The Linguistic Features of Research Article Summaries in Science: A Corpus-Based Genre Analysis

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Abstract

Research Article Summaries (RASs), a structured abstract, remain underexplored in terms of their linguistic realization. This study investigates the distribution and rhetorical functions of five linguistic features in RASs: sentence types, verb tense and aspect, grammatical voice, first-person plural pronouns, and reporting words. A corpus of 115 RASs published in Science Special Issues between 2017 and 2020 was analyzed through manual, section-based coding of 2,488 sentences containing 63,019 words. The findings reveal that RASs employ linguistic features strategically across their four rhetorical sections. Complex sentences predominate (68.61%), particularly in the Results, whereas simpler structures are more frequent in the Conclusion, supporting clarity and accessibility. Present Simple is the most frequent tense, while Past Simple is strongly associated with the reporting of completed findings and Present Perfect with the continuing relevance of previous research. Active voice predominates (81.13%), indicating a contemporary preference for clarity and authorial agency, while the frequent use of we and complete absence of I demonstrate a controlled form of collective authorial presence. Reporting words also vary rhetorically, with assertive forms such as find, show, and reveal concentrated in the Results and more tentative forms such as suggest used in the Conclusion. These findings demonstrate that grammar in RASs functions as a rhetorical resource rather than a set of isolated structural choices. The study contributes to research on scientific discourse by providing a systematic explanation of RASs and offers practical implications for genre-based, corpus-informed EAP/ESP instruction aimed at supporting non-native English-speaking researchers in international publication.

Keywords: corpus-based genre analysis, structured abstract, linguistic features, authorial presence, scientific writing

1. Introduction

Scientific communication in English has become a central medium for sharing knowledge across academic disciplines. Today, English dominates scholarly publishing, with around 90% of research articles written in the language (Kheimets & Epstein, 2002; Martel, 2001). This dominance creates clear challenges for researchers who use English as a second or foreign language, making the ability to produce publication-ready texts that meet international standards an essential academic skill.

Academic writing is widely recognized as particularly demanding for postgraduate students, especially ESL and EFL learners (Hyland, 2008; Lorenz, 1999; Qin, 2014). To support these learners, many corpus-based studies have compared student writing with expert texts, typically drawn from high-impact journals. While such texts provide valuable models, direct comparisons raise methodological concerns, as published articles undergo rigorous peer review and editing. A more reliable approach is to compare publications of different impact levels within the same field, where all texts have been professionally reviewed, allowing for more operational understandings into features of effective academic writing.

Research articles remain the primary means of communicating scientific knowledge, and publishing in international journals is essential for reaching a global audience (Blanca, 2015). However, this requires not only disciplinary expertise but also familiarity with the rhetorical and linguistic conventions of academic discourse, an area that can be particularly challenging for non-native English-speaking researchers.

Within research articles, the abstract plays a crucial role. It functions both as a gatekeeper, helping editors assess submissions, and as a promotional tool, enabling readers to judge relevance (Gillaerts & Van de Velde, 2010; Huckin, 2001; Lorés, 2004). As abstracts are often the only freely accessible part of an article, they frequently determine whether a study is read or cited.

In response to limitations of traditional abstracts, such as the omission of key elements, many disciplines have adopted structured abstract formats (Hartley, 2014; Hartley & Betts, 2009). These improve clarity, consistency, and information retrieval. In some cases, journals also require English abstracts even when the full text is in another language, further reinforcing their role in global dissemination (Martín, 2003; Arsyad, 2014; Santos, 1996; Ventola, 1994).

Within this context, Research Article Summaries (RASs) represent a relatively new and underexplored genre. Introduced by Science following revisions in 2014 and 2017, RASs are structured into sections, typically Introduction, Rationale, Results, and Conclusion, and

provide a brief but thorough account of full-length articles. Despite their increasing use, little research has examined their linguistic and rhetorical features.

To address this gap, the present study conducts a corpus-based analysis of 115 RASs from Science Special Issues (2017–2020). It focuses on five key linguistic features identified by Pho (2008): sentence types, verb tense and aspect, grammatical voice, first-person plural pronouns, and reporting words. By analyzing how these features vary across sections, the study aims to provide empirically grounded insights into this emerging genre.

Accordingly, this study addresses the following research question: What are the linguistic features in terms of sentence types, verb tense and aspect, grammatical voice, first-person plural pronouns, and reporting words found in the RASs in Science?

Overall, the findings are expected to inform EAP and ESP pedagogy by offering practical guidance for teaching abstract writing and supporting researchers in preparing texts for international publication.

2. Literature Review

2.1 The Language of Science

As mentioned earlier, English has become the main language of scientific communication, accounting for around 90% of global research publications (Ammon, 2006; Hamel, 2007; Kheimets & Epstein, 2002). This is notable given that most researchers worldwide are non-native English speakers, which can create both linguistic and communicative challenges. Over time, scientific language has developed to meet the need for precision, clarity, and objectivity. As a result, it often features dense vocabulary, complex noun phrases, and frequent nominalization, allowing processes to be expressed as abstract concepts (Halliday, 1993).

Traditionally, passive constructions have been used to emphasize processes and results rather than the researcher, thereby reinforcing an objective tone. However, this practice has been criticized for making texts harder to read, leading to a gradual shift toward greater use of active voice (Crystal, 1987). Scientific writing also relies heavily on specialized terminology and complex sentence structures, which can make it challenging to understand. Even so, these features serve an important purpose: they allow researchers to communicate complex ideas in a precise, concise, and systematic way (Schleppegrell, 2004; Wellington & Osborne, 2001).

2.2 Linguistic Realization in Research Article Abstracts

Research article abstracts represent a highly specialized form of academic writing with clear communicative purposes. They provide a condensed version of a full study, requiring writers to balance briefness with sufficient detail. Previous research (e.g., Bhatia, 1993, 2004; Hyland, 2005) shows that effective abstracts depend not only on clear rhetorical organization but also on appropriate linguistic choices. These include grammatical features such as verb tense, voice, and nominalization, as well as interactional elements like hedging, boosters, and self-reference, which help writers present their stance and engage readers (Biber, 2006; Hyland, 2005).

For non-native English writers, producing effective abstracts remains particularly challenging. Common difficulties for them include limited grammatical control, restricted technical vocabulary, and unfamiliarity with rhetorical conventions (Al Fadda, 2012; Curry & Lillis, 2010). Studies in Asian contexts further highlight challenges in organizing ideas, developing an authorial voice, and presenting research clearly (Chansri, 2020). These findings highlight that successful abstract writing depends not only on structural organization but also on appropriate linguistic realization. Consequently, this study focuses on five key linguistic features identified by Pho (2008): sentence types, verb tense and aspect, grammatical voice, first-person plural pronouns, and reporting words.

2.3 Linguistic Features

Genre theory conceptualizes academic writing as a system of communicative practices shaped by shared purposes and disciplinary conventions (Swales, 1993). These conventions influence language use at multiple levels, including vocabulary, syntax, and overall organization. In research writing, linguistic features such as tense usage, voice, and lexical selection follow recognizable patterns that facilitate communication within the scientific community.

Move analysis further shows that texts are structured into functionally distinct sections, each characterized by specific linguistic signals (Nwogu, 1997). In addition, register analysis through the concepts of field, tenor, and mode explains how contextual variables shape language use. For example, typical research abstracts within a scientific field use a formal tone and are written for a specialized audience, resulting in dense, information-focused language. Previous studies have also identified common features of research writing, such as the use of past tense, passive constructions, technical vocabulary, and structured organization following the IMRD model (Graetz, 1985).

2.4 Linguistic Features in Move Analysis

Building on genre and move analysis, Pho (2008) proposed a comprehensive framework that connects linguistic features with the rhetorical moves in abstracts. This framework includes grammatical elements (e.g., subject types, tense-aspect, voice), modal and evaluative markers (e.g., epistemic and attitudinal expressions), and interactional features (e.g., self-reference and reporting words). Together, these features function as signals that help realize communicative purposes within each move.

From this broader framework, the present study focuses on five outstanding linguistic features: sentence types, verb tense and aspect, grammatical voice, first-person plural pronouns, and reporting words as they are particularly relevant to the construction and interpretation of RASs.

2.4.1 Sentence Types

Sentence structure plays an important role in expressing ideas clearly and effectively in academic writing. Sentences can be classified based on function (declarative, interrogative, imperative, exclamatory) and structural complexity (simple, compound, complex, compound-complex). Academic writing, particularly in scientific contexts, tends to prefer declarative and complex sentence structures to express detailed relationships between ideas.

However, students often struggle with sentence construction, producing unclear or fragmented sentences that affect communication. Mastery of sentence types, including appropriate use of clauses and connectors, is therefore essential for ensuring coherence, unity, and clarity in academic texts.

2.4.2 Verb Tenses and Aspects

Verb tense and aspect play a key role in shaping meaning in scientific writing, as they indicate temporal relationships and rhetorical functions. Tense shows when an action takes place (past, present, or future), while aspect describes how the action unfolds (simple, progressive, perfect). In research writing, past tense is commonly used to describe methods and results, present tense to state general truths or established knowledge, and present perfect to connect past research to current relevance (Swales & Feak, 2012).

The distribution of tense and aspect varies across sections of research articles, reflecting different communicative purposes. Appropriate use of tense not only enhances clarity but also signals the writer's stance and the status of knowledge claims, making it a crucial feature of effective academic writing.

2.4.3 Grammatical Voices

Grammatical voice shapes how the relationship between the subject and the action is presented in a sentence. Active voice emphasizes the agent performing the action, while passive voice emphasizes the action or its recipient. Scientific writing has traditionally favored passive constructions to maintain objectivity and depersonalization.

However, recent trends indicate increased use of active voice to improve clarity and readability. As a result, the choice between active and passive voice is not just a matter of style but also a rhetorical decision, influencing how information is presented and how accountability is expressed in academic writing.

2.4.4 First-Person Pronouns (We and I)

Although scientific discourse has traditionally emphasized impersonality, the use of first-person pronouns has become more common in modern academic writing. Studies (e.g., Kuo, 1999) show that authors frequently use "we," even in single-authored papers, to describe research processes, present findings, and justify methodological decisions.

This shift reflects a move toward greater authorial presence and engagement with readers. First-person pronouns serve important discourse functions, including guiding readers through the text and clarifying the researcher's contribution, showing that they play an important role in shaping how academic arguments are presented.

2.4.5 Reporting Words

Reporting words are a key feature of academic writing, helping authors present, evaluate, and position knowledge claims. They allow writers to refer to other studies, express their stance, and integrate their work within the broader research context (Hyland, 1999; Thompson & Ye, 1991).

These verbs can be categorized into different types, such as textual (e.g., state), mental (e.g., believe), and research -related (e.g., find), each serving a specific purpose. Choosing the right reporting verb is important because different verbs signal different levels of certainty, evaluation, and authorial stance. Effective use of reporting words improves clarity, strengthen credibility, and make academic writing more persuasive.

3. Methodology

3.1 Corpus Description and Selection

The corpus was selected on the basis of representativeness, reputation, and online accessibility (Nwogu, 1997). It consists of 115 RASs drawn from 37 Special Issues of Science published between 2017 and 2020. This period was selected for three main methodological reasons. First, Science restructured its abstract format in 2017, introducing a four-section structure comprising Introduction, Rationale, Results, and Conclusion. Restricting the corpus to texts published from 2017 onward therefore ensures structural consistency and enhances comparability across the dataset. Second, the four-year period provides a corpus that is sufficiently large for meaningful linguistic analysis while remaining manageable for detailed manual examination. Third, the period precedes the major disruptions associated with the COVID-19 pandemic, thereby minimizing potential variations in editorial and publication practices. The corpus comprises 23 RASs from 2017, 41 from 2018, 21 from 2019, and 30 from 2020, totaling 2,488 sentences and 63,019 words, with an average of 22 sentences and 548 words per RASs. Although relatively small, the corpus size is appropriate for detailed qualitative and quantitative analysis and is comparable to that of previous move-based studies of research article abstracts (Cross & Oppenheim, 2006; Dorό, 2013; Lorés, 2004; Pho, 2008; Samraj, 2002).

Science was selected as the source journal for its international reputation, high scholarly standing, and multidisciplinary coverage. As a

peer-reviewed journal published by the American Association for the Advancement of Science (AAAS), Science is widely recognized as one of the world's leading scientific journals. Its Q1 ranking in the SCImago Journal Rank (SJR) and strong citation impact further support its suitability as a source of high-quality scientific communication (Swales, 2004; Nwogu, 1997). Moreover, its Special Issues encompass a broad range of disciplines, including biology, chemistry, environmental science, medicine, and applied sciences, providing cross-disciplinary representation within the corpus. The concise, information-dense nature of its research abstracts also requires writers to convey research significance, key findings, and implications efficiently to a broad scientific audience, making its RASs well suited to examining rhetorical and linguistic patterns across disciplinary boundaries.

Special Issues were preferred over regular issues because they present a thematically focused and coherent collection of research articles, facilitating comparison of RASs in rhetorical and linguistic analysis. Whereas regular issues cover diverse and often unrelated topics, Special Issues bring together studies addressing specific emerging or significant themes. This thematic coherence helps reduce disciplinary variation while maintaining cross-disciplinary coverage, thereby facilitating the identification of recurring rhetorical patterns. Furthermore, limiting the corpus to research articles, while excluding reviews, news, and features, ensures genre consistency and comparability with previous research. Overall, the use of Special Issues provides a focused, relevant, and manageable corpus for in-depth analysis.

3.2 Analytical Framework and Coding Procedure

The analytical framework integrates genre analysis with corpus-based grammatical analysis within a two-phase research design. Phase I (Move Analysis), reported elsewhere, identified the rhetorical structure of the RASs using frameworks developed by Swales (1990, 2004), Lim (2006), Kanoksilapatham (2003, 2005, 2007, 2012), and Yang and Allison (2004). Phase II, the focus of the present study, examined five linguistic features identified by Pho (2008): sentence types, verb tense and aspect, grammatical voice, first-person plural pronouns, and reporting words.

The RASs were manually coded sentence by sentence according to predefined criteria derived from the relevant frameworks. Sentence types were classified according to Quirk et al.'s (1985) typology as simple (SP), compound (CPD), complex (CPX), and compound-complex (CPDX) sentences. Tense-aspect forms were analyzed in accordance with Comrie's (1976, 1985) theoretical framework, with reference to the pedagogical models of Swales and Feak (2012) and American Psychological Association. (2020). Grammatical voice was classified as either active or passive based on an analysis of verb phrase structures following Quirk et al. (1985). First-person plural pronouns were identified through a comprehensive search for we, us, our, and ours, with particular attention to the use of we as the grammatical subject. Reporting words were identified based on the taxonomies proposed by Thompson and Ye (1991) and Williams (1999).

To ensure coding consistency and reliability, the researcher and two external raters, both PhD-qualified English lecturers specializing in Applied Linguistics, independently coded the corpus following a two-hour training session on the coding scheme, including guided practice with sample texts. The coding covered five linguistic features: sentence types, verb tense and aspect, grammatical voice, first-person plural pronouns, and reporting words. Inter-coder reliability was assessed separately for each feature using Fleiss' kappa, an index appropriate for assessing agreement among three or more coders.

The results indicated very high inter-coder agreement across all five features. Fleiss' kappa values were as follows: sentence types ($\kappa = .925$), verb tense and aspect ($\kappa = .964$), grammatical voice ($\kappa = .973$), first-person plural pronouns ($\kappa = 1.000$), and reporting words ($\kappa = .987$). Overall, kappa coefficients ranged from 0.925 to 1.000, with a mean of 0.970, reflecting almost perfect agreement according to conventional benchmarks. All discrepant cases were subsequently reviewed against the predefined coding criteria and resolved through discussion and consensus among the three coders.

4. Results

4.1 Corpus Overview

Table 1 presents an overview of the corpus. The 115 RASs contain a total of 2,488 sentences and 63,019 words, with mean lengths of 22 sentences and 548 words per RASs. Individual RASs ranges from 12 to 33 sentences and from 357 to 711 words, reflecting variation in research complexity and disciplinary reporting practices.

Table 1. Corpus Overview

Number of RASs	Total Sentences	Total Words	Mean Sentences/RASs	Mean Words/RASs
115	2488	63019	22	548

Sentence distribution across the four rhetorical sections is shown in Table 2. The Results section contains the highest number of sentences (n = 1,049; 42.16%), followed by Introduction (n = 552; 22.19%), Rationale (n = 461; 18.53%), and Conclusion (n = 426; 17.12%).

Table 2. Sentence Distribution Across RASs Sections

Section	Introduction	Rationale	Results	Conclusion
f	552	461	1049	426
%	22.19	18.53	42.16	17.12

4.2 Sentence Types

Table 3 presents the overall distribution of sentence types across the corpus. Complex sentences (CPX) dominate, accounting for 68.61% (n = 1,707), followed by simple sentences (SP; 25.68%; n = 639). Compound-complex sentences (CPDX; 3.62%; n = 90), and compound sentences (CPD; 2.09%; n = 52) occur relatively infrequently.

Table 3. Overall Frequency and Percentage of Sentence Types in RASs

Sentence Type	f	%
Simple (SP)	639	25.68
Compound (CPD)	52	2.09
Complex (CPX)	1707	68.61
Compound-Complex (CPDX)	90	3.62
Total	2488	100

As shown in Table 4, complex sentences appear most frequently across all four sections, with the highest concentration in Results (n = 708) and the lowest in Conclusion (n = 296). In contrast, compound sentences are the least frequent in all sections.

Table 4. Frequency of Sentence Types by Section in RASs

Section	SP	CPD	CPX	CPDX	Total
Introduction	157	17	346	32	552
Rationale	87	7	357	10	461
Results	284	22	708	35	1049
Conclusion	111	6	296	13	426
Total	639	52	1707	90	2488

4.3 Verb Tense-Aspect Forms

The analysis identified nine distinct tense-aspect forms and six tense-aspect combinations in the corpus (Table 5). The Present Simple is overwhelmingly dominant (f = 1,494; 53.4%), followed by the Past Simple (f = 1,067; 38.13%). All remaining forms and combinations accounted for substantially smaller proportions of occurrences. The Future Perfect was the least frequent individual tense–aspect form, occurring only once (f = 1; 0.04%). Table 5 presents the frequency and percentage distributions of these forms and combinations across the four sections of the RASs.

Table 5. Frequency and Percentage Distribution of Tense-Aspect Forms in RASs

Tenses and Combination of Tenses	Sections				f	%
	Introduction	Rationale	Results	Conclusion		
Present Simple	468	227	422	377	1494	53.40
Past Simple	53	224	723	67	1067	38.13
Present Perfect	61	41	10	16	128	4.57
Future Simple	2	2	2	9	15	0.54
Present Progressive	9	4	0	1	14	0.50
Past Progressive	0	0	9	0	9	0.32
Present Perfect Progressive	2	2	0	1	5	0.18
Past Perfect	0	2	0	0	2	0.07
Future Perfect	0	0	1	0	1	0.04
Past Simple + Present Simple	8	2	18	0	28	1.00
Present Simple + Present Perfect	14	4	2	1	21	0.75
Past Simple + Present Perfect	4	0	0	2	6	0.21
Future Simple + Present Simple	0	1	0	3	4	0.14
Present Progressive + Present Simple	2	1	0	0	3	0.11
Past Progressive + Past Simple	0	0	1	0	1	0.04
Total	623	510	1188	477	2798	100.00

A section-level analysis reveals clear variation in tense–aspect use across the four sections. In the Introduction, the Present Simple dominates (f = 468), while the Present Perfect (f = 61) was employed to highlight the ongoing relevance of previous research. The Rationale shows a similar pattern, with the Present Simple (f = 227), followed by Past Simple (f = 224). The Results section differs markedly, with a strong dominance of the Past Simple (f = 723), with Present Simple also strongly represented (f = 422). In the Conclusion, the Present Simple is again most frequent (f = 377), followed by the Past Simple (f = 67) and a limited use of the Future

Simple (f = 9), which is used to signal forward-looking implications.

4.4 Grammatical Voice

The corpus is strongly characterized by the use of active voice. Of the 2,861 predications analyzed, active voice constructions account for 2,321 (81.13%) and passive voice for 540 (18.87%). Active voice dominates across all four sections, although passive voice is relatively more frequent in the Results section, where methodological procedures and observations are described. This distribution reflects genre-specific conventions: active voice foregrounds authorial agency in presenting and interpreting findings, while passive voice supports the impersonal presentation of experimental processes.

4.5 First-Person Plural Pronouns

Table 6 presents the distribution of the self-referring pronoun we across the four sections. A total of 541 instances were identified. The Results section contains the highest frequency (f = 284; 52.50%), followed by the Rationale (f = 155; 28.65%), Conclusion (f = 79; 14.60%), and Introduction (f = 23; 4.25%). Notably, the singular pronoun I is entirely absent from the corpus, curiously in RAS83, a single-authored text in which the author consistently employs we throughout.

Table 6. Frequency and Percentage of Self-Referring We in RASs

Section	f	%
Introduction	23	4.25
Rationale	155	28.65
Results	284	52.50
Conclusion	79	14.60
Total	541	100.00

4.6 Reporting Words

The corpus contains 62 distinct reporting words, occurring a total of 872 times. Table 7 presents the ten most frequent items. Find is the most common (f = 96; 11.01%), followed by show (f = 85; 9.75%), reveal (f = 77; 8.83%), identify (f = 66; 7.57%), use (f = 58; 6.65%), suggest (f = 53; 6.08%), observe (f = 47; 5.39%), demonstrate (f = 29; 3.33%), indicate (f = 25; 2.87%), and describe (f = 18; 2.06%). Reporting words occur most frequently in the Results section, followed by the Conclusion, with minimal usage in the Introduction. Notably, suggest is particularly concentrated in the Conclusion, reflecting its role in hedging and presenting interpretive claims.

Table 7. Frequency and Percentage of Reporting Words in RASs

Rank	Reporting Word	f	%
1	find	96	11.01
2	show	85	9.75
3	reveal	77	8.83
4	identify	66	7.57
5	use	58	6.65
6	suggest	53	6.08
7	observe	47	5.39
8	demonstrate	29	3.33
9	indicate	25	2.87
10	describe	18	2.06

5. Discussion

5.1 The Role of Sentence Complexity in Academic Writing

The findings indicate that complex sentences are a prominent feature of RASs, enabling writers to integrate logical, causal, and conditional relationships within the genre's space constraints (Biber et al., 1999; Halliday, 1993; Quirk et al., 1985). Interpreted within the multidimensional framework of syntactic complexity (Lu, 2011), these patterns suggest that complexity is deployed selectively rather than uniformly.

The higher frequency of complex sentences in the Results section is consistent with corpus-based genre research showing that syntactic complexity varies across rhetorical moves (Zhou et al., 2023; Zhang & Wang, 2025). This pattern supports a functional explanation in which writers elaborate clausal structures where the rhetorical task requires the simultaneous presentation, interpretation, and qualification of findings. By contrast, the greater use of simpler structures in the Conclusion is consistent with its communicative emphasis on clarity and accessibility (Day, 1995; Hyland, 2004; Swales, 1990), echoing the argument that academic writing favors compressed noun phrases over extended dependent clauses (Biber & Gray, 2016). Readability research further suggests that excessive syntactic complexity can strain readers' memory and encourage rereading (Masson & Waldron, 1994; Wen & Yi, 2025).

The limited use of compound and compound-complex sentences indicates that RASs writers may prefer subordination over coordination. This tendency is consistent with accounts of expert writers' selective, rhetorically balanced use of complexity, in contrast to less experienced writers' over-reliance on embedded structures (Viera, 2022). Overall, the findings support a functional view of syntax as a resource shaped by rhetorical purpose. The emphasis on compressed, information-dense structures is also consistent with work on noun-phrase complexity in academic writing, which shows that more proficient writers make greater use of complex noun modifiers (Parkinson & Musgrave, 2014).

5.2 Tense and Aspect as Rhetorical Features in Academic Writing

The distribution of tense and aspect is consistent with a relationship between grammatical choices and rhetorical purpose in RASs. Present Simple predominates in sections concerned with establishing knowledge, framing the research context, and drawing broader conclusions, whereas Past Simple is more frequent when writers report completed research procedures and findings. Present Perfect appears to serve to connect previous research with its continuing relevance to the current study (Hinkel, 2004; Swales & Feak, 2012).

These patterns are consistent with previous accounts of tense as a rhetorical resource in academic writing (Biber et al., 1999; Swales & Feak, 2012). Swales and Feak's (2012) citation-tense framework is especially illuminating: the progression from past through present perfect to present signals that reported research moves gradually closer to the writer's own position and to the current state of knowledge, a pattern that maps onto the section-level distribution observed here.

Corpus-based genre research further supports this view. Wang and Tu (2014) reported that the present tense predominates in the Introduction and Discussion while the past characterizes the Methods and Results, and Rustipa et al. (2023) and Jasrial et al. (2021) documented tense shifts aligned with rhetorical functions and move structure. These studies converge on the view that tense is a meaning-making resource that helps writers manage authority, critique, and scholarly relationships (Hinkel, 2004; Swales & Feak, 2012). Tense and aspect therefore appear to help writers distinguish established knowledge, completed activities, and broader implications, contributing to the rhetorical development of RASs.

5.3 Voice and Authorial Presence in Academic Writing

The predominance of active voice is consistent with a contemporary tendency toward greater clarity, directness, and explicit authorial presence in scientific writing (Arsyad, 2013; Kholili, 2022; Zhang et al., 2012). This pattern aligns with a broader historical shift documented in corpus research: the passive, which dominated scientific prose for much of the twentieth century, has declined steadily since, with a corresponding rise in first-person pronouns and active constructions (Millar et al., 2013; Okamoto, 2023; Seoane, 2013). A survey of 22 influential science journals found that 72% now strongly recommend or prefer the active voice (Okamoto, 2023), confirming that the present findings reflect contemporary editorial and disciplinary norms.

Nevertheless, passive voice remains functionally relevant, particularly when attention is directed toward procedures, processes, or outcomes rather than the researcher. Corpus-based analyses suggest that the passive persists most strongly in Methods sections, where procedural and relational passives may serve methodological precision and cross-study comparability (Hinkel, 2004; Leong, 2020). Long-term studies indicate differences across disciplines. Social sciences show the largest decline in passive voice, while natural sciences still use passive forms to highlight procedures and findings (Le et al., 2025).

The complementary use of active and passive voice therefore appears purposeful rather than categorical. Passive voice highlights processes, results, and facts while backgrounding the researcher, supporting objectivity and a replicable, impersonal tone; active voice signals authorial agency, responsibility, and interpretation, functioning as markers of stance and engagement (Hyland, 2005; Hinkel, 2004; Leong, 2020). Section-level patterns are consistent with this allocation, with active voice predominating in Introductions and passive voice in Methods (Okamoto, 2023).

This finding is consistent with observations that scientific writing has moved beyond a traditionally impersonal style toward a more flexible management of authorial presence (Banks, 2021). The strong use of passive voice in twentieth-century science was a historical writing choice, not an essential feature of scientific writing (Ding, 2002; Seoane, 2013). The balanced use of active and passive voice observed here therefore suggests that writers use voice to manage agency, emphasis, and authorial presence (Okamoto, 2023).

5.4 First-Person Pronouns and Authorial Presence in Academic Writing

The frequent use of we indicates that authorial presence is an established feature of RASs rather than an avoidance strategy. Writers explicitly position themselves when reporting and interpreting their research, particularly in sections where their contribution and agency are most relevant. This pattern supports Hyland's (2002, 2009) view that first-person pronouns are important resources for constructing scholarly identity and establishing authorial responsibility. According to Hyland (2001), self-mention is a powerful means of asserting authority, and we is its most common form of self-mention (Hyland, 2001, p. 1094; Hyland, 2012). The strategic use of we is not simply a rhetorical choice. It is a deliberate way for writers to take responsibility for their claims (Hyland, 2002; Jiang & Hyland, 2015).

The use of we can be understood through the difference between exclusive and inclusive we. Exclusive we refers to the writer(s) alone and is associated with the most powerful authorial roles, such as stating a purpose, explaining a procedure, and stating results or claims, whereas inclusive we draws the reader into the text and promotes unity (Harwood, 2005; Hyland, 2002; Wang et al., 2021). Corpus studies indicate that we is the most frequently used self-mention across disciplines, and its use has increased over time, reflecting the growing collaborative nature of modern science (Hyland & Jiang, 2016, 2017). Its concentration in reporting and interpreting sections is

therefore consistent with its function as an important resource for expressing authorial agency.

The absence of I, even in single-authored texts, further suggests a preference for collective rather than individual identity. Writers frequently adopt the plural we to project a shared, community-focused voice while maintaining the impersonality traditionally valued in scientific writing (Dahl, 2009; Hyland, 2002). The avoidance of I signals a low-risk stance, since first-person singular gives the writer more personal responsibility and a greater risk of being challenged by readers (Hyland, 2002; Wang et al., 2021). Therefore, using we instead of I may allow writers to show their role and responsibility without focusing too much on themselves.

Overall, the findings suggest a balance between indicating authorial presence and maintaining objectivity in academic writing, combining researcher visibility with disciplinary expectations of impersonality. This is consistent with the idea that academic writing involves multiple identities and choices (Hyland, 2001, 2002; Jiang & Hyland, 2015).

5.5 The Role of Reporting Words in Expressing Authorial Stance

The use of reporting words demonstrates how RASs writers manage the presentation and interpretation of scientific evidence. Reporting words are a central resource through which writers attribute content to prior sources while negotiating their own stance toward it (Hyland, 2002; Swales, 1990). Thompson and Ye (1991) distinguished the denotation of reporting words from their evaluative potential, and Charles (2006) grouped them into four semantic classes: ARGUE, FIND, SHOW, and THINK. These words therefore help writers report evidence and show how strongly they support a claim.

More assertive words associated with finding, showing, identifying, and observing are prominent where empirical evidence is presented, supporting the construction of evidence-based claims (Charles, 2006). Their concentration in the Results section reflects the need to present findings as established, verifiable knowledge, and is corroborated by corpus studies showing that research words predominate in Introduction and Methods while discourse words are preferred in Results and Discussion (Deng & Li, 2026). Such assertive words may thus function as boosters that strengthen the evidential force of the claims they introduce.

In contrast, more cautious reporting words in the Conclusion allow writers to qualify interpretations, acknowledge uncertainty, and indicate possible implications (Thompson & Ye, 1991). This shift toward tentative words is consistent with writers being less certain about the truth of a claim, functioning as hedges that present information as interpretation rather than confirmed facts (Hyland, 2004; Hyland & Jiang, 2023). The contrast is therefore rhetorically motivated: writers use stronger language when the evidence is clear and more cautious language when they discuss ideas that go beyond the data.

This variation illustrates the dual function of reporting words: presenting evidence with appropriate confidence while controlling the strength of subsequent interpretations. It also supports the view that reporting words are important resources for expressing epistemic stance and negotiating claims with readers (Hyland, 1999, 2009).

6. Pedagogical Implications

The findings have specific and practical implications for EAP/ESP instruction, particularly for non-native English-speaking researchers targeting high-impact, Scopus-indexed journals. Because the corpus is based on published RASs, it provides authentic, discipline-specific models that can be used directly in the classroom (Flowerdew, 2010; Hyland, 2007).

First, the results support genre-based, section-sensitive teaching of syntactic complexity. Complex sentences dominate the corpus (68.61%) but are unevenly distributed, with the highest concentration in the Results and the lowest in the Conclusion, where simple sentences are used more often to improve clarity. Complexity should therefore be viewed as a functional resource that changes according to rhetorical purpose, rather than as something that is always better (Hyland, 2007; Swales & Feak, 2012). Genre-based activities can help learners understand and use this flexibility (Cheng, 2006).

Second, tense and aspect should be viewed as rhetorical rather than merely grammatical resources. Present Simple is dominant in the Introduction, Rationale, and Conclusion, while Past Simple is more common in the Results. Present Perfect helps connect previous research with the current study. These patterns provide a useful section-by-section guide that can help learners make strategic tense choices and reduce errors (Swales & Feak, 2004, 2012).

Third, the data challenge the idea that academic writing should always be impersonal. The strong use of active voice (81.13%) and first-person plural pronouns shows that authorial presence can be acceptable and effective. However, this presence is carefully controlled: active voice highlights the writer's role in interpreting findings, while passive voice remains useful for describing procedures. Learners should therefore learn to use both voices appropriately (Hyland, 2002, 2005, 2009).

Fourth, the range of reporting words provides a useful corpus-based resource for teaching stance. Assertive words (e.g., find, show, reveal) are common in the Results, while more cautious words (e.g., suggest) are more common in the Conclusion. Teaching learners to choose reporting words according to their rhetorical purpose can help them express stance and integrate sources more effectively (Martin & White, 2005; Bloch, 2010; Hyland, 2004).

Finally, the authentic abstract data can support corpus-based and data-driven learning, in which learners discover patterns from concordance lines and frequency data (Flowerdew, 2010; Gilquin et al., 2007; Oakey, 2020). Such evidence-based materials can be more suitable for specific academic disciplines than conventional grammar instruction (Chang & Kuo, 2011; Hardy & Römer, 2013). Learners can compare these section-level patterns with their own drafts and move beyond intuition toward more informed, genre-aware choices

(Hyland & Jiang, 2021).

Overall, these findings suggest that publication-oriented EAP/ESP instruction should be genre-based, corpus-informed, and focused on rhetorical purpose. This approach can help learners develop the strategic control needed to meet the expectations of international, high-impact journals (Hyland, 2007; Swales & Feak, 2012).

7. Conclusion

This study described the linguistic features of RASs, an emerging genre that has received limited research attention. The study analyzed 115 RASs published in Science Special Issues published between 2017 and 2020. Based on five features identified by Pho (2008): sentence types, tense and aspect, grammatical voice, first-person plural pronouns, and reporting verbs. The study examined how these features are used across the four rhetorical sections of RASs and what they show about the writing practices of high-impact scientific communication.

The findings indicate that RASs use different linguistic features according to the purpose of each section. Complex sentences are common in the corpus (68.61%), especially in the Results, while simpler sentences are more common in the Conclusion, where concise presentation may help make the main implications of the research accessible to readers. Tense and aspect also have different functions. The Present Simple was commonly used to provide general context and state conclusions, whereas the Past Simple was used to report completed research activities and findings. The Present Perfect occurred in contexts that connected previous research with the current study.

Active voice was more frequent than passive voice, accounting for 81.13% of the cases examined. The first-person plural pronoun we is frequently used, while I is completely absent, even in single-authored texts. This pattern suggests that RASs writers may use plural authorial reference as a conventional way of presenting research agency and authorial presence. Nevertheless, the findings do not establish that RASs generally reject impersonal scientific writing; rather, they indicate that authorial presence and active constructions are compatible with the communicative conventions observed in this corpus.

Reporting words also showed section-sensitive patterns. Words such as find, show, and reveal occurred frequently in the Results section, where writers present research outcomes. The word suggest appeared more often in the Conclusion section, where claims may be framed with greater caution. This distribution is consistent with the possibility that reporting words contribute to differences in evidential presentation and degree of commitment across sections, although the study did not statistically test these associations.

Overall, the findings are consistent with the view that grammar functions as a resource for making meaning and that linguistic choices are shaped by rhetorical purpose (Hyland, 2007; Swales & Feak, 2012). The study makes three contributions. First, it adds to the limited research on RASs by providing a systematic description of selected linguistic features and extending earlier work on research article abstracts (Pho, 2008; Samraj, 2002). Second, it demonstrates how genre analysis and corpus-based analysis can be combined to examine the distribution of linguistic features across rhetorical sections. Third, the findings provide discipline-specific examples that can be used in EAP and ESP instruction, particularly for researchers who are preparing manuscripts for international publication (Flowerdew, 2010).

Several limitations should be considered when interpreting the findings. The corpus is relatively small and consists of RASs from only one multidisciplinary journal. Consequently, the observed patterns may not represent RASs published in other journals, disciplines, or publication contexts. In addition, the study examined only five linguistic features and did not address other potentially relevant dimensions, such as lexical density, nominalization, or hedging beyond the analysis of reporting words. Finally, the interpretation of individual features depends on the context in which they occur, and further qualitative analysis would be useful for examining their specific rhetorical functions.

Future research could address these limitations by analyzing RASs from a broader range of journals and disciplines, applying inferential statistical methods to test differences among rhetorical sections, and examining additional linguistic and rhetorical features. Comparisons with conventional research article abstracts and with the full research articles summarized by RASs could clarify which features are distinctive to this genre. Longitudinal research could also investigate whether the conventions of RASs change as the genre develops.

Within these limitations, the study indicates that RASs draw on syntactic complexity, tense and aspect, grammatical voice, authorial reference, and reporting words in ways that correspond to recurring rhetorical functions. The findings therefore contribute to an initial description of RASs and may support the development of teaching materials based on authentic scientific texts. Such materials could help non-native English-speaking researchers recognize how linguistic choices are used to present context, report findings, and formulate conclusions in high-impact scientific communication.

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Author contributions

Watcharaporn led the conceptualization of the study, including the development of the research idea, research objectives, and overall study design. Watcharaporn also developed the coding scheme for data analysis and was responsible for data curation, including the collection, organization, and management of the dataset. In addition, Watcharaporn conducted the RASs analysis, examined the analytical results in relation to the research objectives, and synthesized the findings to address the research questions. Watcharaporn prepared the

original draft of the manuscript, presenting the research process, analytical results, and key findings in a coherent academic narrative.

Prof. Dr. Seongha Rhee made substantial intellectual contributions to the conceptualization and development of the research framework by refining the study's analytical focus, strengthening the alignment between the research objectives and methodological approach, and providing critical input into the interpretation of the findings. Prof. Dr. Seongha Rhee also provided supervision throughout the research process, critically evaluating the analytical approach, assessing the consistency between the results and the study's objectives, and ensuring the overall rigor and quality of the research. In addition, Prof. Dr. Seongha Rhee played a key role in reviewing and editing the manuscript by critically revising its intellectual content, strengthening the theoretical and analytical arguments, improving the logical flow and coherence of the discussion, and enhancing the clarity and academic rigor of the final manuscript.

Both authors discussed the results, contributed to the interpretation of the findings, and approved the final version of the manuscript for publication.

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Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Ethics approval

Not applicable.

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Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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