Different Acquisition of Chinese Pseudo-Attributive Structures by Chinese Natives and Chinese-as-a-Second-Language Learners

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Pseudo-attributive structure is a special subtype of modifier-head structures in Mandarin Chinese and has attracted many linguists and scholars to explore its functions and generating mechanism, creating considerable theoretical achievements. To date, nevetheless, there has not come up any test-based study to inquire why this structure is more difficult than its corresponding real attributive structure. Against the background, this study adopted the Sojump app to test how native Chinese speakers and Chinese-as a-second-language (CSL) learners comprehend pseudo-attributive structure based sentences. The results showed that both native speakers and CSL learners displayed more difficulties in comprehending pseudo-attributive structure-based sentences than real attributive structure-based sentences, but in a different pattern. An interesting finding is that the two groups exhibited the shared difficulty heirarchy in comprehending pseudo-attributive structures (pseudo-adjective structures with appositive relationships > skill-based pseudo-adjective structures in context > skill-based pseudo-adjective structures out of context), and moreover, this hirearchy kept constant irregardless of the Chinese proficiency of CSL learners.

Keywords: acquisition, pseudo-attributive structures, Chinese natives, CSL learners

Pseudo-attributive structures in Chinese refer to the type of modifier-head structure in which the modifier (attributive) and the head noun are misaligned and hence does not constitute a real possessor-belongings relationship semantically. The structures can be further divided into different types according to the diverse sub-categories of the head noun, displaying their syntactic complexity and uniqueness.

Literature review shows that abundant theoretical research has been constructed on Chinese pseudo-attributive structures (p-structures, henceforth). The specific achievements cover the structures' classification (e.g., Hu, 2016; Huang, 1981; Liu, 2009; Zhang, 1994; Zhu, 1982), semantic relationships between the attribute and the head noun (Shao, 2009; Huang, 2008), syntactic position (e.g., Long, 2018) and comparison with real attributive structure from different perspectives (e.g., structuralism: Huang, 1981; Zhu, 1982; cognitive linguistics: Shen, 2008; Generative linguistics: Huang, 1982; Pan & Lu, 2011). Despite debates on how the structures are generated, the consensus has been reached in the following aspects: syntactically, the attributive is an animate noun or pronoun or nominal quantifier (e.g., 弟弟当了三年的兵 /My brother

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served as a soldier for three years), the head noun is either animate or inanimate, and "de" as the attributive marker to link the attributive and the head; semantically, the structure acts as a special NP in that the attributive and the head does not convey a rigid possession (i.e., somebody owns something or somebody) but rather communicate [The attributive has some relationship with or exerted some effect on the head noun] in a broad sense; pragmatically, the construal of the structures depends on the conventional event or situational frame activated by a particular context (e.g., Xu & Pang, 2022), hence distinct from their corresponding real attributive structures which take on a fixed possessive relationship between the two parts. In general, an attributive signifies the essential feature of an entity, and is used to modify or restrict a noun, resulting in a combining NP, the so-called real attributive-head structure. Syntactically, a p-structure is different from a real attrributive-head structure with regard to component movement: while a p-structure is generated by undergoing an NP movement, a real attributive-head structure is base-generated requiring no movement at all (e.g., Huang, 2008; Pan & Lu, 2011). This suggests that p-structures should be more difficult to acquire than real attributive-head structures as a result.

Despite substantial literature regarding the theoretical issues on Chinese p-structures, no study has ever been conducted on how the structures (including different subtypes) are processed and how they are different from the corresponding real attributive structures in cognition, if any. This leads to the native Chinese speakers' difficulty in acquisition, let alone the foreigners who learn Chinese as a second language.

Against the above background, this paper aims to explore how native Chinese speakers and Chinese as a second language (CSL) learners (international students) acquire different types of Chinese p-structures, and whether they exhibit comprehension difficulty for each subtype. The research results are desired to provide guidance for language teaching, especially for teaching Chinese as a second language.

To this end, we proposed three research questions:

First, what patterns or properties did native Chinese speakers and CSL learners show in the acquisition test of Chinese pseudo-attributive structures?

Second, how were different types of the p-structures acquired by the two groups?

Third, how did context modulate the acquisition of Chinese p-structures?

Method

Participants

The participants were composed of two groups, the proficient CSL learners and native Chinese speakers. The CSL learners (100 international students) came from Africa (such as Tanzania, Mozambique, Nigeria, and Ethiopia, etc.) and Southeast Asia (such as Malaysia, Myanmar, Cambodia, and Thailand, etc.) whose Chinese proficiency test scores have reached level 4 or above on the Chinese Proficiency Test (*Hanyu Shuiping Kaoshi*, HSK) designed for foreign students or CSL learners. The native Chinese speakers were all Chinese university students, i.e., 100 undergraduate and graduate students (not language majors) recruited from a Chinese university, who had not participated in the normalization judgement of p-structure materials before.

All the participants were paid to complete the tests online on a voluntary basis.

Materials

Design of Test Items for Chinese Pseudo-Attributive Structures

The test examined the acquisition of two types of syntactic structures based on the characteristics and frequency of the p-structures (Construction 1: NP_1's NP_2 + V de R; Construction 2: V+NP_1's NP_2). Construction 1 is divided into two subtypes based on the semantic relationship between the attributive and the head noun: apposition (e.g. 弟弟的警察干得很好/My younger brother works well as a policeman) and skill possession (e.g. 王婶的窗花剪得挺好/Aunt Wang is good at cutting window flowers). In light of the animacy of the head noun, Structure 1 is subcategrized into two kinds: the p-structures with animate head nouns and the p-structures with inanimate head nouns. Construction 2 results from the insertion of a separable verb or phrase (e.g., 停职/suspend,说坏话/speak ill (bad-mouth)) into a verb-object construction (e.g. *停职她/*suspend her → 停她的职/suspend her position, *说坏话张三/*speak ill Zhangsan→ 说张三的坏话/ speak ill of Zhangsan, or bad-mouth Zhangsan), hence also called VO p-structures.

As there is potential ambiguity in the interpretation of p-structures with skill possession or inanimate head nouns in a single sentence (e.g. " 马莉的钢琴弹得很好 " is generally construed as [the piano does not belong to Ma Li], but can also be interpreted as [the piano belongs to Ma Li]) in

special contexts like “马莉家里” (in Ma Li’s home), we designed two conditions for this type of sentence: with or without contextual cues (Patterns 2 and 3), to compare the impact of context on the understanding of structures. Due to the constraint of transitivity features of Construction 2 (i.e. VO structures in Chinese cannot take objects in general), its acceptability in an isolated sentence is low, so contextual cues were added to enhance the naturalness of the sentence. On this account, the entire test was designed to consist of four major Patterns, each with 10 sentences (5 real attributive-head and 5 p-structure sentences): Pattern 1 (examining apposition p-structures) and Pattern 2 (examining skill possession p-structures) were to test participants’ comprehension of the target sentences out of context, while Pattern 3 (examining skill possession p-structures) and Pattern 4 (examining VO p-structures) to test the sentences comprehension in context.

Therefore, the two major constructions were designed as four Patterns, with Pattern 1–3 testing the comprehension of Construction 1 and Pattern 4 testing the comprehension of Construction 2. Pattern 1 and 3 were designed as comprehension judgment tasks, requiring participants to make true/false judgments on probing sentences after reading the sentence. Pattern 2 and 4 were made as selection judgment tasks, with the former requiring participants to select an answer from A, B, C, or D, and the latter requiring participants to select an answer from A, B, or C. The specific testing materials were illustrated in Table 1.

Normalization of Materials

Prior to conducting the formal testing, we normalized the sentences composed of four types of p-structures (i.e., the four Patterns mentioned above) to ensure that all sentences are in line with the language intuition of Chinese native speakers. The literature review showed that the p-structures were generally divided into three types or constructions: Construction 1: “NP_1 de NP_2 + V de R” (e.g. 他的老师当得好 /He serves as a good teacher); Construction 2: “V + NP_1 + de + NP_2” (e.g. 帮他的倒忙 /Helping him was doing harm); Construction 3: “NP_1 + V + T + de + NP_2” (e.g. 他当了五年的老师 /He has been working as a teacher for five years). Considering that Construction 3 proposed by Huang (1981) aimed to clarify the differences between attributive, pseudo-attributive, and quasi-attributive, our study just focused on the p-structures of Constructions 1 and 2. Therefore, the normalization of materials was confined to the evaluation of these two types of p-structures.

All testing materials were taken from the BCC Chinese corpus developed by the Big Data and Language Education Research Institute of Beijing Language University, and were manually screened and modified afterward. The normalization test was conducted using the same format as in “Design of Test Items for Chinese Pseudo-Attributive Structures.” A total of 15 undergraduate students (with an average age of 19.42 years, *SD* = 0.82, and all aged between 18–23) were invited to evaluate the acceptability of 120 sentences across the four types of sentence patterns (30 sentences for each) through an online questionnaire. Two invalid questionnaires were discarded, and 13 valid questionnaires (3 males and 10 females) were obtained. Finally, 40 key materials (10 sentences for each type) were selected as the testing materials, all of which had an acceptability rating of five or more on a seven point scale. In addition, to test the reliability of the questionnaire, we invited an additional 15 undergraduate students to evaluate the questionnaire online. Two invalid questionnaires were discarded, and 13 valid questionnaires (6 males and 7 females) were obtained. Their ages ranged from 18 to 23 years, with an average age of 19.53 years (*SD* = 1.20). According to the reliability test statistics in SPSS, the Cronbach’s alpha coefficient for the 40 questions (including the 4 types) analyzed among the 13 samples was 0.705, indicating that the questionnaire has higher reliability.

Test Procedure

The materials that have undergone normalization testing

Table 1

Materials of Four Patterns

Pattern 1	Pattern 2	Pattern 3	Pattern 4
1. 小丽的妈妈教得挺好。 Xiaoli’s mother teaches very well.	1. 王婶的窗花剪得挺巧。 Aunt Wang makes the paper cuts for window decoration very skillfully.	1. 今年冬天格外寒冷，为了预防感冒，妈妈的衣服穿得很厚。 This winter is particularly cold. In order to prevent colds, my mother wears thick clothes.	1. 你当你的大领导，我做我的小职员。 You workas a big leader, while I as a junior clerk.
2. 嫂子的媒人住得很远。 My sister-in-law’s matchmaker lives far away.	2. 爷爷的象棋买得挺值。 Grandpa’s chess is well worth buying.	2. 老师特别提出表扬，在班级大扫除活动中，于飞的玻璃擦得挺亮。 The teacher particularly praised Yu Fei for wiping the glass very clean during the class cleaning.	2. 期末考试不及格，弟弟挨了爸爸的板子。 Due to the failure in the final exam, my younger brother got slapped by father.

were used as the final testing materials. The test was conducted in the form of an online questionnaire to investigate the acquisition of p-structures by two groups of participants: native Chinese speakers and CSL learners from Africa and Southeast Asia. The native speaker participants were science and engineering undergraduates and graduates from a university in Shandong province, China, while the CSL learners were international students who were studying or ever studied in China. The questionnaire was designed and results were collected using the sojump app (providing functions equivalent to Amazon Mechanical Turk). As stated in "Materials," the test was comprised of four types of sentence patterns (Pattern 1, Pattern 2, Pattern 3, Pattern 4), each with 10 multiple-choice items, resulting in a total of 40 items. And each item is given 2.5 points, with a total score of 100 points. A correct response was awarded 2.5 points, and an incorrect response received 0 point.

Two versions of the test were designed with the same content but in a different order. Each participant was only allowed to complete one version of the test and could not repeat the test. Each participant received a WeChat red envelope as the payment as he or she completed the test. We collected 100 valid questionnaires from each group for final statistical analysis. Collected data were analyzed using SPSS 3.0 software, including descriptive and inferential analyses (independent samples t-test and one-way ANOVA).

Results

The descriptive statistics showed that there were significant differences in test scores between the two groups of participants (see Figures 1 and 2). The average score for all items by the CSL learners was 45.975 (*SD* = 12.890), with an average accuracy of 49.650%. Specifically, the average accuracy for Pattern 1 was 57.9%, with the average accuracy rates for real and pseudo attributive clauses being 56.4% and 59.4%, respectively. The average accuracy for Pattern 2 was 41.9%, with the average accuracy for real and pseudo attributive clauses 54.4% and 29.4%, respectively, and the probability of selecting "not" for pseudo attributive clauses was 29.4%, while the probability of selecting "yes or no" was 18.4%. The average accuracy for Pattern 3 was 54.4%, with the average accuracy for real and pseudo attributive clauses being 63.8% and 44.4%, respectively. The average accuracy for Pattern 4 was 44.7%.

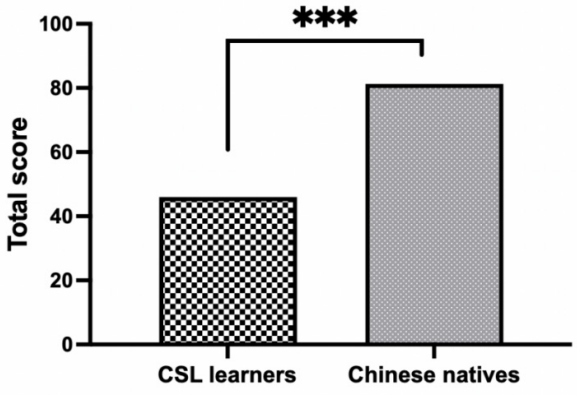

Figure 1. Total Score of CSL Learners and Chinese Natives

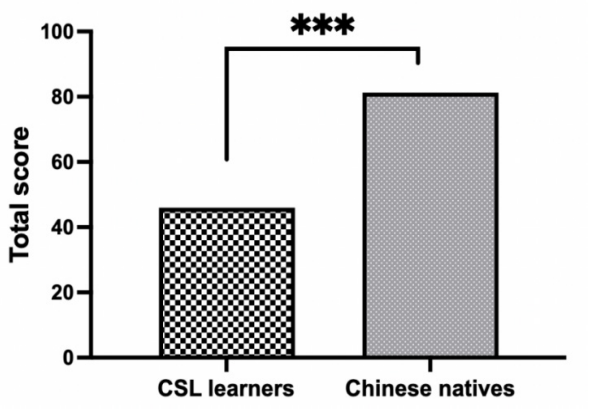

Figure 2. Average Accuracy of CSL Learners and Chinese Natives

As expected, native Chinese speakers performed significantly better than non-native speakers in the test. The average score for native speakers was 81.250 (*SD* = 6.895), with an average accuracy of 81.3%. Specifically, the average accuracy for Pattern 1 was 93.5%, with the average accuracy for real and pseudo attributive clauses being 99.6% and 87.4%, respectively. The average accuracy for Pattern 2 was 50.6%, with the average accuracy for real and pseudo attributive clauses being 91.3% and 10.0%, respectively. The probability of selecting "not" for pseudo attributive clauses was 10.0%, while the probability of selecting "yes or no" was 42.0%. The average accuracy for Pattern 3 was 87.7%, with the average accuracy for real and pseudo attributive clauses being 88.2% and 87.4%, respectively. The average accuracy for Pattern 4 was 93.1%.

The inferential analysis revealed significant differences between CSL learners and native Chinese speakers in the total score ($t = -24.131$, $df = 198$, $p < 0.001$, Cohen's $d = -3.413$), average total accuracy ($t = -21.335$, $df = 198$, $p < 0.001$, Cohen's $d = -3.017$), and average accuracy of the first,

second, third, and fourth patterns (Pattern 1: $t = -17.339$, $df = 198$, $p < 0.001$, Cohen's d = −2.452; Pattern 2: $t = -3.567$, $df = 198$, $p < 0.001$, Cohen's $d = -0.504$; Pattern 3: $t = -14.887$, $df = 198$, $p < 0.001$, Cohen's $d = -2.105$; Pattern 4: $t = -19.923$, $df = 198$, $p < 0.001$, Cohen's $d = -2.818$). As expected, native Chinese speakers had significantly higher average accuracy than CSL learners in all indicators (see Figures 1 and 2). Among them, significant participant differences were found in terms of the syntactic structures containing real attributive (Pattern 1: $t = -12.648$, $df = 198$, $p < 0.001$, Cohen's $d = -1.789$; Pattern 2: $t = -9.077$, $df = 198$, $p < 0.001$, Cohen's $d = -1.284$; Pattern 3: $t = -8.863$, $df = 198$, $p < 0.001$, Cohen's $d = -1.253$) and pseudo attributive patterns (Pattern 1: $t = -8.381$, $df = 198$, $p < 0.001$, Cohen's $d = -1.185$; Pattern 2: $t = 5.810$, $df = 198$, $p < 0.001$, Cohen's $d = -0.822$; Pattern 3: $t = -12.300$, $df = 198$, $p < 0.001$, Cohen's $d = -1.740$).

Due to the large individual differences among the CSL learners, we categorized them into a high-proficiency(HP) group (41 individuals) and a low-proficiency (LP) group (59 individuals) based on the mean total score (45.975) and further compared the testing performance of the two groups. The results showed that the HP group had an average score of 57.805 ($SD = 10.536$), while the LP group had an average score of 37.754 ($SD = 6.275$). The specific accuracy of each group for each type of patterns is listed in Tables 2 and 3.

Table 2

Average Accuracy of Four Patterns by CSL Learners of Different Chinese Proficiency

Group	Pattern 1	Pattern 2	Pattern 3	Pattern 4
LP group	48.6%	32.8%	47.3%	35.9%
HP group	71.2%	54.9%	63.9%	57.3%

Table 3

Average Accuracy of Four Patterns for Real and Pseudo Adjective Clauses by CSL Learners of Different Chinese Proficiency

Group	Pattern 1 for R Cls	Pattern 1 for P Cls	Pattern 2 for R Cls	Pattern 2 for P Cls	Pattern 3 for R Cls	Pattern 3 for P Cls
LP group	40.7%	56.6%	38.3%	27.5%	55.3%	39.3%
HP group	79.0%	63.4%	77.6%	32.2%	76.1%	51.7%

Note: R Cls = real attrributive caluses; P Cls = pseudo attrributive caluses

Independent sample t-tests showed significant differences between the HG learners (41 participants) and the LG group learners (59 participants) in terms of total score ($t = -11.905$, $df = 98$, $p < 0.001$, Cohen's $d = -2.421$), total accuracy ($t = -12.275$, $df = 98$, $p < 0.001$, Cohen's $d = -2.496$), and average accuracy for each pattern (Pattern 1: $t = -7.562$, $df = 98$, $p < 0.001$, Cohen's $d = -1.537$; Pattern 2: $t = -6.419$, $df = 98$, $p < 0.001$, Cohen's $d = -1.305$; Pattern 3: $t = -5.122$, $df = 98$, $p < 0.001$, Cohen's $d = -1.041$; Pattern 4: $t = -5.257$, $df = 98$, $p < 0.001$, Cohen's $d = -1.069$).

To understand whether there were any differences in the acquisition of different types of pseudo-relative clauses, descriptive analyses and one-way ANOVA were conducted for the CSL learners and Chinese native speakers separately(see Figure 3). Results showed that both CSL learners and Chinese natives performed best in Pattern 1 sentences (average accuracy for CSL learners: 57.9%; Chinese natives: 93.5%) and worst in Pattern 2 (average accuracy CSL learners: 41.9%; Chinese natives: 50.6%). One-way ANOVA revealed significant differences between the four types of sentence patterns (CSL learners: $F(396) = 14.693$, $p < 0.001$; Chinese natives: $F(396) = 306.064$, $p < 0.001$). Additionally, the results of each pattern were compared between the CSL learners of

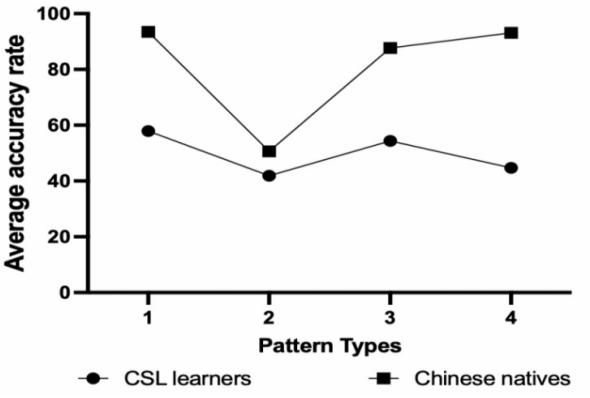

Figure 3. Average Accuracy of 4 Patterns by CSL Learners and Chinese Natives

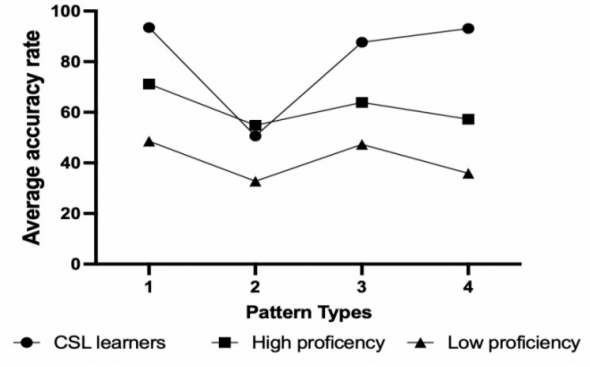

Figure 4. Average Accuracy of 4 Patterns by CSL Learners (HP and LP) and Chinese Natives

different Chinese proficiency and the Chinese natives (see Figure 4). The results revealed that CSL learners relative to Chinese natives had a higher average accuracy in Pattern 2, a bit beyond our expectation.

To investigate the possible influence of context on the acquisition of p-structure based sentences, this study compared the testing results for Pattern 2 and Pattern 3. Independent sample t-tests indicated significant differences between the two patterns (CSL learners: $t = -4.551$, $df = 198$, $p < 0.001$, Cohen's $d = -0.644$; Chinese natives: $t = -18.869$, $df = 198$, $p < 0.001$, Cohen's $d = -2.667$) (see Figures 5 and 6).

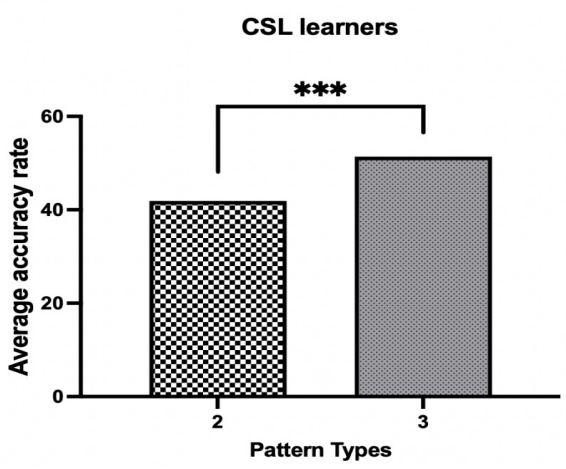

Figure 5. Average Accuracy of Patterns 2 and 3 by CSL Learners

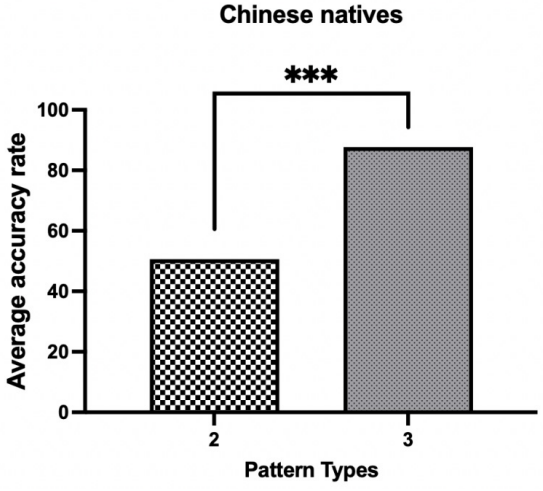

Figure 6. Average Accuracy of Patterns 2 and 3 by Chinese Natives

Discussion

Based on the above statistics, this part summarizes the basic rules of p-structures' acquisition and analyzes why the CSL learners met difficulties in acquiring different subtypes of p-structures, aiming to provide useful insights for Chinese language learning and teaching.

Rules of Pseudo-Attributive Structures Acquisition

The statistical analysis of 200 testing results suggests that both native speakers and CSL learners show the following characteristics in comprehending p-structure based sentences, which preliminary demonstrate the rules of acquiring this structure.

Firstly, p-structure based sentences are more difficult to acquire than real attributive-head structure based sentences, leading to lower accuracy in comprehension. According to some scholars (e.g., Huang, 2008; Shen, 2008; Pan & Lu, 2011), p-structures involve syntactic movement and are derived via transformation such as movement and insertion, while true relative clauses are generated by basic structure. Psycholinguistics has long proved that movement structures are more complex and more difficult to acquire than non-movement structures (Zhou & Liu, 2010).

Secondly, native speakers generally perform better than second language learners in acquiring p-structure based sentences, which has been demonstrated by the test scores of different types of p-structures. The average accuracy is 81.3% for Chinese natives but 45.98% for CSL learners. The statistical difference is significant, indicating that p-structures are indeed a relatively complex syntactic configuration in Mandarin Chinese, and even Chinese native speakers cannot always comprehend them accurately. As a consequence, it is no strange that the CSL learners show inferior performance in the acquisition test of the p-structure based sentences.

Thirdly, the difficulty of acquisition varies with the types of p-structures. According to the testing results of the two groups, the difficulty tendency is similar but the difficulty hierarchy differs (increasing in order): for CSL learners, p-structures with appositive relationships (57.9%) > skill-based p-structures in context (54.4%) > transitive-based p-structures (44.7%) > skill-based p-structures out of context (41.9%); for native speakers, p-structures with appositive relationships (93.5%) > transitive-based p-structures (93.1%) > skill-based p-structures in context (87.7%) > skill-based p-structures out of context (50.6%). The specific learning difficulty trends of the two groups are shown in Figure 3.

For both CSL learners and Chinese natives, the shared point is that p-structures with appositive relationships are the

easiest to learn, and skill-based p-structures out of context (due to potential ambiguity)are the most difficult to acquire; context can facilitate the comprehension of p-structures, so the accuracy is higher in skill-based structures in context than out of context. In brief, all the testing participants follow difficulty hierarchy: p-structures with appositive relationships > skill-based p-structures in context > skill-based p-structures out of context.

The two groups' difference is that except for skill-based p-structures out of context, CSL learners show the poorest comprehension of transitive-based p-structures, while Chinese natives obtain high scores in understanding these types of p-structures (almost the same as that of p-structures with appositive relationships), indicating an obvious deviation between the two groups of participants in acquiring these structures.

Fourthly, context promotes the understanding of p-structures. The measurement results of Pattern 2 and 3 show that context takes effect obviously: under the support of context, the accuracy of skill-based p-structures is significantly increased (the average scores of the two groups were increased by more than 50%); compared with the CSL learners, Chinese natives demonstrate a better contextual effect, and the accuracy is more than 30% higher in context condition than in no-context condition, which is significantly beyond expectation.

Pseudo-Attributive Strctures More Difficult to Acquire Than Real Attributive-Head Structures

Real attributive-head structures refer to the ones with a possessive relationship between the attributive and the head noun, while the p-strucutres appear to show a surficially possessive relationship but do not convey the corresponding functions or meanings between the two parts.

The test results show that there is a significant difference in both within- and between-subject statistics, indicating that the p-structures are indeed more difficult to acquire than real attributive structures. The diverse subcategories within p-structures contribute to the difficulty in acquiring this structure. Compared to real attributive structures, the form-meaning mismatch in p-structures breaks people's cognitive expectations, and the appearance of the head noun contradicts the expectation set by the attributive inherently. The entire structure requires syntactic and semantic reanalysis to achieve effective semantic integration. For native speakers, this process consumes more cognitive resources, and the probability of misinterpreting increases under the pressure of "self-speed" (although the test does not limit completion time). For second-language learners, the form-meaning mismatch makes them feel that the structure is "strange" (and the frequency of p-strucutres in the oral communication of international students is relatively low). For one thing, it is difficult to identify the different ways in which subcategories of p-strucutres show form-meaning mismatch, and for the other, some p-structures are essentially ambiguous, such as the skill-based p-structures examined in Pattern 2 and 3. According to the existing researches (e.g., Hu, 2016), the most discussed p-strucutres, like 他的老师当得好 /He works as a good teacher, also have ambiguity: when "teacher" in "his teacher" is understood as an individual, 当得好 /do better is a complex predicate expressing active meaning, and the structure is a real attributive structure; when "teacher" is understood as the object of 当 /work as meaning "he works as a teacher," the "teacher" here is indefinite, and the resulting structure is a p-structure. The key to ambiguity here arises from the fact that the subject position in Chinese can be a thematic position (thus expressing active meaning) or a non-thematic position (thus expressing passive meaning) (Hu, 2016).

Cognitive Factors Contributing to the Acquisition Difficulty of Pseudo-Structures

The test results of this study show that despite significant differences in the testing scores for p-strucutres between CSL lesarners and Chinese natives, they exhibit a common trend: appositional p-strucutres (Pattern 1) > relational p-strucutres. What factors contribute to this difficulty hierarchy? We proposed the following as the potential aspects, including structural ambiguity, [±animacy] of NP_2, and the interface knowledge of morphology-syntax.

As it is, "NP_1 de NP_2" is an ambiguous structure, as the predicate implied between NP_1 and NP_2 can be differently recovered in different contexts, showing a diverse potential semantic relationship. When NP_2 is a non-animate noun, it may be the possession of NP_1, that is, there is a broad sense of possession between NP_1 and NP_2, which can be realized by different predicates. At this time, NP_2 is specific (e.g., 他的篮球 /his basketball → the basketball he purchased/the basketball he kept/the basketball he received, etc.), and the ambiguity arises. Yet when NP_2 is understood as a particular skill (NP_2 is indefinite, such as "the basketball he plays well" in "his basketball"), another potential ambiguity arises. In

contrast, when NP_2 is an animate noun, the structure "NP_1 de NP_2" does not have an ambiguous possession relationship (e.g., 他的老师 /his teacher), and the syntactic parser only denies the initially confirmed possession relationship when this structure is used as the subject and is followed by a specific verb phrase as the predicate (e.g., 他的老师当得好 /his teacher teaches well), and the semantic relationship between NP_1 and NP_2 can be confirmed by a reanalysis (i.e., NP_1 and NP_2 are of the same individual). As a result, in online comprehension, Pattern 1 is more difficult than Pattern 2, obviously resulting from the potential syntactic ambiguity and the [±animacy] of NP_2.

From the perspective of language construction, morphology governs the formation of words, while syntax governs the generation of phrases and sentences. However, in actual verbal practice, this boundary is often broken, resulting in the so-called morphosyntactic interface, a phenomenon prevalent particularly in Chinese. According to morphology, the internal structure of a word is closed, requiring that other elements cannot be inserted, otherwise the word becomes non-existent (for example, in English, boyfriend → *boyonefriend). But in modern Chinese, the morphology and syntax do not work in such a clear-cut fashion. As a typical instance, separable words in Chinese can be inserted with some aspect particles (e.g., zhe/le/guo) or other compoents (e.g., shengme/what) between the two components of each word. Pattern 4 of the test is about the usage of separable words under the condition of separation, i.e., the situation where intransitive verbs take objects. According to Chinese syntax, the object is unable to appear in the object-verb structure (including words and phrases), but sometimes such variant structures are likely and available for semantic reasons in language communication. The way to solve this syntactic controversy is usually to introduce the semantic object of the object-verb structure by virtue of a prepositional phrase, like* 王涛经常帮忙我 /*Wang Tao often helps me (semantically valid, but not allowed syntactically) → Wang Tao often helps me by giving/doing something, but obviously it is more economical to directly insert the semantic object "me" into the separable word (cf. 王涛经常帮我做某事 / 给某物 /Wang Tao often helps me giving/doing something → 王涛经常帮我的忙 /Wang Tao often helps me/gives me a hand), which gives rise to a p-structure 帮我的忙 /helping me. Chinese natives feel ease to acquire this knowledge, but it is undoubtedly a huge challenge for CSL learners (because not all object-verb structures can take objects), so they make more mistakes in testing, and the resulting difficulty is just next to that of skill-type p-strucutres without context.

Influence of Chinese Proficiency on Comprehending Pseudo-Structures

As expected, native speakers scored much higher than the CSL learners in the testing of different types of p-structure based sentences. Among the CSL learners, HP learners scored on average more than 20% higher than LP learners in all the pattern types, while maintaining the same difficulty hierarchy across types. As shown in Figure 4, Chinese proficiency does indeed affect their performance in understanding various types of p-structure sentences, indicating that the acquisition of this structure differentiates CSL learners with distinct Chinese proficiency. This suggests that in teaching such special structures, different types of structure knowledge should not be taught simultaneously, but should be differentiated into subcategories (e.g., different types within the attributive-head structure) and taught in order of increasing difficulty, consequently leading to better pedagogical results.

Conclusion

Due to the mismatches between form and meaning, the nominal modifier structure that appears to express a normal possessive relationship becomes a p-structure in the sentence context. This is a characteristic of Chinese language and reflects the flexibility and innovation of Chinese syntax.

Our tests show that there are significant difficulty differences in comprhending the four types of attributive strucutres ("NP_1 de NP_2"). The p-structures that express apposition are the easiest to understand, while skill-based p-structures without contextual support are the most difficult, with the other two types in between. Based on this recognition, the difficulty hierarchy of p-strucutres can be summarized as follows (with ">" indicating increasing difficulty): appositional p-strucutres > skill-based p-strucutres with contextual support/VO p-strucutres > skill-based p-strucutres without contextual support.

Because of the differences in the proficiency of native and second language speakers, the above difficulty hierarchy of p-strucutres shows variation with the two groups of testers:

Appositional p-strucutres/VO p-strucutres > skill-based p-strucutres with contextual support > skill-based p-strucutres without contextual support (for native Chinese speakers)

Appositional p-strucutres > skill-based p-strucutres with

contextual support > structure-object p-strucutres > skill-based p-strucutres without contextual support (for CSL learners)

In addition to the proficiency level in Chinese, the degree of mastery of morphological and syntactic knowledge is also an important factor that affects the difficulty hierarchy. Context shows its extra influence on the recognition of p-structures. Appositional p-strucutres are the easiest to understand because both NP_1 and NP_2 are animate nouns. When the two NPs appear in the subject position, participants tend to adopt a default strategy, i.e., the general strategy of animate nouns as subjects. However, when NP_2 is an inanimate noun, "NP_1 de NP_2" can only appear in the sentence as an object of the verb, and the comprehension difficulty increases for the object has undergone movement. But appropriate context can effectively promote the recognition of this type of structure. When a VO structure can be followed by an object becomes really very hard for CSL learner, so they feel more difficult to understand VO p-structures.That is why their difficulty level is not much different from that of skill-based p-strucutres without contextual support in the test.

Despite discrepant performance by the two groups of CSL learners (HP vs. LP) with distinct Chinese proficiency, the testing results showed that there were only differences in scores for each Pattern between the two groups. Nevertheless, the results did not change the overall trend of the difficulty hierarchy (as shown in Figure 4). This again confirms the reliability of p-strucutres' difficulty hierarchy and provides an important insight for Chinese second language teaching: following the strategy of starting with the easier structures and then progressing to the more difficult ones can improve teaching effectiveness, as it is more in line with the cognitive rules of language acquisition.

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