ENGLISH WORD STRESS IN POLISH LEARNERS' SPEECH PRODUCTION AND METACOMPETENCE

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Abstract
This paper focuses on the relations between conscious and subconscious aspects of English word stress acquisition. Using two tasks – reading and written word stress identification, we test metacompetence and production accuracy in the pronunciation of Polish learners, first year and third year English studies majors. The analysis of the collected data and correlations between the students' metalinguistic knowledge and production accuracy, including error patterns and proportions, leads to conclusions concerning the significance of language awareness, learning experience and, indirectly, explicit didactic instruction for English word stress realization. Our results indicate that Polish learners tend to stress the word-initial syllable rather than the penult, typical of their native language. We have also observed a generally large, though smaller in more proficient learners, discrepancy between metacompetence and performance.

Keywords: EFL pronunciation, word stress, language awareness

1. Introduction

English, along with such languages as Spanish, Dutch or Russian uses contrastive stress as a cue to word identification (cf. Cooper et al., 2002; Cutler, 1984; Field, 2005; Kenworthy, 1990; Slowiaczek, 1990). Consequently, lexical access becomes more difficult if word stress patterns are violated in language production (Anderson-Hsieh et al., 1992; Brown, 1990; Field, 2005; Liu, 2006). Word stress errors are naturally very frequent in learning English as a foreign language (EFL) because of the unpredictability of English metrical patterns. Moreover, some learners, especially the native speakers of languages that do not use contrastive word stress, may suffer from stress-deafness (Dupoux et al., 1997; Peperkamp and Dupoux, 2002), which impairs the process of lexical access and FL production. Stress-deafness, however, does not preclude the pronunciation of English words with correct prominence structure, which suggests a certain degree of independence between perception and production in this respect (Altmann, 2006).

Consequently, although usually regarded as a priority in EFL learning (see discussion in Szpyra-Kozłowska, 2015; but cf. Jenkins, 2000), word stress is at the same time regarded as difficult to teach, if not unteachable (cf. discussion in Giegerich, 1992; Jenkins, 2000).

A number of researchers have attempted to investigate the most common reasons for word stress errors and their scale in Polish learners. Archibald (1993) noticed some degree of L1 transfer in Polish and Hungarian speakers' production. In a replication study on Polish university students, characterized by higher language awareness than Archibald's research participants, Waniek-Klimczak (2002) observed an opposite tendency to avoid L1 transfer, even if the strategy also led to stress errors. In a more recent research, Waniek-Klimczak (2015) suggests that FL overgeneralization occurs more often than L1 transfer and points out that explicit instruction and training may improve the advanced Polish learner's command of English word stress. Sobkowiak (1996) suggests that the stress placement error rate is inversely proportional to word frequency.

The variety of potential problems, ranging from English word stress patterns complexity to the difficulty of auditory and motor articulatory control, causes the pedagogical controversies mentioned above. Moreover, Sobkowiak (ibid.), Szpyra-Kozłowska and Stasiak (2010) and Szpyra-Kozłowska (2015) observe a number of specific "difficult words" in English, which are notoriously mispronounced by Polish learners, including the advanced ones. What questions the idea of plain correlation between word frequency and stress error rate is the fact that a considerable number of these difficult words belong to basic English vocabulary. Experienced English pronunciation teachers and researchers (Sobkowiak, 1996; Waniek-Klimczak, 2015; Szpyra-Kozłowska, 2015) unanimously place 'area,' 'event,' 'success,' 'professor,' 'computer' and many others on the infamous word list.

Considering the alleged low teachability of lexical stress, the natural pedagogical response to "words commonly mispronounced" (Sobkowiak, 1996) is to advise learners to observe the stress patterns of new words that they learn (e.g. O'Connor 1967), especially bearing in mind that even stress deafness does not rule out correct speech production. The solution appears natural in second language acquisition, but in classroom learning, where authentic input is limited, and in teaching phonetics to philology students, who are required to attain a high level of linguistic metaknowledge, attempts to facilitate this difficult process by explicit instruction and training are obviously welcome. A moderate effect of training has been demonstrated by Waniek-Klimczak (2015), who found that second year English studies majors outperformed first year students in recognition of correctly and incorrectly stressed English words (78% and 70% accuracy, respectively). Porzuczek (2014) observed consistent stress-assignment strategies used by more proficient learners that helped them manage morphologically complex new words.

2. The study outline

Explicit instruction in word stress involves decisions concerning the balance between the expected efficiency of stress assignment rules to be taught (cf. Porzuczek et al., 2013; Porzuczek, 2014) and focus on individual vocabulary items (Szpyra-Kozłowska, 2015; Szpyra-Kozłowska and Stasiak, 2010) if we consider language competence development. With respect to performance, depending on physiological abilities and motor control, it involves ear training and articulatory practice. In our study we investigate the effects of explicit instruction and practical phonetic training on students' metacompetence and language production and the correlation between the two. For this purpose, we tested the accuracy of word stress realization in Polish learners' speech and written word stress identification. We expected that more experienced students would achieve better results in both tests and better consistency of responses with respect to particular words, which, considering relatively small difference in general learning experience between the two tested groups, would prove a beneficial effect of explicit training on word stress acquisition. Thus the research questions were formulated as follows:

- What are the strategies of word stress realization? Can word stress in L2 be predicted from L1 patterns?
- Does language training predict better metacompetence and word stress realization?
- What are the relations between metacompetence and actual word stress realization?

3. Materials

As research stimuli we used a selection of "words commonly mispronounced" (Sobkowiak, 1996; also appearing in Waniek-Klimczak, 2015, and Szpyra-Kozłowska, 2015). The words were a balanced representation of four major metrical patterns:

- trochee (**Ss**): *surface, palace, purchase, effort*
- iamb (**sS**): *event, distinct, Japan, success*
- dactyl (**Sss**): *energy, industry, capable, opera*
- amphibrach (**sSs**): *develop, determine, professor, computer*

For familiarization with the tasks, we added three more (commonly mispronounced) items: 'area,' 'interesting,' and 'hotel.'

4. Participants

A total of 41 Polish learners of English participated in the study. There were 19 lower-proficiency (LP), first-year students (10 females and 9 males) with the mean age of 19.6 years. The LP group was prior to phonetic training covering English word-stress realization. The higher-proficiency (HP) group included 22 third-year and fourth-year students (20 females and 2 males) with the mean age of 22 years. This group had completed the phonetic training with explicit instructions concerning the phonological and morphological cues to word-stress patterns in English, followed by perception and production exercises. The proficiency level in the LP group was between B1 and B2 in the Common European Framework of Reference for Languages (CERFL). The proficiency in the HP group ranged between B2 and C1 in the CERFL. Apart from differences in proficiency, the critical independent variable for the current study was phonetic training in English word stress that the HP group had received and the LP group had not. None of the participants reported any speech or hearing disorders nor had any indication of such.

5. Procedure

The participants took part in four experiments, two testing production and the other two testing perception for another study. The whole session lasted approximately 20 minutes for each participant. In Experiment 1 we asked the participants to read a list of test words. They were presented in print with orthographic representations for each word in a row format with a 14-inch Times New Roman font. We will refer to this task as 'production' henceforth. The learners were encouraged to read in a natural tempo in the most natural style. At this stage, the participants were unaware of the purpose of the experiment. All productions were recorded in a sound-proof booth in the Acoustic-Phonetic Laboratory, University of Silesia. The signal was captured at 44100 Hz through a dynamic microphone Sennheiser HMD 26 fed by a USBPre2 preamp (Sound Devices) as wav. files.

In Experiment 2 we tested the learners' explicit competence in indicating which syllables carry stress in the test words. We will refer to this task as 'metacompetence' henceforth. The participants were exposed to orthographic representations of the words and were asked to underline which syllable was stressed in correct pronunciation of these words. At this stage, the participants were aware of the purpose of the experiment. Orthographic forms of the words were divided into syllables to facilitate the process of finding the target stressed syllables. For example, the word 'surface' was represented as *SUR-FACE* and the word 'determine' was represented as *DE-TER-MINE*. The task was relatively straightforward and none of the participants exhibited any difficulties with understanding the procedure.

6. Analysis criteria

In the production task the recordings were analysed for finding which syllable was stressed by the speakers in the test words. The analysis was performed by the two authors using auditory impressions supported by visualizations in waveform and spectrogram in Praat (Boersma, 2001). There were 656 items for analysis (41 speakers x 16 words). In a large proportion of the productions it was relatively straightforward to identify which syllable was stressed. However, 1.8% of the items were classified as difficult to categorize. The reasons were as follows: conflicting or unclear accent cues, no vowel reduction, little intensity contrast, pitch variation irrelevant to prominence (e.g., rising intonation in a "list-reading" mode). Such items were classified as incorrectly stressed following the assumed principle that the speakers who were confident about which correct syllable was to be stressed realized one or more consistent cues in signalling stress. In the metacompetence task the underlined syllables were identified from the orthographic representations in the experimental sheet. Word stress accuracy was calculated as the proportion of correctly stressed words to the total number of test words. For inferential statistics the number of correctly stressed words was treated as continuous values. Appendix shows mean correct stress realizations for all test words across the group (LP vs. HP) and task type (production vs. metacompetence).

7. Analysis and results

7.1. Production and metacompetence

Fig. 1 (the next page) shows the mean correct stress realizations for the production and metacompetence task in the LP and HP groups.

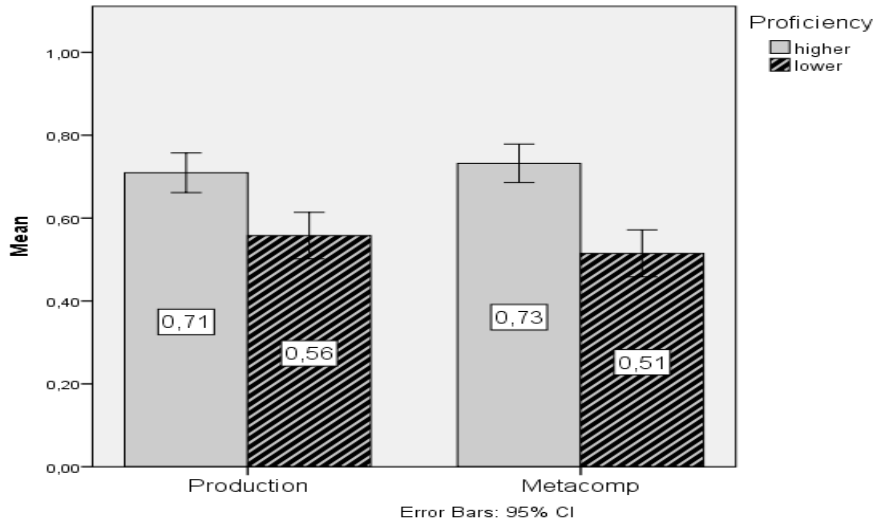

Fig. 1 Mean correct stress realizations for the task type (production/metacompetence) and the group (LP/HP)

The results show that the HP students outperformed the LP students both in production (71% vs 56% respectively) and in metacompetence (73% vs 51%). A reversed pattern for the two groups was observed in that, while the HP students performed better in metacompetence (73%) than in production (71%), the LP group was more correct in production (56%) than in metacompetence (51%).

In order to test significance of the observed patterns, the mean values were rescaled to continuous values ranging from minimum 0 correct realizations to maximum 16 correct realizations. The data were normally distributed for both tasks: production [$W(41)=0.95$, $p=.06$] and metacompetence [$W(41)=.98$, $p=.71$]. Between-group comparisons revealed that the HP learners produced significantly more correct word stress in the reading task [$F(1, 39)=10.97$, $p<.01$], and indicated correctly stressed syllables more frequently in the metacompetence task [$F(1, 39)=26.22$, $p<.01$]. It points to the fact that both proficiency and phonetic training contributed significantly to more correct stress realizations both in production and in metacompetence. Within-group comparisons showed that there were no significant differences in performance between the production and metacompetence tasks in either the HP [$F(1, 21)=1.35$, $p>.05$] or LP group [$F(1, 18)=1.69$, $p>.05$]. These results may lead to the conclusion that production and metacompetence are relatively stable in relation to each other along increasing proficiency in that phonetic training contributes to the development in production and in general awareness of a metrical structure of the tested words. If this is the case, in each group we should observe significant regressions showing how metacompetence predicts production. In other words, accuracy in marking stress in the metacompetence task should predict accuracy in production. In order to test it, we ran linear regressions for each group with a dependent variable of

metacompetence accuracy and an independent variable of production accuracy to see how metacompetence predicted production in each group. The analysis showed that metacompetence significantly predicted production in the HP group [R^2=.51, F(1, 20)=20.98, p<.01], but not in the LP group [R^2=.18, F(1, 17)=3.78, p>.05]. It shows that more correct stress productions in the higher-proficiency group after phonetic training are fed by more developed awareness of the metrical structure of English words.

7.2. Congruency measures

By congruency measures we understand a by-item analysis for a given correctly produced word predicted by correct stress marking of the same word in the metacompetence task. For example, the correct congruency score is obtained if a word 'develop' is correctly produced and at the same time correctly marked for stress. Such analysis is more detailed in matching production and metacompetence than the previously reported regression analyses in that regression tested how the number of correctly marked words predicted the number of correctly produced words for each speaker. In congruency measures we analyse each individual word for each speaker rather than pooled correct scores from the two tasks. Fig. 2 shows the mean congruency measures for the two groups.

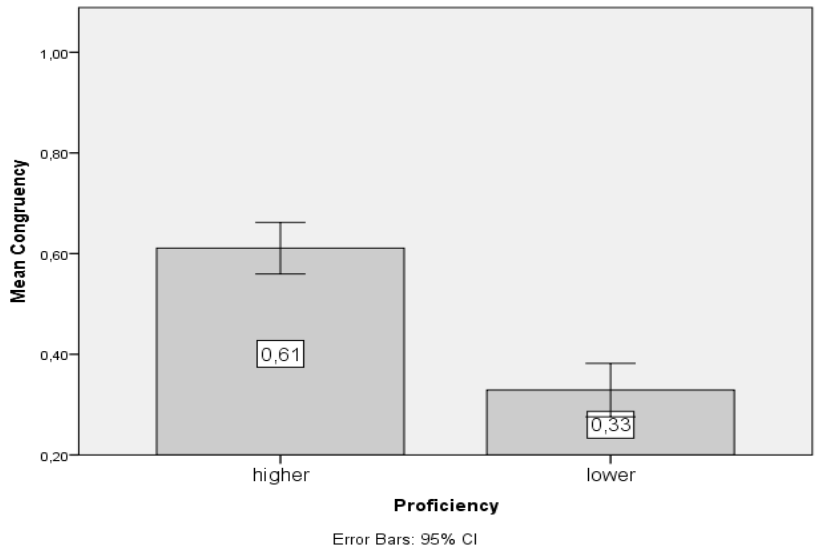

Fig. 2 Mean congruency measures for the HP and LP groups

The results show observable group differences in congruency measures. In the HP group 61% of correct productions were predicted by correct stress marking in the metacompetence task. In the LP group only 33% of the words produced correctly were predicted by correct stress marking. The difference was statistically

significant [F(1, 39)=27.926, p<.01]. It indicates that, together with less effective performance in production, the LP group is also characterized by a wider gap between how the learners produce correct stress and what they know about the metrical structure of these words.

7.3. Metrical pattern effect

The analysis of stress realization in words of various prominence structures is shown in Table 1. It shows the mean number of correct realizations of individual stress patterns with respect to the overall number of tested items in a particular category. Each foot type was represented by four examples, which additionally allowed us to analyse three positions of word stress (initial, second, and penult), represented by eight examples each.

Table 1. Metrical pattern effect (production)

stressed syllable (N=8)	lower-proficiency	higher-proficiency
initial Ss(s)	6.26	6.95
second sS(s)	2.79	4.36
penult (s)Ss	3.42	5.5
foot type (N=4)	lower-proficiency	higher-proficiency
trochee	2.68	3.36
iamb	1.95	2.23
dactyl	3.58	3.59
amphibrach	0.74	2.14

As our analysis revealed, the erroneous productions of three-syllable words never consisted in stressing the final syllable, which made it possible (with the exception of the 1.8% of problematic realizations) to draw conclusions about the stress assignment tendencies or strategies used in the production task on the basis of the correct/incorrect distinction alone. The most obvious observation is that the HP group outperformed the LP group significantly in the pronunciation of items with non-initial word stress. It is also apparent that leftward (practically tantamount to word-initial) misstressing occurs more often than the opposite type of word stress error in Polish students' production.

8. Discussion

The results from the current study show that proficiency and phonetic training are significant predictors of English word stress realization. The higher-proficiency learners both produced and marked more words with correct stress. In our introductory hypotheses we assumed that the critical factor separating the higher-proficiency group from the lower-proficiency group would be phonetic training in prosody of English pronunciation that the first group had completed. However, it

must be emphasized that disentangling proficiency from phonetic training as a categorical predictor in performance is not easy, if possible at all. More precisely, it is our explanatory bet that better performance in the higher-proficiency group was contributed to by explicit instructions and training in word stress patterns in English rather than by higher proficiency. An equally legitimate, although in our opinion less likely, explanation may be that better performance was conditioned by general more exposure to and proficiency with spoken English. In order to tease apart those two factors, future studies should investigate learners with either different proficiency without phonetic training or with the same proficiency and with/without phonetic training. The latter scenario is more difficult to achieve, because properly structured phonetic training requires a sufficient amount of time during which proficiency naturally increases.

Nonetheless, we consider it reasonable to believe that most pronunciation modifications between the first and the third years of studies are mainly a result of explicit pedagogical treatment, especially regarding the pronunciation of basic vocabulary items, known to the students for a long time before their university experience. Another argument for the influence of explicit instruction and training on production improvement is the observation that better production is correlated with better metacompetence. Both regression analyses and congruency scores showed that production and metacompetence in the lower-proficiency group were largely unrelated. The learners in this group were not consistent in producing and marking stressed syllables in that correctly produced words were likely to have an incorrectly marked stressed syllable or, in an inverse pattern, a correctly marked stressed syllable was likely be produced incorrectly. In the higher-proficiency group the consistency was much higher and correctly marked syllables largely predicted correct productions. These differences show that phonetic training and proficiency enhance the awareness of which syllable is stressed in a given word and this awareness feeds correct production. This is in line with a fundamental assumption of the idea of phonetic training in which developing metacompetence is to be reflected in more accurate production.

9. Conclusions

"Difficult words" appear to be more difficult for less proficient learners, which is a pedagogically optimistic observation. However, a large proportion of conscious identification and spoken realization of stress does not form a predictable pattern, suggesting that Polish learners often ignore or do not recognize word stress as an intrinsic lexical property. No consistent L1-driven penult stressing was observed. Instead, a clear preference for word-initial stress prevailed in language production (cf. upper and lower halves of the table in Appendix) and the amphibrach-to-dactyl shift was common even in cross-linguistic cognates ('professor,' 'computer'). This strategy may generally improve the intelligibility of misstressed words, since leftward misstressing is considered to cause less serious

communication problems (Field 2005). Rightward misstressing errors, less frequent than the other type, appear in the pronunciation of 'difficult' trochaic (but not dactylic) words, whose spelling suggests a heavy or superheavy final syllable.

A comparison of results of the two tasks shows that language experience including phonetic instruction and pronunciation training improves both metacompetence and performance, but phonological metacompetence develops faster than pronunciation competence. Finally, the results also indicate that despite a large proportion of mismatches between conscious stress indication and pronunciation, correct stress indication predicts correct production better in higher proficiency (trained) learners, which suggests a beneficial influence of explicit instruction and training on language production in notable proportion of EFL learners.

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Appendix

Mean correct stress realizations in percent for all test words across the group (LP vs. HP) and task type (production vs. metacompetence).

	lower-proficiency				higher-proficiency			
	production		metacompetence		production		metacompetence	
Word	*Mean*	*SE*	*Mean*	*SE*	*Mean*	*SE*	*Mean*	*SE*
computer	15.8	8.59	73.7	10.38	54.5	10.87	59.1	10.73
determine	15.8	8.59	63.2	11.37	77.3	9.14	90.9	6.27
develop	10.5	7.23	36.8	11.37	36.4	10.50	50.0	10.91
professor	31.6	10.96	57.9	11.64	45.5	10.87	63.6	10.50
distinct	42.1	11.64	52.6	11.77	31.8	10.16	36.4	10.50
event	31.6	10.96	47.4	11.77	45.5	10.87	68.2	10.16
Japan	68.4	10.96	66.7	11.43	81.8	8.42	86.4	7.49
success	52.6	11.77	42.1	11.64	63.6	10.50	59.1	10.73
capable	78.9	9.61	47.4	11.77	90.9	6.27	81.8	8.42
energy	94.7	5.26	36.8	11.37	95.5	4.55	77.3	9.14
industry	89.5	7.23	31.6	10.96	72.7	9.72	54.5	10.87
opera	94.7	5.26	47.4	11.77	100	0.00	86.4	7.49
effort	68.4	10.96	47.4	11.77	72.7	9.72	77.3	9.14
palace	36.8	11.37	63.2	11.37	81.8	8.42	90.9	6.27
purchase	78.9	9.61	52.6	11.77	85.7	7.82	95.5	4.55
surface	84.2	8.59	57.9	11.64	100	0.00	95.5	4.55