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Word Segmentation and Reading Comprehension Among Advanced Learners of Chinese

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Abstract

This study investigated college Chinese a second language learners' word segmentation error patterns in reading instructional-level Chinese sentences, the relationship between word segmentation errors and reading comprehension, and learners' perspectives on the role of word segmentation in reading comprehension. The results showed that the learners made five types of word segmentation errors. Four of these types moderately correlated with reading comprehension. The survey data showed that most learners considered word segmentation skills important in reading comprehension. This perception became stronger as the learning level advanced. The learners suggested that three factors hindered them from performing accurate word segmentations.

Keywords: word segmentation, reading Chinese, lexical access, reading comprehension, reading behaviors, advanced learners of Chinese

Chinese writing is classified as non-alphabetic writing in which characters are spaced equally, and no word boundaries are indicated. The overwhelming majority of Chinese characters are free morphemes. Chinese words comprising morphemes (characters) are the smallest combinations of sounds and meanings that can be used independently in the language. The meaning of "independently used" is that the word can serve as a meaningful component or a grammar unit in a sentence. The "smallest combinations" indicate words as individual units in which nothing can be inserted between the character constituents (Huang & Li, 2016). For example, 长江 (Yangtze) is a two-character word, and nothing can be inserted between the characters, e.g., we cannot say "长的江." According to the statistics provided in *Chinese Vocabulary Statistics and Analysis* (1985), out of 15,143 commonly used words, 16.7% are single-character words. These words can serve as morphemes in multi-character words in one context, but as single-character words elsewhere.

Reading a Chinese sentence requires three subcognitive processes: character identification, word segmentation, and lexical access (Shen, 2008). Word segmentation while reading a Chinese text

is complicated as individual characters are lexical morphemes. Different character combinations yield different words with different meanings. For example, the character 明 (bright), when grouped with 天 (day), means *tomorrow* (明天); when grouped with 白 (white), it means *understand* 明白. A Chinese word can comprise one or more characters, such as 天 (day), 天气 (weather), and 天狼星 (Sirius); thus, segmenting a word in a sentential text is contextually dependent. For example, in the sentence "我一个人才不想去那么远的地方，除非你跟我一起去" (I do not want to go that far alone unless you come with me), without considering the context, 个人 (individual) is a word and 人才 (talent) is a word. However, in this context, 个人 and 人才 cannot be grouped together as words. The correct word segmentation should be 个, 人, and 才 as three standalone words.

An early study among native skilled Chinese readers showed that words are major processing units and that automatic word segmentation and recognition occurred while reading Chinese sentences (Chen, 1999). Further studies showed that if readers encountered unknown words, they tried to identify the individual characters within words for lexical access (Li et al., 2011). This observation also holds true among nonnative adult learners of Chinese (Bai et al., 2014; Li, 2008; Shen at al., 2010.)

Studies have shown that learners of Chinese use various strategies to make word decisions during lexical access (Shen, 2008) and that their word segmentation speed and accuracy affect their reading comprehension (Everson & Ke, 1997; Shen, 2008; Yang, 2021).

So far, in a classroom learning context, word segmentation behaviors among advanced adult learners of Chinese and their relations to reading instruction-level materials, their perspectives on their own word segmentation behaviors, and the difficulties they have encountered in word segmentation for reading comprehension remain largely unexamined. Only with this information can educators provide effective and timely pedagogical intervention. It is hoped that this study's results will fill in the literature gap on these topics to provide empirical evidence for taking appropriate pedagogical measures to effect better classroom reading instruction.

In this study, the term of *advanced learners* refers to American third-year and fourth-year college students who have completed 26–32 semester hours of Chinese learning. It is not intended to correlate with a proficiency level defined by a specific standardized proficiency test. At most American universities, third- and fourth-year students are viewed as advanced students compared with second-year students (intermediate level; 20 semester hours completed) and first-year students (beginner level; 10 semester hours completed). We used the term *advanced* in this study to align with the instructional levels of college Chinese curricula in the United States. These learners were chosen because they had accumulated a certain level of vocabulary and reading experience. And reading discourse-level texts at this instructional level have become a major focus of the Chinese curriculum. No existing studies have examined word segmentation behaviors among this group of learners, so we wanted to include a wider scope of advanced learners to get a comprehensive picture of their word segmentation behaviors in reading.

Theoretical Background

Word Segmentation and Recognition Models

Chinese words are spaced equally and can contain one or more characters, so how do readers recognize words when reading? A series of studies (Zhou & Marselen-Wilson, 1995) demonstrated that the human brain's lexical system is a multi-level hierarchical network in which different representation levels correspond to basic linguistic units, such as features (graphic representations), syllables, morphemes, and words. Based on these studies, Taft and Zhu (1997) proposed a four-level representation of the mental lexicon in Chinese reading comprising strokes, radicals, characters, and words. They found that while reading, when readers encounter known words, they process them as units, but if they encounter an unfamiliar word, they tend to process it at the character level, and try to identify character constituents within the word. If the character is unknown, they decompose the character into radicals to figure out individual characters' meanings. To identify radicals, they must use stroke knowledge to understand radicals' physical composition. Predicated on the four-level representation of the mental lexicon framework, Li et al. (2009) proposed a word segmentation and recognition model which assumed that Chinese word segmentation and recognition is an interactive process involving top-down and bottom-up factors comprising three interaction levels. The first level is a visual perception module that abstracts visual features from the stimulus. The second is a character recognition module in which characters are recognized using perceptual information from the first level and feedback information from the word recognition level. The third is the word segmentation and recognition level, which receives information from both character recognizers and the mental lexicon. Word recognition is implemented as a process of combining evidence in which each character provides evidence for word recognition. If two characters provide consistent evidence for the same word, the corresponding word is activated more strongly. If not, the activation of the corresponding word is weaker. The word recognition level provides feedback information for the character recognition level. If a character is part of a word with high activation, it will receive more evidence from the word recognition level. If not, one still can recognize the character based on bottom-up information, but recognition of that character will be slower.

To verify this model, Liu and Li (2014) conducted a study to examine participants' eye movement behaviors by inserting spaces before and after a target word. In addition to this normal presentation, the other three conditions were a space before the target word, a space after it and spaces before and after it. The results showed that the space after the target word facilitated that word's processing but not the space before, which supported the model (Li et al., 2009) in which word recognition involved three levels of interactions but began with character recognition, and word recognition is simultaneous with the detection of word boundaries. Liu and Lu (2018) later examined spacing effects on both words and non-words in Chinese texts, confirming this interactive processing in word segmentation and recognition.

Based on previous studies, Li and Pollatsek (2020) further examined the coordination of word processing and eye-movement control during Chinese reading, provided strong evidence that

word processing entails three levels of interactive processing: the visual level, in which the reader perceives visual presentation of characters, including strokes and radicals; the character level, in which the reader identifies the characters; and the word level, in which the reader recognizes words or performs word segmentation. Readers' corresponding eye-movement behaviors during word processing confirmed this process.

The above studies firmly demonstrate that Chinese readers segment and identify words in Chinese texts through multiple-level, interactive processes to activate characters. Readers confirm and disconfirm words, and select suitable meanings for words using semantic cues provided in the reading context.

Word Demarcation Effects and Word Segmentation Among L2 Chinese Readers

The word segmentation and recognition model discussed in the previous section demonstrated that word segmentation is an indispensable step in lexical access during reading. Other scholars were interested in determining whether word demarcation in reading materials could help facilitate lexical access to improve reading comprehension among L2 Chinese (Chinese as a second language) learners.

Zhou et al. (2020) investigated whether word-boundary information provided by alternating colors in a Chinese sentence would facilitate reading among L2 Chinese learners. Participants comprised 33 Korean-speaking Chinese learners at a Chinese university. The results indicated that explicit word-boundary knowledge conveyed through alternating colors in the text can improve reading speed. Yu (2022) further investigated color- and font-formatting effects as word demarcation on reading comprehension and found that L2 Chinese speakers who completed at least two years of Chinese courses at the college level or equivalent in the US performed better on reading speed and accuracy with word-demarcated text than those who read without word-demarcated text.

How do L2 Chinese learners make word decisions for successful reading comprehension in the classroom environment? Shen (2008) examined word decision strategies among 40 U.S. college beginning and advanced learners of Chinese, finding that both student groups used at least six types of strategies to make word decisions when reading. Although the learners used various strategies requiring multiple levels of linguistic knowledge, the strategy of matching the target item to one's existing mental lexicon was predominant in both groups. Using contextual information to make word decisions was more frequently observed at the advanced level. Moreover, the strategies that required using multiple linguistic cues and contextual information were better predictors of accurate word decisions.

Yang (2021) examined the word segmentation performance and the relationship between word segmentation and reading fluency and comprehension of 100 first to third-year college L2 Chinese students in an American university. The results showed that word segmentation was the major predictor of reading fluency and comprehension among weak readers. The author also

reported that L2 Chinese learners considered the deficits in character recognition as the primary cause of word segmentation difficulty. However, the author did not provide specific information of learners' segmentation errors. The study used for checking reading comprehension was reading comprehension questions to assess understand the main idea and details, draw inferences, and interpret the text purposes. Thus, the study could not pinpoint how a specific word segmentation error affected the lexical access of that specific word.

To sum up, extant literature generated evidence that providing word segmentation knowledge about a text prior to reading for L2 Chinese readers could improve reading efficiency. Learners employed multiple word segmentation strategies while reading for meaning, and word segmentation accuracy could affect comprehension. However, we still know little about advanced L2 learners' word segmentation behaviors, such as types of word segmentation errors and their relation to comprehending instruction-level materials, as well as learners' perspectives in the process of acquiring word segmentation skills.

Research Questions

The present study was designed to address the above-mentioned issues by answering three research questions:

1. What types of word segmentation errors do students make when reading Chinese sentences?

2. What are the relationships between a sentence's word segmentation accuracy and comprehension of the sentence?

3. What are students' perspectives on word segmentation and its relation to reading comprehension?

Methods

Participants

All students whose native language was English enrolled in the second semester of the third- and fourth-year Chinese classes at an American midwestern university participated in the study: 15 in the third-year group and 12 in the fourth-year group. However, three students in the third-year group did not provide complete data, which reduced the number to 12. Thus, 24 students' data (with 12 in each group) were used in this study. Hereafter, the third-year students are also referred to as the year-3 group and the fourth-year students as the year-4 group. For the year-3 group, the students used the textbook *Routledge Intermediate Chinese Reader* (Shen et al., 2013). In this textbook, each main text was provided with a set of supplemental readings. For the year-4 group, the main textbook was *The Routledge Advanced Chinese Multimedia Course: Crossing Cultural Boundaries* (Lee et al., 2014), and the supplemental reading textbook was *10*

Level Chinese (Level 6): Extensive Reading Textbook (He, 2007). Both groups were required to learn the main textbook lessons and partial supplemental readings selected by the instructor.

Instrumentation

The *Word Segmentation, Translation, and Survey Task* (WSTS) was developed for data collection. It consists of three parts:

Part 1: Word segmentation subtask. It consisted of 10 reading sentences at the instructional-level to detect students' word segmentation errors. Students were required to mark words when reading the sentences.

Part 2: Translation subtask. It consisted of the same 10 sentences used in the word segmentation task to assess reading comprehension by requiring students to translate the 10 sentences into English.

Part 3: Survey on word segmentation subtask. The purpose of the survey subtask was to solicit students' perspectives on the role of word segmentation in sentence reading and the difficulties they may have encountered during word segmentation. The survey consisted of two questions.

Because students in each group were required to perform word segmentations and translations that fit their instructional level, two versions of Part 1 in the WSTS were developed, one for the year-3 and the other for the year-4 groups.

How do we define the instructional levels of reading materials? Gillet et al (Gillet & Temple, 1994; Gillet et al., 2012) proposed an oral reading scoring scale to discern three levels of reading materials: independent level, instructional level, and frustration level. Based on this, Shen (2019) developed a scale for L2 Chinese students, in which, for instructional-level material, students can reach an oral reading fluency range of 83–88% prior to instruction. Our study used the instructional-level materials because at the independent reading level, students encounter almost no reading difficulties. The frustration-reading level is avoided, as it does not help students read successfully. To develop Part 1 of the WSTS, the reading material selection for the two groups adhered to the following procedures:

Sentence selection. 25 sentences for each group were initially selected from each instructional-level's corresponding supplemental textbook lessons but had not already been introduced to the students.

Oral reading fluency check. One month prior to the data collection, students from each group were asked to read the initially selected 25 sentences out loud in the audio lab, and their reading speed and time were recorded. Based on students' performance, in each group, 10 sentences with a range of oral reading fluency of 83%–88% as measured by accurate character reading rates per minute (Shen, 2019) were selected to be included in the word segmentation task.

Word frequency, sentence length, and unknown character check. Reading difficulty mainly is affected by two factors: the readers' factor, such as readers' character/word recognition rates measured by unknown characters/words in the text, and the material factor, such as character/word frequency, and sentence-structure complexity, measured by sentence lengths in the text (Shen, 2005; Sung et al., 2013). In this study, we need to measure both factors of the materials to be used. To verify that the sentences selected for the year-3 and year-4 groups were indeed at different instructional levels, for the material factor, we computed word frequency and sentence lengths for each group of sentences. For the word frequency check, we used the online *Modern Chinese Word Frequency Corpus* (2011–2022). During the frequency calculation process, we noticed that the functional words 的 (a structural particle) and 了 (an aspect particle) had very high frequencies. If these two function words appeared in a particular sentence, it would greatly alter the mean frequency of the entire sentence. To resolve this issue, the frequencies of these two function words were excluded. For words that functioned in more than one type of class—for example, the word 出现 can serve either as a verb in the phrase 他出现了 (he appeared) or as a noun in the phrase 他的出现 (his appearance)—we checked the frequency corresponding to their word class in the context of the section "Word Frequency Based on Part of Speech" of the *Modern Chinese Word Frequency Corpus*.

The descriptive statistics indicated that the group of sentences for the fourth-year level had a lower mean word frequency (0.114 vs. 0.379) and a higher mean sentence length than that of the third-year level (39.6 vs. 36.9) as calculated by the number of characters. This suggested that the absolute material difficulty levels of the two sets of reading sentences were different, and that the fourth-year materials were more difficult than those of the third-year level. It should be noted that a slight increase of an average word frequency and sentence length in reading material could bring a big difference of a material difficult level in reading for learners. However, no scales existed that could be used as a reference to define the percentage increment in word frequency and sentence length in the descriptive statistics at the fourth-year level and whether the material's increased difficulty fit fourth-year learners' instructional level, thus, another measure was used to ensure that each group of students could read sentences at their instructional level. The students were required to mark unknown characters in the sentences prior to data collection. The results indicated that the averages of unknown characters in each sentence for the year-3 and year-4 groups were 10.80 and 11.50, respectively. A t-test indicated no statistically significant difference in unknown words between the two groups. It confirmed that the sentences selected for each group had similar difficulty levels for students in corresponding groups.

Data Collection

The data were collected at the end of the spring semester when the two groups of students had completed their third and fourth-year Chinese lessons, respectively. The students were required to complete the word segmentation task first, followed by the translation and survey. Due to the pandemic, the data was collected online with a built-in Respondus LockDown Browser. (See Appendix A for written directions for the data collection.) The maximum time for completing the

WSTS was 60 minutes. The time distribution for the three tasks was 15 minutes for word segmentation, 30 minutes for translation, and 15 minutes for the survey.

Interrater Reliability and Scoring

Part 1: Word Segmentation

This study's first and second authors made word segmentation of WSTS sentences independently with reference to two dictionaries—The *Modern Chinese Dictionary* and the online *Modern Chinese Word Frequency Corpus*. The Pearson correlation coefficient analysis indicated that initial interrater reliability reached 95% ($r = .95$; $p < .05$). It suggested that there were miscounting errors between the two raters. To correct miscounting words, they together checked the inconsistent word counts against the two dictionaries. For example, in the dictionaries, 酥油, 酥油茶, and 茶 all were listed as words. However, in the sentence 唐次仁很乐意跟客人分享当地香浓的**酥油茶**…, the correct word count for 酥油茶 in this context was one word rather than two. One rater miscounted the word as two. To check word count accuracy for the words not listed in the dictionaries, the first author consulted Professor Zhang Bo, a Chinese lexical expert who was on a committee that compiled the *Modern Chinese Dictionary*. Thus, the two authors reached 100% interrater agreement on word segmentation and developed a standard answer sheet for scoring Part 1 of the WSTS. For scoring, one point was deducted for each incorrect word segmentation.

For the word segmentation error types, the second author rated all data based on the criteria established independently, then the first author rated 20% of the data. Interrater agreement reached 100%.

Part 2: Translation

Hereafter, we refer to the English translation sentences as target sentences and Chinese sentences as source sentences. To score the translation task, a template of translation was developed. The two authors of this study translated the two sets of sentences together. Another rater, a native speaker of English and professor of English as a second language, read the translation and made a few editorial changes. The finalized translation was used as the standard translation template for scoring the translation task.

In the present study, the purpose of the translation subtask (from Chinese into English) was to check students' comprehension of the source sentences; thus, we did not evaluate the translation quality but rather the accuracy. We focused on language errors during translation and checked whether the mistake affected the transfer of meaning from the source to the target text. Based on existing studies (Akbari & Shahnazari, 2019; Amini, 2018; Mateo, 2014; Nasution et al., 2017; Waddington, 2001), the first author developed an analytic assessment rubric to evaluate translation accuracy based on four items:1) Addition (AD): A word did not exist in the source sentence, but it was added in the target sentence. The addition altered the meaning of the source

sentence. 2) Omission (OM): A word in the source sentence was omitted, and the omission altered the meaning of the source sentence. 3) Mistranslation (MS): A word was mistranslated, which altered the meaning of the source sentence. 4) Misinterpretation (MI): A word was correctly translated at the word level, but it was inappropriate in the context. This happened when the source word had multiple meanings, but the participants did not choose a meaning fitting the context in their English translation (see Appendix B for examples of each type of errors). One point was deducted for each of the four error types discussed above. In some cases, a source word could be omitted in the target sentence without affecting the overall meaning of the source sentence. Likewise, in the target sentence, some words may have been added to assist the flow of meaning that had no corresponding words in the source sentence. Those omissions and additions were not scored. The second author rated all data based on the criteria established by the first author independently. Then, the first author rated 20% of the data. The interrater agreement reached 95%. The differences were resolved based on discussions.

Part 3: Survey

For the categorization of survey results in Part 3 of the WSTS, each participant was assigned a code. Participants from the year-3 group were coded as TS and those from year-4 as FS. (e.g., TS1 referred to third-year student number 1). Two raters read students' comments and agreed with categorization of all items except one. After the discussion, the two raters reached a 100% agreement.

Data Analysis and Results

Before presenting the analyses and results, we wish to define two terms used in this study. One is *character and word recognition*, which refers to recognizing characters and words in a sentential text, which includes recognizing graphic shape and activating pronunciation and meaning(s). Another term is *word knowledge*, which denotes understanding the concept of a word, such as the differences between a word and phrase, as demonstrated by the ability to point to words in a text while reading (which also is viewed as metalinguistic awareness of words); the formation of a word, such as its morphological structure; the classification of a word, such as the part of speech it is; and the scope of word knowledge, such as the number of words that an individual can name, and the multiple meanings that a particular word can have in sentential contexts (Shen et al., 2020).

Research question 1: *What types of word segmentation errors do students make when reading Chinese sentences?*

To answer this question, participants' word segmentation tasks were evaluated. A total of 1,691 word segmentation errors were identified (867 in the year-3 group and 824 in the year-4 group). Five types of errors were identified: non-words (NW), smaller than the word (SW), word phrase (WP), non-word phrases (NWP), and a word plus a particle (WPP). (See Table 1.)

Type 1. NW: A segmentation was made to group a character cluster together, but linguistically, the character cluster is not a word in any Chinese context. This type of error was mainly caused by not knowing individual characters or words or by taking a random guess.

Type 2. SW: A word segmentation mark was placed between characters within a word. The constituent character could be a word in some other contexts but not in the target context. This type of error could be caused by the student knowing individual characters but not how to group clusters as words in context.

Type 3. WP: Two or more words which include content words or combination of content and function words were grouped together. Thus, multiple words or phrases were treated as a word.

Type 4. NWP: A cluster of characters larger than a word but that was not a phrase was grouped together. This type of error could occur if students were not able to identify or retrieve meanings of certain characters within the cluster and thus had difficulty segmenting the character cluster into words.

Type 5. WPP: The segmentation mark is placed after a particle attached to a word, instead of before the particle. Particles are function words. The most widely used particles in Chinese fall into three types: structural particles (的，地，得), which are used to serve as markers for adjective, adverbial, and complementary components in a sentence; aspectual particles (着，了，过), which indicate how the action relates to time; and modal particles, such as (呢, 吧, 吗), which are placed at the end of a sentence to express a mood. These particles were introduced in the learners' lower-level Chinese classes. This type of error suggested that the students did not view particles as independent words, but instead treated them as suffixes attached to content words. Thus, they marked a function word in combination with a particle as a word.

Table 1. *Examples of the Five Types of Segmentation Errors*

Error type	Error Examples	Error Analysis
NW	唐次/**仁很**/乐/**意跟**/客人……	In the context, 唐次, 仁很 and 意跟 were grouped as words, respectively, but they are nonsense words in any context.
SW	**排/骨**/炖/**土/豆**……	In the context, **排/骨** (ribs) is a word, and 土豆(potatoes) is a word, but a segmentation mark was placed between characters 排骨 and 土豆, respectively. The characters,骨, 土, and 豆 each can be an independent word in other contexts, but in this context 排骨 and 土豆 are words.
WP	**据报告**/中国/是…… 人们/**在一起**/唱唱歌或者下两盘棋。	In this context, 据报告 is a fixed phrase it consists of two words. However, no segmentation marker was placed between 据 and 报告. 在一起 is a structured phrase comprised of two words, 在/一起. However, no segmentation marker was placed between them.

NWP	夏天/**有空调冬**/有暖气……	In this context, 有空调冬 consists of three words, **有/空调/冬**. The character cluster is larger than a word, but it is not a phrase grammatically. No segmentation markers were placed within the cluster.
WPP	不/同/**年纪的**/老人们/……	In this context, the word phrase 年纪的 is an adjective for 老人们. The structural particle 的 is a function word. However, no segmentation marker was placed between 年纪 and 的.

The distributions of the five types of word segmentation errors among the two groups are presented in Tables 2 and 3. The first column (*n*) lists individual participants, while the second column is the error number of a type of word segmentation error the individual made. Next to the number is the error percentage. For example, Table 2 shows that participant #1 made four NW errors, comprising 8% of the total errors. Table 2 also shows that the percentage distribution of the five error types among the year-3 group was 25% NW, 21% SW, 29% WP, 11% NWP, and 14% WPP. WP (29%) was the most frequent error type in this group.

Table 2. *Year-3 Group: Word Segmentation Error Distribution*

n	NW	%	SW	%	WP	%	NWP	%	WPP	%	Total	%
1	4.00	8	3.00	6	31.00	63	5.00	10	6.00	12	49.00	100
2	27.00	35	11.00	14	16.00	20	16.00	20	9.00	12	79.00	100
3	20.00	26	16.00	21	22.00	28	7.00	9	14.00	18	79.00	100
4	29.00	32	27.00	30	14.00	14	8.00	8	20.00	22	98.00	100
5	14.00	16	23.00	26	27.00	29	14.00	15	13.00	14	91.00	100
6	30.00	36	19.00	23	21.00	23	11.00	12	8.00	9	89.00	100
7	21.00	31	29.00	43	15.00	21	5.00	7	2.00	3	72.00	100
8	7.00	12	9.00	15	19.00	31	7.00	11	19.00	31	61.00	100
9	17.00	28	8.00	13	27.00	43	2.00	3	8.00	13	62.00	100
10	10.00	18	12.00	21	17.00	30	7.00	12	10.00	18	56.00	100
11	21.00	32	12.00	18	19.00	29	6.00	9	8.00	12	66.00	100
12	18.00	31	11.00	19	20.00	30	7.00	11	9.00	15	65.00	100
Total	**218.00**	**25**	**180.00**	**21**	**248**	**29**	**95.00**	**11**	**126.00**	**14**	**867.00**	

Note. *n* = number of participants, NW = Nonword, SW = Smaller than a word, WP = Word phrase, NWP = Nonword phrase, and WPP = Word plus particle

For the year-4 group, Table 3 shows that the distribution was 18% NW, 38% SW, 19% WP, 6% NWP, and 19% WPP. The highest error percentage belonged to SW, which comprised 38% of the total errors in the group.

Table 3. *Year-4 Group: Word Segmentation Error Distribution*

n	NW	%	SW	%	WP	%	NWP	%	WPP	%	Total	%
1	12.00	21	35.00	61	10.00	18	0.00	0	0.00	0	57.00	100
2	13.00	15	28.00	33	18.00	21	4.00	6	21.00	25	84.00	100
3	24.00	25	13.00	14	23.00	24	10.00	10	26.00	27	96.00	100
4	11.00	21	24.00	46	9.00	17	4.00	8	5.00	8	53.00	100
5	4.00	8	20.00	41	13.00	27	1.00	2	11.00	22	49.00	100
6	24.00	24	32.00	33	16.00	16	8.00	8	19.00	19	99.00	100
7	9.00	13	28.00	40	13.00	18	3.00	4	18.00	25	71.00	100
8	5.00	8	30.00	48	10.00	16	1.00	2	16.00	26	62.00	100
9	10.00	14	28.00	40	7.00	10	5.00	7	20.00	29	70.00	100
10	2.00	7	22.00	76	3.00	10	2.00	7	0.00	0	29.00	100
11	16.00	21	20.00	27	17.00	24	7.00	9	14.00	19	74.00	100
12	17.00	22	30.00	38	16.00	20	9.00	11	8.00	9	80.00	100
Total	**147.00**	**18**	**310.00**	**38**	**155.00**	**19**	**54.00**	**6**	**158.00**	**19**	**824.00**	

Note. n = number of participants, NW = Nonword, SW = Smaller than a word, WP = Word phrase, NWP = Nonword phrase, and WPP = A content word plus a particle

Research question 2: *What are the relationships between a sentence's word segmentation accuracy and comprehension of the sentence?*

Students' sentence comprehension was measured using the translation method. Tables 4 and 5 show the distribution of the four types of translation errors and percentages.

Table 4. *Year-3 Group: Translation Error Distribution*

n	MS	%	OM	%	AD	%	MI	%	Total	%
1	5.00	12	36.00	84	1.00	2	1.00	2	43.00	100
2	4.00	4	95.00	95	1.00	1	0.00	0	100.00	100
3	5.00	5	89.00	90	3.00	3	2.00	2	99.00	100
4	13.00	8	141.00	82	18.00	10	1.00	1	173.00	100
5	15.00	11	112.00	84	4.00	3	2.00	2	133.00	100
6	17.00	15	79.00	71	13.00	12	2.00	2	111.00	100
7	24.00	19	86.00	69	10.00	8	5.00	4	125.00	100
8	16.00	23	52.00	73	2.00	3	1.00	1	71.00	100
9	12.00	11	96.00	86	2.00	2	1.00	1	111.00	100
10	15.00	19	56.00	69	8.00	10	2.00	2	81.00	100
11	13.00	13	84.00	82	1.00	1	5.00	5	103.00	100
12	14.00	10	115.00	85	5.00	4	2.00	1	136.00	100
Total	**153.00**		**1041.00**		**68.00**		**24.00**		**1286.00**	

Note. *n* = number of participants, MS = mistranslation, OM = omission, AD =addition, and MI = misinterpretation

Table 5. *Year-4 Group: Translation Error Distribution*

n	MS #	%	OM	%	AD	%	MI	%	Total	%
1	16.00	16	66.00	65	10.00	10	10.00	10	102.00	100
2	8.00	4	199.00	91	8.00	4	3.00	1	218.00	100
3	24.00	17	78.00	55	31.00	22	10.00	7	143.00	100
4	6.00	10	50.00	81	4.00	6	2.00	3	62.00	100
5	6.00	7	72.00	86	6.00	7	.00	0	84.00	100
6	4.00	2	164.00	93	7.00	4	1.00	1	176.00	100
7	18.00	22	47.00	57	15.00	18	2.00	2	82.00	100
8	3.00	20	8.00	53	3.00	20	1.00	7	15.00	100
9	11.00	11	89.00	87	1.00	1	1.00	1	102.00	100
10	6.00	33	7.00	39	5.00	28	.00	0	18.00	100
11	9.00	5	150.00	89	6.00	4	3.00	2	168.00	100
12	29.00	15	144.00	73	16.00	8	7.00	4	196.00	100
Total	**140.00**		**1074.00**		**112.00**		**40.00**		**1366.00**	

Note. *n* = number of participants, MS = mistranslation, OM = omission, AD =addition, and MI = misinterpretation

Pearson correlation analyses were performed to detect the connections between word segmentation errors and reading comprehension. As the scoring criteria for word segmentation and reading comprehension were different, before conducting correlation analyses, all original scores on word segmentation and translation were transformed into z-scores to ensure statistical reliability. Table 6 shows that for the year-3 group, four types of word segmentation errors—NW, SW, WP, and NWP—correlate with translation errors. NW moderately correlates with OM (r = .67; p = .01). SW moderately correlates with OM (r = .60; p = .04) and AD (r = .73; p = .00). WP moderately correlated with AD (r = .61; p = .04), and NWP moderately correlates with AD (r = .53; p = .04).

Table 6. *Pearson Correlation Analyses of Word Segmentation and Translation Errors for the Year-3 Group*

Items	MS		OM		AD		MI	
	r	sig.	r	sig.	r	sig.	r	sig.
NW	.07	.82	.67	.01*	.50	.06	.11	.74
SW	.56	.05	.60	.04*	.73	.00**	.40	.20
LW	.35	.27	.32	.68	.61	.04*	.47	.12
NWP	.34	.27	.32	.31	.53	.04*	.32	.31
WPP	.19	.56	.04	.91	.22	.49	.43	.16

Note. Note. MS = mistranslation, OM = omission, AD =addition, MI =misinterpretation, NW = nonword, SW= small than a word, WP = word phrase, NWP = nonword phrase, and WPP = a content word plus a particle. * p <.05 ; ** p <.01

For the year-4 group, Table 7 shows that there are moderate correlations between the NW, WP, and NWP word segmentation errors and OM and AD translation errors. NW correlates moderately with OM (r = .63; p = .02) and AD (r = .58; p = .04). WP correlates moderately with OM (r = .64; p = .01) and AD (r = .70, p = .01). NWP correlates moderately with OM (r = .56; p

= .04) and AD (r = .55, p = .04). As opposed to the year-3 group, no statistically significant correlation between SW and translation errors was detected in the year-4 group. No statistically significant correlations were detected between WPP and the reading comprehension errors in either group.

Table 7. *Pearson Correlation Analyses of Word Segmentation and Translation Errors for Year-4 Group*

Items	MS		OM		AD		MI	
	r	sig.	*r*	sig.	*r*	sig.	*r*	sig.
NW	.43	.16	.63	.02*	.58	.04*	.55	.06
SW	.09	.78	.13	.68	.41	.19	.02	.95
WP	.45	.15	.64	.01*	.70	.01*	.50	.10
NWP	.50	.09	.56	.04*	.55	.04*	.33	.30
WPP	.09	.76	.39	.21	.35	.26	.01	.97

Note. MS = mistranslation, OM = omission, AD =addition, MI =misinterpretation, NW = nonword, SW= small than a word, WP =word phrase, NWP =nonword phrase, and WPP = a content word plus a particle. * p <.05

To sum up, consistent correlations between NW, WP, and NWP word segmentation errors and reading comprehension were detected in both groups. However, for SW, a correlation showed only in the year-3 group. The correlation diminished in the year-4 group.

Research Question 3: *What are students' perspectives on word segmentation and its relation to reading comprehension?*

To answer this question, participants' answers to the two survey items were collected. First, students answered "yes" or "no" to the question, *"Do you think that word segmentation is important for understanding the sentence?"* then justified their choices. In this section, the code "TS" stands for the third-year group and "FS" for the fourth-year group.

In the year-3 group, 67% answered "yes" and 33% "no." In the year-4 group, 92% answered "yes" and 8% "no." The data suggested that most students considered word segmentation important in reading comprehension. The year-4 group had an increased awareness of the role of accurate word segmentation in reading comprehension, as we observed an 25% increase among year-4 students who considered word segmentation important. In the year-3 group, 87.5% of the third-year students who answered "yes" considered word segmentation helpful in breaking the sentence into parts, which facilitated sentence comprehension. They commented, "I think it helps me divide the sentence into smaller parts so that it's easier for me to digest those parts rather than the entire sentence at once" (TS1), and "Understanding parts of the sentence helps build more understanding of the whole text" (TS4). In the year-4 group, in addition to helping break sentences into parts, they also believed that "once a sentence was separated into words, it was easier to use context for sentence comprehension" (FS3). They suggested: "Word segmentation helps break the sentence into small parts, and even when I do not know a word, I can infer what it is from surrounding text I do understand" (FS7), and "When I don't know a word, it is helpful to move it to the side to understand the rest of the sentence first" (FS5). They also stated that

accurate word segmentation helps disambiguate lexical access to characters with multiple meanings: "Word segmentation is important for me to understand the sentence because characters can have different meanings when they are separate compared to when they are attached to another character or set of characters" (FS12).

Compared with the third-year students, the fourth-year students' comments indicated that word segmentation allows them to adopt strategies for using context cues to infer the meaning of words and comprehend the text, in line with Shen's (2008) findings.

Those students who considered that word segmentation was not important in sentence interpretation felt that "even if I segment words perfectly, if I don't know the words, I still can't translate the sentence" (TS12), and "My main struggle is with unfamiliar terms and not knowing some of the words" (FS11). The data suggested that those students relied heavily on the strategies of identifying individual characters and words to access their meanings.

The second survey item was to answer the question, "*In your opinion, what are the major difficulties or obstacles to performing word segmentation and why?*"

For the year-3 students, 67% students reported major difficulties with character or word recognition: "I think it's hard to segment a sentence with words, characters, or phrases that you don't know" (TS1); "Some major difficulties include not recognizing characters; if I don't know what they are, I can't do word segmentation" (TS9); and "Not knowing or not remembering many characters was the major problem" (TS7). 25% students reported a lack of word knowledge including metalinguistic awareness of a word: "I have difficulty understanding what counts as a 'word' or 'phrase'" (TS7). About 8% reported a lack of grammatical knowledge: "I think the biggest difficulty is understanding grammar" (TS11).
For the year-4 students, 73% reported that a lack of word knowledge caused word segmentation difficulty. They could recognize individual characters in a chunk of characters but were not sure how to group characters into words for accurate lexical access. One student commented, "Knowing whether or not a group of 2–3 characters is one word or separate words is a major difficulty because knowing the difference can help to change the sentence's meaning" (FS2). Some students could not distinguish a word from a word phrase: "I don't know if connecting words and modifiers count as separate words or if they should remain attached to other words" (FS10). Other students lacked knowledge of word classes: "If you can understand word types and how they behave in sentences/what kind of environments they appear in, it should be easy to break a sentence into its pieces even if you are missing a large portion of the vocabulary" (FS12). In the year-4 group, 18% considered character/word recognition a major obstacle to word segmentation: "One obstacle would have to be that if one does not know a word, then it can be hard to decipher that particular sentence" (FS10). In this group, 9% considered a lack of grammatical knowledge to affect their word segmentation skills: "I think the major difficulties to word segmentation are probably a poor understanding of grammar and sentence patterns" (FS9).

In sum, both groups considered the difficulties with word segmentation to be caused by three obstacles: inability to recognize characters/words, insufficient word knowledge, and insufficient

grammatical knowledge. However, there were some quantitative differences between the two groups on the first two obstacles. For the year-3 group, not being able to recognize characters/words was the number one obstacle (67%), followed by insufficient word knowledge (25%), and grammatical knowledge (8%). For the year-4 group, lacking word knowledge was the major obstacle (73%); the next was the inability to recognize characters/words (18%), and then insufficient grammar knowledge (9%). These data suggest that year-4 students had learned more characters and words and had developed a stronger sense of the role of word knowledge played in word segmentation for accurate lexical access. Owing to their larger vocabulary knowledge and increased metalinguistic awareness of words, the inability to recognize characters and words is no longer a prominent factor in word segmentation compared with the year-3 group.

Discussion

Findings

The study investigated L2 Chinese advanced students' word segmentation errors in reading sentential texts and their relationship to comprehending the sentential texts, as well as students' perceptions of the role of word segmentation in reading comprehension. It yielded several major findings.

First, advanced students made five types of word segmentation errors when reading instructional-level sentences: nonwords (NW), smaller than the word (SW), marking word phrases as words (WP), nonword phrases (NWP), and words plus particles (WPP). The major error type for the third-year group was WP (29%), while the major error type for the fourth-year group was SW (38%). Why did the third-year group have a high number of WP errors? Perhaps because the third-year students had not acquired sufficient word knowledge and were not clear about the differences between a word and a phrase when trying to discern word segmentations. As learning levels increased, students developed stronger word awareness. Thus, we observed a drop in WP errors in the fourth-year group.

Why did year-4 students make a high number of SW errors? According to Shen's study (2008), although students use various strategies to identify a word during reading, the strategy of matching the target item (word) to the existing mental lexicon is predominant for both beginning and advanced students (Shen, 2008). The year-4 students tried to identify words that had been learned and stored in their mental lexicons. If the target character cluster did not match the words in their mental lexicons, they tried to recognize the individual characters. As the year-4 students had developed stronger concepts of words and had a better understanding of the difference between a word and a phrase, and they were also aware that many individual characters can serve as words. When they were not sure how to group a character cluster as a word for comprehension, they tried to recognize those individual characters within the character cluster and marked them as words. From a developmental perspective, the observed pattern of reduced WP errors and increased SW errors in the fourth-year group was an indicator of students' increased awareness of the concept of words, as well as their advancement in character knowledge. The observed SW errors in both the third-year and fourth-year groups could be

explained by Li et al. (2009) and Li and Pollatsek (2020)'s models that Chinese word segmentation and recognition is an interactive process involving top-down and bottom-up factors.

Second, accurate word segmentation had a statistically significant moderate correlation with sentence comprehension. Students' sentence reading performance was measured by translation. Both the year-3 and year-4 groups made four types of translation errors: mistranslation (MS), omission (OM), addition (AD), and misinterpretation (MI). The correlation analyses revealed that for the year-3 group, NW, SW, WP, and NWP correlated moderately with OM and AD. For the year-4 group, NW, WP, and NWP correlated moderately with OM and AD.

In OM errors, students skipped words while translating. This could be caused by several reasons. One was that the students did not know any characters within the character chunk. Alternatively, they may have recognized some characters, but there was not enough information to judge whether the character chunk was a word. Another reason was that the learners had recognized individual characters within the chunk, but they were not sure how to segment the character chunk into words. Hence, they decided to skip the character chunk. AD errors involved adding words that were not in the source text such that the source text's meaning changed. It indicated that, although students failed to segment words accurately, they still tried to comprehend the text by using available information, such as context or syntactic clues, to guess the meaning of the sentence.

One difference between the two groups was that in the year-3 group, we detected a moderate correlation between SW and OM and AD; however, this observation was absent in the year-4 group. The reason could be that as year-4 students were able to accurately identify more individual characters within the character cluster, so they marked individual characters as words and processed them as words for lexical access. Since recognition of individual characters can aid access to meaning, the absence of a correlation between SW and reading comprehension in the year-4 group was plausible. Obviously, the fourth-year students were more capable of successfully accessing individual characters' meanings, thereby allowing them to use context cues for lexical access and sentence comprehension more effectively. However, even though lexical access did not suffer when word recognition was processed at morpheme level, it certainly slowed down reading speed, as the reader must retrieve individual morphemes' meanings, instead of words that were larger cognitive units from their mental lexicon compared with morphemes. To reduce SW errors, we must continuously expand students' vocabularies. We noticed that no statistically significant correlations were found between word segmentation errors and the two types of translation errors, MS and MI, for both groups. As we noted earlier, mistranslation (MS) of a word can alter the source sentence's meaning, an example of which is provided in Appendix B: The accurate translation of the sentence is 最/重要/的/**一点**/是…… "*The most important* ***point*** *is…*," but the student translated it as "*The most important* ***time*** *is…"* Thus, the word **一点** in this context was mistranslated as "*time.*" The student performed accurate word segmentation of the mistranslated word, so it is understandable that we did not expect a statistically significant correlation between this type of translation error and word segmentation. Similarly, we did not detect the correlation between the translation error of misinterpretation

(MI) and word segmentation errors because an MI error is defined as a word that is translated correctly at the word level but is inappropriate in the context. Thus, the students made no mistakes in word segmentation for the MI words. Naturally, we found no correlation between MI and word segmentation errors.

Furthermore, no statistically significant correlation was found between the word segmentation error WPP and reading comprehension as measured by translation, which was not surprising. With a WPP error, the segmentation mark is placed after a particle (function word) attached to a content word instead of before the particle. This suggested that the students did not view particles as independent words, but rather as suffixes attached to content words. As we mentioned earlier, there were three types of commonly used particles. In the reading materials, all three types had been introduced in lower-level Chinese classes. Thus, students were familiar with the particles. Particles are function words that provide grammatical information about the words attached to them. A particle's grammatical function is bound tightly to the word before it, so the students cognitively tended to treat the word chunk + a particle as a word. As the students already knew these particles' grammatical functions, processing a content word plus a particle as a unit did not affect their comprehension for meaning. Thus, we found no correlation between WPP and reading comprehension, in line with Yang's (2021) findings.

The third finding is that the survey results showed almost all students thought word segmentation plays an important role in reading comprehension. This perception grew stronger as instructional levels increased. They suggested that word segmentation helps (a) break a sentence into parts, which helped them process the sentence even though they did not know some characters in those parts; (b) provide contextual information to figure out the unknown parts; and (c) determine the grammatical structure of the sentence.

Regarding difficulty in word segmentation, students reported three factors: character/word recognition, word knowledge, and grammar. We also observed percentage differences between the two groups in reporting these three factors. Most year-3 students (67%) considered character/word recognition the major difficulty for word segmentation. This observation is consistent with the finding of earlier research (Shen & Jiang, 2013; Yang, 2021) that character/word recognition is critical for accurate word segmentation among less advanced students.

However, for the fourth-year students, most students (73%) considered word knowledge the most important factor in word segmentation, perhaps because they had learned more characters and words than the third-year students. According to Shen (2009), students who had completed three years of Chinese study (26 credit hours) had an average written vocabulary size of 3,328. Thus, we may reasonably assume that when students have accumulated a vocabulary size beyond this threshold, word knowledge plays a more important role than character and word recognition in word segmentation.

Pedagogical Implications

Based on our findings, we recommend the following pedagogical interventions for reading instruction in advanced-level classes. First, character/vocabulary size should be developed to expand mental lexicons through extensive in-class and after-class reading. The current study revealed that failure in character and word recognition was the key difficulty for word segmentation in year-3 students. Thus, we suggest that extensive reading be part of the advanced reading curriculum to help students effectively learn new characters and words. Studies of English as a second language show that extensive reading is one of the best ways to develop vocabulary knowledge and reading skills (Aldukhayel, 2022; Daskalovska, 2018) and is more effective and efficient for developing sight vocabulary (Iwata, 2022). Furthermore, L2 students' reading attitudes improved significantly after reading the graded reading texts (Zhou & Day, 2021), and students who did more extensive reading achieved greater reading rate gains (Milliner, 2021). An early study (Shen, 2007) firmly concluded that L2 Chinese student gained vocabulary through independent online reading with materials easier than the instructional level yield better effects on reading comprehension (Shen, 2005). Thus, we suggest that the difficulty level of extensive reading be suitable for the independent reading level, with an oral reading fluency rate of around 97% (Shen, 2019) for after-class extensive reading to ensure students gain new vocabulary and build positive experiences during extensive reading.

Second, word knowledge should be systematically introduced during reading instruction. The current study showed that another major difficulty reported during word segmentation was a lack of word knowledge, which was the predominant factor for the year-4 group. We suggest systematically introducing word knowledge by helping students (a) develop their metalinguistic awareness of words, such as establishing clear concepts of morphemes, words, and phrases and understand their relationships; (b) recognize parts of speech in a sentential context; and (c) explain the structure of word in a sentential context. Word knowledge instruction could be incorporated into the normal instructional sections of introducing new words, grammar points, and common expressions. With increased word knowledge, students could make informed guesses by using available contextual information when they encounter an unknown word.

Third, word segmentation should be adopted as an instructional activity during reading instruction. Regular word segmentation activities could be conducted before, during, and after reading. Before reading a text, students could perform a word segmentation task for selected sentences and paragraphs. It would help the instructor determine whether the text is suitable for the student and what type of word segmentation errors hinder student comprehension. During reading, when students encounter a reading comprehension problem in certain sentences, the instructor could have students bolster their word segmentation by analyzing and reflecting on their word segmentation errors. It would allow the instructor to provide immediate feedback and interventions. After reading, having students perform word segmentation on sentences and paragraphs containing newly learned words would help students review the new words, transfer them to their long-term memory, and enrich their mental lexicons.

Conclusion

This study investigated word segmentation behaviors among advanced college students of L2 Chinese while they read instructional-level sentential texts and their perspectives on the role of word segmentation in reading comprehension. The students made five types of word segmentation errors. Among the five, four types of errors NW, SW, WP, and NWP, moderately correlated with reading comprehension. The students considered word segmentation skills important in reading comprehension, and this perception was stronger at higher learning levels. They identified three factors that hindered them for performing accurate word segmentation. Among them, inability to recognize characters/words was the predominant factor for the third-year students, while insufficient word knowledge and metalinguistic awareness of word was most common for the fourth-year students. Due to the small sample size and limited reading texts, the findings from this study are suggestive rather than conclusive. Further studies are needed to verify the findings reported.

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Appendix A. Reading Sentences for the Third-Year Group

	Sentence	Mean WF	Mean SL
1	在 2012 年消费者权益日来临之际中国的沃尔玛 (Walmart) 商场推出了共建幸福商场计划并邀请顾客参与下午茶活动。	0.498	49
2	据报告中国是世界上城市化建设速度最快的国家但是在一座座新城崛起的同时越来越多的老城消失了。	0.522	46
3	作为一名大学村官我不仅亲身感受到这些年农村的变化也亲身参与到了整个农村面貌的改变之中。	0.475	44
4	一到下午不同年纪的老人们就自发地聚在一起唱唱歌或者下两盘棋。	0.546	29
5	晚上等吃过晚饭后大妈们会找块空地放个录音机开开心心地跳起舞来。	0.074	30
6	虽然旅馆里能供应旅客爱吃的排骨炖土豆等菜但是菜的品种不是那么多。	0.450	31
7	只要客人愿意唐次仁很乐意跟客人分享当地香浓地酥油茶和地道地藏餐。	0.113	31
8	这六十年间鄂伦春人发生了翻天覆地的变化政府为他们建起了猎民新村。	0.503	31
9	这个地方住着很舒服夏天有空调冬天有暖气感觉到一年四季都象春天一样。	0.176	32
10	以前很多顾客到星巴克 (Starbucks) 店里休闲聊天他们都喜欢那里的环境但这些顾客不喝咖啡也不喜欢太甜的饮料。	0.434	46
	Total mean	0.379	36.9

Note. WF = word frequency; SL = sentence length

Reading Sentences for the Fourth-Year Group

	Sentence	Mean WF	Mean SL
1	他的东西实在少得可怜等我把我的东西摆好后他的东西就隐了形似的几乎看不到。	0.17	35
2	我一下班就直奔家里那是我的快乐之地当远远的看到亮着的灯我的心一阵温暖。	0.13	34
3	据美国某青少年问题专家称父母与子女之间的冲突不但不会令他们之间疏远反而会加强他们的关系。	0.05	43
4	中国现在是仅次于美国的第二大石油消费国所需石油四成依赖进口只有六成是国产的。	0.15	37
5	以前买车是为了代步但现在家里经济负担轻了生活条件好了就想要给自己换辆好点儿的车啦。	0.12	40
6	在这阳光灿烂秋风送爽的季节里中秋国庆两个佳节接踵而来让我们到处都感受到过节的喜庆。	0.13	40
7	来自气象部门的预报显示湖北中西部湖南西北部四川南部等部分地区继续有大到暴雨也就是说长江中下游地区将遭遇多轮强降雨天气。	0.07	58
8	最重要的一点是无论多好的减肥方法都需要减肥者持之以恒的毅力来配合要不然减肥就不会成功。	0.123	42

9	美国学者对部分男女进行了声音测试要求受试辨别从各个方向传来的普通声音。	0.120	34
10	调查中近一半的人认为地铁车厢里应该安装一些低一点儿的拉手以方便乘客。	0.073	33
	Total mean	0.114	39.6

Note. WF = word frequency; SL = sentence length

The following written direction was given during data collection for the completion of WSTS.

Step 1. Please silently read the following sentences and mark word boundaries by inserting the "/ " mark directly in the text as you read along. Once you have finished the word segmentation, please count the word number of the sentence and fill in the number in the parentheses provided.

Step 2. Try your best to translate the sentence into English. If you do not know how to translate the unknown/ uncertain part(s) of the sentence, please underline the unknown/uncertain part(s) in the sentence and skip translating those part(s).

Step 3. Once you have finished translating all sentences, please complete the two survey questions.

Appendix B. Mistranslation Examples (MS)

Error	Error Examples
type 1 (MS)	(Yr. 4 Sentence 5) 最/重要/的/**一点**/是…… The most important point is… Example (MS) 1: The most important **time** is… *Error analysis:* 一点 (point) was mistranslated into "time." (Yr. 4 Sentence 1) 他/的/东西/**实在**/少/得/可怜…… He has so few things (stuff)… Example (MS) 2: His things **sold** very few … *Error analysis:* 实在 was mistranslated into "sold."
type 2 (OM)	(Yr. 3 Sentence 1) 据/报告/中国/是/世界/上/**城市化**/建设/速度/最快/的/**国家**…… According to reports, China has the fastest urbanization rate (speed) in the world… Example (OM) 1: According to the report, China is the world' s fastest growing… *Error analysis:* The source words 城市化, 国家 were omitted. (Yr. 3 Sentence 8) 在/2012 年/消费者/权益/日/来临/之际/中国/的/沃尔玛/商场…… As the 2012 Consumers Rights Day approached, China's Wal-Mart Stores… Example (OM) 2: In 2012, China's Walmart stores … *Error analysis:* the translation for the words 消费者,权益,日,来临, 之际 were omitted.
type 3 (AD)	(Yr. 3 Sentence 1) 据/报告/中国/是/世界/上/城市化/建设/速度/最快/的/国家/……。 According to reports, China has the fastest urbanization rate in the world… Example (AD)1: (Yr. 3 Sentence 1) According to reports, China has the world's fastest speed **per** country…… *Error analysis:* The word "per" has no corresponding word in the source sentence. The addition of "per" has changed the meaning of the source sentence. 我/不仅/亲身/感受/到/这些/年/农村/的/变化/也/亲身/参与/到/了/整个/农村/面貌/的/改变/之中。 I not only have experienced the changes in the countryside over the years but also have participated in the process of changing its appearance. Example (AD) 2: (Yr. 3 Sentence 6) I experienced changes in rural areas over the years as well as participated in the change of **urbanization.**

	Error analysis: The word "urbanization" has no corresponding word in the source sentence. The addition of urbanization has changed the meaning of the source sentence.
type 4 (MI)	(Yr. 4 Sentence 1) 他/的/东西/实在/少/得/**可怜**/等/我/把/我/的/东西/摆/好/后…… He has so few things. After I displayed (or put out) my stuff (or things)… Example (MS) 1: His things are few, (he) **miserably** wait for me to set up my things … *Error analysis:* The word 可怜 was translated into "miserably," which is acceptable in the word level. However, in the sentence level 可怜 modifies "things" (东西)rather than a person; thus, the correct translation should be "very few" or "so few." (Yr. 4 Sentence 8) 调查/中/**近**/一半/的/人/认为**……** Nearly half of the people in the survey believed (or considered)… Example (MS) 2: **Close** investigation of … *Error Analysis:* The word 近 is translated as "close" which is correct in the word level. However, in the sentence level,近 modifies 一半 (half (or 50%) of the participants) rather than 调查(investigation).

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