



LOGICAL OPERATORS IN LOCAL AND INTERNATIONAL ENGLISH RESEARCH ARTICLES IN APPLIED LINGUISTICS: AN INTERACTIVE CLAUSE COMPLEXING ANALYSIS

ALIREZA JALILIFAR 

Shahid Chamran University of Ahvaz, Iran
a.jalilifar@scu.ac.ir

ZAHRA ALISHAEI 

Islamic Azad University of Gachsaran, Iran
alishaei2478@iau.ac.ir

ALEXANNE DON 

University of New South Wales Sydney, Australia
eldon@panix.com

ABSTRACT. This corpus-based study provides a contrastive insight into the interactive influence of logical operators on clause complexing in local and international English journals in applied linguistics from the systemic functional linguistic perspective. The data comprised 320 method sections of research articles in international and local journals from 2016 to 2022. Following Halliday's clause complexing pattern, the logico-semantic relations between clause nexuses were coded as simplex, paratactic, or hypotactic clauses and were contrastively analyzed. The results revealed a distinct difference between local and international authors in applying logical operators in simplex and complex clauses and navigating readers' interpretation patterns. The qualitative analysis attributed this distinct difference to complex, explicit, and reader-oriented information structure which contributed to the fact that maintaining coherence through discourse markers requires the application of adept interactive clause complexing strategies. The cognitive and interactive functions of logical operators shape the systemic selection of clause complexes to optimize the presentation of information for a specific, non-present audience. The findings of this study may assist academic writing teachers in explicitly instructing novice academic authors to employ logical operators proficiently in simplex and complex clauses and manage interactive information structure.

Keywords: Clause complexing, Coherence, Explicitness, Interactive information structure, Logical operators.

OPERADORES LÓGICOS EN ARTÍCULOS DE INVESTIGACIÓN EN INGLÉS LOCALES E INTERNACIONALES EN LINGÜÍSTICA APLICADA: UN ANÁLISIS INTERACTIVO DE LA COMPLEJIZACIÓN DE CLÁUSULAS

RESUMEN. Este estudio basado en corpus proporciona una visión contrastiva de la influencia interactiva de los operadores lógicos en la construcción de complejos clausales en revistas inglesas locales e internacionales de lingüística aplicada desde la perspectiva lingüística funcional sistémica. Los datos comprendían 320 secciones de métodos de artículos de investigación en revistas internacionales y locales de 2016 a 2022. Siguiendo el patrón de complejización de cláusulas de Halliday, las relaciones lógico-semánticas entre los nexos de cláusulas se codificaron como cláusulas simplex, paratácticas o hipotácticas y se analizaron de forma contrastiva. Los resultados revelaron una clara diferencia entre los autores locales e internacionales a la hora de aplicar operadores lógicos en cláusulas simples y complejas y navegar por los patrones de interpretación de los lectores. El análisis cualitativo atribuyó esta clara diferencia a una estructura de información compleja, explícita y orientada al lector, lo que contribuyó al hecho de que mantener la coherencia a través de marcadores del discurso requiere la aplicación de estrategias hábiles de complejidad de cláusulas interactivas. Las funciones cognitivas e interactivas de los operadores lógicos dan forma a la selección sistémica de complejos de cláusulas para optimizar la presentación de información para una audiencia específica y no presente. Los hallazgos de este estudio pueden ayudar a los profesores de escritura académica a instruir explícitamente a los autores académicos principiantes a emplear operadores lógicos de manera competente en cláusulas simples y complejas y a gestionar la estructura informativa interactiva.

Palabras clave: Construcción de complejos clausales, Coherencia, Explicitación, Estructura informativa interactiva, Operadores lógicos.

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1. INTRODUCTION

The overall quality of internationally acceptable research is attributable to the academic work of core countries that serve as the primary producers of internationally published research (Zuengler and Carroll), thereby playing a pivotal role in imposing criteria on research published in international journals. Although this imposition of quality criteria could be viewed as academic imperialism, it is pragmatically inevitable (Jaroongkhongdach et al. 1996). According to Jaroongkhongdach et al., among other factors, a generic aspect that contributes to creating quality in research articles (RAs) is “coherence” which they define as “the logical relationships between contents or ideas” (197). Achievement in academic writing depends on exposing clear information (Hyland), and is managed by observing interactive information structure in combining clauses.

Interactive strategies are defined as “the management of the flow of information that serves to guide readers through the content of the text” (Thompson, Interaction

in academic writing 59). Prior to structuring information, post-academic writers engage in predictive analysis in devising textual markers to give coherence to their texts. Including these markers in texts addresses the expected queries or reactions of readers (Thompson, Interaction in academic writing 58) to proactively lead them to survey the information. These textual clues referred to as “logical operators” (Sinclair 7) account for interactive information structure and semantically determine the relation of clauses to one another, thereby directing readers as they navigate the text (Thompson, Interaction in academic writing 59). For example, logical operators such as “because” or “to” imply questions regarding the reason or purpose of preceding or succeeding information. Our corpus-based study hypothesizes that the linguistic and rhetorical differences in applying logical operators and clause interdependencies can potentially reflect underlying authors’ stance in RAs, which calls for a thoughtful examination of the patterns of rhetorical variations in clause relation in Institute for Scientific Information (ISI) vs Islamic Science citation (ISC) RAs.

Web of Science (WoS) is a globally approved research database that appraises researchers, research outlets, and academic institutions. This database is internationally recognized as an outstanding scientometric center, and journals indexed in WoS are referred to as Institute for Scientific Information (ISI-indexed) journals. However, aiming to document academic texts published in non-English speaking countries, the Islamic Science Citation (ISC) database plays a similar role in evaluating academic texts, and is committed to compiling, analyzing, and sharing multidisciplinary scientific information in the Islamic world. ISI-indexed articles “go through a rigorous peer-review process” (Zhang 203), and the authors’ manuscripts are critically proofread by critical pre-publication readers to align them with the linguistic and genre conventions of English-speaking discourse communities (Burrough-Boenisch 223). ISC-indexed articles, on the other hand, are mostly written and peer-reviewed by local reviewers. Comparing clause complexing strategies in ISI (international) vs ISC (local) applied linguistics RAs can contribute to our understanding of how international academic authors, as professional experts in the field, devise logical operators in taxis and logico-semantic systems to create a clear flow of information for readers, providing a foundation for teaching more effective writing techniques.

Systemic functional linguistics (SFL) offers a theoretical approach that analyzes the relationship between social contexts and linguistic aspects of texts (Halliday and Matthiessen), between purpose and choice (Hart), and between two core concepts of systemic and functional views of language (Halliday). According to the first concept, language is a system of choices for making meaning in a particular context (Halliday and Matthiessen), and the second concept implies that understanding language means understanding the way that it is used and structured in context (Halliday and Matthiessen). In writing, SFL analyzes linguistic choices according to the context and purpose of writing (Wingate 27); therefore, contextualized language use in authentic situations is preferred over decontextualized isolated sentences, and the focus in SFL is on “text in context” (Coffin and Donohue 64).

In SFL theory, clause complexing is “formed out of relations that link clauses together to form clause complexes” (Halliday and Matthiessen 367). Construing cohesion and coherence can be seen as a function of taxis and logico-semantic systems in stretches of discourse (Ngongo). The taxis system is concerned with linking one clause with another clause through equal (paratactic) and unequal (hypotactic) status. In addition to the taxis system, clauses are associated with one another through two basic logico-semantic relations of “expansion and projection” (Halliday and Matthiessen 377). These systems allow authors to develop the meaning of a text by choices that are preferred by the interlocutors in a particular context (Li and Yu 2).

The studies on clause complexes have tended to center their investigation on the frequencies of simplex and complex tactic and logico-semantic clauses in academic texts. The present study, however, intends to uncover the cohesive influence of logical operators on interactive clause complexing strategies in local and international RAs in applied linguistics journals written in English. This study is therefore taken to address the following research question:

How does the use of logical operators in the clause complexing system distinguish international and local authors in managing interactive information structure in their academic texts?

2. CLAUSE COMPLEXING IN SFL

In SFL theory, the term “clause” is referred to as clause simplex, which includes a single clause (Eggin); whereas clause complexing is “formed out of relations that link clauses together to form clause complexes” (Halliday and Matthiessen 367). Any one pair of clauses related by taxis is referred to as clause nexus (Halliday and Matthiessen 375). The nature of clause complexes can be either paratactic or hypotactic. This interdependency is also logico-semantically maintained throughout the text. Figure 1 maps out how clauses are grouped together into clause complexes and illustrates the alternative choices of systemic clause complexing along with their notations to expand or project clauses in texts in SFL.

As figure 1 illustrates, in configuring taxis relations between clauses, authors can alternate between paratactic or hypotactic clause complexing to manage a coherent dialogue in research papers. In terms of symbols, a clause simplex or a clause nexus which conveys the meaning completely is marked by triple vertical lines ($| | |$), and double vertical lines ($| |$) signify every clause in a clause nexus. In light of their “initiating and continuing functions” (Halliday and Matthiessen 375), Arabic numbers (1, 2, etc.) are used to code paratactic clauses, whereas in hypotactic clauses which function as “modification in the structure of groups” (Halliday and Matthiessen 375) Greek letters (α , β , etc.) are used to code the dominant clause as (α) and the dependent modifying clauses as (β , etc.).

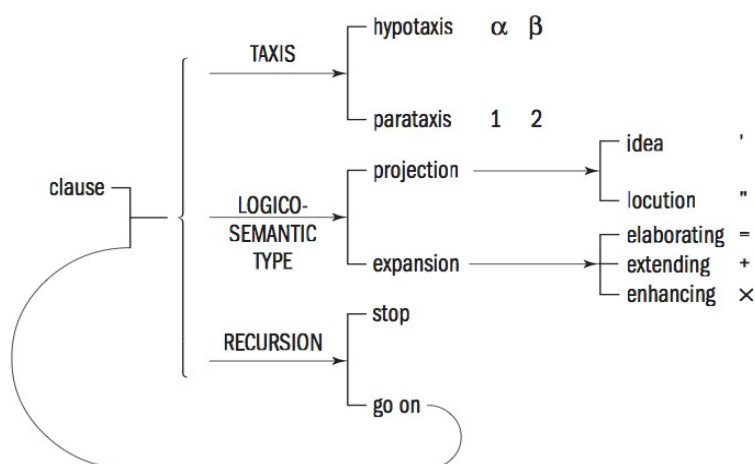


Figure 1. The system of clause complexing in SFL (Halliday and Matthiessen 373).

The logico-semantic relations represent the expansion or projection of the primary clause through the secondary clause. In expansion, additional information is provided through three processes of elaboration, extension, and enhancement (Halliday and Matthiessen 377). In elaboration nexuses (marked by =), one clause elaborates on the meaning of another by restating it in other words, exemplifying, commenting, or specifying it in greater detail; in extension nexuses (marked by +), one clause expands the meaning of another through addition (*and*), giving an exception (*but*), or offering an alternative (*or*). In enhancement nexuses (marked by ×), one clause expands the meaning of another in terms of purpose, manner, condition, reason, time, place, and so on. (*then, yet, so*).

Clause-complexes are also related logico-semantically by means of mental and verbal processes which are called “idea and locution”, respectively (Halliday and Matthiessen 379). In idea nexuses (marked by '), one clause is projected by another that contains a mental process such as *think, believe, consider*, and so on. Finally, in locution nexuses (marked by "), one clause is projected by another that contains a verbal process such as *say, tell, ask*, and so on. Table 1 provides coded examples illustrating how these systems of choices are manifested within RAs in applied linguistics.

The examples in this article are taken from the corpus of the present study and are codified with the abbreviations of the respective name of the journal, the year of publication, and the sequence of coding assigned by the researchers. Table 2 provides a list of the journals' names paired with their respective abbreviations.

Uncovering the interdependency and logico-semantic relations between clauses is considered by Halliday and Matthiessen to be “a powerful grammatical strategy for guiding the rhetorical development of the text” (375). By explicitly defining the

strategic use of discourse markers that international authors make in providing a clear connection and order between clauses, we can assist emerging academic writers in appropriately registering the logical operators in paratactic and hypotactic clauses to register logical relations and coherence in their RAs.

Table 1. Examples of tactic and logico-semantic clause relations in the analyzed method sections.

Logico-semantic relation		Tactic relation	
		Paratactic (1 2)	Hypotactic (α β)
Expansion	Elaboration (=)	1 These have been criticized both on methodological grounds and on the conceptual basis =2 that academic vocabulary is a debatable construct. ESP-2018-4	α Files within each block were randomized before presentation, = β such that each listener rated sentences in a unique order. MLJ-2018-1
	Enhancement ($\times$)	1 Sentence initial bundles, unlike non-initial ones, overlap with sentence starters $\times$ 2 and thus can be seen to share similarities. ESP-2020-6	α Levene's test and Mauchly's test were run $\times\beta$ to examine the homogeneity of between-group variances and the sphericity of within-group variances respectively. EAP-2022-10
	Extension (+)	1 It has more than 600 beds +2 and is located in a modernized and developed city: Taoyuan, Taiwan. ESP-2018-5	+ β While it can be further subdivided into finer-grained subject groupings, α these are small enough $\times\beta$ to make statistical analysis problematic. ESP-2018-4
Projection	Locution (")	1 The interviewer then said , "2 "tell me how you decided to choose this face." MLJ-2018-3	α Children with EAL were asked " β to report the language [they used most commonly]] at home. AL-2022-3
	Idea (')	1 After five rounds of data collection, I believed '2 I had achieved a coherent grounded theory +2 and could derive no new codes from the collected data. EAP-2016-3	α It was believed ' β that exemplars of this occluded genre may be more easily available from this field than from others. ESP-2016-4

Table 2. List of journals and corresponding abbreviations.

ISI journals	
Journal	Abbreviation
<i>Modern Language Journal</i>	<i>MLJ</i>
<i>Applied Linguistics</i>	<i>AL</i>
<i>English for Specific Purposes</i>	<i>ESP</i>
<i>English for Academic Purposes</i>	<i>EAP</i>
ISC journals	
Journal	Abbreviation
<i>Teaching English Language</i>	<i>TEL</i>
<i>Research in English Language Pedagogy</i>	<i>REL P</i>
<i>International Journal of Foreign Language Teaching Research</i>	<i>IJFLTR</i>
<i>Journal of English Language Pedagogy and Practice</i>	<i>JELPP</i>

3. LITERATURE REVIEW

As pointed out above, structuring information in clauses necessitates clause relations through textual resources. Winter (3) conceptualizes clause relations as the examination of how an individual clause or sentence is understood in relation to other clauses or sentences. A number of studies (e.g., Halliday and Hasan; Halliday and Matthiessen; Gerot and Wignell; Thompson; Butt et al; Eggins) have devoted great attention to the way clauses are related in texts. Barker considers Clause-level relationships (CLRs) as semantic relationships of finite clauses related by a conjunction or conjunctive punctuation. Lehman (182) discusses various strategies to relate clauses emphasizing subordination, proposition, hypotaxis, embedding, and parataxis. However, according to Rashidi and Mazdayasna (56), there is a need to consider a shift from the grammatical to the communicative properties of language. Therefore, the interactive approach that writers take to relate clauses in academic writing can differentiate novice and veteran academic writers. Being inexperienced in making syntactically complex clauses may impede novice writers constructing the meaning that conforms to the interactive information structure pattern in international journals (Graham; Scardamalia and Bereiter).

To shed light on clause complexing strategies, some studies have examined the choices of paratactic and hypotactic clauses that professional scholars actually employ to express comprehensive meaning in their academic writing. Baklouti carried out a study comparing the prevalence of clause complexing in research article abstracts in hard and soft disciplines. She evaluated the taxis system and structural choices above the clause to analyze the effect of genre features and disciplinary differences, first between the clause simplex and the clause complex, and then between parataxis and hypotaxis in the RA abstracts. Her statistical analysis confirmed that clause simplex is prevalent in hard discipline abstracts, while soft

discipline abstracts showed a preference for clause complexes. In comparing complex clauses, her study quantitatively confirmed that hypotaxis is preferred over parataxis across all disciplines. She attributes this to the concise and convincing features of the genre of RA abstracts.

Leong similarly conducted a study investigating the frequencies of clause relationships in humanity and science RAs. The results of his study indicated that scientific writing exhibits a greater preference for simple and straightforward clause structures compared to writing in humanities, and variations in paratactic/hypotactic and logico-semantic clause relations are indicative of differences between science and humanities disciplines.

Leong and Bee used Halliday's clause-complex framework to analyze exposition-type essays written by secondary school students in Singapore. Their analysis showed that more proficient writers display a greater mastery of clause-complex structures, but less able writers primarily prefer simplex clauses. However, in the study of abstracts written by English undergraduates, Rukmini showed that both parataxis and hypotaxis clause complexes are employed in their texts. Ngongo also identified the use of taxis and ideational relationships as a significant factor of coherent and cohesive text in the discussion chapter of undergraduate English students' theses.

Building on the insights of these studies, the present study investigates the functional significance of simplex/complex clauses and logical operators in maintaining interactive information structure. The findings will offer insights into how these linguistic features maintain interactive information structure and contribute to the international conventions of reader-friendly academic writing. Research examining metadiscoursal features can have significant pedagogical implications, because metadiscourse studies are rich sources of conventions in constructing knowledge and regulations in managing writer-reader relationships (Khedri and Kritsis).

4. METHOD

The present study uses a sequential quantitative and qualitative methodology. The primary purpose of this analytical research design is to provide a comprehensive understanding of how authors use logical operators to structure complex clauses in the methodology sections of applied linguistics RAs. The methodology section of RAs was chosen because it is predominantly self-administered by the authors and, as Swales and Feak indicate, it is more cautiously analyzed because it is subject to careful analysis by reviewers, supervisors, editors, and examiners.

4.1. *Corpus collection*

The selection of corpus articles was guided by a set of predefined criteria, which were applied to identify suitable texts from both local and international publication.

First, ISI-indexed journals that exclusively specialize in applied linguistics were narrowed down to leading Q1 journals as outlined in Journal Citation Report 2021. This analysis involved a careful examination of the scope and the quartile of journals on their respective websites with the inclusion criterion targeting those with explicit focus on applied linguistics. The same scope criteria as the ISI journals were used in the selection of ISC-indexed journals. To homogenize the data, all local journals as well as local articles were exclusively sourced from Iran. Two additional criteria were identified in each article through a manual review process. The first criterion assessed the description of the method in an independent method section labeled in the articles. Another criterion involved the inclusion of empirical studies, either by the authors' explicit statement or by reference to Swain's and McNamara's definition of empirical research. According to Swain, empirical knowledge is created by observing phenomena and drawing inferences from the collected data and, as McNamara indicates, is characterized by providing evidence for or against the legitimacy of inferences.

Three hundred and twenty method sections from 2016 to 2022 were finally filtered randomly from online databases to be included in the resulting dataset. The final dataset of ISI journals comprised 160 method sections consisting of 245,913 words and 10,310 clause nexuses. Table 3 provides information about the extracted ISI articles.

Table 3. Preliminary information about the method sections of selected articles per ISI journal.

Journal title	No. of articles	Word counts in Methods	Clause nexus counts
<i>Modern Language journal</i>	40	72,031	2,960
<i>Applied Linguistics</i>	40	61,483	2,690
<i>English for Specific Purposes</i>	40	54,329	2,228
<i>English for Academic Purposes</i>	40	58,070	2,432
Total	160	245,913	10,310

The final dataset of ISC journals comprised a total of 160 methodology sections consisting of 162,231 words and 7,439 clause nexuses. Table 4 provides information about the ISC articles selected.

Table 4. Preliminary information about the method sections of selected articles per ISC journal.

Journal title	No. of Articles	Word counts in Methods	Clause nexus counts
<i>Teaching English Language</i>	40	41,426	1,818
<i>Research in English Language Pedagogy</i>	40	40,152	1,791
<i>International Journal of Foreign Language Teaching Research</i>	40	37,425	1,710
<i>Journal of English Language Pedagogy and Practice</i>	40	43,228	2,120
Total	160	162,231	7,439

4.2. Corpus analysis

Analyzing the corpus of the current study consisted of two main phases to answer the question of how academic writers in ISI- and ISC-indexed journals apply discourse markers to create interdependencies (taxis) between clauses and promote logico-semantic and rhetorical structure in the method sections of their research papers. To pursue this aim, the corpus, which comprised extracted articles from the journals published between 2016 and 2022, was first coded and then analyzed quantitatively to illustrate the interactive application of discourse markers to structure coherent information.

4.2.1. Corpus Coding

Each methodology section was subjected to a computer-assisted sentence splitting process to facilitate subsequent analysis. This process involved copying and pasting sentences into a specialized software tool known as the sentence breaker program (tools.00h7.com). As shown in Example (1), this software separates each clause nexuses by three vertical lines (|||), and numbers each clause by angle brackets (<n>), aligned with the established clause analysis in SFL. Given that a period (.) served as the breaker character in this tool, it was necessary to conduct some manual verifications to number clause nexuses accurately in the text. For example, the periods (.) in “i.e.” or “0.5” had to be eliminated prior to analysis. The input and output of Sentence breaker tool is illustrated in the Appendix.

Halliday and Matthiessen’s clause complexing analytical framework was employed in the next stage to analyze the interactive information structure of clauses from the viewpoint of simple, paratactic, and hypotactic and logico-semantic systems. As mentioned earlier, in configuring the logical relations between clauses, authors can alternate between simplex, paratactic, or hypotactic clauses to manage a coherent dialogue in research papers. To unveil the interactive information structure, each clause nexus was codified as simplex or complex. All complex clauses were then analyzed and coded for the paratactic and hypotactic clause

complexing patterns, and the ideational patterns of expansion and projection. This SFL-based analysis intended to highlight the discourse markers employed in systemic choices of paratactic and hypotactic clauses by academic writers to manifest presentation of ideas to non-present audiences.

By referring to the classified tables provided in Halliday and Matthiessen (411), first the clauses of 20 articles were coded into mutually exclusive categories by the main researcher. Then a re-coder with substantial knowledge of English re-examined 10 articles randomly to validate the reliability of the analysis. It is worth noting that the coder and re-coder conflict was negotiated to reach inter-coder consensus. Example (1), taken from the current corpus, shows the division process of clauses, where the clause boundary is represented through bold-faced codes.

(1) ESP-2022-2

<1>||| This article is part of a larger study [[that took place at Missouri S&T, a medium Carnegie R2 doctoral university, located in the American Midwest.]]
|||

<2>||| The larger study was approved by the university Institutional Review Board (IRB). |||

<3>||| For SP collection, a total of thirty-five SP writers, [[who submitted their SPs to the master's program in technical communication at Missouri S&T]], were contacted over a period of three months (August 2018–October 2018). |||

<4>||| Each writer was sent a contact email and a consent form attached with that email. |||

<5>||| **α** The goal of this consent form was | **xβ1** to ensure that each writer's participation in this study was voluntary and || **xβ+2** to let them know that his or her identity would remain confidential. |||

<6>**connective**||| Finally, twenty-four of those thirty-five writers gave me permission to use their SPs. |||

<7>**connective**||| Therefore, the final SP corpus included twenty-four successful SPs submitted to the department from 2005 (the year in which the program began) to 2019 (the year in which I began my research for this study). |||

<8>||| **xβ** Because some of the current and former students did not allow me to access their SPs, || **α** the corpus does not include all the successful SPs submitted to the department since 2005. |||

<9>||| **α** This paper is further unable to specify the percentage of the total SPs the corpus represents | **xβ** since the department does not keep any record of the number of applications and admissions each year. |||

<10> || | α In addition, this paper does not contain the year-wise distribution of the SP collection records || $\times\beta$ because I was not provided with any identifying information including the year the SP was written || $\times\beta$ to maintain confidentiality. || |

<11> || | The SPs were written in response to one of two prompts. || |

Then the main researcher continued coding the remaining articles clause by clause. Therefore, the output of the corpus analysis includes frequencies of simplex and complex paratactic and hypotactic clauses. The percentage of the distribution of each clause type was then expressed in relation to the total number of clauses in the respective methodology section (e.g., the percentage of paratactic extension clauses in relation to all clauses) to accommodate the inconsistency in the word counts.

These analyses were separately carried out for the articles to contrastively address how academic writers in ISI- and ISC-indexed journals employ discourse markers in tactic and logico-semantic systems to organize the information interactively in the methodology section of their RAs. The ISI- and ISC-indexed categories were then analyzed qualitatively. Thus, the findings are derived from the sequential quantitative and qualitative analyses.

5. RESULTS AND DISCUSSION

To analyze coherence as a crucial aspect in research quality assessment, the results of the coding were analyzed quantitatively. This quantitative analysis included frequency counts of simplex and complex clauses in the method parts of ISI Q1 and ISC journals in applied linguistics. To determine the percentages of these strategies, raw numbers of different types of clause relations to structure the information were separately counted in the ISI and ISC research articles, and their percentages were calculated. The empirical data pertaining to this contrastive analysis in managing coherent information structure is presented in Figure 2 below.

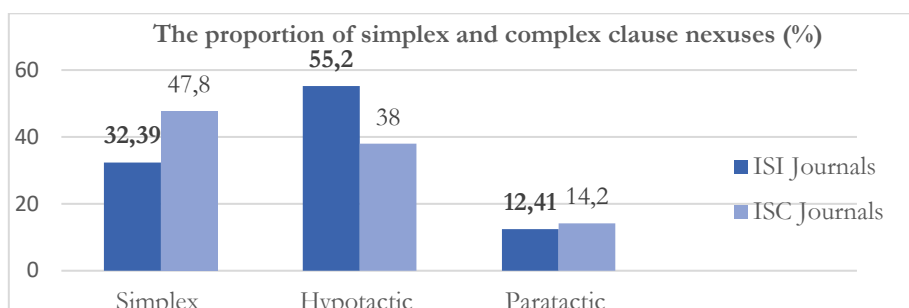


Figure 2. Distribution of simplex and complex clause nexus in ISI and ISC articles.

As illustrated, there is a noticeable disparity between the two sets of methods in ISI and ISC RAs in the use of simple and hypotactic complex clauses. ISI employ hypotactic relations to construct interactive information structures proportionately more than simplex clauses (55.2% vs. 32.39%). ISC methods, on the other hand, exhibit greater prevalence of simplex clauses which is about 1.47 times as high as ISI methods (47.8% vs. 32.39%). The difference in the use of hypotactic clauses by ISI and ISC authors can be expressed as a ratio of 1.45 (55.2% vs. 38%).

The statistical analysis using a z-test for proportions confirmed that these differences are statistically significant. The use of simplex clauses was significantly higher in ISC articles ($z = -20.79$, $p < .001$), while hypotactic clauses were significantly more frequent in ISI articles ($z = 22.63$, $p < .001$). A smaller but still significant difference was also observed for paratactic clauses ($z = -3.48$, $p < .001$).

Findings from the previous scholarly literature on academic writing have highlighted three salient characteristics that contribute to the overall coherence in academic articles. These features are identified as complexity (Bailey and Heritage; Staple, et al; Jagaiah, et al.), explicitness (Biber and Gray) and reader-oriented information structure (Thompson, Interaction in academic writing 59). Therefore, the qualitative analysis of simplex and complex clauses in ISI versus ISC journals will undertake an examination of these features in academic writing.

5.1. Complexity

Complexity reflects “sophisticated vocabulary and sentence structures” (Bailey and Heritage) and, according to Datchuk and Kubina (181), constructing complex sentence structures is more crucial at academic levels. Similarly, Jagaiah et al. (2577) point to the fact that “proficiency in the construction of sophisticated and varied sentence structures, namely, syntactically complex sentences, is important in producing high-quality texts.” The notable prevalence of complex structures in ISI RAs can be attributed to the fact that international authors opt for integrating the meaning tightly and tend to write economically. Attaining complexity while maintaining a continuous flow of integrated discourse that is coherent is an exclusive function of complex clauses (Halliday and Matthiessen 389) and is potentially facilitated by the strategic use of logical operators in the text. Note example (2):

(2) ESP-2022-9

||| **×β** As was made clear by the additional comments on Facebook or Twitter, || **α** the customers posted the screenshots || **×β1** because they were displeased with the response || **+2 and therefore** wanted to vent their dissatisfaction. |||

As illustrated in (2), the semantic influence of developing a clause nexus by embedding four clauses is “the *tighter integration in meaning*” (emphasis added) (Halliday and Matthiessen 365). Creating a link between clauses is the dynamic

potential of clause complexes and allows the author to “choreograph’ very long and intricate patterns of semantic movement while maintaining a continuous flow of discourse that is coherent” (Halliday and Matthiessen 389). In this example, the author has afforded the logical operators “as”, “because”, and “therefore” to construct interrelated complex clauses to integrate the information. However, a more frequent use of simplex clauses in ISC journals may result from the inclination of local academic authors towards looser integration in meaning. Consider example (3):

(3) TEL-2022-1

Simplex clause ||| In the first step, the two intact classes are assigned to teacher syllabus group and negotiated syllabus. |||

Simplex clause ||| The two intact groups received the FLLM questionnaire and FLA scales. |||

As the mockup examples (3a) and (3b) show, there are two possible ways of combining the two sentences in example 3 using different syntactic strategies. By the strategic use of logical operators “after”, “first”, and “then”, the author could employ the dynamic function of complex clauses to provide structurally complex and linguistically economical information for non-present audiences while maintaining a coherent flow of discourse.

(3a) Hypotactic enhancement

||| **×β After** assigning the two intact classes are assigned to teacher syllabus group and negotiated syllabus, | | **α** they received the FLLM questionnaire and FLA scales. |||

(3b) Paratactic enhancement

||| 1 First, the two intact classes are assigned to teacher syllabus group and negotiated syllabus | | **×2 and then** received the FLLM questionnaire and FLA scales. |||

This tendency toward simplex clauses might result from the local authors’ limited awareness of the cognitive effects of complex clauses in structuring economical and interactive information for non-present readers. Cognitively, authors are forced to consume the reader’s time wisely and settle for writing everything in fewer words “by producing unique sentences whose selected content has been in some way predetermined by that of its immediately preceding sentences” (Winter 47). Therefore, it may be superfluous to overload the minds of the non-present readers with an unjustified burden of 28 words when 20 would do. Meanwhile, using logical operators through hypotactic clauses can assist the reader in deeply comprehending the relationships between clauses while allowing the author to take advantage of the dynamic potentials of complex clauses to bolster the information interactively. Consider example (4):

(4) TEL-2022-6

Paratactic extension ||| 1 Out of 108 participants, 37 students had averages below 14 || +2 and were excluded from the study. |||

As the mockup examples (4a) and (4b) show, applying hypotactic logical operators “since” or “because” can assist readers in construing the cohesive relations between clauses while allowing the author to promote or postpone the information interactively as follows:

(4a)

||| **xβ Since** 37 out of 108 participants had averages below 14, || **α** they were excluded from the study. |||

(4b)

||| **α** 37 out of 108 participants were excluded from the study || **xβ because** they had averages below 14. ||

Consider example (5) which illustrates the importance of logical operators in hypotactic clauses.

(5) RELP-2020-10

Complex clause ||| **α** First, they were asked || **β** to fill in the first questionnaire (MPS) in 15 minutes. |||

Simplex clause ||| After that, the questionnaires were gathered |||

Complex clause ||| **α** and the second questionnaire, i.e. TALIS, was distributed, again with the time set of 30 minutes || **xβ** to be filled. |||

By employing a hypotactic logical operator “when” these three clause nexuses can be integrated into one hypotactic complex structure as shown in (5a).

(5a) Complex clause

||| 1 **xβ When** the first questionnaire (MPS) was filled || + 2 and gathered in 15 minutes, || **α** the second questionnaire, i.e. TALIS, was distributed || **xβ** to be filled in 30 minutes. |||

As Jagaiah et al. indicate, writers who construct sentences by making connections between clauses can create complex structures, which will consequentially alleviate the load on the cognitive resources of interpreters. It is, therefore, important to know that the systemic choice of linguistic forms is not exclusively determined by the text and context. However, the distinctive cognitive and interactive functions of logical

operators can influence authors' priorities on the systemic choice of clause complexes to maintain reader-oriented information structure for non-present audiences.

5.2. Explicitness

Explicitness is managed through “decontextualized, autonomous assumptions and logical relations” which are explicitly encoded in the text (Biber and Gray 2). According to Bruce, the method sections of humanities RAs are discernibly engaged with complex structures, which correlate with a higher prevalence of causal connections that authors project in the ongoing discourse. Hyland (81) provides two reasons for this complexity. According to him, “soft sciences are presumed to have less rigor”, and “variables are more varied and causal connections more tenuous.” Halliday and Matthiessen (411) have categorized the logical operators for maintaining these causal connections under the hypotactic finite and non-finite clauses because they can solely be realized by employing hypotactic interdependency. As examples (6) to (9) from international journals illustrate, the enhancing logical operators “since”, “because”, “although”, “if”, “in order to” and so on are explicitly manifested through the strategic use of hypotactic enhancement clause ($\times\beta$).

(6) MLJ-2020-4

|| $\times\beta$ **If** only the target words were included, || α the participants may have become discouraged || +2 and not taken the tests seriously. || |

(7) AL-2020-10

|| $\times\beta$ **Because** the project was led by hostage and crisis police services, || α data were supplied by the police themselves, according to their own internal data management process. || |

(8) ESP-2018-1

|| | α All but one of the NSs are British, || $\times\beta$ **although** half had been working in non-UK universities for a relatively long period. || |

(9) EAP-2020-5

|| | α Each of the university's library websites was searched || $\times\beta$ **in order to** identify the theses || $\times\beta$ **to** include in the study. || |

To account for the frequency of these hypotactic logical operators in local and international RAs, a random dataset of 100,000 words per journal was subjected to the navigation tool in Word doc. By activating the Ctrl and F keys, the document can be searched for the location and frequencies of a particular character, word, or phrase within the text. The results of this analysis are presented in Table 5 below.

Table 5. Distribution of causal logical operators in ISI vs ISC journals.

<i>Logical markers</i>	<i>ISI Journals</i>	<i>%</i>	<i>ISC Journals</i>	<i>%</i>
<i>“If”</i>	79	7.34%	21	2.51%
<i>“Because”</i>	98	8.93%	36	4.29%
<i>“Since”</i>	26	2.42%	34	4.05%
<i>“Although”</i>	45	4.18%	9	1.08%
<i>“(In order) To”</i>	834	77.13%	738	88.07%
<i>Word count</i>	100,708 words		100,647 words	

As Table (5) illustrates, the heightened prevalence of causal logical operators in ISI-indexed journals can be construed as a deliberate attempt by international authors to explicitly communicate the causal interdependencies between clauses which in turn increases the occurrence of hypotactic clauses in ISI-indexed journals. The prevalence of simple and paratactic complex clauses in ISC academic texts is, therefore, expected to correlate with the underuse of explicit hypotactic logical operators. Consider examples (10) and (11) where the underuse of justifying discourse markers is related to the corresponding rise in the number of simple clauses and paratactic extensions in the text.

(10) Tel-2016-8

Simplex clause ||| They had no previous experience of attending language institutes; |||

Simplex clause ||| they had studied English only at school. |||

(11) IJFLTR-2016-3

Paratactic extension:

||| **1** Some of them did not prefer to take part in the study ||| **+2** and were removed. |||

Examples (10) and (11) from ISC journals engage readers in a reasoning discourse; however, the clause lacks the explicit causal discourse markers. These simple and paratactic clauses can be augmented hypotactically to evince logical operators explicitly as follows:

(10a)

||| **×β Since** they had studied English only at school, ||| **α** they had no previous experience of attending language institutes. |||

(11a)

||| **α** Some of them were removed, || **×β because** they did not prefer to take part in the study. |||

In (12), the author has used nominalization to structure the propositional information in the text which in turn reduces the explicit manifestation of discourse markers in the text.

(12) RELP-2020-1

||| **The task performance instructions** were provided in participants' L1 – Persian. |||

Hypotactic augmentation gives authors opportunities to deploy discourse markers and structure reader-friendly information more explicitly. Example (12) can be augmented by hypotactic logical operators “to” and “because” as follows:

(12a)

||| **×β Because** all participants were native Persians, || **α** they were instructed in their L1 (Persian) || **×β to ensure accurate** performance of the task. |||

It can therefore be deduced from these examples that while ISI authors take an analytical and interactive approach toward method description, ISC authors tend to adopt a descriptive and narrative technique to provide intricate explanations of the procedures for collecting and analyzing data.

5.3. Reader Orientation

Reader-oriented writing style is the other distinguishing feature in academic writing. According to Thompson, expert writers deploy interactive approaches to engage readers in the text when they proactively identify the information that readers are likely to require in the unfolding text (Interaction in academic writing 58). Hypotactic clauses possess an exclusive either/or option that facilitates an interactive strategy of information structure which makes readers aware of the key concept of the information. This intrinsic function is the “progressive or regressive sequence” of hypotactic clauses (Halliday and Matthiessen 393), and may contribute to their dominant frequency in the method section in ISI-indexed journals, and is externally signaled by the strategic use of logical operators in hypotactic clauses. Examples (13) and (14) from international journals illustrate this function of hypotactic enhancement clauses by using the hypotactic discourse marker “to” as follows.

(13) EAP-2022-2

||| **×βn To** assess writing quality in addition to L1 status, || **α** each essay was scored || **×βn** using a custom holistic rating scale. |||

(14) ESP-2020-7

||| **α** We were unable to find discussions of issues of statistical significance || **×βn** using smaller corpora, such as ours, || **×βn to** compare highly similar texts written in the same genre. |||

As exemplified in (13) and (14), hypotactic clauses give authors the opportunity to structure the information progressively or regressively to thematize **α** or **β** clauses strategically. By utilizing progressive or regressive clauses, authors imbue a cognitively enhancing quality on the **α** or **β** clauses as a cognitive mechanism to engage non-present readers either preemptively or consequentially in the ongoing discourse. Therefore, employing the logical operators adeptly through hypotactic clauses gives academic writers authority in maintaining the cognitive and interactive attributes of information to control the mental states of the readers and assist non-present audiences in recovering the writer's primary interpretations and goals. Consider example (15) from a local journal:

(15) TEL-2018-7

Paratactic extension ||| **1** *Outliers were identified* ||| **+2** *and removed*. |||

Hypotactic enhancement ||| **α** This was crucial || **×β** because the Pearson correlation is highly sensitive to these extreme values. |||

As shown in mock up examples (15a), (15b) and (15c), by applying the logical operator “to” the author could have promoted or postponed the information strategically while providing complex and explicit information for non-present readers.

(15a)

||| **α** It was crucial || **×β1 to** identify || **+2** and remove outliers || **×β** because the Pearson correlation is highly sensitive to these extreme values. |||

(15b)

||| **×β1 To** identify || **+2** and remove outliers || **α** was crucial || **×β** because the Pearson correlation is highly sensitive to these extreme values. |||

(15c)

||| **xβ** Because the Pearson correlation is highly sensitive to extreme values,
 || **α** it was crucial || **xβ1** to identify || **+2** and remove outliers. |||

This expressive function assumes greater significance in the thematized or unthematized purpose clauses (Baklouti 520) which, as stated by Thompson, perform different functions in discourse (“Initial vs final purpose clauses” 77). The regressive purpose clause indicates a problematic situation that evokes expectations relating to its solution generated in the subsequent clauses; the function of progressive purpose clauses, however, is to state the rationale for performing a specific solution constrained to its previous clauses (Thompson, “Initial vs final purpose clauses” 62). Example (16) therefore should have been hypotactically augmented as (16a) by explicitly employing the logical operator “to”:

(16) RELP-2018-6

||| **α** All of the faculty members and students teaching and studying in different undergraduate and graduate programs of the English Department were selected through an accessible non-probabilistic cluster sampling method as those from whom the corpus of the study was extracted || **xβ** in order to investigate the Iranian EFL instructor evaluation scheme. |||

(16a)

||| **xβ In order to** investigate the Iranian EFL instructor evaluation scheme,
 || **α** an accessible non-probabilistic cluster sampling method was used ||
xβ to select all of the faculty members and students teaching and studying in different undergraduate and graduate programs of the English Department
 || **xβ to** extract the corpus of the study. |||

According to Eggins (320), experienced writers thematize the main or dependent clause proactively to increase coherence and highlight pivotal information effectively in their text. Using paratactic and simplex clauses restricts the clause capacity to thematize the information strategically, because this regressive and progressive function is an exclusive function of hypotactic clauses. Meanwhile, using hypotactic clauses is predicated on the maintenance of proper logical operators in the text.

6. CONCLUSION

The interactive strategies that writers take to accommodate knowledge, rhetorical expectations, and processing abilities reveal writers' awareness of non-present audience (Jiang and Hyland). Veteran authors aim to arrange the information so that readers will “recover the writer's preferred interpretations and goals” (Hyland 49). Therefore, the purpose of the present study was to provide a contrastive analysis of the interactive use of discourse markers through effective clause complexing

techniques in the method section of RAs in ISI Q1 (international) and ISC (local) journals.

The findings showed that the viable prevalence for hypotactic clauses lies in the attributes of the complex, explicit, and reader-oriented information structure in the academic texts that are fulfilled by applying hypotactic clauses to structure meaning in the method section of RAs in applied linguistics. The hypotactic clause nexus possesses some either/or functions (finite/nonfinite, progressive/regressive) that make comprehension more attainable to the readers. It also allows academic authors to leverage logical operators in the taxis system and structure interactive information for non-present readers and maintain coherence in their RAs.

The prevalent tendency toward hypotactic clauses in ISI applied linguistic articles is perhaps due to international journal authors being more writer-responsible by explicitly engaging readers in an interactive dialogue. From the viewpoint of the writer's accountability for effective communication, international authors equip readers with functional discourse markers to contribute in organizing the information fluently and circumventing ambiguity. Moreover, international authors engage readers in an explicit dynamic interplay of shifting between the dual choices of regressive or progressive hypotactic clause relations as a means of cognitive engagement of the non-present audience. In this case, lower use of hypotactic clauses and logical operators in ISC articles would be seen as a lack of recognition of the reader's cognitive potency to participate consequentially or preemptively in processing the information.

Expecting students to become academic writers of English requires the explanation of fully-fledged principles which are necessary for coherent communication (Hawes). Explicit instruction in alternative selection of proper choices to structure the information interactively would be a helpful pedagogical strategy and would result in a more reader-friendly text which is academically and internationally acceptable in the respective discourse community. This instruction could be done through writing assignments such as noticing and identifying cohesive devices in international RAs, analyzing simple and complex clauses in the articles in leading journals, transforming sentences into texts by the appropriate selection of logical operators and connecting clauses interactively through complex structures. Leong and Bee recommend writing courses to incorporate the proper use of clause-complex structures as part of their writing lesson in their syllabus that will positively result in greater mastery of students' writing.

Even though there are many different information structuring options available to authors, and "the theorist is free to select any grammar" (Sergueevna Andrianova et al. 366), further research is recommended to determine whether international authors employ more complex structures in their academic writing across all sections of a research article. This understanding might assist novice writers in enhancing their academic writing skills. It is suggested that further corpus-based research be carried out on the interactive information structure in other sections of local and

international RAs. A cross-discipline analysis might also render pedagogical advantages in academic writing.

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APPENDIX

The input and output of Sentence breaker tool

Sentence Breaker**(Version: 1.0)**

Breaker Character .	Number Format (<n>	Start With 	End With
------------------------	-----------------------	----------------	--------------

Input:

The study followed a mixed-methods approach in that it combined both quantitative and qualitative methods for data collection and data analysis. Frequencies and percentages were used for descriptive analysis of data. As for the qualitative data, inductive thematic analysis was used and the themes emerged from the data were discussed. To collect data, a bio-data questionnaire, the portfolio contribution questionnaire and semi-structured oral interviews were used which will be detailed in the next section. The participants were chosen by means of convenience sampling procedure. The preliminary participants of the study were ninety undergraduate EFL students at the University of Isfahan who were majoring in English literature

DO IT!

COPY OUTPUT

CLEAR

Output:**Number of clause nexus: 52**

<1>||| The study followed a mixed-methods approach in that it combined both quantitative and qualitative methods for data collection and data analysis.|||
 <2>||| Frequencies and percentages were used for descriptive analysis of data.|||
 <3>||| As for the qualitative data, inductive thematic analysis was used and the themes emerged from the data were discussed.|||
 <4>||| To collect data, a bio-data questionnaire, the portfolio contribution questionnaire and semi-structured oral interviews were used which will be detailed in the next section.|||