THE RELATIONSHIP BETWEEN THE PRODUCTION OF WORD STRESS AND MUSICAL ABILITIES IN POLISH LEARNERS OF ENGLISH

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Abstract

The pilot study presented in this paper is exploratory in nature and aims first to investigate if there exists a relationship between the production of word stress and learners' musical abilities, and then, to explore the effects of this relationship on teachability of word stress to Polish advanced students of English. The results of the analysis on the auditory recordings were compared with the information provided by the informants in a questionnaire and a performance music test. The obtained data were analysed using descriptive statistics. The results show that the students tend to overgeneralise word stress rules in English rather than transfer the penultimate syllable rule from Polish. In addition, there seems to be a relationship between word stress production and musical ability for the majority of the participants.

Keywords: English word stress, musical abilities, phonetic training

1. Introduction

Word stress is an essential element of English language learning as it affects the comprehension and intelligibility of spoken English. Yet, it is often a great challenge for Polish learners to master it successfully. The existing rules enabling the prediction of English word-stress on the basis of word morphology, grammatical category and segmental composition, "have a very limited pedagogical value in the context of learning English as a foreign language" (Sobkowiak, 2004: 241). Learners rather tend to rely on their knowledge of some rules, overgeneralize them, as well as transfer others from their L1, which frequently results in errors even at an advanced level (Waniek-Klimczak, 2015). Some learners seem to be more successful than others in word stress acquisition and it is traditionally assumed that those with talent for music have greater chances to achieve good pronunciation as they are more sensitive to pitch variations and

can imitate rhythmic patterns better than others. This paper focuses on the relationship between the production of English word stress and learners' musical ability and aims to investigate the effect of this correlation on teachability of word stress to Polish advanced students of English.

2. Word stress in Polish and English

Generally, stress is defined as "a conventional label for the overall prominence of certain syllables relative to others within a prosodic structure in a linguistic system" (Clark, Yallop and Fletcher, 2007: 339) and prominence is a term used to cover all the impressions created by stressed syllables. This means that stress manifests the effects of factors including loudness, pitch and length usually in different combinations.

Phonetically, stress in Polish is often related to loudness or intensity, that is stressed syllables are pronounced louder than unstressed ones (Dłuska, 1974; Weinsberg, 1983) or to greater articulatory energy (Dukiewicz and Sawicka, 1995). This type of stress is categorised as dynamic and expiratory, because the syllable's sonority depends on the intensity of exhalation (Weinsberg, 1983). However, tone or fundamental frequency has also been proposed to be the main correlate of Polish stress and its classification has been changed from dynamic to melodic or tonal (Jassem, 1962). Stress pattern in Polish is generally fixed with the penultimate syllable carrying the primary stress. In polysyllabic words, alternating preceding syllables usually carry secondary stress. For example, in a word consisting of four syllables, the primary stress falls on the third (penultimate) syllable, and the secondary stress falls on the first syllable, as in *kolo'rowy*.

In English, a stressed syllable is perceived to be prominent when it is marked by at least one of the following factors: pitch, loudness, quality and quantity. Cruttenden (1997) claims that it is the changes in pitch that predominantly characterise a stressed syllable, while Crystal maintains that it is usually due to an increase in loudness, "but increases in length and often pitch may contribute to the overall impression of prominence" (2008: 454). Stress placement in individual English words is highly variable and often unpredictable. Yet there are a number of rules that enable the successful determination of stressed syllables and these refer to the phonological structure of a syllable, the number of syllables within a word, its grammatical category and morphological complexity with changes in meaning in the case of compound nouns depending on how their elements are stressed (for a detailed analysis of English stress, see e.g., Giegerich, 1992; Sobkowiak, 2004).

A crucial statement about stress in English is that its patterns are important not only because they enable words to be distinguished or assigned meaning, but mainly for the reason that it is one of the factors causing rhythmic differences between languages and "the rhythm of spoken English is to a very large extent

determined by strong beats falling on the stressed syllables of words" (Clark et al., 2007: 339).

2.1. Word stress - pedagogical perspective

Among the many features that Polish students of English must manage in the process of language learning, word stress appears to be particularly demanding. Both phonetic and phonological aspects are responsible for that difficulty. On the phonetic level, the differences in the dominating correlates of stress between languages play a major role (see above). The lengthening of stressed vowels present in English additionally has a strong connection with vowel reduction. The appropriate realisations of stressed/reduced contrasts by non-native speakers contribute to the achievement of stress-timing impressions in their English performance, since the basic problem in the acquisition of stress-timed rhythm seems to lie in vowel length adjustments (Waniek-Klimczak, 2009).

Phonologically, the problems with correct stress assignment can be due to the general organisation of speech and particularly to its metrical parameter of quantity. According to Waniek-Klimczak, "Polish is quantity insensitive, while English is sensitive to the weight of the rhyme. Sensitivity to quantity forms the basis for phonological conditioning of stress in English" (2002: 222). Yet, it is not only quantity that affects stress assignment. Syntactic category and morphological information are also stress sensitive. Despite the existence of a number of rules facilitating stress placement in English, learners do not seem to resort to them eagerly (Sobkowiak, 2004)

Confronted with the challenge of stress assignment in English, Polish learners use a variety of strategies. Overgeneralisations with regard to syntactic category are reported to be dominant (Archibald, 1993), with the tendency to stress initial syllables in nouns and final ones in verbs. Transfer from L1 is also a common strategy, even at an advanced level (Waniek-Klimczak, 2015). Quantity sensitivity is another significant parameter commonly operating in stress assignment, as well as language learning experience and explicit instruction. These strategies seem to confirm the assumption that Polish learners compute word stress and do not store it lexically (Waniek-Klimczak, 2002). The problems of misstressed words that occur demonstrate that the strategies may fail and when they do, "recognition of the word is made much more difficult" as "stress forms part of a word's phonetic identity" (Roach, 2002: 202). This leads to the conclusion that the most basic issue that Polish learners should be concerned with as regards stress, is its correct placement in words and realisation.

2.2. Word stress and musical aptitude

Traditionally, it is assumed that learners with talent for music have greater chances to achieve good pronunciation as they are more sensitive to pitch variations and can imitate rhythmic patterns better than others. A number of scholars interested

in the relation between musical ability and the development of certain pronunciation skills (e.g. Magne et al., 2006; Milovanov et al., 2010; Fonseca-Mora et al., 2011; Połać, 2014; Malarski and Jekiel, 2016) point to the positive influence of this kind of correlation on the foreign language learning process. According to Balčytytė-Kurtinienė (2015: 419), "[E]nhanced musical aptitude and simultaneous musical exposure seems to improve the ability of foreign language learners to distinguish between rapidly changing sounds, stresses, vowel reduction, rhythm and intonation". Interestingly, music and speech prosody share common features, such as melody (intonation) and rhythm (stress and timing) (Nooteboom, 1997). Thus, although correct stress placement is a problematic element of English pronunciation for Polish students, those with a good ear for music seem to be more successful than others both in its acquisition and further production. As Hausen et al. (2013: 1) state, "there is a robust link between music and speech perception and that this link can be mediated by rhythmic cues (time and stress)".

3. The current study

3.1. Aims

The study aims first to investigate if there exists a relationship between the production of word stress and learners' musical ability, and then to explore the effects of this relationship on teachability of word stress to Polish advanced students of English. Having prepared a tool for assessing students' musicality, the instructor would be able to correlate phonetic training with students' musical ability.

3.2. Participants

The participants who volunteered to take part in the experiment were twenty second year students of English Philology at the University of Łódź: fifteen females and five males. Their age ranged from 19 to 23 (M: 20, S.D.: 0.91). The students were recorded in November 2016 and January 2017. By the time the research was conducted, they had completed a 3-session training of word stress.

3.3. Questionnaire

Before the experiment the students were asked to answer several questions in a questionnaire. Five of them were related specifically to word stress:

1) Do you think word stress is a difficult element of English pronunciation?
2) What do you think can help in practicing word stress?
3) Do you have any strategies in deciding on the stressed syllable?

4) Do you think word stress is important in communication?
5) What do you think is more important in successful communication than word stress?

In addition, as the study's main focus is on the correlation between word stress and musical ability, two questions about participants' musical hearing and musical background were asked:

6) Do you have any experience in music?
7) Do you think you have a good ear for music?

3.4. Stimulus

For the purpose of the study, 20 words from Sobkowiak's (2004) list of Words Commonly Mispronounced were chosen: six 2-syllable words, six 3-syllable words, six 4-syllable words and two 5-syllable words. Selected items were then divided into two categories following Waniek-Klimczak's (2015) classification related to the source of error, namely transfer from L1 (7 words) and overgeneralization (13 words). It was expected that longer words will be most problematic for students as regards correct stress placement.

Table 1. Words categorised according to predicted sources of errors

Transfer from L1			Overgeneralization			
2 syl.	3 syl.	4 syl.	2 syl.	3 syl.	4 syl.	5 syl.
export (noun)	industry	development	palace	area	characterise	administrative
produce (noun)	cholera		Japan	determine	admirable	veterinary
event				professor	catastrophe	
success				canary	anatomy	
					economic	

3.5. Procedure

The experiment consisted of the following tasks: (a) reading a word list; (b) reading words from phonetic transcription; (c) producing "Ooo" (*ba ba*) patterns; (d) imitation.

First, the participants were recorded while reading 20 items from the prepared list, then reading them again – this time from phonetic transcription, producing word stress patterns on the basis of visual marks using the so-called *ba ba* syllables, and, finally, imitating the words after an instructor. Visual cues, that is the representation of the number of syllables and prominence (e.g., *economic* "ooOo") were used in order to check students' ability to produce prominence contrasts with non-verbal stimuli and sensitivity to the specific correlates they use when marking stressed syllables. Students were well-acquainted with this kind of

task, as it was practiced during pronunciation classes. All the assessment of correct stress placement was performed auditorily by the two authors individually and checked for differences.

3.6. Music test

As mentioned above, the students were asked about their musical experience and musical hearing in a questionnaire, but then we decided it would be necessary and more credible to design a short music test and then compare participants' answers with the results of the test. It consisted of two parts: perception and production. The tasks in the test were similar to those performed by children in Poland when taking entrance exams to primary music schools. First, the participants had to decide if the chords were major or minor (we used the notion "happy" for major, and "sad" for minor). There were eight chords altogether, played one at a time. This part of the test was presented on the piano. Then, the task was to choose the highest tone out of three played in sequence in different intervals ranging from major second to two octaves, and finally the lowest tone out of the three in similar intervals. Both tasks consisted of four groups of three sounds. After this the students were asked to repeat six sounds after the instructor. By doing this, we expected to check their ability to intonate tones correctly, that is repeat the same tones (e.g., c^1, a, or e^1). We decided not to ask the students to sing songs or repeat longer musical phrases with voice, because we both agreed that this might make them uncomfortable, especially those students who answered "no" to both questions in the questionnaire related to their musicality. Finally, we asked them to imitate four rhythmic patterns after the instructor by clapping their hands. An example rhythmic pattern used in the music test is shown below:

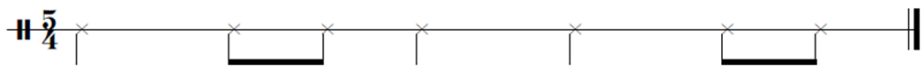

Figure 1. An example rhythmic pattern used in the music test

3.7. Results

3.7.1. Word stress questionnaire

Only one of our respondents claimed that word stress is not a difficult element of English pronunciation (Question 1), while others admitted that it is difficult, with the majority of 14 respondents choosing the answer "to some extent", and the remaining 5 stating "yes" in the questionnaire. Answers to Question 2 concerning the activities that can help in practising word stress give the priority to listening to authentic speech (radio, TV, native speakers) and the drilling of word stress patterns. Referring to a dictionary and saying words out loud were also mentioned by a few learners.

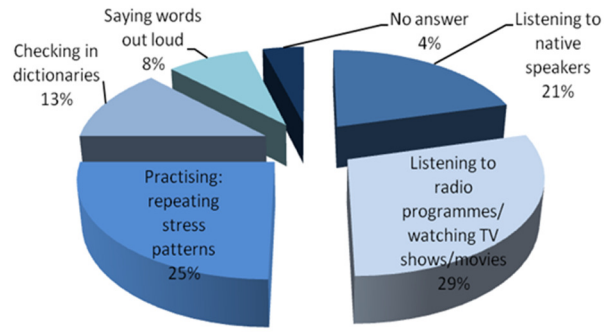

Figure 2. Q2. What do you think can help in practising word stress?

Almost half of the participants admitted that they rely on their intuition as their strategy in deciding the stress patterns of individual English words (Question 3), which could be related to 5 answers stating that they try and choose what sounds most natural. 3 of the respondents do not use any strategies, while some individuals try to use rules and dictionaries or look at the context.

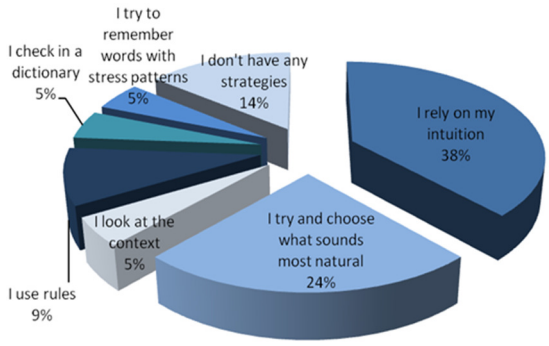

Figure 3. Q3. Do you have any strategies in deciding on the stressed syllable?

All of the participants claimed that word stress is important in communication (Question 4), but to a different degree: 13 chose the answer "yes" and 7 "to some extent". When they were asked what they think is more important in successful communication than word stress, the respondents, unexpectedly, pointed to pronunciation (33%), which means that they somehow disassociate word stress from pronunciation, a term that, according to them, covers others elements, for instance individual segments, weak forms, connected speech processes that they are acquainted with during their first year of studies. In the second place they put vocabulary (29%) and grammar (22%). There were single answers concentrating

on the prosodic aspects of speech production, namely pitch and tone, rhythm and intonation, but also fluency and speaking without fear were mentioned by some individuals.

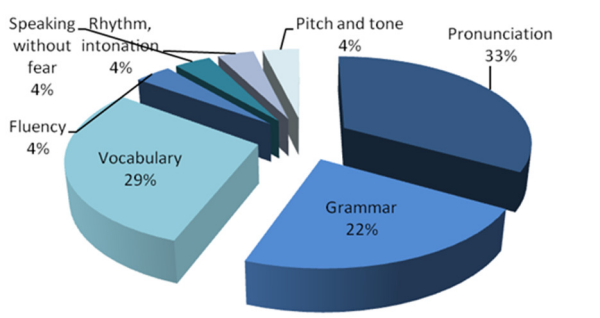

Figure 4. Q5. What do you think is more important in successful communication than word stress?

3.7.2. Word stress test

Incorrect stress placement in English by Polish learners is usually guided by two strategies. The fixed penultimate syllable stress pattern of Polish often results in shifting stress from the non-penultimate to the penultimate syllable in L2 English, which is an example of L1 transfer. Another strategy for stress placement in English is overgeneralisation of L2 rules (Waniek-Klimczak, 2015). Both of these strategies are found in the performance of our participants, with overgeneralisation being more frequent.

As expected, the most difficult words for the participants were the ones consisting of 3 syllables and more. In part 1 of the experiment, the top three are *canary*, *administrative* and *veterinary* and they were misstressed by 18 speakers out of 20. The reason for providing the incorrect stress pattern in *canary* is overgeneralisation, as the initial syllable carries prominence if it is misstressed. As for the two other words, the learners provided too many different versions of stress pattern (see Table 2) to draw definitive conclusions about the category of the error. Other commonly misstressed words are *characterise*, *admirable* and *economic*. They are all 4-syllable lexical items classified as overgeneralisations (see Table 1). Half of the informants transferred the Polish stress placement rule in *industry*, stressing the penultimate syllable. Similarly, *cholera*, *Japan*, *event* and *success* were stressed the Polish way, but by fewer speakers. Other, less frequent mispronunciations are due to overgeneralisation.

Visual cues employed in Part 2 did not seem to pose a considerable problem for the majority of participants. Only Speaker12 stands out with 12 instances of incorrect stress productions. Three other speakers failed to produce Oo patterns 5 (Sp.2 and 6) and 6 (Sp.4) times. Yet, apart from accuracy, the interesting phenomenon here is that the learners seem to represent different sensitivity to

different words stress cues; some of them tend to rely on pitch, others on length, and there are those who relate it to loudness. This variable reliance on various cues is not likely to be the effect of the instruction, as no examples of Oo productions were provided by the instructor prior to the recording session.

In part 3 the frequency of misstressed words dropped considerably, especially with respect to *canary*, *administrative*, *veterinary*, *professor*, *development* or *catastrophe* (the last being stressed correctly by all the speakers). The reversed trend, that is providing the same or higher number of mispronounced words was observed in the words *cholera*, *export*, *area*, and *produce*. The first one, despite its obvious reference to an illness, functions colloquially in Polish as a relatively frequent swear word, and that may be the reason for its lack of improvement. Although the part of speech was clearly indicated in the instructions and stress included in the IPA transcription, *export* and *produce* were not stressed correctly by some speakers, which showed their lack of knowledge about the noun - verb stress homographs. This improper stress placement unexpectedly increased between part 1 and 3: 2 speakers stressed the second syllable in *export* in part 1 and 3 did so in part 3; and 0 speakers stressed the second syllable in *produce* in part 1 and 5 did so in part 3. The word *area*, which was stressed correctly by all the participants in part 1, was wrongly "corrected" by one speaker whose proper production was immediately followed by the incorrect one.

Table 2. Number of instances of misstressed words in Part 1 (reading), Part 2 (visual cues), Part 3 (IPA transcription), Part 4 (imitation) and sources of errors. [1] - instances of 'no-stress strategy'

no.	word	reading	IPA	Ooo	imitation	source of error
1	canary	18	0	6		overgeneralisation
2	administrative	18	5	10	1 (Sp2)	12: *admi'nistrative* 4: *admini'strative* 1: *'administrative* 1: *administa'tive*
3	veterinary	18[1]	1	10		8:vete'rinary 5: ve'terinary 3: veteri'nary 2: veterinary
4	characterise	15	6	13		overgeneralisation
5	admirable	12		8		overgeneralisation
6	economic	11[1]	5	8	2 (Sp9, 17)	overgeneralisation
7	industry	10	0	6[1]		transfer
8	professor	9	1	2		overgeneralisation
9	development	8	2	1	1 (Sp1)	overgeneralisation
10	catastrophe	8	0	0		overgeneralisation
11	cholera	7	1	7		transfer
12	anatomy	6	12	2		overgeneralisation
13	determine	6	2	2		overgeneralisation
14	palace	5('palace > pa'lace)	1	4		overgeneralisation

15	export	2	1	3		overgeneralisation
16	Japan	1	2	0		transfer
17	area	0	2	1(‘are a >a’rea)		overgeneralisation
18	produce	0	0	5		overgeneralisation
19	event	0	0	0		transfer
20	success	0	1	1		transfer

Interestingly, three cases of ‘no-stress strategy’ were noticed in the speakers’ production, as none of the syllables were identified as more prominent than others in *veterinary*, *economic* and *industry* (indicated by [1] in Table 2). Part 4 turned out to be the least problematic for the learners, as only four of them did not manage to imitate the words correctly and only one word per speaker was wrongly stressed.

Generally, if they were not sure about the stress patterns of words, the learners tried to cope with the task in different ways. In a few cases, we had an impression that the speakers were aware of the proper stress patterns, but somehow could not stress the words properly and struggled between what they had already known after training and the fossilised version that they felt comfortable with, which resulted in double stressing (e.g., *de’ve’lopment*). Or, the participants “corrected” the correct version providing the incorrect stress pattern (*palace1, area3*). Speaker2 tried out different patterning of *administrative* in the three parts of the experiment, not succeeding in any of them (Part 1: *admi,nistra’tive*, Part 3: *admini’strative,* Part 4: *admi’nistrative*).

3.7.3. Music test

The music test devised for the purpose of this study showed considerable differences between the perception tasks and the production tasks (see Table 3). The speakers did not vary much in the perception task, achieving the mean score of 90.3%. None of them obtained the maximum score, although almost half of them were close to it. The task that posed the greatest problem consisted in verifying whether the chords that they heard played on the piano were major or minor. It may be the case that some participants had the tendency to associate major chords with higher pitch and minor ones with lower pitch, as one of the repeatedly misidentified major chords was played in great octave, which is low-pitched. Recognizing the highest and lowest sounds in two other perception tasks was rather easy for the respondents and the majority of them achieved 100%. These surprisingly high scores are most probably due to the relatively distant intervals between the three sounds, which made the identification of the outlier too easy.

Table 3. The results of the three components of the music test. Mean scores of 83% and above (the musical group) are marked in gray

Sp.	Perception	Production – Intonation	Production – Rhythm	Mean
1	92%	33%	50%	58%
2	88	33	100	74
3	88	100	100	96
4	88	100	100	96
5	92	83	88	88
6	88	50	50	63
7	92	0	83	58
8	88	100	100	96
9	92	33	75	67
10	96	100	100	97
11	79	33	75	62
12	96	17	100	49
13	96	83	100	93
14	92	67	100	86
15	88	0	100	63
16	81	67	100	83
17	94	100	75	90
18	88	17	75	60
19	81	83	88	84
20	88	50	100	79
Mean	90.3	55.5	88.1	77
S.D.	4.4	37.1	18	16

The production part of the experiment generated greater inter-speaker variability, especially with regard to the intonation task. Two participants did not manage to produce any of the six sounds, and five succeeded in repeating all of them. A number of speakers expressed surprise at the type of task they were asked to perform and felt uneasy or shy, yet most of them tried to do their best. Repeating rhythmic sequences appeared to be less interfering with the respondents' emotions, who, as a group, scored much better in the task generating lower variability. Interestingly, when observed on the level of individual speakers, the results of the intonation and rhythm tasks are not necessarily comparable, as there are learners who scored very low in the former and obtained a high or maximum score in the latter. This may suggest and seems to be consistent with a traditional assumption that these two are not automatically present within one's array of music capabilities and possessing a good ear does not mean that one can dance to the rhythm accurately.

In order to classify the participants as having and not having musical abilities in this experiment, we set the score of 83% of the mean of all the components of the music test as the minimum for being assigned to the group of musical learners and nine speakers fulfilled this requirement. This decision was motivated by a visible gap in the scores (between 79% and 83%).

Table 4. The mean results of the music test and the questionnaire. Inconsistencies between the music test scores and the speakers declarations are marked in gray

Sp.	Music test	Questionnaire: 'a good ear for music'	Questionnaire: experience
1	58	No	No
2	74	I suppose yes	Yes
3	96	Yes	Piano, choir
4	96	Yes	Private lessons, choir
5	88	Yes	No
6	63	No answer	Choir
7	58	No answer	No
8	96	Probably yes	No
9	67	Yes	No
10	97	Quite good	Clarinet – 12 years
11	62	Not really	No
12	49	No	No
13	93	Yes	No
14	86	I think so	No
15	63	Yes - to some extent	Shanty band
16	83	No	No
17	90	No	No
18	60	No	No
19	84	No	No
20	79	No	No

Studies exploring the effect of musical ability on L2 acquisition often rely either on the participants' declarations of musicality, reporting experience in playing musical instruments or formal music education, or verify these abilities with a test (e.g., Pastuszek-Lipińska, 2008; Zybert and Stępień, 2009; Jekiel and Malarski, 2016). Our results show that declarations and the actual tested abilities do not always go hand in hand (Table 4). In the majority of cases these declarations match the results of the test, but in five of them, they diverge from each other. Speakers 2, 9 and 15 claimed 'having a good ear for music', while they scored 74 and below. On the other hand, speakers 17 and 19 declared a lack of musical ability, but they scored 90% and 84% respectively. Two other speakers did not provide answers to this question. When it comes to music experience, five of the respondents stated they either played some musical instruments and/or belonged to a choir or band. This information, in all of the five cases, is related to positive

declarations of having 'a good ear for music'. Yet with regard to the music test, the link between experience and the obtained score is not always present; for example, Speakers 2, 6 and 15 have some music experience, declare good music hearing ("supposedly" or "to some extent"), but scored 74, 63 and 63 in the test.

Table 5 shows the results of both of the components of our experiment, with the four parts of the words stress test presented in columns 2-5. The two final columns present the mean scores of word stress test and music test for each of the speakers. The scores of 83 and above have been highlighted. It can be observed that these scores, for both tests, often match within a speaker. In other words, if a speaker scored 83 or above in one of the tests, then he or she scored similarly in the other test. That is true in eight cases.

Speaker10 is outstanding in that this participant achieved the highest scores in both tests. His weaker performance was noted in Part 1 of the word stress task, but he demonstrated a good control over his production activities when prompted with the IPA transcription and improved all of the misstressed words in Part 3. This ability may be linked directly to the experience he gained through formal music education (12 years of music school). Speaker3 and 8 obtained identical scores, not only in the means, but also in individual tasks of the tests. Interestingly, Speaker3 declared experience in music (piano lessons and choir singing), while Speaker8 stated no experience at all and was hesitant about her 'ear for music' ("probably yes"). Similarly, Speaker5 scored high, especially in word stress tasks (94%), despite the lack of experience, but declaring good music hearing. Speakers 13, 14, 16 and 17 scored relatively similarly, with Speaker13 gaining the highest score in the music test (93%) and claiming musicality. Speaker 14 wrote "I think so" and the other two were negative about their music ability. All of these four participants declared no music experience.

Table 5. The results of the four components of the word stress test and the mean results of the music test. Scores of 83% and above are marked in gray

Sp.	Part 1	Part 2	Part 3	Part 4	part 1-4 (mean)	music test
1	55	100	60	95	78	58%
2	60	75	75	95	76	74
3	55	95	95	100	86	96
4	70	70	55	100	74	96
5	75	100	100	100	94	88
6	65	75	75	100	79	63
7	55	100	65	100	80	58
8	55	95	95	100	86	96
9	60	90	75	95	80	67
10	75	100	100	100	94	97
11	45	95	80	100	80	62

12	65	40	75	100	70	49
13	75	90	85	100	88	93
14	70	95	85	100	88	86
15	65	95	70	100	83	63
16	60	90	85	100	84	83
17	45	95	70	95	76	90
18	55	100	60	100	79	60
19	70	100	75	100	86	84
20	55	95	75	100	81	79
mean	62	90	78	99	82	74
S.D.	9,2	14,7	13,0	2,1	6,2	23,0

Three speakers obtained the score of 83% or above in only one of the two tests. Speaker 4 scored very high in the music test (96%), but only 74% in the word stress test. However, if separate components of the latter test are taken into account in the analysis, it can be seen that this speaker scored the lowest of the whole group in Part 3, which is the IPA transcription. Speaker 4 is also the only one who did not manage to improve his word stress production from Part 1 with the help of transcription, but worsened it (77% in Part 1, 50% in Part 3). The only explanation for this unusual performance seems to be low IPA reading skills and perhaps excessive focus on individual sound segments, rather than stress marks. However, his score in Part 2 (70%), which is second lowest for the group, may indicate a different problem, namely some kind of inability to control stressed and unstressed items, not necessarily lexical ones, as this part of the test, rather than using real words, employed visual cues in the identification of prominent elements in a sequence. This may suggest that possessing music ability and experience does not entail the successful realisation of prominence patterning in a controlled context of read-out speech or visual stimuli.

A similar disproportion between the words stress test and music test can be observed in the scores of Speaker17. In this case, however, although the mean scores are close to the ones achieved by Speaker4, there are substantial differences between the participants in the individual parts of the two tests. Speaker17 got the lowest group score in Part 1 of word stress test, resulting from the lack of knowledge of the correct stress patterns of the listed words, but high in Part 2, and improved her production in Part 3, which shows that her control over prominence production through visual stimuli (cues and IPA transcription) is much stronger than in the case of Speaker4. Interestingly, Speaker17 belongs to the four participants who did not manage to imitate all the twenty words in Part 4, and despite the maximum score for intonation in the music test (regardless of declaring no musical abilities in the questionnaire), she had difficulties in imitating rhythmic patterns.

Although Speaker15 was not categorised as musical (score of 63%, despite claiming to have a relatively 'good ear for music' and some informal music experience), he managed to gain 83% in the word stress test. The individual components of the music test reveal an interesting phenomenon, namely that he scored 0 in the intonation task, but 100 in the rhythm and 88 in the perception tasks. This case points to the disproportion between how an individual perceives the differences in pitch and the way she or he is able to produce them and suggests that the technical ability of voice control may play a crucial role in the identification of general music aptitude.

Table 6. Ranking according to music test results

Speaker	Music test	Word stress test
10	97	94
3	96	86
8	96	86
4	96	74
13	93	88
17	90	76
5	88	94
14	86	88
19	84	86
16	83	84
20	79	81
2	74	76
9	67	80
15	63	83
6	63	79
11	62	80
18	60	79
7	58	80
1	58	78
12	49	70

Table 6 presents the ranking of speakers ordered according to their music test scores. It aims at demonstrating the relationship between high music performance and high word stress performance with a thick line after Speaker16 separating musical and non-musical learners of English. There are ten speakers that belong to the former group, which makes half of the whole sample. Only two of them have word stress scores that fall below the threshold of 83% and these are the cases described above. The performance of the remaining eight speakers may imply the existence of the relationship between their music ability and the ability to acquire English words stress with greater ease than those who were categorised as non-musical. The relationship can also be observed among these latter speakers; those with a low music score have a low word stress score. There is only one

exception, that of Speaker15, who scored 83% in the words stress test, but this is a borderline case.

4. Discussion

Despite the apparent existence of a link between musicality and word stress production that can be detected in the present pilot study, it is not a straightforward one and various factors influencing the way an individual is assigned musical talent or not should be carefully analysed.

The first consideration concerns the reliability of participants' declarations, which tend to be subjective and based on assumptions and self-reflection. The fact that two speakers in this experiment obtained identical scores in all the components of the tests (Speakers 3 and 8), but one has no music experience and the other one is relatively well-experienced and declares having 'a good ear for music', may suggest that definite conclusions should not be drawn in studies employing the music abilities variable if not supported by objective (if possible at all) music tests, not just participants' declarations. Declaring no music experience and being hesitant about music ability in general does not mean that learners have no talent for music and tests should always be carried out if any relationship between music hearing and linguistic ability is to be detected.

The second issue that needs to be taken into account in the way the music test is conducted is the implementation of perception and production tasks. As observed in the present paper, these two do not always generate comparable results. Yet, improved methodology would perhaps enable more reliable results to be obtained. It seems that the perception part of the experiment is relatively demanding and complex for the respondents, especially when it comes to the identification of highest and lowest sounds; the intervals between the sounds should be smaller and perhaps the three sounds should not be presented to participants within the range greater than the fifth. Moreover, perhaps the perception part could be complemented with some sort of self-checking computer-based task, as proposed by Jekiel and Malarski (2016). As for the production part, the intonation and rhythm tasks should be identical for each of the participants, meaning they should be asked to repeat the same sounds and rhythms, and in the same arrangement. The sound stimuli should be presented with sufficient length so that the respondents have time to tune in and find the appropriate pitch height.

The perception task here did not take into account cases in which the speakers potentially possessing musical hearing failed to imitate the sounds due to the lack of control over the voices and/or experience in singing. That is why the production task could be supplemented with a 'sing a song' task, in which participants would be asked to sing a well-known song with a simple melody and a rather narrow interval range, preferably *Sto lat* (the equivalent of *Happy birthday* in Polish). In this experiment, we purposely avoided this type of task, as we had assumed that it might make our respondents feel uneasy and some of them would even refuse

to cooperate. Yet, singing a familiar melody could be more effective than imitation of random sounds in determining musical ability. The participants would be free to choose the comfortable pitch range and tempo, and no restrictions would be put on the way the task should be completed. This would eliminate the problem of adjusting the height of pitch to the individual pitch range of each participant. Moreover, the task would allow the ability to produce appropriate intervals within the tonal system that Poles are brought up in to be verified. Still, one may hear of individuals who score high in terms of the perception of pitch differences, complex harmonic structures and rhythms, and differentiating between various music scales and intervals, but much lower on the production level. That is why it seems necessary to implement various tasks testing musical ability from different angles.

Experience in music seems to help develop voice control and awareness of pitch intervals, but, even if supported with excellent results of music tests, it does not automatically work with recreating prominence patterning with the use of visual stimuli, as we could observe in the case of Speaker 4. Despite his general good pronunciation performance, high music test score and perfect imitation ability, he was not successful in reading out words with word stress patterns indicated in the IPA transcription and in producing prominence contrasts through *ba ba* sequences. This case prompts a different line of thinking which leads to the far-fetched question of what has made other speakers successful if not music ability, which they possess perhaps by accident.

5. Conclusions

Polish learners find English words stress rather difficult, but relatively important in communication and they seem to over-generalise its rules in English or place stress randomly rather than transfer the penultimate syllable rule from Polish.

Although complex and in need of verification, there seems to be a relationship between word stress production and musical ability for the majority of the participants in this pilot study. Possessing musical abilities that were tested by means of perception and production tasks appears to predispose learners to greater ease in the acquisition of English word stress. This link should be validated in studies of greater samples and well-designed music tests.

Declarations of good music hearing and experience in playing music do not always correlate with actual, objective ability. A music test should not be oriented around perception or production only, but ought to balance the two and take into account the possibility of one prevailing over another in the analysis of a correlation with foreign language acquisition processes.

A secondary question provoked by the performance of an outlier in the study has been raised in relation to the factor/s responsible for the inability to perform prominence patterning out of visual stimuli, if they were not based on music ability.

6. Pedagogical implications

The apparent relationship between musical ability and the production of word stress that we observed in the present study may result in providing some useful pedagogical implications. First, identifying the proportion between musical and non-musical learners in a classroom may inform the teacher of what kind of activities should be used to ensure the maximum potential for success in acquiring English word stress among the learners. Musical pupils are expected to manifest greater tone-rhythm imitation skills and notice the ways in which prominence contrasts are fulfilled; hence tasks consisting in word imitations and repetitions in the context seem to be very effective in their case. Non-musical learners may gain less out of these activities if not supplemented with metalinguistic instruction and non-verbal prominence practice. Second, the production of prominence contrasts with the use of visual stimuli revealed that different learners have different sensitivity to different word stress cues; whereas for some of them pitch is the most salient feature of a prominent element, for others it is length, yet, there are those who rely on loudness in the main. This finding might point to the need to make the Polish learner aware of all the components of stressed syllables and the need to consciously practice all three. Since the learners' voice control may be limited in tasks employing the production of stressed/unstressed contrasts, perhaps implementing some activities typical of music ear-training instruction to reinforce imitation abilities and voice control would be useful.

The higher score of correctly stressed words in part 3 of the word stress test may prove the usefulness of the IPA transcription, whose implementation additionally influenced the pronunciation of individual segments in tested words, especially the reduced schwa vowel, which strengthens the contrast between stressed and unstressed syllables. Teachers should therefore be encouraged to employ the IPA transcription in their classes for practising primary and secondary word stress in addition to the focus on sound segments.

All in all, since the imitation task of the word stress test resulted in the highest accuracy, drills and repetition tasks should constitute a vital element of word stress teaching.

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