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A Narrative Review of Studies on the Syntax-Lexical Semantics Interface: With Special Reference to the Chinese Language

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Abstract: In microlinguistics, the syntax-lexical semantics interface is a key research area that focuses on the interaction between the lexical properties of predicates and the related syntactic structures. This paper provides an overview of the main studies in the area published internationally in the past four decades, categorizing them into three major groups of approaches (the Projectionist, the Constructionist, and the interactive). It also offers a critical reflection on the field and provides suggestions for future research. Two recent trends of research are highlighted: (1) empirical research with evidence from neurocognitive experiments; (2) emphasis shifting from the first language (L1) to second language (L2) acquisition with an eye on linguistic typology and special interest in Chinese, a language of typological significance. We hold that the Projectionist theory or approach could be used to explain the syntactic differences among verbs whereas the Constructionist may be more suitable for explaining the realization of different argument structures of the same verb. The recent interactive and dynamic approach to the syntax-lexical semantics interface seems to have the strongest explanatory power, which is supported by an increasing body of neurocognitive evidence. Further interdisciplinary research from such perspectives as linguistic typology, cognitive psychology and neurocognitive science may be instrumental in solving important issues including Baker's Paradox and cross-linguistic variation regularities of verb lexicalization.

Keywords: Syntax-Lexical Semantics Interface, Predicate, Syntactic Structure, Lexical Semantics

1. Introduction

As pivotal features of human language, syntax refers to rules for combining words or elements while lexical semantics concerns word meaning and the manner in which words mediate between our concepts and linguistic form. The interaction between syntax and lexical semantics has attracted much scholarly attention. The syntax-lexical semantics interface is mainly about the question of whether and how the lexical properties of predicates correlate with the syntactic structures in which they appear. It focuses on which semantic elements of verbs are related to the syntactic structures and how these elements can be separated, represented and classified to find the regularities or rules governing the interface.

The history of research on syntax-lexical semantics interface can be traced back to Fillmore [1] and Carter [2]. Fillmore [1] found the syntactic difference between the English words *hit* and *break* was the causative alternation and such difference was caused by the nuance of lexical meaning. Such a decisive role lexical meaning plays in sentence structure was called "linking" (of arguments) by Carter [2]. The two pioneering studies aroused the interest of many scholars in the syntax-lexical semantics interface. The significance of this research area is twofold. Theoretically, it may help to solve Plato's Problem, the Learnability Problem — a strong correlation between meaning and structure might explain the rapidity of language acquisition: children need not learn syntactic structures of verbs on an item-by-item basis, but rather, make generalizations on the basis of the

regular correlation [3]. Practically this research area may offer beneficial insights for such disciplines as applied linguistics and lexicography.

Since an ocean of literature has accumulated in this research area, an exhaustive review is beyond us. This paper aimed to classify the related representative studies into three different groups, critically analyze two recent trends and the main Chinese studies in this field, and tentatively propose some directions or implications for future research.

2. Major Approaches to the Syntax-Lexical Semantics Interface

Different theories approach the relationship between syntax and lexical semantics in different ways. Three major groups of approaches to the syntax-lexical semantics interface have formed in the past four decades: the Projectionist, the Constructionist and the (bidirectional) interactive. The first argues that it is lexical semantics that determines syntax, the second holds that it is the syntax that determines the lexical semantics, and the last thinks there exists an interaction between lexical semantics and syntax.

The first group, the Projectionist, has the longest history. It adopts the traditional approach of mapping from lexical semantics to syntax. Studies of this group can be classified into different subgroups according to which semantic elements determine the syntactic structure [4]. The most dominant subgroup is based on semantic roles, the elements in the conceptual framework of verbs. Semantic role [5] is also called thematic relation by Gruber [6] and Jackendoff [7, 8], semantic case by Fillmore [1], theta-grid by Stowell [9], and participant role by Cruse [10]. Furthermore, another subgroup centers around predicate decomposition. Representative studies are Thematic Relations Hypothesis by Jackendoff [11] and Aspectual Interface Hypothesis by Tenny [12].

In addition, according to the manner in which the semantic elements are represented or the mapping is realized, the Projectionist can be divided into several subgroups [4]. Fillmore [13] and Chomsky [14] proposed one-to-one mapping from lexical semantics and syntax, arguing that one argument could match and fulfill only one semantic role. But Gruber [6], Huddleston [15], Jackendoff [7], Starosta [16] and Dowty [17] proved the existence of many-to-one mapping. Concerning the universality of mapping, Perlmutter and Postal [18] put forward the Universal Alignment Hypothesis while Rosen [19] argued for verb-specific mapping embodied in his Little Alignment Hypothesis., Anderson [20], Baker [21] and Levin and Hovav [22] alleged that the mapping was direct. But later some argued for mediated mapping which could be further divided into two types. One is based on a grading system (especially a thematic role hierarchy) and the other an intermediate role [4]. The former was supported by Jackendoff [7], Givon [23], Kiparsky [24], Larson [25, 26], Levin and Hovav [27] and Carter [28] etc. The latter was related to the prototypicality of semantic roles and advocated by Foley and Van Valin [29] (Role and Reference Grammar) and Dowty

[17].

The second group, the Constructionist, has developed for about two decades. It has a new approach to mapping from syntax to lexical semantics. Construction is a relatively fixed pairing of meaning and form. The representatives are Goldberg [30], Langacker [31, 32] and Croft [33, 34] etc. The main advocate Goldberg [30] acknowledges that the Projectionist approach is convincing in explaining the typical syntactic phenomena of verbs, but not powerful when addressing the special ones. The Projectionist approach turns out to be uneconomical because various lexical senses are often needed for different argument structures and that sometimes results in redundancy. Goldberg [30] argues for the merging of the participant roles of verbs and the argument roles of the construction, and the merging complies with two principles: the Semantic Coherence Principle and the Correspondence Principle. Another (radical) constructionist Croft [33] proposed the Causal Relation Hypothesis and the clausal meta-construction.

The last group, the (bidirectional) interactive, began to grow only recently. With a combinatory view, it acknowledges both the influence of lexical semantics on syntax and that of syntax on lexical semantics. Hokes, Stowe and Doedens [35], Osterhout, McLaughlin, Kim, Greenwald and Inoue [36], Van Herten, Kolk and Chiwilla [37], Kim and Osterhout [38], Kuperberg, Kreher, Sitnikova, Caplan and Holcomb [39], Friederici and Weissenborn [40], Shen [41], Liu [4] and many others support this viewpoint. Liu [4] advanced a three-level interactive model. In his model, the interaction between lexical semantics and lexical grammar determines syntactic components, the interaction between words determines syntactic structures, and the interaction between absolute syntactic structures (i.e. constructions) and temporary syntactic combinations testifies and coerces the legitimacy of temporary syntactic combinations.

In summary, the Projectionist theory or approach is very suitable for explaining the syntactic differences among verbs and the Constructionist fits the realization of different argument structures of one verb. So the former can be called the external approach and the latter the internal one. But an interactive and dynamic approach is more persuasive and plausible for two reasons. First and foremost, it combines the advantages of the other two. Furthermore, the (dynamic) interaction between syntax and lexical semantics is supported by more and more neurocognitive evidence in recent years.

3. Recent Trends of Research on the Syntax-Lexical Semantics Interface

3.1. Empirical Research with Evidence from Neurocognitive Experiments

In recent years, a vast body of neurocognitive experiments provided evidence for the syntax-lexical semantics interface. In an ERP study, Kutas and Hillyard [42] discovered that semantic incongruity elicited an obvious brain potential, N400. Later P600 was found to be related to syntactic anomaly. The

coexistence of semantic incongruity and syntactic anomaly elicited both N400 and P600, but of a much smaller amplitude. That proved the existence of an interaction between semantics and syntax. The fact that semantic incongruity also elicited P600 [35, 37-39] further proved the interaction between the two, but the real nature of P600 is still a matter of considerable debate [43, 44]. Osterhout, McLaughlin, Kim, Greenwald and Inoue [36] claimed that there was a tipping point between the nerve tracts of syntactic processing and those of semantic processing, and the more powerful tracts of the two types would determine sentence comprehension. Friederici and Weissenborn [40] established a tertiary model highlighting the interaction between syntax and semantics.

Brain imaging technology like fMRI also appears to be a very promising research method to explore the interaction of semantic and syntactic processing, where the hemodynamic activity can be clearly observed [45, 46].

Liu [4] did behavioral experiments on the thematic hierarchy of the Chinese word *chi* (eat), and the result was further proved by evidence from his ERP study [47].

In light of many neurocognitive findings, researchers claim that the relation between semantics and syntax is not invariable: on one hand, syntactic processing might guide semantic processing, on the other hand, semantic processing might direct syntactic processing [48].

3.2. Emphasis Shifting from L1 Acquisition to L2 Acquisition with a Focus on Linguistic Typology

In the area of first language acquisition, linguists have not reached an agreement about how children manage to acquire the argument structure alternation so quickly and successfully — Baker's Paradox, an important part of the Learnability Problem. Baker [49] and Fodor [50] supported "lexical conservatism" and thought children were very careful in learning to avoid alternation mistakes. But Mazurkewich and White [51], Pinker [52] and others used children's overgeneralization to disprove the lexical conservatism. Furthermore, Pinker [52, 53] and Grimshaw [54] supported semantic bootstrapping while Landau and Gleitman [55], Naigles [56], Fisher, Hall, Rakowitz and Gleitman [57] did behavioral experiments to argue for syntactic bootstrapping. Goldberg, Casenhiser and Sethuraman [58] investigated the corpus CHILDES and found that there was always a prototypical verb for each construction in learning, which is in line with Tomasello's idea [59].

In the recent two decades, the syntax-lexical semantics interface has been studied in the area of second language acquisition in combination with linguistic typology. Lexicalization is an important term here which means the mapping process from the semantic components of a word to the lexical form. According to linguistic typology, the lexicalization differences among languages are systematic [60, 61]. Such differences would influence the interlanguage and L2 learners would have to reset the lexicalization parameters. Researchers made various studies covering topics like argument alternation, resetting of lexicalization parameters, acquisition of narrow-scope rules and the relationship

between thematic roles and argument realization etc. They were White [62], Sorace [63, 64], Inagaki [65, 66] and Montrul [67] etc, involving EFL learners of different native languages. Special attention has also been paid to the acquisition of verb-argument constructions (VACs) adopting the methods of corpus [68, 69], experiments [70] and a combination of the two [71]. However, few important studies were made on foreign language learners of China except those by Juffs [72, 73].

4. Main Studies on the Chinese Syntax-Lexical Semantics Interface

The syntax-lexical semantics interface has aroused the interest of Chinese scholars. Early Chinese linguists classified semantic roles on the basis of Chinese characteristics. Lv [74] proposed twelve semantic roles, Ding and Lv [75] eight, Deng [76] nine and Tang [77] twelve. There are different classifications and controversies still exist.

Concerning the manner of mapping, Tao [78] proposed Emergent Argument Structure Hypothesis. He did diachronic research on the Chinese word *chi* (eat) and argued that the relationship between the conceptual structure and argument realization was dynamic. Furthermore, Hu and Tao [79] proved the low transitivity features of the Chinese verb *nong*. These studies provided Chinese evidence for the viewpoint of Hopper [80] and Thompson and Hopper [81].

Yuan [82], Shen [83] and Lu [84] studied how verb meaning determined sentence structure in Chinese. Tsai [85] argued that syntax-semantics mapping was cyclic and closely aligned with syntactic predication and provided a principled account of an asymmetry between Chinese declarative and modal constructions with respect to their subject specificity. Zhan [86] discussed the relationship between argument structure and variation in sentence patterns. Cheng [87] took into account the conceptual framework of clauses when studying argument structure. An obvious recent trend is that Chinese researchers becoming enthusiastic about cognitive linguistics and Construction Grammar. Some special constructions in Chinese have been investigated. Yu and Jiang [88] and Li [89] did research on BA construction. Yang, Cai, Xie and Jiang [90] examined the processing mechanism of Qing construction. Many others conducted contrastive studies between English and Chinese in relation to the syntax-lexical semantics interface, like Yang [91] and Guo [92]. It is generally acknowledged that English verbs and Chinese verbs have different coding schemes of semantic embodiment. The main reason for such difference is the English people and the Chinese people have different perspectives on the same event (especially the event structure). The former tends to appeal to summary scanning while the latter is the combination of serial scanning and summary scanning.

Scholars represented by Shen [41], Liu [4], Sun and Shi [93] argued for a bidirectional interaction between syntax and lexical semantics. As mentioned in the first part, Liu [4] set up a three-level interactive model.

An important topic that aroused heated discussion among Chinese researchers is the non-patient object, a very special phenomenon in Chinese. Guo [94] studied the locative object, Feng [95] and Chen [96] investigated the tool object, Liu and Liu [97], Wang [98] and Yang [99] also analyzed the non-patient object from the perspectives of decategorization, cognitive motivation, pragmatics or parameter analysis [4]. As mentioned in the second part of the paper, Liu, Zhang, Cao and Wen [47] conducted an ERP study on the thematic hierarchy of the Chinese word *chi* (eat) and proved it to be instrument > locative > source > means > patient. To the best of our knowledge, this may be the first neurocognitive study of its kind. Chinese is of typological significance since most of the research on syntax-lexical semantics interface is based on English, so it deserves more attention.

5. Conclusions and Implications for Future Research

We first presented a classification of the representative studies in this field, and then analyzed the two recent trends and the major studies in China. Arguably, an interactive and dynamic approach to the syntax-lexical semantics interface may have greater explanatory power than the Projectionist or the Constructionist. Challenges or gaps in this field have been shown. Among them, at least three are key problems: Baker's Paradox, the cross-linguistic variation regularities of verb lexicalization and the nature of the controversial brain potential P600. To resolve the remaining issues, researchers should make use of the latest findings in related disciplines. Interdisciplinary work is necessary.

There are at least three implications for future research, which also mean challenges and opportunities awaiting scholars in this field.

First, further research should be conducted from the linguistic typological perspective. Most of the current studies are about English and more evidence from other languages is needed as far as the foreign language and the native language are concerned. Examinations on a larger scope of languages will enable us to see the regularities of verb variation. Such tools as semantic maps, especially those covering Chinese, are useful for deepening our understanding of Baker's Paradox but are still not sufficiently employed.

Second, further studies should be carried out in combination with cognitive psychology and neurocognitive science. Only by exploring the biological mechanism of human mind can we get closer to the nature of the syntax-lexical semantics interface, including the brain potential P600. Except ERP, techniques like fMRI, EEG and MEG etc., can also be applied more to examine subjects of different languages. In this sense, more investigations can be made among EFL learners in China since it has the largest number of learners of English, the most widely used language in the world.

Last, more macroscopic research should be carried out in combination with recent findings in formal semantics, corpus linguistics and computational linguistics to handle large-scale data efficiently and avoid subjectivity in research. Any breakthrough in such fields, like semantic annotation, is beneficial.

To sum up, an interdisciplinary methodology is likely to be the only solution. Only by the joint efforts of linguists, psychologists, neurocognitive scientists and scholars from other sciences could we ultimately discover all the truth about this area.

Acknowledgements

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