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MODERN EMPIRICAL METHODS IN COGNITIVE LINGUISTICS RESEARCH

У статті аналізується проблема сучасних емпіричних методів, як істотного інструменту когнітивної лінгвістики для систематичного і точного аналізу даних досліджень; представлені рекомендації з використання методів в різноманітних трансгресивних дисциплінах з різними способами збору емпіричних даних.

Ключові слова: емпіричні методи, емпіричні дані, когнітивна лінгвістика, статистика.

В статье анализируется проблема современных эмпирических методов, как существенного инструмента когнитивной лингвистики для систематического и точного анализа данных исследований; представлены рекомендации по использованию методов в разнообразных трансгрессивных дисциплинах с разными способами сбора эмпирических данных.

Ключевые слова: эмпирические методы, эмпирические данные, когнитивная лингвистика, статистика.

The problem of modern empirical methods as an essential tool of cognitive linguistics for the systematic and rigorous analysis of the numerical data researchers is analyzed; the guidelines for employing methods from a variety of intersecting disciplines, laying out different ways of gathering empirical evidence is presented in the article.

Keywords: empirical methods, empirical evidence, cognitive linguistics, statistics.

Introduction. Cognitive Linguistics (CL) has been asking theoretical questions for a long time. Most have revolved around understanding how language fits in with everything else about us: the ways we are in our environments, the ways we feel, and the ways we imagine.

Although CL is fundamentally committed to the psychological reality of its theoretical constructs, much of this work is based purely on the linguistic intuitions of the theoreticians. However, there is a growing awareness that linguistic theory should be grounded in the observation of language usage, in experimental tests of its validity, and in general knowledge of cognitive function. Work in cognitive metaphor, cognitive grammar, psycholinguistics, discourse management, conceptual integration, and spatial cognition has produced tantalizing proposals about the conceptual underpinnings of human languages.

A major movement in cognitive linguistics has thus developed around the commitment to pursue empirical studies that might help substantiate its claims, and to develop a coherent account of the connection between language and cognition.

The Empirical Methods in Cognitive Linguistics (EMCL) workshops were conceptualized as a practical bridge between theoretical and empirical work. Because Cognitive Linguistics does not assume isolation for linguistic processes, most of the methods used to study cognition can potentially be adapted to investigating language. At the same time, language usage data, including co-speech gesture and signed languages, are sources of overt manifestations of cognitive processing, situated cognition, and social behavior. The potential for methodological cross-fertilization is already obvious in the broad range of methods in use. The latest International Cognitive Linguistics Conferences have yielded provocative offerings on everything from eye-tracking studies, to corpus analyses, to nonlinguistic behavioral studies, to computational modeling.

Goals. The aim of the article is to present the guidelines for employing methods from a variety of intersecting disciplines, laying out different ways of gathering empirical evidence for claims originally motivated by theoretical considerations or by a particular set of data.

Much modern research in second-language acquisition (R. Rueda, D. August, C. Goldenberg, J. Plass, D. Chun, R. Mayer, D. Leutner and others) has taken a cognitive approach [1]. Cognitive research is concerned with the mental processes involved in language acquisition, and how they can explain the nature of learners' language knowledge. This area of research is based in the more general area of cognitive science, and uses many concepts and models used in more general cognitive theories of learning. As such, cognitive theories view second-language acquisition as a special case of more general learning mechanisms in the brain. This puts them in direct contrast with linguistic theories, which posit that language acquisition uses a unique process different from other types of learning.

Cognitive approaches, including Functional linguistics (T. Bates, B. MacWhinney and others), Emergentism (J. Elman, B. MacWhinney and others), Cognitive linguistics (R. Langacker, D. Ungerer, R. Schmid and others), and Constructivist child language researchers (P. Brooks, C. Slobin, M. Tomasello and others), view the linguistic sign as a set of mappings between phonological forms and conceptual meanings or communicative intentions [3, c. 4-28]. They hold that simple associative learning mechanisms operating in and across the human systems for perception, motor-action and cognition as they are exposed to language data as part of a communicatively-rich human social environment by an organism eager to exploit the functionality of language are what drives the emergence of complex language representations.

As an academic discipline one of the main goals of Linguistics is to study patterns and regularities of languages around the world, such as phonological structures and grammatical constructions like markers for tense, gender, or number, definite and indefinite articles, relative clauses, case marking of grammatical roles, and so on. Psychology, on the other hand, studies people's behavior, motivation, perception, performance, cognition, attention, and so on.

Over the last century, the academic fields of linguistics and psychology have developed following rather different paths (G. Heiman, G. Helmstadter, S. Jurs, M. Sabourin, W. Wiersma et al.). Linguistics, by seeing its subject matter as existing at the level of structures of languages – beyond individuals themselves – gathered knowledge mainly through the careful and detailed analysis of phonological and grammatical patterns, by means of what philosophers of science and epistemologists call the method of reasoning [6; 11]. Psychology, on the other hand, by marking its

definitive separation from Philosophy during the second half of the 19th Century, defined its subject matter at the level of the individual and embraced a method of knowledge-gathering which had been proved useful in the hard sciences: the experimental method. Ever since, peoples' behavior, performance, and mental activity began to be studied with rigorously controlled experimental methods of observation and data gathering.

An essential tool of the modern experimental method is Statistics (G. Heiman, D. Hinkle, J. Jurs, W. Wiersma, R. Witte, J. Witte), especially inferential statistics, which is a carefully conceived mathematically-based conceptual apparatus for the systematic and rigorous analysis of the numerical data researchers get from their measurements [5; 13].

One important difference between linguistics and psychology has to do with the question of what counts as empirical evidence for falsifying or supporting a given theoretical claim. What is a well-defined valid piece of information that can be safely incorporated into the body of knowledge in the field? What counts as an acceptable method for obtaining such a piece of information? When can that piece of evidence serve as a robust counterargument for an existing argument? These are questions for which linguistics and psychology traditionally have had different answers. For example, if some theory in linguistics states that the plural marker in language X is provided by a marker *x*, then if through your detailed observations of the language you find a counterexample where the plural marker is not *x* but *y* (i.e., well-accepted linguistic expressions that do not fit the proposed pattern) you can, with that very piece of information, falsify the proposed theoretical statement. In such a case you would be making a contribution to the theory after which the body of knowledge would be modified to become something like the regular plural marker in language X is provided by a marker *x*, but there are some irregular cases such as *y*.

The same would happen if some linguistic theory describes some grammatical pattern to be generated by a rule A, but then you observe that if you apply such a rule to some sentences you actually generate *ungrammatical* ones (which linguists usually write down prefacing it with an asterisk). Again, by showing these ungrammatical sentences you would be providing linguistic *evidence* against a proposed theoretical statement. You would be falsifying that part of the theory and you would be de facto engaging in a logical counter-argumentation, which ultimately would lead to the development of a richer and more robust body of knowledge in that field.

The situation in psychology is quite different. Because the subject matter of psychology is not defined at the level of the abstract structure of a language as linguistics does, but defined at the level of peoples' behavior (often used to infer people's cognitive mechanisms), performance or production, the elements that will allow you to falsify or support a theoretical statement will be composed of empirical data observed at the level of peoples' behavior or performance. For instance in order to falsify or support a theoretical statement such as

English speaking children have difficulties learning irregular forms of the plural you would have to generate a series of studies that would provide empirical data (i.e., via observation of real children), supporting or challenging the original statement. Moreover, you would have to make several methodological decisions about how to test the statement, as well as how exactly to carry out your experiments. For example, because you will not be able to test the entire population of all English speaking children in the world (much less those not yet born!), you will have to choose an appropriate sample of people who would represent the entire population of English speaking children (i.e., you would be working only with a subset from that population). And you will have to operationalize terms such as «difficulties» and «learning» so it is unequivocally clear how you are going to measure them in the context of your experiment. And because it is highly unlikely that all individuals in your sample are going to behave in exactly the same manner, you will need to decide how to deal with that variability, and how to characterize in some general but precise sense what is going to be considered a «representative» behavior for your sample (i.e., how to establish a proper measure of central tendency), how to describe the degree of similarity of children's behavior, how to objectively estimate the error involved in any measurement and sampling procedure, and so on. Within the realm of the experimental method all these decisions and procedures are done with systematic and rigorous rules and techniques provided by statistical tools.

The moral here is that linguistics and psychology, for historical and methodological reasons, have developed different ways to deal with the question of how you gain knowledge and build theories, how you falsify (or support) hypotheses, how you decide what counts as evidence, and so on. Where the relatively new field of cognitive linguistics is concerned, which gathers linguists and cognitive psychologists (usually trained within the framework of the experimental method), it is very important to:

- a) keep in mind the nature and the implications of these methodological differences, and
- b) understand the complementarity of the two methods of knowledge-gathering as practiced in linguistics and experimental psychology.

Cognitive linguistics, emerging out of linguistics proper, and initially in reaction to mainstream Chomskian-oriented approaches, has made important contributions to the study of human language and its cognitive underpinnings. This new field, however, relying mainly on linguistic methods of evidence gathering has made claims not only about languages, but also about the psychological reality of peoples' cognition. For example, an important subfield of cognitive linguistics, conceptual metaphor theory, has, for the last twenty-five years or so, described and analyzed in detail thousands of metaphorical expressions such as *the teacher was quite cold with us today and send her my warm hellos* [8, c. 9]. The inferential structure of these collections of linguistic expressions has been modeled by theoretical constructs called conceptual metaphors, which map the elements of a source domain (corresponding in the above examples to the thermic bodily experience of Warmth) into a more abstract one in the target domain (in this case, Affection). The inferential structure of the metaphorical expressions mentioned above (and many more) is thus modeled by a single conceptual metaphor: Affection Is Warmth.

But beyond the linguistic description, classification, and analysis of linguistic expressions using methods in linguistics proper, conceptual metaphor theory has made important claims about human cognition, abstraction, and mental phenomena. For instance, it has claimed that conceptual metaphors are ordinary inference-preserving cognitive mecha-

nisms. These claims, however, are no longer at the level of linguistic data or the structure of languages, but at the level of individuals' cognition, behavior, and performance. Because of this, many psychologists believe that giving a list of (linguistic) metaphorical expressions as examples does not provide evidence (in cognitive and psychological terms) that people actually think metaphorically. In other words, what may count as linguistic evidence of metaphoricity in a collection of sentences for linguists may not count as evidence for psychologists that metaphor is an actual cognitive mechanism in peoples' minds. It is at this point where some psychologists react and question the lack of empirical «evidence» to support the psychological reality of conceptual metaphor (G. Murphy, R. Gibbs et al.) [4; 10, с.99-108]. Moreover, how do we know that some of the metaphors we observe in linguistic expressions are not mere «dead metaphors,» expressions that were metaphorical in the past but which have become «lexicalized» in current language such that they no longer have any metaphorical meaning for today's users? How do we know that these metaphors are indeed the actual result of real-time cognitive activity? And how can we find the answers to such questions? These are reasonable and genuine questions, which from the point of view of experimental psychology, need to be addressed empirically.

Cognitive linguistics, which is part of cognitive science – the multidisciplinary scientific study of the mind – is located at the crossroads of linguistics and cognitive psychology and as such, has inherited a bit of both traditions. It is therefore crucial for this field that the search for evidence and knowledge be done in a complementary and fruitful way.

The dominant model in cognitive approaches to second-language acquisition, and indeed in all second-language acquisition research, is the computational model [2]. The computational model involves three stages. In the first stage, learners retain certain features of the language input in short-term memory. Then, learners convert some of this intake into second-language knowledge, which is stored in long-term memory. Finally, learners use this second-language knowledge to produce spoken output. Cognitive theories attempt to codify both the nature of the mental representations of intake and language knowledge, and the mental processes which underlie these stages.

Other cognitive approaches have looked at learners' speech production, particularly learners' speech planning and communication strategies. Speech planning can have an effect on learners' spoken output, and research in this area has focused on how planning affects three aspects of speech: complexity, accuracy, and fluency. Of these three, planning effects on fluency has had the most research attention. Communication strategies are conscious strategies that learners employ to get around any instances of communication breakdown they may experience. Their effect on second-language acquisition is unclear, with some researchers claiming they help it, and others claiming the opposite [12].

The cognitivists are convinced that learning depends upon perception and insight formation. They feel that all learning is in the nature of problem solving. The learner tries to solve new problem on the basis of previous learning. If language learning is explained purely in terms of imitation, it should not be possible for a child to produce any occurrences, which he has not heard before (which are not part of the input). Indeed, children constantly surprise their parents by producing occurrences, which have not been heard by them before. Even the behaviorists have to accept this phenomenon and they try to account for it. The explanation offered by them was that a child is able to produce new occurrences through the process of substitution.

Summary. According to the Cognitivists, even a very limited amount of language data may be sufficient to reveal the underlying rules, and once the rule is known, it can be used or applied to produce an infinite number of sentences. The Cognitivists, tend to look at only that part of the language, where general rules apply, because for them language learning is the process whereby the rules of language are discovered and internalized. Progress in cognitive linguistics is achieved through the production of consecutive steps in (1) theoretical cognitive linguistics, which serves to generate hypotheses, followed by (2) empirical observations in experimental psychology meant to test those hypotheses. Experimental psychology thus has the last word as far as empirical cognitive linguistics is concerned.

The process of gathering knowledge in cognitive linguistics is, of course, open for new developments not only in linguistics and psychology, but in neuroscience and other new neighboring fields, as well. It is through the ongoing process of mutual feeding that genuine knowledge gathering is perpetuated.

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