Correlation between Directionality and Disfluency in English-Chinese Bilateral Sight Translation

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***Abstract*—Directionality has always been a topic of debate among interpreting practitioners and scholars. Disfluency, as an important indicator, measures the quality of Sight Translation (ST). This study is to explore the impacts of directionality on the disfluency of bilateral ST between English and Chinese, with the purpose of finding out the correlation between them. The author adopts four disfluency indicators, namely Silent Pause (SP), Filled Pause (FP), Repetition (Rt), and Repair (Rr) to answer questions: What are the features of disfluency in ST in two directions? What is the correlation between directionality and disfluency in ST? 17 interpreting major students of comparable standard as subjects completed both E-C and C-E ST experiments. The results show that: (1) The incidence of SP is the highest in both E-C and C-E ST, followed by FP, then Rr, and finally Rt; many student interpreters do the basic pre-task preparation poorly, leading to a large number of SPs; lots of SPs coincide with respiration and those over 10 seconds occur only in E-C ST; (2) There are no statistically significant differences between E-C and C-E ST in terms of the four disfluency indicators, i.e., directionality exerts no significant effect on the disfluency of student interpreters' ST.**

***Keywords*—directionality, disfluency, Sight Translation (ST)**

I. Introduction

Disfluency, as an important indicator, measures the quality of interpreting, including Sight Translation (ST) [1]. Previously, there are plenty of studies on disfluency in simultaneous interpreting and consecutive interpreting [2–10]. However, there are few studies on the relation between interpreting directionality and ST, and even fewer ones combining ST, disfluency and directionality.

The significance of this research lies in three aspects: First, it probes into interpreting disfluency and ST, which have received little attention in China. Related researches only show that ST training can improve the ability of simultaneous interpreting and consecutive interpreting [5, 11–13]. Second, it contributes to filling the gaps in the research on the impacts of interpreting directionality, in that the studies combining "sight translation", "interpreting disfluency", and "interpreting directionality" are even scarcer. Third, pedagogically, the findings about the impacts of directionality on disfluency of E-C bidirectional ST may help optimize interpreting teaching, and aid student interpreters to practice more efficiently.

II. Literature Review

A. Sight Translation (ST) and Cognitive Effort Model

ST is a hybrid between written translation and interpreting in that the source text is written and the target text is spoken [1, 11]. In ST, the source text remains visually accessible to the interpreter [11, 14].

Gile's Effort model [15] explains the cognitive efforts in interpreting, including Listening and Analysis (L), Memory (M), Note-taking (N), Production (P), and Coordination (C). In interpreting, these "Efforts" vie for limited cognitive resources. The Effort Model of ST goes through two stages. Initially, Gile models ST as: ST = Reading + Production. Gile notes that in ST, Reading and Analysis Effort (R) takes the place of the L Effort. And there is no M Effort in ST because the source text is all along in front of the interpreters' eyes.

But as his studies deepen, Gile finds there is also short-term M Effort in ST, because the Reading and Analysis operations overlap with Production. Plus, due to the syntactic differences between source language and target language, the interpreter may have to keep in memory some information until it can be appropriately inserted in the target-language speech. Therefore, Gile [16] revises the Effort Model of ST as: ST = Reading Effort + Memory Effort (short-term memory) + Speech Production Effort + Coordination. Gile's cognitive Effort Model makes a relatively complete analysis of the cognitive process of ST, and is of profound theoretical significance.

B. Interpreting Disfluency

Disfluency is a key criterion for evaluating interpreting quality. Goffman [17] calls these disfluencies "linguistically detectable faults", and claims these "faults" mirror the efforts made by interpreters to search for the corresponding expression, figure out the logic, and organize output. Mead [6] proposes to adopt quantitative methods for assessing interpreting disfluency. The methodology proposed by Mead makes the assessment of interpreting disfluency more scientific and standardized.

The classifications of disfluency are diverse. Maclay and Osgood [18] first categorize disfluency into 4 types: false start, repeat, silent pause and filled pause. Later Garnham [19] identifies "disfluencies" as false start, correction, interjection, pause, hesitation, repetition, slip of the tongue, etc.

Domestic researches on interpreting disfluency started later than those began abroad, and most of them were carried out in the past two decades. Yang [20] reviews foreign researches of disfluency in daily speaking in native language, and divides disfluency into three main types: pause, repetition, and self-correction. Later, Xu [8] studies the types, duration, frequencies and causes of their pauses in C-E consecutive interpreting, and finds that pauses caused by information organizing account for the largest proportion, and pauses caused by retrieving target language have the longest duration. Qi [21] reviews the development of interpreting disfluency studies, and identifies six major dimensions of disfluency

research, including interpreting quality evaluation, fluency predictors and influencing factors, interpreting commonalities, disfluent feature descriptions, and interpreting cognition. Yet, few researches in China studied the reasons of disfluency thus there is much room for the disfluency research.

C. Directionality in Interpreting

Directionality has always been a topic of debate among interpreting practitioners and scholars studying interpreting. Some scholars are in favor of B-A interpreting [22, 23]; while other scholars prop up A-B interpreting [3, 24]. But just as Gile [25] states, above claims are somewhat subjective judgments in the traditional sense, lacking empirical evidence and foundation.

Some scholars study the impacts of directionality on interpreting through empirical methods. Tommola and Helevä [2] conduct a two-way interpreting experiment with interpreting-majored students as subjects, which confirms that better understanding of native language in interpreting will result into advantage output, and points out that the impacts of directionality in interpreting depends on specific language combination. Tommola and other researchers [26] study the effects of simultaneous interpreting directionality on the neural activity of professional interpreters' brains. It shows that A-B interpreting will trigger more cognitive load than the other way round. Jänis [27] analyzes Finnish-Russian student interpreters' performance and finds that student interpreters have more energy to process the output in higher accuracy when interpreting into Language A. While interpreting into Language B, they employ generalization and compression strategies more frequently owing to lack of cognitive energy. Related studies have shown that the greater the difference in language structures, the more difficulties in information receiving, understanding, storage, extraction, etc. Thus, output quality will be greatly affected [28]. Therefore, there are reasons to believe that the disfluency characteristics in E-C two-way interpreting may be greatly different from other language pairs.

Domestically, only a few studies focus on the directionality of interpreting. Chen [7] imitates the experiment of Al-Salman and Al-Khanji [4] to study the impacts of directionality on E-C two-way simultaneous interpreting. Chen finds that interpreters perform better when interpreting from Language A (Chinese) to Language B (English) than conversely, and prefer to interpret from Chinese to English, which is consistent with Al-Salman and Al-Khanji's. Fu [9] conducts E-C two-way CI experiments involving 15 senior English majors in China. The results show that compared to E-C ST, the frequency of pause and proportion of pause in all disfluencies in C-E interpreting increase significantly, while Rr has opposite outcomes. Compared to C-E ST, the frequency of Rt when interpreting into Chinese is significantly lower, but the proportion of Rt in all disfluencies does not show significant difference. Later, He *et al.* [29] conclude that interpreting directionality has a significant impact on the cognitive load in the task of ST, and compared with E-C ST, C-E ST entails greater cognitive load.

To summarize, interpreting studies, whether at home or abroad, mainly focus on SI and CI, and little attention is paid to ST. Foreign studies related to interpreting rarely involve Chinese, and most of which are languages used in European and American countries. In addition, most disfluency studies focus only on pauses, and neglect other disfluency types such as Rt and Rr. Motivated by the gaps in this area that need to be filled domestically, the author conducts this experiment to probe into the impacts of directionality on four indicators of disfluency in E-C bidirectional ST.

III. Research Methodology

A. Research Questions

The purpose of the experiment is: to analyze the types, frequencies, duration, distribution of different disfluency forms; and to explore what correlations exist between directionality and disfluency in ST. Based on the objectives of this research, the author attempts to address the following questions: (1) What are the features of disfluency in ST in two directions? (2) What is the correlation between directionality and disfluency in ST?

B. Research Design

1) Research subjects

The subjects of this experiment are 17 students majoring in interpreting in a Normal University in China, among whom 5 are of class 2019, 12 of class 2020. They all speak Chinese as their mother tongue and English as the foreign language. The students of class 2020 just enrolled and have not undergone systematic interpreting training, while students of class 2019 have not taken sight interpreting courses and possess little knowledge and training of ST. All students have not passed China Accreditation Test for Translators and Interpreters Level 2. Thus, their interpreting proficiency are moderately at the similar level.

2) Research material

As shown in Table 1, the author selects two excerpts from political leaders' speeches as experiment materials. One is PM Lee Hsien Loong's remarks at the Special ASEAN Summit on COVID-19 delivered on April 14, 2020, 615 words long; while the other is Premier Li Keqiang's Remarks at the Special ASEAN, China, Japan and South Korea Summit on COVID-19 released on April 14, 2020, 780 words long.

Table 1. Comparison between English and Chinese materials

Materials	Speaker	Title	Date of speech	Length
English material	Lee Hsien Loong, PM of Singapore	Remarks at the Special ASEAN Summit on COVID-19	April 14, 2020	615 English words
Chinese material	Li Keqiang, Premier of China	Remarks at the Special ASEAN, China, Japan and South Korea Summit on COVID-19	April 14, 2020	780 Chinese characters

According to the "Grading system for the difficulty degree of C-E/E-C sight translation materials" (See Table 2) modified from Huang and Bao's [10] "Grading System for the Difficulty of C-E/E-C Consecutive Interpreting Materials", the two experimental materials are of equal difficulty (See Table 3), and can be used as experimental materials to investigate the impacts of directionality on the

disfluency of ST.

Table 2. Grading system for the difficulty degree of C-E/E-C sight translation materials

Indicators	0	1	2
Vocabulary	There are few low-frequency words, complex technical terms, proper nouns, abbreviations, numbers, etc.	There are some low-frequency words, including more complex technical terms, proper nouns, abbreviations, numbers, etc.	There are many low-frequency words, complex technical terms, proper nouns, abbreviations, numbers, etc.
Syntax	Simple sentences are dominant, and the syntactic structure is simple.	The proportions of single sentence and compound sentence are equal, and the syntactic structure is relatively complex.	Compound sentences are dominant, and the syntactic structure is very complex.
Length of sentence/clause	Most sentences and clauses are short, of which interpreter's eye can grasp every word, e.g., shorter than 3/4 line of Times New Roman or 宋体 printed on A4 paper in 五号 font size.	Most sentences and clauses are of medium length, of which interpreter has difficulty in covering a complete sentence or clause, e.g., 1-1.5 lines of Times New Roman or 宋体 printed on A4 paper in 五号 font size.	Many long sentences or clauses, of which are extremely difficult for interpreter to grasp every word, e.g., 1.5 or more lines of Times New Roman or 宋体 printed on A4 paper in 五号 font size.
Logic	The logical relationship between different chunks and units is relatively simple, and conjunctions are used frequently.	The logical relationship between different chunks and units is complex, and conjunctions are not often used.	The logical relationship between different chunks and units is very complex, and conjunctions are rarely used.
Cultural factor	The cultural information contained is of small amount. SL and TL have little difference regarding cultural information.	With moderate amount of cultural information. SL and TL differ regarding cultural information	With large amount of cultural information. SL and TL differ greatly regarding cultural information
Thematic and encyclopedic knowledge	There is little and easy thematic knowledge or encyclopedia knowledge	There is a moderate amount of and complex thematic knowledge or encyclopedia knowledge	There is a large amount of and very abstruse thematic knowledge or encyclopedia knowledge

Table 3. Scale of experiment materials' difficulty

Indicators	Score for difficulty (English material)	Score for difficulty (Chinese material)
Vocabulary	1 (It contains several organization names, agreement names, low-frequency place names, and low-frequency words, which have been presented in preparation for translation; some common terms in the economic, financial, and political fields; 2 abbreviations, 2 simple numbers)	1 (It contains many common terms in the economic, financial, and political fields; 2 proper nouns (English abbreviations have been given in the original speech); 5 Chinese four-character expression, 3 simple numbers)
Syntax	1 (Simple sentences and compound sentences have similar ratio, and the syntactic structure is complex.)	1 (Although simple sentences make up the majority, there are many sentences without subject and typical Chinese parallel sentences.)
Length of sentence/clause	1 (Due to the characteristics of English words and the preference for sentence making, the sentence span is large, increasing reading effort.)	0 (Due to the characteristics of Chinese characters and the preference for Chinese sentence making, the sentence span is small, and the reading effort is little.)
Logic	0 (The logical relationship between different chunks and units is simple, and conjunctions are used frequently.)	1 (Chinese is a parataxis language using few conjunctions, and the logical relationship between different chunks and units is not obvious.)
Cultural factor	0 (It has little cultural information and very small cultural difference)	0 (It has little cultural information and very small cultural difference)
Thematic & encyclopedic knowledge	1 (It involves some thematic knowledge)	1 (It involves some thematic knowledge)
Sum	4	4

3) Experiment procedures

The interpreting experiment was conducted in the interpreting booth in the Simultaneous Interpreting Laboratory of the University.

At the beginning, there was a brief introduction to the text theme. Before interpreting, 10 minutes was given to the subjects to get familiar with the material. The subjects were allowed to annotate based on the terms and words given in the preparation. Then the subjects started E-C interpreting and recorded their output during the whole process. After that there was a 10-minute break. Then C-E ST continued.

Finally, all ST recordings were checked out to be valid,

thus 17 pairs of samples were collected.

C. Disfluency Indicators Applied in the Research

Given the purposes and needs of this experiment, disfluencies were finally divided into Silent Pause (SP), Filled Pause (FP), Repetition (Rt), and Repair (Rr). These four disfluency indicators were also applied in the previous study of Yuan and Wan [30].

Silent Pause (SP) refers to silence in the stream of speech, which happens when the interpreter gets stuck while interpreting and does not make any oral sound. In the previous literature at home and abroad, there are two most commonly used minimum thresholds for SP: 0.25 s and 0.3 s. Considering that the subjects in this research are student interpreters, the author determined 0.3 s as the minimum threshold for SP.

Filled Pause (FP) is audible evidence proving that the interpreter cannot produce the target language for a while but is still in the language activity. 5 kinds of FP found are marked as: uh [FP], um [FP], (throat-clearing) [FP], (sigh) [FP], and "Chinese" [FP]. "Mixed" pauses which comprise both SP and FP were counted separately.

Repetition (Rt) includes non-semantic occurrence of a phrase, word, or even part of a word again and again. An example in the delivery, "share a common share a common [Rt] destiny.", is a Rt of phrases. What's more, "contribute to the negotiation of China, China [Rt], Japan, and South Korea trade zone,", "China" is a Rt of a word. In the delivery "not lose the pre prevention [Rt] and control of epidemic" is the Rt of part of the word "prevention".

Lastly, correction, false start, restoration of links, etc., are generalized as repair (Rr). For example, "Respected fellows and colleges, colleagues".

D. Data Collection and Processing

1) Data collection

After the experiment was completed, the author imported the 34 recordings of 17 subjects into Xunfei Ting Jian (www.iflyrec.com) for the preliminary transcription. Then, the author proofread to mark disfluencies.

FP, Rt, and Rr were identified manually first. SP and its duration were identified and calculated by Adobe Audition CC 2019, and the duration of SP was marked in square brackets like "[1.779 s]" inserted in the transcripts.

2) Data processing

After transcribing subjects' recordings, proofreading the transcripts and identifying disfluencies, the author calculated the data including each subject's recording time and frequencies of the four disfluency indicators, and analyzed the law of disfluencies in ST in two directions from different angles, as well as the correlation between directionality and disfluency.

IV. Results and Discussion

A. Analysis of SP, FP, Rt, Rr in Both E-C and C-E ST

1) SP

a) Analysis of SP cases

There are pauses about mistranslation of terminology, super-long SP and SP within a word. The pause about mistranslation of terminology means the subjects make disfluencies when translating some terms even though their standard translation is given in advance. For example:

Subject 8: 东盟 [2.337 s] 协调, [1.489 s] 东盟协调 [Rt] [2.698 s] 公共卫生 [0.408 s] 紧急 [0.692 s] 事件 [0.725 s] 工作小组 [1.655 s] 也应该保持对这个问题的密切关注。

The author finds that 14 of all 17 subjects translate "The ASEAN Coordinating Council Working Group on Public Health Emergencies" inaccurately or non-fluently, reflecting that these student interpreters are lack of effectiveness when doing pre-task preparation. Subject 8 even commits 6 SPs and 1 Rt when translating the organization's name, which could be avoided by adequate pre-task preparation.

For Super-long SP, the author means that the interpreter pauses for far more than the minimum threshold because of various reasons. For example:

Subject 8: 总的来说, [0.716 s] 全体各方, [28.334 s] 国际法规 [Rr] [0.437 s] 将会 [1.708 s] 维持[0.371s]并且得到尊重。[5.631 s] 在这方面, [0.493 s] 我很害怕 [1.028 s] 公众的信心会有所下降。

Here comes out a 28.334 s-long SP of Subject 8. The source text is "And on all parties, I fear that there will be diminished confidence that international rules will hold and be respected in a crisis." But in C-E ST, there is no SP longer than 10 s. This may reflect the structural and word-order differences between English and Chinese. Chinese sentences are mostly short and simple. In contrast, English has more longer compound sentences with complex structures. Moreover, English words extend spatially longer than Chinese characters on paper, which leads to a longer span. Chinese sentences, by contrast, are usually of small space span on paper, thereby interpreters can grasp more content at one sight. We can apply syntactic linearity when interpreting to avoid Super-long SP. We can also add adhesive components in E-C interpreting to make the translation smooth and coherent.

For SP within a word, the author finds that the interpreters break between a complete word and pause in C-E ST. For example:

Subject 2: [0.742 s] and to com [0.668 s]-municated [1.247 s] about [1.989 s] sharing [0.882 s] epidemic informations and entry [0.422 s]-e [0.944 s] exit [Rt] personnel [0.345 s] control,

Subject 15: to form [0.929 s] a situation [0.947 s] of [0.445 s] collabo, [0.941 s] of collabo [0.445 s]-ration [Rt] [1.855 s] to [0.820 s] con [0.570 s]-trol the pandemic.

There are several reasons behind the occurrence of SP within a word. Some occur because subjects intend to earn some time to either understand the following sentences, figure out the logic, search for the corresponding words in English, or organize their output, thus forget what they are articulating. For example, the "com [0.668 s]-municated" of Subject 2, and the "collabo [0.445 s]-ration" of Subject 15 may be attributed to subjects' poor command of a specific word, being not sure about a word's part of speech, pronunciation, etc.

b) Frequency of SP

In E-C ST, each subject has 22.107 SPs per minute on average. Among them, Subject 2 has the highest number of SP per minute, which is 30.731 times/min, and Subject 14 has the least number of SP per minute, which is 17.176 times/min. In C-E ST, each subject has 22.519 SPs per minute on average. Among them, Subject 13 and Subject 15 have the highest number of SP per minute, both of which are 26.462 times/min, and Subject 9 has the least number of SP per minute, which is 17.484 times/min.

The above indicates a higher frequency of SP in C-E ST. Moreover, statistically, even if the incidence of some subjects' FP, Rt, and Rr is very low, they still have a lot of SPs in their output. SP seems to be somewhat inevitable. On the other hand, the author finds that of all SPs, a large number coincide with respiration, which means it takes a subject more than 0.3 s to finish a respiration, leading to a SP. Interpreters should train themselves to breathe at syntactic and grammatical boundaries such as between sentences, clauses, and sense groups or meaning units.

c) Duration of SP

Time variables of SP include SP total time and its percentage, SP duration and average SP duration.

1. Description of SP Duration in E-C ST. In E-C ST, the total time of SP of Subject 8 is the longest, which also directly led to her recording time being the longest. At the same time, total time of SP affects the values of SP total time/recording time, SP time/min (s/m), and average SP duration. These three values of Subject 8 are all the largest of all subjects, while Subject 1 has the shortest total time of SP. Likewise, Subject 1 enjoys the smallest SP total time, SP time/min and average SP duration among all subjects. Interestingly, Subject 1's recording time is not the shortest, which is 0.06 minute longer than the shortest 6.346 minutes of Subject 14.

The author divides E-C SP total time/recording time into three intervals: lower (0~25%), intermediate (25%~50%), higher (50%~) (see Table 4). We can find that the total time of SP accounts for a large proportion in student interpreters' E-C ST. 4 of 17 subjects' SP time even exceed half of their recording time.

Table 4. Distribution of SP total time/recording time in E-C ST

SP total time/ recording time	Subjects
Lower (0~25%)	Subject 1, 5, 14
Intermediate (25%~50%)	Subject 3, 4, 6, 7, 9, 10, 11, 15, 16, 17
Higher (50%~)	Subject 2, 8, 12, 13

2. Description of SP Duration in C-E ST. In C-E ST, Subject 6 has the longest total time of SP, which ranks the third largest. The law of SP time/min is consistent with SP total time/recording time. In terms of average SP duration, Subject 6 lasts an average of 1.337s per SP, which is the third longest. Subject 3 has the shortest total time of SP. We can see from Table 5 that the total time of SP accounts for a larger proportion in student interpreters' C-E ST than in E-C ST. All of 17 subjects' SP time are beyond 25%, and 3 subjects' SP time exceeded half of their recording time (See Table 5).

Table 5. Distribution of SP total time/recording time in C-E ST

SP total time/ recording time	Subjects
Lower (0~25%)	
Intermediate (25%~50%)	Subject 1, 2, 3, 4, 5, 7, 9, 10, 11, 13, 14, 15, 16, 17
Higher (50%~)	Subject 6, 8, 12

2) FP

a) Analysis of FP cases

The author finds 5 types of FP: uh, um, throat-clearing, sigh, and some Chinese, which are marked as: uh [FP], um [FP], (throat-clearing) [FP], (sigh) [FP], and "Chinese" [FP].

For the "Chinese" [FP], the author means the interpreters say Chinese in C-E ST. It only occurs in Subject 1's delivery:

Subject 1: Third, we should [2.331 s] make efforts to the [4.385 s] um [FP], 哎呀我去, 这个也好难呀 [FP],

The underlined part in the case of Subject 1 is extremely unprofessional, which should be completely avoided.

b) Frequency of FP

The frequency of FP is much smaller than that of SP. In both E-C and C-E ST, FP is the second frequent disfluency indicator.

In E-C ST, each subject has 1.902 FPs per minute on average. Among them, Subject 4 has the highest number of FP per minute. In contrast, Subject 5, 8 and 16 have no FP at all during the whole E-C ST process. Among all 17 subjects, 8 subjects have 3 or less FPs during the E-C ST.

In C-E ST, each subject has 2.045 FPs per minute on average. Among them, Subject 4 also has the highest number of FP per minute. In contrast, Subject 5 and Subject 12 have no FP at all during the whole C-E ST process. Among all 17 subjects, 9 subjects have 3 or less FPs during the C-E ST. In addition, we can find that Subject 5 committed no FP in both E-C and C-E ST, showing that she has a good control over FP.

3) Rt

a) Analysis of Rt cases

There are repetitions of syllable in the subject's delivery, for example:

Subject 1: make efforts to [1.461 s] (sigh) [FP] [0.528 s] let south As south [Rt], [1.283 s] 诶不是 [FP] north 诶不是 [FP] ea east [Rt] Asia [0.487 s] against uh [FP] [0.477 s] fight against [Rr] [0.387 s] epidemic.

Some syllable Rts are caused because the subject fails to recall the corresponding expression of certain words in target language. This kind of syllable Rt is actually hesitation, such as "ea east [Rt]" of Subject 1. Prior to this, Subject 1 had several amendments such as "south" and "north", which reflects that the basic knowledge of some student interpreters is not solid. And when they see the source language, they cannot immediately think of its corresponding expression in the target language, namely, the language conversion of theirs is not automatic. On the other hand, some syllable Rts occur because interpreters ignore what they are saying when reading the following sentences, which reveals the unskilled multitasking.

b) Frequency of Rt

It is found from the data that Rt has the smallest proportion among four disfluency indicators studied in this research.

In E-C ST, subjects have 0.900 Rt per minute on average. Subject 11 has the highest number of Rt per minute, while in contrast, Subject 16 has no Rt at all during the whole E-C ST process. Among all 17 subjects, 7 subjects have 3 or less Rts during the E-C ST.

In C-E ST, subjects have 1.399 Rts per minute on average. Subject 1 has the highest number of Rt per minute, while in contrast, Subject 5 and Subject 8 have no Rt at all during the whole E-C ST process. Admittedly, subject 5 committed no FP in both E-C and C-E ST, no Rt in C-E ST, only 1 Rt in E-C ST, showing that she has good control over disfluencies, making her interpreting output relatively fluent. Also, her recordings are comfortable for the audience to listen to. Among all 17 subjects, 9 subjects have 3 or less Rt during the C-E ST.

4) Rr

a) Analysis of Rr Cases

When analyzing Rr, the author finds that the Rr methods used by the student interpreters can be divided into five categories: self-monitoring Rr, slips of tongue Rr, false Rr, unnecessary Rr, grammatical Rr.

For the self-monitoring repairs, the interpreters are aware of their interpreting mistakes during the interpretation process and can correct them in a timely manner. For example:

Subject 7: We need to strengthen the cooperation between [0.567 s] uh [FP] among [Rr] countries [0.934 s] and guarantee [0.646 s] the security of [1.782 s] crops and market,

It is necessary to further enhance the self-monitoring ability so as to avoid unnecessary errors before they occur.

For the slips of a tongue Rr, it means that some Rrs occur after the slips of tongue, for example:

Subject 15: 对于过，各成员国 [Rr] 来, [0.371 s] 之间 [Rr], [0.953 s] 我很担心 [2.294 s] 这会 [0.301 s] 对 [0.839 s] 国际规则 [1.355 s] 产生 [2.148 s] 影响，

In this example, “过” actually combines the intonation of “各” and the pronunciation of “国”.

For the false Rr, it means that some Rrs occur after false starts, for example:

Subject 1: And the econo, the world economy [Rr] [0.858 s] has been [0.755 s] hurt seriously.

Accordingly, it is necessary for the interpreters to, when reading the source text, increase reading speed, expand the sight coverage, and understand the original text correctly at fast rate, so as to avoid false starts.

For the unnecessary Rr, it means that repairing for optimizing word diction is completely unnecessary. Accuracy and fluency are of top importance for interpreting output, and there is no need to spend cognitive resources on wording. For example:

Subject 17: 同时也会伤害, 损伤我们的, 损害我们的[Rr] 经济, [0.499 s] 以及加剧失业问题。

“伤害” “损伤” “损害” are of totally same meaning, so it is totally unnecessary to commit Rr.

For the grammatical Rr, it means that some Rrs can be avoided by adopting the principle of syntactic linearity, for instance:

Subject 1: [1.049 s] 将会使控制 [Rr] [0.453 s]跨国的人口……

By adopting syntactic linearity, we can translate it as “将会使跨国的人口得到控制”, avoiding an obvious disfluency.

b) Frequency of Rr

Rr is the third-most indicator among four disfluencies. In E-C ST, subjects have 1.818 Rrs per minute on average. Among them, Subject 2 has the highest number of Rr per minute. In contrast, Subject 16 has the least number of Rr per minute —only 1 Rr during the whole E-C ST process. In C-E ST, subjects have 1.555 Rrs per minute on average. Among them, Subject 1 has highest number of Rr per minute. In contrast, Subject 5 has the least number of Rr per minute. The above data displays that all subjects are somewhat aware of correcting their speech from time to time, even though they attempted unsuccessfully sometimes in corrections.

B. Correlation Between Interpreting Disfluency and Directionality

1) Comparison of SP between E-C and C-E ST

Three statistical approaches namely, Tests of Normality, Paired-Samples Test, and Rank Sum Test are employed to analyze the correlation between interpreting disfluency and directionality. The author analyzes impacts of directionality on ST disfluency from the perspective of times of SP/minute, SP duration/minute and average SP duration.

a) Times of SP/minute

Table 6 displays the results of each subject in terms of times of SP/minute in both E-C and C-E ST, and then two columns of data are tested for normality, the results of which are shown in Table 7

It can be seen from Table VII that the Shapiro-Wilk significance coefficients of the two columns of E-C and C-E data on times of SP/minute are 0.262 and 0.814 respectively, both greater than 0.05, indicating that the two sets of data are in accordance with the normal distribution. Therefore, paired-samples test can be used to test whether there is statistically significant difference between them. The author used SPSS 26.0 to perform a paired-samples test on those above data, and the results are as follows in Table 8:

Table 6. Times of SP/minute in E-C and C-E ST

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17
E-C	19.83	30.73	22.53	21.70	20.60	22.04	20.91	19.77	20.66	24.63	21.82	17.33	23.50	17.18	26.21	19.50	26.99
C-E	21.41	22.91	22.27	23.82	20.38	22.53	22.31	22.57	17.48	25.10	21.06	21.44	26.46	20.12	26.46	19.16	25.26

Table 7. Results of tests of normality for times of SP/minute

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
E-C	0.159	17	0.200*	0.935	17	0.262
C-E	0.124	17	0.200*	0.970	17	0.814

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 8. Results of paired-samples test for times of SP/minute

Paired Differences					t	df	Sig. (2-tailed)
Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
			Lower	Upper			
−0.284	2.799	0.679	−1.723	1.155	−0.418	16	0.681

Table VIII shows that the significance coefficient is 0.681 (Sig. = 0.681>0.05), indicating that there is no statistically significant difference between the two sets of data. Specially, interpreting directionality has no significant effect on the times of SP/minute for student interpreters' ST.

b) SP Duration/minute

The data of each subject's SP duration/min in both E-C and C-E ST are shown in Table 9. Likewise, two columns of data are tested for normality and the results indicate that the Shapiro-Wilk significance coefficients of E-C and C-E data of SP duration/min are 0.727 and 0.130 respectively, both greater than 0.05, indicating that the two sets of data are in accordance with the normal distribution.

Therefore, the author used SPSS 26.0 to perform paired-samples test on the above data, and the results are shown in Table 10. We can see that the significance coefficient is 0.817 (Sig. = 0.817>0.05), indicating that there is no statistically significant difference between the two sets of data. Specially, interpreting directionality does not exert significant effect on the SP duration/min for student interpreters' ST (See Table 10).

c) Average SP duration

The data of each subject's average SP duration in both E-C and C-E ST are shown in Table 11. Likewise, two columns of data are tested for normality and the results indicate that the Shapiro-Wilk significance coefficients of E-C and C-E data of average SP duration are 0.046 and 0.189 respectively. 0.189 is greater than 0.05, yet 0.046 is less than 0.05, indicating that the E-C data of average SP duration conform to abnormal distribution, while C-E data of average SP duration conform to normal distribution. In this sense, the paired-samples test cannot be applied to test whether there is statistically significant difference between the two sets of data. Thus, the author turns to the rank sum test and the results are shown in Table 12.

Table 9. SP duration/minute in E-C and C-E ST

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17
E-C	11.93	36.77	19.73	22.04	14.24	21.71	26.33	37.70	17.82	19.23	23.28	31.46	30.37	13.10	28.58	21.69	25.80
C-E	22.37	26.44	15.84	17.22	16.58	30.13	23.95	31.20	17.92	19.27	25.65	30.41	27.53	15.44	28.27	21.02	27.68

Table 10. Results of paired-samples test for SP duration/minute

Paired Differences					t	df	Sig. (2-tailed)
Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
			Lower	Upper			
0.285	5.007	1.214	−2.289	2.860	0.235	16	0.817

Table 11. Average SP duration in E-C and C-E ST

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17
E-C	0.60	1.20	0.88	1.02	0.69	0.99	1.26	1.91	0.86	0.78	1.07	1.82	1.29	0.76	1.09	1.11	0.96
C-E	1.05	1.15	0.71	0.72	0.81	1.34	1.07	1.38	1.03	0.77	1.22	1.42	1.04	0.77	1.07	1.10	1.10

Table 12. Results of test statistics for average SP duration

	C-E–E-C
Z	−0.734b
Asymp. Sig. (2-tailed)	0.463

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks

It can be seen from the above results that the Asymp. significance coefficient is 0.463, greater than 0.05, indicating that there is no statistically significant difference between the two sets of data. Specially, interpreting directionality has no significant effect on the average SP duration for student interpreters' ST.

2) Comparison of FP between E-C and C-E ST

The author presents the data of each subject's times of FP/minute in both E-C and C-E ST in Table 13. Likewise, two columns of data are tested for normality and the results indicate that the Shapiro-Wilk significance coefficients of E-C and C-E data of average SP duration are 0.001 and 0.000 respectively, both less than 0.05, indicating that the two sets of data conform to abnormal distribution. Thus, the author turns to the rank sum test and the results are shown as follows in Table 14.

It can be seen from the above results that the Asymp. significance coefficient is 0.959, greater than 0.05, indicating that there is no statistically significant difference between the two sets of data. That is to say, interpreting directionality has no significant effect on the times of FP/minute for student interpreters' ST.

3) Comparison of Rt between E-C and C-E ST

The data of times of Rt/minute in both E-C and C-E ST are presented in Table 15. Likewise, two columns of data are tested for normality and the results indicate that the Shapiro-Wilk significance coefficients of E-C and C-E data of times of Rt/minute are 0.002 and 0.046 respectively, both less than 0.05, indicating that the two sets of data conform to abnormal distribution. Likewise, the author turns to the rank sum test and obtains the results as follows in Table 16.

It can be seen from the above results that the Asymp. significance coefficient is 0.227, greater than 0.05, indicating that there is no statistically significant difference between the two sets of data. That is to say, interpreting directionality has no significant effect on the times of Rt/minute for student interpreters' ST.

4) Comparison of Rr between E-C and C-E ST

The data of times of Rr/minute in both E-C and C-E ST are presented in Table 17. Likewise, two columns of data are tested for normality and the results indicate that the Shapiro-Wilk significance coefficients of E-C and C-E data of times of Rr/minute are 0.368 and 0.051 respectively, both greater than 0.05, indicating that the two sets of data are in accordance with the normal distribution.

Table 13. Times of FP/minute in E-C and C-E ST

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17
E-C	3.12	1.32	3.25	8.29	0.00	0.45	0.34	0.00	0.17	1.48	0.23	0.30	5.11	3.47	0.32	0.00	3.48
C-E	4.32	0.22	1.87	8.98	0.00	0.78	0.25	0.35	0.93	1.17	0.10	0.00	9.37	0.17	0.13	0.14	2.74

Table 14. Results of test statistics for times of FP/minute

	C-E–E-C
Z	−0.052b
Asymp. Sig. (2-tailed)	0.959

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.

Table 15. Times of Rt/minute in E-C and C-E ST

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17
E-C	0.62	2.65	0.76	0.61	0.15	2.03	0.11	0.44	0.17	0.30	3.15	1.60	0.81	0.32	0.32	0.00	0.70
C-E	3.96	2.12	0.56	2.88	0.00	1.85	0.50	0.00	0.16	0.73	2.76	1.62	1.27	0.83	0.65	0.57	0.83

Table 16. Results of test statistics for times of Rt/minute

	C-E–E-C
Z	−1.207b
Asymp. Sig. (2-tailed)	0.227

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

Table 17. Times of Rr/minute in E-C and C-E ST

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17
E-C	2.81	4.26	1.72	2.15	0.87	3.84	0.67	0.44	1.02	1.03	2.25	1.60	2.78	1.42	1.61	0.15	1.74
C-E	3.33	1.34	2.06	2.53	0.39	2.44	0.63	1.38	0.93	1.31	1.28	0.07	3.03	0.66	0.51	0.86	1.07

Therefore, the author performs a paired-samples test to see whether there is statistically significant difference between the two sets of data, and the results are shown in Table 18. It can be seen that the significance coefficient is 0.176 (Sig. = 0.176>0.05), indicating that there is no statistically significant difference between the two sets of data. Specially, interpreting directionality has no significant effect on the Rr/minute for student interpreters' ST.

Table 18. Results of paired-samples test for times of Rr/minute

Paired Differences					t	df	Sig. (2-tailed)
Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
			Lower	Upper			
0.326	0.950	0.230	−0.162	0.815	1.415	16	0.176

To sum up, directionality exerts no significant effect on the disfluency of student interpreters' ST in terms of four aspects, namely SP, FP, Rt, Rr, based on the fact that there are no statistically significant differences between E-C and C-E ST among student interpreters.

V. Conclusion

A. Major Findings

This study examines the characteristics of disfluency in two directions in terms of SP, FP, Rt and Rr, and figures out the correlation between directionality and disfluency in ST. Following are the major findings:

First, among the four disfluency indicators examined in this research, the incidence of SP is the highest in both E-C and C-E ST, followed by FP, then Rr, and finally Rt. Most SPs are formed because some student interpreters are unprofessional in doing pre-task preparation. A large number of SP coincide with respiration; SP over 10s occurs only in E-C ST. Second, from the aspect of FP, sighing and speaking Chinese in C-E ST are extremely unprofessional, which should be absolutely avoided. Third, some syllable Rts are caused because the subject is unfamiliar with, or fails to recall the corresponding expression of certain words in target language, or ignores what they are saying while reading the following source text. Fourth, it is necessary to further enhance the self-monitoring before Rr occurs; for the grammatical Rr, they can be avoided by adopting the principle of syntactic linearity.

In addition, correlation analysis in two directions displays that there are no statistically significant differences between E-C and C-E ST with respect to the frequency of SP, FP, Rt, Rr, although the average value of each disfluency index has a certain difference in two directions. There is also no statistically significant difference in SP duration/min and average SP duration. In other words, directionality exerts no significant effect on the frequency of SP, FP, Rt, Rr, SP duration/min and average SP duration. To summarize, directionality exerts no significant effect on the disfluency of student interpreters' ST. In other words, there are no correlations between directionality and disfluency in ST among student interpreters.

B. Implications

By studying the disfluencies of the student interpreters' ST, the author discovers some problems in the student interpreters' ST in two directions, which can help them make more targeted improvements in their future training. At the same time, the characteristics of student interpreters' disfluencies will provide guidance for teachers' teaching.

On the one hand, student interpreters can enhance their efficiency of interpreting training by: (1) spending time improving the agility of thinking, and increasing the reading speed; (2) sufficient pre-task preparation, which must be done by means of annotations, underlining the main verbs, segmenting compound sentences before interpreting, etc.; (3) repeatedly practicing set phrases, so as to develop the quick interpretation reflexes, establish an automatic connection between the source and target language chunks, and achieve high-speed and efficient conversion.

On the other hand, interpreting teachers can better train student interpreters, and make their interpreting courses more pertinent by training students to split attention, cultivating student interpreters' strong sense of fluency and asking students to keep memorizing language chunks to improve the automaticity of interpreting output.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Professor Fen Gao conducted the research design and critically revised the manuscript along the way; Fan Yang performed the statistical analysis and drafted the manuscript; Kexin Zhang contributed the data collection and proofreading. All authors contributed to the conception, design and data analysis of the study. All authors approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

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