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Phrasal Discourse Style in Cross-Disciplinary Writing: A Comparison of Phrasal Complexity Features in the Results Sections of Research Articles

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Abstract. The present study aimed at exploring how research article writers from two academic disciplines exploit phrasal complexity features (PCFs) to verbalize the results sections of research articles with the eventual aim of assisting advanced EFL writers with their composition strategies. To this end, following a manual search, 200 empirical research articles in the fields of Applied Linguistics and Physics were comparatively examined. Due to the low rate of success of tagging programs in identifying the occurrences of PCFs, the datasets were also manually analyzed. The results revealed that the research article writers drew upon three high-frequency phrasal complexity features, namely, pre-modifying adjectives, post-modifying prepositional phrases, and nominalizations. The study also revealed that the results sections of research articles included different amounts of exceedingly complex patterns of pre-modification, a hybrid of novel appositive structures, and great reliance on hyphenated adjectives. Overall, we believe that these findings can be used to heighten the awareness of academic writers and instructors regarding the linguistic characteristics of academic writing and of the variations of how such phrasal features of compression are constructed in different academic subjects.
Keywords: Phrasal Complexity Features; Applied Linguistics; Physics; Results Section.

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1. Introduction

Known as the "master narrative of our time" (Montgomery, 1996), research articles (henceforth RAs) have sparked an apparent upsurge in scholarly interest among writing researchers since Swales' seminal book on genre analysis in 1990. This interest can be ascribed to the pre-eminent role that RAs justifiably play in the circulation and transmission of academic knowledge production (Peacock, 2002). Despite continuing interest in various sections of research articles, one of the key segments that has gained much less attention compared to other typical segments is the results section (Lim, 2010, 2011b; Sheldon, 2013; Williams, 1999; Ruiying & Allison, 2003). Being "the key driver of an article" (Cargill & O'Connor, 2009, p. 22), the results section is considered a crucial hybrid where the new scientific knowledge claims are made and the novel core research findings are presented, explained, highlighted, justified, compared, and validated via the synthesis of non-verbal and verbal modes of data representation (Basturkmen, 2009; Brett, 1994; Lim, 2011b; Swales & Feak, 2012; Ruiying & Allison, 2003). This hybridity in both content and presentation can attach a good deal of significance to the results section of an RA in many academic disciplines and renders it multimodal in many ways. Yet, discourse-based studies reveal that formulating and verbalizing main points in this often-times multimodal section is a daunting task for many novice research writers, and an especially demanding section to be read and written (Basturkmen, 2009; Lim, 2010, 2011b).

Another key area that is being explored in genre-based studies is the notion of the linguistic features typical of the different stages of RAs (e.g., results section). Among the multitude of linguistic resources closely connected with

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academic writing, five grammatical features of structural compression, that is, pre-modifying adjectives, pre-modifying nouns, nominalizations, appositive noun phrases, and post-modifying prepositional phrases are reported to be the hallmarks of present-day academic prose, and a good number of the recent studies in the field of Applied Linguistics have focused on such features (see Table 2) (e.g., Ansarifar, Shahriari, & Pishghadam, 2018; Biber & Gray, 2016; Lan & Sun, 2019; Noguera-Díaz & Pérez-Paredes, 2018; Ruan, 2018; Staples, Egbert, Gray, & Biber, 2016). Chiefly embedded in complex noun phrase constructions, these five specific grammatical resources appear to be increasing in frequency in academic texts (Biber & Gray, 2011, 2016; Gray & Biber, 2018). The massive expansion of the use of such linguistic resources has also made sentence constructions highly compressed and such compact constructions can be identified in various academic disciplines (Biber & Gray, 2013; Lan & Sun, 2019). For example, the following text sample demonstrably shows a dense use of these linguistic features typical in academic writing prose: premodifying adjectives are **bold underlined**; premodifying nouns are in *italics*; appositive postmodifiers are in ***bold italics***; post-modifying prepositional phrases are underlined.

> To examine whether *talker variability* or *feedback type* during training had an impact on adaption, **binary-coded data** (***1=word, 0=nonword***) of responses to critical items were submitted to **logistic linear mixed effects regression** (***LMER***) models with contrasted-coded fixed effects of L1(***Dutch, English***), Block (***1, 2***), Feedback (***lexical, semantic context***) and variability (***single talker, multiple talker***) and their **2-and 3-way** interactions (A text excerpt extracted from corpora utilized for the present study).

The prevalence of such grammatical features of structural compression can be ascribed to two contributing factors: First, pre/post-modifying noun phrases (NPs) can fulfill the functions of (pre/post) modification and complementation, thus allowing the expansion of the meaning of head noun elements. In this way, the basic construction of nominal phrases can be represented along a continuum of structural compression as follows (Biber, Johansson, Leech, Conrad, & Finegan, 1999):

> Determiner + **pre-modification** + head noun element + **post-modification**/ complementation

Second, complex noun phrase constituents can enable writers to condense a considerable amount of information into a limited number of words, thus making the style more concise, making scientific language more compact and more functional (Halliday & Martin, 1993; Lan & Sun, 2019; Parkinson & Musgrave, 2014). For instance, in the following four-noun premodification string, rewording these high lexical density strings demands many more words, flouting norms of linguistic brevity and conciseness that often characterize some academic disciplines (e.g., Physics).

> *scalar tensor coupling parameters / classroom assessment practices questionnaire*

Biber and Gray (2011) reason that the grammatical features of structural compression are preferred linguistic options in academic prose because "they are more economical; they allow for faster, more efficient reading and they are equally comprehensible to the expert reader" (p. 20). More recently, Biber and Gray (2016) and Gray and Biber (2018) have viewed such compact linguistic resources as phrasal complexity features (PCFs) and have documented that modern academic writing is predominantly constructed utilizing these linguistic devices. They also characterize the emergence of PCFs as important linguistic innovations of written discourse and assert that they have dramatically expanded in frequency in academic prose written over the last century (Biber & Gray, 2011, 2016; Gray & Biber, 2018). This may reflect the tremendous expansion of PCFs in academic writing, and thus, it seems essential for professional academic writers from diverse academic disciplines and language backgrounds to recognize the increasing importance of these key linguistic resources (Ruan, 2018).

Given the significance of PCFs in writing for academic purposes, research yet seems far from being adequate in terms of the nuances of PCFs as they have largely remained underexplored in connection with professional academic texts (Biber & Gray, 2016). Furthermore, considering various communicative functions (e.g., reporting results, commenting on results, and describing methodology) that each part of a research article might serve, PCFs have been practically under-researched and further studies are needed to show how these essential grammatical devices are formulated and used to verbalize the results section of RAs. Therefore, in order to address the paucity of knowledge in this important academic context, the present study offers a discursive approach by focusing on how research article writers exploit PCFs in the results sections they produce. Thus, the study systematically examines the deployment of PCFs in the results sections of accredited scientific RAs in Applied Linguistics and Physics disciplines. By investigating the RA results sections (RARs) written by expert writers between two different academic disciplines, analysts are able to identify how expert writers develop their texts by exploiting PCFs to verbalize the results section considered "the empirical heart of a scientific article" (Thompson, 1993, p. 106), and may gain new insights into the established text conventions of published academic texts.

Finally, and most importantly, exploring the possible (inter)disciplinary variations across academic disciplines with reference to PCFs may be pedagogically illuminating to English for Specific Purposes (ESP) practitioners teach-

ing relevant research article writing courses and may help enhance our understanding of different linguistic resources (notably PCFs) of academic texts.

2. Literature Review

2.1. RA and Studies on the Results Sections of RAs

The research article is the pivot around which a large number of studies revolve. This can be generally attributed to a starring role that empirical RAs play in the international professional communities as it still remains "the principal site of knowledge-making" (Hyland, 2009a, p. 67). Today, RAs are perceived as an active communication channel within academic fields whereby scientific findings are widely disseminated. For this reason, a cornucopia of genre-based studies have thus far investigated RAs and have shared insights into the schematic patterns and linguistic-textual mechanisms deployed in RAs from diverse academic disciplines (Le & Harrington, 2015; Kanoksilapatham, 2015; Lim, 2011b; Swales, 1990; Williams, 1999).

The studies into research articles, in general, can mainly fall into two broad strands. One line of research has analyzed the macro structures and organizational patterns of the major sections (i.e., Introduction, Methods, Results, and Discussion; IMRD) in RAs in various fields of study (e.g., Kanoksilapatham, 2015; Sheldon, 2013; Swales, 1990; Ruiying & Allison, 2003; among others). The other line of studies within which the current study falls has examined textual features and specific linguistic devices in different academic disciplines (e.g., Ansarifar, et al., 2018; Gray, 2015; Le & Harrington, 2015; Staples, et al, 2016). Despite ongoing interest in different sections of RAs, one of the key but less charted segments, compared to other typical sections, is the results section (Lim, 2011b; Sheldon, 2013; Williams, 1999). The results section is deemed an undoubtedly indispensable component of RAs in which empirical data can be typically transformed into knowledge and presented in the form of valid and scientific statements to academic researchers, readers, and other members of a professional discourse community.

Having analyzed the result sections of 20 sociology research articles, Brett (1994) found that new findings are accentuated, interpreted and commented on by writers. He (1994) further pointed out that the results section embrace features that deserve further scientific exploration. Likewise, Thompson (1993) argued that the results section functions as a crucial constituent in the experimental research article by offering the fresh scientific knowledge in a specific way.

Lim (2010) also acknowledges the difficulty of dealing with the results section despite its vital function. Its difficulty may arise from the necessity to demonstrate: clarity in presenting principal findings, considerable rhetorical skills required for interpretation and reconstitution of data, a variety of communication functions (e.g., reporting results and commenting on results) used in this section, changing meaning between different modes (i.e., verbal to visual information), (inter/sub) disciplinary variations, and unfamiliarity with appropriate linguistic resources (Brett, 1994; Lim, 2011b; Swales, 1990). Nevertheless, despite the considerable significance of this section, Sheldon (2013) remarks that while the results section encompasses a rich rhetorical structure, scant attention is devoted to it as it is sometimes coalesced into the discussion section of research articles (see Brett, 1994; Thompson, 1993; Ruiying & Allison, 2003), and thus straightforward conclusions can hardly be drawn about free-standing results sections by studying mixed sections.

2.2. Research Articles and Phrasal Complexity Features

Recognized as the most distinctive linguistic resources of present-day academic prose, studies of PCFs have disputed the stereotypical view that structural complexity is primarily clausal in nature (Biber & Gray, 2010, 2016; Gray, 2015; Gray & Biber, 2018). Several recent studies have well documented that these linguistic devices are extensively employed in academic writing compared to either spoken or other informational written registers (e.g., Biber & Gray, 2016; Gray, 2015; Noguera-Díaz & Pérez-Paredes, 2018; Ruan, 2018).

Parkinson and Musgrave (2014) found that the use of pre-modifying nouns is particularly highly utilized in certain genres (especially science RAs). They argued that this great diversity of meaning relationships between head noun elements and their pre-modifying nouns might add difficulty to both writing and reading academic texts since a noun can consolidate with a variety of various nouns in different meaning relations.

Investigating and describing how RAs vary within academic disciplines, Gray (2015) showed variation in linguistic devices such as nominal pre/postmodifiers across disciplinary strands. She demonstrated that academic disciplines and registers often draw exceptionally upon phrasal complexity features to impart information. Gray also reported that the humanities disciplines tended to have a commonly greater use of clausal elaboration whereas the natural sciences drew largely upon phrasal compression. However, there exists a significant difference between the pervasiveness of compression and the much lower incidence of elaboration structure in all academic disciplines (Gray, 2015). Biber and Gray (2016) characterized PCFs as a structurally compressed and highly innovative feature of academic prose and varied across disciplines and registers; for instance, science writing exploits PCFs the most whereas humanities texts use them the least (Gray, 2015). Staples et al. (2016) found that science RAs produced by

specialists for other specialist readers are inclined to depend more heavily on PCFs than those in non-science RAs such as the social sciences and humanities.

More recently, in a corpus-based investigation into phrasal complexity, Ansarifar et al. (2018) compared three categories of abstracts produced by the Iranian graduate students of applied linguistics (MA and PhD students) and the expert writers from the same discipline in terms of noun modifiers. They found that the MA writings varied considerably from the expert writings in terms of four types of modifiers. Yet, Ansarifar et al. (2018) reported no important difference in the use of noun modifiers except for prepositional phrases as noun postmodifiers between the PhD group and expert writers.

In another recent corpus-based study of structural compression in academic writing, Ruan (2018) examined the occurrences of the complex noun phrases and the different patterns of nominal phrasal elements in 200 English research article abstracts written by English and Chinese academic researchers. Contrastive linguistic differences in terms of the phrasal modification revealed significant differences in the distribution of simple and complex noun phrases in the RA abstracts between the two above-stated groups where Chinese authors deployed more complex noun phrases in producing abstracts compared to their English counterparts. He also found that the abstracts in English and Chinese RAs predominantly consisted of attributive adjectives, noun modifiers, and prepositional phrases.

Overall, the existing literature on RAs has clearly shown the increasing importance of genre and discipline in the use of phrasal complexity features. However, almost no previous linguistic research to date has systematically investigated phrasal complexity features in top-tier research articles, notably in the results sections of RAs between two different disciplines. Motivated by the need to expand our knowledge of the PCFs in the results sections of research articles, the present study compared PCFs in two academic disciplines, that is, Applied Linguistics and Physics in order to help ascertain the key areas where (inter) disciplinary variations exist, with the ultimate aim of improving academic writing instruction. Secondly, by examining these two disciplines, it should be possible to reveal systematic patterns of linguistic variation between academic disciplines in terms of phrasal discourse style and demonstrate how professional academic writers of different disciplines deploy PCFs to create discourse of a particular style notably with explicit reference to the results section of RAs. Thirdly, this line of interdisciplinary study also contributes to uncovering the complex picture of less documented disciplinary variations in linguistic features and in interpreting the characteristic features of the humanities and sciences which we see as pedagogically useful.

Finally, since phrasal discourse style is generally viewed as an essential linguistic resource for imparting technical information concisely in academic writing, more empirical studies looking into linguistic features characteristic of this area will enhance our understanding of disciplinary variations associated with the compressed discourse style in academic writing. Accordingly, the following research questions were raised in this study:

1. What phrasal complexity features characterize the RARs of Applied Linguistics and Physics?
2. Which disciplinary distinctions between Applied Linguistics and Physics can be drawn in using phrasal complexity features in RARs?

3. Method

3.1. Corpus Selection

To specify how PCFs were deployed by research article writers, two corpora including research articles of Applied Linguistics as well as Physics were utilized for the present study.

3.1.1. Selection of Disciplines

Following Becher's (1994) taxonomy of disciplinary areas, two academic disciplines, namely, Applied Linguistics and Physics as subfields of the humanities and natural sciences were singled out. The primary motivation behind the selection of these disciplines was that firstly, according to Le and Harrington (2015), Applied Linguistics is still relatively under-studied compared to other scientific disciplines. Secondly, few if any studies have thus far focused on PCFs in close relation to Applied Linguistics RARs. Thirdly, due to the systematic patterns of linguistic differences in the use of PCFs across academic disciplines in modern academic prose (Biber & Gray, 2016; Gray & Biber, 2018), an interdisciplinary analysis (Applied Linguistics vs. Physics) might be pedagogically enlightening. Therefore, an exploration into these disciplines should cast new light on interdisciplinary variations of phrasal discourse style in present-day academic prose.

With respect to Physics, it enjoys a distinctive and multifaceted style of organizing and presenting knowledge which makes it a unique academic discipline (Doran, 2018). The discourse that represents this uniqueness is equally multifaceted as it embraces "mathematics, image, nuclear symbolism, gesture, demonstration apparatus and many other semiotic resources that each brings their own functionality and their own particular construal of knowledge" (Doran, 2018, p. 21). Therefore, a deeper understanding and proper recognition of the role that PCFs might play in Physics appears to be of vital importance for its entire discipline.

3.1.2. Selection of Journals and Research Articles

In order to compile a thorough list of discipline-specific journals published in Applied Linguistics and journals published in Physics, we selected the most popular journals which could appropriately represent Applied Linguistics/ Physics and could be "more relevant and acceptable to the disciplinary communities" (Bhatia, 2008a, p.166). Subsequent to that, five informants representing each discipline from Iranian state universities were consulted regarding the prestigious scientific journals in their respective fields. Based on the journal impact factor (JIF), as one of the essential indicators of a journal quality (Kanoksilapatham, 2015), SCImago Journal Rank (SJR), thematic specialization of the journals, and the insiders' recognition and readership, the top 10 journals playing leading roles in Applied Linguistics (Appendix A) (Le & Harrington, 2015) and 13 established journals in Physics (Appendix B) were identified. It was felt that this approach could contribute to minimizing subjectivity of selection and confirm that the target journals enjoyed high quality.

Having identified the target accredited journals from each discipline, we randomly selected 110 empirical RAs from each discipline to ensure a good degree of representivity, objectivity and comparability of texts. To achieve this, we set three key criteria for the selection of the research articles to control comparisons. First, only data driven articles were included. The reason for this decision was to control possible variations in rhetorical organization and linguistic constructions (Ruan, 2018); Therefore, research articles presenting article/book reviews, meta-analyses, and special issues were excluded. Second, due to the fluid and dynamic nature of genres or disciplines (Lim, 2010; Swales, 1990), only the RAs from the most recent issues of each journal, published between 2014 and 2018 were obtained in order to exhibit the linguistic characteristics of present-day academic prose (Biber & Gray, 2016; Gray & Biber, 2018; Ruan, 2018). Third, due attention was especially exercised to choose only one paper from every author in order to control the impact of individual peculiarity. While the majority of the selected RAs possessed recognizable IMRD sections, several RAs did not commonly fulfill the functions of the IMRD patterns representing variants (i.e., ILMRD, IMRDC, IMRC, and ILMRDC); However, they all contained an explicit section labelled as the results section.

Following Brett's (1994) model, furthermore, the results sections of the RAs denoting different headings (e.g., *Results*, *Findings*, *Analysis and Results*, and *Data Analysis*) were considered as the results sections in the two disciplines. Nevertheless, it was noticed that the heading labels of the results sections vary considerably particularly in Physics, ranging from *Numerical Results*, *Numerical Analysis, Experimental Analysis, Simulation Results, Results and Benchmarks, Benchmark Results, Analysis, Results from the statistical analysis, Basic equations and Results, Experimental Results, Experiments and Results, Model Results,* to *Experimental Setup and Results*, all of which were analyzed under the umbrella of "Results".

The above uniform standards led to the initial selection of 207 empirical RAs. To attain a corpus of similar size and to have an equal distribution in each discipline, we analyzed 200 full-length RAs as the final dataset. In total, RARs consisted of 345,470 words. Compared to previous studies (e.g., Brett, 1994; Ansarifar et al., 2018; Lim, 2010, 2011b; Ruan, 2018), the present corpus was considered large enough to adequately capture the phrasal complexity features deployed in RARs. Table 1 illustrates the size of our corpus.

Table 1. Descriptive Details of the Size of RARs.

Two Academic Disciplines	No of RARs	Minimum Text Length in Words	Maximum Text Length in Words	Sum	Mean	Std. Deviation
Linguistics	100	400	5303	187916	1879.16	1167.586
Physics	100	291	4596	157554	1575.54	940.562

3.1.3. Linguistic Model

Drawing on the system of grammatical feature types laid out in Biber and Gray (2010, 2011, 2016), five specific linguistic resources were singled out. Table 2 provides a list of these linguistic devices with some examples.

Table 2. Linguistic Features Utilized in the Study.

Linguistic Resources	Examples From Our Corpora
Pre-modifying Adjectives	*semantic context/ radiated energy*
Pre-modifying Nouns	*lexicalization patterns/ curvature singularity*
Nominalizations	*consumption/ improvement*
Appositive Noun Phrases	*motivational self-talk (MST)*
Post-modifying Prepositional Phrases	*One of the sites did report an effect on comprehension in relation to attending to a morphological versus a lexical form*

3.2. Procedure

Corpus-based studies looking into linguistic features employ grammatical tagging and computer software programs to automatically specify and extract lexicogrammatical characteristics in datasets. Chief among tagging programs is the Biber Tagger (1988). The Biber tagger is a computational linguistic corpus tool produced by Biber (Biber, 1988; Biber et al., 1999) to tag grammatical information associated with each word in a text (Gray, 2015). While this annotating tool provides practical help in identifying various linguistic features, several concerns over its accuracy rate are raised. First, it cannot count or tag automatically many features such as appositive noun phrases as noun postmodifiers (Biber & Gray, 2011, 2016; Lan & Sun, 2019). Second, this automatic tagging tool has little success in distinguishing PPs with adjectival functions from those functioning as adverbials (Biber & Gray, 2016; Ruan, 2018). The distinction between these two foregoing linguistic elements is of fundamental importance for the present study in that noun post-modifiers are ubiquitously used in present-day academic writing (Biber & Gray, 2016). Likewise, the Biber tagger has low success rate in identifying nominalizations (Gray, personal communication, July, 12, 2017). Third, it is not commercially and publically accessible to the researchers within the domain of discourse studies as it is the property of Northern Arizona University (Gray, personal communication, July, 12, 2017). Given the shortcomings discussed above, we thus decided to discover the intended PCFs by a team of three experts including a university faculty member in the field of Applied Linguistics, a Physics professor, and the first author of the study.

3.2.1. Pilot study

In order for the coders to gain a good understanding and to ensure greater uniformity of coding, we randomly chose 5% of the entire data and independently operationalized the first round of trial rating. Following this was a brief discussion of how to report and tally PCFs per text in order to achieve maximum comparability between coders. Subsequently, a subset of 20% of the whole datasets was randomly selected and evenly distributed between the first author of this study and the invited coders. After three weeks interval, we convened a second round of meetings and the coders shared RARs in which PCFs were manually analyzed and highlighted. To ensure the independence of the analyses, the team compared and discussed RARs in group discussions before moving on to the next phase. Any divergent notions of linguistic features of interest were negotiated and discussed until clear consensus of opinions emerged. Having conducted the pilot analysis regarding the target linguistic features, the researchers decided to set the preliminary analysis as a benchmark for the remaining 75 percent of the RAs. Finally, in order to measure the degree of agreement and consistency between the coders, Cohen's Kappa (k) was calculated. The Kappa coefficient was 0.826, which demonstrates a high strength of agreement between the coders. Having reached an overall agreement on the PCFs identified in RARs, the researchers then converted the raw counts of the phrasal features into a normalized rate of occurrences (per 1,000 words) for each text. This facilitated statistical comparisons across the texts of varying sizes in the dataset (Biber, 1988).

4. Results

This section introduces the quantitative analysis of PCFs in detail, followed by comparisons of the patterns of similarities and differences emerging from the corpora. Then, the two research questions are statistically answered and interdisciplinary comparisons are made based on statistical evidence. In order to provide a brief quantitative snapshot of the extent to which RA writers utilized phrasal complexity features in the texts they generated, we classified the linguistic features of interest into two groups according to their frequencies normalized per 1000 words in the entire datasets: A high-frequency group and a low-frequency group. As Table 3 shows, the high-frequency phrasal complexity features encompassed pre-modifying adjectives (*M= 50.12, SD=16.03*), post-nominal modifiers (*M= 40.38, SD= 13.59)* and nominalizations *(M= 35.82, SD= 1.12)* respectively while the low-frequency phrasal complexity features were comprised of appositive noun phrases (*M=19.30, SD=12.37*), followed by noun-modifying phrasal features (*M= 16.74, SD= 9.07*).

Table 3. Descriptive Statistics for PCFs Used in Results Sections of RAs (Normalized per 1, 000 words).

Linguistic Features	No	Minimum	Maximum	Sum	Mean	Std. Deviation
Pre-modifying adjectives	200	18.81	135.05	10024.11	50.1206	16.03899
Pre-modifying Nouns	200	.00	64.00	3348.19	16.7409	9.07397
Nominalizations	200	8.08	91.78	7165.29	35.8264	15.88843
Appositives	200	.00	57.50	3861.99	19.3099	12.37831
Prepositional Phrases	200	10.28	82.29	8077.97	40.3899	13.59021

In response to the first research question (i.e., What phrasal complexity features characterize the RARs of Applied Linguistics and Physics?), the occurrence rates of the linguistic elements based on per 1000 words are discussed in each discipline. As Table 4 illustrates, pre-modifying adjectives (*M= 52.69, SD= 16.44*), followed by nominalizations (*M= 40.54, SD= 18.46*) and noun post-modifiers (*M= 37.86, SD= 14.40*) were the most prevalent features respectively among the linguistic devices deployed by the Applied Linguistics RA writers while appositive noun phrases (*M= 26.35*, *SD= 11.80*), followed by noun-modifying phrasal features (*M=17.50, SD= 10.18*) were recognized as low-frequency phrasal complexity features.

With regard to the Physics RA writers, Table 4 shows that pre-modifying adjectives (*M=47.55, SD=15.27*), followed by postnominal modifiers (*M=42.91, SD=12.28*) and nominalizations (*M=31.11, SD=11.02*), were found to be the most frequent types of linguistic elements of interest since they revealed a high rate of occurrence in the RAs whereas nouns as nominal premodifiers (*M=15.97, SD=7.78*), followed by appositive noun phrases (*M=12.26, SD=8.26*) were infrequently used in this dataset.

Table 4. Descriptive Statistics for PCFs Used by Each Group in Results Sections of RAs(Normalized per 1, 000 words).

Linguistic Features	Linguistics & Physics	N	Mean	Std. Deviation	Std. Error Mean
Pre-modifying adjectives (Feature 1)	Linguistics	100	52.6906	16.44463	1.64446
	Physics	100	47.5505	15.27505	1.52751
Pre-modifying Nouns (Feature 2)	Linguistics	100	17.5072	10.18284	1.01828
	Physics	100	15.9746	7.78648	.77865
Nominalizations (Feature 3)	Linguistics	100	40.5414	18.46629	1.84663
	Physics	100	31.1115	11.02358	1.10236
Appositives (Feature 4)	Linguistics	100	26.3555	11.80778	1.18078
	Physics	100	12.2643	8.26348	.82635
Prepositional Phrases (Feature 5)	Linguistics	100	37.8605	14.40224	1.44022
	Physics	100	42.9192	12.28431	1.22843

In response to the second research question (i.e., Which disciplinary distinctions between Applied Linguistics and Physics can be drawn in using phrasal complexity features in RARs?), we further drew a comparison between the writings of the two groups in terms of PCF use. To this end, a series of independent samples *t*-tests were conducted to compare the writings of the groups in terms of the grammatical features of interest they produced. The results revealed statistically significant differences in generating PCFs of interest between the two groups except for feature two, pre-modifying nouns, (*M=17.50, SD= 10.18,* for Applied Linguistics; *M=15.97, SD=7.78,* for Physics; t (198) = 120, p = 0.23, two-tailed).

In order to estimate the magnitude of the differences between the means of the two groups, Cohen's *d* index of effect size was used. Following Cohen's *d* (1988) guidelines for interpreting effect sizes, a *d* value of 0.2 is considered small effect, a *d* value of 0.5 is medium effect, and a *d* value of 0.8 is considered large effect (Cohen, 1988). In the present study, as Table 5 displays the effect sizes are large for appositive noun phrases and nominalizations (features 3 & 4) while medium effect sizes are observed for features 1 and 5.

Table 5. Interpretation of Effect Sizes for Each Linguistic Element.

Linguistic Features	F1	F3	F4	F5
Cohen's Levels	0.32	0.62	1.38	0.37
Cohen's Interpretation	Medium	Large	Large	Medium

4.1. Patterns of Similarities and Differences

While analyzing and coding the datasets manually, we discovered variegated patterns of use of the linguistic features deployed by RA writers in the results sections. These usage patterns are mainly associated with adjectives occurring as noun pre-modifiers. In what follows, the most prevalent patterns of similarities and differences in the RARs are discussed. A closer examination of the RARs demonstrated that there existed a considerable degree of overlap with respect to patterns of use between the groups. In general, RAR writers principally utilized adjectives acting as noun

pre-modifiers in the form of six major shared types including single, bipartite, tripartite, quadripartite, quintipartite adjectives respectively (see Table 6). Notwithstanding the shared patterns of use of these linguistic resources between the groups, closer consideration of premodification constructions revealed several distinctive types of pre-modification that make their conspicuous presence in the corpora. These distinguishing types of embedded pre-modification were recognized as patterns of difference (see Table 6).

Table 6. Patterns of Use of Multiple Pre-modifiers Deployed by RA Writers. Asterisk (*) indicates the presence of each pattern of language use in two disciplines.

Pattern No	Patterns of Language Use	Pertinent Examples	Linguistics	Physics
# 1	Single Pre-modifiers	*individual writing/ radiated energy*	*	*
# 2	Bipartite Pre-modifiers	*positive nonverbal percentage/ differential azimuthal correlation*	*	*
# 3	Tripartite Pre-modifiers	*dynamic natural pedagogical environment/ typical applied electric fields*	*	*
# 4	Quadripartite Pre-modifiers	*subsequent logistic linear mixed effects regression/parity-even high-order nonrenormalizable SME coefficients*	*	*
# 5	Quintipartite Pre-modifiers	*(the) forming soft break-down free high resistance oxygen vacancy conductance switching mechanism*		*
# 6	Sub-modified prenominal constructions	*significantly higher lexical endorsement rates*	*	
# 7	Antonymous Pairs of Adjectives	*quark-antiquark system/ unpolarized and polarized rate*		*
# 8	Conjoined Hyphenated Identical Nouns	*electron-electron interaction/ line-line shapes*		*
# 9	Coordinated Adjectival Modifiers	*Piezoelectric and Ferroelectric properties/ Constitutive and dynamic role*	*	*
#10	Fixed Participle Forms	*lexicon-triggered meaning negotiations/ single-field inflation*	*	*
# 11	Noun- Adjective-Noun	*photon differential scattering cross section/quantum mechanical technique*		*
# 12	Multitudinous Hyphenated Adjectives	*chiral nucleon-nucleon next-to-next next-to-leading interaction*		*

Table 6 demonstrates the shared patterns of language use (i.e., patterns, # 1, # 2, # 3, # 4, #9, and #10) serve similar functions in developing RARs, illustrating interdisciplinary similarities. Among the PCFs, pre-modifying adjectives figure predominantly in the entire datasets. Biber et al., (1999, p. 508) and Biber and Gray (2016, p.184) classified attributive adjectives in general into two main semantic categories, namely, "descriptors" and "classifiers". In our study, we found numerous instances of both categories in the corpora. Examples of adjectives occurring as descriptors included *new independent periodic orbits, weighted least-squares linear fit, higher L2 oral proficiency,* and *successful context-inference practice* while adjectives functioning as classifiers were found in *typical applied electric fields, conventional shell-model calculations, extensive English learning experience,* and *L2 phonemic awareness test.* However, Biber and Gray (2016) report that academic prose and newspaper prose tend to frequently exploit adjectives functioning as classifiers.

On the other hand, interesting patterns of difference include diverse pre-modifying adjectives co-occurring in the attributive zone. The first pattern of difference discovered only in the Applied Linguistics corpus (#6) was sub-modified pre-nominal constructions in which some words modify other pre-modifiers instead of characterizing the main head noun element. Viewed as one of the key aspects of the internal logical construction among strings of pre-modifiers, sub-modification can impact the normal order of elements in the nominal group (Biber, et al., 1999; Ruan, 2018). In effect, these constructions in which an adverb sub-modifies the meaning of a following attributive or participle adjective can add another layer of structural pre-modification in the nominal group, thus developing the complexity of its basic internal formation (Ruan, 2018, p.13). Furthermore, these types of pre-modification not only depict the logical constructions of sub-modification within the complex noun phrases, but also they condense information into a complex noun phrase (Ruan, 2018). Reporting a very small proportion (i.e., less than 2%) of this type of compact style of writing in RA abstracts, Ruan (2018, p. 13) viewed it as a distinct linguistic resource for generating dense

texts. While being particularly common in linguistics research articles, exceedingly rare instances (four instances) were found in the Physics corpus.

The second patterns of difference (#5 & #12) appear to epitomize the linguistic characteristics of Physics as we found no instances of such a highly condensed structure in linguistics. Using highly stacked pre-modifiers or tightly multitudinous hyphenated adjectives occurring before head noun elements in science writing not only makes the texts impenetrable for non-specialist readers since it requires specialized knowledge to absorb, but it can also sacrifice clarity at the expense of conciseness. This can also create a state of tension between lucidity of meaning and economy of structure in academic writing (Ruan, 2018). Halliday and Martin (1993, p. 77) related this form of discourse mainly to grammar of science writing and "scientific jargon". They further argued that scientific discourse prefers complex embedded nominal groups and abstract academic discourse, yet these are difficult to process and digest due to the strings of lexical words without any grammatical words (function words) in between. Therefore, these patterns may suggest that academic writers in Physics tend to employ phrasal modification rather than clausal modifiers to convey technical information concisely. This tendency also explains why writers opt for a complex expression such as *chiral nucleon-nucleon next-to-next next-to-leading interaction* than its reworded clause *the interaction between chiral nucleon with chiral nucleon at next-to-next-to-next-to leading order*. Therefore, we can reasonably infer that dense academic prose is highly valued in Physics texts as a high level of inexplicitness seems to be tolerated by proficient readers.

Noticeably absent from Applied Linguistics research articles, pattern #7 refers to adjectival antonym pairs (morphologically-related antonymous pairs) in which one element is derived from the other by a negative prefix. The pairs of adjectives occurring in pre-head situations are not antonyms but complements. Put simply, there is a symmetrical relationship between two elements constituting a unit neither of which depends on the other but which complement one another. For example, *quark-antiquark system* refers to a model that includes both quark and diquark elements. Since the structural formations of these compounds are reasonably predetermined and abundant, this finding may also suggest features of prefabricated language chunks (formulaic sequences) in science prose such as Physics.

Another pattern of difference which emerged, pattern #8, refers to a reduplicative compound pattern in which two conjoined hyphenated identical nouns (in some cases, adjectives) co-occur in the attributive position. This pattern of use is mainly exploited to condense a fuller clausal structure into embedded phrasal features. For example, the noun phrase *electron-electron interaction* could be paraphrased as *in the interaction process between electron and electron*….

Finally, yet importantly, an interesting pattern of difference came out through a good number of pre-modifiers in which nouns occur before adjectives (i.e., N+Adj+N). No instances of the use of such combinations were found in linguistics RARs. These expressions in which the main head noun is expressed by N+Adj+N can be roughly expanded into an elaborating, post-modifying clausal structure. For example, *photon differential scattering cross section* can be paraphrased as *differential scattering cross section of photon* or *scattering cross section of photon differentiated in X* and *quantum mechanical technique* can be paraphrased as *technique of quantum mechanics*. Using an *of* phrase in place of the last modifier in the string may help make such a complex nominal group relatively easier to read and assimilate. However, such compact structures are highly functional and effective techniques whereby the science writers can condense the same amount of information contained in the extended clausal structures into dense phrasal expressions. The purpose of packing information into limited words can also assist the specialists in reading and acquiring the information faster albeit the situation can be the polar opposites for the non-expert as they need to deduce the expected meaning and logical relations of inexplicit grammatical structures (Biber & Gray, 2010, 2016; Ruan, 2018). In this regard, Doran (2018) relates the higher degree of semantic encapsulation to abstraction and technicality employed in physics.

The second area to mention is related to the grammatical functions of appositive nominal post-modifiers. Notwithstanding its infrequency in the entire datasets, the use of appositive noun phrases can be noteworthy due to the increasing prominence in academic prose (Biber & Gray, 2011, 2016; Parkinson & Musgrave, 2014). In our datasets, appositive post-modification was primarily exploited in the examined texts to perform 19 multifaceted textual constructions, namely, providing more descriptive information, referring to further information provided in the appendix, showing actual results, restating the research questions, clarifying statements, providing contrasting statements, introducing acronym or initialism, showing technical abbreviations, describing equations, restating the items of questionnaire, providing reason(s), explaining questionnaire scales, expressing analytical results, explaining statistical methods, re-explaining methodological procedures and variables, giving an example, incorporating multiple embedded appositives, itemizing the members of a group or individual item(s), indicating the data location, and presenting statistical results in tables, charts, among others. Therefore, it can be safely concluded that these appositive constructions are distinctive to or indicative of the writing of the results section in RAs as some of these structures have not been already reported.

Overall, the brief examples provided above may illustrate how phrasal complexity features can convey compressed meanings and suggest that phrasal modifiers are considered viable alternatives to fuller and elaborated clausal structures (Biber & Gray, 2010, 2016)**.** These particular compression features can further embody structural complexity of the natural science disciplines, creating informationally condensed discourse, and can support previous findings on the widespread use of nominal style of science writing compared to non-science writing (Gray, 2015; Halliday & Martin, 1993). Therefore, this finding can lend support to Gray (2015, p.127) who suggests that features

associated with structural compression are more prevalent in the natural science disciplines compared to features of grammatical elaboration which are more frequently used in humanities disciplines.

5. Discussion and Conclusion

The present study has explored PCFs in the RARs between two academic disciplines, namely, Applied Linguistics and Physics. The exploration enabled us to obtain a sense of which linguistic devices were favored by the RA writers in the results sections and discover varied patterns of use associated with PCFs. Accordingly, we discuss the most prevalent linguistic features that they utilized to articulate RARs and draw a comparison to judge the extent to which the usage of PCFs identified in our datasets is similar to or different from one another.

5.1. What phrasal complexity features characterize the RARs in Applied Linguistics and Physics?

In response to the first research question, the results indicated the RA writers preponderantly exploited three high-frequency phrasal complexity features, that is, pre modifying adjectives, noun post-modifiers, and nominalizations to characterize the results sections they created. The greater exploitation of these types of phrasal modification may in part signal RA writers' marked tendency toward increased information load used for presenting disciplinary content knowledge for the intended readers in the results sections.

Among the high-frequency phrasal complexity features, pre-modifying adjectives in the form of the shared as well as varied patterns are the first most favored phrasal structures for conveying information and the core linguistic tools that carry primary responsibility for characterizing the results sections. The greater propensity for using such phrasal modifiers is that pre-modifying adjectives can serve to a great extent to impart the impression of the novelty of the research results, to augment or reinforce the research findings, to evaluate the prominence of findings, and can function as a rhetorical strategy for creating the favorable account of new results for the target readers.

Another plausible explanation for the higher frequency of feature one is that adjectives in prenominal position can be typically used as devices for academic argumentation, objective and subjective description of the results and the results section is a segment in which such argumentation, persuasiveness and evaluation are inevitably built up (Paltridge & Starfield, 2020). Therefore, considering the prevalence of pre-modifying adjectives in our datasets, the use of such prenominal modifiers seems to be typical of the reporting as well as presenting of new scientific knowledge in the results section. However, our findings can be in contrast to some handbooks on writing scientific texts (e.g., Wallwark, 2011; Wilkenson, 1991) in which the sparing use of adjectives in scientific writing was propounded.

Our findings can, moreover, provide supporting evidence for previous studies in which these compressed linguistic resources were found to be extensively used in modern academic prose (Ansarifar et al., 2018; Biber & Gray, 2016; Gray & Biber, 2018; Gray, 2015; Noguera-Díaz & Pérez-Paredes, 2018; Ruan, 2018; Staples et al., 2016). Comparing the frequency of adjectives functioning as noun premodifiers in the examined texts (i.e., occurring 50 times per 1000 words) with the frequencies reported by others (e.g., Ansarifar et al., 2018; Biber & Gray, 2011; Gray & Biber, 2018; Parkinson & Musgrave, 2014), we can safely deduce that pre-modifying adjectives play a predominant role in informational writing and that more than half of the pre-modifiers used in present-day academic writing seem to belong to adjectives as noun pre-modifiers. The findings of this study can also approximately concur with Gray (2015) and Gray and Biber (2018) who reported that the use of attributive adjectives as noun pre-modifiers occurred 60 to 75 times per 1,000 words in all academic disciplines.

The next two dominant linguistic devices that proliferated in the studied texts were post-nominal modifiers and nominalizations. The moderately high incidence of prepositional phrases(PPs) with adjectival functions in written discourse can arise principally from numerous sources including their flexibility in syntactic structures, demarcation of broad meanings of nouns, modifying functions of nouns, and placement in different sentence slots (Hinkel, 2004). However, the extensive use of post-nominal modifiers, being vastly polysemous and sometimes ambiguous in meaning, can also give rise to greater complexity and difficulty in processing efficiently and can lead to mental confusion for non-proficient readers to understand the meaning relationships between the main head noun element and its modifiers (Swan, 2016). Previous research (e.g., Biber et al., 1999) found far more frequency of PPs as the most prevalent post-nominal modifiers in all written academic registers, ranging from 65 to 80%. Recent studies such as Parkinson and Musgrave (2014) and Ansarifar et al. (2018) report PPs (occurring 27.7 and 21.39 per 1000 words respectively (in their datasets, suggesting a decreasing trend. Yet, the frequency of these linguistic elements in our datasets was about 40 times per 1, 000 words. Therefore, it is hard to substantiate or refute previous findings.

Concerning nominalizations, the relatively high frequency of nominalizations can derive primarily from the fact that these devices help remodel the grammar, condense information, and contribute to flow of a text, without which creating numerous scientific and technical concepts can be difficult (Coffin, Donohue, & North, 2009). Coffin et al. (2009) further assert that since nominalization provides measurement, comparison, classification, evaluation, and ordering of events in technical and scientific fields, it is deemed an essential linguistic resource for developing the fields. Using such constructions can be therefore considered valuable assets to the RA writers in elaborating, re-meaning, and re-semanticizing the concepts (Halliday, 1998).

As for the low-frequency phrasal complexity resources, that is, appositive noun phrases and pre-modifying nouns, the results revealed that the incidences of appositive noun phrases as noun post-modifiers in the studied texts was higher compared to the frequencies reported in the existing literature (Ansarifar et al., 2018; Biber & Gray, 2011; Biber et al., 1999; Lan & Sun, 2019; Parkinson & Musgrave, 2014) and a good number of multifaceted textual appositive constructions were unveiled. Therefore, our findings not only reinforce the previous research but also corroborate the growing recognition and increasing trend of these linguistic devices in modern academic prose. Additionally, the low frequency of pre-modifying nouns can be in contrast to the occurrences suggested in the related literature in which these types of phrasal features of compression were reported to be as prevalent as premodifying adjectives in natural science, especially in Physics (Biber & Gray, 2016; Gray, 2015).

Another conceivable explanation can lie in the fact that nouns as nominal premodifiers can sometimes be interchangeably used with *of*-genitive structures, albeit these are viewed as a newer structural compressed alternative to *of*-genitive as well as '*s*-genitive constructions respectively (Biber & Gray, 2016). However, Hinrichs and Szmrecsanyi (2007, p. 469) contend that "genitive choice is dependent upon a complex mechanics of interlocking factors, no single one of which can be held solely responsible for the observable variation".

5.2. Which disciplinary distinctions between Applied Linguistics and Physics can be drawn in using phrasal complexity features in RARs?

In response to the second research question, the results revealed that research article writers in Applied Linguistics and their counterparts in Physics generated phrasal complexity features in the results sections differently except for feature two (i.e., pre-modifying nouns). The dissimilarities may indicate a significant difference in how notions and knowledge are formulated and disseminated in various academic disciplines (i.e., Applied Linguistics vs. Physics) according to disciplinary writing conventions. This can also imply that writing researchers and ESP instructors need to be sensitized not only to linguistic resources and the related functions, but also to variations in how such pre/post nominal styles are deployed in various academic disciplines. The variations may further suggest the demands and discursive peculiarities of the discourse community of each discipline to frame their academic texts (i.e., RARs). Therefore, the observed variations can align to a large extent with that of Gray (2015) who argues that there exists a growing trend moving from soft disciplines (the humanities) to hard disciplines (natural science) with regard to these linguistic resources. However, a confluence of shared patterns of language use with reference to features one and four was found, as discussed earlier.

The results also suggested the absence of significant differences in the use of feature two (nouns functioning as noun pre-modifiers) which comparably pre-modify the head noun (compared to pre-modifying adjectives). This can display the shared stylistic preference (conscious or unconscious), common understanding of the use of phrasal modification among community of ESP practitioners, and ubiquity of these compressed linguistic resources in modern written academic prose (Biber & Gray, 2016; Staples et al., 2016). However, these phrasal constituents were found to be approximately the least common type of phrasal complexity features in the two disciplines examined. On the whole, the conspicuous absence of difference in the use of feature two (#2) across the groups can run counter to the literature in which differences in the frequency of these linguistic resources across levels, genres, and disciplines were reported (e.g., Gray, 2015; Staples et al., 2016).

Worthy of attention is the use of NPs with multifarious pre-modifying adjectives and lengthy noun cluster pre-modification that can also provide mounting and credible evidence for functional expansions of these formulations (Biber et al., 1999; Biber & Gray, 2016; Noguera-Díaz & Pérez-Paredes, 2018). The reason for using such highly complex constructions and multiple levels of phrasal embedding in which a considerable amount of information is condensed into fewer words can be due to numerous reasons including "information explosion", the surge of the empirical RA, the development of numerous academic (sub)disciplines, advances and changes in technology, and being an extremely effective technique for academic professionals (Biber & Gray, 2010, p.18). Further, the multifarious embedded premodification can illustrate the potential complexity of pre-modification of NP and can indicate that in principle there is no restriction on adding pre-modifying features in NPs. Moreover, the sequences into which the multiple embedded pre-modifications occur can be generally determined by a wide range of semantic, syntactic, and even pragmatic properties. Among these, the sematic relationships take the lead in determining the order in that the intended meaning can have a powerful influence on the order (Biber, et al., 1999). Yet, in order to comprehend these types of highly stacked adjectival pre-modification in which no function words exist in between, highly complex knowledge is required. Related to this point, Maton and Doran (2017) assert that the target audience has already gained substantial epistemological encapsulation elsewhere and it thus is disciplinary insiders' discourse. Nevertheless, while excessively pre-modified constructions can create confusion and semantic ambiguity which might impact the clarity, communicative purpose, and readability of the results sections, this could also be used as a distinct epistemic strategy which enables RA writers to achieve greater structural compression and express certain concepts in the fewest words.

Concerning feature three (i.e., nominalizations), the results indicated interdisciplinary differences. While nominalizations are mainly used as linguistic devices to increase informational density by reducing clausal processes to a noun and leaving semantic relationships deducible as well as inexplicit in science writing (Halliday, 1998), these features appeared at a much higher frequency in Applied Linguistics than in Physics in the present study. This can be in line with Biber and Gray (2016) who found variations across academic sub-registers in the use of nominalizations

and to a large extent with that of Jalilifar, White and Malekizadeh (2017) whose study illustrates key differences between Applied Linguistics and Physics textbooks in terms of nominalizations. Therefore, future studies might investigate nominalization by subdividing the categories as well as patterns of this linguistic feature.

The results of feature four (appositive noun phrases) displayed interdisciplinary differences between the groups. While being infrequently used in both datasets, statistically significant differences were noted. The marked differences in frequency can run counter to previous studies in which higher reliance of this feature is reported in present-day science research writing (e.g., physics) compared to modern humanities academic writing (Biber & Gray, 2016). In addition to this, multifarious structures some of which have not been documented to date were also observed. The manifold constructions discovered in this study may serve as evidence for other studies in which various patterns of appositive noun phrases were reported (see Ansarifar et al., 2018; Biber & Gray, 2016; Noguera-Díaz & Pérez-Paredes, 2018). Considering interdisciplinary variations, our findings may demonstrate implicit language differences associated with both disciplinary factors and epistemological orientations underlying different research articles with regard to feature four. According to Biber and Gray (2011), appositional post-modification represents complex meaning relationships to the head noun, adding optional or descriptive information. The complexity might be ascribable to the lack of overt grammatical markers that can make the meaning relations between the head noun and the modifier inexplicit in academic writing in that the expert reader anticipates the intended compact style of readings (Biber & Gray, 2010). For Biber and Gray (2010, 2016), this is a recent linguistic innovation in modern professional academic prose. Hence, ESP students, as suggested by recent studies, should be aware of the various syntactic and functional patterns of appositive constructions in order to recognize them in written texts and promote their understanding of professional academic texts particularly of the results sections and should be able to interpret and utilize such linguistic features in this specific section. As for feature five (i.e., post-nominal prepositional phrases), the results revealed that this linguistic resource was favored in both datasets. Yet, our findings seem to contradict the previous studies in which these linguistic devices were found to be heavily relied on in science writing compared to the humanities (e.g., Biber & Gray, 2016). Therefore, this finding might refute the prevalent stereotype about the pervasiveness of PPs in academic discourse, yet a larger corpus is needed to draw correct conclusions.

These findings can be used to heighten research article writers and instructors' awareness of linguistic characteristics used in the results section of RAs as well as of variations in how such phrasal features of compression are constructed in two academic subjects. Awareness and recognition of these similarities and variations identified in RARs could help ESP students understand how language is utilized in a particular way in an academic discipline and commence employing discipline-specific language in appropriate ways. Thus, our findings may be used as a good guide for ESP learners when they intend to select the type of phrasal modification that is appropriate to disciplinary use. Further research is needed to include an extended analysis of a range of grammatical complexity features with a larger sample size in order to provide more specific descriptions of the discourse qualities of present-day professional academic writing.

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Appendix A

Information on Applied Linguistics Journals

No	Journal	No of RAs	IF
1	Journal of Second Language Writing	12	4.20
2	Applied Linguistics	10	3.04
2	Language Learning	12	1.65
3	TESOL Quarterly	9	2.25
4	The Modern Language Journal	16	2.78
5	Language Teaching Research	3	2.08
6	Journal of English for Specific Purposes	4	1.36
7	Language and Memory	10	3.85
8	Language and Speech	6	1.43
9	Language, Cognition and Neuroscience	10	1.52
10	Journal of English for Academic Purposes	8	1.73

Appendix B

Information on Physics Journals

No	Journal	No of RAs	IF
1	Physical Review A	6	2.90
2	Physical Review B	17	3.81
3	Physical Review C	4	3.30
4	Modern Physics Letter A	5	1.33
5	Physics Letters A	9	1.86
6	Physical Review D	14	4.39
7	Nuclear Physics	8	1.99
8	Journal of Physics D: Applied Physics	4	2.37
9	Journal of Applied Physics	11	2.17
10	The European Physical Journal C	4	5.17
11	Laser and Photonics Reviews	4	8.52
12	Nuclear Physics B	6	3.28
13	Progress of Theoretical and Experimental Physics	8	2.29