Understanding Advanced Level Academic Writing on Syntactic Complexity

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Abstract

Recent publications have highlighted the combination of large-grained and fine-grained indices to tap into syntactic complexity. Yet few studies have examined the writing produced by more advanced academic writers from a cross-linguistic perspective. This paper reports a corpus-based comparison of the native speaker (NS) and the Chinese advanced academic writers' written abstracts. The study analyzed 120 texts within applied linguistics to discuss the extent to which the Chinese and the native writers' writing differed in 16 measures of syntactic complexity. The article also compared across levels of English language proficiency and language background. The results revealed that the NS professional group generated more subordination than the Chinese professional writer group. Within-group comparisons yielded statistically significant differences in fine-grained syntactic complexity for the Chinese group. These results show considerable differences between the Chinese academic writers and native speakers residing in subordination. The results have implications for incorporating subordination to writing instruction for L2 writers at a more advanced level.

1 Introduction

In second language (L2) writing research, syntactic complexity refers to the sophistication of syntactic structures exhibited in language production (Lu, 2011; Ortega, 2015). Previous scholarship has frequently used syntactic complexity to assess writing quality. It can demonstrate learners' language development and syntactic maturity (Crossley et al., 2011; Lu, 2011; Ortega, 2003; Wolfe-Quintero et al., 1998). Several researchers have attempted to determine a comprehensive and organic measuring system to assess L2 writing and L2 language proficiency since 2009. The call for a more comprehensive and multi-dimensional construct (Norris and Ortega, 2009; Bulté and Housen, 2012) combined with the introduction of large-scale corpus-based approaches (Biber and Gray, 2010; Biber, Gray, and Poonpon, 2011), led to the attempted integration of fine-grained measures of complexity at both the phrasal level and the clausal level and large-grained measures of complexity at the clause or sentence level (the length-based indices, such as the length of clauses, T-units, and/or sentences).

Many studies have shown that first language (L1) background can potentially impact L2 syntactic complexity (Kuiken and Vedder, 2019; Lu and Ai, 2015; Staples and Reppen, 2016). Some studies on L1 and L2 syntactic complexity have focused on primary and secondary school students (Jiang et al., 2019). With the growing number of international students enrolled in higher education in English speaking countries in recent years,

extensive research on L2 syntactic complexity has been dedicated to identifying potentially different patterns of syntactic complexity between native speakers (NSs) and non-native speakers (NNSs) of English at university-level (Ai and Lu, 2013; Casal and Li, 2019; Lu and Ai, 2015; Staples and Reppen, 2016). However, a limited number of studies have examined the variation of L2 written syntactic complexity at more advanced levels of language development. It is still unclear how much the written syntactic complexity produced by highly advanced non-native speaker (NNS) writers differs from that of advanced NS writers. The investigation of the patterns of syntactic complexity at more advanced stages of language proficiency would enrich the current literature on L2 syntactic complexity and especially on "the manifestation and development of complexity in a second language" (Housen et al., 2019). Moreover, it is estimated that 440-650 million Chinese citizens are English learners (He and Zhang, 2012). Answering the question about the extent of the differences in written syntactic complexity between Chinese writers and NS writers at the graduate level and between professional Chinese writers and professional NS writers would contribute to our understanding of the writing process and is crucial to L2 writing pedagogy.

Some studies have investigated different writing tasks by L2 beginner writers and L2 university-level writers (Bulté and Housen, 2018; Crossely and McNamara, 2014; Lahuerta Martínez, 2018; Verpoor, Schimid, and Xu, 2012). However, very few of these studies have focused on abstract writing (Ansarifar et al., 2018, is an exception), which is used for various purposes like degree projects, publications, or conferences (Lorés, 2004). Abstracts represent the highest level of language proficiency. Yet, abstracts produced by writers at more advanced levels of language development and how abstracts differ across writers from different L1 backgrounds is little known.

The present study aims to bridge this gap by investigating how large-grained complexity measures and fine-grained complexity measures of syntactic complexity differ between native English academic writers and Chinese academic writers in abstract writing. To investigate this, we designed a cross-sectional study using four written corpora. We hope to contribute to the research of L2 academic writing and L2 writing pedagogy in English for Academic Purposes for a growing group of Chinese authors.

2 Literature review

2.1 Writing development and syntactic complexity

Syntactic complexity is an essential construct for second language acquisition (SLA). It refers to "the range of forms that surface in language production and the degree of sophistication of such forms" in SLA (Ortega, 2003, p.492). Syntactic complexity has been increasingly taken as a multidimensional construct in nature (Bulté and Housen, 2012; Lu, 2011; Norris and Ortega, 2009). To obtain a fair representation of this aspect of writing, SLA researchers are encouraged to measure overall complexity (mean length of Tunit), subordination or coordination (clauses per Tunit), and subclausal or phrasal sophistication (mean length of clause, complex nominal per clause) (Norris and Ortega, 2009).

In L2 writing research, the use of large-grained indices (the length-based indices) at the syntactic level has indicated that advanced L2 users would produce longer sentences and more diverse or elaborate language (Housen and Kuiken, 2009; Lu, 2011; Ortega, 2003; Wolfe-Quintero et al., 1998). Over the past 40 years, syntactic development and syntactic complexity used to rely on clausal subordination measures and T-unit based measures, such as clauses per T-unit (C/T), mean length of clause (MLC), mean length of T-unit (MLT), dependent clause per clause (DC/C) and dependent clauses per independent clause (Bardovi-Harlig and Bofman, 1989; Ellis and Yuan, 2004; Larsen- Freeman, 2006; Wolfe-Quintero et al., 1998). For instance, Ortega's (2003) research synthesis found that mean length of T-unit (MLT) and clause per T- unit (C/T) widely used in college-level ESL and EFL writing, among the 27 studies from 1976 through 1998, 25 of them employed MLT and 11 of them used C/T. Ortega (2003) indicated that a one-year observation period needed to be taken into account to observe substantial changes in MLT for college-level L2 and foreign language writers. Several studies revealed that MLT was significantly positively correlated with L2 language proficiency

(e.g., Yang et al., 2015). The written texts produced by higher-level L2 writers will exhibit an increase in both MLT and C/T when course levels in the program define L2 language proficiency. However, there may be no significant difference between immediately adjacent levels (Yang, 2013). In a longitudinal study of university-level L2 complexity development, Bulté and Housen (2014) noted that MLT has shown an increase after four-month long academic English instruction. MLT and subjective writing quality ratings correlated to each other.

However, several researchers have criticized the widely-spread use of large-grained measures (Biber et al., 2011; Bulté and Housen, 2012; Larsen- Freeman, 2009; Norris and Ortega, 2009). As T unit-based measures alone are not able to reflect the knowledge of the learner" (Bardovi-Harlig, 1982, p.391) accurately. Besides, large-grained indices are insufficiently sensitive to capture the subtler changes in writing development (Larsen-Freeman, 2009). some researchers have emphasized the use of a fine level of granularity in recent years (Bulté and Housen, 2012; Larsen-Freeman, 2009; Norris and Ortega, 2009) to more accurately reflect the specific structures employed by the learners (Norris and Ortega, 2009) and/or to get a comprehensive profile of L2 language development (Bulté and Housen, 2014). For instance, the same T-unit (*the man takes the plane to work*) in two different sentences have different grammatical features: (a) *The American man takes the plane to work five days a week*; (b) *The man takes the plane to work*, *although it is very exhausting*. In (a), an adjective (*American*) is used to elaborate the noun (*man*). Moreover, an adverb (*five days a week*) elaborates the verb phrase. In (b), the original T-unit is elaborated with a subordinate clause (*although it is very exhausting*). We can extract essential points can be from the two examples above. Even though the MLT score in two sentences is the same (12), the score alone only provides a general picture instead of a more detailed indication of the types of elaboration included in the text. MLT score is not sensitive enough to provide interpretable information on syntactic complexity (Norris and Ortega, 2009). Therefore, the study of L2 development should include the multiple dimensions of complexity (Bulté and Housen, 2020).

Using large-scale corpus investigations, Biber et al. (1998) remarked that written language "primarily relies on full noun phrases," and subordination structures are more common in conversation. Furthermore, Biber et al. (2011) suggested the sequence of development in L1 syntactic complexity and hypothesized that the development of L1 academic writing relies heavily on nominal structures. In particular, on the usage of phrasal modification. Some evidence from both NS and NNS studies supports the developmental hypothesis that academic writing is "more syntactically complex than oral texts." And phrasal level complexity, such as noun phrases (NPs) complexity is a later development in academic writing (Ansarifar et al., 2018, Biber et al., 2011; Lahuerta Martínez, 2018; Lu, 2011; Parkinson and Musgrave, 2014; Yong, 2017). Parkinson and Musgrave (2014) pointed out that the more proficient L2 Academic English Purposes Purposes group generated a wider variety of complex nominals. Ansarifa et al. (2018) showed that L2 MA-level writers and L2 expert writers differ in phrasal features, while L2 writers at the Ph.D. level only differed in one phrasal feature (multiple prepositional phrases as post-modifiers) when compared with L2 expert writers.

Different from the developmental hypothesis (2011), based on Halliday and Matthiessen's systemic functional grammar (1999), Norris and Ortega (2009) hypothesized that the direction of the development of L2 syntactic complexity runs from coordination to subordination and then to greater use of phrasal complexity at higher levels of proficiency. Several studies have confirmed this sequence of language development for English as a Foreign Language (EFL) writers in secondary education and at the university level (Jiang et al., 2018; Lu, 2011). Moreover, studies have shown that subordination or coordination does not necessarily decrease along with the development of L2 language proficiency (Lahuerta Martínez, 2018; Mancilla et al., 2017). The high-level NNS group produced more subordination (dependent clause per clause, dependent clause per T-unit) and coordination (coordinate phrases per clause, CP/C) than the low-level NNS group (Mancilla et al., 2017). This result is different from the previous claim that language learners with advanced knowledge would exhibit lower levels of subordination (Norris and Ortega, 2009). Lahuerta

Martínez (2018) found a similar result, which demonstrated a significant increase in sentence coordination and subordination in the higher grade of secondary education students. Pallotti (2009) proposed that the decrease of subordination after a certain point in the development of syntactic complexity "might be interpreted as a sign of higher proficiency." Some recent studies have explored both large-grained and fine-grained complexity measures to observe the relationship between L2 writing quality and syntactic complexity (Casal and Lee, 2019; Crossly and McNamara, 2014; Taguchi et al., 2013; Jiang et al., 2019). Taguchi et al. (2013) reported that the L2 high-rated essays (essays score above 90) did not necessarily contain more complex language at the clausal complexity than the L2 low-rated essays (essays score below 80). However, the former group includes more phrasal complexity (attributive adjectives and post-noun modifying) than the latter. Similarly, Casal and Lee's study (2019) revealed that clausal complexity, such as T-units per sentence (T/S) and clauses per T-unit (C/T), is not a distinguishing factor in the assessed quality of first-year L2 undergraduate-level writing. Yet, the high-rated essays used more nominal modifiers (adjective premodification, preposition post-modification, and participle modification). This finding suggests that L2 learners use a wide range of complex nominals in academic writing when language proficiency has improved.

2.1 Langue proficiency and syntactic complexity

Previous scholarship observed variation of syntactic complexity across genres and language proficiency. Several L1 studies have investigated the effect of genre on written syntactic complexity. The choice of different measures of syntactic complexity, task types, and the level of participants has contributed to the understanding of the broad range of L1 writing development.

Previous studies have shown that argumentative essays exhibited a higher degree of syntactic complexity than narratives. Lu (2011) reported that, compared to narratives, argumentative essays produced by L1 Chinese university-level writers were more complex on 13 of the 14 syntactic measures when he did not control timing condition and institution. In a conceptual replication study (e.g., Lu, 2011), Yoon and Polio (2017) found significant genre effects on the length of production units (MLC, MLS, MLT) for both NNS and NS linguistic complexity. For instance, the length of production units produced by NS and NNS writers in argumentative essays was longer than that of narrative essays. Different from NS writers, NNS writers generated high phrasal-level complexity in argumentative writing (coordinate phrases per clause [CP/C], coordinate phrases per T-unit [CP/T], complex nominals per clause [CN/C], complex nominals per T-unit [CN/T], verb phrases per T-unit [VP/T]). NS writing only exhibited differences on one measure (CN/C) in both narrative and argumentative essays.

3   Methodology

3.1   Description of corpora used

The data consists of four corpora of 120 abstracts (dissertation, research articles) written by 30 Chinese Ph.D. writers, 30 Chinese professional writers, 30 NS Ph.D. writers, and 30 NS professional writers from the applied linguistics program. We chose abstracts written from the same discipline (applied linguistics) between 2005-2019.The Chinese corpora consist of random data selected from China National Knowledge Infrastructure (CNKI), an online national database under the lead of Tsinghua University, including journals, doctoral dissertations, masters' theses, proceedings, and ebooks. Research article abstracts in the Chinese corpora were from the top-rated 10 Chinese journals of applied linguistics and foreign language teaching/learning issued in China. All the Chinese writers are of Han nationality. We used the Proquest database to obtain abstracts written by the NS writers. English research article abstracts were chosen from 10 academic journals of applied linguistics and foreign language teaching/learning, such as Annual Review of Applied Linguistics, Applied Linguistics, Journal of Second Language Writing, Language, Culture and Curriculum, Language learning, Language Teaching Research, Modern Language Journal, Second Language Research, Studies in Second Language Acquisition, TESOL Quarterly. All the texts contributors are single authors. To control for the L1 background, we looked into all the NS writers' education backgrounds and personal websites to

verify that they were native speakers of English. We manually cleaned section headers, footers, and page numbers in the abstracts. Spelling errors in the raw data were corrected, such as "is build" and "softwares". The words in the brackets and parenthesis were also deleted. Since all abstracts used in the study were either published or grade; we would expect corrections at the accuracy level but not at the complexity level by instructors, reviewers, or editors.

The descriptive details of the text corpora are presented in Table 1. We sampled the first 150 words from all the abstracts to balance the equal sizes of the four corpora to compare grammatical features of interest (Ansarifar et al., 2018; Crawford and Csomay, 2015).

	Number of abstracts	Number of words	Mean length of abstract
CHPhD	30	4,597	153.2
NSPhD	30	4,557	151.9
CHPW	30	4,592	153.0
NSPW	30	4,593	153.1
Total	120	18,339	152.8

Note: CHPhD = Chinese PhD-level; NSPhD = native speaker PhD-level; CHPW = Chinese professional writers; NSPW = native speaker professor writers

Table 1: Descriptive details of the four corpora.

3.2 Description of corpora used

The analyses consisted of 8 large-grained and fine-grained measures of syntactic complexity based on previous research. This study used L2SCA, a computational software developed by Lu (2010), to analyze the traditional large-grained syntactic complexity. This computational software yields 14 indices of complexity targeting the length of production unit, amount of subordination, amount of coordination, and degree of phrasal sophistication. In the present study, eight measures were chosen (see Table 2). T-units per clause (CT/C), complex T-units per T-unit (CT/T), clauses per sentence (C/S), and verb phrases per T-unit (VP/T) are not included in this study, for they were poor candidates for developmental indices (Lu, 2011). Academic English writing at the advanced level emphasizes the use of nominal modifiers. The eight fine-grained phrasal and clausal complexity measures (see Table 3) in this

study were processed using TAASSC 1.3.8 (Kyle, 2016). TAASSC includes the classic 14 indices of syntactic complexity measures (L2SCA), seven phrase types, and ten phrasal dependent types.

Dimension	Label	Description
Length of production unit	MLC MLS MLT	Mean length of clause Mean length of sentence Mean length T-unit
Amount of subordination	C/T DC/C	Number of clause per T-unit Number of dependent clauses per clause
Amount of coordination	CP/C T/S	Number of coordinate phrases per clause Number of T-units per sentence
Degree of phrasal sophistication	CN/C	Number of complex nominal per clause

Table 2: large-grained syntactic complexity measures (modified from Lu, 2017, p.503).

Grammatical structures	Abbreviation
Adjective modifiers	Amod
Noun as modifiers	Nn
Prepositional Phrase	Prep
possessives	Poss
Subordinating conjunction	Mark
Relative clauses	Rcmod
Clausal complement	Ccomp
Adverbial clauses	Advcl

Table 3: Fine-grained measures selected in this study and analyzed by TAASSC.

4 Research question

RQ1. How is the large-grained and fine-grained syntactic complexity associated with abstracts produced by the Chinese Ph.D. group and the NS Ph.D. group?
RQ2. Are there systematic patterns of large-grained and fine-grained syntactic complexity on abstracts between the Chinese Ph.D. group and the NS. Ph.D. group?

5 Results

5.1 Differences between the Chinese and NS group on syntactic complexity

The first question in this study was whether syntactic complexity measures differed systematically across the group of Chinese and NS writers. Table 4, Table 5, Table 6, Table 7, and Table 8 present the mean scores and standard deviations of all the large-grained and fine-grained measures for Chinese and NS writers.

	MLS		MLC		MLT	
	M	SD	M	SD	M	SD
CH PhD	28.45	9.36	18.29	5.45	26.77	8.89
CH PW	25.25	5.64	16.09	3.10	22.53	5.15
NS PhD	23.45	4.73	16.28	4.05	22.7	5.46
NS PW	25.42	6.12	14.40	3.79	24.80	8.22

Table 4: Descriptive statistics of large-grained measures concerning length of production.

	C/T		DC/C	
	M	SD	M	SD
CHPhD	1.07	.24	.29	.13
CHPW	1.40	.20	.26	.10
NSPhD	1.46	.44	.29	.15
NSPW	1.76	.56	.38	.14

Table 5: Descriptive statistics of large-grained measures concerning amount of subordination.

	T/S		CP/C	
	M	SD	M	SD
CHPhD	1.07	.16	.66	.35
CHPW	1.17	.24	.65	.37
NSPhD	1.05	.16	.56	.30
NSPW	1.04	.19	.55	.34

Table 6: Descriptive statistics of large-grained SC measures concerning amount of coordination.

	CN/C	
	M	SD
CHPhD	2.89	1.01
CHPW	2.48	.53
NSPhD	2.48	.71
NSPW	2.21	.69

Table 7: Descriptive statistics for large-grained measures concerning degree of phrasal sophistication.

To determine which (if any) of the means were significantly different between each group of the writers (Ph.D. and professional), we ran both independent sample *t-tests* and Mann Whitney *U* tests. To avoid type I error, we set the alpha value for each comparison to .05/8 (.006), where .05 is the significance level for the complete set of tests, and 8 is the number of tests performed.

Independent samples t-tests showed that significant differences were found in DC/C between NS and Chinese professional writer groups (t (53.602) = 3.688, p = .001; d = 0.952). The result indicates Chinese professional writers produced less subordination than NS professional writers. We expected that the Ph.D. group would demonstrate a similar pattern as the professional writer group on DC/C/. However, there were no significant differences in DC/C between the NS and Chinese Ph.D. groups. The effect size of DC/C between the two professional writer groups exceeds 0.8. The Mann Whitney *U* tests revealed a significant difference in the C/T indices between the two groups of professional writers. The number of C/T produced by the Chinese professional writers is far less than the NS professional writers. The Mann Whitney *U* tests revealed a significant difference in the C/T indices between the two groups of professional writers. The number of C/T produced by the Chinese professional writers is far less than the NS professional writers.

Similar to what we did in the previous section, the alpha value for each comparison was at

.006(.05/8) to avoid Type I errors. An independent samples *t-test* was conducted to determine whether there is statistical evidence between groups of (Ph.D., and professional writer) for 'nouns as modifiers'(nn), $t(58) = 3.246$, $p = .002$, $d = 0.83$ between two groups of experienced writers. Mann Whitney U tests did not indicate significant differences between the two groups of Ph.D. writers and the two groups of professional writers for 'possessives' (poss), 'prepositional phrases' (prep), 'adjective modifiers' (amod), 'adjective modifiers' (advcl), 'clausal complement' (ccomp), and 'subjective conjunction' (mark).

Chinese professional writers produced more subordination structures (advcl, mark, ccomp) and more phrasal level fine-grained complexity (amod, nn, prep, poss) compared with NS professional writers on clausal level of fine-grained measures. Chinese professional writers would produce more nominal modifiers (except rcmod) than NS professional writers. However, the Chinese Ph.D. group generated fewer fine-grained subordination structures than the NS Ph.D. group. At the same time, the phrasal level nominal modifiers they produced were lag behind the NS group.

	M	SD
Poss		
CHPhD	.05	.03
CHPW	.05	.04
NSPhD	.05	.05
NSPW	.04	.05
Prep		
CHPhD	.31	.82
CHPW	.32	.08
NSPhD	.30	.03
NSPW	.29	.06
Amod		
CHPhD	.42	.10
CHPW	.41	.15
NSPhD	.33	.14
NSPW	.38	.14
Nn		
CHPhD	.23	.13
CHPW	.26	.15
NSPhD	.24	.10
NSPW	.17	.08
Advcl		
CHPhD	.03	.06
CHPW	.03	.04
NSPhD	.03	.03
NSPW	.03	.04
Rcmod		
CHPhD	.02	.02
CHPW	.01	.01
NSPhD	.02	.03
NSPW	.03	.03
Ccomp		
CHPhD	.04	.06
CHPW	.12	.08
NSPhD	.07	.07
NSPW	.09	.07
Mark		
CHPhD	.06	.05
CHPW	.13	.08
NSPhD	.08	.06
NSPW	.09	.07

Table: 8 Descriptive statistics for fine-grained syntactic complexity measures.

5.2 Differences in syntactic complexity between the Chinese writer groups

To investigate the differences in syntactic complexity among Chinese groups, we ran independent sample *t-tests* and Mann-Whitney *U* tests. A Mann-Whitney *U* test shows that the Chinese professional writer group (*Mdn* = .1292) produced more ccomp (U = -4.119, p = 0.000) than the Chinese Ph.D. group (*Mdn* =.0000). Also, Chinese professional writer group (*Mdn* = .1339) produced more mark *(U = -3.109, p = 0.002)* than the Chinese Ph.D. group (*Mdn* =.0000).

5.3 Differences in syntactic complexity between the NS writer groups

Having established the between-group differences in levels of syntactic complexity between the Chinese groups, we continued to examine the between-group differences in syntactic complexity between the NS groups. An independent samples *t-test* showed that significant differences were found in nn between the NS Ph.D. group and the NS professional writer group (t (54.285) = 2.991, p = .004; d = 0.77).

6   Discussion

This study investigated grammatical features representing different dimensions of syntactic

complexity associated with the Chinese and English native speakers at advanced levels of academic English across two L1s (Chinese, English). We found differences in the syntactic patterns by the NS writers and the Chinese writers in writing abstracts. In this section, we provide illustrations of these patterns, as well as explanations for these differences related to language proficiency and language typology between the NS group and the Chinese group, and discuss differences observed within the NS group and within the Chinese group.

6.1 Writing development and syntactic complexity

Starting with the traditional large-grained measures of syntactic complexity, we saw more similarities than differences. Significant differences in C/T and DC/C were found between the NS professional writer group and the Chinese professional writer group. No substantial differences were detected between the NS Ph.D. group and the Chinese Ph.D. across the eight large-grained and fine-grained measures. There were no significant differences between the NS group and the Chinese group on the eight fine-grained measures.

According to the developmental prediction, advanced proficiency L2 writers were expected to reduce subordination at the clausal level but capitalize on phrasal level complexity (Norris and Ortega, 2009; Ortega, 2003; Wolfe-Quintero et al. 1998). The corpus-based research (Biber et al., 2011) has provided evidence that noun phrases are the main characteristic of academic writing for advanced learners. We expected the two groups to exhibit a similar pattern in subordination and phrasal sophistication because both the Chinese group and the NS group can be characterized as advanced-level writers of academic English. In our results, only the Chinese Ph.D. group appeared to meet this prediction. The differences in C/T and DC/C align with Lu and Ai's (2015) findings and signify that Chinese writers produced longer clauses, more coordinate phrases, fewer subordinate structures, and more complex nominals, even though only the differences in subordination reached significance. We suggest that the cause of this reduction in clausal complexity cannot be readily attributed to proficiency but are likely to originate in language

typological differences. We will discuss it in the following section.

Our results on Chinese-NS differences in the mean values of phrasal sophistication (CN/C) did not yield statistical significance, which is in line with Lu and Ai's study (2015). Besides, the Chinese group in our study did not significantly differ from the NS group in terms of coordination. In Lu and Ai's (2015) study, the amount of coordination used by the upper-intermediate Chinese group was less than those of the NS group. And this feature was related to the use of punctuation to combine independent clauses in the Chinese language. One of the reasons for these conflicting results in coordination could be that the Chinese participants in our study are advanced academic English writers. And they have a written proficiency equivalent to that of NS writers in coordination, as opposed to those of the college-level writers used in Lu and Ai's (2015) study. Another reason could be the genre differences. Graetz (1985) argued that "the abstract avoids subordinate clauses, uses phrases instead of clauses."

6.2 Cross-linguistic differences and syntactic complexity

After establishing statistically significant differences in subordination between the Chinese and the NS writers, we further examined the intra-group comparison to investigate whether the within-group exists. As shown in Table 9 and Table 10, the patterns of syntactic complexity varied across the two languages in the study.

The within-group statistical analysis revealed that language proficiency did not differ significantly in large-grained syntactic complexity for the Chinese subgroups except for two fine-grained measures. Our results are largely in line with the results Ai and Lu (2013) reported on the non-significant differences between the lower and high proficiency NNS groups in the dimension of MLC, DC/C, CP/C, T/S, and CN/C.

The NS writers in our study tend to generate shorter T-units and less subordination along with improved language proficiency. There were no statistically significant differences within the NS group on all the fine-grained measures, different from what we found in the Chinese group.

Systematic functional linguistics (Halliday and Matthiessen, 1999, 2004) proposes that the sequence of language development runs from coordination ('to express ideas') to subordination ('to express the logical connection of ideas'), and finally to nominalization with the employment of grammatical metaphors. Lower-level language exhibits coordination but moves to subordination at the intermediate level and more complex phrases at the advanced language level (Bardovi-Harlig, 1992; Norris and Ortega, 2009). If we look at the different patterns of syntactic complexity within the Chinese group and the NS group, the mean values of subordination for the NS group still exceed those of the Chinese group. In the Chinese language, zero connectives are very common in subordination (Yu, 1993). In the Chinese language, conjunctions can be left out if the relationship is clear from the context. Logical connectives are not always necessary to connect the logical semantic relationship between clauses.

We have found in this study that L2 proficiency does not always result in a similar variation in written syntactic complexity as the syntactic pattern of English native speakers, especially when the target language is typologically different from the source language. Compared with the Chinese Ph.D. group, the Chinese professional writer group is expected to have more experience in academic writing and, therefore, produced more phrasal sophistication but less subordination. However, unlike our expectations, the developmental trend in subordination and phrasal sophistication is not evident within the Chinese group in our results.

Additionally, the within-group analysis has shown the significant differences in two subordinate structures (ccomp, mark) between the Chinese Ph.D. group and the Chinese professional writer group. The Chinese professional writer group produced significantly more clausal complements and subordinate clauses than the Chinese Ph.D. group, which echoes large-grained clausal subordination measures. Conversely, the NS subgroups did not differentiate in all eight fine-grained complexity measures.

The consistent differences in both large-grained clausal level and fine-grained clausal level subordination structures have supported that typological differences likely affect syntactic complexity. Finally, previous studies have found disciplinary variation for both phrasal features and clausal features in academic writing. Biber and Gray (2010) and Gray (2015) have shown that soft science is different from hard science writing in phrasal complexity. Humanities writing relies less on phrasal structures than science writing does. Our results in fine-grained measures are in line with the discipline norms.

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7 Conclusion

Using L2SCA and TAASSC, this study examined the extent to which the multiple dimensions of syntactic complexity differ in academic English writing across two languages background (Chinese, English) and language proficiency through a corpus-based cross-sectional approach. We employed both the traditional large-grained complexity measures and fine-grained complexity measures. We have answered the questions (a) whether the writings of Chinese advanced-level writers better approximate the writing of NS advanced-level writers in syntactic complexity and (b) whether the L1 backgrounds differentiate syntactic complexity at different levels of L2 proficiency.

Our results show that the Chinese advanced level writers in the corpus data were syntactically similar to the NS advanced level writers in large-grained complexity measures. However, the intra-group statistical analysis results revealed different patterns in syntactic complexity.

The findings from this study provide additional insights into the relationship between patterns of syntactic complexity, language proficiency, and L1 backgrounds. Abstracts written by more advanced academic English writers exhibited visible cross-linguistic influences in syntactic complexity. Moreover, the improved language proficiency level did not link to the variation of syntactic complexity within the Chinese groups. Further research would

be needed to determine whether these patterns are similar for the same populations of writers from the same L1 backgrounds (Chinese, English) in performing multiple writing tasks. Future research should also address what L1 factors might be contributing to these differences across language proficiency.

Academic writing plays a vital role in university education and graduates school education for academic success. Our findings pose useful implications for L2 writing pedagogy in course designs and assessment. When formulating writing evaluation criteria, L2 writing instructors should take language proficiency and writing purposes into account. The course design and writing assessment should strengthen L2 writers' understanding of writing for different purposes and employ appropriate language forms in academic writing. L2 writing instructors need to be able to deal with the linguistic differences of their students to improve the diversity and elaboration of syntactic structures in written productions. Since we found typologically different languages, such as Mandarin Chinese and English, may differ in patterns of subordinate structures in academic writing, writing activities should involve L2 writers' awareness about how the cross-linguistic factor will affect L2 academic writing. Moreover, the instruction of syntactic complexity needs to take attention and awareness into account, especially on how to help L2 advanced-level writers develop multidimensionally syntactic complexity in performing academic writing tasks.

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