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**ABSTRACT**

of the dissertation for the degree of Doctor of Philosophy

**THREE-FOUR MEMBER PHONEME COMBINATIONS  
IN MODERN GERMAN  
(experimental-phonetic research)**

Speciality: 5708.01 – Germanic languages

Field of science: Philology

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The work was performed at the Department of Indo-European languages of the Institute of Linguistics named after Nasimi of Azerbaijan National Academy of Sciences and at the Laboratory of Experimental Phonetics and Applied Linguistics of Azerbaijan University of Languages.

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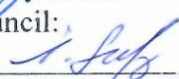
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## GENERAL CHARACTERISTICS OF THE WORK

**The actuality and the usage degree of the research work.** The study of the features of the realization of the phoneme inventory of the language in the act of speech is one of the important issues of syntagmatic phonology, because the investigation of paradigmatic relations alone is not enough in the interpretation of the phonological system. F.Y.Veysalli notes: *“In paradigmatics, when the confrontation of units is on the same differential features, the interaction in syntagmatics is opposition. It expands its range in terms of variability, and in addition to differential features, it also includes integral features”*<sup>1</sup>.

When defining phoneme combinations in syntagmatics, it is necessary to take into account the universal and special, i.e. the specific peculiarities of a particular language system. According to N.S.Trubeskoy, *“phoneme combinations in each language are only special, they are subjected to the rules and laws applicable to that language, and they must be examined separately for each language”*<sup>2</sup>. Y.S. Maslov pointed out that *“each language has a wide set of repetitive elements and a system of flexible rules by which these elements are combined in meaningful sentences”*<sup>3</sup>.

The combinatorics of phonemes is an important feature of language units due to their fundamental system-wide features, such as discreteness and diversity. In syntagmatics, the rules of combining phonemes in the description of system and structural features of a language are no less important than its phonemic structure. According to A.A.Akhundov, *“without statistical analysis of the*

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<sup>1</sup> Вейсалов, (Вейсялли) Ф.Я. Вариативность гласных фонем современного немецкого языка (экспериментальные данные и теоретические проблемы) / F.Y.Veysalli. Seçilmiş əsərləri, – Bakı: Mütərcim, – II c. – 2014. – s. 223.

<sup>2</sup> Trubeskoy, N.S. Fonologiyanın əsasları. / Almandadan tərcüməsi, “Son söz” və “Qeydlər” prof. F.Veysəllinindir. – Bakı: 2-ci nəşri, – 2012. – s. 310.

<sup>3</sup> Маслов, Ю.С. Введение в языкознание. – Москва: Высшая школа, – 1974. – с. 4.

*phonemes of a language, the analysis of its phoneme structure, the system of phonemes can not be considered complete”<sup>4</sup>.*

*According to F.Y. Veysalli, “... the combination is subjected to certain regularities inherent in each language ... the phoneme inventory of the language also contributes to the successful study of the combinatorics of phonemes. ... If the inventory of phonemes is small, for example, in languages without diphthongs and affricates, then the rules of phoneme combinations in that language will be much larger. ... if the phoneme inventory is large, then there should be fewer phoneme combinations. ... there is an inverse relationship between the number of phonemes in a language and their combinatorial rules”<sup>5</sup>.*

Comparison of the phoneme system and phonotactical features helps to identify similarities and differences in languages, the key to mastering the phonological system of the second language. It helps to identify receptive difficulties, because phonemes and phoneme combinations which are not typical for the mother tongue in the studied language create certain difficulties. In the absence of three- and four-member consonant combinations in the syllable and morpheme in the Azerbaijani language, such combinations are common in the German. For example, Azerbaijanians have difficulties in pronunciation of the consonant combinations in German, for example: /mst/, /rtsf/, /nʃtr/, /Rntr/, /ntʃl/, /Rnʃt/, /rth/, /nstr/, /kbr/, /nʃv/, /Rnst/, /pstl/, /Rpst/, /Rkfr/, /nkʃl/, /Rpst/, /lpst/, /mtsm/, /nst/, /pskr/, /nstl/, /rstl/, /ŋst/, /pstr/, /ntr/, /ntsh/, /çsl/, /mpn/, /stk/, /nsf/, /npl/, /str/, /nst/, /nsk/, /ktr/, /mpk/.

The study of phonemic combinations in syntagmatics allows to determine the regularities that constitute the essence of the phonological system, which, in turn, is especially relevant for typological research. An accurate description of the problem provides a basis for the identification of similarities and differences

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<sup>4</sup> Axundov, A.A. Azərbaycan dilinin fonemlər sistemi. – Bakı: Maarif, – 1973. – s. 203.

<sup>5</sup> Вейсало́в, (Вейсъялли) Ф.Я. Вариативность гласных фонем современного немецкого языка (экспериментальные данные и теоретические проблемы) / F.Y.Veysalli. Seçilmiş əsərləri, – Bakı: Mütərcim, – II c. – 2014. – s.312.

between the phonotactic models of languages, the frequency of usage of phonemes in syntagmatics. All this can be evaluated as the relevance of the research.

This topic had been investigated in researches of N.S.Trubeskoy, H.Glison, J.Greenberg, A.Demirchizade, A.A.Akhundov, Y.S.Maslov, L.R. Zinder, L.V.Bondarko, F.Y.Veysalli, L.A.Verbitskaya, R.K.Potapova and others. However, a study of the linguistic literature on the subject reveals that the problem has not been adequately studied in terms of experimental-phonetic analysis.

**The object and the subject of the research.** The object of research is to determine the phonetic structure of German words in the light of three-four member phoneme combinations. The object of this dissertation is to study the regularities of the structure of phonemes of words in the German language. Combinatorial analysis shows that not all consonants are connected to each other in the same way.

The subject of the research is to generalize and classify the features of usage of consonant combinations in the word structure on the basis of German language material.

**Aims and objectives of the research work.** The main purpose of the research is to study the characteristics of three- and four-member consonant combinations in the syntagmatic structure of the German language and to determine their main phonotactic syllable models. In order to perceive the mechanism of formation of three- and four member consonant combinations more completely and diversified and to analyze them we, in some cases involve in research two-member consonant combinations, too. For this purpose, the following tasks were performed in the research:

- to analyze the scientific and theoretical literature on the subject;
- to select language material for experimental-phonetic analysis in accordance with the purpose of the research;
- to group the consonant combinations used in German in the beginning of the word (anlaut), in the middle of the word (inlaut) and at the end of the word (auslaut);

- to determine the variability of consonant combinations in German;
- to reveal the combinatorial regularities of consonants in spontaneous speech and to summarize the acoustic indicators of experiments;
- to carry out a qualitative analysis of syllables on the basis of known syllable models in German and to determine the characteristics of syllables according to two parameters open /closed, covered/ uncovered on the basis of language material;
- to determine the longitude of words and to define the regularities of syllable composition in their structure;
- to give an experimental-phonetic interpretation of the differences and similarities in the phonotactics of consonant combinations in German.

**The research methods.** Comparative, mathematical and statistical calculation, oscillographic analysis methods were used in the research. “150 monosyllabic, disyllabic and polysyllabic words from Dude's *Das deutsche Wörterbuch*” (1962) were selected as research material in German.

**The main provisions for defense:**

1. The discovery of phonotactic models in syntagm should be based on the results of the analysis of specific language material.
2. In order to identify phonotactic models on the syntagmatic axis, it is necessary to study the possible phoneme combinations in the structure of the word at the beginning, middle, end (anlaut, inlaut, auslaut).
3. Syntagmatic analysis of phoneme realization in a specific language serves to determine the characteristics of usage combinatorial features.
4. The study of peculiarities of usage of phonemes in paradigmatics and syntagmatics allows to identify the characteristics of general combinatorial models for a number languages.
5. In the flow of speech the activity of syllable components gives the possibility of differentiation of discrete components of information and also it realize their integration into a whole informative structure. Taking into consideration characteristics of

segmental and suprasegmental rules gives the base to the proper or correct realized syllable consequence, to adequate transmission of information in the process of communication.

6. It is possible to master the norms of pronunciation of German languages (German – S.J.) on the basis of their dynamic and typical syllable models used for a construction of a statement.

7. At the modern stage of phonological researches it is impossible to study oral speech without reference to segmentation because the phonetic articulation of speech gives an impetus to solve a number of problems – the perception of speech, automatic recognition etc.

**The scientific novelty of the research.** The scientific novelty of the work is that in scientific-theoretical literature the German language is studied not only on the basis of monosyllabic words, but also in polysyllable words. In addition, the statistical study of the frequency of usage of phoneme combinations and the experimental-phonetic study of the phonetic changes in which the consonants are exposed in these combinations can be considered as a scientific novelty of the work.

**Theoretical and practical significance of the research.** Theoretical significance can be deduced from the fact that the results of the research can be applied to future research in the field of phonotactics. The results can also be used as a platform for learning phonemic combinations of other languages.

The results of the research can find their practical application in the teaching of the course of practical phonetics of the German language. Also, the experimental-phonetic results of the research may be used in lectures on theoretical courses of German phonetics, in compilation of textbooks etc.

**Approbation and application.** The main items of the research work are reflected in the published articles of the author, as well as discussed at the scientific seminar of the Department of Indo-European Languages.

**The name of the organization where the dissertation is performed.** The dissertation work was performed in the department of Indo-European languages of the Institute of Linguistics named

after Nasimi of ANAS and in the Laboratory of Experimental Phonetics and Applied Linguistics of Azerbaijan University of Languages.

**The total volume of the dissertation with a sign including a separate volume of the structural units of the dissertation.** The research work consists of an introduction, three chapters, a conclusion, a list of references and appendices. The "Introduction" part of the dissertation 7 pages (13643 characters), the first chapter 45 pages (84413 characters), the second chapter 43 pages (69987 characters), the third chapter 39 pages (49981 characters), the results of the research part is 4 pages (7191 characters). The total volume of the dissertation is 225215 characters, excluding the list of used literature.

## THE MAIN CONTENT OF THE WORK

The introductory part of the dissertation describes the actuality, defines the object and the subject of research, the goals and objectives, research methods, the main provisions, scientific novelty, theoretical and practical significance of the topic, approbation and application, structure of scientific research.

The phonetic structure of the word *“On the phoneme system of language”* is analyzed in the first subchapter of the first chapter of the research entitled **“Phonemic structure of the word in German and consonant combinations in the phonotactic structure of language”**. Although the phonemic structure of the word in German has been studied to some extent, its phonotactic structure, the co-articulation of sounds in consonant combinations, and the related syllable and accent-rhythmic structure of the word have not been sufficiently studied. This shortcoming manifests itself mainly in the study of the pronunciation mechanism of phoneme combinations.

When talking about the phonetic structure of a word, the distributive features of phonemes and phoneme combinations in words are usually considered. In syntagmatics, the distribution of phonemes is associated with the beginning, middle, and end of a word structure.



The description of the phonetic structure of the word should be analyzed according to four components: 1) the phonetic structure of the word; 2) the phonotactic structure of the word; 3) the syllable structure of the word; 4) the accent-rhythmic structure of the word.

In German, which is characterized by specific consonant combinations, consonants form clusters, mainly at the beginning and end of the word. It is very difficult to determine the interphonemic connections in consonant combinations from the articulatory-acoustic point of view. Analysis of articulatory-acoustic and auditory-perceptual aspects of phoneme combinations and phonemic study of these aspects are of special importance for linguistics.

Subchapter II of the study, entitled *“From the history of the study of the phoneme system in German”* states that the phonological system of language should include two important issues, such as the composition of phonemes and the description of phonotactic models arising from their combination in syntagmatics.

According to L.R. Zinder, the determination of the phoneme structure of a language depends on several factors: *“the theoretical basics, the volume of language material involved in the study, the method of research”*<sup>6</sup>.

In phonology, various methods are used to determine the status of phonemes. The most common method is the method of working with quasi-names, which is also used by I.A. Baudouin de Courtenay<sup>7</sup>. This method is widespread in world linguistics thanks to N.S. Trubeskoj<sup>8</sup>. The essence of this method is that paronyms (quasi-names) are mechanically compared, and if such an encounter is

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<sup>6</sup> Зиндер, Л.Р. К вопросу о составе фонем в современном немецком языке // – Ленинград: Наука. Ленингр. отд-ние, Исследования по языку и литературе: Philologica. – 1973. – с. 163-168.

<sup>7</sup> Бодуэн де Куртенэ, И.А. Избранные труды по общему языкознанию / И.А. Бодуэн де Куртенэ. – Москва: Изд-во АН СССР, – т. I. – 1963. – 383 с.; т. II. – 389 с.

<sup>8</sup> Trubeskoj, N.S. Fonologiyanın əsasları. Almandan tərcüməsi, “Son söz” və “Qeydlər” prof. F. Veysəllinindir. – Bakı: 2-ci nəşri, – 2012. – 385 s.; Trubetzkoj, N.S. Gründzüge der Phonologie. – Prague. – 1939. – 271 s.

associated with meaning, the sound element that distinguishes them is called a phoneme<sup>9</sup>.

Criticizing N.S.Trubekoy's rules on phoneme and variant relations, F.Y.Veysalli writes: *"Like American structuralists, N.S. Trubekoy's concept of segmentation and identification is based on a binary opposition and focuses on differentiation based on associative perception. ... In distinguishing and recognizing a word, we must take into account, in addition to the relevant features, the irrelevant features"*<sup>10</sup>.

N.S.Trubekoy cannot solve the problem of variant and phoneme unless he distinguishes important issues such as norm, system and act of speech. Based on the three-pronged approach proposed by F.Y. Veysalli, we consider it right to differentiate a third level - the norm, by attributing the system as emic, and speech as ethic level<sup>11</sup>.

Another common method is the strong and weak position theory of the Moscow School of Phonology. After defining the status of a phoneme with quasi-names, AA Reformatzky determines its functionality in language by its usage in a strong and weak position<sup>12</sup>. According to F. Veysalli, *"... a phoneme is meaningless because it is a unit of the plan of expression. So, not only is it impossible to talk about the homonymy of the phoneme, but also different phonological interpretations of the same unit of expression are impossible"*<sup>13</sup>.

The third most common method in phonology is the elimination method. A comparison of the following words clearly

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<sup>9</sup>Veysalli, F.Y. Azərbaycan dilinin funksional qrammatikası: fonemika/ morfemika / F.Y.Veysalli. – Bakı, – 2014. – 530 s.

<sup>10</sup>Veysalli, F. Dilçiliyə giriş / F.Y.Veysalli. – Bakı: Mütərcim, – 2017. – s. 83.

<sup>11</sup> Вейсалов, (Вейсялли) Ф.Я. Вариативность гласных фонем современного немецкого языка (экспериментальные данные и теоретические проблемы) / F.Y.Veysalli. Seçilmiş əsərləri, – II c. – Bakı: Mütərcim, – 2014. – s. 237

<sup>12</sup> Реформатский, А.А. Введение в языковедение / А.А.Реформатский – Москва: Аспект Пресс, – 2005. – с. 215.

<sup>13</sup> Yadigar (Veysalli), F. German dilçiliyinə giriş. / F.Y.Veysalli. – Bakı: Mütərcim, – 2011. – s. 201.

shows the importance of each phoneme for the phonetic structure of the word:

*/de.R/ - /<sup>^</sup>e.R/; /vi.R / - /<sup>^</sup>i.R/; /zɛ.R/ - /<sup>^</sup>e.R/ and so on.*

Elimination can be used to determine the meaning of words when the phoneme components are known, whereas the main task is to determine the phoneme structure. Therefore, the method of elimination and working with minimal pairs cannot be considered successful.

One of the methods used to prove the phonemicity of language sounds is the morphological principle proposed by L.V.Sherba. For example, we can easily separate “t” consonant in the words /təʊ/, /<sup>^</sup>ast/ and /nɛt/, although /st/ and /t/ have no meaning in these words. We do this on the basis of the potential connection of these consonants with the grammatical meaning. We can perform the same operation on the words /<sup>^</sup>ta:fəl+n/ and /ge:p+t/, because in the first word the morphological boundary precedes /n/, and in the second word /t/ passes before/. /n/ indicates the total, and /t/ means personal and quantitative. The connection with meaning shows the inner strength of language. So, the phonemes that act as morphemes in the language are: /t/, /s/, /p/. The essence of L.L.Bulani's principle of the residual part is that if one of the consonants in the sound shell of a word can be separated by a morphological boundary, the other sound is separated by a residual part and can be taken away from the act of conversation.

For example, in the word /nɛt/ /t/ can already be separated due to morphological connection, as in /ge:t/ and in /n/ due to morpheme connection (/<sup>^</sup>ta:fəl+n/ can be separated according to the principle of residual section in / ε /<sup>14</sup>.

According to the principles of morphological and residual division, 23 consonant phonemes are defined in German. These are: /b/, /p/, /v/, /f/, /pf/, /m/, /d/, /t/, /z/, /s/, /n/, /l/, /ʃ/, /z/, /ts/, /tʃ/, /l/, /j/, /ç/, /g/, /k/, /ng/, /h/.

Subchapter III of Chapter I, entitled **“Distribution of consonants in German”**, examines the syntagmatic relations

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<sup>14</sup>Буланин, Л.Л. Фонетика современного русского языка /Л.Л.Буланин. – Москва: Высшаяшкола, – 1970. – 206 с.

between language units. N.S.Trubeskoy emphasized that “... in the study of the phonetic structure of language is necessary to determine the regularity of the combination of phonological units”<sup>15</sup>. N.S.Trubeskoy wrote that “in syntagmatics, the rules of combining phonemes are individual in each language, and in the choice of language it is no less important than the structure of the phoneme”<sup>16</sup>.

Referring to the paradigmatic and syntagmatic relations between language units, J.Greenberg wrote that “paradigmatic and syntagmatic relations between language units at the system and speech levels are mutually conditioned and complementary”<sup>17</sup>.

In syntagmatics, the study of regularities between phoneme combinations is the only way to interpret the genetic relationships between languages and the systemic relationships of language. According to F.Veysalli, “not only systemic and structural differences between the mother tongue and the learned language, but also the mother tongue with the language encountered at the same time are the obstacles to learning a non-native language. are the differences between the ability of each unit to enter into a relationship”<sup>18</sup>.

In order to determine the combinatorial relations between phonemes in the system, it is necessary to study the relationship of the phoneme with other phonemes, the sequence of realization of phonemes in combinations and the composition of phonemes within a syllable.

S.Maslov wrote about the importance of studying the distribution of phonemes: “The distribution of any element (phoneme, morpheme, phoneme variant, etc.) in relation to other elements in the text or in the higher levels of language, i.e an element is a set of positions and environments in which it is found, as

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<sup>15</sup> Trubeskoy, N.S. Fonologiyanın əsasları. / N.S.Trubeskoy. Almancadan tərcüməsi, “Son söz” və “Qeydlər” prof. F.Veysəllinindir. – Bakı: 2-ci nəşri, – 2012. – s. 311.

<sup>16</sup> Ibid, p. 311.

<sup>17</sup> Гринберг, Дж. Некоторые обобщения, касающиеся возможных начальных и конечных последовательностей согласных // Вопросы языкознания, – 1964. № 4, – с. 56.

<sup>18</sup> Yadiqar (Veysəlli), F. Fonetika və fonologiya məsələləri / F.Yadiqar. – Bakı: Maarif, – 1993. – s. 57.

*opposed to positions and environments in which it cannot be found”<sup>19</sup>.*

Not only phonemes but also phoneme combinations serve to differentiate the sound shell of words and word forms. Phoneme combinations in any language are regulated not only by common features for all languages, but also by internal laws that are important for a particular language. V.B.Kasevich differs in the interpretation of phoneme distribution. He examines the co-articulation in phoneme combinations, stating that “*co-articulation has a reciprocal effect on the spoken chain of phonemes. The concept of co-regulation requires the phonetic interaction of phonemes ... because the effect of co-articulation cannot cover indefinite phoneme sequences*”<sup>20</sup>.

J.M.Babayev writes that the problem of phonemic combinations occupies a central place in modern phonological researches: “*The vocals in language paradigmatics may not be proportional to the vocals in syntagmatics. The ratio of vowel and consonant phonemes in language and speech may differ, so to accurately study the vocality of a language, it is necessary to consider the ratio of vowels and consonants not only in the system, but also in different texts (specific realities)*”<sup>21</sup>.

It is theoretically inadmissible to interpret the distribution of phonemes on a syntactic axis in a particular language with the facts of another language, in other words, each language must be interpreted with its own combinatorial features.

Subchapter IV of Chapter I, “***Consonants with Limited and Unlimited Distribution***”, states that while some phonemes are used in different combinations and positions, there are limitations in the realization of some phonemes. For example, in German, the /t/ phoneme is used at the beginning of a word, before or after a vowel

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<sup>19</sup>Veysəlli, F.Y. Azərbaycan dilinin funksional qrammatikası: fonemika/morfemika / F.Y.Veysəlli. – Bakı: Prestij çap evi, – 2014. – s. 59.

<sup>20</sup>Касевич, В.Б. Фонологические проблемы общего и восточного языкознания. В.Б. Касевич. – Москва: Наука, – 1983. – с. 102.

<sup>21</sup> Бабаев, Дж.М. О соотношении вокализма и консонантизма (на материале азербайджанского и русского языков) // – Баку: ВСУ, Русский язык и литература в Азербайджане. – 2011. №4, – с. 4.

in the middle. For example: /ʃte:ən/ “stehen” (to stand), /ˈtra:gən/ “tragen” (to carry), /ˈny:tsliç/ “nützlich” (useful), /ʃtra:sə/ “Straße” (street) /t/ consonant is present in three, four and more phoneme combinations at the beginning, middle and absolute end.

In the word /ˈhɛrpst,blu:mə/ we see that the consonant b comes one after the other. Therefore, the distribution of this consonant is unlimited. However, the distribution of the /ŋ/ and /h/ consonant is limited. The first comes in the middle and at the end of the word, but it is never used at the beginning, and the second never comes at the end of the word. Therefore, they are called phonemes with limited distribution<sup>22</sup>.

Chapter II of the research, entitled “**Combinatorics of consonant combinations in German**”, analyzes two-, three- and four-member consonant combinations in subchapter I “*On consonant combinations in the phonetic structure of words in German*”. Phoneme combinations in the speech chain are connected the different positions of the word structure with the beginning, middle and end. In syntagmatics, the models and laws of phoneme combinations are stable. Here, in the study of phoneme combinations, it is important to identify distribution features.

The subchapter II of the chapter II entitled “*Boundary problem of consonant phonemes in consonant combinations*” states that the distinction of phonemes in certain phoneme combinations or in the flow of speech is based on certain constitutional articulatory-auditory features. From a functional point of view, the main phase of the occlusive-plosive consonant is the phase of maintaining the compression, the boundary of which is formed and heard due to the phoneme. Is determined by the exact moment of onset of compaction<sup>23</sup>. In some cases, the reduction of the soft palate, vocal cords, as well as other speech organs in the oral cavity, which is

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<sup>22</sup>Маслов, Ю.С. Введение в языкознание / Ю.С.Маслов. – Москва: Высшая школа, – 1979. – с. 54.

<sup>23</sup>Вейсалов, Ф.Е. Варьирование фонем и проблема обучения правильному произношению // Тез.докл. VIII Респ.конф. «Актуальные проблемы преподавания иностранных языков», посвящ. 60-летию Великой Октябрьской социалистической революции. – Алма-Ата, – 1977. – с. 53.

characteristic of a given phoneme in the position of the lips in non-lip consonants, over time does not fall on top. Therefore, in such cases, the condition of the soft palate, vocal cords, and lips makes it impossible to determine the boundary between the first phase of the phoneme and the first phase of the subsequent phoneme. When one of the myths has a nasal condyle, the return of the vocal cords to the previous position at the junction of the vowel with the deaf vowel and the vowel with the vowel, as well as the reduction of the lips. When *s* is replaced by a non-lip phoneme, it creates an additional border. The boundary between phonemes is defined in the oral cavity at the junction of two phonemes formed by the same member of speech, in the explosive consonant sounds, the mouthpiece. One of these phonemes can be distinguished from the other only by the activity of the soft palate in the combination of the explosive consonant with the nasal consonant. If phonemes are formed by different parts of speech, the movement of the lips and tongue, as well as the soft palate, the presence of one of these sounds before the other, and the kip It is stored or reduced simultaneously in the phoneme that comes after the stage of formation. The transition from one phoneme to another occurs through a member of the speech, as well as a change in the place of formation of the obstacle, the type of phoneme, the definition of the boundary. Certain articulatory-auditory difference in phases, the change of this or that phoneme in different phoneme combinations, the modification of that phoneme ensures its functional integrity.

The combinatorial analysis of consonant phonemes in German is carried out in the third subchapter of the second chapter of the research entitled *“Consonant combinations in German”*. It also states that *“it is expedient to consider combinatorial analysis after determining the phonemicity of separate phonemes in the language”*<sup>24</sup>. In German, we can define the following variants of consonants:

- 1) consonants at the beginning of the word;
- 2) consonants in the middle of the word;

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<sup>24</sup>Трубецкой, Н.С. Основы фонологии / Н.С.Трубецкой – Москва: Изд-во иностр.лит. – 1960. – с. 207.

- 3) consonants at the end of the word;
- 4) consonants before the stressed vowel;
- 5) consonants after the stressed vowel;
- 6) consonants in the unstressed position;
- 7) consonants in the neighborhood of consonants;
- 8) consonants in the second unstressed syllable;
- 9) consonants after long vowels;
- 10) consonants after short vowels;
- 11) consonants in a combination of two- and three-membered consonants

12) consonants in a combination of three- and more consonants

Thus, there are 12 variants of each consonant in German.

In the research, consonant phonemes are taken in the following positions. We analyze the consonant combinations according to the following models:

1) S(K)	2) S (K)	3) S (K)	4) S(K)
SS	SS	SS	KK
vowel + SSS	vowel + SSS	vowel + SSS	vowel + SSS
SSSS	SSSS	SSSS	SSSS

In this model, three- and four-syllable consonant combinations are analyzed.

There are very few two-member consonant combinations after long vowels: (/a:/ after = 14; /o:/ after 4; /u:/ after 15; /e:/ after 17; after /ø:/ and after /y:/ - 4; /i:/ - only 3 combinations are found. After short vowels, the number of two-member consonant combinations is as follows:

- /a/ + two-member consonant combination = 50 compounds;
- /ɔ/ + two-member consonant combination = 43 compounds;
- /ʊ/ + two-member consonant combination = 71 combination;
- /ɛ/ + two-member consonant combination = 74 combination;
- /œ/ + two-member consonant combination = 6 compounds;
- /y/ + two-syllable consonant combination = 2 compounds;
- /i/ + two-syllable consonant combination = 54 compounds



A characteristic feature of the VKK model is that one of members of the consonant combination is the sonant in 221 of the actually permissible combinations of vowels with 368 two-member consonant combinations.

The largest combinability has vowels of /a/ and /ε/. If we do not take into account the combinations in which /a/ acts as the beginning element of the morphemes "an" and "ab" and its manifestation is conditioned by the combination of morphemes, then the number of combinations of /a/ and /ε/ is almost the same. The third and fourth places are divided by the vowels /a/ and /ε/. The vowel /v/ is often found in the morphemes "un" and "ur". The vowels /i:/, /y:/, /ø:/, /o:/, /œ/ and /y/ have the least combinability. Of the 368 possible combinations in which the vowels act in the anlaut position, 62 are represented by the following phonotactic models.

Almost half of all permissible combinations of the VKK model, ie 176, have such a phonotactic model.

15 combinations with the vowel anlaut (5 of which were due to the morpheme "ab") have a phonotactic model, both of which are "friction-clogging explosions": V + K (ps) + K (ns).

The vowels in anlaut can appear only in 21 combinations before the consonant-combination "friction-clutter-explosion + groove". Their phonotactic model is: V + K (ps) + K (ns).

In 10 cases, the "an" and "ab" morphemes help. In 25 combinations, vowels appear before the consonant combination "grooved + friction-compacted-explosive". The phonotactic model of these compounds can be represented as follows: V + K (ns) + K (ps).

Only one combination was developed for the model V + K (ns) + K (ns).

The summits show such features in the combinations of the VKKK model that distinguish them from the previous types. This is primarily due to the number of possible combinations in German. The number of these compounds is  $148764 (14 \cdot 23^3 = 14 \cdot (217 \cdot 22 \cdot 23) = 14 \cdot 10626)$ .

The analysis shows that the summits of all models have a large number of combinations. Out of 395 combinations, only 15 are long vowels. Here the greatest activity belongs to the share / ε /: 115

combinations; then /a/ vowel comes 85 combination; There are 51 combinations of /v/, 37 combinations of /ɔ/ and 34 combinations of /i/. Such high combinations of the vowels /ε/, /a/, /v/ and /i/ with the three-part post-vocal consonant combination show the consonants “in”, “im”, “ob”, “ur”, “un”, “ um ”, “ er ”, “ ab ”, “ an ”, “ ent ”, “ alt ”, “ ost ”, “ ir ” and so on. due to its appearance in morphemes.

Analysis of these compounds shows that the number of three-member consonant compounds with /ε/ is 107, /a/ with 82, and /v/ with 49. Then there are compounds with the vowels /i/ and /i/. Their number is 34, respectively. Then /œ/ (6 combinations), /y/ (3 combinations) were recorded. These figures are as follows in combination with short vowels:

- /e:/ + three-member consonant combinations = 7
- /ø:/ + three-member consonant combinations = 4
- /y:/ + three-member consonant combinations = 34
- /o:/ + three-member consonant combinations = 2
- /a:/ + three-member consonant combinations = 3
- /u:/ + three-member consonant combinations = 3
- /i:/ + three-member consonant combinations = 1

Four-member consonant combinations are observed mainly after short vowels. After /o:/ (2) and /e:/ (4) a four-member consonant combination can be found. Specifically, the four-member consonant compounds used after vowels are as follows:

- /ε/ + four- member consonant combinations = 40
- /a/ + four- member consonant combinations = 15
- /ɔ/ + four- member consonant combinations = 8
- /v/ + four- member consonant combinations = 5
- /i/ + four- member consonant combinations = 4

In four-member consonant conjunctions, as in three-membered conjunctions, one or both are sonorous. One of the three members is fricative consonant. The sonors are usually /m/ or /n/ at the beginning of the compound, and /r/ in the fourth place.

The analysis of consonant combinations according to the KKVKK model shows that the second of the two-member consonant combinations in the position before the vowel is usually sonorous / m, n, l, r /, and the first component is /k/, /g/, /b/, /p/, /f/, /d/, /t/, /ts/,

/s/. One of the so-nants (/ m, n, l, r /) also appears in the second consonant combination. Another feature is that they allow /a/, /ε/, /ɔ/, /ɪ/, /y/ to combine more than short vowels.

The KKK + V + KKK model uses very few combinations as a whole.

Analysis of this model shows that the number of compounds decreases as the summit coverage increases. According to this model, regardless of whether the consonant combinations are in the prevocal and postvocal positions, one of the consonants coming from both sides must be sonor. dir. The least involved are /o:/, /y/. It is a vowel /œ/ that does not participate in any combination.

The text “Das Ende” is analyzed in subchapter IV of Chapter II **“Statistical study of consonant combinations in German”**. A total of 4,050 words and symbols were used in this text. He defined two-, three- and four-syllable combinations in the text. The consonants in the text are in the following sequence:

Two- member consonant combinations: rg, ns, ks, fk, ts, rt, fn, rh, kg, tt, rh, lf, fm, gl, rn, nt, st, rg, nt, gl, fts, kl, lt, çt, rd, nv, nd, fr, rf, st, lc, rk, ft, kr, rg, xt, fn, rl, kr, nd, kt, pr, br, ct, tsv, jt, rm, fg, sg, kt, kr, nts, nk, kr, rc, lt, kt, lh, st, ng, lt, lb, tts, tv, gr, lc, tr, pfl, rd, rt, fv, xt, rg, lt,rl, nt, rm, tr, br, xt, rd, rg, gl, st, tr, fr, rd, ct, rb, mz, lb, fr, kt, lc, nts, rv, lz, ns, rf, tr, bl, fv, nd, rh, ft, rts, dr, fr, tst, kr, nk, rz, rm, nt, rt, nts, kt, rts, fp, rts, rl, nt, lt, fl, fr, jt, br, xt, tv, tr, fr, dr, gl, lc, tr, fr, lt, lc, fr, fp, lt, pl, lb, tst, fr, rm, ls, fr, dr, fr, rb, tsts, lt, lc, rd, rt, ns, nd, fn, rv, rt, fp, rl, pt, rc, bl, rts, kt, rd, ml, rb, tsg, pt, ft, lf, nt, fp, jr, pt, tst, st, sg, fr, ml, bl, kt, rs, br, fv, ks, nz, lb, fh, gl, fr, dr, xt, tsv, rl.

Three- member consonant combinations: nft, nft, pgl, rtst, rtstl, nftl, nth, fpr, nth, rtst, rtsn, rjl, rtst, nts, nft, rst, rft, ttst, ntv, nft, fpr, nkl, rgr, nst, nst, nbl, rkt, nkt, nft, skr, ntv, skr, nkt, nst.

Four- member consonant combinations: lpst, rmft, lpsl, nksg.

Of these / those within a morpheme: rg, ks, çt, jl, fr, xt, lt, tr, fv, xt, lç, fr, rts, fr, st, gl, rts, ft, fn, nd, tr, rh, fr, fm, gl, st, rn, lç, ft, ft, kr, nk, lpst, fpr, rg, fv, xt, fn, nt, kr, br, tsv, rm, rç, rk, rtsn, kr, nts, kr, rç, çt, nk, lt, nt, rm, lb, tv, rn, gr, rm, tr, pfl, rd, gv, xt, tr, nk, ls, br, rd, gl, st, st, fr, çt, jt, jr, lb, fr, lç, tsv, lz, fr, nt, nft, jl, tr, fp, pf, fv, ts, nk, pt, nts, nts, ft, rts, fr, dr, rt, jt, rn, çn, kr, nk, nd,

rn, rr, nts, rts, fp, rts, lt, fl, fr, br, tv, tr, nk, fr, dr, ct, gl, lc, tr, nk, fr, fr, fp, lb, ts, st, ct, rd, skr, pt, fn, rd, rç, bl, rd, ml, rb, st, nk, lf, fp, ts, st, ft, fr, ml, fr, ks, gl, fr, ts, nst, ft, ts/.

The compounds that occur at the morpheme junction are: ns, fk, nd, rb, ntl, nt, kt, rç, rg, fts, pgl, rk, rh, kg, lf, lt, rd, nv, rtsl, rf, st, nfl, nth, ft, kt, ct, fg, rjl, rt, sg, kt, ft, kt, pt, lh, lt, nts, kt, rgr, lt, rl, nt, rm, ft, xt, rgr, rb, rft, ts, mz, kt, ntv, ntsv, nts, nft, gst, rv, rt, ts, rf, bl, rgr, rh, rz, ts, rz, rm, lpjl, kt, rl, nt, xt, nft, lt, pl, nsg, sz, rgt, rm, fr, ts, nkt, ts, rt, rv, ntv, rts, kt, gt, nkt, bt, gt, sg, kt, rs, nz, fh, nk/.

Two-member consonant combinations used in the lexeme as follows: /rt, nts, rt, rt, ts, fv, rl/; three-member consonant combinations are used in the lexeme as follows: /nft, nbl/; The four-member consonant combinations are developed in the lexeme junction as follows: /rmft/.

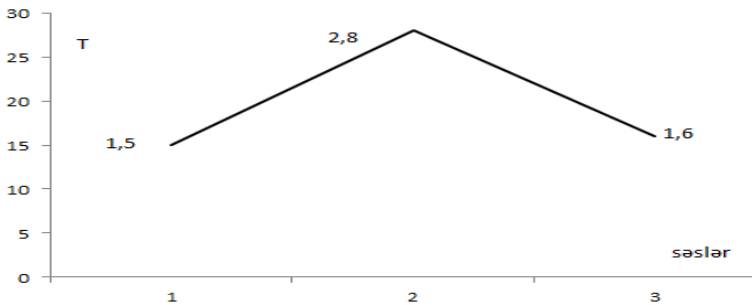
Three-member: /ntl, pgl, rtsl, nfl, nth, nth, rjl, nts, rgr, rft, ntv, ntsv, nft, gst, rnr, nsg, rgt, ntv, nkt/ consonant combinations and four-member /lpst/ consonant combination comes at the morpheme junction. quadruple /lpst/; three-member /nft, nbl/, four-member /rmft/ consonant combinations are used at the lexeme junction; The four-syllable /lpst/ consonant combination comes at the morpheme junction; four-membered /lpst/.

Subchapter I of Chapter III of the research work **“Experimental-phonetic analysis of German consonant combinations”** – *“Selection and analysis of experimental material”* - the rules of the experiment, the principles of selection of language material and announcers and the interpretation of the results dedicated to the language material for the experiment was voiced by German speakers. The experimental material was selected according to the models KKV, VKK, KKKV, VKKK, KVKKKK. The experiment was performed in the "Praat" program. Only the time parameter of consonant combinations was analyzed in the research work, because the parameters of intensity and melodicty are not clearly expressed in consonants.

In subchapter 2 of Chapter III, *“The analysis of two- and three-member consonant combinations”* two- and three-member

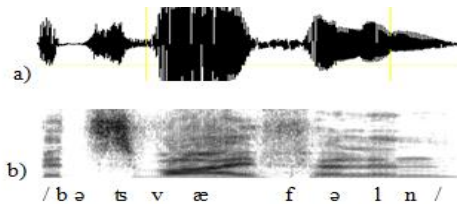
consonant combinations are involved in the experimental phonetic analysis.

The total length of the word /'tsvæ/ (zwei-iki) is 635 m/sec, and the absolute length of the affricate /ts/ in that word is 317 m/sec. The average relative value of the word is 1.5 m/s. The total length of the word "bezweifeln", which is structurally complex, is 992 m/s, and the length of the /ts/ summit in the middle position is 311 m/s. The total length of the word /tsvælf/ (zwölf - twelve) is 670 m/s, and the time consumption of the /ts/ summit used earlier is 222 m/s. The average relative value of the word is 1.6 m/s (see: point.3.2.1).



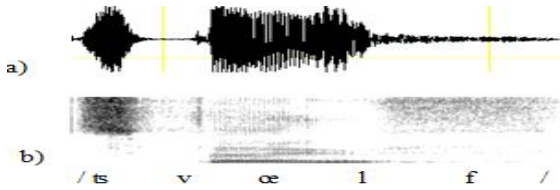
**Graph 3.2.1.**

**Average relative tenses of German words /tsvae/, /bøtsvæfəln/ and /tsvælf/**



**Figure 3.2.1.**

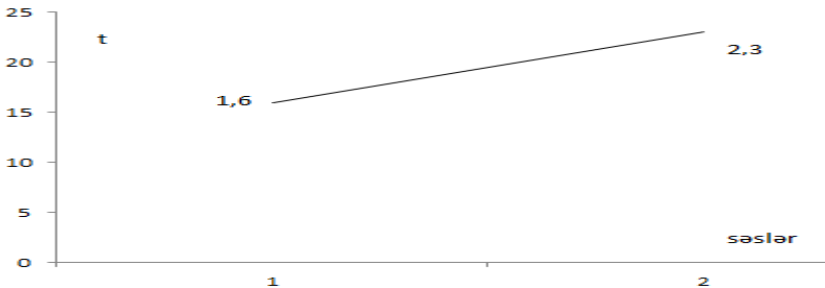
**Oscillogram (a) and spectrogram (b) of the word /betsvæfəln/**



**Figure 3.2.2.**

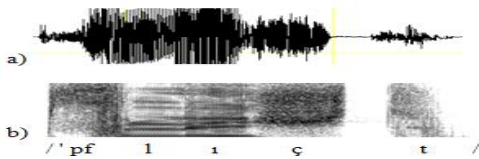
**Oscillogram (a) and spectrogram (b) of the word /tsvœlf/**

The total time of pronunciation of the word /'pflicht/ is 637 m/s, and 203 m/s is used for the initial affix /pf/. The average relative value of the word is 1.6 m/s. Consisting of 7 phonemes /gəpfle: kt/ the pronunciation time of the word is 948 m/sec. The time parameter of the /pf/ summit in the middle position is 272 m/s. According to the average absolute length, we can measure the tempo of each phoneme in this word with the following formula:  $\frac{948 \frac{m}{san}}{7} = 135 \text{ m/sec}$ . Thus, the length of each phoneme is about 135 m/s (see gr. 3.2.2).



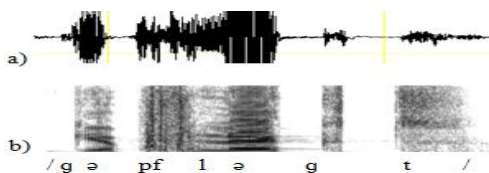
**Graph 3.2.2.**

**Average relative time values of the German words /'pflicht/, and /gəpfle:kt/**



**Figure 3.2.3.**

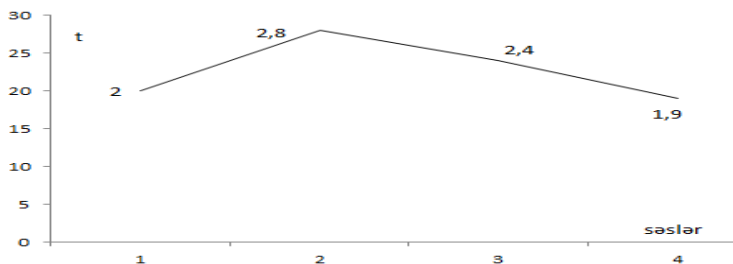
**Oscillogram (a) and spectrogram (b) of the word /'pflicht/**



**Figure 3.2.4.**

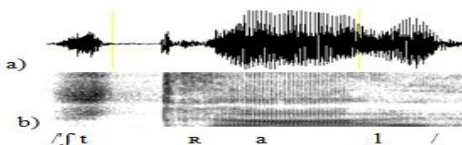
**Oscillogram (a) and spectrogram (b) of the word /gəpfle:kt/**

The total length of the word involved in the experiment /'ʃtrɑ:l/ is 840 m/sec. The length of the /ʃtr/ consonant combination is 345 m/sec. In the /ʃtr/ consonant combination, the length of each consonant is 115 m/s. The reason for this is the length of the phoneme /a:/ in the middle of the word (see: gr.3.2.3).



**Graph 3.2.3.**

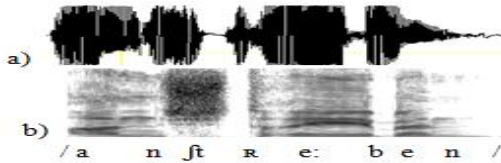
**Average relative time values of the German words /ʃtrɑ:l/, /'anʃtrɛ:bən/, /'ʃtrɛŋ/ and /'ʃtrɑ:sə/**



**Figure 3.2.5.**

**Oscillogram (a) and spectrogram (b) of the word /ʃtrɑ:l/**

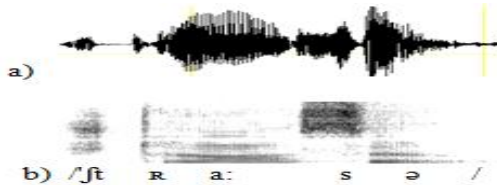
The total pronunciation time of the word /'anʃtrɛ:bən/ (try) was 1048 m/s. On average, 115 m/s was used for each phoneme. The length of the /ʃtr/ consonant combination is 321 m/sec. The average relative value is 2.8 m/s (see gr. 3.2.3).



**Figure 3.2.6.**

**/'anʃtre:ben/ word oscillogram (a) and spectrogram (b)**

The word /'ʃtrɛŋ/ (serious) consists of 5 phonemes. The total length of this word is 671 m/s, on average, the length of each summit  $\frac{671}{5} = 133$  m/s. On the average the length of the /ʃtr/ combination junction is 326 m/sec. (see: gr. 3.2.3). The total length of the German word /'ʃtra:sə/ is 997 m/sec, and if we measure it by the formula  $\frac{992}{6}$ , we will find that each phoneme takes 166 m/sec. The length of the /ʃtr/ consonant combination is 312 m/s. The so-called average relative value is 1.9 m/s (see: gr. 3.2.3).

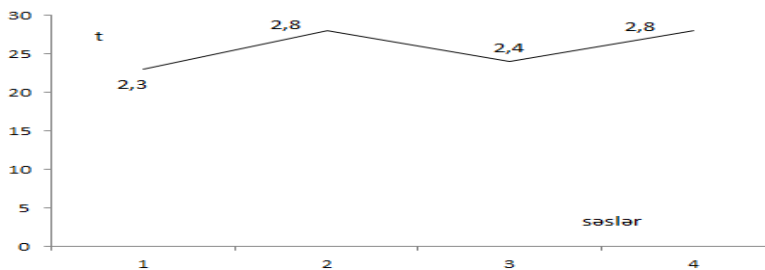


**Figure 3.2.7.**

**Oscillogram (a) and spectrogram (b) of the word /'ʃtrɛŋ/**

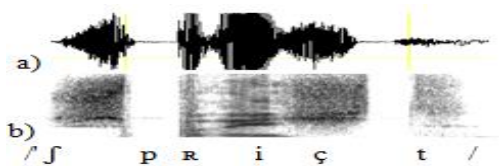
The total time spent on the word /'ʃpɪçt/ (speaks) is 929 m/sec. When /ʃpɪ/ is used for the consonant combination, it is equal to 363 m/sec. 121 m/s was spent on each consonant. The average relative value obtained from the mathematical calculation is 2.3 m/s (see: gr. 3.2.4).





**Graph 3.2.4.**

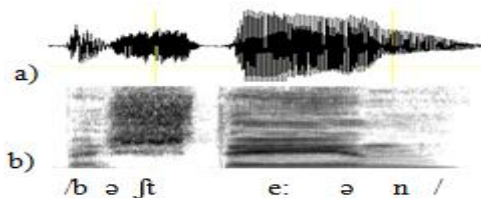
**Average relative time values of the German words /'ʃpɾiçt/, /bəʃpɾɛçvŋ/, /bəʃte:ən/ and /'ʃpɾa:xə/**



**Figure 3.2.8.**

**Oscillogram (a) and spectrogram (b) of the word /'ʃpɾiçt/**

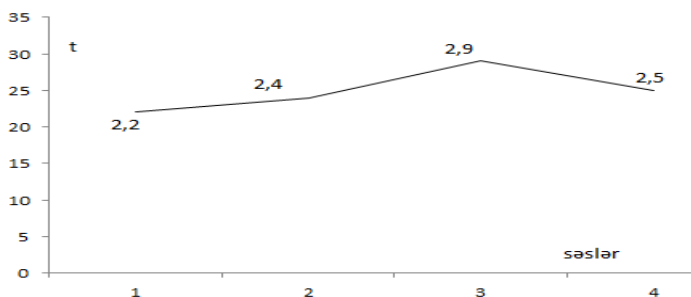
The total length of the word /bəʃpɾɛçvŋ/ oscillographically analyzed is 987 m/s. The length of the consonant combination /ʃpɾ/ in the word is /'ʌŋʃtre:ben/ 321 m/sec. The average relative time value of the word is 2.8 m/sec (see gr. 3.2.4). The average pronunciation time of the word /bəʃte:ən/ is 678 m/s, and the time spent on the consonant combination /ʃpɾ/ is 332 m/s. The average relative time value of the word is 2.4 m/s (see gr. 3.2.4).



**Figure 3.2.9.**

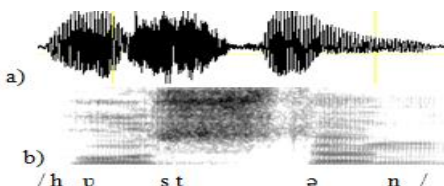
**Oscillogram (a) and spectrogram (b) of the word /bəʃte:ən/**

The German words /hustən/ and /gɛstɛrn/ differ in both phoneme structure and composition. The /st/ consonant combination came in both words is used in inlaut. However, this consonant combination is characterized by different acoustic parameters in these words. The average relative time in the analyzed word /hustən/ is 2.2 m/s, and in the word /gesten/ it is 2.4 m/s (see gr. 3.2.5). The average relative time of the word KVKKK model /dʊrst/ was recorded at 2.9 m/s. The average length of the /rst/ consonant combination is 276 m/sec. The consonant /R/ in the word has a serious effect on its acoustic appearance. The average pronunciation time of the word oscillographically analyzed /'kʊnst/ is 2.5 m/sec (see gr. 3.2.5).



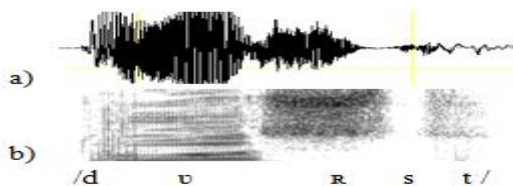
**Graph 3.2.5.**

**Average relative tenses of the German words /hustən/, /gɛstɛrn/, /dʊrst/, /'kʊnst/**



**Figure 3.2.10.**

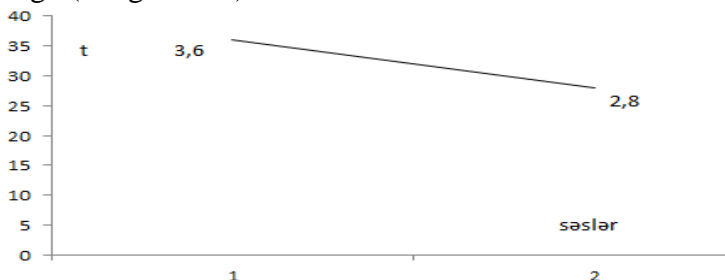
**Oscillogram (a) and spectrogram (b) of the word /hustən/**



**Figure 3.2.11.**

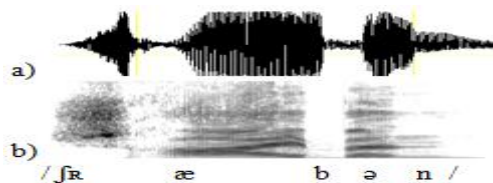
**Oscillogram (a) and spectrogram (b) of the word /dʊrst/**

An oscillographic analysis of the word /'ʃræbən/ shows that less time is spent in the anlaut than in the /ʃr/ consonant combination. The main informative part of a word is /æ/ diphthong, so its length is pronounced with a lot of time. The average relative pronunciation rate of this compound is 3.2 (see: gr. 3.2.6). In the word /hʊpʃræbər/ (helicopter), three consonants are used at the junction of morphemes one after the other: /pʃr/ and the approximate length of these consonants equals to 300 m/sec. The average pronunciation time of each consonant in this combination is 100 m/s on average (see gr. 3.2.6).



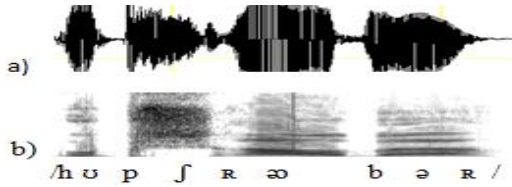
**Graph 3.2.6.**

**Average relative time values of the German words /'ʃræbən/, /hʊpʃræbər/**



**Figure 3.2.12.**

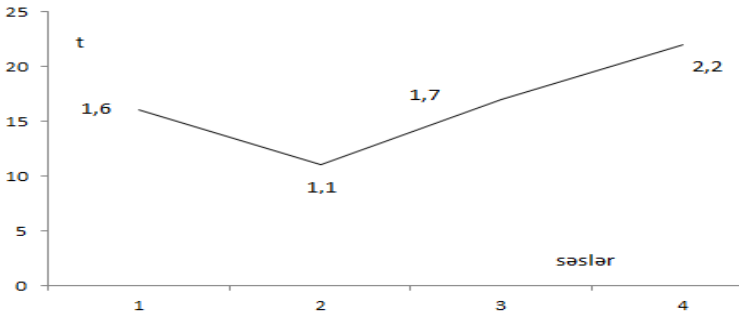
**Oscillogram (a) and spectrogram (b) of the word /'ʃræbən/**



**Figure 3.2.13.**

**Oscillogram (a) and spectrogram (b) of the word /hɔpʃrəbər/**

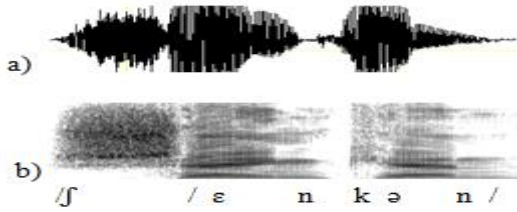
In the word /ʃenken/, which is realized in the middle position, /nk/ is 314 m/s of the combination of two consonants. It is a joint usage of a sonant and occlusive-explosive consonant. The average pronunciation speed is 1.7 m/s (see gr. 3.2.7). The sonant /l/ is pronounced relatively briefly in the word /falʃ/, but is characterized by a high index /ʃ/ to the second component of the compound. The average relative length in the consonant compound is 2.2 m/sec (see gr. 3.2.7).



**Graph 3.2.7.**

**Average relative tenses of German words /ʃenken/, /falʃ/, /ʃenken/**

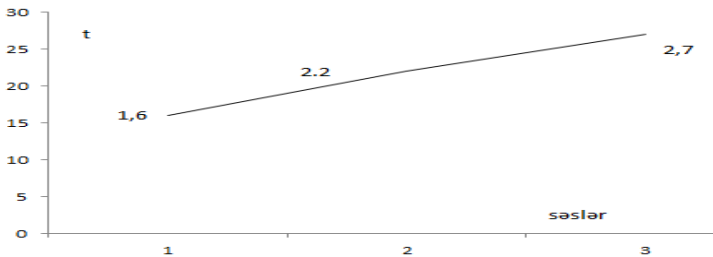
We see the same picture in the word /flæʃ/ (meat). In this the so-called /fl/ consonant combination, the time taken was 1.9: 1.6 m/s. The main tempo of the word falls on the combination of /æʃ/. The average sounding length of the so-called consonant compounds is 1.7 m/s (see gr. 3.2.7).



**Figure 3.2.14.**

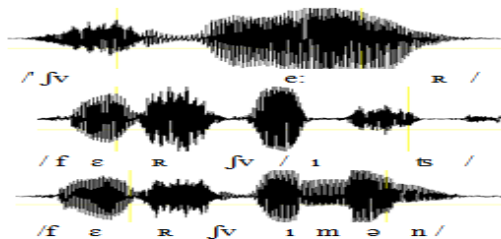
**Oscillogram (a) and spectrogram (b) of the word /fænken/**

Acoustic indicators of the oscillographically analyzed words /'fve:r/, /fɛr'fvits/ and /fɛr'fvimən/ in the first word /fʋ/ the average relative length of the consonant combination is 1.6 m/sec, in the word /fɛr'fvits/ /Rʋ/ the average relative length of the consonant compound is 2.2 m/sec, and in the word /fɛr'fvimən/ the average relative length of the consonant compound /Rʋ/ is 2.2 m/sec (see: gr. 3.2.8).



**Graph 3.2.8.**

**Average relative time values of the German words /'fve: r/, /fɛr'fvits/ and /fɛr'fvimən/**



**Figure 3.2.15.**

**Oscillograms of the words /'fve:r/, /fɛr'fvits/ and /fɛr'fvimən/**

The following **conclusions** were drawn from the analysis of the theoretical literature on phoneme combinations in Germanistics, including the acoustic parameters of three- and four-member consonant combinations in German:

1. The number of phoneme combinations in syntagm directly depends on the phoneme inventory of the language. While the richness of the phonological system provides the basis for the richness of phonemic combinations in syntagmatics, the limitations of the phoneme inventory in paradigmatics lead to a small number of phoneme combinations. The phonological system of the German language consists of forty phonemes, three of which are diphthongs / $\text{æ}$ ,  $\text{æ}$ ,  $\text{ɔø}$ /, and three are affricates / $\text{pf}$ ,  $\text{ts}$ ,  $\text{tʃ}$ /.

2. Existing affricates and diphthongs in the phonological system have a negative impact on the number of phoneme combinations in the syntagmatics of that language, i.e the number of phoneme combinations in the language where diphthongs and affricates are less.

3. According to the items accepted in the research work a combinational analysis of the language material shows that the possible phoneme combinations from theoretical point of view do not coincide in ratio with concrete phoneme combinations.

4. The small number of phonemes in the word structure affects on the increase in the time spent on the separate components of the consonant combinations in the language. A large number of syllables in a word reduces the time spent on each component of the separate phonemes in the word, including the consonant combination. This fact has a linguistic basis, i.e. in such words each phoneme carries a large information load, and therefore it takes more time to recognize these words. An increase in the number of time so-called phonemes reduces the functional load of the components of individual phonemes, including consonant compounds. This fact can be explained by the theory that the phonetic cover is important in the recognition of a word.

5. Distributive and statistical analysis of the language material shows that no more than three consonants can be used in a word in German, and up to seven consonant combinations can occur in a

morpheme junction (in the middle of a word). For example, /*hɛrɪpstʃtra:se*/ seven consonants are used in succession in the structure of the word.

6. The results of the language material we are researching do not coincide with the statistical indicators of lexemes in the dictionary. While there are many three- and four-member combinations in the dictionary, but in the text we have studied, the consonant combinations can be explained mainly as follows: within a morpheme two-member phoneme combinations represent a majority, at the junction of morphemes three-four member consonant combinations are often met. In consonant compounds, one or both of the components are sonants: l, n, m, r, ŋ.

7. In the analyzed text from the total number of syllables monosyllabic, disyllabic and trisyllabic ones are 72 percent, 14 percent of all the text are four-syllable, 6,5 percent are five-syllable words, 4 percent are six-syllable, 2 percent are seven-syllable words.

8. In spite of the richness of the syllable model in German four- and five-syllable consonant combinations at the beginning of the word are not met in German; all the possible trisyllabic consonant combinations at the beginning of the word are ten times less than in the end of the word.

9. In consonant combinations, sonants are processed in preposition or postposition (end). If in compound word or on the junction of morphemes are used an explosive consonant or one fricative, so in these cases the beginning consonant of these compounds or their end will be sonants.

10. The results of the experimental-phonetic analysis of selected words containing two-, three- and four-consonant combinations in German in the research work can be summarized as follows: although the length of consonant combinations at the beginning and middle of the word is relatively low, in consonant combinations realized in the postposition, time consumption is high. The timing of the prevocal and postvocal combinations in a word depends on the acoustic quality of the vowel in the word - its shortness and length. Acoustic analysis also confirms that the total

time consumption of a word is inversely proportional to the number of its components (vowels and consonants).

11. So far as the syllable at the end of the word has a greater load due to the time index, the consonant compounds in it are expressed with higher tenses. This can be explained by the general prosodic structure of the word, i.e. when completeness or enumeration intonation occurs at the end of words, the auslaut of the word is set against the anlaut.

12. The research work carried out gives a necessary linguistic material for the implementation of methodical system which provides the consideration into account the specific regularities of teaching German language to Azerbaijan – speaking audience. All these form the practical perspectives of the work.

**The following articles were published regarding the topic:**

1. On the experimental-phonetik research of consonant combinations in German and the Azerbaijani languages // – Baku: Foreign languages in Azerbaijan, – 2009. №3/4, – p. 26-30 (in the Azerbaijani).
2. About some problems of phonotactics in German language // – Baku: Foreign languages in Azerbaijan, – 2010. №2/3, – p. 34-38 (in the Azerbaijani).
3. On the main causes of interferencia in language learning.// “The 60 – year jubilee of indepent activity of German language faculty. Proceedings of scientific-practical conference, – Baku, – 2010, – p. 94-95 (in the Azerbaijani).
4. The research of orphophonnic peculiarities in the realization of phonological system // “The actual problems of speech culture and terminology”. Materials of Republican scientific conference, – Baku, – 2011, – p. 41-45 (in the Azerbaijani).
5. On the importance of phoneme combinations in language learning // The actual problems of teaching foreign languages. Republican Scientific Conference, – Baku, – 2012, – p. 202 (in the Azerbaijani).
6. On the role of combinatorial models in language learning // Materials of International scientific-practical conference. “The



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7. On the syntagmatic structure of the word // – Baku: Foreign languages in Azerbaijan, – 2014. №2, – p. 37-42 (in the Azerbaijani).
  8. On the segmental organization of the word in language // – Baku: Azerbaijan National Academy of Sciences (ANAS), Transactions of the Institute of Linguistics, – 2015. №1, – p. 160-163 (in the Azerbaijani).
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  11. On some peculiarities of the sentence intonation //– Baku: Science, Problems of terminology, – 2016. – p. 165-170 (in the Azerbaijani).
  12. Some orthographic and orphoepic coincidence in German and the Azerbaijani languages // – Baku: ANAS, The Institute of Linguistics named after Nasimi. Researches, – 2017. №4, – p.137-145 (in the Azerbaijani).
  13. Experimental phonetic analysis of consonant combinations in the modern German language // Modern problems of applied linguistics. The proceedings of International Scientific Conference, – Baku, – October 25-26, – 2018, – p. 12 (in the Azerbaijani).
  14. The results of combinational variants of vowel combinations in the modern German language (1) //– Baku: Transactions of the Institute of Linguistics, – 2018. №2, – p. 317-327 (in the Azerbaijani).

15. About the phoneme system in German language // Informational technology as the base of effective innovative development. Collection of articles of Scientific – publishing centre “AETERNA”, – Taganrog, –August 19, – 2019, – p. 65-68 (in Russian).
16. The peculiarities of pronunciation of consonant combinations in German language // – Baku: Problems of terminology, – 2019. – p. 169-173 (in the Azerbaijani).
17. The results of combinational variants of vowel combinations in the modern German language. (2) // – Baku: Transactions of the Institute of Linguistics, – 2019. №2, – p.105-108 (in the Azerbaijani).
18. The distribution of consonants in German language // – Baku: Science, Problems of terminology, – 2021. №1, – p. 114-117 (in the Azerbaijani).
19. On the research of phonemic system of German language // The XIV International Scientific Symposium “A person in history” dedicated to the 140<sup>th</sup> anniversary of the founder of modern Turkey Mustafa Kemal Atatürk, –Turkey: Ankara,– May 26, – 2021, – p.116-121 (in Turkey).

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