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Genre-Based Analysis and Interactional Metadiscourse Analysis of the Unstructured Abstracts for Research Articles in Scopus-Indexed Q1 Journals: Experimental Abstracts on COVID-19

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Abstract

Abstracts serve as a crucial medium of providing readers with succinct information extracted from research articles (RAs), and assisting academic authors in publicizing their research to the clinical and health science discourse community. However, the rhetorical move structure and the interactional metadiscourse categories (IMCs) of RA abstracts on the Coronavirus Disease 2019 (COVID-19), one of the most threatening diseases in clinical and health science fields, remain underexplored. This study sought to investigate the move structure and the IMCs used in each move of the English RA abstracts on COVID-19. A corpus of 143 experimental unstructured abstracts was purposively compiled from international journals included in the Scopus database. The target journals were indexed in Quartile 1, as reported by Scimago Journal & Country Rank website in 2022. The coding scheme for the move analysis was adapted from those of Hyland (2000) plus Kanoksilapatham (2013), while the coding scheme for the IMC analysis was adapted from Hyland's (2005a) interpersonal model. The findings revealed that the Result Move was often required while the Background, Methods, and Discussion Moves were conventionally used. The Purpose Move was found to be merely optional in the abstracts. Furthermore, the predominant IMCs discovered in each move of the experimental abstract genre may imply its own inherent nature, that is, how the authors exhibited their position and interaction. Taken together, the current study has important pedagogical implications for designing and developing guidelines for writing unstructured abstracts of experimental RAs.

INTRODUCTION

The COVID-19 pandemic was a life-changing event that impacted "people's lives and healthcare systems" (Iyer & Simkins, 2022, p. 1) around the world, leading to multiple adverse consequences. It resulted in an alarming number of 600,000,000 cases globally (Green, et al., 2022), threatened worldwide health and economy (Yeboah & Yaya, 2023; Zhang et al., 2021),

and worsened the situation with emerging variants of SARS-CoV-2 that were resistant to conventional drugs (Rothenberger et al., 2022). For these reasons, researchers, investigators, and health professionals from a wide range of fields in clinical and health sciences were aware of, and interested in producing empirical studies on COVID-19 (e.g., Bošnjak et al., 2020; Fintelman-Rodrigues et al., 2020; Merchante et al., 2022; Ward et al., 2021; Wu et al., 2021). By doing so, their research findings were disseminated to their respective fields to help address relevant issues, gaps or limitations in medical practices and healthcare of various dimensions.

It has been acknowledged that abstracts are a key component of RAs, serving to provide readers with a succinct summary of content at the opening of the article. It is considered an independent genre (Abdollahpour & Gholami, 2018) and also serves as a promotional genre, seeking to convince and grab readers' attention (Breeze, 2009; Jiang & Hyland, 2017; Zibalas & Šinkūnienė, 2019), and assist readers in scrutinizing "the flow of information" (Jiang & Hyland, 2017, p. 11). For these reasons, it is important that authors "hook the reader at the outset" (p. 11) of the article to promote their work (Jiang & Hyland, 2017). Albert (2000) points out that the abstract, in certain ways, can be utilized as "a marketing tool" (p. 1) for encouraging readers in the fields of medicine to make a decision on whether to examine the entire RA. Pho (2008) also asserts that it is utilized to partly "sell the article" (p. 231), as it is a crucial genre that is initially presented. Hence, RA abstracts can be used as tools to disseminate knowledge and information in the competitive publication context (Martín et al., 2014).

To determine and understand how authors from highly ranked international academic journals shape the rhetorical organization of a RA abstract, it is essential to possess knowledge about the communicative functions conveyed through moves (Swales, 2004) in the abstract genre. As such, Swales' (1990) CARS Model has been widely adopted to examine the rhetorical moves in numerous studies related to English for Specific Purposes (ESP) (Graves et al., 2013). However, this approach (1990) was originally employed to detect moves in the introduction section of RAs. Another approach is Hyland's (2000) five-move model which has been widely adopted to determine the rhetorical moves of RA abstracts across disciplines. This model has even been applied in various fields such as accounting (Amnuai, 2019), dentistry (Alyousef, 2021), law (Ghasempour & Farnia, 2017), environmental science and applied linguistics (Saeeaw & Tangkiengsirisin, 2014), and linguistics and applied linguistics (Suntara & Usaha, 2013).

In addition to the significance of bearing insights into the rhetorical moves of the abstract genre, it is also worth investigating interactional metadiscourse resources, or henceforth, interactional metadiscourse categories (IMCs). In the current study, different IMCs were utilized across different abstract moves, providing insights on how authors capitalized on this linguistic repertoire to express their stance and develop a relationship with readers, thereby involving them in the discourse propositions (Hyland, 2005b). In this regard, Hyland's (2005a) interpersonal model of metadiscourse has been widely employed to explore metadiscourse resources invested in various genres. This model consists of two main types of linguistic resources: interactive resources and interactional resources. According to Hyland (2005a, pp. 50–52), interactive resources are primarily employed to structure a discourse for target readers. The use of this metadiscourse type can be observed from the way the writer assesses the readers; for instance, their understanding abilities, familiarity with relevant texts, and the

writer-reader relationship. Interactive resources contain five categories in total: transition markers, frame markers, endophoric markers, evidentials, and code glosses (Hyland, 2005a), as presented and exemplified in Table 1 below. However, they appear to be unpopular as surmised in a number of prior studies, primarily due to the scarcity of these instances in the short, compact abstract genre. For example, Suntara (2018) opted to only present the findings on transition markers found in the RA abstracts in the field of food technology. Likewise, Suntara and Chokthawikit (2018) opted to do so as well in the field of public health.

Table 1

Interactive resources

No.	Category	Discourse function	Example
1	Transition markers	involve the linguistic features the author uses to assist readers to understand the relations among ideas or arguments presented in a discourse; for example, adding, comparing, and drawing conclusions.	- Addition (e.g., and, also, moreover) - Comparison (e.g., in the same way, likewise, similarly) - Consequence (e.g., consequently, thus, therefore)
2	Frame markers	involve the markers that facilitate readers' interpretations of the arguments presented in a discourse. This type of marker performs different functions.	- Sequencing arguments (e.g., first, second, next) - Demonstrating stages in a discourse (e.g., in sum, to summarize) - Presenting discourse goals (e.g., my purpose is, the paper proposes, I hope to) - Exhibiting topic shifts, (e.g., now, well, OK).
3	Endophoric markers	refer to the markers utilized to direct readers to the intended parts of the discourse.	e.g., see Figure 3, refer to the next part, as mentioned above, etc.
4	Evidentials	refer to outside sources, e.g., hearsay and literature, the author uses to support their arguments in a discourse.	N/A
5	Code glosses	refer to the linguistic features used to offer additional information.	e.g., that is, this is called, in other words, for example, this can be defined as, etc.

Note. Adapted from Hyland (2005a).

On the other hand, for interactional resources or IMCs in the current study, the writers use these linguistic resources to initiate a relationship with the readers, urging them to interact with their arguments and content in the discourse. Interactional resources also contain five subcategories in total: hedges, boosters, attitude markers, self-mentions, and engagement markers (Hyland, 2005a), as presented and exemplified in Table 2.

Table 2

Interactional resources

No.	Category	Discourse function	Example
1	Hedges	refer to the linguistic features used to allow for possible and different viewpoints or perspectives.	perhaps, might, may, possible, be likely to
2	Boosters	refer to the linguistic features used to confidently convey the author's perspectives and stance, thereby narrowing other possibilities or options.	demonstrate, show, clearly, obviously, potent
3	Attitude markers	refer to the linguistic features used to express the author's attitudes of different aspects, e.g., importance, agreement, surprise, and frustration.	- Attitude verbs (e.g., agree, disagree, prefer) - Adjectives (e.g., remarkable, appropriate, logical), - Sentence adverbs (e.g., Surprisingly, Unfortunately)
4	Self-mentions	refer to the author presence exhibited in a discourse through the employment of first-person pronouns, first-person possessive adjectives, and first-person possessive pronouns.	- First-person pronouns (e.g., I, we) - First-person possessive adjectives (e.g., my, our) - First-person possessive pronouns (e.g., mine, ours)
5	Engagement markers	refer to the linguistic features the author uses to engage readers in a discourse.	- Reader pronouns (e.g., you, your, inclusive we) - Interjections (e.g., you may notice, by the way) - Directives (note, see, consider)

Note. Adapted from Hyland (2005a).

Similar to the current study, a number of earlier studies aimed to explore how scholars exhibited their interactional stance and engagement in the genre (Hyland, 2005a) through the employment of IMCs. They investigated which IMCs were more frequently used and how they served discourse functions across different abstract moves, or in the entire abstract genre (e.g., applied linguistics in Ashofteh et al., 2020 and Nur et al., 2021; food technology in Suntara, 2018; public health in Suntara & Chokthawikit, 2018).

However, to date, no research studies have investigated the rhetorical moves, together with the IMCs used in each move of English unstructured abstracts of experimental RAs on COVID-19 or SARS-CoV-2, which was a trending topic and area of interest at the time of this study. In the current study, the experimental abstracts of the RAs refer to unstructured abstracts in which the subheadings, i.e., background, purpose, methods, results, and discussion, are not required to mark each textual boundary following the journal's authorship or submission guidelines. Simply put, the authors had the freedom to produce the RA abstract genre without predetermined subheadings.

These abstracts were collected from international academic journals across a variety of fields in clinical and health sciences, all indexed in the Scopus database. All of them were indexed in the first quartile (Q1) as well, and were generally considered the most prestigious or highest-quality journals. Therefore, the current study aims to investigate two levels: a) the rhetorical move structure in terms of move sequences and move frequencies; and b) the IMCs in terms

of frequencies and discourse functions invested in each move of unstructured abstracts of experimental RAs on COVID-19.

Research questions

1. What are the move sequences of unstructured abstracts on COVID-19 and what is the status of each move?
2. What IMCs, i.e., hedges, boosters, attitude markers, self-mentions, and engagement markers, are most frequently used in each move of the unstructured abstracts?

LITERATURE REVIEW

Genre, genre analysis, and move identification approaches

Swales (1990) defines genre as "a class of communicative events, the members of which share some set of communicative purposes" (p. 58). In this regard, the communicative event can be realized as a context where language serves an important function. However, the context where non-verbal communication takes place cannot be considered as such an event. Genres can either be spoken or written and typically serve a communicative purpose (Swales, 1990). Swales asserts that genre analysis should be employed as an approach to uncover rhetorical moves in a discourse. A move is defined as "a discoursal or rhetorical unit that performs a coherent communicative function" (Swales, 2004, p. 228). Kanoksilapatham (2012) affirms that genre analysis, also known as 'move analysis' originally created by Swales in 1990, can be used to effectively explore how a written genre is organized, and to foster students' writing in academic writing courses.

Hyland (2013) defines genre as "the recurrent uses of more-or-less conventionalized forms through which individuals develop relationships, establish communities, and get things done using language" (p. 1). Genre analysis is considered a discourse analysis approach that involves examining the repetitive use of a language involving lexico-grammatical features (Hyland, 2013). From this, Hyland (2000) designed a move analysis model to analyze RA abstracts. His model covers five moves: introduction, purpose, method, results, and conclusion, and has been widely applied to explore rhetorical moves in the abstracts of numerous academic disciplines. His model was highly popular among prior genre-based studies because it was generated and designed based on a large corpus of RA abstracts compiled from both soft and hard disciplines (Amnuai, 2019; Saeeaw & Tangkiengsirisin, 2014; Suntara & Usaha, 2013).

As far as move identification is concerned, both a top-down approach and a bottom-up approach were taken into consideration. The top-down approach focuses on identifying communicative functions, while the bottom-up approach examines the linguistic features (Biber et al., 2007, as cited in Li et al., 2020). To ensure precision in move identification, a combination of both approaches was, therefore, applied in the current study. To illustrate, Jirapanakorn et al. (2014) primarily embraced the top-down approach which prioritizes "texts in the context" (p. 25) for move identification in the introduction sections of medical RAs.

Likewise, Vathanalaoha (2017) mainly employed the top-down approach to identify moves in RA abstracts in dentistry, with the view that this approach was more viable as it explicitly sought to determine the communicative purpose. Nevertheless, Swales (2004) suggests that the bottom-up approach be embraced to uncover the rhetorical moves as the approach is impartial.

Previous studies on the RA abstract moves

Abdollahpour and Gholami (2018) previously examined the move structure of RA abstracts in medical sciences. A large corpus of 1,500 abstracts was compiled from five databases and analyzed using Santos' (1996) move scheme model. They found that the medical abstracts typically contained five moves. Move 1: Situating the research; Move 2: Presenting the research; and Move 5: Discussing the research were conventional, while Move 3: Describing the methodology and Move 4: Summarizing the results were obligatory.

Vathanalaoha (2017) compared move structures of RA abstracts between Thai journals and international journals in dentistry. His genre analysis was based on Kanoksilapatham's (2013) five-move model and it revealed that the abstracts from both types of journals overall showcased a similar rhetorical organization of the genre in terms of move frequency, except for Background Move (Move B), which was regarded as an optional move in Thai journals, but a conventional move in international journals. As such, he stated that this could be attributed to cultural differences. For instance, Thai authors might not prefer to pinpoint recent research gaps or limitations of earlier studies in Move B.

Hwang et al. (2017) also compared the move structures of RA abstracts of nanoscience and nanotechnology journals between Vietnamese and native authors of English. Although the comparative study is interesting, the corpora compiled in this study were relatively small, with each containing only 30 abstracts collected from the same five journals. The genre analysis was based on Hyland's five-move model and revealed that both groups overall produced a similar move structure in terms of move frequencies and move sequences. Despite this, some variations could also be observed. That is, the Vietnamese authors were inclined to include the Introduction Move, corresponding to Move B in the current study, less frequently in their abstracts than their counterparts. This finding appears to align with Vathanalaoha's (2017) study, which suggests that non-native authors were not interested in forming such a move, a difference that could be explained by cultural factors and writing styles. In this case, the lack of an Introduction Move in the genre might distance non-native authors from being members of the discourse community at the international level as the move was frequently included in the abstract genre produced by native authors of English and international authors.

Metadiscourse concepts and models

Hyland (2005a) asserts that metadiscourse helps a writer provide an opinion or perspective, as well as involve readers as members of a specific discourse community. His interpersonal model of metadiscourse has been widely adopted or applied to identify metadiscourse features in different types of genres garnered from a variety of disciplines. This model comprises two

main typologies, each of which serves a different discourse function and contains its own categories. The first typology is 'interactive metadiscourse' and is primarily used to organize a discourse, while the second typology is 'interactional metadiscourse,' primarily used to involve readers in perspectives, arguments, or interpretations in a discourse (Hyland, 2005a). More importantly, the latter serves diverse discourse functions depending on each of its categories, which include hedges (e.g., may, possible, seem); boosters (e.g., show, demonstrate, clearly); attitude markers (e.g., appropriate, fortunately, interestingly); self-mentions (e.g., I, exclusive we, my, our); and engagement markers (e.g., see, note, consider) (Hyland, 2005a). In order to propose "a model of interaction" for academic writers, Hyland (2005b) categorized the interactional metadiscourse into two main dimensions, as illustrated in Figure 1 below. This model encourages writers to draw on linguistic resources of different types and functions to convey their ***stance*** towards discourse materials, and to ***engage*** readers in their arguments provided in the discourse. Hence, this model helps establish a connection between writers and readers, as well as between readers and the discourse materials or the writers' arguments.

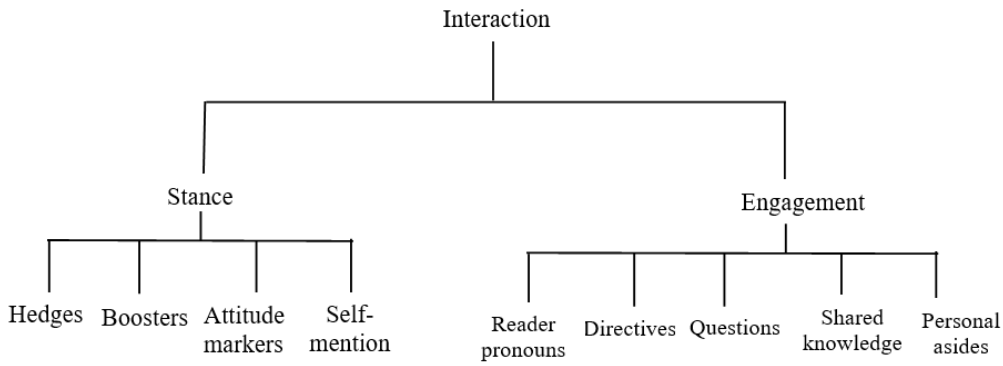

Figure 1 Key resources of academic interaction

Note. From "Stance and Engagement: A Model of Interaction in Academic Discourse," by K. Hyland, 2005b, *Discourse Studies, 7*(2), p. 177.

Previous studies on the IMCs

Recent decades have witnessed numerous studies exploring IMCs in multiple genres, including RA abstracts collected from various disciplines. Most of these studies yielded findings that are worth discussing here. One of such findings is a key investigation by Suntara (2018) in which the analysis of 100 RA abstracts from three food technology journals was done to identify the IMCs used across different moves. The IMC identification was based on Hyland's (2005) classification of stance. It was found that attitude markers were predominantly used in the Introduction Move; self-mentions were used in the Purpose Move (Move P) together with Methods Move (Move M); boosters were used in the Product Move—corresponding to the Result Move (Move R) as in the current study; and hedges were used in the Conclusion Move—corresponding to the Discussion Move (Move D) as in the current study.

Subsequently, Suntara and Chokthawikit (2018) also identified IMCs in 60 RA abstracts collected from three public health journals. The identification was also based on Hyland's (2005) classification of stance. Interestingly, this study shares a similar use frequency of IMCs with Suntara's (2018) study in that attitude markers were most frequently used in Move B, followed by self-mentions in Move M, and attitude markers and hedges in the Conclusion Move. However, attitude markers were found to be most frequently used in the Product Move or Move R in Suntara and Chokthawikit's (2018) study. This demonstrates that some variations can be observed in Move R between disciplines.

Finally, Wei and Duan (2019) compared the employment of metadiscourse features in two corpora. Their first corpus contained 60 RA abstracts written by Chinese authors in hard sciences, while their second corpus contained 60 RA abstracts written by English authors across the same discipline. Hyland's (2005a) interpersonal model of metadiscourse was applied to identify the features. The study found that English authors tended to use IMCs more frequently than their Chinese counterparts. In this regard, they showed a significantly more frequent use of self-mentions than Chinese authors in order to exhibit their authorship. Hence, these findings could help inform non-native authors of IMCs that were more commonly used by their native peers and the manner in which they were used in the abstract genre.

RESEARCH METHODOLOGY

Data collection

The data collection procedures consisted of two main parts. The first part involved selecting journals in clinical and health sciences, while the second part involved selecting English unstructured abstracts of RAs on either COVID-19 or SARS-CoV-2. A purposive sampling technique was employed to select both the academic journals and unstructured abstracts.

In the current study, clinical and health sciences journals listed on Elsevier's Scopus database and indexed in the first quartile (Q1) of the journal rankings were selected for analysis. These journals were selected over a sole reliance on specialists' recommendations to address the potential issue of subjectivity in journal selection (Kanoksilapatham, 2015). The journal rankings (Q1–Q4) were reported with SJR indicators on the SJR website in the year 2022. Three Scopus-indexed Q1 journals were purposively selected from each of five subject areas: 1) Biochemistry, Genetics, and Molecular Biology; 2) Immunology and Microbiology; 3) Medicine; 4) Neuroscience; and 5) Pharmacology, Toxicology, and Pharmaceutics. Meanwhile, only two journals were considered qualified and selected from the other subject area, i.e., Multidisciplinary, as they met the selection criteria of the current study spelled out below. All of the above subject areas were verified by a subject specialist and lecturer holding a Ph.D. degree and associate professorship in medical technology, ensuring their explicit relevance to clinical and health sciences. With this verification, assurance was given that the academic journals categorized under these subject areas could be pertinent to clinical and health sciences. Despite that, the subject specialist suggested that we delve into the aims and scopes of the journals to exactly determine whether they also sought to publish experimental research

articles on COVID-19 or SARS-CoV-2. As a result, 17 qualified journals were selected for the journal dataset (see Appendix 1).

In the current study, a journal was considered qualified if it met all the three selection criteria below:

1) the journal was indexed exclusively in Q1;
2) the journal published empirical RAs grounded on experimental research; and
3) the journal's author or submission guidelines either required authors to submit an unstructured abstract of the RA, or allowed them to submit an abstract without predetermined subheadings.

Regarding the selection of the abstracts, the unstructured abstracts of the experiment-based RAs focusing on either COVID-19 or SARS-CoV-2 were compiled from the qualified journals as described above. Moreover, the length of each abstract fell within the range of 150 to 250 words. From this, finally, a corpus of 143 abstracts was compiled, totaling 27,933 words. All of the experiment-based RAs published between 2020 and 2022 were compiled from the 17 Scopus-indexed Q1 journals as reported by the SJR website in 2022. In this regard, we employed a checklist of predetermined criteria developed from a pilot study, rather than arbitrary judgement, for selecting the qualified abstracts (see Appendix 2).

Data analysis

Move analysis

The coding scheme for the abstract moves in the current study was initially based on Hyland's (2000) five-move model and Kanoksilapatham's (2013) move coding procedures. Then, the adopted coding scheme was employed to code a dataset of COVID-19 abstracts in the pilot study. The descriptors for move functions were then adjusted to align with those of the COVID-19 abstract moves, as presented in Table 3 below. The motives for adopting the two models are explained herein. Hyland's (2000) five-move model was developed from a sizable corpus of RA abstracts compiled from multiple disciplines of both sciences and social sciences (Amnuai, 2019; Saeeaw & Tangkiengsirisin, 2014; Suntara & Usaha, 2013). His model was widely applied to uncover the RA abstract moves in a number of genre-based studies (e.g., Alyousef, 2021; Hwang et al., 2017; Saeeaw & Tangkiengsirisin, 2014). It covers five different moves: Introduction, Purpose, Methods, Product, and Conclusion. Meanwhile, Kanoksilapatham's (2013) move coding procedure was utilized to uncover the RA abstract moves in civil engineering. Similarly, her model also covers five different moves: Background, Purpose, Methods, Results, and Discussion. Notably, the terms 'Introduction, Product, and Conclusion' were used in Hyland's (2000) five-move model, whereas 'Background, Results, and Discussion' were used in Kanoksilapatham's (2013) coding procedure. However, a one-on-one comparison of the move functions between two corresponding moves—Introduction and Background, Product and Results, and Conclusion and Discussion—revealed that they shared several key move functions. In light of Kanoksilapatham's (2013) coding procedure, we decided to use the terms 'Background (B); Purpose (P); Methods (M); Results (R); and Discussion (D) Moves' as the descriptors for the functions of each move as they are aligned more closely with those of each

move in the COVID-19 abstract genre (as revealed by the preliminary analysis from the pilot study). Furthermore, Kanoksilapatham's (2013) coding procedure was employed, as noted above, to uncover the RA abstract moves in civil engineering, a hard discipline, thereby corresponding with the target genre in the current study.

Table 3

The devised coding scheme for move analysis

Move	Move function
Background (Move B)	Providing background information on the research topic; and/or referring to established findings of the previous studies; or stating the significance of the research topic; and/or indicating research gaps, problems, issues, or limitations
Purposes (Move P)	Stating the purposes or objectives of the research
Methods (Move M)	Describing experimental research procedures, e.g., laboratory testing, animal models, clinical trials, data collection, and data analysis
Results (Move R)	Presenting the main findings only; or presenting the main findings with slight elaboration or interpretations
Discussion (Move D)	Discussing various aspects of the findings, e.g., restating some findings or methods; stating generalizations about the research being conducted; explaining the implications of the specific findings; describing the practical applications of the approaches, strategies, models, clinical trials, therapies, experiments of the research; or making suggestions for further research

Note. Adapted from Hyland (2000, p. 204) and Kanoksilapatham (2013, pp. 5-7).

In the current study, a top-down approach was primarily employed to identify a communicative function through scrutinizing the "content of the text" (Pho, 2008, p. 233). In other words, we aimed to identify moves by examining the scientific content of the COVID-19 abstracts, as well as by examining "texts as context" (Lieungnapar & Watson Todd, 2011, p. 9), thereby prioritizing the contextual clues (Lieungnapar & Todd, 2011) in each COVID-19 abstract. Moreover, a bottom-up approach serving to examine linguistic features in the genre (Pho, 2008; Swales, 2004) was also employed to identify each move more precisely.

Move sequence

In the current study, a move boundary was marked at a phrasal level as findings from the pilot study revealed that a communicative function could be expressed through such a textual phrase (Pho, 2008). Thus, Table 4 below exemplifies how each single move was marked using the devised coding scheme.

Table 4

Example of the move identification

Phrase or sentence	Textual boundary	Move
Sentences 1-3	**S1:** Remdesivir (RDV, GS-5734), the first FDA-approved antiviral for the treatment of COVID-19, is a single diastereomer monophosphoramidate prodrug of an adenosine analogue. // **S2:** It is intracellularly metabolized into the active triphosphate form, which in turn acts as a potent and selective inhibitor of multiple viral RNA polymerases. // **S3:** RDV has broad-spectrum activity against members of the coronavirus family, such as SARS-CoV-2, SARS-CoV, and MERS-CoV, as well as filoviruses and paramyxoviruses.	Move B
Phrase	To assess the potential for off-target toxicity,	Move P
Sentences 4-7	**S4:** RDV was evaluated in a set of cellular and biochemical assays. // **S5:** Cytotoxicity was evaluated in a set of relevant human cell lines and primary cells. // **S6:** In addition, RDV was evaluated for mitochondrial toxicity under aerobic and anaerobic metabolic conditions, and for the effects on mitochondrial DNA content, mitochondrial protein synthesis, cellular respiration, and induction of reactive oxygen species. // **S7:** Last, the active 59-triphosphate metabolite of RDV, GS-443902, was evaluated for potential interaction with human DNA and RNA polymerases.	Move M
Sentence 8	**S8:** Among all of the human cells tested under 5 to 14 days of continuous exposure, the 50% cytotoxic concentration (CC50) values of RDV ranged from 1.7 to .20 mM, resulting in selectivity indices (SI, CC50/EC50) from .170 to 20,000, with respect to RDV anti-SARS-CoV-2 activity (50% effective concentration [EC50] of 9.9 nM in human airway epithelial cells).	Move R
Sentence 9	**S9:** Overall, the cellular and biochemical assays demonstrated a low potential for RDV to elicit off-target toxicity, including mitochondria-specific toxicity, consistent with the reported clinical safety profile	Move D

Note. Abstract No. 9 in AAC.

To elaborate, the corpus of RA abstracts was examined to identify move sequences. This way, move sequences identified were divided into two main types, as listed below.

1. *Canonical move sequence* refers to a sequence of moves arranged in a logical, linear sequence, e.g., B-R-D, B-M-R-D, B-P-M-R-D. As shown in Table 4 above, the move sequence of the abstract genre was generally B-P-M-R-D.

2. *Deviant move sequence* refers to a sequence of moves deviating from the canonical move sequence. It is the sequence in which one of these move types manifests: a cyclical move, an embedded move, a reversal move, or a mixed move.

2.1) *A cyclical move* involves a move that re-manifests in a move sequence. The example below demonstrates how Move M and Move R functioned as the cyclical moves in the abstract genre.

M-R-M-R-M-R-D

> **Move M:** We have developed a COVID-19 vaccine, hAd5 S-Fusion+N-ETSD, that expresses SARS-CoV-2 spike (S) and nucleocapsid (N) proteins with modifications to increase immune responses delivered using a human adenovirus serotype 5 (hAd5) platform. // **Move R:** Here, we demonstrate subcutaneous (SC) prime and SC boost vaccination of CD-1 mice with this dual antigen vaccine elicits T-helper cell 1 (Th1)-biased T-cell and humoral responses to both S and N that are greater than those seen with hAd5 S wild type delivering only unmodified S. // **Move M:** We then compared SC to intranasal (IN) prime vaccination with SC or IN boosts // **Move R:** and show that an IN prime with an IN boost is as effective at generating Th1-biased humoral responses as the other combinations tested, but an SC prime with an IN or SC boost elicits greater T cell responses. // **Move M:** Finally, we used a combined SC plus IN (SC+IN) prime with or without a boost // **Move R:** and found the SC+IN prime alone to be as effective in generating humoral and T-cell responses as the SC+IN prime with a boost. // **Move D:** The finding that SC+IN prime-only delivery has the potential to provide broad immunity—including mucosal immunity—against SARSCoV2 supports further testing of this vaccine and delivery approach in animal models of viral challenge. [abstract No. 3 in SR]

2.2) An *embedded move* involves a move which is fused as a segment of another move. The example below demonstrates how Move M, as shown in the underlined phrase, is embedded in Move R.

> **Move M:** Using golden Syrian hamsters infected with an early circulating SARS-CoV-2 strain harboring the D614G mutation in the spike protein; // **Move R:** we show here that rather than being related to a first wave of apoptosis as proposed in previous studies, the innate immune cells play a major role in the destruction of the olfactory epithelium. We observed that while apoptosis remains at a low level in the damaged area of the infected epithelium, the latter is invaded by Iba1+ cells, neutrophils and macrophages. [a part of Move R: abstract No. 7 in CMLS]

2.3) A *reversal move* refers to a move which is arranged in reverse order in a move sequence. As exemplified below, Move M, where research activity verbs (e.g., investigate and identify) are frequently used (Kanoksilapatham, 2009; 2014), is presented before Move P.

B-M-P-R-D

> **Move B:** The COVID-19 pandemic marks the third coronavirus pandemic this century (SARS-CoV-1, MERS, SARS-CoV-2), emphasizing the need to identify and evaluate conserved immunogens for a pan-sarbecovirus vaccine. // **Move M:** Here we investigate the potential utility of a T-cell vaccine strategy targeting conserved regions of the sarbecovirus proteome. We identified the most conserved regions of the sarbecovirus proteome as portions of the RNA-dependent RNA polymerase (RdRp) and Helicase proteins, both of which are part

of the coronavirus replication transcription complex (RTC). Fitness constraints suggest that as SARS-CoV-2 continues to evolve these regions may better preserve cross-reactive potential of T-cell responses than Spike, Nucleocapsid, or Membrane proteins. // **Move P:** We sought to determine if vaccine-elicited T-cell responses to the highly conserved regions of the RTC would reduce viral loads following challenge with SARS-CoV-2 in mice using a rhesus adenovirus serotype 52 (RhAd52) vector. // **Move R:** The RhAd52.CoV.Consv vaccine generated robust cellular immunity in mice and led to significant reductions in viral loads in the nasal turbinates following challenge with a mouse-adapted SARS-CoV-2. // **Move D:** These data suggest the potential utility of T-cell targeting of conserved regions for a pan-sarbecovirus vaccine. [abstract No. 9 in npj]

2.4) A *mixed move* refers to a co-occurrence of two or more move types in a move sequence. As exemplified below, Move R, functioning as a cyclical move, co-occurred with Move M functioning as an embedded move.

B-R-M (embedded in R)-R-D

Move B: The current coronavirus disease 2019 (COVID-19) pandemic presents a global public health challenge. The viral pathogen responsible, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), binds to the host receptor ACE2 through its spike (S) glycoprotein, which mediates membrane fusion and viral entry. Although the role of ACE2 as a receptor for SARSCoV-2 is clear, studies have shown that ACE2 expression is extremely low in various human tissues, especially in the respiratory tract. Thus, other host receptors and/or co-receptors that promote the entry of SARS-CoV-2 into cells of the respiratory system may exist. // **Move R:** In this study, we found that the tyrosine-protein kinase receptor UFO (AXL) specifically interacts with the N-terminal domain of SARS-CoV-2 S. // **Move M:** Using both a SARS-CoV-2 virus pseudotype and authentic SARS-CoV-2, // **Move R:** we found that overexpression of AXL in HEK293T cells promotes SARS-CoV-2 entry as efficiently as overexpression of ACE2, while knocking out AXL significantly reduces SARS-CoV-2 infection in H1299 pulmonary cells and in human primary lung epithelial cells. Soluble human recombinant AXL blocks SARS-CoV-2 infection in cells expressing high levels of AXL. The AXL expression level is well correlated with SARS-CoV-2 S level in bronchoalveolar lavage fluid cells from COVID-19 patients. // **Move D:** Taken together, our findings suggest that AXL is a novel candidate receptor for SARS-CoV-2 which may play an important role in promoting viral infection of the human respiratory system and indicate that it is a potential target for future clinical intervention strategies. [abstract No. 9 in CR]

Move frequency

The frequency of each move was converted into a percentage to determine its status using three cut-off values following Kanoksilapatham's (2005) study. A move with a frequency of less than 60% was regarded as an optional move; if it was between 60% and 99%, it was regarded as a conventional move; and if it had a frequency of 100%, it was regarded as an obligatory move.

IMC analysis

The results from the move analysis stage were incorporated into IMC analysis. The current study aimed to identify which IMCs were most frequently used and how they served the discourse functions in each move. The coding scheme for the IMC analysis was initially based on Hyland's (2005a) model but was subsequently modified, following the pilot study results and in-depth discussions with an inter-coder in order to harmonize it with the nature of the target genre. In the current study, the devised coding scheme contains five categories: hedges, boosters, attitude markers, self-mentions, and engagement markers along with their respective subcategories (see Appendix 3). As for the coding procedure, each IMC identified was carefully analyzed from the word level to the phrase level to examine how it served a discourse function in the context of each move. With regards to this, Hyland (2005a) asserts that emphasis should be placed on the contextual use rather than on "simple linguistic criteria" (p. 27) when it comes to metadiscourse identification as the metadiscourse itself is flexible, to which any new linguistic markers could be added.

Measures of the inter-coder reliability

Move analysis

An inter-coder reliability must be assessed to verify the reliability of the move analysis reliability as well as the coding consistency. Following standard protocol, a high degree of agreement must be reached between coders from the textual analyses (Crookes, 1986). In this study, the researcher and the inter-coder were qualified to serve as coders due to their academic background in clinical and health sciences, as well as their completion of Corpus Linguistics and ESP courses in a doctoral program. Subsequently, each coder was tasked with independently analyzing a random dataset of the abstracts accounting for at least 25% of the monitor corpus (n = 122). Then, the coding results were calculated to determine percentages of agreements and the inter-coder reliability. Finally, any disagreements arising between the two coders were discussed until a final decision could be reached.

IMC analysis

The researcher of this study, along with a lecturer of English who specializes in metadiscourse and holds a Ph.D. in Reading and Writing from the UK, served as the coders. Similarly, as noted above, the coding results were calculated to determine the percentage of agreement and the inter-coder reliability between the two coders. Any discrepancies were then addressed until a final decision was reached.

Statistical analysis

The kappa statistic was used to evaluate the inter-coder reliability values between the two coders. Percentages were used to report the results of the percentages of agreement rates, moves, and IMCs. Then, a chi-square test was performed to determine whether there was a significant difference in the frequency of hedges, boosters, attitude markers, self-mentions, and engagement markers in the same move of the abstract genre.

RESULTS AND DISCUSSION

Move sequence

In the current study, the percentage of agreement for each move fell between 81.82% and 100%, and the average percentage was 97.60%. This indicates a strong percentage of agreement. Moreover, Cohen's kappa value was at 0.97, demonstrating a high level of inter-coder reliability for the move analysis (McHugh, 2012) (see Appendix 4).

Two major typologies of move sequences were identified in the COVID-19 corpus: canonical move sequences (82.52%) and deviant move sequences (17.48%). This indicates that the authors showed a strong tendency to construct unstructured abstracts in a linear, logical manner rather than a deviant arrangement where a move arrangement was relatively arbitrary or uncertain, resulting in "structural variations" (Kanoksilapatham, 2013, p. 3). Notably, the former yielded seven different move sequences while the latter yielded 17 different ones, totaling 24 types of sequences in the corpus (see Appendices 5 and 6).

Table 5

Percentage of the canonical move sequence

Rank	Move sequence	Percentage (%)
1	B-M-R-D	35.66
2	B-R-D	17.48
3	B-P-M-R-D	16.78
4	B-P-R-D	7.69
5	B-P-M-R	2.10
6	B-M-R	2.10
7	P-M-R	0.70
	Total	82.52

As presented in Table 5, the most frequent move sequences were B-M-R-D, B-R-D, and B-P-M-R-D. The overall picture indicates that four-move sequences occupied most of the rankings (45.45%). As such, Alyousef (2021) and Salager-Meyer (1990) argued that a four-move sequence may be used to produce a well-structured abstract. Notably, Move B, Move R, and Move D always appeared in the top three sequences, suggesting that the authors tended to grant prominence to them in producing unstructured abstracts for Q1-indexed journals. Nonetheless, the top two sequences did not include Move P, suggesting that the authors opted to exclude it as they probably realized that the reasons and the ways the experimental research was conducted were already implied or signaled through Move M. By doing so, they could allocate space to the move in which they wished to emphasize or supply more scientific content.

Table 6

Percentage of the deviant move sequence

Rank	Move sequence	Percentage (%)
1	Embedded move	9.09
2	Mixed move	5.59
3	Cyclical move	2.10
4	Reversal move	0.70
	Total	17.48

Table 6 provides percentages of deviant move sequences. The embedded move was the most common. In this regard, the sequence "B-M(embedded in R)-R-D" where Move M was embedded in the textual boundary of Move R, was most frequently observed, as in example (1) below.

(1) **Move M:** Using data from 1,076 participants enrolled in ChAdOx1 nCov-19 vaccine efficacy trials in the United Kingdom, // **Move R:** we found that inter-individual variation in normalized antibody responses against SARS-CoV-2 spike and its receptor-binding domain (RBD) at 28 days after first vaccination shows genome-wide significant association with major histocompatibility complex (MHC) class II alleles. [a part of Move R: abstract No. 4 in N-Med]

Mixed moves in the sequences where embedded moves co-occurred with either reversal moves or cyclical moves were frequently identified (Appendix 6). As noted above, the deviant move sequences yielded more different types of sequences than the linear ones. This could be attributed to the nature of the COVID-19 abstract genre of which the authors could construct independently following the authors' guidelines that either required or allowed them to submit the unstructured abstracts without predetermined subheadings. Furthermore, this could be partially attributed to several complicated experiments conducted to yield various research results (Kanoksilapatham, 2013).

Move frequency

As shown in Table 7 below, the COVID-19 corpus revealed five typologies of the abstract moves, each of which accounted for different frequencies (n). This finding aligns with several earlier studies (e.g., Hyland, 2000; Kanoksilapatham, 2009, 2013). Three types of move statuses were discovered, including optional, conventional, and obligatory statuses. The corpus also revealed the move sizes, falling between 4.06% and 45.63%, depending on the word count percentage of each move.

Table 7

Move frequency in the COVID-19 corpus

Moves	n (%)	Move status	Move size (%)
Background	140 (97.90)	Conventional	21.87
Purpose	51 (35.66)	Optional	4.06
Methods	105 (73.43)	Conventional	15.09
Results	143 (100)	Obligatory	45.63
Discussion	135 (94.41)	Conventional	13.36

Background move

Move B in the unstructured abstracts on COVID-19 was regarded as a conventional move (97.90%), which lends support to the findings of Vathanalaoha and Tangkiengsirisin (2018) and Kanoksilapatham (2015). Its move size (21.87%) was the second largest among all the rhetorical moves. Generally, it was usually first constructed in the abstract genre, which aligns with the findings of Ahmed (2015); Amnuai (2019); and Li and Pramoolsook (2015). Move B in the current study mainly concerned contextual background of the research topics under investigation, as in example (2) below; the recent research gaps, problems/issues, or limitations that needed to be addressed, as in (3); and the significance of the research topic, highlighting its importance and contribution, as in (4).

> **(2):** The impact of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), the causative agent of COVID-19, is global and unprecedented. // **(3):** Although remdesivir has recently been approved by the FDA to treat SARS-CoV-2 infection, **no oral antiviral** is available for outpatient treatment. // **(4):** AT-527, an orally administered double prodrug of a guanosine nucleotide analog, was previously shown to be **highly efficacious** and **well-tolerated** in hepatitis C virus (HCV)-infected subjects. [Move B: abstract No. 3 in AAC]

Purpose move

Move P was regarded as an optional move (35.66%). Its move size (4.06%) was the smallest. This move was mainly formed to express the research purpose or objective. The linguistic structure 'Exclusive We + present verb + direct object' was the most frequent, as in example (5). In this regard, Vathanalaoha (2017) revealed that Move P did not use the singular subject pronoun 'I' in experimental abstracts. Additionally, Move P did not appear in the form of a research question or hypothesis in the experimental abstracts on COVID-19.

> (5) Herein, **we present** a rapid and cost-effective lipid nanoparticle (LNP) encapsulated-mRNA platform for in vivo delivery of SARS-CoV2 neutralization antibodies. [Move P: abstract No.10 in CR]

Methods move

Move M was regarded as a conventional move (73.43%) in the current study. This result aligns with the findings of Rungnaphawet (2016), Suntara and Usaha (2013), and Vathanalaoha (2017). However, it did not align with those of Ahmed (2015) and Alyousef (2021), who reported that Move M was an obligatory move. In the current study, Move M was larger than Move P and Move D; however, it was smaller than Move B and Move R.

Notably, Move M was considered as a conventional move even though the methodology is generally indispensable in experimental research. This indicates that majority of the authors chose not to present it overtly in the abstract genre. This could be evidenced from the fact that multiple experimental procedures have become well-established and recognizable in

academic fields (Kanoksilapatham, 2015). For this reason, readers in respective discourse communities were expected to be informed about those procedures to a certain extent. Therefore, the authors decided not to include Move M in the abstract genre probably due to, in part, the fact that they might wish to save textual space for the other moves to which they gave more prominence.

As such, it was observed that some details of the experimental procedures were mentioned or inserted in other moves, especially Move P, Move R, and Move D. This did not, however, entail that those details would be regarded as Move M. This phenomenon can be justified by the fact that the communicative function was prioritized over procedural details or information when it comes to identifying moves in the current study. For example, those procedural details were either mentioned in Move P as underlined in example (6) or mentioned in Move R as in example (7). In this regard, Move M was not necessarily included in the abstract genre. Overall, Move M of the COVID-19 abstracts commonly came after Move B and only outlined a brief account of experimental procedures, clinical trials, or animal models.

> (6) Here, we describe a human 2D air–liquid interface culture system which was characterized by **confocal and electron microscopy** and **single-cell mRNA expression analysis**. [Move P: abstract No.1 in EMBO]

> (7) **In vitro characterization of this vaccine** confirms its structural and antigenic integrity. **In-vivo immunogenicity evaluation in mice** indicates that [...]. [a part of Move R: abstract No. 9 in EMI]

Results move

Move R was regarded as an obligatory move (100%), consistent with the findings of Alyousef (2021) and Vathanalaoha (2017). Its move size (45.63%) was the largest by far. This move frequently preceded Move D and mainly presented the main findings that were sometimes accompanied by brief interpretations. This lends support to the Alyousef's (2021) study which found that Move D was often merged with Move R in experimental abstracts. As for the current study, the results strongly suggest that the authors were inclined to give special attention to this move to highlight experimental findings partly because it was crucial at the time to disseminate novel or cutting-edge knowledge to the discourse community to address existing challenges related to COVID-19 or SARS-CoV-2. Example (8) below illustrates an instance of Move R.

> (8) We show that K18-hACE2 mice replicate virus to high titers in the nasal turbinates, lung, and brain, with high lethality, and cytokine/chemokine production. In contrast, adenovirus mediated delivery results in viral replication to lower titers limited to the nasal turbinates and lung, and no clinical signs of infection. [Move R: abstract No.5 in EMI]

Discussion move

Move D was regarded as a conventional move (94.41%), aligning with several genre-based studies that focused on RA abstracts in hard disciplines (e.g., Alyousef, 2021; Kanoksilapatham,

2009, 2013; Vathanalaoha, 2017). Its move size (13.36%) was larger than Move P, yet smaller than the others. Move D was typically written in the last sequence and occurred after Move R. This move mainly concerned discussing the experimental results in various dimensions, namely, suggesting the implications of specific findings as in example (9); suggesting the practical applications of the strategies, models, or trials adopted in research as in (10); generalizing the research undertaken as in (11); restating certain results or methods; and suggesting further research.

(9) In brief, our results reveal **a novel mechanism** by which SARS-CoV-2 inhibits the innate immune response; that is, ORF10 induces mitophagy-mediated MAVS degradation by binding to NIX. [Move D: abstract No. 4 in CMI]

(10) Our **strategy** has the potential to prevent severe COVID-19 courses in SOT or autoimmunity settings and to prevent immunopathology while providing viral clearance in severe non-transplant COVID-19 cases. [Move D: abstract No. 4 in MT- MCD]

(11) Our findings highlight viral helicase as a druggable target and the clinical potential of bismuth(iii) drugs or **other metallodrugs** for the treatment of SARS-CoV-2 infection. [Move D: abstract No. 9 in NM]

Employment of IMCs in each move

In the current study, the agreement rate for each IMC across five different moves fell between 96.80 and 100. The average percentage was 98.11, showing a strong level of agreement. Furthermore, Cohen's kappa value for each IMC across different moves ranged from 0.95 to 1.00 with an average value of 0.97. Therefore, these statistical results revealed a high level of inter-coder reliability for the IMC analysis (see Appendix 7). Overall, 1,916 IMC tokens were discovered in the corpus, making up 6.86% of the corpus. More interestingly, the Chi-square tests revealed significant differences (i.e., $p < 0.05$) in two dimensions. First, a head-to-head comparison of the frequency of hedges, boosters, attitude markers, and self-mentions showed significant differences ($p < 0.05$) among the moves. Simply put, the authors displayed a significant difference in the use of each IMC across different moves, except for engagement markers ($p = 0.317$) (see Appendix 8).

Table 8

The overall frequency of the IMCs

Category	Move B	Move P	Move M	Move R	Move D
Hedge	141	3	21	99	142
Booster	126	13	38	308	118
Attitude	262	11	33	191	129
Self-mention	3	40	78	103	53
Engagement marker	1	0	0	0	3
Chi-value	446.45	46.37	43.13	164.94	156.65
p	0.00	0.00	0.00	0.00	0.00

Second, the comparison of each IMC frequency in the same move showed a significant difference ($p < 0.05$), as shown in Table 8 above. In other words, the authors demonstrated a significant difference in the use of each IMC in the same move. Notably, these findings indicate that the scholars tended to show a unique preference for the interactional metadiscourse devices when it came to forming each move in the experimental abstracts on COVID-19. This could represent the nature of each communicative function. To elaborate slightly, they mainly capitalized on attitude markers in Move B; self-mentions in Move P and Move M; boosters in Move R; and hedges in Move D. Next, the findings, exemplification, and discussion of the IMCs utilized in each move of the abstracts are presented.

Table 9

The frequency of each IMC in Move B

	Hedge	Booster	Attitude marker	Self-mention	Engagement marker
n	141	126	262	3	1
%	7.36	6.58	13.67	0.16	0.05

Note. n refers to the frequency of tokens in the COVID-19 corpus.

Move B centers around the rationale of the research topics under investigation, as well as the recent problems, issues, limitations, or research gaps, that required potent medical practices to address challenges, bridge recent gaps, or mitigate the adverse impact of COVID-19 or SARS-CoV-2 on healthcare. For these reasons, it was not surprising that the authors employed attitude markers (13.67%) more significantly than other IMCs to express their perspectives on various aspects of this move. The attitude markers in the form of adjectives, especially through the top five ranked linguistic choices *'effective (n = 19 tokens), major (9), new (7), critical (6), and promising (6)*, were the most predominant (see Appendix 9), as in example (1) below.

(1) Currently, however, no **effective** drug or vaccine is available to treat or prevent the resulting coronavirus disease 2019 (COVID-19). [a part of Move B: abstract No. 5 in CR]

This finding was in line with Suntara and Chokthawikit's (2018) study in public health and Suntara's (2018) study in food technology, reporting that attitude markers were the most frequent in Move B in the RA abstract genre. Moreover, the current study saw the relatively balanced investment of hedges (7.36%) and boosters (6.58%), accounting for only 0.78% in difference. To illustrate, they mainly hedged their arguments, claims, or statements as in example (2), whereas they boosted their arguments on the scientific content of this move, as in example (3). However, the authors were not interested in the use of self-mentions to manifest themselves as the authors or investigators, or engagement markers to involve readers in Move B.

(2) Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is transmitted on mink farms between minks and humans in **many** countries. [a part of Move B: abstract No. 6 in STTT]

(3) Antiviral therapies are **urgently** needed to treat and limit the development of severe COVID-19 disease. [a part of Move B: abstract No. 5 in AAC]

Table 10

The frequency of each IMC in Move P

	Hedge	Booster	Attitude marker	Self-mention	Engagement marker
n	3	13	11	40	0
%	0.16	0.68	0.57	2.09	0

Move P involved the purpose or objective of the research. This move saw the fewest occurrences of the IMCs, accounting for only 67 tokens (3.50%) when compared to the other moves. This suggests that the authors were not inclined to use the interactional devices in this move, which is commonly written in a concise, straightforward, and lucid manner. However, they tended to use self-mentions to establish authorial identity (Hyland, 2005a; Zhang & Pan, 2023) in their work. Only self-mentions in the form of exclusive 'We', referring to the authors or investigators, were used, as in (4) below.

(4) Thus, **we** aim to characterize the molecular mechanism by which SARS-CoV-2 Spike protein advances human macrophage (MΘ) inflammatory and glycolytic phenotypes and uncover novel therapeutic strategies. [Move P: abstract No. 4 in CMLS]

Table 11

The frequency of each IMC in Move M

	Hedges	Boosters	Attitude markers	Self-mentions	Engagement markers
n	21	38	33	78	0
%	1.10	1.98	1.72	4.07	0

Move M typically encompassed the designs, research procedures, experiments, trials, animal models, and data collection. Similar to Move P, Move M rarely used the IMCs to express the ways the authors asserted an interactional stance and engagement with scientific content. Notably, self-mentions were most frequently used in this move. Only exclusive self-mentions, 'We' and 'Our' were found. In this regard, the former significantly outnumbered the latter (see Appendix 10). This phenomenon indicates that when it came to forming Move M and also Move P in the unstructured abstracts on COVID-19, the authors from Q1-indexed journals primarily used these self-mentions to demonstrate authorial identity in their work (Hyland, 2005a; Wu & Zhu, 2014; Zhang & Pan, 2023) reflecting a practice shared by multiple authors (Millar et al., 2020), i.e., to gain recognition and trustworthiness (Harwood, 2005) or be recognized for their contributions to their respective fields, as in example (5) below. Surprisingly, some authors chose to either boost or hedge their claims or statements on the scientific content of this move even though knowledge, research procedures, or experiments in clinical and health sciences were generally well-established and robust as in (6).

(5) **We** have developed a prototype two-dose vaccine (BReC-CoV-2) by combining the Receptor Binding Domain (RBD) antigen, via conjugation to Diphtheria toxoid (EcoCRM®). [a part of Move M: abstract No. 6 in npj]

(6) On the basis of YF17D, we developed an exceptionally **potent** COVID-19 vaccine candidate called YF-S0. [a part of Move M in abstract No. 8 in MT-MCD]

Table 12

The frequency of each IMC in Move R

	Hedge	Booster	Attitude marker	Self-mention	Engagement marker
n	99	308	191	103	0
%	5.17	16.08	9.97	5.38	0

Move R saw the highest frequency of IMCs among all the rhetorical moves. This strongly indicates that scholars from Q1-indexed journals tended to underscore the importance of Move R, which presented the main research results obtained from various forms of experiments. As such, Hyland (2005b) argues that academic authors need to capitalize on interactional resources to make the results and the interpretations more convincing for readers, as well as to convey their stance, express themselves, and involve the readers. The investment of boosters was significantly more frequent than the others in this move. The boosters in the form of lexical verbs, particularly these top five lexical choices: *show (n = 70), demonstrate (30), reveal (22), find (21), and exhibit (10)*, were the most common (see Appendix 11). The rationale behind the highly frequent use of boosters in Move R could be that the authors aspired to foreground the experimental discoveries on such a novel or cutting-edge topic of COVID-19 or SARS-CoV-2 at the time in order to publicize them in the highly competitive context of clinical and health sciences. For these reasons, the use of hedging devices, generally contrary to that of the boosting ones (Hu & Cao, 2011), was much lower in Move R. These findings lend support to Wang and Jiang's (2018) study in hard sciences and Suntara's (2018) study in food technology, indicating that the authors tend to prioritize highlighting research results. Such findings also align with Hu and Cao's (2011) study in that the empirical RA abstracts showed more significant preferences for the use of boosting strategies than the non-empirical abstracts. More interestingly, it was also found that the employment of boosters and self-mentions in Move R was significantly more prevalent than those of other moves. This strongly indicates that the authors not only sought to emphasize their findings with confidence, but also to project authorial identity in this move, as in example (7). Moreover, the authors often used attitude markers, securing the second rank, to express their viewpoints, perspectives, or thoughts on the results, to a certain extent, as in (8) below.

(7) **We show** that K18-hACE2 mice replicate virus to high titers in the nasal turbinates, lung and brain, with high lethality, and cytokine/chemokine production. [a part of Move R: abstract No. 5 in EMI]

(8) These **disappointing** results call for **a word of caution** in the interpretation of anti-SARS-CoV-2 activity of drugs solely based on their activity in Vero cells. [a part of Move R: abstract No .5 in AAC]

Table 13

The frequency of each IMC in Move D

	Hedge	Booster	Attitude marker	Self-mention	Engagement marker
n	142	118	129	53	3
%	7.41	6.16	6.73	2.77	0.16

Move D involved discussion of the research findings. It exhibited the third highest frequency of the IMCs. Noticeably, the employment of hedges was significantly more frequent than the others in this move. Hedges in the form of modal verbs (n = 54), particularly *may (23), can (16), and could (13)*, and those in the form of lexical verbs (n = 36), especially *suggest (26) and indicate (9)*, were the most common (see Appendix 12). These findings indicate that the authors are inclined to be mindful of the arguments or claims regarding the findings being discussed. In other words, they often hedged the implications of their experimental findings. This is evident in example (9), and in example (10) where the performance or efficacy of the strategies, approaches, experiments, trials, or models adopted was discussed. These findings are congruent with Suntara's (2018) study in that authors are likely to invest hedging devices in Conclusions, and with Wang and Jiang's (2018) study in hard sciences, which reported that hedging devices were most frequently used in the Results and Discussion Section.

(9) Collectively, **these results suggest** that DIG and OUA **may** be an alternative treatment for COVID-19, with **potential** additional therapeutic effects for patients with cardiovascular disease. [Move D: abstract No. 6 in SR]

(10) **The technological strategy** we describe here **can** be adapted by other producers, particularly in low- and middle-income countries. [Move D: abstract No. 10 in SR]

In the current study, the authors balanced three types of the IMCs in this move: hedges, boosters, and attitude markers, which showed a slight difference in frequency. Attitude markers in the form of epistemic adjectives (n = 89), particularly *promising (12), important (9), and new (9)*, were the most predominant. Meanwhile, boosters in the form of lexical verbs (n = 85), particularly *provide (27), demonstrate (15), and highlight (5)*, were the most common. Similar to Move M and Move R, self-mentions in the form of exclusive 'We' and 'Our' were observed and used in a similar way as noted above. Engagement markers in the form of inclusive 'Our' were observed only in this move. This marker type is typically employed to engage readers in the discourse content (Hyland, 2005a). In the current study, the authors often used it to involve the readers in recognizing the contributions their research made to the respective field as in example (11), as well as underscore the findings that may enrich an insight into the research topic under investigation, as in example (12) below.

(11) This study enhances **our** understanding on the proteases and provides FDA approved drugs for prevention and/or treatment of COVID-19. [Move D: abstract No.4 in AAC]

(12) Taken together, these epitopes may be used to improve **our** understanding of natural and vaccine induced immunity, and to facilitate the development of T-cell-targeted vaccines that harness pre-existing SARS-CoV-2 immunity. [Move D: abstract No.4 in npj]

CONCLUSION

This study sought to assist prospective writers of English in overcoming the challenges of producing unstructured abstracts for experimental RAs through an exploration of the genre

on COVID-19 or SARS-CoV-2. It also sought to assist scholars with limited writing experiences in producing an RA abstract that should align with expectations of the intended discourse community (Kanoksilapatham, 2005). In turn, this would help bolster their chances of having their work published in international journals rather than in local ones for their professional development.

This study also offers insights into how the abstract genre in question was constructed and textually organized through the lenses of move structures, together with how the nature of the abstract move was reflected from the perspective of the interactional metadiscourse strategies that were predominantly implemented. As for pedagogical implications, novice scholars and highly skilled learners in an academic writing course should be motivated and guided to examine the professional writing styles culled from Scopus Q1-indexed journals, as yielded in this study, in order to develop an understanding of the writing conventions of the target genre. For instance, the most common move sequence, along with rhetorical moves with obligatory and conventional statuses should be foregrounded. They should be also made aware of the deviations which could be attributed to the authors' freedom of choice in constructing the move structure, or to the experimental discoveries obtained from the sophisticated research procedures (Kanoksilapatham, 2013).

Despite having adequate knowledge of scientific content in experimental research, a deeper understanding of the key and common IMCs, along with respective linguistic choices invested in each single move is even more important. Prospective writers should not only learn how to present subject content but also how to adopt interactional tactics to interact with readers and take a stance on propositions in the genre (Hyland, 2005a). This kind of genre should not be dry or tedious as it is widely acknowledged that the abstract genre is generally promotional in nature (e.g., Breeze, 2009; Zibalas & Šinkūnienė, 2019).

LIMITATIONS AND RECOMMENDATIONS

One key limitation was the specialized corpus of the current study was compiled from only Scopus-indexed Q1 journal articles published between 2020 and 2022 only. Hence, more data could be collected for future prospective corpora as a more substantial corpus size could cater for more nuanced insights into the findings as well as help enhance the generalizability of these results. Another limitation is that the current study is centered exclusively on unstructured abstracts of RAs grounded on experimental research designs. It is recommended that the RA abstracts grounded on other research designs, e.g., cohort study, cross-sectional study, and case-control study (Grimes & Schulz, 2002) be embraced as well to uncover the move structure and the IMCs used in those areas across different moves.

Furthermore, it is recommended that further studies consider conducting a comparative study to explore the potential similarities and differences in RA abstracts between international and local journals. Finally, this study limited its scope to only the written language in the RA abstract genre. To garner deeper insights, it is recommended that in-depth interviews with professionals in terms of move structure and the linguistic features invested in the target genre be undertaken.

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APPENDIX 1
The list of qualified and selected journals

No.	Titles of the qualified journals	Abbreviations used in the current study
1	Cell Research	CR
2	Signal Transduction and Targeted Therapy	STTT
3	Molecular Therapy - Methods and Clinical Development	MT-MCD
4	Nature Biotechnology	NB
5	Nature Microbiology	NM
6	Nature Immunology	NI
7	Nature Medicine	N-Med
8	Antimicrobial Agents and Chemotherapy	AAC
9	Cellular & Molecular Immunology	CMI
10	EMBO Journal	EMBO
11	Cellular and Molecular Life Sciences	CMLS
12	Cell Death and Disease	CDD
13	Emerging Microbes & Infections	EMI
14	npj Vaccines	npj
15	Protein & Cell	PC
16	Science Bulletin	SB
17	Scientific Reports	SR

APPENDIX 2
The checklist of selection criteria for the unstructured abstracts

No.	Selection Criteria	Yes	No
1	The RAs focusing on the same research topic or area (i.e., COVID-19 or SARS-CoV-2) were selected. The abstracts of these RAs had to contain one of these key terms: COVID-19; novel coronavirus disease; and SARS-CoV-2. One of these key terms had to be explicitly shown in either the title, the keyword section, or in the abstract content.		
2	The abstracts were collected from the RAs grounded on experimental research.		
3	The abstracts of the RAs were originally written in English.		
4	The abstracts of the RAs were collected from the academic journals meeting all the selection criteria in this study.		
5	The abstracts were taken from the RAs published in Scopus-indexed Q1 journals. The journals were ranked by the SJR website in the year 2022 at the time of our investigation.		
6	The abstracts were unstructured, where subheadings were not required.		
7	The word count of the abstracts ranged from 150 to 250 words.		

APPENDIX 3
The devised coding scheme for IMC analysis

IMCs	Subcategories and token examples	Discourse functions
Hedge	• **Nouns**: potential • **Lexical verbs**: indicate, suggest, appear • **Modal verbs**: can, could, may, might • **Epis. adjectives**: current, frequent, potential • **Epis. adverbs**: currently, potentially, possibly • **Phrases**: one of the, majority of	withhold commitment and open dialogue
Booster	• **Nouns:** evidence, potency • **Lexical verbs**: show, demonstrate, highlight • **Epis. adjectives**: high, potent, robust • **Epis. adverbs**: urgently, rapidly, strongly • **Modal verb:** will • **Phrases**: a wide range of, with greater strength	emphasize certainty or close dialogue
Attitude marker	• **Nouns**: safety, necessity, challenge • **Lexical verbs**: require, alleviate, challenge • **Epis. adjectives**: effective, promising, safe • **Epis. adverbs**: poorly, still, notably • **Phrases**: play a major role, a word of caution	express writer's attitude to proposition
Self-mention	**First-person pronouns**: I, my, me, we, our • Exclusive *We* and Exclusive *Our*	explicit reference to author(s)
Engagement marker	• Inclusive *We* • consider, note, you can see that	explicitly build relationship with reader

Note. Adapted from Hyland (2005a).

APPENDIX 4
Percentage of the agreement rate for move analysis

Move	n	Agreement	Disagreement	Percentage
Background	30	30	0	100%
Purpose	11	9	2	81.82%
Methods	24	23	1	95.83%
Results	30	30	0	100%
Discussion	30	30	0	100%
Total	**125**	**122**	**3**	97.60%

Inter-coder reliability by Cohen's kappa analysis for move analysis

	Value	Asymptotic Standard Error[a]	Approximate T[b]	Approx. Sig
Kappa	.969	0.017	21.075	.000
N of Valid Cases	125			

Symmetric measures

- Not assuming the null hypothesis.
- Using the asymptotic standard error assuming the null hypothesis.

APPENDIX 5
Frequency and percentage of the canonical move sequences

Move Sequence	Number of abstracts	Percentage (%)
B-M-R-D	51	35.66
B-R-D	25	17.48
B-P-M-R-D	24	16.78
B-P-R-D	11	7.69
B-P-M-R	3	2.10
B-M-R	3	2.10
P-M-R	1	0.70
Total	**118 out of 143 abstracts**	**82.52%**

APPENDIX 6
Deviant move sequences

6.1) Embedded moves in move sequences

Move Sequence	Number of abstracts	Percentage (%)
B-**M** (embedded in R)-R-D	7	4.90%
B-**P** (embedded in M)-M-R-D	3	2.10%
B-P-**M** (embedded in R)-R-D	1	0.70%
B-R-**P** (embedded in M)-M-D	1	0.70%
P (embedded in M)-M-R-D	1	0.70%
Total	**13 out of 143 abstracts**	**9.09%**

6.2) Mixed moves in move sequences

Move Sequence	Number of abstracts	Percentage (%)
B-R-B-D	1	0.70%
B-R-M (embedded in R)-R	1	0.70%
B-R-**M** (embedded in R)-R-D	1	0.70%
B-P-M (embedded in R)-R-P-D	1	0.70%
B-M-P (embedded in M)-M-R-D	1	0.70%
B-M-R-P (embedded in M)-M-R-D	1	0.70%
B-P (embedded in M)-M-R-M-R-D	1	0.70%
B-M (embedded in R)-R-M (embedded in R)-R-D	1	0.70%
Total	**8 out of 143 abstracts**	**5.59%**

6.3) Cyclical moves in move sequences

Move Sequence	Number of abstracts	Percentage (%)
B-P-R-**P**-**R**-D	1	0.70%
M-R-**M**-**R**-**M**-**R**-D	1	0.70%
B-P-R-M-**R**-D	1	0.70%
Total	**3 out of 143 abstracts**	**2.10%**

6.4) Reversal move in move sequence

Move Sequence	Number of abstracts	Percentage (%)
B-**M**-P-R-D	1	0.70%
Total	**1 out of 143 abstracts**	**0.70%**

APPENDIX 7
Percentage of the agreement rate and Cohen's kappa for the IMCs

	Coded units	Agreements	Disagreements
Hedges	**45**	**45**	**0**
Background	12	12	-
Purpose	-	-	-
Methods	2	2	-
Results	5	5	-
Discussion	26	26	-
Percentages of agreement	**100**		
Cohen's *K*	**1.00**		
Boosters	**94**	**91**	**3**
Background	12	12	-
Purpose	-	-	-
Methods	4	3	1
Results	51	50	1
Discussion	27	26	1
Percentages of agreement	**96.80**		
Cohen's *K*	**0.95**		
Attitude Markers	**108**	**105**	**3**
Background	46	45	1
Purpose	3	3	-
Methods	2	2	-
Results	33	31	2
Discussion	24	24	-
Percentages of agreement	**97.22**		
Cohen's *K*	**0.96**		
Self-mentions	**68**	**68**	**0**
Background	-	-	-
Purpose	4	4	-
Methods	20	20	-
Results	28	28	-
Discussion	16	16	-
Percentages of agreement	**100**		
Cohen's *K*	**1.00**		
Engagement markers	**2**	**2**	**0**
Background	-	-	-
Purpose	-	-	-
Methods	1	1	-
Results	-	-	-
Discussion	1	1	-
Percentages of agreement	**100**		
Cohen's *K*	**1.0**		

Summary

	Coded units	Agreements	Disagreements
Totals	317	311	6
Percentages of agreement	**98.11**		
Cohen's *K*	**0.97**		

APPENDIX 8
Distribution of the IMCs in the COVID-19 corpus

Category	Hedges	Boosters	Attitude markers	Self-mentions	Engagement markers
Move B	141	126	262	3	1
Move P	3	13	11	40	0
Move M	21	38	33	78	0
Move R	99	308	191	103	0
Move D	142	118	129	53	3
Chi-value	213.409	444.073	356.236	104.065	1.000
p	0.000	0.000	0.000	0.000	0.317

APPENDIX 9
Top ranked IMCs, subcategories, and linguistic choices in Move B

IMCs	Top-five ranked subcategories and linguistic choices				
Attitude markers (n = 262; 13.67%)	**1. Epistemic adjectives (n = 165)** effective (19) major (9) new (7) critical (6) promising (6)	**2. Nouns (35)** challenge (6) need (6) threat (3) crisis (2) efficacy (2)	**3. Epistemic adverbs (29)** poorly (4) still (4) accurately (2) effectively (2) notably (2)	**4. Lexical verbs (29)** require (8) lack (6) be needed (6) fail (3) exacerbate (2)	**5. Modal verbs (2)** should (2)

Noted. n refers to the number of tokens or occurrences.

APPENDIX 10
Top ranked IMCs, subcategories, and linguistic choices in Move M

IMCs	Top-five ranked subcategories and linguistic choices				
Self-mentions (n = 78; 4.07%)	**1. Exclusive** We (n = 72)	**2. Exclusive** Our (n = 6)	3. N/A	4. N/A	5. N/A

Noted. n refers to the number of tokens or occurrences.

APPENDIX 11
Top ranked IMCs, subcategories, and linguistic choices in Move R

IMCs	Top-five ranked subcategories and linguistic choices				
Boosters (n = 308; 16.08%)	**1. Lexical verbs (207)**	**2. Epistemic adjectives (55)**	**3. Epistemic adverbs (41)**	**4. Nouns (3)**	**5. Modal verb (1)**
	show (70)	potent (18)	the most (5)	potency (2)	will (1)
	demonstrate (30)	strong (9)	strongly (5)	evidence (1)	
	reveal (22)	robust (7)	highly (5)		
	find (21)	high (5)	completely (3)		
	exhibit (10)	enhanced (4)	potently (3)		

Noted. n refers to the number of tokens or occurrences.

APPENDIX 12
Top ranked IMCs, subcategories, and linguistic choices in Move D

IMCs	Top-five ranked subcategories and linguistic choices				
Hedges (n = 142; 7.41%)	**1. Modal verbs (n = 54)**	**2. Lexical verbs (36)**	**3. Epistemic adjectives (26)**	**4. Nouns (18)**	**5.Epistemic adverbs (7)**
	may (23)	suggest (26)	potential (12)	potential (17)	potentially (3)
	can (16)	indicate (9)	possible (3)	limitation (1)	currently (1)
	could (13)	implicate (1)	current (2)		nearly (1)
	might (2)		certain (1)		partially (1)
			feasible (1)		probably (1)

Noted. n refers to the number of tokens or occurrences.

APPENDIX 13
The list of references for RA abstracts used to exemplify move sequence and move frequency in the results section

Example	Move	Abstract No.	Abbreviations for journal title	Author
Table 4. Example of the move identification	All	9	AAC	Xu et al. (2021)
Cyclical move: M-R-M-R-M-R-D	M, R, D	3	SR	Rice et al. (2021)
Embedded move: M (embedded in R)	a part of Move R	7	CMLS	Bourgon et al. (2022)
Reversal move: B-M-P-R-D	All	9	npj	Dagotto et al. (2022)
Mixed moves: B-R-M (embedded in R)-R-D	B, M, R, D	9	CR	Wang et al. (2021)
(1)	a part of Move R	4	N Med	Mentzer et al. (2022)
(2), (3), (4)	B	3	AAC	Good et al. (2021)
(5)	P	10	CR	Deng et al. (2022)
(6)	P	1	EMBO	Lamers et al. (2021)
(7)	a part of Move R	9	EMI	Gu et al. (2021)
(8)	R	5	EMI	Rathnasinghe et al. (2020)
(9)	D	4	CMI	Li et al. (2021)
(10)	D	4	MT-MCD	Peter et al. (2022)
(11)	D	9	NM	Yuan et al. (2020)

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APPENDIX 14
The list of references for RA abstracts used to exemplify the IMCs in each move

Example No.	Move	Abstract No.	Abbreviations for journal titles	Authors
(1)	a part of Move B	5	CR	Wang et al. (2020)
(2)	a part of Move B	6	STTT	Song et al. (2022)
(3)	a part of Move B	5	AAC	Kumar et al. (2022)
(4)	P	4	CMLS	Umar et al. (2022)
(5)	a part of Move M	6	npj	Wong et al. (2022)
(6)	a part of Move M	8	MT-MCD	Li et al. (2022)
(7)	a part of Move R	5	EMI	Rathnasinghe et al. (2020)
(8)	a part of Move R	5	AAC	Kumar et al. (2022)
(9)	D	6	SR	Cho et al. (2020)
(10)	D	10	SR	León et al. (2021)
(11)	D	4	AAC	Kuo et al. (2021)
(12)	D	4	npj	Meyers et al. (2021)

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