

THE ROLE OF THE MUSICAL HEARING IN THE FORMATION OF PHONETIC AND PHONOLOGICAL COMPETENCE

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ABSTRACT: The main objective of the study was to determine whether the musical hearing may be considered among factors affecting the degree of a foreign accent in a second language (L2) and how important it is mastering the perceptual and productive aspects of the suprasegmental level of foreign languages by students of linguistics specializations. The results of the study showed that subjects with developed musical hearing performed tasks on both aspects - perceptual and productive - more successfully. However, there are reasons to assume that the significance degree of the influence of a developed musical hearing on both the perceptual and productive aspects may differ depending on a range of other factors. Therefore, further research aimed at establishing the role of musical hearing in the hierarchy of the factors affecting the development of the phonetic and phonological competence is of great importance. The obtained results might contribute to finding new original forms and methods of teaching phonetics of foreign languages based on musical art, as well as to improving the efficiency of mastering the phonetic-phonological competence by students of linguistics majors, and to creating auxiliary programs aimed at the developing of musical, and, consequently, phonetic hearing.

KEYWORDS: auditory channel, musical hearing, intonation perception, intonation production, factors affecting the degree of foreign accent, phonetic and phonological competence.

1. Introduction

The communication crisis, which everybody has to deal with on account of the COVID-19 pandemic, is one of the most pressing issues of the modern world. Due to the existing danger, people are forced to work remotely. Therefore, the need for virtual communication increases. Taking into account the significant traffic load teleconferencing is more and more often conducted without visual support. Thus, the meaning of the auditory channel increases comparing to the visual channel. Sociologists emphasize that audio communication has its own characteristics: the refusal of visual aids means the absence of non-verbal communication tools (France, Anderson & Gardner, 2001). Therefore, the current environment, in which most of the business and academic communication in many countries takes place remotely, requires developing perceptual skills. It should be emphasized that this topic is of great importance especially in respect of the interlingual communication. That means that the perceptual aspect of learning a foreign language should attract particular attention. Despite the fact that a great number of studies on the subject of interaction between music and language has been carried out by scientists from different areas, especially neurologists, speech therapists, and musicologists, this problem is still not enough scrutinized in linguistics. Of great interest today is the interrelation between musical and phonetic hearing. For example, such scientists as Nazaikinskii E. V. (Nazaikinskii, 1972), Asafyev B. V. (Asafyev, 1971), Kirnarskaya D. K. (Kirnarskaya, 2004) emphasize the connection between music and speech but do not specify the degree of interaction between the two phenomena. In their article *The linguistic benefits of musical abilities* Aniruddh D. Patel and John R. Iversen point out the interrelation between musical abilities and certain phonetic and prosodic skills in language (Patel & Iversen, 2007). However, they focus on the underlying mechanisms of this interaction without taking into account its degree. Moreover, a great number of scientists do not consider musical hearing as a factor influencing the second language acquisition. For instance, Siti Khasinah lists the following factors that have a special impact on second language learning: motivation, attitude, age, intelligence, aptitude, cognitive style, and personality (Khasinah, 2014). There is also an approach that takes into account both internal factors, such as age, personality, motivation, experiences, cognition, native language and external factors, among which are curriculum, instruction, culture and status, and access to native speakers (Lightbown & Spada, 2013; Macaro, 2010). Thus, we conducted an experimental phonetic research at the Department of phonetics of the German language in 2020, to establish the degree of the influence of the developed musical hearing on the phonetic-phonological competence when learning a foreign language.

2. Materials and Methods

To test our hypotheses, we used the following methods in the practical part of the study:

1. Expert assessment of musical hearing;
2. Questionnaire method;
3. Empirical study of auditory perception;
4. Statistical treatment (the Shapiro–Wilk test, the Mann–Whitney U test).

The aim of the study was to establish the role of the developed musical hearing in the formation of phonetic-phonological competence of students of linguistics majors.

The study **objectives** were formulated as follows:

- to establish the influence of the developed musical hearing on the manifestation degree of the perceptual and the productive interference aspects among the students of linguistics specializations;
- to study out the degree of influence of the developed musical hearing on the formation of the phonetic-phonological competence of students of linguistics majors.

The object of the study was phonetic interference that occurred while studying the phonetics of the German language by students of linguistics majors.

The subject of the study was the dependence of the degree of the phonetic interference manifestation at the suprasegmental level on the degree of the musical hearing development.

The subjects in this experimental-phonetic study were 33 first-year students of the Faculty of the German Language of the Moscow State Linguistic University (23 females and 10 males) aged 17 to 20 years. The students had no theoretical knowledge on the subject «Intonation in German language» and could rely exclusively on their hearing by the time of the experiment.

The study was conducted in three stages.

The first stage was an expert assessment of the musical hearing, during which a group of 20 students with the developed musical hearing was identified by an expert. It should be taken into account that the development degree of the musical hearing was not classified. The main criterion of the audition was the exact reproduction of a certain melody. For the convenience of interpretation, we divided the subjects into two groups: Group 1 included subjects with a developed musical hearing, group 2 - without a developed musical hearing.

In **the second stage**, the subjects were asked to complete a questionnaire with the following points: name and surname, age, sex, music education, and German knowledge.

During **the third stage** the subjects had to perform three tasks aimed at developing the skill to intone affirmative and interrogative sentences according to the German pronunciation standard. The tasks were formulated in the following way:

- 1) Listen to the following sentences and mark graphically the word, which the sentence stress falls on. Repeat everything you have heard in accordance with your notes.
- 2) Listen to the following sentences, and then show graphically how the melody develops (falls/goes up/remains unchanged).
- 3) Listen to the dialogue. Show graphically the melody development. Read the dialogue according to your notes.

4) The tasks were arranged on the principle “from easy to difficult”: in the first task there were simple sentences that consisted of no more than four short words; in the second task the subjects had to work with both simple and complex sentences; the third task contained a dialogue. The control of the tasks performing was carried out individually. All recordings were played twice with an interval of 10 seconds, which was enough for the tasks to be completed. All oral responses of the subjects were recorded. For a more detailed description of the results, a point system was introduced: one point was assigned to each correctly given answer. In the first task, the maximum total score to be achieved was 28 points (the students were able to get a maximum of 14 points for both perceptive and productive aspects). In the second task, the maximum score was 8 points; during the completion of the third task, the subjects could score a maximum of 12 Points, of which 6 points were given for the productive aspect, and 6 points - for the perceptive aspect. Thus, the maximum total score was 48 points.

3. Results

Our results show that the subjects with a developed musical hearing demonstrate significantly higher scores on both perceptual and productive aspects than subjects without a developed musical hearing (Table 1).

Table 1. General evaluations of the subjects in relation to the productive and perceptual aspects

D	ex	Developed musical hearing (by groups)	Perceptual aspect (points)	Productive aspect (points)	Total score (points)
		2	19	19	38
		2	20	15	35
		2	22	12	33
		2	20	16	36
		2	19	18	37
		2	18	16	34
		2	20	18	38
		2	21	15	36
		2	18	16	34
0		2	21	19	40
1		2	18	17	35
2		2	21	18	39
3		2	19	11	30
4		1	26	19	45
5		1	22	16	38
6		1	26	17	43
7		1	25	18	43
8		1	23	19	42
9		1	26	20	46
0		1	20	18	38
1		1	21	19	40
2		1	22	20	42
3		1	24	20	44
4		1	21	19	40
5		1	24	18	42
6		1	22	18	40
7		1	20	17	37
8		1	26	20	46
9		1	26	20	46

0		1	27	18	45
1		1	28	19	47
2		1	22	18	40
3		1	23	17	40

(Source: drawn up by the authors)

Before the statistical criterion was applied we carried out the Shapiro-Wilk test to check that the underlying data were normally distributed. According to the test results, the p-value exceeds 0.05, therefore it is assumed that there is abnormal distribution (Table 2).

Table 2. The Shapiro-Wilk test results

	Developed musical hearing (by groups)	Perceptual aspect (points)	Productive aspect (points)	Total score (points)
Mean	1	23.7	18.5	42.2
	2	19.7	16.2	35.8
Median	1	23.5	18.5	42.0
	2	20	16	36
Minimum	1	20	16	37
	2	18	11	30
Maximum	1	28	20	47
	2	22	19	40
Shapiro-Wilk p-value	1	0.195	0.058	0.266
	2	0.246	0.117	0.939

(Source: drawn up by the authors)

Based on the results, a further analysis of the data was performed using the Mann-Whitney U test (Table 3).

Table 3. The Mann-Whitney U test results (95% Confidence Interval)

		statistic	p-value	Mean difference	Lower	Upper
Perceptual aspect	Mann-Whitney U	18.0	< .001	4.00	2.000	6.00
Productive aspect	Mann-Whitney U	50.0	0.003	2.00	1.000	3.00
Total score	Mann-Whitney U	13.0	< .001	6.00	4.000	9.00

(Source: drawn up by the authors)

According to Table 3 the subjects with the developed musical hearing show statistically more significant results in both perceptual (with p significance level < .001) and productive (with p significance level = 0.003) aspects. Below there are graphs with pairwise differences of both groups for

each of the aspects according to the Mann-Whitney U test (Fig. 1). Fig. 1 (left panel) depicts the mean and median values of both subjects groups regarding the assessment of the productive aspect with the confidence interval of 95%. The mean difference between the two groups equals 2 points. The average total score of Group 1 is 18.5 points whereas the average total score of Group 2 is 16.2 points. Fig. 1 (right panel) demonstrates the mean and median values of both subjects groups regarding the assessment of the perceptual aspect with the confidence interval of 95%. In contrast to the productive aspect assessment the mean difference between the two groups regarding the perceptual aspect is even higher making 4 points. As the graph shows, the mean in Group 1 is 23.7 points whereas the mean in Group 2 equals 19.7 points. It is noteworthy that the data dispersion in the perceptive aspect is significantly less than in the productive aspect. The statistical significance is, therefore, increasing.

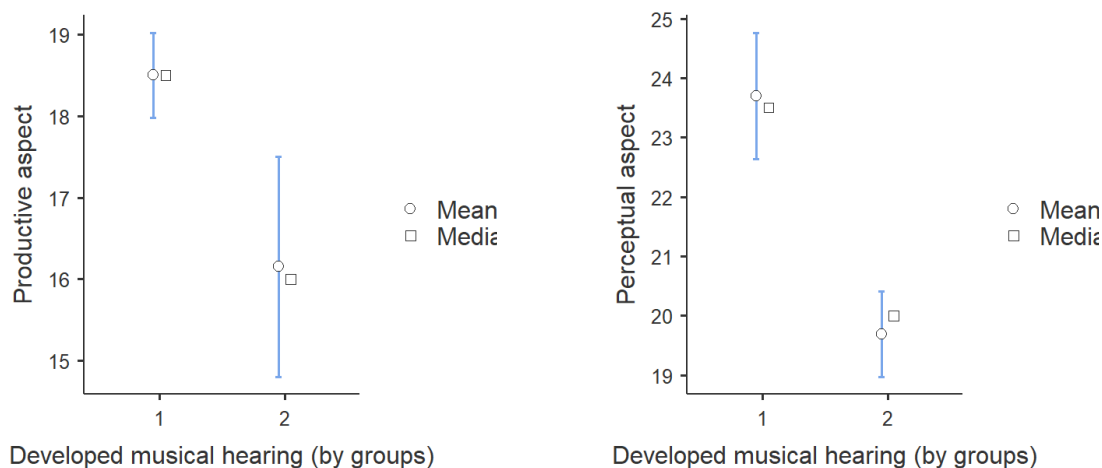


Fig. 1. The mean and median of Group 1 and Group 2 for the productive (left panel) and the perceptual (right panel) aspects (95% Confidence Interval). (Source: drawn up by the authors).

Fig. 2 compares the total scores of both subjects groups for both aspects. From Fig. 2 it is clear that the total score in Group 1 is significantly higher than in Group 2. While the average total scores of the subjects group without a developed musical hearing (Group 2) is 35.8 points, the average total score of the group with the developed musical hearing (Group 1) reaches 42.2 points. The mean difference equals 6 points.

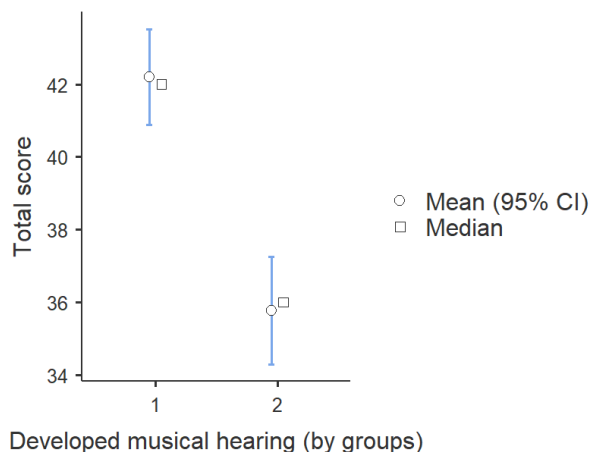


Fig. 2. The mean and median of Group 1 and Group 2 for perceptual and productive aspects (95% Confidence Interval). (Source: drawn up by the authors).

4. Discussion

According to our results, a developed musical hearing has a statistically significant effect on both the productive and perceptual aspects of phonetic and phonological competence. A more obvious

degree of influence can be traced within the framework of the perceptual aspect, which can be explained by the fact that speech production is also influenced by a set of other factors, such as voice control, the structure of the articulatory apparatus, and others. Thus, a developed ear for music influences the formation of phonetic and phonological acquisition, which is consistent with some of the results of already conducted studies in this area. In particular, A. O. Ilnér emphasizes in his article “The link between musical and phonetic abilities in teaching foreign languages” that components of speech and musical hearing, which are responsible for intonation and accent-rhythmic organization, are related to each other. The author also notes that a developed musical hearing and a sense of rhythm allow students to capture phonemic features (such as vowel length and brevity) more clearly (Ilnér, 2015). However further analysis of other materials on the research topic showed that musical ability has as yet not been found to significantly affect degree of L2 foreign accent (Flege, 1995; Tahta, Wood, & Loewenthal, 1981; Thompson, 1991). It should be mentioned though that all studies except for one (Flege, 1995) have identified mimicry ability as a significant variable affecting the degree of L2 foreign accent (Piske, MacKay & Flege, 2001). Thus we believe that musical hearing as the key component of musical ability should be studied among factors influencing phonetic and phonological acquisition as it serves as a basis to mimicry ability. Despite the fact that the factors affecting degree of foreign accent by the second language acquisition are currently being actively studied, most of them are aimed at researching a limited number of variables such as age of L2 learning, length of residence in an L2-speaking country, gender, formal instruction, motivation, language learning aptitude, amount of native language (L1) use and presence or absence of pronunciation training (Combei & Marotta, 2019; Piske, MacKay & Flege, 2001). The age of L2 learning appears to be the most significant predictor of degree of foreign accent. However, the relative importance of other variables is uncertain. Some of the variables relating to subject characteristics tend to be overlooked due to the complexity of the analysis and lack of adequate experimental control in some studies. In addition, the phonetic aspect often fades into the background by second language acquisition, since vocabulary and grammar come to the fore even when studying in specialized linguistic specialties. Taking into account the growing importance of the auditory channel in communication and the social significance of a strong foreign accent as a result of absence of phonetic and phonological competence, we consider it necessary to study musical hearing among other factors affecting degree of foreign accent.

5. Conclusion

On the basis of the analysis outcomes it can be inferred that the results of the subjects with a developed musical hearing are significantly higher than the results of the subjects with the absence of the developed musical hearing in all aspects with the confidence level of 95%. Moreover, it should be pointed out that the difference between the results is much more noticeable in respect of the perceptual aspect. Such a result is of particular importance for the study, as the successful performing of the tasks aimed at the perception is directly dependent on hearing skills. As for the tasks aimed at the productive aspect, different factors can influence their successful completion: on the one hand, individual factors such as, for instance, peculiarities of the structure of the speech apparatus; on the other hand, some L1 articulation features may cause transfer. In other words, when studying the interrelation between musical hearing and the productive aspect, a greater number of factors should be taken into account.

It should be also mentioned that although it has been established that the achievements of the two subjects groups differ from each other significantly, the evaluation criteria for students should be considered when applying the obtained data in the pedagogical practice. Nevertheless, there are many reasons to assume that a larger sample size will produce more accurate study results. It can also be shown in a larger study that the significance degree of the influence of the developed musical hearing on the perception as well as on the production can be different. Therefore, further research in this area is required to identify all factors which influence the formation of the phonetic and phonological competence, and to determine the role of the musical hearing in this hierarchy. We also believe that a study with a longitudinal design should be carried out in order to trace the dynamics of the formation of phonetic and phonological competence throughout a training course. We believe that our research results can contribute to the search for new original forms and methods of teaching phonetics on the basis of musical art, to the creation of auxiliary materials aimed at the development of musical, and, consequently, phonetic hearing. To sum up, taking into account students' musical abilities can help increase the effectiveness of improving phonetic and phonological competence.

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