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Influence of Field Independent-Dependent Cognitive Styles and Exam-oriented Education on Second Language Syntactic Priming

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Abstract: Syntactic priming is an important paradigm for the study of sentence production. It refers to the tendency to repeat previously used sentence structures in the process of language production and comprehension. Field independent-dependent dimension, as an essential dimension of cognitive style, has different effects on individual perception, thinking and other cognitive processes. The nine-year compulsory education that most Chinese students receive is an exam-oriented education, which includes English learning. The effect of exam-oriented education on second language syntactic priming is unclear. The purpose of this study is to investigate the influence of the field independent-dependent dimension of cognitive style and exam-oriented education on second language syntactic priming. In this study, field dependent-independent cognitive style is measured by Embedded Figure Test, and second language syntactic priming is measured by picture description. The results show that field independent-dependent cognitive style has no effect on second language syntactic priming. While exam-oriented education inhibits second language syntactic priming for English learners at different levels. Future studies may use different methods of syntactic priming and cognitive style to measure and refine the thresholds for second language level in syntactic priming studies.

Keywords: syntactic priming, second language, field independence, field dependence, cognitive style, exam-oriented education

1. Introduction

When people comprehend and produce a sentence, there is a tendency to reuse the syntactic structures that have appeared or been used previously. This phenomenon is known as syntactic priming [1]. The existence of syntactic priming has been well researched. The research nowadays around syntactic priming is mainly related to second language (L2) syntactic priming, cross-linguistic syntactic priming, and factors affecting syntactic priming. There are some factors that affect L2 syntactic priming, such as second language level [2]. Recent studies have gradually focused attention on L2 syntactic priming on cognitive factors such as working memory [2, 3].

Cognitive style is an essential and stable cognitive factor for individuals. Field independence and field dependence, as one of the most widely studied cognitive styles, have a non-negligible

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influence on an individual's information processing. People adopt different cognitive styles and therefore differ in the way they process information.

L2 syntactic priming is closely related to L2 acquisition. English education in China is exam-oriented, which emphasizes the importance of "remembering" rather than "applying", which indirectly leads to the simplification of English expression by Chinese English learners, and thus may have an impact on L2 syntactic priming.

This paper aims to investigate the effect of the field independence-dependence dimension of cognitive styles and exam-oriented education with L2 level on L2 syntactic priming. The research questions proposed are: (1) Does exam-oriented education has an effect on L2 syntactic priming with different L2 levels? (2) Do L2 speakers with field dependent cognitive style differ from those with field independent cognitive style in syntactic priming tasks? (3) Is there an interaction of cognitive style and L2 level on syntactic priming? In this paper, an experiment will be conducted to solve these three questions. The results of this paper may contribute to understanding the cognitive factors underlying sentence production and the influence of exam-oriented education on L2 expression, and provide experience for future research on L2 syntactic priming.

2. Literature Review

2.1. Syntactic Priming

Bock used picture description to study syntactic priming, in which he asked participants to repeat a number of sentences (priming sentences), including four structures: active, passive, prepositional (PO), and double-objective (DO) sentences. The participants were then asked to describe a new picture with a sentence (target sentence), and the results showed that the participants tended to use the previously used sentence structure [1]. There are three theoretical models explaining syntactic priming, namely the procedural priming model [4], the structural priming model [5], and the verb syntactic representation model [6].

The procedural priming model was used by Bock and Loebell [4] to explain syntactic priming. Procedural priming is an implicit process, where one extracts phrase structure fragments similar to the priming sentence when they retrieve the information to produce the target sentence. This process is proven not to be influenced by semantic information.

The structural priming model also regards syntactic priming as an implicit process. Unlike the procedural priming model, this model views syntactic priming as the result of semantic-structural pairing. The "semantic information-sentence structure" mapping of the priming sentence leads to the selection of the same sentence structure as the priming sentence when one generates the target sentence.

The basis of the verb syntactic representation model is Roelofs' model [7]. Roelofs' model divides lexical information into three levels, lemma level, conceptual level, and word-form level, which are responsible for lexical syntactic information, semantic information, phonological and morphological information, respectively. The production of a word in a given sentence structure activates the nodes associated with it in the lemma level. The degree of activation gradually decreases but does not disappear. The subsequent processing of a sentence (target sentence) enhances the activation of the nodes and facilitates the processing of the structure.

2.2. Cognitive Style

Cognitive styles are defined as people's stable ways of cognition, thinking, and learning [8]. Cognitive styles have been gradually classified by researchers into several dimensions, including field independent-dependent dimension [9], holist-serialist dimension [10], locus of control

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dimension [11], etc. Among them, field independence-dependence is the earliest and most widely studied dimension. Field independent (FI) individuals refer to those who rely less on field during information processing. Field dependent individuals (FD) refer to those who rely more on field during information processing. FD individuals are more likely to use external cues and show stronger environmental dependence, while FI individuals are more likely to rely on internal perceptual cues.

Common measures of field independence-dependence include the Rod-and-Frame Test and the Embedded Figure Test (EFT). The Rod-and-Frame Test determines the cognitive style of participants by asking them to accurately adjust the rod to a vertical position within a frame that is tilted at an angle, and the EFT determines the cognitive style of a participant by examining the ability to identify a specific simple figure from a complex figure.

2.3. Exam-oriented Education

Education in China is exam-oriented. Chinese students take English as a compulsory course from elementary school onwards. English is greatly weighted in various examination systems. Learning a second language for the sake of exams may not yield the same results as learning for interest. One of the characteristics of English learning under exam-oriented education is that students get high scores but lack the ability to express in English [12]. Students often have difficulty using the language flexibly and lack opportunities to communicate in reality. Therefore, exam-oriented education may have an impact on L2 syntactic priming.

3. Methodology

3.1. Participants

There are thirty participants in this experiment, all of whom are college students who have passed CET-4. These 30 participants are all native Chinese speakers, 10 of whom score above 500 in CET-4 (high-level group), 10 score between 425 and 500 (medium-level group), and 10 do not reach 425 (low-level group). The mean age of the participants is 21.07 (SD = 1.39). There are 11 males and 19 females.

3.2. Materials

EFT is used to measure field independent-dependent cognitive style. The Chinese revision of EFT is used in this experiment [13]. The scoring rules are: Part 1 is used as an exercise and the achieved score is not credited to the final grade. Questions 1 and 2 of the second and third parts are worth 0.5 points each; questions 3 and 4 are worth 1 point each; questions 5-10 are worth 1.5 points each. The total score is 24 points. The normative scores (NS) for adult males and females are 9.86 and 9.69, respectively. The normative standard deviations (NSD) are 4.45 and 4.89, respectively. The formula is t = (statistical score - NS) / NSD. t = t * 10 + 50. If t is greater than 50, it indicates field independent style. The converse indicates field dependent style.

Picture description task is used to measure L2 syntactic priming. The experiment consists of 20 groups of priming tasks. Each task presents two pictures depicting the priming sentence and the target sentence respectively. Each group of priming sentences and target sentences can be presented using PO and DO structures.

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3.3. Procedures

Participants are first divided into three groups based on their CET-4 scores: low L2 level group, medium L2 level group and high L2 level group. All participants then complete EFT, which is divided into three parts. The final score is obtained by adding up the scores of the second and third parts, with the first part being the practice phase, which does not count towards the final score. Each part consists of a number of complex figures, among which the participants have to find a simple figure.

In the second phase of the experiment, participants are asked to work one-on-one with the experimenter to complete the picture description tasks. In each set of tasks, the experimenter first describes the picture presented on the left side of the slide (using a DO/PO sentence structure), followed by participants describing the picture on the right side of the slide. The whole experiment is recorded and the sentence structures used by the participants are recorded after the completion of the experiment.

3.4. Data Collection and Analysis

Syntactic priming data are entered into Excel after all participants have completed the experiment. Results consistent with the syntactic structure of the priming sentence are recorded as 1 and inconsistent as 0. EFT results are also entered into EXCEL. SPSS26.0 is used to analyze the results. Two-way ANOVA is used as the statistical method of this experiment.

4. Results

Table 1 shows the mean and standard deviation of FD and FI in different L2 level groups.

Table 1: Descriptive Statistics for FI/FD and L2 Level.

	FD		FI		Total	
	M	*SD*	*M*	*SD*	*M*	*SD*
A	10.40	2.07	10.80	0.84	10.60	1.51
B	10.80	1.92	11.20	0.84	11.00	1.41
C	11.67	1.53	10.14	0.38	10.60	1.07
Total	10.85	1.82	10.65	0.79	10.73	1.31

Table 2: Tests of Between-Subjects Effects.

Source	Type III Sum of Squares	*df*	Mean Square	*F*	*Sig.*
Corrected Model	6.74a	5	1.35	0.75	0.59
Intercept	3311.61	1	3311.61	1843.03	0.00
L2_Level	0.87	2	0.43	0.24	0.79
cog	0.41	1	0.41	0.23	0.64
L2_Level * cog	5.47	2	2.74	1.52	0.24
Error	43.12	24	1.80		
Total	3506	30			
Corrected Total	49.87	29			

*$p < .05$

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It is shown in Table 2 that the main effect of the L2 level is not significant ($F = 0.24$, $P = 0.79 > 0.05$). There is no significant difference in syntactic priming among the three L2 level groups. The main effect of cognitive style is not significant, $F = 0.23$, $p = 0.64 > 0.05$, i.e., there is no significant difference in syntactic priming between the FD and FI groups. L2 level and field dependent-independent cognitive styles interaction is not significant, $F = 1.52$, $p = 0.24 > 0.05$, i.e., there is no significant difference in syntactic priming of FI and FD with different L2 level.

5. Conclusion

During the experiment, it was found that three participants in the low-level group completed all sentences using only a PO sentence structure and did not achieve the priming effect at all. Interviews after the experiments revealed that they were most exposed to PO structures and rarely used DO structures during the process of learning English. In addition, although a trend of interaction between L2 level and field independent-dependent cognitive style was found, it was not significant. It is speculated that it was caused by the insufficient sample size. Although studies have demonstrated the effect of L2 level on the integration of languages [14,15], it is not yet clear how the L2 level specifically correlates with syntactic priming. That is to say, the difference in language ability between CET-4 is not large enough, and there may not be significant language ability difference between high score and low score. Therefore, grouping according to CET-4 scores and the way in which they are grouped may not really distinguish the L2 level needed for the experiment.

Additionally, exam-oriented education inhibits L2 syntactic priming of L2 learners of different levels (participants tended to use PO structure). Under exam-oriented education, students commonly used memorized syntactic expressions. The activation of memorized sentences was much higher than that of syntactic priming, presumably because rote teaching under the exam-oriented education consolidates students' long-term memory of vocabulary and sentences. When confronted with a picture that needed to be described, the sentences in long-term memory are activated.

To sum up, field dependent-independent cognitive style has no significant effect on syntactic priming. In addition, syntactic priming does not interact with L2 level. Exam-oriented education has inhibitory effect on L2 syntactic priming of L2 learners with different L2 levels. Future studies could alter and refine L2 level and explore the correct L2 level threshold when studying syntactic priming. In addition, this study only used the picture description method to measure syntactic priming. Future experiments could use other research methods such as sentence completion task and sentence recall task.

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