence that the same may not hold for the learner acquiring L2 English morpho-phonology. The judgment data on primary stress addressed a statistically significant difference across the set of real derivations and the set of nonsense derivations. The analysis suggested that the suffixes' relative frequencies exerted a significant influence on the learner.

With respect to the individual suffix groups, we found that the *-ic* derivations presented no great difference between the real derivations and the nonsense derivations. The correct judgment rates for the *-ic* derivations were lower than those for the *-ity* and *-tion* derivations in both pools of real and nonsense derivations. As for the knowledge of secondary-stress placement, the participants showed no significant difference across the real derivations and the nonsense derivations. Therefore, it followed that word familiarity does not play much role in the acquisition of the form part of the lexicon, though the subsequent chapters will address further considerations on this point.

The present study also provided some insights into the order of acquisition of the morphology-phonology interface. In particular, the statistical significance found between the correct judgment rates for the words carrying primary stress only and the words carrying both primary stress and secondary stress suggested that the learner is quicker at implementing his or her ability to judge whether the given derivation possesses or lacks a secondary stress. The results also suggested that the ability to compute where in the given word a secondary stress is to fall may develop at a later stage. No evidence was found in support of the possibility that the growth of knowledge on secondary stress is associated with and influenced by suffix frequency.

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