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The Anaphor Features and Antecedent Retrieval of Mandarin "Ta"

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Abstract: The studies of antecedent retrieval of Chinese personal pronouns have been the focus of semantic and syntactic scholars. It has also been a difficult problem for learners. This study works on the actual mastery of native Chinese speakers regarding the pronoun "Ta" (他, he) in the third person singular in terms of anaphor features and antecedent retrieval. Two experiments, "Ancient Chinese vs. Modern Standard Chinese" and "uncommon usage vs. common usage", reveal native speakers' antecedent retrieval regarding the pronoun "Ta" (他, he) in the third person singular. Experiment 1 found that native Chinese speakers had an error rate of about 25% when analyzing sentences containing "Ta" in Old Chinese and about 2% in Modern Standard Chinese. The results of Experiment 2 illustrate that native Chinese speakers made about 14% of the errors in the analysis of the uncommon usage of "Ta", while only about 1% of the errors were made in the common usage. Therefore, Chinese learners do not need to know all the usage of "Ta" in Ancient Chinese and uncommon usage, but they need to learn all the usage in Modern Standard Chinese and common usage to achieve the goal of good understanding.

Keywords: third person singular pronoun, antecedent retrieval, error rates

1. Introduction

1.1. Anaphor Features and Antecedent Retrieval of Mandarin Pronoun

Earlier researchers have indicated that individuals who understand language initially assess the connection between the linguistically straightforward long-range reflexive pronouns and the nearest subject position. They then proceed to contemplate more remote antecedents with greater structural distance [1] [2] [3] [4] [5]. The investigation of referring words or phrases such as pronouns, reflexives, and anaphoric definite descriptions have been thoroughly explored within the domains of linguistics and psycholinguistics. Researchers in both linguistics and psycholinguistics have demonstrated curiosity in comprehending the establishment of interpretation and grammatical utilization of referring expressions [6] [7] [8]. Especially within the realm of psycholinguistics, scholars have explored anaphoric expressions to glean insights into how readers or listeners organize textual information. Additionally, they have used these expressions to gain insights into the cognitive processes within working memory that facilitate comprehension at the sentence and discourse levels [4] [9] [10] [11] [12] [13] [14] [15].

DOI: 10.54254/2753-7064/16/20230645

There are also linguists from other focus, who study the personal pronoun anaphora. In her work from 1999, Hickmann examined the cohesion and anaphora present in narratives created by children. She posited that the development of anaphora follows pragmatic principles, alongside unique linguistic characteristics that determine how languages align functions within both discourse and sentences through corresponding structures [16]. Ning, Pang, and Shi Jun-Feng wrote "Resolving anaphora for third-person pronouns within the fragmented content of the Chinese Internet text." Drawing from the traits exhibited by Chinese personal pronouns within the sudden content of the Chinese online environment, they suggest an approach to resolving anaphora. This approach utilizes a corpus and employs the maximum entropy principle [17]. In 2008, Fei, Li, and their colleagues conducted research on the resolution of pronominal anaphora in Chinese using conditional random fields. They present an approach that employs Conditional Random Fields for tackling the task of resolving anaphora related to personal pronouns in Chinese written materials. This technique considers various anaphoric attributes and their interrelations. Experimentation on the Chinese ACE (Automatic Content Extraction) training corpus validates the viability of their proposed method for resolving anaphora related to Chinese personal pronouns [18].

Given previous studies, this study is more inclined to narrow the research point to one personal pronoun: "Ta" and deepen the study on it. The study focuses on the personal pronoun "Ta" and conducts reading recognition experiments on two Chinese native speakers from the aspects of "Ancient Chinese and Modern Standard Chinese" and "uncommon usage and common usage" respectively. The purpose of this is to find out the correct rate of anaphora recognition of "Ta" by people whose native language is Chinese, that is, the true using situation. Because sometimes, people's understanding of what the pronoun knows about the object can be vague or even wrong. The presence of these errors also doesn't seem to have a big impact on people's cognition. What is the error tolerance rate? So, to what extent should a Chinese language learner at least master the anaphora of the pronoun "Ta"? What about second-language learners of Chinese?

1.2. Mandarin Personal Pronoun "Ta"

The study of personal pronouns is often associated with discourse analysis. Helmbrecht made a typical study on the relationship between the formal meaning of personal pronouns and discourse in 2015 [19]. He offers a compelling typological analysis of the unconventional applications of personal pronouns. The study showcases that the discrepancy between form and meaning within personal pronouns is predominantly linked to discourse. This implies that the referents of personal pronouns shift fluidly within specific contexts, leading to the inclusion of supplementary pragmatic nuances in their interpretation.

Linguists have shown a significant fascination with the third-person pronoun "Ta" in Mandarin. Within the sixth volume of "Essays on Linguistics" by Yuyanxue Luncong, two out of thirteen articles are dedicated to investigating its origins [20]. Li and Thompson have explored its role within anaphoric processes [21]. Despite extensive examination of when "Ta" is used or not, the importance of its application for referring to non-human entities has yet to be acknowledged. Therefore, the types and tokens in this study will include the non-human case of "Ta".

Some scholars also examine the non-referential aspect of "Ta". The use of the non-referential term "Ta", which translates to "it" in Chinese, is viewed as a "dynamic element" according to Chao [22] and Lü et al [23]. Despite occasional mentions, there is a limited number of organized inquiries into its syntax, semantics, or purpose. Zhu [24] and Ma [25] treated the non-specific use of "Ta" as the primary object in a double-object construction. Iljic placed considerable importance on the semantic contexts and modal implications of the non-specific "Ta", rather than its syntactic structure [26]. As far as is known, a comprehensive analysis of this non-specific element can be found in Lin's work, where "Ta" was examined as the specifier of AgrOP (Object Agreement

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Phrase) [27]. However, Yuan took an alternative stance, asserting that the non-specific "Ta" functions as a preform for the VP [28]. Based on previous studies on the pronoun "Ta" (he) and my thinking, I designed the following two sets of experiments.

2. Experiment 1: Antecedent Retrieval of "Ta" in Ancient Chinese and Modern Standard Chinese

There are some different ways of saying "Ta" in Ancient Chinese. In Ancient Chinese, the usage and form of personal pronouns may be different from modern ones. As a learner who is learning both Ancient Chinese and Modern Standard Chinese (including First Language and Second Language), this can be a barrier to cognition and learning. Experiment 1 compares the cognition and recognition of "Ta" in Ancient Chinese and Modern Standard Chinese, revealing the real cognition level of "Ta" in the two by native Chinese speakers. In addition, based on the degree of comprehensive use, this study selects "彼" (bǐ, "that") and "其" (qí, "its" or "their") as the study objects of Ancient Chinese; Modern Standard Chinese has only one object: "他" (tā, "he").

2.1. Materials and Method

Experimental 1 has a sentence matric: it includes 5 sentences of Ancient Chinese and 5 sentences of Modern Standard Chinese. Of course, all sentences contain the third person singular "Ta". The types of Experiment 1 are Ancient Chinese and Modern Standard Chinese; tokens are 10 sentences. Before the experiment begins, these 10 sentences will be printed on the same test paper at the same time, so that the participants can answer them conveniently. The sentences in the test are generated by the input requirements using AI.

彼山之巅, 云雾缭绕, 似乎通往仙境.

bǐ shān zhī diān(NP), yún wù liáo rào(SV), sì hū tōng wǎng xiān jìng(PE).

At the peak of that mountain, with clouds and mist swirling, it seems to lead to a fairyland.

李明正在图书馆里认真地阅读一本小说, 而他的朋友则在咖啡馆等他.

Lǐ Míng(subj.) zhèngzài túshūguǎn lǐ rènzhēn de yuèdú(PAC)yī běn xiǎoshuō(DO), ér(conj.)tā de péngyǒu zé zài kāfēiguǎn děng(PAdvC)tā (DO).

Li Ming is earnestly reading a novel in the library, while his friend is waiting for him in the café.

其功德无量, 受人景仰.

qí gōng dé wú liàng(NP), shòu rén jǐng yǎng(PVP).

Their virtues are immeasurable, admired by others.

昨天, 张伟在球场上打篮球, 然后他和他的姐姐跑去了电影院.

zuótiān(TAP), Zhāng Wěi(subj.)zài qiúchǎng shàng dǎ lánqiú(PVO), ránhòu(conj.)tā hé tā de jiějie (subj.)pǎo qùle diànyǐngyuàn(PVO).

Yesterday, Zhang Wei played basketball on the court, and then he and his sister ran to the cinema.

彼时, 人们尚未觉察到大变革的迹象.

bǐ shí(NP), rén mén shàng wèi jué chá dà biàn gé de jì xiàng(SVO).

At that time, people had not yet noticed the signs of significant change.

陈磊喜欢中午跳绳锻炼身体, 而他的朋友更喜欢在晚上锻炼.

Chén Lěi(subj.) xǐhuān zhōngwǔ tiàoshéng duànliàn shēntǐ(PVO), ér(conj.)tā de péngyǒu(DO)gèng xǐhuān zài wǎnshàng duànliàn(PVO).

Chen Lei likes skipping rope at noon for exercise, while his friend prefers to exercise in the evening.

其计划周详, 步步为营, 最终取得了胜利.

DOI: 10.54254/2753-7064/16/20230645

qí jì huà zhōu xiáng(NP), bù bù wéi yíng(AdvP), zuì zhōng qǔ dé le shèng lì(Adv. Clause).

Their plans were detailed, taking careful steps, and ultimately achieving victory.

吴涛的聪明才智使他在学校中出类拔萃, 而他的双胞胎兄弟也同样出色.

Wú Tāo de cōngmíng cáizhì(subj.) shǐ tā zài xuéxiào zhōng chū lèi bá cuì(PVO), ér(conj.)tā de shuāngbāo bìxiōngdì(subj.)yě tóngyàng chūsè(PVO).

Wu Tao's intelligence made him excel in school, and so did his twin brother.

彼地气候适宜, 四时如春.

bǐ dì qì hòu shì yí(NP), sì shí rú chūn(PE).

The climate there is pleasant, with all seasons resembling spring.

尽管困难重重, 孙宇保持着积极的心态, 而他的同学也因此受到了鼓舞.

jǐnguǎn kùnnán zhòngzhòng(CAP), Sūn Yǔ(subj) bǎochí zhe jī jí de xīn tài(PVO), ér(conj.)tā de tóngxué yě yīn cǐ shòu dào le gǔwǔ(PVO).

Despite the difficulties, Sun Yu keeps a positive attitude, and his classmates are encouraged by it.

("Chinese sentences" are presented on the test paper, but "pinyin", "component analysis" and "translation" will not show up, just for analysis.)

2.2. Participants and Procedure

33 Chinese students from George Mason University (GMU) participated in Experiment 1. They are all Ph.D. students from ECE majors, and all of them are native Chinese speakers who came to the U.S. as adults. They were randomly numbered from 1 to 33. On one hand, the experiment opted for a suitable size for the experimental group to enhance experiment efficiency; On the other hand, it is convenient for statistics and sufficient to discover the experimental results. The experiment was carried out in a quiet room with sufficient light, unobstructed air, and moderate temperature. Therefore, the external interference is assumed to be 0. The participants will not be informed in advance about the content of the test before the test begins.

All the participants used the test questions with the same content and answered them simultaneously in the same space for 10 minutes. (In the stage of experimental design and preparation, it is believed that a person whose native language is Chinese can analyze a question within one minute.) The full score of the test is 100 points, that is, 10 points for each question; if two "Tas" appear in a sentence, all correct answers are scored for this question. To avoid uneven energy distribution, the order of the 10 questions is one Ancient Chinese and one Modern Standard Chinese alternately.

2.3. Statistical Analysis and Results

Firstly, the test results of the experiment are introduced. The test successfully predicted the behavior and results of the participants in Ancient Chinese and Modern Standard Chinese. Secondly, the experimental results are presented in Python to view the distribution and regularity of the results.

Table 1: Experiment 1 (ancient Chinese and modern standard Chinese) test results statistics.

	A	M	Total
1	50	50	100
2	30	50	80
3	10	40	50
4	40	50	90

DOI: 10.54254/2753-7064/16/20230645

Table 1: (continued).

...	...	...	...
32	50	50	100
33	40	50	90

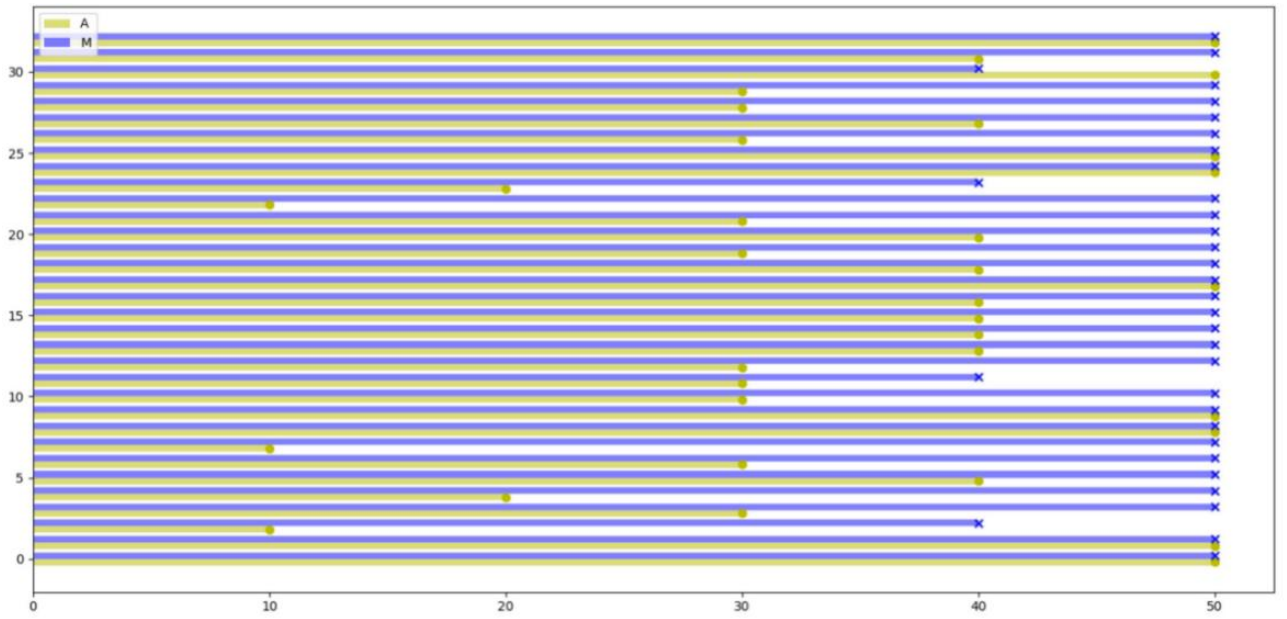

Figure 1: Test results of Experiment 1 "Ancient Chinese and Modern Standard Chinese" (Horizontal: test score; Vertical: participant number).

Observing the figure provided, it becomes evident that the A group's scores are notably inferior to those of the M group. Most of the M group has a full score of 50 points, and some have 40 points; in contrast, the A group has 50 points, and the scores are more uneven, with the lowest score being 10 points. Through Table 1, it is known that the error rate of the A group is about 25%, and the error rate of the M group is about 2%. Among the native speakers of Chinese, "Ta" has antecedent retrieval cognitive errors of ≤ 25% in Ancient Chinese and ≤ 2% in Modern Standard Chinese, and they can understand the basic meaning of sentences. This result further confirms the observation of the experimental results in Figure 1.

Combined with the above analysis of the results of Experiment 1, Reading Times and Comprehension are also used as reference factors for the experimental results. According to experimental observations, most of the participants left the room within the prescribed 10 minutes and generally completed the test within 6-8 minutes. In other words, Reading Times and Comprehension have no effect on experimental results.

2.4. Discussion

The experimental results believe that for native speakers of Chinese, the antecedent retrieval cognition of "Ta" in Ancient Chinese is worse than that in Modern Standard Chinese. The cognitive error tolerance rate of "Ta" in Ancient Chinese is 25%, and the cognitive error tolerance rate in Modern Standard Chinese is 2%. Then it can be roughly considered that it is more important to

DOI: 10.54254/2753-7064/16/20230645

master the antecedent retrieval of "Ta" in Modern Standard Chinese, and it is necessary to achieve complete mastery. The reason why "Ta" is not well mastered in Ancient Chinese may be because many expressions are not used often or are not used in spoken.

3. Experiment 2: Antecedent Retrieval Cognitive Comparison of "Ta" in Uncommon Usage and Common Usage

Xu Liejiong believed that the third-person pronoun singular "Ta" in Chinese has two special usages, one of which is that the antecedent can be either animate or inanimate; the second is that the antecedent can be a singular form may also be a plural form [29]. On this basis, Experiment 2 of this study enriches the interpretation of "Ta" in uncommon usage, for example: "Ta" can be used to express abstract concepts, symbolic meanings, etc., and appears in some rhetorical and creative contexts. On the contrary, the common usage of "Ta" is to usually refer to a male. The experiment selects "他" (tā, "he") as the study object for the cognitive comparison of Antecedent Retrieval in Uncommon Usage and Common Usage.

3.1. Materials and Method

The experimental project also includes 10 sentences: the test includes 5 Uncommon Usage and 5 Common Usage sentences with "Ta". All sentences contain the third person singular "Ta". The types of Experiment 2 are Uncommon Usage and Common Usage; tokens are 10 sentences. The content of the questionnaire in Experiment 1 was not repeated with that in Experiment 2. The sentences in the test are generated by the input requirements using AI.

1. 月光洒在大海上, 照亮了波涛的每一次起伏, 仿佛大自然在述说着它的故事, 而唯有他能够倾听明白.

yuèguāng(subj.) sǎ zài dàhǎi shàng, zhàoliàng le(pred.) bōtāo de měi yī cì qǐfú(obj.), fǎngfú dàzìrán zài shùyù zhe tā de gùshì, ér wéiyǒu tā nénggòu qīngtīng míngbái(Adv. clause).

Moonlight falls on the sea, illuminating every rise and fall of the waves, as if nature is telling its story, and only he can understand it clearly.

2. 我的朋友正在图书馆认真地阅读一本书, 他对知识非常感兴趣.

wǒ de péngyǒu(subj.) zhèngzài túshūguǎn rènzhēn de yuèdú(pred.) yī běn shū(obj.), tā(subj.) duì zhīshì fēicháng gǎn xìngqù(obj.).

My friend is reading a book attentively in the library, and he is very interested in knowledge.

3. 在那片茫茫沙漠中, 只有他与风沙为伴, 漫步在无尽的黄沙之中.

zài nà piàn mángmáng shāmò zhōng(attr.), [zhǐyǒu tā(subj.) yǔ fēngshā wéi bàn, mànbù(pred.) zài wújìn de huángshā zhī zhōng.] [Adv. clause]

In that vast desert, only he and the wind-blown sand are companions, strolling amidst endless golden sands.

4. 这位科学家在取得了重大进展, 他的发现引起了轰动.

zhè wèi kēxuéjiā(subj.) qǔdé le zhòngdà jìn zhǎn(pred.), tā(subj.) de fāxiàn yǐnqǐ le hōng dòng (pred.).

The scientist made great progress and his discovery caused a sensation.

5. 雨停后, 大地散发出新的气息, 万物在这场自然的洗礼中获得更新, 唯有他感受独有的清爽.

yǔ(subj.) tíng hòu(pred.), dàdì sànfā chū xīn de qìxí, wàn wù zài zhè chǎng zì rán de xǐ lǐ zhōng huò dé gēng xīn, wéi yǒu tā gǎn shòu dú yǒu de qīng shuǎng(Adv. clause).

After the rain stopped, the earth exuded a new breath, and all things were renewed in this natural baptism, and only he felt a unique refresh.

DOI: 10.54254/2753-7064/16/20230645

6. 那个年轻人是一名优秀的钢琴家, 他的表演技巧令人惊叹.

nàge niánqīng rén(subj.) shì yī míng yōu xiù de gāng qín jiā(pred.), tā(subj.) de biǎo yǎn jì qiǎo lìng rén jīng tàn(pred.).

The young man is an excellent pianist and his showmanship is amazing.

7. 在那座古老的城市里, 街巷弯弯曲曲, 古老的建筑与石板路延伸至远方, 仿佛他在追寻着岁月的足迹.

zài nà zuò gǔlǎo de chéngshì lǐ(Adv. of time), jiēxiàng(subj.)wān wān qū qū(pred.), gǔlǎo de jiànzhù yǔ shíbǎn lù yánshēn zhì yuǎnfāng(S-P structure), fǎngfú tā zài zhuīxún zhe suìyuè de zújì.

In that ancient city, streets, and alleys wind and twist, ancient buildings and stone roads extend into the distance, as if he is tracing the footprints of time.

8. 公园里有一只漂亮的小猫, 它跟着主人走来, 他是一个喜欢小猫的人.

gōngyuán lǐ(subj.) piào liàng de xiǎo māo(pred.), tā(subj.) gēnzhe zhǔrén zǒu lái(pred.), tā(subj.) shì yīgè xǐ huān xiǎo māo de rén(pred.).

There is a beautiful cat in the park. It follows its master. He is a man who loves kittens.

9. 夜晚降临, 星星点缀着黑幕, 宇宙的奥秘在寂静中展现, 只有他凝视星空, 似乎能够与宇宙相通.

yèwǎn jiànglín(S-P structure), xīngxīng diǎnzhuì zhe hēi mù(pred.), yǔzhòu de àomì zài jìjìng zhōng zhǎnxiàn(pred.), zhǐyǒu(Adv. clause)tā níngshì xīngkōng(S-P structure), sìhū(Adv. clause)nénggòu yǔ yǔzhòu xiāngtōng(pred.).

As night falls, stars adorn the dark canvas, the mysteries of the universe unfold in silence, only he gazes at the starry sky, as if he can communicate with the cosmos.

10. 在比赛中, 队长领导着团队取得了胜利, 他的领导能力得到了认可.

zài bǐsài zhōng(Adv. of time), duìzhǎng(subj.) lǐngdǎo zhe tuánduì qǔdé le shènglì(pred.), tā(subj.) de lǐngdǎo nénglì dédào le rènkě(pred.).

In the competition, the captain led the team to victory, and his leadership skills were recognized.

3.2. Participants and Procedure

The participants in Experiment 2 were the same as those in Experiment 1. They took the test in Experiment 2 at the same time and place on the second day. The experimental procedures of the two experiments are also the same.

3.3. Statistical Analysis and Results

The test results of Experiment 2 show the antecedent retrieval cognitive recognition performance of the participants in the uncommon usage and common usage of “Ta”. In addition to the statistical tables of the scores, the figure of the scores is also presented for easy observation.

Table 2: Experiment 2 (uncommon usage and common usage) test results statistics.

	U	C	Total
1	50	50	100
2	50	50	100
3	40	50	90

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Table 2: (continued).

4	50	40	90
...	...	...	...
32	50	50	100
33	40	50	90

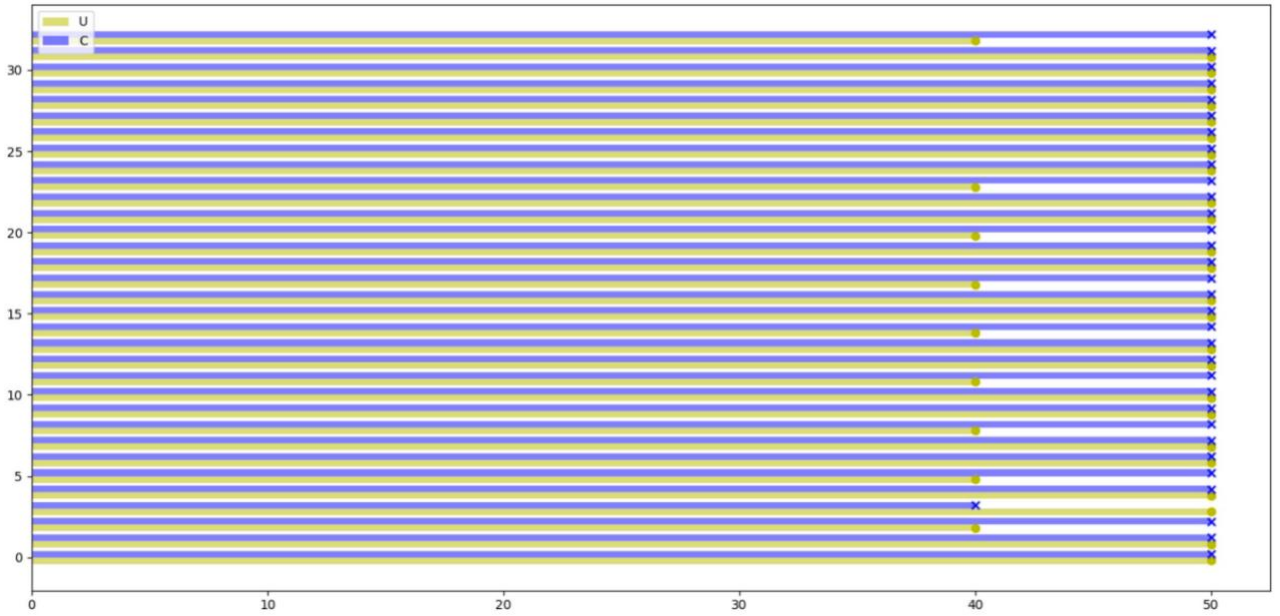

Figure 2: Test results of Experiment 2 “Uncommon Usage and Common Usage”. (Horizontal: test score; Vertical: participant number).

According to Figure 2., the difference between the scores of Group U and Group C is not as large as that of Group T and Group M; the score of Group C is higher, basically 40 and 50. Through Table 2, we know that the error rate of Group U is about 14%, and the error rate of Group C is about 1%. Among the native speakers of Chinese, “Ta” has antecedent retrieval cognitive error of ≤ 14% in uncommon usage and ≤ 1% in common usage, both of which can achieve the basic semantics of the sentence.

3.4. Discussion

According to the experimental results of Experiment 2, “Ta”’s antecedent retrieval cognition in uncommon usage is worse than that in common usage. The cognitive error tolerance rate of “Ta” in uncommon usage is 14%, and the cognitive error tolerance rate in common usage is 1%. Then it can be generally considered that it is more important to master the antecedent retrieval of “Ta” in common usage, and it must be completely mastered. At the same time, the special usage in the test can confirm that “Ta” is dynamic in Chinese [22] [23].

4. Conclusion

The study results of two experiments, confirm people’s basic impression about the Chinese third-person singular pronoun “Ta”. Native Chinese speakers grasp the anaphor features and antecedent retrieval of “Ta”: modern Chinese is better than Ancient Chinese, and common usage is better than

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uncommon usage. At the same time, the results can also help FLA and SLA Chinese learners to have a more specific understanding of the third-person singular “Ta”. In general, if learners appear to make ⩽25% errors on usages of “Ta” in Ancient Chinese, ⩽2% in Modern Standard Chinese, ⩽14% in uncommon usage, and ⩽1% in common usage, there will be no big pronoun cognitive bias. The results of these experiments can not only provide a reference for Chinese language learners but also give some insights for future related studies.

The next step of the study hopes to establish some connections between these two sets of data, for example, the usage of “Ta” is divided into special usages in Ancient Chinese and the special usage of modern Chinese, and so on. And this study focuses on studying “Ta” as a male “Ta”, and future s can be expanded to include female “Ta” and animal “Ta”.

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