Original Paper

A Systematic Review of Research on Syntactic Priming: Focus on Research by Chinese Scholars from 2008 to 2020

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Abstract

Syntactic priming, recognized as a fundamental phenomenon, plays a pivotal role in enhancing learners' ability to produce target structures. A bibliometric review and analysis of domestic syntactic priming research conducted over the past fifteen years has revealed three salient characteristics: a) intra-linguistic research and factors that might affect the priming effects are the most common themes for scholars to investigate; b) more scholars attempt to get further research combining syntactic priming with other theories in SLA or psycholinguistics; c) The research participants and syntactic structures are limited, and thus need expansion in future's research.

Keywords

syntactic priming, syntactic representation, double-object structure, language proficiency

1. Introduction

In the past few decades, a striking form of repetition had been revealed by linguists. This kind of repetition is a core concept in syntactic priming (Pickering & Ferreira, 2008). Researchers have identified the phenomenon of structural priming in everyday communication (Levelt & Kelter 1982). Syntactic priming, also known as structural priming, refers to the tendency of people to be influenced by the structure of sentences they have been exposed to in everyday language communication, and thus to adopt the same syntactic structure in subsequent utterances (Bock, 1986). The occurrence of priming is automatic and subconscious. The syntactic structure that has been previously understood and generated is called the prime sentence, while the subsequent output sentence under the influence of the prime sentence is called target sentence (Biria et al., 2010). For example, if the prime sentence includes a double-object syntactic structure like in (1)a, it is a higher possibility of the participants to increase the chance of producing a target sentence with the same syntactic structure like (1)b.

(1) a. A fan sent the singer a card.

    b. Lily bought Sarah a pen.

Research on structural priming was initially focused on the field of language production (Bock, 1986; Bock & Loebell, 1990). These studies suggest that structural priming in language output is essentially a syntactic priming that is rooted in the syntactic representations shared by the priming and target sentences. During language production, once the syntactic representation of the priming sentence is activated, it would impose an immediate effect on the structure of the target sentence.

For more than a decade, a growing number of empirical studies have been conducted to explore the mechanism of structure initiation. Among these studies, there is no shortage of domestic scholars who have studied various aspects of syntactic priming (Ren, 2011; Jiang, 2012; Zhao, 2014; Feng & Gao, 2020). Syntactic structures like passive voice, dative and transitive sentence, embedded wh-questions (e.g., I wonder what she is reading.) are being conducted in these studies to see whether syntactic priming could facilitate learners' language production. The current research sets out to analyze and critically review the syntactic priming research by Chinese scholars, clarifies their characteristics, and conclude the trend for this kind of study.

2. Foci of Syntactic Priming and Representation of Syntax

2.1 The Major Research of Syntactic Priming

Though Bock (1986) had laid the foundation on syntactic priming, there's no consensus on participants' performance when they have a choice between alternative structures. Whether priming occurs when a speaker hears and repeats a syntactic structure or when a speaker only hears a syntactic structure remaining discussion. McDonough (2006) concluded two types of speculations after summarizing several studies. The first speculation was that priming occurs when a speaker hears and repeats a syntactic structure, which was also called production priming. The other one was that priming occurs when a speaker only hears a syntactic structure, that is to say, comprehension priming. Examples from McDonough illustrated that syntactic priming happened when the speaker was previously produced or listened to a specific language structure. Nonnative speakers of English were asked to finish a picture description and matching activity. When they had pictures that illustrated dative verbs (2a), they were more likely to produce a double-object dative when describing another image (2b). Speakers could choose to use either a prepositional dative (2c) or a double-object dative. Because of the existence of syntactic priming, they might unconsciously choose the same structure that they've heard or learned previously.

(2) a. A boy is pouring a girl some juice.   double-object

    b. A man is serving a girl an ice cream.   double-object

    c. We give candy to children.   prepositional dative

In McDonough's study, he set up two experiments to testify two research questions. The first one is when does the priming occurs. The second one is whether syntactic priming could facilitate learners' use of the target structure. Together these results from the two experiments provide essential insights into the occurrence of syntactic priming during dyadic interaction (Branigan, Pickering, & Cleland, 2000). Moreover, results show that more syntactic priming would occur for prepositional datives but not for the double-object ones. Although the research above has been carried out on the priming effect between prepositional datives and the double-object ones, few empirical investigations of the priming effect on other syntactic structures have been investigated. The mechanism by which whether syntactic priming facilitates L2 development has not been established, which still needs further investigation. More scholars (Chang, Dell, Bock, & Griffin, 2000; Dotan et al., 2021; Xia & Wang, 2017) begin to conduct additional priming research on different syntactic structures like active and passive sentences, embedded wh-questions.

2.2 Syntactic Representation and Mappings

How to explain the syntactic representation? Two points of view have been a core question to be concerned (Pickering & Ferreira, 2008). The first one is the functionalist. The one-to-one principle proposed by Anderson (1984) argued that a specific linguistic form merely has one meaning corresponding to it. Different syntactic elements can map into diverse functions, with each component corresponds to multiple mappings (MacWhinney, 1984), that is, the form-function mappings defined by MacWhinney. Based on the Competition Model (Bates & MacWhinney, 1981), language learning was seen as input-driven associative learning, with the form-function mappings as its basic theoretical structure. In terms of functionalist, syntactic knowledge is derived from other forms of language, especially the perception of utterances (named cues). The input contains several cues, referring to some linguistic targets or usages (Cai & Su, 2019). The form serves as a cue of activating functions during language comprehension, and competition exists within different linguistic cues.

The Competition Model was initially used to explain the process of a sentence or syntactic phenomenon in first language acquisition. An explanation for priming that is compatible with functionalist is that when a speaker hears and repeats a particular sentence, they will pay more attention to the most prominent entity. When speakers are exposed to prime sentences of passive voice with picture description as task type, the most outstanding objects might be mentioned first. This may lead to speakers' focusing on saying those prominent elements first. For example, the picture shows a burning building as the most outstanding object, and the speaker might describe it with any kind of syntactic structure like the building is burning. They might use passive voice or double-object sentences to describe the picture. They might pay more attention to describing the object in the picture but not use a specific syntactic structure to describe it. It is utterly incompatible with syntactic priming's characteristic of independence. Scholars soon rejected this view.

As for the second point of view, scholars (Bock, 1987) argued the relationship between implicit learning and syntactic priming. Most of these experiments examined "intralingual" priming, i.e., the influence of the presentation of a previous sentence pattern on the tendency to select a subsequent sentence pattern under the same linguistic conditions. The fundamental characteristic of the priming effect is "unconscious and implicit processing", which is not perceived and artificially controlled without the involvement of conscious and explicit activities (Xu & Gao, 2008). Moreover, implicit processing and explicit processing coexist, and the implicit ones would not be affected by explicit processing. Therefore, they are relatively independent (Tulving, 1995). Therefore, most scholars researched priming would separate the two processing ways from implicit and explicit. Research on implicit processing and explicit processing was commonly conducted in the last decade.

Messenger (2021) demonstrated that syntactic structures provide rules for mapping the conceptual item of an event to the structure ones of a sentence. According to his explanation, though these rules are abstract and cannot be understood independently, the combination of each lexical element could make them into a whole sentence so that the speaker could comprehend and produce. For example, different syntactic structures like active voice, passive voice, or double-object dative. Syntactic representation would specify the rules and divide them into several participant roles like agent and patient. These participant roles would map into different syntactic elements. Various elements in other orders would have different syntactic elements like subject, verb, direct object, etc. All these mappings make syntactic priming possible.

(3) a. The cake was made by him.

      S[patient]   O[agent]

    b. He made a cake.

    S[agent]   O[patient]

    c. He   sent   me   a   card.

    Subject   verb   indirect object   article   direct object

A meta-analysis had been adopted by Mahowald et al. (2016) verified that the syntactic priming effect critically demonstrates the existence of mental representations of linguistic structure among speakers. However, Previous studies have not figured out the factors that might affect the priming effect. To date, more and more research (Dotan et al., 2020; Feng & Gao, 2020) on syntactic priming gradually focuses on what factors would affect the syntactic priming effect and the duration of the syntactic priming effect.

3. Collection and Analysis of Domestic Empirical Studies

Since the last century, psycholinguists and more interdisciplinary linguists were started to research syntactic priming. Most of their studies were about the analysis of the theoretical model, syntactic structure, implicit learning, working memory, and so on. In contrast, little research was about the

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factors that might affect the priming effects. Little of them could pinpoint the main factors on it. In the last few years, an increasing number of domestic scholars have conducted several studies on syntactic priming. According to the above generalization of syntactic priming, we are now turning to analyze the domestic empirical studies in the last fifteen years. Fifteen relevant papers from CSSCI are collected and categorized. A brief generation and categorization among the eight of them are shown in Table 1. Our research questions are as followed.

What are the main research themes in domestic empirical research on syntactic priming?

What factors might affect the syntactic priming effect most according to these studies?

What are the trends of future research directions for syntactic priming?

Table 1. Generalization and Categorization of Empirical Research by Chinese Scholars from CNKI

	Author	Year	Key questions	Variables	Techniques	Conclusion	Limitations
Dissociation of implicit and explicit processing in cross-language syntactic priming	Xu Hao, Gao Caifeng	2008	Cross-language syntactic priming effect; implicit processing	Grade; whether priming effects are observed; the order of main clause and subordinate clause	Two experiments; Chinese complex sentences as targets.	1. Both low-efficiency and advanced-efficiency learners have the priming effect based on implicit processing. 2. The phenomenon of syntactic priming has been observed only at the primary stage of SLA.	It's hard to identify the core nature of priming inhibition hypothesis.
Effects of language proficiency and task type on structural priming in L2 production of English dative constructions	Wang Min	2009	What extent the priming effect would be modulated by proficiency level and task type.	Language proficiency; priming factors; structure of target sentence	Sentence completion task by Pickering & Branigan (1998)	1. L2 learners with higher language proficiency – stronger priming effect. 2. No significant interaction between language proficiency and task type.	Only one syntactic structure had been observed in this research. Generalizability of the study findings is still relatively limited.

	Author	Year	Key questions	Variables	Techniques	Conclusion	**Limitations**
A study of the influence of input mode and discourse position on the syntactic priming effect in Chinese second language learners	Feng Liping; Gao Chenyang	2020	How would different input modes and discourse positions affect priming effect?	Language background; discourse position; input modes	Oral sentence completion paradigm	1. When the discourse position is in the middle, the priming effect would be the strongest. 2. Sentence frequency and input mode work together on priming effect.	Only in the experimental background not in the classroom background.
Effects of Comparative Continuation Task Condition on EFL Argumentative Writing	YU Qingping ; WANG Luyao	2020	Continuation tasks; interaction and syntactic alignment	Accuracy, complexity, and fluency of three writing tasks	Comparative continuation task	1. OCC and CCSF could facilitate written language. 2. High-quality alignment could not be improved.	OCC and CCSF are both implicit inputs.
A structural priming study of syntactically indeterminant verbs among Chinese English learners	Xu Chengping	2020	priming conditions; syntactic features; syntactically indeterminate verbs	The production of reflexive causative verbs and ergative verbs	Experimental paradigm from Bock 1986	1. Syntactic priming could activate the rule-based memory's processing while suppress competitive structures. 2. Degree of priming	Not mention.

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structures.
2. Degree of priming depends on learners' cognitive models.

According to Table 1, by analyzing and categorizing these eight domestic research on syntactic priming, it can be seen that the relevant experiments on it are mainly focused on the following three aspects.

The first aspect is cross-linguistic research in syntactic priming. Early examples of cross-linguistic research into syntactic priming include Xu and Gao (2008), Jiang (2012), and Wang and Qu (2012) etc. This kind of research often uses the mother language to prime the syntactic structure of a second language, usually Chinese to English. These studies looked at whether a syntactic priming effect exists for native Chinese learners of English across languages and whether cross-language priming could be achieved. If so, what about the duration time? Using two experiments with grade, proficiency, and production of the order between main sentence and clause sentence as variables, Xu and Gao (2008) explores the existence of cross-language syntactic priming phenomena that are essentially characterized by implicit processing. Results not only show the objective existence of the implicit syntactic priming effect, but also proposed the suppression theory of priming effect. Priming effect might disappear among the high-proficiency L2 learners because of the suppression theory. Jiang (2012) explains whether the cross-linguistic priming of passive structure is originated from prepositional priming. Oral picture description task currently exists for the measurement of its hypothesis. Results reject the idea that "cross-linguistic priming of passive structure results from prepositional priming", whereas support the model of the representation of syntactic information (Pickering & Branigan, 1998). That is to say, the priming of passive structure comes from the activation of lexical level syntactic representation. Another scholar, like Wang and Qu (2012), research whether priming effects would occur among the cross-linguistic interaction in Chinese EFL. Their major study concludes that syntactic priming would occur in the disfavored double-object structures while disappearing in favored ones. Though language efficiency could not determine whether the priming effect would occur or not, it could influence its effect size. Priming output can facilitate second language development by helping learners pass through the second language stage when inappropriate structures are strong. Overall, these results indicate that the syntactic priming effect would not occur in all proficiency of L2 learners because many factors like the extent of implicit learning are hard to control. Together these results provide important insights into cross-linguistic priming research.

The next section of the research was concerned with intra-linguistic syntactic priming. There is a growing body of studies (Zhao, 2014; Xia & Wang, 2017; Zhang, 2020; Xu, 2020) beginning to investigate the intralingual syntactic priming of L2 learners and native Chinese speakers. Some of these studies would take advantage of completion paradigm, double-object structure, mono-transitive or intransitive sentences to conduct their research. Zhao (2014) proposes the core question among syntactic representation and sentence processing: how is sentence structure characterized, and how is it activated? Sentence completion task was used to examine whether there are differences in the representations of the mono-transitive and intransitive structures of Chinese L2 learners at different levels. The outcome is contrary to that of Wang (2009), which argues that Chinese English learners' syntactic representations move from concrete representations to abstract representations. However, Zhao's experiment confirms that there is indeed a syntactic priming effect within the language (intralingual). Both high and low proficiency learners tend to produce more intransitive sentences. In Xia and Wang (2017), English embedded wh-questions are used to be the target structure. Research verifies the validity of the conclusion that syntactic initiation promotes the learning of second language. Results show that priming effect could facilitate the production of L2 complex structure continuously. It can thus suggest that more target structures could be activated by lexical repetition and thus arouse the priming effect. There is no conclusion about whether the syntactic representations move from abstract to concrete. Another research conducted by Wei and Jin (2020) takes advantage of working memory to investigate the priming effect of L2 syntax. One interesting finding is that working memory would work together with the priming effect to impact the production of double-object sentences.

The last one comes to the factors that might affect the priming effect and further application. The representatives are Wang (2009), Wei and Jin (2020), Feng and Gao (2020), Yu and Wang (2020), etc. As for task type and language proficiency, Wang (2009) carried out two experiments to investigate whether proficiency and task type would separately affect the syntactic priming effect. A mixed between-group design was applied, with sentence completion task as technique. Further statistical tests revealed that high-proficiency learners would be more sensitive than low-proficiency ones upon the priming of double-object structures. This finding is consistent with that of Wang and Qu (2012). Moreover, task type would affect the strength of the priming effect. What is insufficient is that only two task types were applied in this research, which the differences might be related to modality. Compared with written modality, the priming effect of oral modality is more substantial than the written one. Some factors in the experiment might interrupt the results. Other authors (see Feng & Gao, 2020) question the influence of input modes and discourse position on the syntactic priming effect. Except for what has been discussed earlier, factors like task type and language proficiency have been investigated. In Feng and Gao's study, the oral sentence completion task was also applied to examine the similarities and differences of Chinese syntactic priming effects under input modes and discourse position. Surprisingly, only when the prime sentences locate in the middle of the text can they have the most

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potent priming effect. This might relate to visual input enhancement. The input modes contain auditory input and visual input. Auditory input has a more substantial impact on semantic comprehension among the high-frequency structures, whereas visual input helps withdraw structural information among low-frequency structures.

Except for the three themes of domestic syntactic priming research, there exist other scholars conduct further research combing syntactic priming with other theories. Yu and Wang (2020) investigates the effects of comparative continuation writing task. Syntactic analysis was used to analyze the target structures' production among compositions. Priming was applied to the experiment to investigate whether the priming effect in the continuation task would do good to the production of target structures.

4. Conclusion

This study has identified three research questions. According to what we have discussed, answers could be given to reply those three questions. First, there are three main themes in domestic empirical research on syntactic priming. They are cross-linguistic research, intra-linguistic research and factors that might affect the priming effects. As time goes by, few scholars researched the first theme. In contrast, more and more scholars focus on the last two themes and further investigate them, combining them with other theories like input enhancement or the continuation task. Second, factors like task type, language proficiency, input modes, discourse positions, and so on would affect the priming effect to some extent. Whether it is strong or weak, it all depends on the actual conditions. There is still no consensus on which factor could be the most influential one. Third, the research population needs to expand. More kinds of participants could be involved in priming effect research. What's more, more syntactic structures need to be studied. We are still no sure that whether all syntactic structures could have the same priming effect. Maybe some of them could not arouse the priming effect. That's what we need to get further investigation. Equally important, it's a necessity for scholars to apply the priming theory into practical use.

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