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Основные особенности английского академического и профессионального медицинских дискурсов

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Аннотация. Цель исследования – выявить способы снижения сложности английских медицинских текстов на примере изучения академического и профессионального дискурсов. Научная новизна заключается в том, что впервые проведено исследование, направленное на изучение количественных и качественных характеристик научных медицинских статей и медицинских обзоров с целью выявления основных особенностей их языковой организации, способствующей лучшему пониманию английских медицинских текстов. Результаты исследования показывают, что с точки зрения количественного анализа профессиональный медицинский дискурс демонстрирует более низкий уровень сложности текста по сравнению с академическим медицинским дискурсом. Это проявляется в сокращении количества употреблений специфических терминов, сложных словоформ и росте синтаксической простоты. Качественное исследование демонстрирует, что оба типа медицинского дискурса имеют практически одинаковый показатель внутренней когезии и индекс лексического разнообразия. Однако в случае академического медицинского дискурса лексическое разнообразие достигается за счет использования различных медицинских терминов и понятий, что приводит к ухудшению понимания текста непрофессиональной аудиторией. В ходе анализа также было отмечено, что в профессиональном медицинском дискурсе доминируют референциальная когезия, уровень нарративности и показатель соотношения употребления абстрактных/конкретных слов, что в целом способствует общему снижению сложности текста.

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The main features of English academic and professional medical discourses

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Abstract. The research objective is to view various ways of complexity reduction of English medical texts on example of Academic Medical Discourse and Professional Medical Discourse. The scientific novelty lies in conducting for the first time the study aimed at investigating the quantitative and qualitative characteristics of academic articles and their professional media reviews in order to estimate the features that contribute to better comprehension of medical texts. The research results show that from the point of quantitative analysis, Professional Medical Discourse demonstrates higher level of simplicity in comparison to Academic Medical Discourse. It can be viewed in reduction of a number of unique and difficult words, overall decrease of word length and growth of syntactic simplicity. Qualitative study reveals that both types of medical discourse have a practically identical index of deep cohesion with the domination of additive conjunctions. Lexical diversity is also presented on the same level, however, in the case of Academic Medical Discourse, it is achieved by the usage of various medical terms and notions that leads to the deterioration of text understanding by a non-professional audience, while in Professional Medical Discourse, more lexical units of common language are applied. At the same time, referential cohesion, word concreteness and level of narrativity dominate in Professional Medical Discourse, which contributes to a general simplification of the presented information.

Introduction

The relevance of the study is explained by the necessity to arrange effective communication between scientists, doctors and their patients. Nowadays different models of medical communication can be observed within written and spoken types of discourse, therefore, a question arises as to what features of medical discourse can contribute

to better understanding and cooperation between the participants of communication. Moreover, health has always been one of the greatest values for any person, thus the issues related to health care are always at the top of the list of human priorities. For the last decades, a lot of medical research has been conducted. The results of these investigations are published in various academic medical journals; however, their main findings sometimes remain unnoticed by the large audience mainly due to the complicated medical language of academic society. Nowadays some professional medical institutions together with medical journals aim to overcome this situation and bring up-to-date medical knowledge to a wider range of people by presenting the results of academic articles in the form of media medical reviews. Therefore, it becomes vital to analyze the linguistic peculiarities of these kinds of texts, highlight the level of complexity of academic articles and medical reviews and observe the main strategies that are applied by the authors to simplify scientific information.

The hypothesis of our work is the idea that academic articles possess higher level of text complexity in comparison to their reviews due to their more complicated nature and structure. In our research, medical discourse is understood as a type of institutional discourse where communication between participants is arranged according to specific rules/regulations and aimed at discussing some medical issues (Кочеткова, Барсукова, Ремпель и др., 2018).

Different scientists offer various definitions for the term 'text complexity'. R. S. Frantz et al. refer text complexity to the level of sophistication and challenge of a reading selection or other type of text (Frantz, Starr, Bailey, 2015). M. Solnyshkina et al. view text complexity as a group of factors affecting and contributing to text comprehension, or a set of features that make understanding of a text challenging for a group of people or a particular person (Gatiyatullina, Solnyshkina, Kupriyanov et al., 2023). In our opinion, the main advantage of applying text complexity analysis to discourse investigation is the opportunity to view both quantitative and qualitative characteristics of a text regarding a reader's background, prior and cultural knowledge.

The material for the research comprises two corpora: the first one (Academic Medical Discourse) was collected from Open Access medical articles published in English within the time period 2023-2024. Overall, the corpus of 567234 tokens was compiled. The second corpus (Professional Medical Discourse) of 296421 tokens is represented by the explanatory reviews, where the scientists gave the overview of their publications within news by highlighting their main findings. Though these two corpora illustrate medical discourse, there are some key points that differentiate them. Academic articles belong to academic discourse, so their structure, organization and language are directed by the rules of the academic style of writing. In their turn, medical reviews represent a kind of hybrid discourse as they comprise a combination of two different types of discourse, medical and media (Баландина, 2024).

To fulfil the stated purpose, the following tasks were completed:

- to compile two relevant and balanced medical corpora of academic and professional texts;
- to distinguish the quantitative characteristics of the analyzed types of discourse;
- to highlight the qualitative features of the studied discourse;
- to compare the level of complexity of academic and professional texts.

The methods of text complexity and discourse analysis were selected to arrange a detailed investigation of medical discourse, both from quantitative and qualitative aspects. To receive relevant and accurate data, different software tools were applied: Coh-Metrix, Readability Analyzer, LancsBox. Coh-Metrix and Readability Analyzer provide measures for evaluating text complexity, while LancsBox allows arranging a deep qualitative analysis of corpora.

The theoretical background for the research is presented by the works of scientists in the field of medical discourse analysis and the study of its relevant features by И. Ф. Шамара (2013), Ж. Н. Макушева, М. Б. Ковалева (2014), Т. А. Пивоварчик (2018), Т. В. Кочеткова, М. И. Барсукова, Е. А. Ремпель, А. Я. Рамазанова (2018), М. П. Кожарнович (2021), О. П. Довгер, К. М. Лопата, А. Ю. Груздов (2023); the text complexity investigation and mainly the qualitative and quantitative measures of text description by E. Castello (2009), R. S. Frantz, L. E. Starr, A. L. Bailey (2015), D. Fisher, N. Frey, D. Lapp (2016), A. A. Churunina, M. I. Solnyshkina, I. E. Yarmakeev (2023).

The practical value of the research is presented by the possibility to use the findings in various fields of humanitarian knowledge. The results can be applied not only in some special linguistic courses such as Text Analysis and Medical Discourse Study, but also in completing specific practical tasks: selection of texts for books and exams.

Discussion and results

The overall complexity of the analyzed medical discourse can be estimated by means of the Flesh-Kincaid Grade Level Readability Formula that presupposes the following steps to be completed:

1. Calculate the average number of words used per sentence (ASL – average sentence length).
2. Calculate the average number of syllables per word (ASW – average number of syllables per word).
3. Estimate text complexity through the Flesh-Kincaid Reading Grade formula (FKRG): $FKRG = (0.39 \times ASL) + (11.8 \times ASW) - 15.59$.

Our research showed that the average score of complexity for Professional Medical Corpus is 13.89, which corresponds to a difficult level of comprehension, however, if we compare it to the Academic Medical Corpus, we can see that it is ranked as extremely difficult with the general score being 22.03.

Reduction of complexity can be observed both at word and sentence levels. Comparison of randomly chosen fifty samples dedicated to the questions of cardiology and gastroenterology showed the following changes within the texts that can vividly illustrate the shift to simplification (see Table 1).

Table 1. Comparison of quantitative data

Statistical indicators	Professional Medical Corpus	Academic Medical Corpus
Total number of unique words	47%	54%
Total number of repeated words	53%	46%
The percentage of easy words	79%	67%
The percentage of difficult words	21%	33%
Average number of syllables per word	2	2
Average word length	5 characters	6 characters
Average number of words per sentence	24	46
Average number of short sentences	11%	0%
Average number of medium sentences	36%	22%
Average number of long sentences	51%	78%
Average number of passive constructions	4%	21%
Average number of active constructions	96%	79%

Table 1 indicates the decrease of complexity not only on the lexical level, which is reached by the reduction of word length, choice between ordinary and unique words and their frequency within the text, but also by the growth of overall syntactic simplicity. Comparative evaluation of texts from the two analyzed corpora highlights the increase of syntactic simplicity from 18% to 32% in Academic Medical Discourse compared to Professional Medical Discourse. The dynamics of the above mentioned quantitative changes can be illustrated by the following examples that indicate the difference in defining one and the same medical term ‘portal hypertension’:

- *Portal hypertension (PHT) is a severe complication of chronic liver disease, like cirrhosis, where increased pressure builds up in the portal vein* (First Hospital of Jilin University. New test shows promise for diagnosing and managing portal hypertension // Medical Press. 18.03.2024. <https://medicalxpress.com/news/2024-03-portal-hypertension.html>).
- *Portal hypertension (PHT) is characterized by an abnormal elevation in the pressure difference between the portal vein and hepatic venous system. It is the primary cause of the development of main complications observed in cirrhosis patients, such as variceal hemorrhage, ascites and hepatic encephalopathy, causing a high risk of mortality and morbidity* (Xiaoming Xu, Jiacheng Liu, Yixuan Zhu, Fajuan Rui, Chao Wu, Jie Li. Spleen stiffness measurement as a non-invasive assessment in patients with portal hypertension // eGastroenterology. 2024. No. 2. <http://dx.doi.org/10.1136/egastro-2023-100031>).

In the first sentence, the definition is given in a simpler way in comparison to the second sentence, which was taken from the Academic Medical Discourse, due to the smaller number of words, lower percentage of hard words (13% vs 31%) and a growing level of syntactic simplicity (17% vs 42%).

In order to evaluate the change of complexity, we need to look deeper into some qualitative features of both types of discourse. The first issue of consideration is related to deep cohesion analysis that deals with the estimation of conjunction usage within a text. According to the software program Coh-Metrix, Professional Medical Discourse and Academic Medical Discourse have an average amount of deep cohesion that corresponds to 54% and 52%, respectively. The data show practically identical level of text coherence; however, attention should be paid to the types of conjunctions that prevail in each corpus. Table 2 showing the distribution of conjunctions gives the general overview of various linking-word groups that were applied by the authors.

Table 2. Comparison of the distribution of conjunctions

Percentage	Additive conjunctions	Contractive conjunctions	Causative conjunctions	Sequential conjunctions
Professional Medical Discourse	72%	12%	10%	6%
Academic Medical Discourse	83%	9%	5%	3%

The findings indicate that additive conjunctions constitute the basis for both types of discourse, as they help to create the overall picture of the problem under consideration. At the same time, the usage of contractive, causative and sequential conjunctions dominates in the Academic Medical Discourse, as it tends to present a more detailed, logical and argumentative explanation to the described results.

The second point of analysis is related to the study of referential cohesion, which is achieved by the repetition of words, word stems, concepts and ideas. According to Coh-Metrix data, Professional Medical Discourse (Referential cohesion = 45%) has a higher level of this type of cohesion in comparison to Academic Medical Discourse (Referential cohesion = 33%). The key point here is that in an academic publication, the idea under consideration develops smoothly and moves from one idea to another, while in Professional Medical Discourse, the main attention is given to the bullet points of the publication that are constantly referred to. Therefore, in professional discourse more cases of concept and idea repetitions can be observed.

The third point of investigation is connected with the examination of lexical diversity of both types of medical discourse. The term ‘lexical diversity’ indicates the range and variability of vocabulary within a text and reveals the richness of its lexicon (McCarthy, Jarvis, 2010). Generally, for that purpose of lexical diversity measurement,

the index of Type-Token Ratio (TTR) is used. Traditionally TTR is calculated by dividing the number of different words by all the words within the text. Therefore, the index of TTR is substantially affected by the length of the analyzed abstract. So, we should admit that this formula presupposes a significant limitation that should be mentioned in connection with the accuracy parameters of TTR calculation. The length of the paragraph under consideration should not exceed 1000-word forms, otherwise the estimation of lexical diversity index would not be properly estimated. It can be explained by the fact that the longer the text is, the more functional words it contains and thus, the lower the lexical diversity index is. Therefore, in our research TTR of 70 random abstracts from both types were estimated and then the average indicator was calculated. As a result, the following data were received: the coefficient of TTR for Professional Medical Discourse equals 0.47, while for Academic Medical Discourse, it stands for 0.53. The findings reveal an approximately equal index of average lexical diversity, with a slight domination of Academic Medical Discourse. However, if we concentrate attention on the used tokenized forms and key word analysis, we can state that the lexical diversity of Academic Medical Discourse is achieved through the usage of various medical terms that are marked by the system "Readability Analyzer" as 'rare and difficult for comprehension': *Fn subspecies, organotypic oral mucosal infection, microfluidic chamber cap*. While in Professional Medical Discourse, the percentage distribution of such terms is lower and they are generally accompanied by lexical units that allow better understanding and interpretation of the discussed issues. Table 3 'Key word collocations' demonstrates the co-occurrence of the selected key words with other tokens within randomly selected texts.

Table 3. Key word collocations

Keywords	Professional Medical Discourse	Academic Medical Discourse
Lungs	disease, heart, action, Alpha-1 antitrypsin deficiency, cardiovascular, conditions, develop, enzyme, patients, arteries, blood, breakdown, etc.	disease, Alpha-1 antitrypsin deficiency, Chronic Obstructive Pulmonary Disease, CVD risk, pulse wave velocity, neutrophil proteinases, measures, etc.
Bacteria	Streptococcus anginosus, immune systems, Helicobacter pylori, prevent gastric cancer, tumor, etc.	H. pylori driver bacteria, DNA, fresh gastric tissues, fresh stomach tissues, S. anginosus, adhesins, cell-cell tight junctions, etc.

Lexical level analysis also requires concentrating attention of the level of word concreteness/abstractness within the analyzed corpora. Word concreteness also affects the notion of text complexity, as abstract concepts are harder to understand (Gatiyatullina, Solnyshkina, Kupriyanov et al., 2023). Academic Medical Discourse can be characterized by the usage of 38% of concrete words, while in Professional Medical Discourse, the percentage reaches 66%. Therefore, we can state that academic discourse consists of more abstract notions and terms that cause comprehension problems for a non-prepared reader.

The last point of comparative analysis is related to narrativity and the structural organization of the two types of medical discourse. Academic and professional discourses can be characterized by a rather low level of narrativity, which constitutes 6% and 18%, respectively. However, a comparison of these two numbers shows the triple increase of narrativity in the case of Professional Medical Discourse. The growth of the index can be explained by the structural organization of texts. On the one hand, academic articles are generally written according to a strict IMRaD structure that does not presuppose a high degree of narrativity, as scientific texts tend to present results and explain findings rather than retell the whole history of research. On the other hand, texts that comprise foundation for our Professional Medical Discourse corpus can be described as a mixture of medical discourse with some elements of mass media discourse, as their main aim was to reveal and explain the research results as news. Such a hybrid nature of professional discourse led to the growth of the narrativity level as well as the general simplification of the whole information.

Conclusion

In conclusion, we can state that medical written discourse can be represented by different genres. In our study, academic articles comprise the foundation for Academic Medical Discourse, while medical reviews in the form of news reports are regarded as examples of Professional Medical Discourse. The parallel language analysis of academic articles and medical reviews contributes to finding the peculiarities of the quantitative and qualitative characteristics of these two types of discourse.

Academic Medical Discourse gains a higher degree of complexity in comparison to Professional Medical Discourse according to the Flesh-Kincaid Grade Level Readability Formula. Complexity reduction can be observed both at word and sentence levels. At the word level, there is an average decrease of 7% for the number of unique words and a fall in 12% for the number of difficult words. Moreover, the general length for a word went down per one syllable. At the sentence level, we can come across some changes in percentage distribution between short, medium and long sentences. In Academic Medical Discourse, the majority of the sentences are represented by complex, long sentences with numerous relative clauses, while in Professional Medical Discourse, there are more cases of medium and even simple sentences. Decline of syntactic simplicity can be also illustrated by the correlation between active and passive constructions, as there are more cases of passive sentences in academic articles than in medical reviews.

Qualitative data show a practically identical index for deep cohesion in both types of discourse. Additive conjunctions constitute the largest group in academic articles and medical reviews; however, in Academic Medical

Discourse, there are more examples of contractive, causative and sequential conjunctions that lead to a rise of complexity, because such linking words create more complex sentence structures with more implicit meanings that cause difficulty in text comprehension. At the same time, referential cohesion dominates in Professional Medical Discourse, as more cases of concept and idea repetitions, which contribute to better understanding, can be found there.

The index of lexical diversity highlights a slight drop in Professional Medical Discourse with the simultaneous growth of several concrete words that lead to a better text comprehension and overall reduction of complexity. The level of narration also reveals the increase of simplicity in Professional Medical Discourse compared to Academic Medical Discourse due to its triple percentage rise.

Further research perspectives in this field can be aimed at investigating other linguistic features of professional medical reviews, mainly their lexical and syntactic levels of organization.

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