The Use of Relative Clauses in Humanities and Social Sciences Research Articles: A Case Study

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Abstract For authors to publish their research papers in peer-reviewed journals, it is important to provide a clear rationale for their study, have a strong methodology, interpret their findings effectively, and highlight the contribution of their study to existing literature. However strong these aspects of content may be, it is nonetheless authors' language and communication competence that influence whether or not the message is conveyed to readers successfully. To this end, authors need to be meticulous in sentence construction. Varying sentence complexity is one important consideration in this respect. Although relative clauses play a significant role in sentence complexity, they have received relatively limited attention from researchers investigating academic writing. This case study is an attempt to identify how authors in humanities and social sciences use relative clauses in their research articles. To this end, we investigated their use in research papers in five journals. Our corpus was comprised of 22,801 running words. Data revealed that relative clauses accounted for 40% of the total number of sentences in the corpus. They were more commonly used in the introduction and discussion & conclusion sections. Reduced relative clauses were also generally more common than full relative clauses, with comparatively frequent use in the results section. We also found that the active voice was more dominant than the passive voice in relative clauses in all sections except the methodology, discussion and conclusion sections. We discuss the results from the perspective of transitivity, and offer some recommendations.

Keywords Relative Clauses, Sentence Complexity, Academic Writing, Scientific Writing, Sentence Length

1. Introduction

The importance of writing in the academic world is often expressed with the slogan 'Publish or Perish'. Although this slogan seems controversial in academia, those who successfully publish receive more credit as the measure of competency resulting in better employment and promotion opportunities (Rawat & Meena, 2014). Any publication has its own worth; however, peer-reviewed journal publications are regarded particularly important since they are assumed to "provide a valid measure of the quality of a manuscript and its adherence to the norms of the field" (Solomon, 2007, para. 14). Peer-reviewed journals have their own set of criteria for accepting a manuscript for publication. For research papers, these normally include the rationale for the study, the strength of the methodology, the interpretation of the data collected, and the overall contribution of the paper to existing literature. However, even if these common generic features are satisfactory, we would argue that the language competence displayed in the manuscript could be a determining factor. The first thing encountered and processed by the reader is the text itself. Therefore, the first impression of the reader is inevitably influenced by the way the message is communicated. The American Psychological Association (2009) warns that "incorrect grammar and careless construction of sentences distract the reader, introduce ambiguity, and generally obstruct communication" (p. 77). It is therefore essential for authors to avoid giving the impression that they do not pay sufficient attention to detail (Benson & Silver, 2013). Given the fact that "the publication world is dominated by the English Language" (p. vii), authors whose native language is not English may face formidable challenges (Ventola & Mauranen, 1996) in their pursuit of "publishing not to perish" despite their wealth of knowledge in their disciplines. Our own experience as journal editors has also alerted us to the fact that while first-language users appear to have an advantage, they do not necessarily pay sufficient attention to linguistic detail. In other words, all authors can benefit from paying more attention to academic language use.

One way of raising awareness of competent academic language use is to analyze peer-reviewed journal texts. Frequent use of certain language elements may point to how language is utilized by competent, published authors,

awareness of which could give novice and non-native English writers' insights into how they could enhance their manuscripts linguistically. As academic authors tend to make frequent use of complex sentences (Wiechmann, 2015) and given that authors need to feel confident in their ability to use them (Bailey, 2011), we focus on one aspect of their use in this paper, namely, the use of relative clauses. These are defined as "a type of subordinate clause that modifies a head noun in the main clause. Its main function is to restrict the possible set of individuals, objects, events, etc. to the subset the [author] intends to [mention]" (Alotaibi, 2016, p. 58). An example of this from the data set we analyzed for this current study is "[T]he research project involved additional research questions *that required two unique survey instruments*."

The wide variety of relative clause types in English is one of the factors that increase their potential difficulty level. In an attempt to use 'scientific language', novice writers may opt to increase the length of their sentences using relative clauses, which could result in misrepresentation if not done meticulously (Gopen & Swan, 1990). It is therefore important to emphasize at this stage that our focus on relative clauses is not intended to promote an increase in their use. Maxims of clarity (see for example Grice's maxim of manner (1989)) will inevitably apply to sentence complexity.

Another reason why we focused on relative clauses is the relatively limited interest shown in this language element despite the central role they play in modifying a noun. The frequency and the role of complex structures such as relative clauses is a relatively understudied topic (Wiechmann, 2015). Although some researchers have investigated their use in hard sciences (Cho & Lee, 2016; Master, 2002), investigations in humanities and social science publications are relatively limited. Also, previous research mainly focused on full relative clauses noting relative clause reduction is "controversial and is not uncontested in the literature" (Tse & Hyland, 2010, p. 1882). However, we believe that authors may make tactical decisions in their choice of full and reduced relative clauses and this requires closer attention. Another aspect of relative clauses we investigated in this research concerns the use of active versus passive voice. Previous research has investigated different aspects of transitivity in academic writing (e.g. Guo, 2012, Halliday and Matthiessen, 2004, Nunn, 2014, Nunn et al., 2016); however, their use in relative clauses has not been the focus of these studies. We believe that focused attention on transitivity choices can enhance our understanding of transitivity in subordinate clauses. Yet another element of effective language use is varying sentence length, which requires authors to plan their use of words strategically. For stylistic reasons related to clarity and concision, sentence length in relative clauses needs special attention. However, there seems to be a dearth of studies interested in this aspect of relative clause use in research articles.

2. Research Questions

This research aims to answer the following questions:
1. How frequently are relative clauses used in the chosen humanities and social science research articles?
2. Which types are used more frequently (reduced and full) in these articles?
3. What is the ratio of active voice to passive voice in relative clauses used?
4. a) What is the average sentence length in these articles?
   b) What role does the use of relative clauses play in the authors' choice of sentence length?
   c) Why do the authors seem to use long sentences?

3. Literature Review

Although we provided an initial definition of relative clauses by Alotaibi (2016, p. 58) in the introduction (a type of subordinate clause that modifies a head noun in the main clause), Wiechmann (2015) cautioned that it is not an easy task to identify a fixed set of properties for relative clauses. However, relative clauses have been categorized according to their types, and a distinction has been made in terms of reduction. We give details of these in the following subsections.

3.1. Types of Relative Clauses

Authors are advised by the American Psychological Association (2009, p. 66) to avoid using successive nouns to modify a final noun. In order to clarify the relationships between words, they are advised to untangle the string, one way being to use a relative clause. If we consider the example - 'commonly used investigative expanded issue control question technique' vs 'a control-question technique that is commonly used to expand issue in investigations.' -, the use of a relative clause in the latter helps clarify the relationship between words and helps to unlock the meaning.

One approach to distinguishing relative clauses is based on the grammatical function of their head in the relative clause (Fitz, Chang & Christiansen, 2011, p. 40), a summary of which is given in Table 1 below.

Table 1.   Relative clause construction

Relativized role	Example
Intransitive subject	Acculturation has been defined as adaptation to a new major society that *results* when people of one ethnicity move to an area with different cultural features. (Text 5)
Transitive subject	…little research exists *that investigates* how best to leverage the potential of the iPad as a language-learning tool in this educational context. (Text 3)
Direct object	…further interviews with representatives [*that*] they knew to be involved with Hispanics. (Text 5)
Indirect object	...the girl who the boy gave the apple to/ the girl who/ to whom the boy gave the apple.
Oblique object	… the boy who the girl played with

Adapted from Fitz, Chang & Christiansen (2011)

Another categorization of relative clauses is related to restrictiveness. Cowan (2008) notes that "[a] restrictive relative clause is one that serves to restrict the reference of the noun phrase modified" while "[a] nonrestrictive relative clause adds information about the noun modified" (p. 421), and "provide[s] background information or expressive evaluation about a referent that is already identified and hence does not need any more referential specification" (Radden & Dirven, 2007, p. 164). Below are two examples of a restrictive and a non-restrictive relative clause from our corpus:

Restrictive: the financial situation of the immigrant is among *the factors that affect whether changes in food habits will be profound or minimal*. (Text 5)

Non-restrictive: The Scott County study is based upon interviews with a convenience sample of 11 community representatives and 18 Hispanic immigrants, *which may limit the ability to extrapolate the findings to the general population*. (Text 5)

A non-restrictive relative clause is accompanied by commas, as is seen in the second example above. The commas "reflect the pauses in speech and a falling intonation pattern at the end of the clause (Cowan, 2008, p. 421). The American Psychological Association (2009, p. 83) suggests that authors use the relative pronoun *that* for restrictive clauses, and *which* for non-restrictive clauses.

3.2. Relative Clause Reduction

Master (2002) defines relative clause reduction as "the deletion (and often concomitant syntactic alteration) of certain elements of a relative clause, the result of which does not change the meaning of the clause in any way" (p. 203), and identifies two types of reduction operations: those that delete an element of the relative clause, and those that combine deleting with the syntactic alteration of an element.

DeCapua (2017), on the other hand, defines reduced relative clauses as those without a full verb phrase. Table 2 displays examples of relative clause reduction in active and passive voices. We also note that 'be' may be the main verb, in which case neither active or passive is selected. Effectively this provides a third option for the writer rather than the standard two-way distinction (Nunn, 2014). Reduced relative clauses in academic writing help authors condense information (Biber, 1988), and vary sentences by decreasing sentence length.

Table 2. Relative clause reduction

Examples: Reduced Relative Clauses in Active Voice	
Tsiros and Mittal (2000 [12]) present results [that] suggest that (1) regret specifically influences repurchase intentions [Text 4]	• no auxiliary: main verb regular present tense
Tsiros and Mittal (2000 [12]) present results suggesting that (1) regret specifically influences repurchase intentions[Text 4]	• *that* dropped: main verb changed to present participle
…the females *[that were] majoring* in this field. [Text 1]	• *be* auxiliary + main verb already present participle
…the females *majoring* in this field. [Text 1]	• *who* and *were* dropped
Study participants [*who were*] *not in attendance* were provided with a copy of the results by mail. (Text 5)	• *be* main verb, followed by a preposition phrase
Study participants *not in attendance* were provided with a copy of the results by mail. (Text 5)	• *that* and *were* dropped
I explored the factors that are critical in supporting learner acceptance. (Text 3)	• *be* main verb, followed by an adjective
I explored the factors critical in supporting learner acceptance. (Text 3)	• *that* and *was* dropped
Examples: Reduced Relative Clauses in Passive Voice	
Figure 1 presents the research model that is considered herein. (Text 3)	• present passive
Figure 1 presents the research model considered herein. [(Text 3)	• *that* and *is* dropped
The landscape *that is being installed* now... .	• *be* auxiliary (time, present) + *be* auxiliary (aspect, progressive), main verb already past participle
The landscape *being installed* now…	• *that* and *is* dropped

Adapted from DeCapua (2017)

3.3. Functions of Relative Clauses in Academic Writing

In academic English, a restrictive relative clause in either full or reduced forms is commonly used to provide definitions. Swales and Feak (2012) note that "the term being defined is first assigned to a class or group to which it belongs and then distinguished from other terms in the class" (p. 71), as in the following example:

Term	*is/are*	*a/an* class	*that/wh*-word	distinguishing detail
A solar cell	is	a device	that/which	Converts the energy of sunlight into electric energy.

In their investigations into full relative clauses used in journal descriptions, Tse and Hyland (2010) identified the categories of modification produced by relative clauses as scope, clarity, and evaluation. The first "concerns the scope of the noun's reference and the extent to which the clause acts to either specify this scope more specifically through restriction or expand it by encompassing other candidates" (p. 1883). The second provides elaboration or exemplification. The last, on the other hand, "expresses the writer's attitude or judgment towards the modified entity" (p. 1884).

The use of relative clauses also helps authors vary sentence length. Authors mainly relying on short sentence can sound simplistic and halting while those who use long sentences frequently -even if they may be concise and elegant- reduce the readability of their texts (Kallan, 2016); therefore, authors should vary the length of their sentences.

3.4. Sentence Length and Relative Clauses

One way authors can establish their voice in their writing is by choosing to control and manipulate the focus and length of their sentences (Dean, 2000). This requires authors to make informed decisions about the average length of their sentences, avoiding frequent long, complicated sentences that increase the likelihood of making grammatical mistakes and losing readers' interest (Kline, 2009). However, shorter and potentially disconnected sentences also likely have a negative impact on readers' comprehension (Eika, 2016). The American Psychological Association (2009) cautions that writing simple sentences makes the prose choppy and boring, and recommends that authors vary sentence length to help readers maintain interest and comprehension.

The types of detailed explanation and qualification required in academic writing increases sentence length (Kallan, 2016). Specialized written texts appear to include far longer sentences than those in general language (Gotti, 2008). In fact, Barber (cited in Gotti, 2008) found that the average sentence length in scientific texts is 27.6 words. Similarly, Turner (2008) notes that "[r]esearch writing, especially in the social sciences and humanities, tends to have a longer average number of words per sentence than writing for a general audience" (para. 2).

Relative clauses inevitably increase sentence length. Longer sentences may include multiple relative clauses, some of which may be used in their reduced forms. The following sentence from our corpus illustrates this point.

> In the field of financial literacy, *which also displays a gender bias favouring men in terms of scores on financial literacy tests*, Agnew and Cameron-Agnew (2015) found that financial conversations in the home between parents and children occurred at an earlier age with sons than with daughters, *with evidence also suggesting financial discussions with daughters were at a more superficial level*. (Text 1)

This 61-word sentence includes two non-restrictive relative clauses, one in its full form, and the other in its reduced form. Although they illustrate a sophisticated ability to synthesize complex information concisely, Eika (2016) observes that "having more than two relative clauses in one sentence may require more parsing efforts, hence possibly reducing readability" (p. 467).

4. Methodology

4.1. Corpus

Our corpus was derived from peer reviewed journals in humanities and social sciences, which included Business and Economic Research, Salud Publica de Mexico, English Language Teaching and the International Journal of Psychology and Behavioral Sciences. (See appendix A for the full references of the papers). One reason why we chose to include only humanities and social sciences articles in this case study was our own background as researchers. Both of us are social scientists with slightly different specializations. The primary specialization of the principle author of this study is adult education and lifelong learning. His research interest over the years has been in language learning and teaching. On the other hand, the second author is an applied linguist with extensive experience in teaching English as a foreign language and literary analysis of academic articles. Combined together, our training background and experiences in the field prompted us to focus on academic writing in the humanities and social sciences for the purposes of this case study.

We chose the articles based on convenience sampling. That is, they were all downloadable free of charge in PDF format. We chose research articles with a similar generic organizational structure, which we believed would help us categorize data more effectively. Taken together, the corpus derived from these articles comprised 22,801 words. In establishing the corpus, the tables, figures, captions, references, authors' bio-data, acknowledgements and appendices were discarded.

4.2. Analyses

We identified all the instances of relative clauses (both full and reduced) in each of the research papers, and categorized them under the relevant section headings such as abstract or results. During this stage, we identified all the instances of relative clause pronouns in full relative clauses, excluding those used as noun clause markers as in the following example from text 2.

> Results suggest *that* face to face communications by and amongst young people are diminishing fast at the expense of social media such as Facebook and What''s App − (Text 2) (*that* functioning as a noun clause marker)

We also kept the following aspects of relative clauses outside the scope of our study: a) restrictive and non-restrictive types, and b) prepositional phrases, which could in fact be regarded as a type of reduced relative clause as in the example of 'Study participants [that were] not in attendance were provided with a copy of the results by mail'. (Text 5)

Although the papers adopted a similar generic structure, headings such as literature review were missing in some of the papers. A review of literature was always present, but it was in the introduction rather than in an independent section. In order to make comparisons between different sections, we combined introduction and literature review sections as well as discussion and conclusion sections. We, as two individual researchers, checked the identification and coding of the relative clauses separately to reduce the likelihood of any error.

We also identifed the number of sentences in each section manually. An online software available at www.http://countwordsworth/wordspersentence.com was used to identify the average sentence length of each corpora.

In order to identify statistical differences between different data sets, we used different tests. For example, we used Student's t-test to compare reduced and full relative-clauses, and active and passive voice use in the relative clauses. The Pearson product-moment correlation coefficient (r) was used to assess the relationship between the sentence length and relative clause frequency, and between the word counts and relative clause frequency. The p-value < .05 was considered significant in determining the significance of the difference between the data sets.

5. Results and Discussion

The first research question aimed to identify the frequency of relative clauses in the analyzed research papers. The results can be seen in Table 3.

Table 3 shows that there was a total number of 388 relative clauses used in the five articles analyzed. It is also seen that relative clauses were used most frequently in the introduction and literature review sections of the articles (32%). This was followed by the discussion and conclusion section (29%) and the method section (20%). The percentages of relative clauses in the results section (16%) and the abstract (2%) were comparatively lower. When the frequency of relative clause use is considered in relation to the number of words used in each section, it is seen that authors tended to increase their use of relative clauses as they increased the number of words they used. The Pearson product-moment correlation coefficient we computed to assess the relationship between the two variables revealed that there was a strong correlation between them (r=.9394, n=5, p=.0177).

When the total number of sentences (961) in the corpus is considered, the 388 instances of relative clauses represents 40% of all sentences. This indicates the potential significance of relative clause construction in research articles in the given scientific disciplines. In their case study that compared the use of relative clauses in three science and engineering journal papers to their use in the field of English for Specific Purposes (ESP) as a social science, Cho and Lee (2016) also identified a high frequency of relative clauses in both corpora. However, they found that relative clauses were used with the highest frequency (3,249 cases) in the ESP corpus in comparison to the hard sciences corpus. Similarly, the analysis of the frequency of relative clauses per 100 sentences in their corpora showed that the ESP corpus received the highest frequency of 26.3 cases. Although not a focus of this current study, Cho and Lee (2016) found that non-restrictive relative clauses in the ESP corpus was not as common as those in the hard-science corpus (20.9% in the ESP corpus vs 48.2%, & 48.5 in the science corpora). The authors note that the comparatively less frequent use of relative clauses in the hard-science papers investigated in their study may be due to researchers' tendency to use 'simple, straightforward' sentences. However, Tse and Hyland (2010) found that the hard sciences articles contained 22% more relative clauses per 1,000 words than the social science articles they investigated. Despite these contradictory results, the findings of our research together with those in previous research indicate the heavy weight relative clauses carry in research articles as a distinct genre, 'ensur[ing] semantic clarity between phrases and sentences" (Cho & Lee, 2016, p. 68) and establishing textual variety. Therefore, we believe that the results of this case study into humanities and social sciences support the findings of previous research into relative clauses in hard sciences, increasing the amount of evidence available in the literature.

Table 3. Frequency of relative clauses

Sections	The Number of Relative Clauses		Word Count		(r)	p
	f	%	f	%		
Abstract	9	2	744	3		
Intro & Lit Review	124	32	7465	33		
Method	79	20	3559	16		
Results	64	16	5071	22	. 9394	.0177
Discussion & Conclusion	112	29	5962	26		
Total	388	100	22801	100		

p < .05

The second research question aimed to identify the ratio of reduced relative clauses to full relative clauses. Table 4 below summarizes the data for this question.

Table 4.   Ratio of reduced vs full relative clauses

Sections	Sentence count	Full relative clauses		Reduced relative clause		*Total*		p	t
		f	%	F	%	F	%		
Abstract	33	3	2	6	2	9	2		
Intro & Lit Review	293	50	34	74	31	124	32		
Method	79	26	18	53	22	79	20	.0473	-1.7022
Results	64	27	18	37	15	64	16		
Discussion & Conclusion	110	41	28	71	29	112	29		
Total	961	147	100	241	100	388 (147+241)	100 (38+62)		

p < .05

As is seen in Table 4, the number of reduced relative clauses (241, 62%) was higher than that of full relative clauses (147, 38%). The two data sets were compared using Student's t-test revealing a difference at a statistically significant level (p= .0473 < .05). Taken as a whole, our findings therefore showed that reduced relative clauses in the five humanities and social sciences research articles we investigated in this study are almost 1.7 times (62% vs 38%) more frequent than full relative clauses. However, this use of relative clauses seems to be different in hard-sciences. Master (2002) identified much less frequent use of full relative clauses in Biology and Engineering research reports. He also found that computer science and engineering geology did not employ any reduced forms. He believes that this may be because of the perception that reduced relative clauses are too informal for a research article. Some manuals may endorse this strictly. A study guide compiled for engineers, for example, warns authors that "in science and technology, many writers tend to place the action into nouns rather than the verb" (Pennington & Rybicki, 2009, p. 52). It is suggested this may be achieved by avoiding the use of relative clauses. An example given is as follow (p. 53).

	Action hidden in relative clause: **There are several factors that can** INCREASE the complexity and number of components within a product.
	Action put into verb: **Several factors can** INCREASE the complexity and number of components within a product.

Instructions of this kind likely discourage science authors from employing relative clauses when drafting their papers. This seeming difference between hard and soft sciences is important to note since it indicates a potential challenge for researchers drafting manuscripts in collaboration with scholars in a different discipline from their own. We -as scholars in humanities and social sciences and reviewers and editors of various journals- feel that any kind of prescription for authors to (not) use a certain type of relative clauses would be problematic and limit authors' freedom. For us, it is essential that authors make tactical choices about their language use. They may, therefore, opt for use of reduced relative clauses in an attempt to use fewer words in more complicated sentences. This may be necessary when they are obliged to adhere to word limits required by journals they write for. This can also be linked to recommendations for competent behavior. Varying sentence length is advised for example by the American Psychological Association. (2009). Communicating concisely in order to condense information is also commonly recommended (see for example, Biber, 1988, Grice, 1989).

When the different sections of the articles are considered, we note that not all sections show a significant difference. Reduced relative clauses were only slightly more common in the method section (22% vs 18%), as exemplified in the following example:

> Variables *included in the quantitative analysis* could be thought of as falling into three groups. (Text 1)

The ratio of reduced relative clauses to full relative clauses in the discussion and conclusion section was only 29% vs. 28%. Introduction and results sections included a slightly higher number of full relative clauses (34% vs 31% and 18% vs 15% respectively). The abstract received the same percentage of full and reduced relative clauses (2%). These figures suggest that different choices are made at different stages of communication as the argumentation of the paper develops (see Grice's principle, 1989).

The third research question concerned the ratio of active voice to passive voice in the relative clauses used in articles. A summary of the data analysis for this question is given in Table 5 below.

Table 5. Comparison of active and passive voice frequency in relative clauses

Sections	Active		Passive		*Total*		p	t
	f	%	f	%	f	%		
Abstract	8	3	1	1	9	2		
Intro & Lit Review	91	35	33	25	124	32		
Method	44	17	35	27	79	20		
Results	44	17	20	15	64	16	.0027	2.8453
Discussion & Conclusion	70	27	42	32	112	29		
Total	257	100	131	100	388 (257+131)	100 (66+34)		

p < .05

Table 5 shows that out of 388 incidences of relative clauses in the corpus, 257 (66%) were in the active voice in comparison to 131 (34%) in the passive voice. The difference between the two was also at a statistically significant level (p=.0027 < .05). When the different sections of the research papers are taken into consideration, we see that the active voice was dominant in the relative clauses in the abstract, introduction and literature review, results, and discussion and conclusion section (3% vs 1%, 35% vs 25%, and 17% vs 15% respectively). However, the method section received a higher percentage of the passive voice (27%) compared to the active voice (17%). Similarly, albeit a relatively smaller difference, discussion and conclusion section included more relative clauses in the passive voice (32% vs 27%). It is important to note that the first person singular or plural pronouns were only present in two of the sentences that included a relative clause. These are as follows:

> Rogers and Steinfatt reported that non-verbal communication "is a field of multiple nuances *which we have only begun to explore*" (p 162). (Text 2)

> **I** explored the *factors critical* in supporting learner acceptance. (Text 3)

As can be seen, it is only the former that includes 'we' in the relative clause sentence. And the pronoun 'we' in this example appears in a direct-quote rather than in the authors' own words. On the other hand, the latter has 'I' in the main clause, but not in the relative clause. Taken together, this indicates that the use of the active voice in relative clauses does not induce authors to display their own role in the text through the use of personal pronouns.

Table 6. Average sentence lengths

Sections	*Total*		
	a*	b**	c***
Abstract	33	744	22.55
Into & Lit review	293	7465	25.48
Method	160	3559	22.24
Results	242	5071	20.95
Discussion & Conclusion	233	5962	25.59
Total	961	22801	23.73

a*number of sentences
b** number of words
c***average sentence length

The fourth research questions aimed to identify the average sentence length, the role relative clauses play in sentence length, and the possible reasons for variety of sentence length in the articles analyzed. Table 6 describes the data analysis results for the first part of the question.

As can be seen in Table 6 above, the average sentence length of the corpus analyzed in this study is 23.7. When different sections of the manuscripts are considered, the longest average sentence length is found in the Discussion and Conclusion sections (25.59), followed by the Introduction & Literature Review sections (25.48). One reason for this may be the nature of the discussion section in research papers requiring authors to highlight the significance of their findings and their contribution to their disciplines. Sentence length in this section may be affected by the way authors combine the restatement of their findings and their interpretations of them. In this section, authors also make evaluative remarks and compare their findings to previous research findings, which increases sentence length. An example of this from our corpus (text 1) is as follows.

> While previous research has used experiments to assess risk aversion, *which* require a certain competence in numeracy to calculate rates of risk relative to return, the general risk continuum *used* in this paper removes the requirement for numerical aptitude, *suggesting* the differential gender risk aversion by major *identified* above may be due more to societal influences. (Text 1)

As can be seen, this sentence includes four relative clauses: one full and three reduced. The author highlights his contribution to the field by pointing out the difference between his method and the one used in previous research. In doing this, he makes a comment on the previously used method using a non-restrictive relative clause that increases the length of the dependent clause significantly. Similarly, the sentence length of the independent clause is increased by the author's use of a restrictive relative clause to define the method used in his research. The other non-restrictive relative clause following the main clause embeds two reduced relative clauses (one in the active voice and one in the passive voice). These linguistic choices made by the author results in a 56-word long

sentence, which is far beyond the average sentence length (27.6) in an academic text identified by previous researchers (Barber cited in Gotti, 2008).

The relatively longer sentences in the introduction and literature review section, on the other hand, may be due to authors' decision to introduce and define concepts in their area of focus, and establish boundaries. The rationale for their study and the expected impact of their research results may have encouraged them to increase their sentence lengths by using a variety of dependent clauses that include relative clauses. Some examples from our corpus include the following in Table 7:

Table 7. Examples of lengthened sentences

Examples	Comments
Acculturation has been defined as adaptation to a new major society *that results* when people of one ethnicity move to an area with different cultural features. (Text 5)	A restrictive relative clause is used to define a concept.
Daruvala (2007) also references Kruse and Thompson (2001, 2003) as well as Holt and Laury (2002) as researchers *who have found contradictory findings to those mentioned above when investigating gender risk differences.* (Text 1)	Restrictive relative clauses are used in both full and reduced forms to highlight previous research findings.
Behavioral intention captures the extent to which a user intends to, and is willing to, use a technology. (Text 3)	A restrictive relative clause is used to establish the boundaries.
This can then lead to a learning context *characterized by higher engagement and thus more sustained learning.* (Text 3)	A restrictive relative clause is used in its reduced form to highlight the problem the authors perceive.
However, despite these potential benefits, little research has addressed factors *predicting the acceptance of the iPad as a language-learning tool in the KSA.* (Text 3)-	A restrictive relative clause is used in its reduced form to highlight a gap in the literature, which emphasizes the contribution of the research.

It is also important to note that the results section included the shortest sentence length (20.95), which is significantly lower than the average sentence length (27.6) in scientific texts identified by Barber (cited in Gotti, 2008). Research papers that combine results and discussion sections may encourage authors to write longer sentences when they compare their results to those in previous research, or when they make comments on them. However, the fact that results sections in the five research articles in our corpus were separate may indicate a possible reason for the relatively shorter sentences in this section.

Another interesting finding worthy of further investigation is that the lowest sentence length (20.65) is found in text 2, which was authored by five 'non-native speakers' of English from the Czech Republic. As an initial hypothesis, there has been speculation that comparatively lower sentence length in this paper may be attributed to the authors not being 'native speakers' of English. Previous research found that so-called non-native speakers who

submitted research articles to the British Journal of Surgery tended to produce significantly shorter sentences than native speakers who had their papers published in the same journal (Mertens, 2008). However, we do not wish to imply that the native/non-native distinction is a simple one or even a valid one or indeed that the distinction is in any way a reflection of competence in academic written literacy. It has been suggested that not feeling worried about writing quality, native speakers may be less meticulous about wordiness (Newell, n.d.), which increases the length of their sentences. Cultural differences in academic style are certainly worthy of future investigation, assuming the study does not depend on an over simple binary distinction that does not reflect the internationalization of academic literacy in English.

6. Conclusions

The research presented in this paper investigated a relatively understudied topic in academic writing: Relative clauses in their full and reduced forms used by authors in humanities and social sciences. It also investigated the use of the active and passive voices in relative clauses for transitivity purposes. These unavoidable linguistic choices are particularly important for authors aiming to be publishable as they can reflect a degree of competence or sophistication in technical writing in their disciplines. As Hamoy points out, authorial voice is at least partially "determined by the features that [the author uses] and how those features are read and interpreted by the reader" (Hamoy, 2014, p. 16). Voice and competence are also inextricably related.

Results showed that relative clauses were common in the corpus, and that they were more frequently used in the discussion & conclusion as well as introduction & literature review sections, indicating the significance of this linguistic element in the developing argumentation of a paper in the analyzed scientific disciplines. Results also showed that with their particular use in the discussion & conclusion section of the manuscripts, relative clause reduction was more common than full relative clauses. On the other hand, authors were found to use active voice more frequently in their relative clauses than passive voice. However, the passive voice in relative clauses appeared more frequently in the result section.

Considering the role of relative clauses have in varying sentence structure and length, as well as helping establish an authorial voice, these findings are particularly important. They can inform authors in the scientific community about important choices that are available when writing research papers which affect the readers' perceptions of competence. However, we believe that journals and/or academic writing instructors should shun a prescriptive approach to using relative clauses. Authors need to have a variety of linguistic choices at their disposal, and they should use them in well-informed ways to establish their voice and

demonstrate their competence.

Appendix A- List of Texts Analyzed

Text 1- Agnew, S. (2017). The role of gender, cognitive attributes and personality on willingness to take risks. *Business and Economic Research, 7*(1), 1-16.

Text 2- Fisher, E., Rupova, R., & Bittenerova, D. (2014). *How young people communicate: A Czech perspective. Business and Economic Research, 4*(2), 323-338.

Text 3- Lawrence, B. A. M. (2016). IPad acceptance by English learners in Saudi Arabia. *English Language Teaching, 9*(12), 34-46.

Text 4- Taylor, S. A. (2016). Attitude and gender as predictors of insurance loyalty. *International Journal of Psychology and Behavioral Sciences, 6*(3), 99-102.

Text 5- Gray, V., Cossman, J. S., Dodson, W. L., & Byrad, S. H. (2005). Dietary acculturation of Hispanic immigrants in Mississippi, *Salud Publica de Mexico, 47*(5), 351-360.

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