

WUT: 2018
**IX International Conference “Word, Utterance, Text:
Cognitive, Pragmatic and Cultural Aspects”**

**EXPERIMENTAL RESEARCH OF PREPOSITIONAL SEMANTICS
AND PROTOTYPICAL SPATIAL SCENES**

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Abstract

The article presents the analysis of the possible ways to apply experimental methods and techniques to the study of prepositional semantics and the spatial scenes described by the meanings of spatial prepositions. Relying on the idea of polysemy of prepositions and the supposition that each of their meanings denotes a certain spatial scene, the author presents the results of the experimental study of the spatial meaning of the Russian preposition *na* and the corresponding prototypical spatial scene. The experiment was performed with the use of the completion method and involved Russian native speakers of two different age groups (18 – 24 and 45 – 65). The participants of the experiment had to complete a phrase by filling in the gap between two nouns with a suitable preposition. As a result the author found out the following features of the mental representations of spatial relations: the prototypical scene that is evoked by a certain meaning of the preposition can vary depending on the age and experience of the speaker; prototypical spatial scenes can change in course of time if there occur changes of geometric and functional parameters of the objects involved in spatial relations.

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Keywords: Preposition, meaning, spatial scene, prototypical scene.



1. Introduction

1.1. Experimental research in contemporary linguistic study of prepositional semantics

Contemporary linguistics has a wide range of techniques and methods of research among which experimental methods are of crucial importance. Almost any psycholinguistic study (Залевская, 2012) is characterized by the use of one or several of the following types of experiments: associative experiments, subjective definitions of word meanings, the method of semantic differential offered by Charles E. Osgood, the method of completion (it is when speakers are asked to complete a phrase or a sentence with one or several words, depending on the context), methods of indirect study of semantics, for example, detecting semantic distance, graded scaling, etc. The use of modern technologies, such as eye-tracking, fMRT, EEG and others, in experimental studies of mental and language representations of the different fragments of reality is also becoming increasingly popular. However, if the experimental methods, techniques and technologies mentioned above are used in the study of words and their semantics, they are mostly used in connection with notional words, while such semantically and functionally ambiguous lexical items as prepositions are often left beyond experimental research. Therefore, one of the goals of this research is to analyze the perspective of the use of experimental methods in the study of prepositional semantics.

1.2. Prepositions as language means of spatial relations' representation

In many languages prepositions are an important lexical means that shows spatial relations between objects of reality. Despite the fact that prepositions have been an object of intensive study for several decades already, their meanings and functions still present many unsolved questions, especially if their semantic and functional features are compared across different languages (Aric, 2010; Senft, 2017). The title of the book by Lin Lougheed 'the Great Preposition Mystery' (Lougheed, 1981) describes the situation with the study of prepositions more precisely than anything: they were a mystery more than three decades ago when the book was first published and they are still a mystery now. Needless to say, that Russian prepositions are not an exception.

A prepositional meaning can contain significant information which indicates a segment of the space in which an object is located. If, for example, we compare such Russian prepositional phrases as *книга на шкафу*, *книга в шкафу*, *книга под шкафом*, we will see that it is the preposition that differentiates the meanings of the phrases by indicating different space segments in each case and showing the type of relations between the two objects (*книга* and *шкаф*). Prepositions can also indicate the direction of the movement of an object and in a number of languages, just as in English, a preposition can be the only language means that shows direction in a sentence: *the boy went out of the room* and *the boy went into the room*, whereas in Russian two language means share the function of showing direction. These means are the preposition and the prefix of the verb: *мальчик вышел из комнаты* and *мальчик вошел в комнату*.

Speaking about prepositional semantics, many researchers agree that prepositions can be polysemous, having several distinct lexical meanings to denote relations between objects not only in different categories (space, time, cause-effect relations, part-whole relations, etc.), but also within one category, for instance, the category of space (Evans, 2010; 2013; Бороздина, 2013; Селиверстова, 2004). Besides, it is believed that the spatial meaning of a preposition is the one that gives rise to the development of non-spatial meanings of prepositions (Evans, 2010; 2013; Evans & Tyler, 2003; Gärdenfors, 2015).

Such diversity of points of view on the meanings of prepositions proves that prepositional semantics needs further study with the use of experimental methods which involve the participation of native speakers.

1.3. Prepositions, spatial scenes and their prototypes

Cognitive approach to the study of prepositions has thrown much light on the development of their meanings (Evans, 2010; 2013; Evans & Tyler, 2003), especially in the way which shows how prepositional meanings develop and transfer from spatial to non-spatial domains (Bennet, 1975; Gärdenfors, 2015). As a result of cognition and interaction with reality individuals conceptualize space in such a way that it is divided into segments which function as separate spatial scenes. It is supposed that a prepositional meaning corresponds to a separate spatial scene. Each spatial scene reflects a certain kind of relations between two objects and its mental representation is a concept. Afterwards the content of the spatial concept is transferred to non-spatial domains on the basis of similarity. Thus, cognitive-experiential approach offers a logical explanation of prepositional polysemy and the transference of their spatial meanings to non-spatial domains. Nevertheless, there are still unsolved tasks. We still need to find out which of the spatial meanings of polysemous prepositions is the basic one and, consequently, which of the spatial scenes expressed by its meaning is the prototypical one.

2. Problem Statement

The experimental research of prepositional semantics and the corresponding spatial scenes is essential for the development of a number of theoretical issues: the study of the connection between language and cognition, the role of language in mental processes, cognition and conceptualization of spatial entities in one language and across different languages; development of polysemy within prepositions and the evolution of prototypical spatial scenes in course of time.

Besides, of special interest are issues connected with the analysis of the ways individuals conceptualize space and spatial entities. One of the interesting questions here is the interdependence between the age of an individual, his/her experience and the content of spatial concepts, prototypical spatial scenes, in particular.

Another problem which needs investigation is the semantics of the Russian preposition *на* and the spatial scenes it reflects.

Finally, the existing experimental methods and techniques need to be adjusted to the study of prepositions. In this research it is the completion method that is modified for the analysis of language and mental representations of spatial relations.

3. Research Questions

The research is aimed at finding out answers to the following questions:

- if any of contemporary experimental methods and techniques used for the analyses of notional words can be applied to the study of prepositional semantics, the real spatial scenes they denote and the mental representations of the corresponding spatial relations;
- if the completion method is applicable to the study of prepositions and what results it can give regarding prepositional semantics and usage;
- if there is prototypical spatial scene for the given meaning of a preposition and the spatial relations it denotes;
- if prototypical spatial scenes are subjected to any changes in course of time and what are the causes if such changes occur;
- if there are any variations in the prototypical spatial scenes across different groups of speakers, such as different age groups.

4. Purpose of the Study

The study presents a brief description of the stages of the experimental research aimed at finding out the prototypical spatial scene which is connected with the spatial meaning of the Russian preposition *на*, which roughly corresponds to the English preposition *on* but has its own semantic and functional peculiarities. Special attention is given to the investigation of the mental representation of spatial relations expressed by the preposition *на* and its variations depending on the age of the speakers and their cognitive and life experience. Another goal of investigation is to see whether prototypical scenes can change over time and to find the reasons which cause the process. Finally, the general purpose of the study is to show that in spite of the complicated status prepositions should not be neglected in experimental research.

5. Research Methods

To achieve the goals mentioned above it is necessary to turn to the experiment which involves native Russian speakers. The chosen method is called the completion method which implies that the participants of the experiments should fill in the gaps in the phrase relying on the given context. Taking into consideration the fact that spatial prepositions usually express the relations between two objects (figure and ground) the participants of the experiment were given cards with two different Russian nouns in the nominative case (for example, *книга ... стол*) with a gap between them, which should be filled with a preposition so that as a result there was a grammatically correct word combination. The participants could change the word order and the case of the nouns. Each participant got 10 different cards with different pairs of nouns.

It was hypothesized that to complete the word combinations the participants of the experiment would choose the preposition which is most often used to express the spatial relations typical for the objects named by the given nouns. The participants were instructed to write down the first variant of the prepositional phrase which occurred to them.

The experiment consisted of two stages. On the first stage 36 native speakers of Russian aged from 18 to 24 (students of different departments of Kursk State University, Russia) participated in the experiment (Group 1). After the data received from Group 1 were analyzed there was another stage of the experiment in which 28 native Russian speakers aged from 45 to 65 (representatives of various professions and different social groups) took part (Group 2). The data received from the second group were analyzed and compared with the results of Group 1. The comparative analysis helped to find out whether there are any differences in the way individuals interpret the prototypical spatial scene denoted by the preposition *на*, depending upon their age.

6. Findings

The analysis of the experimental data demonstrates that in both the groups most of the coincidences in the prepositions used to connect the two offered nouns occurred in the case when the participants had to fill in the gap between the words *книга* and *стол*: 31 native Russian speakers of Group 1 (87%) and 25 individuals from Group 2 (92%) filled in the gap with the Russian spatial preposition *на*. In this type of spatial relations the first object, *книга*, was chosen as a figure and the second one, *стол*, functioned as a ground. Such results prompt a conclusion that this spatial scene can be considered as the prototypical one for the spatial meaning of the Russian preposition *на*.

As far as other pairs of nouns are concerned, the prepositions offered by the participants vary to a great degree. One of such variable cases was observed when the speakers had to fill in the gap between the words *книга* and

телевизор. The great variety of prepositions used to connect the two words was not only observed within one research group (especially Group 1). There was also a great difference between the results received from Group 1 and Group 2.

The analysis of prepositional phrases offered by the Russian speakers showed that they had some difficulty in establishing the type of spatial relations between the objects denoted by the nouns *книга* and *телевизор*. 2 individuals refused to give any variant of a preposition to be inserted in the gap between nouns. In addition, among those variants which were offered there were several grammatically incorrect ones. In several cases a non-spatial meaning of the preposition was used instead of a spatial one. Besides, several participants failed to use a suitable preposition to fill in the gap between the nouns and used a conjunction instead (see Table 01).

Table 01. The results of the experiment in Group 1

Prepositional Phrase	Number of Occurrences	Prepositional Phrase	Number of Occurrences
<i>книга на телевизоре</i>	2	<i>телевизор на книге</i>	1
<i>книга около телевизора</i>	4	<i>телевизор с книгой</i>	1
<i>книга о телевизоре</i>	2	<i>книга от телевизора</i>	1
<i>книга в телевизоре</i>	1	<i>книга к телевизору</i>	1
<i>книга за телевизором</i>	1	<i>телевизор по книге</i>	1
<i>книга рядом с телевизором</i>	3	<i>книга про телевизор</i>	1
<i>книга перед телевизором</i>	2	<i>книга без телевизора</i>	1
<i>книга под телевизором</i>	1	<i>книга вместо телевизора</i>	1
<i>книга над телевизором</i>	1	<i>телевизор без книги</i>	1
<i>книга у телевизора</i>	1	<i>телевизор за книгами</i>	1
<i>книга из телевизора</i>	1	<i>книга по телевизору</i>	1
<i>телевизор в книге</i>	1	<i>книга для телевизора</i>	1
<i>телевизор под книгой</i>	1	<i>книга и телевизор</i>	1

Such a variety of the prepositions used by the participants of Group 1 shows that in the mind of contemporary Russian speakers aged from 18 to 24 the spatial relation described by the prepositional phrase *книга на телевизоре* does not belong to the prototypical scene which is characteristic of the following spatial meaning of the Russian preposition *на*: «употребляется при выражении пространственных отношений при указании на предмет, на котором помещается, укрепляется какой-л. другой предмет» [http://slovonline.ru/slovar_efremova/b-14/id-47753/na.html] (the preposition is used to express spatial relations in which one object is placed or fixed on another one).

The results of the experiment look more convincing and understandable if we consider the idea that prepositions do not only express the information about the spatial position of one object in relation to the other but that they are also used to denote functional connections between the two objects. The preposition *на*, for example, shows that the surface of the first object (the ground) can function as a support for the second one (the figure) [Селиверстова, 2004]. It is obvious that the top surface of modern of TV-sets is not wide enough to function as a support for a book, for example. The Internet offers a picture which represents this situation in a funny way

[https://yandex.ru/images/] (see Figure 01). The logical conclusion here is that relying on the experience of cognition and interaction with reality, namely, the sphere of spatial relations, the speakers of a younger age (Group 1) do not consider the spatial scene described by the phrase *книга на телевизоре* as a possible prototype for the spatial meaning of the preposition *на*, because most of younger speakers do not conceptualize the TV-set as a three-dimensional object but as a two-dimensional one.

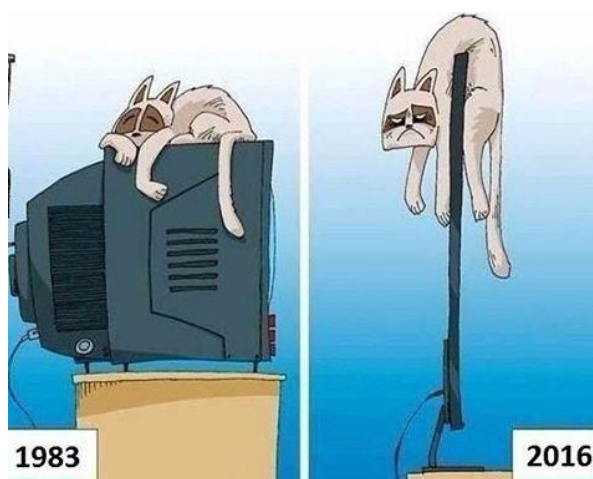


Figure 01. The evolution of typical spatial scenes

However, it is important to mention that quite different results were received from older Russian speakers (Group 2). A considerable number of individuals, that is 16 out of 28 (57%), joined the nouns *книга* and *телевизор* with the help of the preposition *на* (*книга на телевизоре*). Moreover, there was an obvious tendency among Group 2 participants: the older the participants were the more often they used *на* to describe the possible spatial relation between such entities as a book and a TV-set. Besides, in Group 2 there were much fewer variants of prepositions used to fill in the blank between the nouns (see Table 02). On the whole, Group 2 offered only 6 variants of prepositions, while Group 1 offered 26 variants.

Table 02. The results of the experiment in Group 2

Prepositional Phrase	Number of Occurrences	Prepositional Phrase	Number of Occurrences
<i>книга на телевизоре</i>	16	<i>книга перед телевизором</i>	1
<i>книга около телевизора</i>	5	<i>книга о телевизоре</i>	2
<i>книга рядом с телевизором</i>	3	<i>книга возле телевизора</i>	1

The results of the analysis of the experimental data show that the speakers of the second age group, having a different experience of cognition and interaction with reality, have a different view on the content of the prototypical spatial scene expressed by the meaning of the analyzed Russian preposition. In the mind of older Russian speakers there is a strong association with the previously popular models of TV-sets with a wide top surface which could function as a support for another object.

7. Conclusion

The present experimental research has brought us to a number of conclusions:

- the image of the prototypical spatial scene that is stored in the mind of the speaker and that is evoked by a certain meaning of a preposition can vary depending on the age of the speaker and, correspondingly, on his/her experience of cognition and interaction with the world;
- the spatial scene which is considered to be a prototypical one for this or that spatial meaning of a preposition can be substituted by another one in course of time if one of the objects involved in the spatial scene can no longer fulfil its function in relation with the other object (for example, if the object can no longer be a support for another object, such as the case for the Russian preposition *на*).

Moreover, the data received in this research give evidence in favour of a wider usage of experimental methods and techniques (the method of completion in particular) in the study of prepositions, especially those of the Russian language, and the spatial scenes they represent in the language and evoke in the mind.

Further research in this direction can be aimed at comparing the data received in the experimental study of spatial prepositions of other languages and the mental representations of prototypical spatial scenes stored in the mind of speakers of different languages.

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