A Review of the Influencing Factors in Second Language English Syntactic Priming

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Abstract. Syntactic priming refers to the cognitive phenomenon in which individuals unconsciously reuse previously encountered syntactic structures during language processing. It holds significant research value for uncovering the mechanisms of second language acquisition and optimizing output-driven teaching. Drawing on 13 Chinese academic articles published between 2009 and 2023 in the China National Knowledge Infrastructure (CNKI), this paper systematically reviews three major experimental paradigms in syntactic priming research and summarizes the key factors influencing syntactic priming effects among Chinese learners of English. These factors are examined from three dimensions: linguistic factors, learner factors, and experimental factors. The findings indicate that linguistic factors include the number of thematic roles, verb consistency, and syntactic features; learner factors involve language proficiency and working memory capacity; and experimental factors encompass task intensity and the recency effect. This study provides theoretical insights into the mechanisms of syntactic priming in second language learners and the design of related experiments, while also offering practical guidance for optimizing teaching strategies in English as a second language instruction.

Keywords: syntactic priming, second language English, research paradigms, influencing factors

1. Introduction

Syntactic priming, also referred to as syntactic persistence or structural priming, describes the phenomenon in which individuals tend to reuse syntactic structures that they have recently processed (read, heard, or produced) when generating sentences, thereby promoting syntactic consistency [1, 2]. The study of syntactic priming contributes to a deeper understanding of the internal mechanisms of second language learning and supports the goal of effective language output in second language teaching. Recent research has focused primarily on the influence of factors such as English proficiency, working memory capacity, and task intensity on syntactic priming in English L2 learners [3-5]. Although some studies have examined individual factors, research on the interactive effects of multiple factors-such as learners' individual differences and task design-remains insufficient, underscoring the need for more systematic reviews.

This study uses the China National Knowledge Infrastructure (CNKI) as the primary data source and identifies 27 articles indexed in the Chinese Social Sciences Citation Index (CSSCI) published

between 2009 and 2020 with the keywords “syntactic priming” and “structural priming.” After manual screening, 13 articles with high relevance to the topic were retained as the research basis. Building on these, this paper constructs a review framework encompassing research paradigms, influencing factors, teaching implications, and future research prospects. Theoretically, this review provides new evidence from Chinese learners to support the “usage-based theory of second language acquisition” by revealing the interactive mechanisms of multiple factors. Practically, the findings contribute directly to the “output-driven” teaching reform in Chinese college English classrooms, enabling the precise design of syntactic priming tasks to enhance students’ syntactic automatization and diversity in authentic communication.

2. Research paradigms

The development of syntactic priming research is largely driven by the diversity of its experimental paradigms. Different paradigms reveal the conditions of occurrence, the intensity of effects, and the internal mechanisms of syntactic priming from specific perspectives, collectively forming the methodological foundation of this research field. Among the 13 highly relevant papers retrieved from CNKI, three paradigms with a frequency of occurrence ≥2 were selected to ensure representativeness, accounting for 73.33% of all paradigms. These include: (1) the picture description paradigm (26.67%), (2) the sentence completion paradigm (33.33%), and (3) the sentence recall paradigm (13.33%). The following sections detail the experimental procedures, applicable contexts, and main findings of these three paradigms.

2.1. Picture description paradigm

According to Bock, the picture description paradigm is one of the most classic and widely used paradigms in syntactic priming research. In this paradigm, participants are first presented with a sentence containing a specific syntactic structure (e.g., active, passive, DO, PO) in auditory form [6]. They repeat the sentence aloud, after which a picture is shown, and they are asked to describe the event depicted. If the description employs the same or a similar syntactic structure as the priming sentence, it is considered evidence of syntactic priming.

For example, Xue employed variations of this paradigm in both Experiment 2 and Experiment 3 [5]. In Experiment 2, participants first heard the experimenter describe a picture (the priming sentence). They were then shown a new picture depicting a different event and instructed to “describe this picture in their own words.” The priming effect was measured by comparing the frequency of target structure usage under different priming conditions. In Experiment 3, an additional “repetition” step was added: after hearing the priming sentence, participants repeated it aloud before describing the target picture. This design intensified the priming effect by requiring an extra output step.

The picture description paradigm has both notable strengths and limitations. Its high ecological validity, approximating real communicative situations, enables it to better reflect learners’ syntactic choices in natural contexts, thereby enhancing external validity. However, it requires extremely rigorous control of experimental materials. The target pictures must be clearly describable using the intended syntactic structure, and features of the depicted elements (e.g., animacy or spatial relationships of agents and recipients) must be carefully matched and controlled to prevent confounding effects on syntactic choice.

2.2. Sentence completion paradigm

Pickering demonstrated that in the sentence completion paradigm, participants are presented with incomplete priming sentences [2]. Due to syntactic constraints, these fragments can only be completed using either a PO or a DO structure. After completing the priming sentence, participants are given a target sentence fragment containing only the subject and verb. At this stage, they may choose either structure, allowing researchers to examine how completing the priming sentence influences the completion of the target sentence.

Wei applied a modified oral version of this paradigm [4], presenting participants with object-relative clauses and passive relative clauses as priming sentences, followed by target fragments involving object relationships. By comparing the proportions of object-relative clause usage across different priming conditions, the study assessed the strength of the priming effect.

The sentence completion paradigm offers the advantage of strong variable control. Unlike the picture description paradigm, it generates output within a restricted syntactic framework, minimizing interference from participants' spontaneous productions and yielding more precise data. However, despite efforts to mask the experimental purpose, some sensitive participants may still recognize the task's intention and adopt strategies to conform to the hypothesis, thereby compromising the purity of the results-particularly in the absence of strict experimental controls.

2.3. Sentence recall paradigm

In the sentence recall paradigm, participants are first briefly shown the target sentence, followed by the priming sentence. They are required to recall and repeat the priming sentence, and then quickly recall and repeat the target sentence. Results show that the syntactic structure of the priming sentence significantly influences the form of the recalled target sentence.

For instance, Zhao employed this paradigm using the priming sentence "Rebecca believed her new lawyer to be the best" (a non-restrictive object-enhancing construction) and the target sentence "Mike expected that his son would be successful" (a restrictive object-enhancing construction) [7]. If participants recalled the target as "Mike expected his son to be successful" (shifting to an infinitive structure), this was considered evidence of priming.

The main advantage of this paradigm is that the lexical items of the priming and target sentences do not overlap, effectively eliminating lexical interference. Participants must reconstruct the syntactic form within the memory retention period, thereby directly testing the activation of abstract syntactic representations. However, this paradigm also presents limitations: (1) recall tasks may introduce additional variables due to memory load, affecting the reliability of the priming effect; and (2) its ecological validity is relatively low, as recalling sentences differs from natural language use and may not fully reflect authentic syntactic selection processes.

In addition to the three paradigms described above, other studies have employed methods such as the self-paced moving window paradigm, the translation selection paradigm, the reading-aloud paradigm, and the reading-to-write paradigm. These approaches provide complementary perspectives that further enrich syntactic priming research.

3. Influencing factors

3.1. Linguistic factors

This section examines influencing factors from two dimensions: intra-linguistic factors and cross-linguistic factors. Intra-linguistic factors include the number of thematic roles, the consistency of key verbs in priming and target sentences, and syntactic features. Cross-linguistic factors focus on the impact of syntactic similarities and differences across languages on syntactic priming effects. A comprehensive analysis of these factors provides both a theoretical framework for future empirical studies and practical guidance for the effective design of syntactic priming tasks in second language teaching.

Thematic roles constitute an important intra-linguistic factor. Thematic roles refer to the semantic roles assigned to participants in an event (e.g., agent, patient). Differences in the number of thematic roles reflect the conceptual complexity of a sentence. Zhao investigated the moderating effect of thematic role number on syntactic priming among Chinese learners of English [7]. The study employed priming sentences containing non-defining relative clauses with different numbers of thematic roles (e.g., Rebecca believed her new lawyer to be the best, with two thematic roles) and subject-control relative clauses (e.g., Catherine ordered her secretary to be faster, with three thematic roles). Target sentences were restrictive relative clauses (e.g., Mike expected that his son would be successful). Results showed that advanced learners, after processing sentences with more thematic roles, were significantly less likely to retell the target sentence using the infinitive structure. This indicates that greater conceptual complexity inhibits syntactic priming. In contrast, lower-level learners showed no significant differences. The findings suggest that as proficiency increases, learners gradually establish stronger connections between lexical semantics, argument structure, and syntactic information, enabling conceptual complexity to regulate syntactic selection.

Verb consistency between priming and target sentences is another important intra-linguistic factor, largely through the "lexical boost effect." Hui found that when both sentences shared the same key verb (e.g., changed), target sentence reading times were significantly shorter, indicating that verb repetition enhanced priming [8]. However, priming also occurred when different verbs were used (e.g., adopted vs. changed), showing that learners can rely on abstract syntactic representations to achieve priming. This supports both the abstract nature and cross-verb generalizability of syntactic representation. Thus, verb consistency is not essential for priming, but it substantially strengthens its effect.

Syntactic features also strongly influence priming intensity, especially in relation to structural complexity and form. Xu found that in reflexive imperative sentences, the opaque mapping between semantics and lexical items caused learners to be misled by the priming sentence, producing inaccurate argument structures [9]. By contrast, case-marking sentences-with stable representations, prototypical semantics, and cross-linguistic similarities (e.g., Chinese subject–predicate sentences)-exhibited weaker priming but stronger extraction advantages. Similarly, Jiang compared marked and unmarked passive constructions in Chinese with English passives [10]. Despite differences in word order (e.g., NP + 被 + NP + V in Chinese vs. NP + V + by + NP in English), cross-linguistic priming still occurred, indicating that syntactic representations are partially abstract and shared across languages, though formal differences weaken the priming effect. Collectively, these findings suggest that the salience of syntactic features, the transparency of semantic-lexical mapping, and cross-linguistic consistency play critical roles in modulating priming. When features are transparent and prototypically salient, structural priming can persist beyond lexical repetition and achieve broad transfer.

Word order preference has recently attracted greater attention as a linguistic factor influencing syntactic priming. Wang examined word order preferences in adverbial clauses within coherent discourse and found, through a read-and-retell task, that intermediate-level Chinese learners of English were more readily primed by preposed word orders, reflecting a positive preference pattern [11]. This tendency is attributed to the combined influence of L1 transfer (Chinese favors preposed adverbial clauses) and the developmental stage of L2 acquisition. In discourse tasks with high ecological validity, preferred structures are more easily activated and reinforced due to stronger mental representation. By contrast, Yang, studying ambiguous relative clauses, found that priming often occurred in less-dominant responses under baseline conditions, indicating a reversed preference effect [12]. Together, these studies highlight the importance of word order or structural preference as a variable regulating priming. Wang emphasized the roles of L1 transfer and frequency accumulation in producing positive preferences, while Yang emphasized differences in abstract structural configurations across languages, showing how structural competition can trigger reversed priming in bilingual representation. Methodologically, Wang employed discourse-oriented read-and-retell tasks emphasizing semantic coherence, while Yang used sentence completion and comprehension tasks with tighter syntactic control. Regarding participant profiles, Wang studied intermediate learners, whereas Yang focused on advanced English majors. Taken together, their results show that whether preferences appear positive or reversed depends not only on structural salience and L1 transfer, but also on task type, discourse coherence, and learner proficiency-making word order preference a complex but crucial dimension of syntactic priming.

In sum, these studies have advanced both theoretical and methodological understanding of syntactic priming. Zhao highlighted the role of conceptual structure, extending priming research beyond grammar alone; Wang demonstrated the value of discourse-level investigations, improving ecological validity; Jiang provided empirical evidence for cross-linguistic priming; and Xu enriched the field by examining polyfunctional verb constructions.

3.2. Learner factors

Language proficiency has been systematically examined as a key learner factor in second language syntactic priming, though findings suggest different mechanisms of influence. Wang, in an intralingual L2 production context, compared Chinese learners of English at different proficiency levels and found that high-proficiency learners were more sensitive to structural priming and exhibited stronger effects. This led to the conclusion that “the higher the proficiency, the more significant the intralingual priming effect.” [13] The explanation offered was that more mature abstract syntactic representations and smoother retrieval processes lower the activation threshold of target structures, thereby increasing the likelihood of recurrence. By contrast, Xu, in a cross-linguistic priming task involving main-subordinate order, concluded that “the higher the second language proficiency, the easier it is to inhibit the priming force of the native syntax on the second language, and the smaller the cross-linguistic priming effect.” [14] Although both studies employed multi-factor experimental designs, they demonstrated opposite regulatory effects of proficiency depending on whether priming was intralingual or cross-linguistic. Specifically, Wang manipulated task type in an L2 - L2 intralingual setting and found that advanced learners, owing to their more mature abstract representations, were significantly more sensitive to priming in double-object versus prepositional-object structures than lower-level learners, and that the priming effect increased with proficiency [13]. In contrast, Xu, in an L1 - L2 cross-linguistic scenario, introduced working memory as a variable and confirmed that high-proficiency learners, drawing on stronger L2 working memory resources, could effectively suppress interference from L1 main-subordinate order. As

proficiency improved, cross-linguistic priming decreased. Taken together, these findings indicate that the influence of proficiency on syntactic priming is neither linear nor singular, but rather operates through multiple pathways-strengthening representations, inhibiting cross-linguistic interference, and coordinating working memory resources [14].

Working memory is another critical learner factor, with distinct mechanisms and manifestations. Wei investigated its role in internal syntactic priming in English, using relative clauses as the target structure [4]. Employing a pretest-priming task-posttest design with a one-week delay, and using oral sentence completion tasks, Wei examined the influence of working memory on immediate and delayed output. The results showed that working memory capacity significantly affected the production of object-relative clauses in immediate priming-larger capacity produced stronger immediate effects. However, working memory had no significant influence on delayed comprehension or output, suggesting that it is primarily related to explicit, real-time syntactic processing. By contrast, Xu, from a cross-linguistic perspective, examined the influence of Chinese and English working memory on priming in main-subordinate complex sentences [14]. Using a translation selection task, Xu found that the effect of working memory depended heavily on L2 proficiency: at higher L2 levels, L2 working memory inhibited L1 priming, whereas at lower L2 levels, L1 working memory enhanced cross-linguistic priming. Both studies employed multi-factor designs, but Wei focused on the temporal dimension of internal priming, while Xu explored the interaction of working memory and proficiency in cross-linguistic priming. Collectively, the findings suggest that the role of working memory in syntactic priming is not independent, but closely interacts with proficiency and context. In intralingual immediate output, working memory functions as a "facilitator," whereas in cross-linguistic transfer it interacts with proficiency, serving as an "inhibitory threshold amplifier."

3.3. Experimental factors

Task intensity has been shown to exert a strong influence on syntactic priming. Xue conducted three experiments that systematically manipulated task intensity-no priming, unidirectional priming, and bidirectional priming-to investigate its regulatory effect on transitivity and case structures in English among Chinese learners [5]. In Experiment 1 (no priming), participants simply described pictures, producing the lowest task intensity and reflecting only baseline syntactic preferences. In Experiment 2 (unidirectional priming), participants listened to priming sentences but did not repeat them before picture description. This medium-intensity task partially activated syntactic representations without enforcing imitation. In Experiment 3 (bidirectional priming), participants listened to priming sentences, repeated them aloud, and then described the pictures. By adding a repetition step, task intensity and cognitive load were substantially increased. Results showed that low-level learners only exhibited significant priming for transitivity and case structures under the bidirectional condition, while under unidirectional priming only transitivity was affected. High-level learners, however, demonstrated case-structure priming under unidirectional priming, which was further strengthened under bidirectional conditions. These gradient effects indicate that task intensity modulates priming by regulating the activation and retention of syntactic representations. For lower-level learners especially, high-intensity bidirectional tasks promote the extraction and application of abstract structures through sequential processes of "auditory input - oral repetition - autonomous production."

Task type and recency effect also play key roles in shaping priming outcomes. Wang compared written sentence completion with oral picture description and found that the latter, being closer to natural communication and more interactive, produced significantly stronger priming effects,

particularly for ditransitive constructions [13]. Dai investigated the recency effect and observed that longer intervals between priming and target sentences weakened priming, consistent with the principle of recency priority in implicit learning [15]. Importantly, priming effects in written production could last for at least two days, providing further evidence of the cumulative nature of structural priming. Together, these findings suggest that both task type and timing are crucial variables in experimental design. Interactive tasks and shorter intervals facilitate stronger and more sustained priming effects.

4. Discussion - research and pedagogical implications

Based on a systematic review of the influencing factors discussed above, this study highlights three variables with the greatest potential for teaching intervention-language proficiency, task intensity, and the recency effect-and proposes actionable strategies for improving English classroom instruction. First, language proficiency regulates syntactic priming through dual pathways: amplification within the L2 and suppression across languages. This contrast suggests that instruction should be tailored to proficiency levels. For lower-proficiency learners, high-repetition, low-cognitive-load bidirectional priming (listen-repeat-speak) can help establish stable form-meaning mappings. For example, a sequential picture description activity can be used, in which each picture is described aloud with the target structure, repeated by the students, and immediately followed by their own description of a new picture. Such frequent imitation reduces negative L1 transfer. For higher-proficiency learners, explicit priming tasks can be designed around low-frequency structures in their production (e.g., low-attachment relative clauses in English). By leveraging the inverse-preference effect, representation and retrieval of non-dominant structures can be enhanced, thus improving the diversity and flexibility of the L2 syntactic system. Second, the gradient effect of task intensity has been clearly demonstrated in Xue's three experiments [5]. Instructionally, this can be embedded into a progressive writing sequence. In the first stage, a complete model text containing the target structure is provided; students listen and repeat simultaneously, completing bidirectional auditory-oral priming. In the second stage, auditory support is withdrawn and only keywords are provided to guide written sentence completion, creating a unidirectional priming condition. In the third stage, students engage in open writing without structural prompts, requiring autonomous use of the primed structures. This graded release from controlled to semi-controlled to free production avoids cognitive overload while ensuring the cumulative benefits of structural priming. Finally, the temporal window of the recency effect has been precisely quantified by Dai [15]. When 30 intervening sentences are inserted between the prime and the target, the priming effect of double-object constructions significantly attenuates, but remains detectable even after two days [15]. This finding has direct implications for classroom design. On the one hand, instructors should distribute high-frequency input of target structures across lessons rather than concentrating it in a single session. For example, in the warm-up-presentation-practice-production cycle of each lesson, at least one explicit and one implicit priming opportunity should be included, allowing repeated exposure across time. On the other hand, continuation-writing tasks can exploit the delayed priming effect by requiring students to produce written continuations 48 hours after reading. This leverages the long-term trace of priming, compelling retrieval and consolidation of the target structure. Feedback should focus on accuracy and variety, providing immediate corrections to form a closed loop of input - delay - output - feedback, thereby transforming the laboratory-verified two-day window into an operable classroom-based cyclic review mechanism. In summary, language proficiency determines the direction and strength of priming, task intensity provides the cognitive leverage for priming to occur, and the recency effect shapes the temporal rhythm of input and output. These three

factors interact synergistically to form a precise pedagogical chain answering who learns what, when. If instructors take proficiency stratification as the premise, intensity gradients as the method, and temporal distribution as the lever, structural priming can be transformed from a laboratory phenomenon into a classroom routine, upgrading the output-driven model of L2 syntax teaching.

5. Conclusion

This study systematically reviewed three major categories of factors influencing syntactic priming among Chinese learners of English: learner-related variables, language-related variables, and experimental design factors. It also summarized three mainstream research paradigms: picture description, sentence completion, and sentence recall. The findings confirmed that advanced learners are more sensitive to intralingual priming and can activate low-frequency structures through inverse-preference effects, whereas lower-level learners require high-intensity bidirectional input to establish form-meaning mappings. Task intensity and temporal distribution jointly determine whether priming can accumulate and persist for at least two days. Instructionally, a precise chain of level stratification - intensity gradient - time fragmentation should be adopted: for low-level learners, listen-repeat-speak consecutive tasks should be designed; for high-level learners, explicit low-frequency structural priming should be introduced to trigger inverse preference; target structures should be cyclically embedded in warm-up, presentation, practice, and production stages, combined with 48-hour delayed continuation writing, to form a closed loop of input - delay - output - feedback. This approach converts laboratory findings into classroom routines, supporting the advancement of output-driven syntactic instruction.

Nevertheless, current research remains limited. Most studies focus on English majors or intermediate-level learners, with insufficient attention to younger students, non-English majors, or longitudinal developmental trajectories. The interaction between working memory and priming has not been sufficiently integrated with eye-tracking or ERP methods to reveal online processing mechanisms. Experimental task types predominate, while the effects of priming in authentic classroom-based blended learning remain underexplored. Moreover, the switching between inverse and positive preferences, and the extent to which this process is influenced by emotional or motivational factors, remains unclear. Future research should broaden sample ranges and language contexts, employ multimodal techniques to compare immediate and delayed effects, incorporate classroom discourse corpora to test ecological validity, and investigate the regulatory roles of affect, motivation, and individual differences. Such efforts would contribute to building a more explanatory and comprehensive binary model of syntactic priming.

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