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Phrasal Syntactic Complexity Measures in Linguistics Research Articles Written by Iraqi and English L1 Writers

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ABSTRACT

Complex phrasal structures are considered the distinctive features in the academic writing of high-proficiency writers. The use of more complex phrasal structures increases the quality of the written text. Based on the contrastive rhetorical theory of writing, writers are required to use linguistic components in a specific way that meets the genre of writing. This study aims to investigate and compare the phrasal syntactic complexity measures of the texts of linguistics research articles written by Iraqi and English L1 writers. It identifies if there is a significant difference between the writing of Iraqi and English L1 writers in terms of using phrasal syntactic structures. This study utilised the corpus-based method to analyse linguistics research articles written by Iraqi and English L1 writers and published from 2016 to 2020. Twelve phrasal syntactic complexity measures were analysed by using the automatic analyser TAASSC. This study revealed a significant difference between the writing of Iraqi and English L1 writers in terms of the analysed phrasal complexity measures. Utilising the complex phrasal structures in Iraqi research articles would significantly contribute to the quality and publication acceptance in reputable international journals. This study is therefore significant to guide Iraqi researchers to improvise their academic writing skills for publication purposes.

Keywords: English for research publication purposes ERPP; English L1 writers; linguistics research articles; Iraqi writers; phrasal syntactic complexity

INTRODUCTION

Syntactic complexity has been traditionally adopted as the primary indicator of assessing written text complexity (Kim, 2014). Generally, it is used to refer to the sophistication degree of syntactic structures utilised in written texts (Lu, 2014). It has been defined in terms of the language components and the connections between these components (Bulté & Housen, 2012, 2014). As a construct, syntactic complexity has received significant attention in previous writing studies since measures of syntactic complexity are considered reliable indicators of writing quality, writers' proficiency, and development (Biber et al., 2011; Lu, 2010). Syntactic complexity measures have been widely utilised to describe and compare the features of syntactic structures used in written text, especially texts written by English L1 and L2 writers (Casal et al., 2021). Studies of syntactic complexity have identified developmental stages of syntactic structures in the writing of L2 learners; these stages start from fragment, clause, coordination, subordination, and phrasal complexity, which is produced by high-proficiency learners (Wolfe-Quintero et al., 1998). Therefore, texts written by high-proficiency writers, specifically for academic purposes, intend to

include more phrasal structures. According to Biber et al. (2011, 2013), phrasal syntactic complexity measures are the best indicators of writing quality, writers' proficiency, and development; they called for more attention to phrasal structures in the academic writing of advanced proficiency writers. It has been found that academic texts intend to include more nouns, nominals, prepositional phrases, and attributive adjectives (Biber et al., 2011, 2016; Lu, 2011). Previous syntactic complexity studies have focused on analysing written texts by school students (Barrot, 2013; Bi & Jiang, 2020), college-level students (Espada-Gustilo, 2011; Lu & Ai, 2015; Yoon & Polio, 2017), and postgraduate candidates (Yang et al., 2015). However, a few studies have tackled texts written by advanced proficiency writers; most of these studies have analysed master and doctoral dissertations and other non-published texts (Ansarifar et al., 2018; Song & Wang, 2019; Wu et al., 2020). The importance of investigating the syntactic complexity of written texts for publication purposes has been argued by Lu et al. (2020) to draw a clear picture of the practice of advanced proficiency writers in using complex structures to achieve different rhetorical goals. According to the contrastive rhetorical theory of writing, writers need to use linguistic structures in a specific way that meets the genre of writing (Hyland, 2003; Swales, 1990). Texts written for the same communicative purposes intend to share the same linguistic features (Hyland, 2003). The investigation of syntactic structures used in texts written for publication purposes intends to describe the practice of writing for publication by English L2 writers.

Writing in English for publication purposes is considered a challenging task, especially for English L2 writers. Iraqi writers are not an exception; they face different hurdles in using English for academic purposes (Keong & Mussa, 2015; Jasim Al-Shujairi & Tan, 2017; Mohammed et al., 2015). Iraqi writers also suffer low publication productivity in international peer-reviewed journals. Recent Iraqi studies have suggested that using the English language for publication purposes is one of the main factors that negatively impact the publication productivity of Iraqi researchers in peer-reviewed international journals (Jameel & Ahmad, 2020). Therefore, there is a crucial need to analyse the linguistic features, specifically the phrasal level of syntactic complexity, since this level is found to be considered the best discrimination level of academic writing by advanced proficiency writers (Biber et al., 2011, 2013; Biber & Gray, 2013; Casal & Lee, 2019; Liu & Li, 2016; Lu, 2011). By reviewing previous studies of the Iraqi context, it is evident that they neglect to investigate the linguistic features of texts written for publication purposes. An exception is a study by Alsahlanee & Jaganathan (2022), which investigated the use of complex lexical items in writing published research articles. It reported that Iraqi writers use a significantly lower amount of complex lexical items in their texts than their peers, English L2 and L1 writers. This study hypothesised that Iraqi writers of linguistics research articles use less complex phrasal structures than English L1 writers in their writing of linguistics research articles. Using less complex phrasal structures impacts writing quality and reflects the low proficiency of Iraqi writers (Biber et al., 2011; Biber & Gray, 2013; Casal & Lee, 2019; Lu, 2011).

Comprehending the importance of the use of complex phrasal structures in academic texts written for publication purposes on the one hand, and the need to investigate the practice of Iraqi writers in writing research articles in the English language on the other hand. Therefore, this study aims to investigate and compare the use of complex phrasal structures in writing linguistics research articles by Iraqi and English L1 writers. It intends to reveal if there is a significant difference between the writing of research articles by Iraqi and English L1 writers in terms of using complex phrasal structures. This study seeks to determine the exact phrasal measures that significantly discriminate between the writings of Iraqi and English L1 writers. The significance of this study arises from the crucial need to investigate the writing of Iraqi writers for publication

purposes in order to improve writing quality and increase publication productivity. Since writing quality plays an essential role in accepting manuscripts for publication in international peer-reviewed journals (Lillis & Curry, 2015). Thus, this study aims to answer the following questions:

1. To what extent do the Iraqi and English L1 writers utilise complex phrasal structures in their writings of linguistics research articles?
2. Is there a significant difference between the writing of linguistics research articles by Iraqi and English L1 writers in terms of phrasal syntactic complexity measures?
3. What are the significant phrasal syntactic complexity measures in writing linguistics research articles by Iraqi and English L1 writers?

LITERATURE REVIEW

This section discusses previous syntactic complexity studies of written academic texts. It intends to show the relationship between using complex syntactic structures in academic texts and writing quality, writers' proficiency, and development. It also presents and compares large and fine-grained measures of syntactic complexity adopted in previous studies to evaluate the complexity of different syntactic structures.

SYNTACTIC COMPLEXITY IN ACADEMIC WRITING

Complexity construct in writing studies generally refers to the elaboration and variation of language elements utilised to compose written texts (Ellis, 2003). Syntactic complexity captures the range and degree of sophistication of the syntactic structures used in writing (Ortega, 2003; Pallotti, 2015). It has received remarkable attention in writing studies to analyse language development and proficiency (Biber & Gray, 2016; Kyle & Crossley, 2018; Norris & Ortega, 2009; Ortega, 2003). Traditionally, it was evaluated by means of the general ratio of overall and clausal measures. Early studies of syntactic complexity relied only on clausal elaboration by utilising measures like T-unit, C-unit, and length-based indices to capture the syntactic complexity of writing. They assumed that T-unit and clausal measures are the optimal indicators of syntactic complexity (Wolfe-Quintero et al., 1998). They relied on the assumption that sentence-long and more embedded clauses increase the complexity of written texts. Any addition to the simple clause, which contains a subject, verb, and object only, will increase the clausal complexity (Biber & Gray, 2016). Measures like clauses per T-unit and words per clause have been utilised by Beers & Nagy (2011) to reveal differences among four genres of student writing. Bulté & Housen (2014) notice that early syntactic complexity studies focused only on the increase of language elements such as subordination clauses as factors to increase language complexity; on the other hand, the phrasal level of syntactic complexity has been neglected. Norris & Ortega (2009) stated that syntactic complexity is a multidimensional construct. It contains various levels of sophistication, such as global, clausal, and phrasal levels. Due to this multidimensional nature of syntactic complexity, various measures have been proposed in previous studies to evaluate sub-constructs of syntactic complexity. These measures are generally classified into five types: length-based, sentence-based, subordination-based, coordination-based, and particular or phrasal structures measures (Esfandiari & Ahmadi, 2021).

In academic writing studies, the syntactic complexity construct has been utilised as a means to describe and compare the texts written by different writers. A wide variety of syntactic complexity studies have tacked topics like comparing syntactic structures of texts written by English L1 and L2 writers (Ansarifar et al., 2018; Nasseri, 2021; Wang & Lowie, 2021; Wu et al., 2020), analysing syntactic structures used in the writing of experts and emerging writers (Yin et al., 2021), revealing the differences of syntactic structures utilised across research article's part genres (Casal et al., 2021). The use of complex syntactic structures by L2 writers indicates the ability of these writers to use L2 maturely by utilising different and complex syntactic structures in their writing to achieve particular communicative goals (Ortega, 2015). Measures of syntactic complexity are considered reliable indicators of writing quality. Texts written by beginner and intermediate L2 writers intend to score low measures of syntactic complexity (Wolfe-Quintero et al., 1998). On the other hand, syntactic complexity studies have found that academic writing, specifically writing for publication purposes, tends to contain a high amount of complex syntactic structures (Ai & Lu, 2013; Lu, 2011; Ortega, 2003). The writers of research articles rely on using complex syntactic structures in order to express complex ideas and indicate the relationships among variables of the study (Beers & Nagy, 2009, 2011).

Recent syntactic complexity studies have analysed and compared the texts of published research articles. Lu et al. (2020) argue to include the investigation of syntactic complexity to identify the syntactic features of the texts written by advanced proficiency writers for publication purposes. Ansarifar et al. (2018) compared abstracts of master's theses, doctoral's dissertations, and published research articles written by English L2 writers (Persian L1). They concluded that published research articles have the highest degree of phrasal complexity than doctoral and master abstracts. Wu et al. (2020) analysed the syntactic complexity of unpublished research articles written by English L2 writers and published research articles written by English L1 writers. They have reported that English L2 writers use more complex nominals and coordinate phrases than English L1 writers. It has been found that not all syntactic complexity measures increase with proficiency levels. Therefore, Norris & Ortega (2009) proposed a hypothesis to trace syntactic complexity development; learners rely on the coordinate clause, subordinate clause, and then phrasal structures. The growth of syntactic complexity in beginner and low-intermediate proficiency levels is reflected through using more coordination. The upper-intermediate level shows an increase in subordinate structures. Finally, advanced writers' texts contain more phrasal structures (Biber et al., 2011; Norris & Ortega, 2009). Texts written by high-proficiency writers do not necessarily show an increase in the use of causal complexity (Taguchi et al., 2013). The writing of advanced writers is generally characterised by containing more phrasal syntactic structures (Biber et al., 2011; Norris & Ortega, 2009). It has been proved that the phrasal level of syntactic complexity is the dominant structure in the academic writing of advanced proficiency writers (Biber & Gray, 2013; Bulté & Housen, 2014; Gray, 2015; Halliday, 2004; McNamara et al., 2010). In her study that compared the syntactic complexity of the master dissertations written by EFL, ESL, and L1 writer Nasseri (2021) revealed that EFL writers rely on utilising a medium amount of subordination and coordination and lower phrasal structures in their texts, which differ from the texts of ESL writers which contain a medium amount of subordination and phrasal structures, L1 texts found to have a higher number of phrasal structures followed by subordination structures. In the context of academic writing, phrasal syntactic complexity is more significant than clausal syntactic complexity (Casal & Lee, 2019). The texts of research articles written for publication purposes intend to contain more phrasal and subordination structures (Beers & Nagy, 2011). These texts are usually written by field expert writers or graduated students who are

supposed to have an advanced English language level. Lu (2011) states that the phrasal dimension of complexity has great power in discriminating between the writing of different groups at specific proficiency levels. Based on the findings of previous studies, we can perceive the importance of investigating the complexity of phrasal structures in the texts of published research articles. Therefore, this study adopted measures of phrasal complexity to investigate and compare the texts of linguistics research articles written by Iraqi and English L1 writers.

MEASURES OF SYNTACTIC COMPLEXITY

A wide variety of measures have been proposed to capture syntactic complexity in L2 writing studies. Syntactic complexity measures are generally classified into two groups: large-grained and fine-grained measures. The former includes traditional syntactic complexity measures, which are based on the length and ratio of syntactic structures. Large-grained measures relied on investigating t-unit and subordination structures as the main indicators of syntactic complexity. These measures have received remarkable attention in previous studies (Nasseri, 2021). Early studies heavily utilised large-gained measures of syntactic complexity based on the assumption that sentence length and the number of clauses increase writing complexity. For instance, Wolfe-Quintero et al. (1998) considered measures like dependent clause per clause and clause per T-unit as valuable indicators of syntactic complexity. In their study to explore the writing of four different genres, Beers & Nagy (2011) utilised clause per T-unit and word per clause measures of syntactic complexity. Norris & Ortega (2009) noticed that T-unit measures of syntactic complexity evaluate features of subordination clauses in written texts. Traditional syntactic complexity measures neglect the impact of phrasal structures on complexity. Therefore, recent syntactic complexity studies tried to shed more light on the phrasal structures by approaching syntactic complexity more nuancedly by evaluating different levels of syntactic complexity (Biber et al., 2013; Biber & Gray, 2013; Lu, 2011). Syntactic complexity is a multidimensional construct that contains dimensions like overall, subordination, coordination, and phrasal complexities (Norris & Ortega, 2009). Various measures have been proposed to gauge the overall sentence complexity, amount of coordination, amount of subordination, and phrasal sophistication (Lu, 2017; Ortega, 2003). It has been found that phrasal complexity is the dominant structure in academic writing (Biber et al., 2011). Traditional measures of syntactic complexity have been widely criticised in recent studies for two main issues; the first is that these measures evaluate only clausal subordination (Biber et al., 2011), and the second reason is that these measures are hard to be interpreted since each measure may combine the analysis of different syntactic structures in one measure (Norris & Ortega, 2009).

On the other hand, Due to the previous criticism of the redundancy of traditional clausal measures of syntactic complexity and the neglection of evaluating the phrasal level of syntactic complexity. Various fine-grained measures of syntactic complexity have been proposed to evaluate different levels of syntactic complexity and shed more light on phrasal complexity, especially in academic writing (Biber et al., 2011; Kyle & Crossley, 2018). Each fine-grained measure gauges a specific syntactic structure in order to be interpretable. Biber & Gray (2016) stated that phrasal as well as clausal structures are essential levels of syntactic complexity; they argued that phrasal elaboration is the distinct feature of academic writing. Kyle (2016) has developed a computational tool to analyse Syntactic complexity and sophistication; TAASSC contains a wide variety of fine-grained measures to capture different levels of syntactic complexity. Lu (2011), in his automatic syntactic complexity analyser, included fine-grained

measures (complex phrases per clause / complex phrases per T-unit / complex nominal per clause / complex nominal per T-unit) to capture the phrasal level of syntactic complexity. Measures of phrasal complexity are more significant than traditional and clausal measures in evaluating the academic writing of different groups (Casal & Lee, 2019; Kyle & Crossley, 2018). High-rated writings have been found to include more phrasal structures, unlike lower-rated writing, which intends to contain more clausal structures (Taguchi et al., 2013).

METHODOLOGY

DATA OF THE STUDY

The data of this study were derived from a corpus of English published research articles in the linguistics field. The corpus of this study is classified into two balanced sub-corpora: the first is the corpora of Iraqi linguistics research articles, which contains English research articles written by Iraqi writers only and published in journals indexed in the Scopus database. The latter is the corpora of English L1 linguistics research articles; it includes English research articles written by English L1 writers and published in Scopus journals. Each sub-corpora contains 50 full linguistics research articles; these are all published in the period from 2016 to 2020.

TABLE 1. Number of Iraqi research articles from each journal

Journal Name	Number of RAs
ASIATIC: IIUM Journal of English Language and Literature	1
International Journal of Innovation, Creativity and Change	16
Asian EFL Journal Research Articles	6
Dirasat, Human and Social Sciences	3
Discourse Studies	1
Global Journal Al-Thaqafah	2
International Journal for the Semiotics of Law	1
International Journal of Applied Linguistics & English Literature	1
KEMANUSIAAN	2
Lingua	1
Linguistic Research	1
Opción	3
The Asian ESP Journal	6
The Asian Journal of Applied Linguistics	1
The Southeast Asian Journal of English Language Studies	1
Theory and Practice in Language Studies	3
Utopía y Praxis Latinoamericana	1

Due to the limited number of linguistics research articles published in Scopus journals by Iraqi writers, all open access research articles written by Iraqi writers and indexed in the Scopus database were included in the corpora of Iraqi linguistics research articles, as presented in (Table.1). On the other hand, five linguistics journals were selected for the corpora of English L1 research articles to collect research articles: Applied Linguistics, Studies in Second Language Acquisition, English for Specific Purposes, System, and Assessing Writing as illustrated in (Table.2). These journals were collected according to the following criteria: the journal should be indexed in the Scopus database with a high cite score and published by a reputable publisher. Only open access research articles written by English L1 writers were included in the corpora of English L1. The criteria were considered to determine the language background of research article writers

based on the institution affiliated. All writers affiliated with institutions established in a country using English as a native language were considered English L1 writers. The collected research articles files were all in (pdf.) format; there were a total of 100 files converted to (txt.) format by using an automatic software (Ant file Converter), which was designed by Anthony (2017) to convert files to plain text format, a manual check has been followed the automatic converting to check the accuracy. After converting all research article files, all tables, figures, keywords, references, and author names were removed from texts since these components are not relevant to phrasal syntactic complexity analysis.

TABLE 2. Number of English L1 research articles from each journal

Applied Linguistics	Studies in Second Language Acquisition	English for Specific Purposes	System	Assessing Writing
12	10	8	11	9

SYNTACTIC COMPLEXITY ANALYSIS

Recognising the nature of syntactic complexity as a multidimensional construct (Norris & Ortega, 2009) and the significant role of phrasal syntactic complexity in analysing and comparing phrasal structures of academic texts written by advanced proficiency writers (Biber et al., 2011, 2013). This study intends to adopt the computational tool TAASSC to analyse and compare the phrasal level of syntactic complexity. This computational tool, TAASSC, is an automatic analyser of syntactic sophistication and complexity designed by Kyle (2016). It contains fine-grained measures to evaluate the clausal complexity (31 indices), phrasal complexity (132 indices), and syntactic sophistication (190 indices). Since this study aims to analyse the writing of advanced proficiency writers (published research articles), it will focus on the phrasal measures of syntactic complexity. For the Phrasal levels, TAASSC includes measures for seven noun phrase types and ten phrasal dependents (Kyle, 2016; Kyle & Crossley, 2018). This study adopted 12 indices to evaluate the phrasal level of syntactic complexity, as shown in (Table.3). The utilised measures of the phrasal level of syntactic complexity were all reported to be correlated with writing quality (Kyle & Crossley, 2018).

TABLE 3. Phrasal measures of syntactic complexity

Phrasal measures	Abbreviations
dependents per nominal	av_nominal_deps
dependents per object of the preposition	av_pobj_deps
prepositions per nominal	prep_all_nominal_deps_struct
prepositions per object of the preposition	prep_pobj_deps_struct
adjectival modifiers per object of the preposition	amod_pobj_deps_struct
dependents per object of the preposition (standard deviation)	pobj_stdev
dependents per nominal (standard deviation)	nominal_deps_stdev
dependents per direct object (standard deviation)	dobj_stdev
dependents per direct object	av_dobj_deps
dependents per nominal subject (standard deviation)	nsubj_stdev
determiners per nominal	det_all_nominal_deps_struct
adjectival modifiers per direct object	amod_dobj_deps_struct

STATISTICAL ANALYSIS

This study adopted descriptive and inferential statistics to answer this study's research questions. The data obtained from the phrasal syntactic complexity analysis was measured with the computational tool TAASSC (Kyle, 2016), implemented in the Statistical Package for the Social Sciences (SPSS) to calculate the descriptive and inferential statistics. The first research question utilised descriptive statistics to show the extent to which Iraqi and English L1 writers implement complex phrasal structures in their writings of linguistics research articles. The mean values of all measures will be presented for research articles written by Iraqi and English L1 writers. On the other hand, the inferential statistics were calculated to answer the second and third research questions. A one-way multivariate analysis of variance MANOVA was used to answer the second research question, which aimed to reveal if there is a significant difference between the writing of Iraqi and English L1 writers in terms of 12 phrasal syntactic complexity measures. In case of the presence of significant difference, a series of analyses of variance (ANOVA) was conducted for each phrasal syntactic complexity measure among the two groups of the independent variable (Iraqi and English L1 writers) to reveal that exact phrasal measures that significantly discriminate between the writing of Iraqi and English L1 writers.

RESULTS AND DISCUSSION

This section intends to provide a quantitative overview of the phrasal syntactic complexity measures of the two writers' groups, Iraqi and English L1, as evaluated by the computational tool TAASSC (Kyle, 2016). It aims to reveal if there is a significant difference and the exact phrasal syntactic complexity measures that discriminate between the two groups of writers. The number of words in each sub-corpora of the study is illustrated in figure .1, which shows a significant difference in the total number of words utilised in the linguistics research articles written by Iraqi and English L1 writers. The mean of the number of words in linguistics research articles written by Iraqi writers is (4548.58), while their counterpart written by English L1 writers is (7811.28).

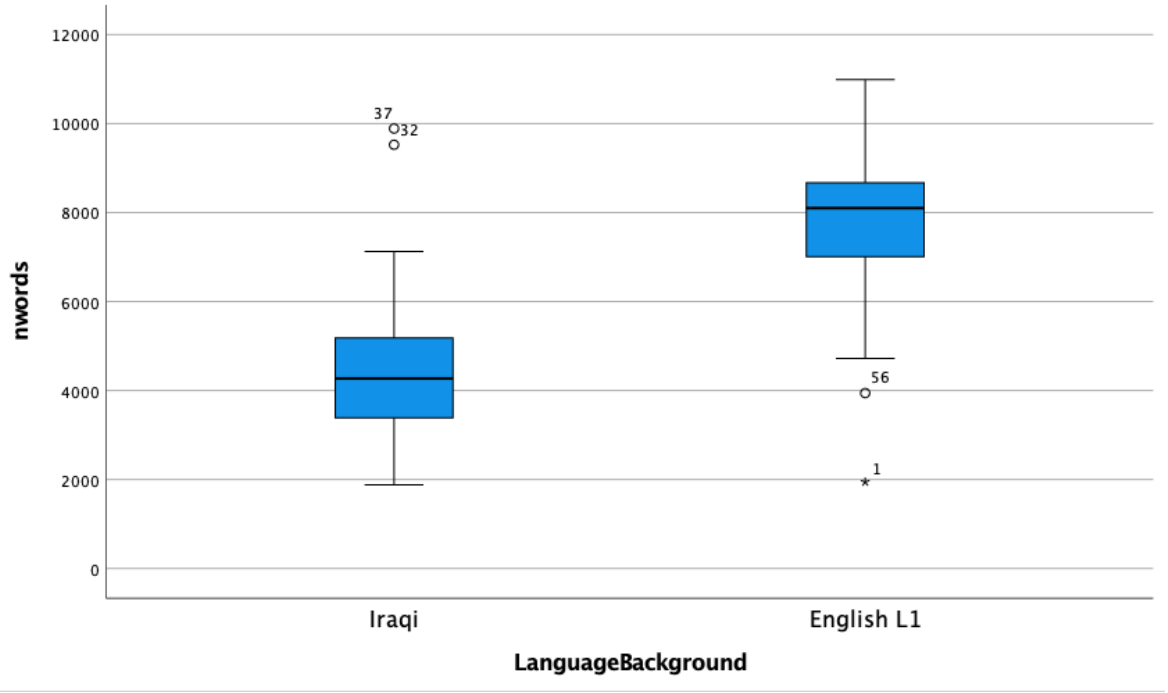

FIGURE 1. Number of words in the two corpora of the study

RESEARCH QUESTION 1

The first research question intended to describe the extent to which Iraqi and English L1 writers utilise complex phrasal structures in their writings of linguistics research articles. Table.4 illustrates the mean and standard deviation values of the analysed phrasal syntactic complexity measures of the writings of the two groups of the study Iraqi and English L1 writers. Values of 12 phrasal syntactic complexity measures correlated with writing quality, according to Kyle & Crossley (2018), were included in the statistical analysis using Statistical Package for the Social Sciences (SPSS). We can notice from means of phrasal syntactic complexity measures (dependent variables) of the writing of Iraqi and English L1 writers (two groups of the independent variable) that Iraqi writers employ less complex phrasal structures than English L1 peers in 11 out of 12 measures. Only in determiners per nominal measure, the mean of Iraqi writers is (.360), while for English L1 writers is (.310). This measure evaluates the use of determiners in nominals, which indicates that Iraqi writers rely on employing determiners to compose noun phrases. According to Kyle & Crossley (2018), the high mean value of the phrasal complexity measure refers to high-quality texts. Academic writing by advanced proficiency writers intends to include more complex noun phrases (Biber et al., 2011).

TABLE 4. Dependent variables descriptive statistics disaggregated by the independent variable (N=100)

	Iraqi n=50		English L1 n=50	
Variable	M	SD	M	SD
dependents per nominal	1.35	.135	1.47	.138
dependents per object of the preposition	1.42	.127	1.53	.109
prepositions per nominal	.229	.035	.266	.028
prepositions per object of the preposition	.210	.030	.245	.026
adjectival modifiers per object of the preposition	.270	.067	.298	.052
dependents per object of the preposition (standard deviation)	1.16	.082	1.21	.063
dependents per nominal (standard deviation)	1.23	.079	1.29	.062
dependents per direct object (standard deviation)	1.24	.100	1.32	.093
dependents per direct object	1.60	.224	1.75	.193
dependents per nominal subject (standard deviation)	1.10	.108	1.21	.122
determiners per nominal	.360	.051	.310	.045
adjectival modifiers per direct object	.340	.082	.372	.073

RESEARCH QUESTION 2

A one-way multivariate analysis of variance MANOVA was conducted to answer the second research question, which was implemented to reveal if there is a significant difference in the writing of linguistics research articles by Iraqi and English L1 writers (independent variables) in terms of phrasal syntactic complexity measures (dependent variables). The preliminary assumptions testing of the one-way MANOVA was conducted. According to the Shapiro-Wilks test, the assumption of normality was assumed for two groups of the independent variable and 12 dependent variables $p < .05$ (see Table. 5). For multivariate outliners, the Mahalanobis distance was used, the critical value of the chi-square 32.91 (degree of freedom 12) was not exceeded (max value = 26.633), so the assumption is tenable. Linearity and multicollinearity were also assumed since the Pearson correlations of dependent variables are significant and less than (.9). The homogeneity of variance is assumed using Levene's test of equality of error. Finally, the assumption of co-variance is violated as Box's M result shows Box's M = 132.362, F (66,30622.718) = 1.768, p = <.001. As a result of this violation, this study will report the Plliais trace, which is the most robust statistic for general protection in case of violating homogeneity of co-variance metrics (Tabachnick et al., 2007).

TABLE 5. Test of normality for dependent variables (Shapiro-Wilk)

	Kolmogorov-Smirnova			Shapiro-Wilk		
Variable	Statistic	df	Sig.	Statistic	df	Sig.
dependents per nominal	.047	100	.200*	.991	100	.765
dependents per object of the preposition	.038	100	.200*	.993	100	.858
prepositions per nominal	.053	100	.200*	.994	100	.946
prepositions per object of the preposition	.060	100	.200*	.990	100	.700

adjectival modifiers per object of the preposition	.051	100	.200*	.988	100	.524
dependents per object of the preposition (standard deviation)	.045	100	.200*	.988	100	.490
dependents per nominal (standard deviation)	.063	100	.200*	.985	100	.304
dependents per direct object (standard deviation)	.065	100	.200*	.976	100	.069
dependents per direct object	.047	100	.200*	.994	100	.917
dependents per nominal subject (standard deviation)	.063	100	.200*	.974	100	.052
determiners per nominal	.054	100	.200*	.985	100	.335
adjectival modifiers per direct object	.046	100	.200*	.989	100	.572

Results of the one-way multivariate analysis of variance MANOVA indicate a significant difference between the writing of Iraqi and English L1 writers in terms of the phrasal syntactic complexity measures. On the combined dependent variables, Pillai's trace = .620, F (12,87) = 11.836, P < .001, partial (2 = .620, observed power = 1.00. Through these results, we can conclude that there is a significant difference in the linear combination of phrasal syntactic complexity measures in the writing of the two groups of the independent variable, as evaluated by using the computational tool TAASSC (Kyle, 2016). The effect size was large. The observed power is 1.00, which indicates that there is 100 % that the result is significant. This finding contributes to the blurry picture of the difference between the writings of English L2 and L1 advanced writers in terms of phrasal syntactic complexity. Wang & Lowie (2021) found no significant difference between Chinese and English L1 advanced writers of research articles. On the other hand, Wu et al. (2020) reported significant differences between research articles written by English lingua Franca and American writers using large-grained syntactic complexity measures.

RESEARCH QUESTION 3

Based on the second research question results, which yield that there is a significant difference between the writing of Iraqi and English L1 writers in terms of the linear combination of phrasal complexity measures. The third research question was implemented to identify the exact phrasal complexity measures that caused the significant difference revealed by the MANOVA test. Each ANOVA was tested using the Bonferroni method at a .004 (.05 / 12) alpha level. Results shown in (Table.6) demonstrated that there is a significant difference between the writing of Iraqi and English L1 writers in 10 out of 12 phrasal complexity measures (dependents per nominal / dependents per object of the preposition/prepositions per nominal / prepositions per object of the preposition/dependents per object of the preposition (standard deviation)/ dependents per nominal (standard deviation) / dependents per direct object (standard deviation) / dependents per direct object/dependents per nominal subject (standard deviation) / determiners per nominal) as illustrated in (Table.4). Furthermore, two phrasal complexity measures have shown no significant difference in the writing of Iraqi and English L1 writers, amod_pobj_deps_struct p = .020 and amod_dobj_deps_struct p = .43. the effect size is significant for the ten significance ANOVAs. Based on the descriptive statistics shown in (Table .3) we can notice that Iraqi writers score higher mean of the measure (determiners per nominal) than English L1 writers, which means that the Iraqi writers' utilisation of more determiners in a nominal is significantly different from the English L1 writers according to the result of ANOVA test. In all other significant measures, English L1 scored high mean values than Iraqi writers.

TABLE 6. ANOVA Results of each phrasal complexity measure

Variables	Results
dependents per nominal	F (1,98) – 17.655, p < .001, Partial η2 - .153, observed power - .986
dependents per object of the preposition	F (1,98) – 22.835, p < .001, Partial η2 - .189, observed power - .997
prepositions per nominal	F (1,98) – 32.618, p < .001, Partial η2 - .250, observed power - .100
prepositions per object of the preposition	F (1,98) – 39.618, p < .001, Partial η2 - .135, observed power - .100
adjectival modifiers per object of the preposition	F (1,98) – 5.586, p. 020, Partial η2 - .135, observed power - .648
dependents per object of the preposition (standard deviation)	F (1,98) – 9.171, p. 003, Partial η2 - .135, observed power - .851
dependents per nominal (standard deviation)	F (1,98) – 16.953, p < .001, Partial η2 - .135, observed power - .983
dependents per direct object (standard deviation)	F (1,98) – 19.977, p < .001, Partial η2 - .135, observed power - .993
dependents per direct object	F (1,98) – 12.175, p < .001, Partial η2 - .135, observed power - .933
dependents per nominal subject (standard deviation)	F (1,98) – 22.230, p < .001, Partial η2 - .135, observed power - .997
determiners per nominal	F (1,98) – 26.931, p < .001, Partial η2 - .135, observed power - .999
adjectival modifiers per direct object	F (1,98) – 4.187, p .43, Partial η2 - .135, observed power - .926

CONCLUSION

This study analysed and compared the phrasal syntactic complexity measures of the texts of linguistics research articles written by Iraqi and English L1 writers. It aimed to describe the use of phrasal structures as well as reveal the differences between the writings of Iraqi and English L1 writers. The descriptive statistics of the number of words in linguistics research articles written by English L1 writers are relatively higher than those written by Iraqi writers, indicating that Iraqi writers compose shorter research articles than English L1 peers. The mean value of the number of words for English L1 research articles is (7811.28), while for research articles written by Iraqi is (4548.58). It also showed that generally, mean values of the phrasal syntactic complexity measures of linguistics research articles written by English L1 writers are higher than their counterparts written by Iraqi writers, which showed that English L1 writers use more complex phrasal syntactic structures. A high value of phrasal measures of TAASSC indicates the use of more complex phrasal structures (Kyle, 2016). Iraqi texts record only one measure mean value higher than English L1 texts (determiners per nominal). This finding reflects that the Iraqi writers of linguistics research articles utilise more nominals with determiners than English L1 peers. This finding requires further studies to identify the exact reason behind Iraqi writers' extensive use of determiners.

On the other hand, the inferential analysis revealed a significant difference between the writings of linguistics research articles by Iraqi and English L1 writers in terms of the utilised phrasal syntactic complexity measures. The linear combination of the 12 measures showed a significant difference between the two groups of writers. This significant difference contributes to the debates regarding the writing of advanced English L1 and L2 writers regarding syntactic complexity. This finding aligns with the finding of Wu et al. (2020). In order to identify the exact

significant measures, a series of ANOVA tests for all measures have revealed that 10 out of 12 analysed measures are significant between the writing of linguistics research articles written by Iraqi and English L1 writers. These measures (dependents per nominal / dependents per object of the preposition/prepositions per nominal / prepositions per object of the preposition/dependents per object of the preposition (standard deviation)/ dependents per nominal (standard deviation) / dependents per direct object (standard deviation) / dependents per direct object/dependents per nominal subject (standard deviation) / determiners per nominal) showed a significant power to discriminate between the writings of the two groups of the study. This finding supports the critical role of the complex phrasal structures in the writing of advanced proficiency writers, as argued earlier (Biber et al., 2011; Biber & Gray, 2013; Lu, 2011). Therefore, we can conclude that Iraqi writers use fewer phrasal structures, which impacts writing quality and chances of publication in peer-reviewed journals. In order to increase publication productivity, Iraqi writers of linguistics research articles are required to use the linguistic components, specifically phrasal structures, as their peers to produce high-quality texts that meet the requirements of the publication community of practice.

REFERENCES

Ai, H., & Lu, X. (2013). A corpus-based comparison of syntactic complexity in NNS and NS university students' writing. In *Automatic treatment and analysis of learner corpus data* (pp. 249–264). https://doi.org/10.1075/scl.59.15ai

Alsahlanee, A., & Jaganathan, P. (2022). Lexical complexity in the writings of Iraqi, English L2, and English L1 writers. *Asian Journal of University Education*, *18*(4), 1105–1118. https://doi.org/10.24191/ajue.v18i4.20044

Ansarifar, A., Shahriari, H., & Pishghadam, R. (2018). Phrasal complexity in academic writing: A comparison of abstracts written by graduate students and expert writers in applied linguistics. *Journal of English for Academic Purposes*, *31*, 58–71. https://doi.org/10.1016/j.jeap.2017.12.008

Anthony, L. (2017). *AntFileConverter* (1.2.1). Waseda University.

Barrot, J. S. (2013). Revisiting the role of linguistic complexity in ESL reading comprehension. *3L, Language, Linguistics, Literature*, *19*(1).

Beers, S. F., & Nagy, W. E. (2009). Syntactic complexity as a predictor of adolescent writing quality: Which measures? Which genre? *Reading and Writing*, *22*(2), 185–200. https://doi.org/10.1007/s11145-007-9107-5

Beers, S. F., & Nagy, W. E. (2011). Writing development in four genres from grades three to seven: syntactic complexity and genre differentiation. *Reading and Writing*, *24*(2), 183–202. https://doi.org/10.1007/s11145-010-9264-9

Bi, P., & Jiang, J. (2020). Syntactic complexity in assessing young adolescent EFL learners' writings: Syntactic elaboration and diversity. *System*, *91*, 102248. https://doi.org/10.1016/j.system.2020.102248

Biber, D., & Gray, B. (2013). Nominalizing the verb phrase in academic science writing. *The Verb Phrase in English: Investigating Recent Language Change with Corpora*, *9*, 1–27. https://doi.org/10.1017/CBO9781139060998.006

Biber, D., & Gray, B. (2016). *Grammatical complexity in academic English: Linguistic change in writing*. Cambridge University Press.

Biber, D., Gray, B., & Poonpon, K. (2011). Should we use characteristics of conversation to measure grammatical complexity in L2 writing development? *Tesol Quarterly*, *45*(1), 5–35. https://doi.org/10.5054/tq.2011.244483

Biber, D., Gray, B., & Poonpon, K. (2013). Pay attention to the phrasal structures: Going beyond T-units—A response to WeiWei Yang. *Tesol Quarterly*, *47*(1), 192–201.

Biber, D., Gray, B., & Staples, S. (2016). Predicting patterns of grammatical complexity across language exam task types and proficiency levels. *Applied Linguistics*, *37*(5), 639–668. https://doi.org/10.1093/applin/amu059

Bulté, B., & Housen, A. (2012). Defining and operationalising L2 complexity. In *Dimensions of L2 performance and proficiency: Complexity, accuracy and fluency in SLA* (pp. 21–46). John Benjamins Amsterdam/Philadelphia. https://doi.org/10.1075/lllt.32.02bul

Bulté, B., & Housen, A. (2014). Conceptualizing and measuring short-term changes in L2 writing complexity. *Journal of Second Language Writing*, *26*, 42–65. https://doi.org/10.1016/j.jslw.2014.09.005

Casal, J. E., & Lee, J. J. (2019). Syntactic complexity and writing quality in assessed first-year L2 writing. *Journal of Second Language Writing*, *44*, 51–62. https://doi.org/10.1016/j.jslw.2019.03.005

Casal, J. E., Lu, X., Qiu, X., Wang, Y., & Zhang, G. (2021). Syntactic complexity across academic research article part-genres: A cross-disciplinary perspective. *Journal of English for Academic Purposes*, *52*, 100996. https://doi.org/10.1016/j.jeap.2021.100996

Chee Keong, Y., & Mussa, I. H. (2015). Academic writing difficulties of Iraqi postgraduate students in Malaysia. *International Journal of Education and Research*, *3*(6), 25–34.

Ellis, R. (2003). *Task-based language learning and teaching*. Oxford university press.

Esfandiari, R., & Ahmadi, M. (2021). Syntactic Complexity Measures and Academic Writing Proficiency: A Corpus-based Study of Professional and Students' Prose. *The Journal of AsiaTEFL*, *18*(3), 745–763.

Espada-Gustilo, L. (2011). Linguistic features that impact essay scores: A corpus linguistic analysis of ESL writing in three proficiency levels. *3L: The Southeast Asian Journal of English Language Studies*, *17*(1), 55–64.

Gray, B. (2015). On the complexity of academic writing: Disciplinary variation and structural complexity. In *Corpus-based Research in Applied Linguistics* (pp. 49–78). John Benjamins.

Halliday, M. (2004). The Language of Science.–London/N.-Y. *Continuum*, *140*, 158.

Hyland, K. (2003). *Second language writing*. Cambridge University Press. https://doi.org/10.1017/CBO9780511667251

Jameel, A. S., & Ahmad, A. R. (2020). Factors impacting research productivity of academic staff at the Iraqi higher education system. *International Business Education Journal*, *13*(1), 108–126. http://ejournal.upsi.edu.my/index.php/IBEJ/article/view/3568

Jasim Al-Shujairi, Y. B., & Tan, H. (2017). Grammar errors in the writing of Iraqi English language learners. *International Journal of Education and Literacy Studies*, *5*(4), 122. https://doi.org/10.7575/aiac.ijels.v.5n.4p.122

Kim, J. (2014). Predicting L2 Writing Proficiency Using Linguistic Complexity Measures: A Corpus-Based Study. *English Teaching*, *69*(4).

Kyle, K. (2016). *Measuring syntactic development in L2 writing: Fine grained indices of syntactic complexity and usage-based indices of syntactic sophistication*.

Kyle, K., & Crossley, S. (2018). Measuring syntactic complexity in L2 writing using fine-grained clausal and phrasal indices. *The Modern Language Journal*, *102*(2), 333–349. https://doi.org/10.1111/modl.12468

Lillis, T., & Curry, M. J. (2015). The politics of English, language and uptake. *AILA Review*, *28*(1), 127–150. https://doi.org/10.1075/aila.28.06lil

Liu, L., & Li, L. (2016). Noun phrase complexity in EFL academic writing: a corpus-based study of postgraduate academic writing. *Journal of Asia TEFL*, *13*(1), 48.

Lu, X. (2010). Automatic analysis of syntactic complexity in second language writing. *International Journal of Corpus Linguistics*, *15*(4), 474–496. https://doi.org/10.1075/ijcl.15.4.02lu

Lu, X. (2011). A corpus-based evaluation of syntactic complexity measures as indices of college-level ESL writers' language development. *TESOL Quarterly*, *45*(1), 36–62. https://doi.org/10.5054/tq.2011.240859

Lu, X. (2014). Computational methods for corpus annotation and analysis. *Computational Methods for Corpus Annotation and Analysis*, *9789401786454*, 1–186. https://doi.org/10.1007/978-94-017-8645-4

Lu, X. (2017). Automated measurement of syntactic complexity in corpus-based L2 writing research and implications for writing assessment. *Language Testing*, *34*(4), 493–511. https://doi.org/10.1177/0265532217710675

Lu, X., & Ai, H. (2015). Syntactic complexity in college-level English writing: Differences among writers with diverse L1 backgrounds. *Journal of Second Language Writing*, *29*, 16–27. https://doi.org/10.1016/j.jslw.2015.06.003

Lu, X., Casal, J. E., & Liu, Y. (2020). The rhetorical functions of syntactically complex sentences in social science research article introductions. *Journal of English for Academic Purposes*, *44*, 100832. https://doi.org/https://doi.org/10.1016/j.jeap.2019.100832

McNamara, D. S., Crossley, S. A., & McCarthy, P. M. (2010). Linguistic features of writing quality. *Written Communication*, *27*(1), 57–86.

Mohammed, S., Mohammed, H., & Fahim Abdal Hussein. (2015). Grammatical error analysis of Iraqi postgraduate students' academic writing. *International Journal of Education and Research*, *3*(6), 283–294. www.ijern.com

Nasseri, M. (2021). Is postgraduate English academic writing more clausal or phrasal? Syntactic complexification at the crossroads of genre, proficiency, and statistical modelling. *Journal of English for Academic Purposes*, *49*, 100940. https://doi.org/10.1016/j.jeap.2020.100940

Norris, J. M., & Ortega, L. (2009). Towards an organic approach to investigating CAF in instructed SLA: The case of complexity. *Applied Linguistics*, *30*(4), 555–578. https://doi.org/10.1093/applin/amp044

Ortega, L. (2003). Syntactic complexity measures and their relationship to L2 proficiency: A research synthesis of college-level L2 writing. *Applied Linguistics*, *24*(4), 492–518. https://doi.org/https://doi.org/10.1093/applin/24.4.492

Ortega, L. (2015). Syntactic complexity in L2 writing: Progress and expansion. *Journal of Second Language Writing*, *29*, 82–94. https://doi.org/https://doi.org/10.1016/j.jslw.2015.06.008

Pallotti, G. (2015). A simple view of linguistic complexity. *Second Language Research*, *31*(1), 117–134. https://doi.org/10.1177/0267658314536435

Song, R., & Wang, H. (2019). An investigation into the syntactic complexity of Chinese doctoral dissertation abstracts. *Journal of PLA University of Foreign Languages*, *42*, 84–91.

Swales, J. M. (1990). *Genre analysis: English in academic and research settings*. Cambridge University Press.

Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). *Using multivariate statistics* (Vol. 5). pearson Boston, MA.

Taguchi, N., Crawford, W., & Wetzel, D. Z. (2013). What linguistic features are indicative of writing quality? A case of argumentative essays in a college composition program. *Tesol Quarterly*, *47*(2), 420–430.

Wang, M., & Lowie, W. (2021). Understanding Advanced Level Academic Writing on Syntactic Complexity. *Proceedings of the 35th Pacific Asia Conference on Language, Information and Computation*, 452–462. https://aclanthology.org/2021.paclic-1.48

Wolfe-Quintero, K., Inagaki, S., & Kim, H.-Y. (1998). *Second language development in writing: Measures of fluency, accuracy, & complexity* (Issue 17). University of Hawaii Press.

Wu, X., Mauranen, A., & Lei, L. (2020). Syntactic complexity in English as a lingua franca academic writing. *Journal of English for Academic Purposes*, *43*, 100798. https://doi.org/10.1016/j.jeap.2019.100798

Yang, W., Lu, X., & Weigle, S. C. (2015). Different topics, different discourse: Relationships among writing topic, measures of syntactic complexity, and judgments of writing quality. *Journal of Second Language Writing*, *28*, 53–67. https://doi.org/10.1016/j.jslw.2015.02.002

Yin, S., Gao, Y., & Lu, X. (2021). Syntactic complexity of research article part-genres: Differences between emerging and expert international publication writers. *System*, *97*, 102427. https://doi.org/10.1016/j.system.2020.102427

Yoon, H.-J., & Polio, C. (2017). The linguistic development of students of English as a second language in two written genres. *TESOL Quarterly*, *51*(2), 275–301. https://doi.org/10.1002/tesq.296