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Evidentials, Code Glosses, Hedges and Boosters in Academic Articles: A Cross-Disciplinary Study

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Abstract
This paper investigates the frequency and contextual uses of the metadiscoursal devices of evidentials, code glosses, hedges and boosters in four academic disciplines, namely, linguistics, literature, chemistry and medicine. Hyland and Hinkel's taxonomies of metadiscourse provided the search items. The data analyzed consisted of a corpus of forty research articles, divided into four subcorpora equally drawn from the four disciplines. The corpus was randomly selected from leading international journals and processed by the corpus analysis toolkit, AntConc. The AntConc concordancer was employed so that each metadiscourse item could be counted and examined in its context. The findings show that hedges were the most frequent metadiscoursal device, which may be seen as an indication of the academic authors' tendency to use language of caution and uncertainty. The second rank in frequency was occupied by evidentials, which reflects the need for academic writing to establish credibility. Code glosses and boosters have the least frequency, which may measure for the value of conciseness in academic discourse. The analysis also shows that linguistics and literature exceed the two scientific disciplines, chemistry and medicine, in the frequency of the four metadiscoursal devices. Linguistics manifests the highest distribution of hedges and code glosses, medicine the highest number of boosters, literature the highest frequency of evidentials. Chemistry has the lowest frequency of all metadiscoursal devices. This study aims to help students of academic writing to learn about the use of the selected metadiscoursal devices in many disciplines. Future studies need to investigate more metadiscoursal devices in other academic disciplines.

Keywords: Academic Discourse; Evidentials, Hedges; Code Glosses; Boosters

Introduction

Academic writing, a correlation between writers and readers (Hyland & Tse, 2004), is thought to be a significant field of research in the way it manifests so clearly the author's stances and language capacities. Due to discourse modulation reality (Halliday, 1993), academic writers aim to appear competent when they adopt a certain stance relevant to the truth value of the content presented so that their views may be seen to be balanced (Hyland, 2000b, 2005a, 2005b). When authors write their essays, reviews or manuscripts, they

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exist in their writings. They do not only present facts or analyses, but they display their being in discourse as well. They refuse, doubt, confirm, suppose and argue for/against the content offered. They paraphrase, exemplify, quote and reword the content. They communicate with readers via meta-discourse and exist in their deliberate selection of meta-discourse types.

Metadiscourse means those devices which organize a text, guide the reader throughout the text and explain the author's attitude towards the propositional material (Bunton, 1999; Hyland, 1998c; Mauranen, 1993; Schiffrin, 1980). Text-commentary, writer-reader interaction, exchange of language, text-evaluation and interpretation-all signify the essence of metadiscourse (Hyland, 2017; Hyland & Tse, 2004). Metadiscourse is an indication of the author's existence throughout the reading process. It aids the writer to deliver his point and interact with the reader" (Hyland, 2005a). Metadiscourse enables authors to ensure text coherence and project their own appraisal on the information presented (Vande Kopple, 1985). Meaning is the sum of two categories: text information and the way authors offer that information via metadiscourse means.

Meta-discourse, therefore, is a writer's ongoing commentary on a text and in the text (Hyland, 2017). It can be simply defined as the author's discourse about text discourse (Hyland, 2015). It is a widespread device in academic writing (Hyland, 2017) as it offers rhetorical devices that render discourse more convincing. Therefore, authors are rhetorically manifest in their discourse via their use of meta-discourse which aims to establish effective interactive communication between writers and readers. This interaction underlines the audience-sensitive stance of meta-discourse (Hyland, 2015). Authors' judgments towards content are made clear via meta-discourse (Hyland & Tse, 2004). Meta-discourse endorses the idea that language is more than just a vehicle for conveying content per se; it is concerned with the ways in which this content is presented. Writer-reader interaction is thus at the heart of academic communication.

The use of meta-discourse confirms the fact that academic writing is by no means only a matter of grammar, syntax or vocabulary. Rhetorical devices, namely meta-discourse, are essential for any academic writer to master if their writing is meant to be accurate and objective. This very idea is put forth by Vassileva (1997) when she examined hedges in academic writing. To hedge means to weigh evidence; to convey doubt (Salager -Meyer, 1997). Hedges alleviate the force of a proposition for the purpose of being careful when it comes to the presentation of facts or views, rendering the content more acceptable and reasonable (Salager-Meyer, 1994), and observing fuzziness levels (Lakoff, 1973). This act helps authors to manifest their honesty (Swales, 1990). However, hedges are just one of the device types meta-discourse involves. To boost, on the contrary, means to assist and uphold the content presented. To use evidentials means to refer to the original source of information. Contrary to hedges, boosters and evidentials work together to present the author's degree of certainty. To code glosses means to restate the content for the sake of clarifying it, which is a salient feature of English academic discourse (Mauranen, 2012, 2017). It seems that these four metadiscourse devices substantially account for academic discourse being precise, supported, documented and evidently conspicuous.

Integrating quantitative and qualitative data and based on software-processed corpora, this study aims to compare and contrast the use and frequencies of metadiscourse items in research articles representing four academic disciplines which belong to two different branches of knowledge: the humanities (Linguistics and Literary Studies) and natural sciences (Chemistry and Medicine). Linguistics Research Articles (LinRAs), Literature Research Articles (LitRAs), Chemistry Research Articles (ChRAs) and Medical Research Articles (MedRAs) were examined in reference to their metadiscourse usage. Relevant literature mostly examined one discipline (e.g., Binmahboob (2022); Hyland (1999); Keshavarz and Kheirieh (2011)Binmahboob (2022)Zarei and Mansoori (2011)). Detecting metadiscourse markers in more than one discipline was believed to render more comprehensive results about the discipline-based similarities and/or differences amongst academic authors.

Theoretical Framework

This research is based on Hyland's model of metadiscourse (1998c, 2004, 2005a, 2015, 2017). Hyland's interpersonal model of metadiscourse covers two levels. The first, the interactive, has to do with discourse organization and explanation. It comprises transitions, frame markers, endophoric references, evidentials and code glosses. The second level, the interactional, comprises features involved in writer-reader/hearer communication. It includes hedges, boosters, attitude markers, engagement markers and self-mention. Sub-categories of hedging devices and boosters are adapted from Hinkel (2005) as well. Interactive resources ensure the smooth development of information in text, while interactional resources exhibit the writer's very person in the text and build communication with text recipients (Hyland, 2004, 2005a, 2015).

On the interactive level, transitional devices, used to add, contrast and order discourse constituents, guarantee logical discourse development. Frame makers refer to discourse boundaries. Endophoric references refer to different text parts. Evidentials are items which refer to quoted , mostly third- party material. This device is indispensible in all academic writing. Code glosses signal the rewording of the content so that readers may understand the author's point, which is a common feature in the English language (Mauranen, 2017). Code glosses elaborate previous material by rephrasing, reformulating and restating it (Hyland, 2005a, 2007).

Exemplification, in addition to reformulation, is another means to code gloss (Hyland, 2007). Code glosses affirm the importance and the truth-value of certain content by restating or exemplifying it (Biber, Johansson, Leech, Conrad, & Finegan, 1999).

On the interactional level, hedges reduce a proposition's force via the manifestation of doubt as they soften assertions and present questioned points (Holmes, 1995; Hyland, 1994). Boosters, on the contrary, increase the force of the content (Holmes, 1982; Holmes, 1995; Meyer, 1997). Hedges are communicative strategies indicating the author's state of lacking confidence towards the content. To hedge is to present an opinion that can be questioned (Hyland, 1998a), to present a claim without being committed to it (Channell, 1994; Myers, 1989), to be more polite via indirectness (Brown, Levinson, & Gumperz, 1987) and to lessen the author's responsibility towards the content (Hinkel, 1997; Levinson, 1983). Boosters signal the author's confidence in the information presented (Hyland, 1998b, 1998c). They are devices which support the informational content and serve author-reader engagement (Hyland, 1998a). Hedges and boosters offer authors an opportunity to make communicative, interactional and rhetorical effects (Hyland, 1996, 2012; Markkanen & Schroder, 1997). It seems that hedges and boosters are about the author's point of view regarding the information, not about the information itself. Attitude markers have to do with the author's stance, agreement or disagreement, about the material. Engagement markers address the reader. Self-mention is the author's use of first-person pronouns in the text.

Thus, the analytical framework of this study is based on Hyland and Henkel's taxonomies of metadiscourse. Evidentials, code glosses, hedges and boosters were selected to provide the search items in LinRAs, LitRAs, ChRAs and MedRAs. These four metadiscourse categories were chosen because they were believed to occur frequently in academic writings. Research on hedging devices and boosters has always received considerable attention. Previous literature displays remarkable interest as regards the quantitative use of hedges and boosters (Ahmadpour, Kuhi, Naderi, & Ahmadpour, 2017; Besançon, Jansen, Cockburn, & Dragicevic, 2021; Farrokhi & Emami, 2008; Hryniuk, 2018; Lee, 2020; Serholt, 2012; Varsanis & Tsangalidis, 2020). However, a few studies have examined hedges and boosters across disciplines (Vold, 2006), and even fewer studies have investigated metadiscourse devices other than hedges and boosters. Reference to the source of information (evidentiality) and elaborating discourses (code glosses) are two interpersonal markers that are thought to be indispensable for writers, yet seem to receive less interest from academicians in their analytical research.

This study aimed to detect hedges, boosters, evidential and code glosses across LinRAs, LitRAs, ChRAs and MedRAs. For this purpose, it focused on two branches of knowledge, humanities and sciences. Two disciplines were selected from each branch. The aim of the study was "instructional": that of helping teachers and students of academic writing (Hyland, 2008) gain "a specialized literacy that consisted of the discipline-specific rhetorical and linguistic practices of a particular community" (Hyland, 1999). The branch of humanities was selected as it was more interesting to students who were majoring in linguistics, literature and translation. Moreover, being the lingua franca of academic discourse, English is targeted by course analysts who are interested in academic writings. As for the science branch, medicine and chemistry disciplines were chosen as a large number of students were specializing in both disciplines.

Literature Review

Metadiscourse is openly presented in Vande Copple's contribution (1985). Researchers usually consider metadiscourse a linguistic tool that helps them in projecting their own identities in the text. Nevertheless, some researchers consider it as a tool of textual organization. The former signifies those who adopt the interactive/interpersonal model of metadiscourse; the latter take on the reflexive model (Hyland, 2015). Advocates of metadiscourse as being a tool of structuring textual texture include Ädel (2006) and Mauranen (1993). Supporters of the interactive/interpersonal model and pioneers in the research field of metadiscourse include Hyland Hyland (1994, 1998a, 1998c, 2000a, 2000b, 2004, 2005a, 2015, 2017) and Salager-Meyer, Ariza, and Zambrano (2003).

Hedging devices and boosters are examined by many researchers, due to the contrastive nature of the two tools. Hinkel (1997) examined metadiscourse in first and second language student writings. She concluded that native speakers' writings manifest less distribution of metadiscourse. Hinkel (2005) investigated hedges and boosters in academic essays in English written by first and second language writers. In this study, second language writers showed fewer tendencies to use hedges. Many scholars are interested in analyzing the frequencies of hedges and/or boosters in academic writings (Meyer, 1997; Salager-Meyer, 1994). Vold (2006) conducted research on epistemic modality markers, a hedging device, across the English, French and Norwegian languages in reference to two disciplines: linguistics and medicine. Results show the French researchers' lack of interest in using epistemic modality and that disciplinary affiliation has little influence on the proportion of hedges.

Mirzapour and Mahand (2012) compared and contrasted hedges and boosters in the abstract, introduction and conclusion sections of two types of articles: Library and Information Studies and Computer Science. The

findings showed a higher use of metadiscourse in Library and Information. Algı (2012) studied hedges and boosters in paragraphs of argumentation written by first and second English language speakers and found a parallel use of the two devices. Serholt (2012) focused on hedges and boosters in writings by Swedish learners of English and the effect of gender. It was concluded that females tended to show stronger commitment towards the content. Salichah, Irawati, and Basthomi (2015) analyzed hedges and boosters in undergraduate students' articles. Students manifested a greater tendency to use hedges. This was due to their interest in being polite. Haufiku (2016) examined hedges and boosters in ten theses, with a focus on introductions, discussion and conclusions. The study concluded that there was an unequal distribution in the uses of hedges and boosters and a preference for the use of distancing phrases as a hedging device. Takimoto (2015) examined hedges and boosters in academic articles, finding that natural science articles were under-represented as to the distribution of hedges and boosters, contrary to philosophy articles. The study attempted to imitate Hyland's framework (1998a).

These studies show that hedges and boosters are the focal points around which most research revolves. Hence, this study is original in its focus on evidentials and code glosses in addition to hedges and boosters. This study is also significant in bringing together linguistics and literature, which are so sensitive when it comes to the use of language, and chemistry and medicine, which pay more attention to mere information and facts. The current study is interested in frequency and types of metadiscourse and its implications as well. Previous studies have examined metadiscourse, mostly regarding the frequency of hedges and boosters, without further analysis of its types and implications.

Methodology

The research data is a corpus of forty published articles from four disciplinary affiliations. Discourse-analytical methodology has to do with the contextual investigation of metadiscourse-related items. These items are selected from Hyland's model (1998c, 2004, 2005a, 2007, 2015, 2017) and Hyland and Tse's (2004) – the model is presented in Table 1. Metadiscourse devices selected included evidentials, code glosses, hedges and boosters. The first two categories are about text interpretation (Interactive resources); the other categories are about the writer's reluctance or certainty towards the propositional information (Interactional resources). Hence, the four selected categories are supposed to be of great interest to authors. The first step, to determine the analytical categories, is also based on Hinkel (2005) for more exemplification of hedges and boosters-the model is presented in Table 2. These models, together with Hyland and Henkel's, provide the metadiscourse items that will be investigated in context.

The first step in our study is to follow Hyland and Hinkel to identify clearly the linguistic features to investigate. Hyland (1998c, 2004, 2005a, 2007, 2015, 2017) and Hyland and Tse (2004) present the following model of metadiscourse in academic writing:

Table 1: *Hyland's Metadiscourse Model*

Category	Function	Examples
Interactive resource: Transitions	Express semantic relation between main clauses	in addition/but/thus/and
Interactive resource: Frame markers	Refer to discourse acts, sequences, or text stages	finally/to conclude/my purpose is
Interactive resource: Endophoric markers	Refer to information in other parts of the text	noted above/see Fig/in section 2
Evidentials	Refer to source of information from other texts	according to X/(Y, 1990)/Z states
Interactive resource: Code glosses	Help readers grasp meanings of ideational material, they are restatement of the content	namely/e.g./such as/in other words/for example/that is/to put it another way/or/this is called/this can be defined as/especially/particularly/in particular
Interactional resource: Hedges	Withhold writer's full commitment to, show his reluctance and unwillingness towards the content	might/perhaps/possible/about
Interactional resource: Boosters (Emphatics in Hyland (1998c))	Emphasize force or writer's certainty in proposition	in fact/definitely/it is clear that/it is obvious
Interactional resource: Attitude markers	Express writer's attitude to proposition	unfortunately/I agree/surprisingly
Interactional resource: Engagement markers	Explicitly refer to or build relationship with reader	consider/note that/you can see that
Interactional resource: Self-mentions	Explicit reference to author(s)	I/we/my/our

Hinkel (2005) categorizes hedging devices into: epistemic hedges, lexical hedges, possibility hedges, downtoners, assertive pronouns, adverbs of frequency. Based on Hinkel (2005), the following table summarizes hedging categories:

Table 2: *Hinkel's Model of Hedges*

Hedging category	Examples
Epistemic hedges	according to (+noun), actually, apparent(-ly), approximate(-ly), broad(-ly), clear(-ly), comparative(-ly), essential(-ly), indeed, likely, most (+ adjective), normal(-ly), potential(-ly), probable(-ly), rare(-ly), somehow, somewhat, theoretically, the/possessive pronoun very (+superlative adjective + noun, e.g., the/his/their very best/last minute/moment/dollar/penny/chance), unlikely
Lexical hedges	(at) about, (a) few, in a way, kind of, (a) little + noun, maybe, like, many, more or less, more, most, much, several, something like, sort of
Possibility hedges	by (some/any) chance, hopefully, perhaps, possible, possibly, in (the) case (of), if you/we know/understand (what [pronoun] mean(s)), if you catch/get/understand my meaning/drift, if you know what I mean (to say)
Downtoners	at all, a bit, all but, a good/great deal, almost, as good/well as, at least, barely, basically, dead (+ adjective), enough, fairly, (a) few, hardly, in the least/ slightest, just, (a) little (+ adjective), merely, mildly, nearly, not a (+ countable noun, e.g., thing/person), only, partly, partially, practically, pretty (+ adjective), quite (+adjective), rather, relatively, scarcely, simply, slightly, somewhat, sufficiently, truly, virtually
Assertive pronouns	any- words (anybody, anyone, anything), any, some- pronominals (somebody, someone, something), some
Adverbs of frequency	annually, daily, frequently, monthly, per day/hour/year occasionally, often, oftentimes, seldom, sometimes, sporadically, regularly, usually, weekly

Hinkel (2005) explains the role played by intensifiers, or boosters in Hyland's terms. Table 3 summarizes categories of intensifiers (adapted from Hinkel (2005)):

Table 3: *Hinkel's Model of Intensifiers/Boosters*

Category of boosters	Example
Amplifiers	absolutely, a lot (+ comparative adjective), altogether, always, amazingly, awfully, badly, by all means, completely, definitely, deeply, downright, forever, enormously, entirely, even (+ adjective/noun), ever, extremely, far (+ comparative adjective), far from it, fully, greatly, highly, hugely, in all/every respect(s)/way(s), much (+ adjective), never, not half bad, positively, perfectly, severely, so (+adjective/verb), sharply, strongly, too (+ adjective), terribly, totally, unbelievably, very, very much, well.
Emphatics	a lot (+ noun/adjective), certain(-ly), clear(-ly), complete, definite, exact(-ly), extreme, for sure, great, indeed, no way, outright, pure(-ly), real(-ly), such a (+ noun), strong, sure(-ly), total.
Universal and negative pronouns	all, each, every- pronominals (everybody, everyone, everything), every, none, no one, nothing

The second step was to prepare the study corpora. These contained forty research articles written in English and equally divided among the four disciplines involved: linguistics, literature, chemistry, and medicine, or LinRAs, LitRAs, ChRAs and MedRAs respectively (See appendix for corpora identification/documentation). Hence, four separate corpora were compiled by the author from the leading international journals in each field: for Linguistics: *Lingua* (published by Elsevier), and *Discourse & Communication* (pub. SAGE); for Literary Studies, *The Journal of Commonwealth Literature* (pub. SAGE), for Chemistry, *Communications Chemistry* (pub. Springer Nature) and for Medicine *Nature Cancer* and *Nature Immunology* (pub. Springer Nature). The articles, randomly selected, were all published recently between 2020-2021.

The third step was to search for each metadiscourse item in each corpus. This was done via the corpus software AntConc (Anthony, 2005). First, each corpus was transformed into a TEXT file so that it can be processed separately by the software. Second, AntConc is processed to generate word lists of each corpus. The LinRAs corpus contains 101,422 words, the LitRAs corpus contained 79,142 words, the ChRAs corpus contained 59,947 words and the MedRAs corpus contains 153,137 words. The four corpora contain 393,648 running words.

Fourthly, the frequency of evidentials, code glosses, hedges and boosters was investigated according to the study's analytical frameworks. AntConc was processed so that the numbers of the relevant metadiscourse types were generated. Each candidate item was typed in the search box so that its frequency was presented.

Then, the AntConc concordance tool was employed to generate results in Key Word In Context (KWIC) format, a step followed by the manual investigation of each search item in its context to exclude examples which do not perform metadiscourse functions. The frequency of metadiscourse items in each corpus is normalized per 1000 words. The mathematical calculations were carried out in Microsoft Excel. The frequencies of metadiscourse types in the four corpora having been established, the search results are analysed, interpreted and discussed in the following section. Both quantitative and qualitative approaches were employed in this research. When calculating the metadiscourse frequencies in each corpus, a quantitative approach was utilized. To interpret the search results, a qualitative approach was adopted.

Results

- *LinRAs Search Results*

i. LinRAs Word Tokens

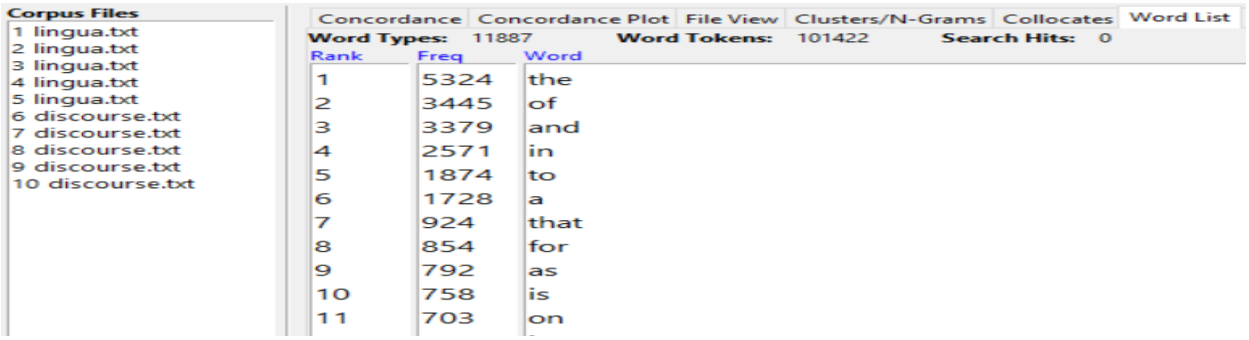

Figure 1: *LinRAs Word Count*

ii. LinRAs: Evidentials

Table 4: *Evidentials in LinRAs*

Evidentials	Frequency	%	Per 1000 Words
according to	40	0.0004	0.39
state (s)	9	0.0001	0.09
( )	989	0.0098	9.75
Total	1038	0.0102	10.23

iii. LinRAs: Code Glosses

Table 5: *Code Glosses in LinRAs*

Code Gloss Category	Frequency	%	Per 1000 Words
namely	20	0.0002	0.20
e.g.	200	0.0020	1.97
such as	89	0.0009	0.88
in other words	13	0.0001	0.13
for example	53	0.0005	0.52
that is	42	0.0004	0.41
or	483	0.0048	4.76
especially	51	0.0005	0.50
particularly	18	0.0002	0.18
in particular	21	0.0002	0.21
Total	990	0.0098	9.76

iv. LinRAs: Hedges

Table 6: *Hedges in LinRAs*

Hedging device	Frequency	%	Per 1000 Words
Might	41	0.0004	0.40
Epistemic hedges	374 (*most* has the highest frequency with 112 hits)	0.0037	3.69
Lexical hedges	692 (*more* has the highest frequency with 230 hits)	0.0068	6.82
Possibility hedges	132 (*if* has the highest frequency with 77 hits)	0.0013	1.30
Downtoners	430 (*only* has the highest frequency with 156 hits)	0.0042	4.24
Assertive pronouns	196 (*some* has the highest frequency with 117 hits)	0.0019	1.93
Adverbs of frequency	106 (*often* has the highest frequency with 43 hits)	0.0010	1.05
Total	1971	0.0194	19.43

v. LinRAs: Boosters

Table 7: *Boosters in LinRAs*

Boosters	Frequency	%	Per 1000 Words
in fact	11	0.0001	0.11
it is clear that	3	0.0000	0.03
it is obvious	1	0.0000	0.01
Amplifiers	221(*even and very* have the highest frequency with 32 hits each)	0.0022	2.18
Emphatics	179 (*total* has the highest frequency with 28 hits)	0.0018	1.76
Universal and negative pronouns	240 (*all* has the highest frequency with 157 hits)	0.0024	2.37
Total	655	0.0065	6.46

- *LitRAs Search Results*

i. LitRAs Word Tokens

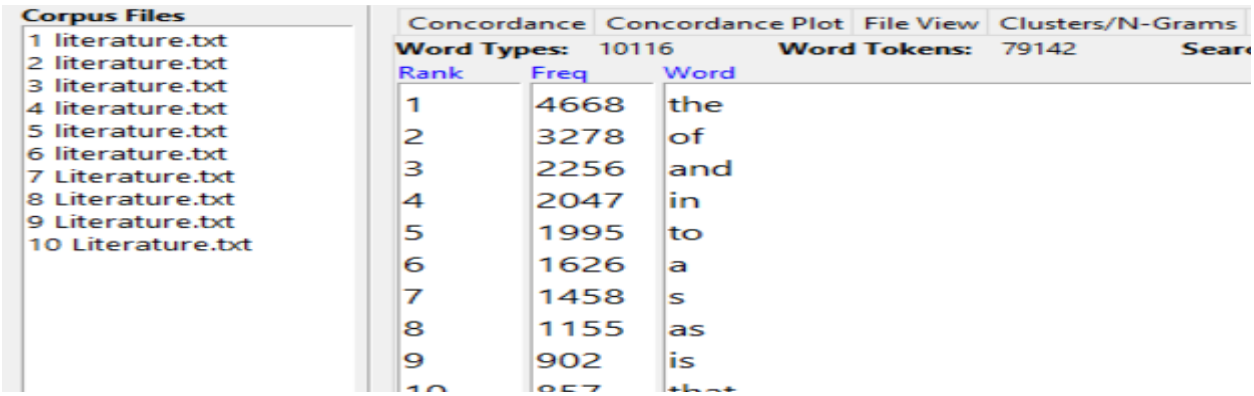

Figure 2: *LitRAs Word Count*

ii. LitRAs: Evidentials

Table 8: *Evidentials in LitRAs*

Evidentials	Frequency	%	Per 1000 Words
according to	14	0.0002	0.18
state (s)	-	0.0000	0.00
( )	1166	0.0147	14.73
Total	1180	0.0149	14.91

iii. LitRAs: Code Glosses

Table 9: *Code Glosses in LitRAs*

Code Gloss Category	Frequency	%	Per 1000 Words
namely	23	0.0003	0.29
e.g.	2	0.0000	0.03
such as	36	0.0005	0.45
in other words	15	0.0002	0.19
for example	28	0.0004	0.35
that is	38	0.0005	0.48
or	294	0.0037	3.71
especially	12	0.0002	0.15
particularly	9	0.0001	0.11
in particular	18	0.0002	0.23
Total	475	0.0060	6.00

iv. LitRAs: Hedges

Table 10: *Hedges in LitRAs*

Hedging device	Frequency	%	Per 1000 Words
Might	52	0.0007	0.66
Epistemic hedges	279 (*most* has the highest frequency with 56 hits)	0.0035	3.53
Lexical hedges	550 (*more* has the highest frequency with 136 hits)	0.0069	6.95
Possibility hedges	174 (*if* has the highest frequency with 88 hits)	0.0022	2.20
Downtoners	465 (*only* has the highest frequency with 143 hits)	0.0059	5.88
Assertive pronouns	170 (*any* has the highest frequency with 63 hits)	0.0021	2.15
Adverbs of frequency	84 (*often* has the highest frequency with 29 hits)	0.0011	1.06
Total	1774	0.0224	22.42

v. LitRAs: Boosters

Table 11: *Boosters in LitRAs*

Boosters	Frequency	%	Per 1000 Words
in fact	11	0.0001	0.14
it is clear that	4	0.0001	0.05
it is obvious	-	0.0000	0.00
Amplifiers	343 (*even has* the highest frequency with 52 hits)	0.0043	4.33
Emphatics	241 (*clear(ly)l* has the highest frequency with 46 hits)	0.0030	3.05
Universal and negative pronouns	177 (*all* has the highest frequency with 119 hits)	0.0022	2.24
Total	776	0.0098	9.81

- *ChRAs Search Results*

i. ChRAs Word Tokens

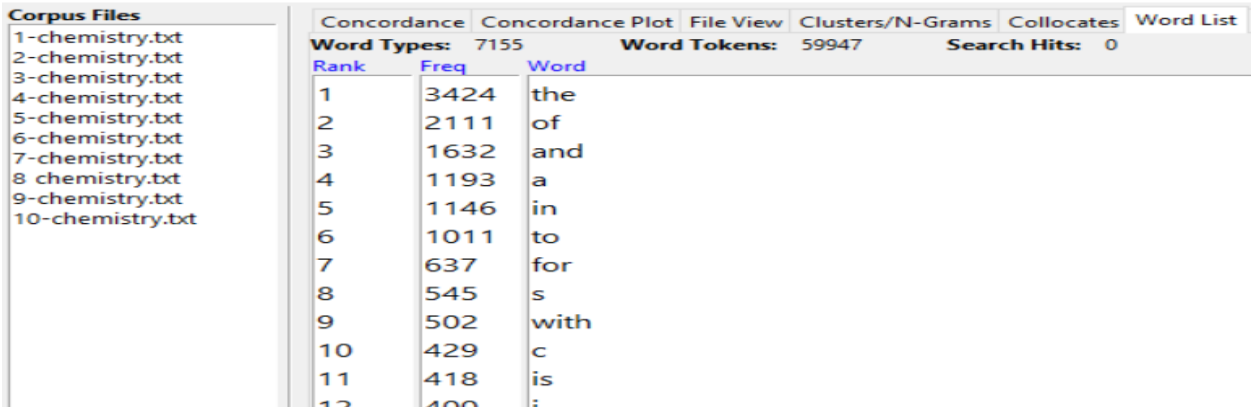

Figure 3: *ChRAs Word Count*

ii. ChRAs: Evidentials

Table 12: *Evidentials in ChRAs*

Evidentials	Frequency	%	Per 1000 Words
according to	15	0.0003	0.25
state (s)	-	0.0000	0.00
( )	629	0.0105	10.49
Total	644	0.0107	10.74

iii. ChRAs: Code Glosses

Table 13: *Code Glosses in ChRAs*

Code GlossCategory	Frequency	%	Per 1000 Words
namely	4	0.0001	0.07
e.g.	10	0.0002	0.17
such as	27	0.0005	0.45
in other words	-	0.0000	0.00
for example	12	0.0002	0.20
that is	16	0.0003	0.27
or	250	0.0042	4.17
especially	7	0.0001	0.12
particularly	13	0.0002	0.22
in particular	4	0.0001	0.07
Total	343	0.0057	5.72

iv. ChRAs: Hedges

Table 14: *Hedges in ChRAs*

Hedging device	Frequency	%	Per 1000 Words
Might	5	0.0001	0.08
Epistemic hedges	167 (*potential(ly)* has the highest frequency with 58 hits)	0.0028	2.79
Lexical hedges	157 (*more* has the highest frequency with 64 hits)	0.0026	2.62
Possibility hedges	53 (*if* has the highest frequency with 28 hits)	0.0009	0.88
Downtoners	131 (*only* has the highest frequency with 43 hits)	0.0022	2.19
Assertive pronouns	36 (*any* has the highest frequency with 23 hits)	0.0006	0.60
Adverbs of frequency	28 (*often* has the highest frequency with 11 hits)	0.0005	0.47
Total	577	0.0096	9.63

v. ChRAs: Boosters

Table 15: *Boosters in ChRAs*

Boosters	Frequency	%	Per 1000 Words
in fact	2	0.0000	0.03
it is clear	1	0.0000	0.02
it is obvious	-	0.0000	0.00
Amplifiers	113 (*highly* has the highest frequency with 20 hits)	0.0019	1.88
Emphatics	133 (*total* has the highest frequency with 27 hits)	0.0022	2.22
Universal and negative pronouns	146 (*all* has the highest frequency with 98 hits)	0.0024	2.44
Total	395	0.0066	6.59

- *MedRAs Search Results*

i. MedRAs Word Tokens

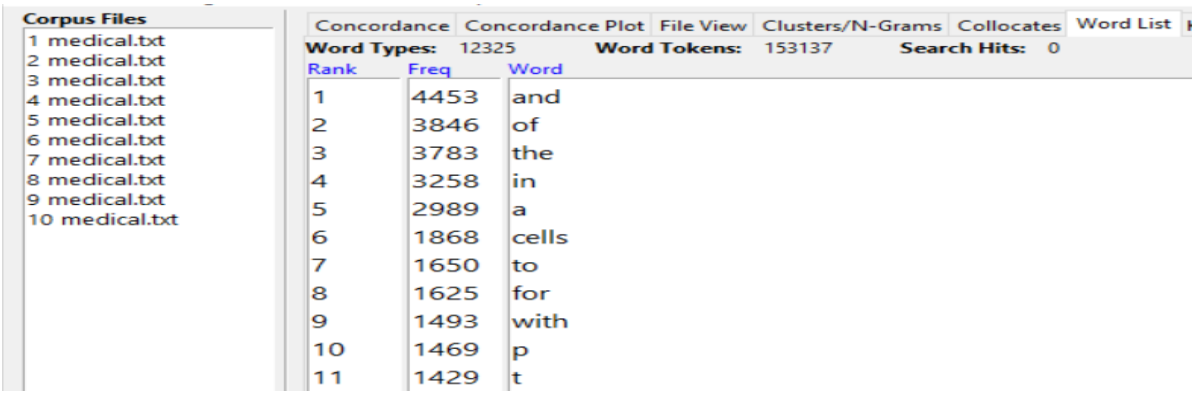

Figure 4: *MedRAs Word Count*

ii. MedRAs: Evidentials

Table 16: *Evidentials in MedRAs*

Evidentials	Frequency	%	Per 1000 Words
according to	31	0.0002	0.20
state (s)	-	0.0000	0.00
( )	1040	0.0068	6.79
Total	1071	0.0070	6.99

iii. MedRAs: Code Glosses

Table 17: *Code Glosses in MedRAs*

Code Gloss Category	Frequency	%	Per 1000 Words
namely	3	0.0000	0.02
e.g.	74	0.0005	0.48
such as	78	0.0005	0.51
in other words	-	0.0000	0.00
for example	24	0.0002	0.16
that is	14	0.0001	0.09
or	766	0.0050	5.00
specially	3	0.0000	0.02
particularly	6	0.0000	0.04
in particular	4	0.0000	0.03
Total	972	0.0063	6.35

iv. MedRAs: Hedges

Table 18: *Hedges in MedRAs*

Hedging device	Frequency	%	Per 1000 Words
might	15	0.0001	0.10
Epistemic hedges	281 (*potential(ly/most)* have the highest frequency with 49 hits each)	0.0018	1.83
Lexical hedges	802 (*at* has the highest frequency with 500 hits)	0.0052	5.24
Possibility hedges	67 (*if* has the highest frequency with 45 hits)	0.0004	0.44
Downtoners	171 (*only* has the highest frequency with 69 hits)	0.0011	1.12
Assertive pronouns	80 (*some* has the highest frequency with 41 hits)	0.0005	0.52
Adverbs of frequency	246 (*per* has the highest frequency with 208 hits)	0.0016	1.61
Total	1662	0.0109	10.85

v. MedRAs: Boosters

Table 19: *Boosters in MedRAs*

Boosters	Frequency	%	Per 1000 Words
in fact	3	0.0000	0.02
it is clear	-	0.0000	0.00
It is obvious	-	0.0000	0.00
Amplifiers	153 (*well has* the highest frequency with 55 hits)	0.0010	1.00
Emphatics	205 (*total* has the highest frequency with 81 hits)	0.0013	1.34
Universal and negative pronouns	449 (*all* has the highest frequency with 299 hits)	0.0029	2.93
Total	810	0.0053	5.29

Dscussion of Results

Based on the search results, the frequency of each metadiscourse item in the four disciplines is presented in Table 20.

Table 20: *Metadiscourse Frequency in the Corpora*

Disciplinary Affiliation	Evidentials	Code Glosses	Hedges	Boosters
Linguistics	1,038	990	1,971	655
Literature	1,180	475	1,774	776
Chemistry	644	343	577	395
Medicine	1,071	972	1,662	810
Total (in all corpora)	3,933	2,780	5,984	2,636
%	0.0100	0.0071	0.0152	0.0067
Per 1,000 Words	9.99	7.06	15.20	6.70

Based on Table 20, hedges have the highest distribution in the four disciplines. This means that academic authors usually refuse to give full commitment towards the information presented. Boosters show the lowest distribution, a thing compatible with the highest distribution being of hedges. This is because hedges and boosters refer to two differing attitudes: reluctance versus certainty. Regardless of the disciplinary affiliation, skepticism seems to be a unique feature pertaining to academic discourse. On the contrary, confidence is not verified by academic authors as they consider hedges a device that guarantees accuracy and authenticity.

Evidentials are second to hedges regarding their recurrence. Evidentials refer to the author's acknowledgment of third-party material, which is a prerequisite for the validity and credibility of academic writing. Hence, academic authors are careful to document third-party material in order not to be accused of plagiarism. Code glosses, the re-interpretation of information, are under-represented in academic articles. This refers to academic authors' preference for conciseness rather than verbosity. The numbers tell us that academic research, regardless of disciplinary differences, is over-represented in its frequencies of hedges and evidentials, which encode the features of academic doubt and trustworthiness. Numbers also manifest that code glosses and boosters are under-represented in all academic disciplines, while authors choose not to appear repetitive or over-confident.

Regarding humanities and natural science, metadiscourse item frequencies are presented in Table 21.

Table 21: *Metadiscourse in Humanities and Natural Science*

Branch	Evidentials/ Per 1,000 Words	Code Glosses/ Per 1,000 Words	Hedges/ Per 1,000 Words	Boosters/ Per 1,000 Words
Humanities	2,218/ 12.28	1,465/ 8.11	3,745/ 20.74	1,431/ 7.93
Natural Science	1,715/ 8.05	1,315/ 6.17	2,239/ 10.51	1,205/ 5.66

Firstly, returning to the quantitative results in Table 20, LinRAs surpass other disciplines as to the employment of hedges, with LitRAs coming next. Table 21 shows that the humanities display considerably more hedging devices than natural sciences. Though skepticism is a governing rule in natural science as there is no absolute truth, the humanities prove to be more skeptical as regards the propositions examined. When it comes to evidentials, the humanities also exceed the natural sciences. LinRAs and LitRAs are more richly supplied with documentation of sources of information. The humanities need to establish sources of evidence for the content presented more than natural sciences do. Showing higher distributions of hedges and evidentials, the humanities provide evidence that they do not just contain simple discussions of theoretical propositions. The humanities obviously manifest a methodology that demands accurate examination of phenomena, authentic documentation of sources and careful expression of content.

In addition to hedges and evidentials, the humanities also outstrip the natural sciences concerning code glosses and boosters, the differences for each metadiscourse item being 10.23 per 1,000 words regarding hedges, 4.23 regarding evidentials, 2.27 with reference to boosters, and 1.94 in respect of code glosses. For hedges and evidentials, the gap between the humanities and natural sciences is much wider than between boosters and code glosses. This is evidence for the 'messier' nature of complexity in the humanities'.

Research in natural science is famous for its accuracy and correctness; this is due to its dependence on scientific experiment and observation. Humanities exceed natural sciences concerning the frequencies of hedges and evidentials. This can be explained since the humanities are inherently less reliable and more likely to be subjective, and hence, they have a greater need to display hedges and evidentials. Humanities and natural sciences manifest semi-similar frequencies regarding code glosses and boosters, which show low distribution in both. Authors tend to refrain from showing complete certainty as supported by boosters. This goes back to the changeable nature of knowledge as what is asserted over-emphatically may be subject to questions and doubts afterwards. Authors avoid the increased wordiness created by code glosses so that their writings may not be boring and repetitive.

The following section zooms in on each academic discipline to discuss its search results in detail. The use of high numbers of hedges and evidentials in linguistics needs a closer look. The different kinds of hedging devices, which together are ranked first in occurrence, are not equally used. Lexical hedges, especially *more*, have the highest frequency. Lexical hedges are items signaling unspecified degrees which reduce the force of the content and mirror authors' hesitation and caution towards information. Lexical hedges in LinRAs are extensively used for the purpose of avoiding a clear statement related to the content, for example:

-Speakers of L2 English became progressively more accurate in… (*Lingua*)
-Intertextual references of memes triggered more amusement… (*Lingua*)
-More attention to news about Syrian refugees… (*Discourse & Communication)*
-National newspapers were more active than international ones on Instagram (*Discourse &* Communication)
- COVID-19 humor was judged as more aversive… (*Lingua*)

Downtoners, particularly *only*, are the second hedging device in frequency. Downtoners are items which reduce the force of a statement by expressing vagueness and de-emphasizing the prominence given to the content, as in:

-Only a few studies focused on… (*Lingua*)
-Only a handful of studies investigated… (*Lingua*)
-The theme of security was indicated only by the word dangerous… (*Discourse & Communication*)
-Because there is only one chance to discover… (*Discourse & Communication*)
-If the L2 idioms only partially overlap with the L1 equivalents… (*Lingua*)

Epistemic hedges, *most* in particular, rank third. They encode the authors' attitudes, the extent to which they believe, disbelieve, trust, doubt, know, and question and the like. They interpret authors' knowledge about a proposition in a manner that renders it indecisive and inconclusive. For example:

-This seems the most accurate approach… (*Lingua*)
-The overall most common statistical measure was the Chi-… (*Lingua)*
-Adjectives relating to the most commonly occurring theme in the reports (*Discourse & Communication*)
-The most frequent and significant collocates of refugees… (*Discourse & Communication*)
-The most gruesome consequences of the Coronavirus pandemic… (*Lingua*)

Assertive pronouns, especially *some*, are indefinite pronouns which render a statement vague. Academic authors sometimes display vagueness rather than explicitness. For example:

-Some aspects of the semantic grid observed… (*Lingua*)
-Some fake posts use people with some authority… (*Discourse &Communication*)
-Some cases of the neurological disorder… (*Lingua*)
-Fake information invariably created fears in some electorates…… (*Discourse & Communication*)
Possibility hedges, *if* in particular, refer to degrees of probability. For example:
-If a grammar generates the sentence X… (*Lingua*)
-If context availability is criterion for…. (*Lingua*)
-If Europe would open its borders… (*Discourse & Communication*)
-If he loses the 2019 election… (*Discourse & Communication*)

Frequency adverbs, particularly *often*, are used to avoid any expression of complete accomplishment. They are cautious words which open a domain to multiple judgments. Examples include:

-The research on political journalism has often been based on… (*Discourse & Communication*)
-The documents produced by think tanks often blend… (*Discourse & Communication*)
-Idiom frequency is often defined as… (*Lingua*)
-Expressions containing familiar words more often go unnoticed… (*Lingua*)

Evidentials are the next metadiscourse category in extent of distribution in LinRAs. Among these, parentheses are the most influential device due to their prevalence. LinRAs observe parentheses so that sources of information may be enclosed and documented. This increases LinRAs credibility and validity. Examples include:

-Albert and Salam (2013) believe that …. (*Discourse & Communication*)
-White (1991b) investigates…. (*Lingua*)
According to is used in a similar manner to denote the source:
-According to Van Leeuwen (2007)… (*Discourse & Communication*)
-According to Berwick (1985)…. (*Lingua*)
-According to neuro-psychological evidence ….. (*Lingua*)

Code glosses are the third metadiscourse category in frequency, which recurs the most adding more explanation via offering broader scope and alternative interpretations. For example:

-Deficit is not comparable in depth or in breadth to that of human languages. (*Lingua*)
- News shared collectively in groups or by a person… (*Discourse & Communication*)
-A direct motion verb or by adding a gerund (*Lingua*)
-Covid-19 heaviest outcomes or consequences… (*Lingua*)

To give examples means to add more elaboration, which is a frequent tool to code glosses. Hence, *e.g.*, *such as* and *for example* are highly represented:

-…in semantic impairment, e.g., an impairment for knowledge… (*Lingua*)
-Other criteria such as active participation of all newspapers… (*Discourse & Communication*)
-systems will have causes, for example usage frequency, cultural influence… (*Lingua*)

Boosters come lowest on the scale. To boost is to show a high confidence level, which is congruent with a high distribution of universal pronouns, especially *all:*

-All aspects of language learning… (*Lingua*)
-All newspapers have participated as external narrator… (*Discourse & Communication*)

To amplify is to increase the power of the statement; to make it stronger in effect. *Even* and *very* are frequently used to serve that purpose of intensifying the content:

- It appears that even advanced learners have failed… (*Lingua*)
- Soros is very strongly represented in the European Parliament… (*Discourse & Communication*)
Emphatics show force and confirmation. *Total* is used to emphasize the content:
-The total amount of publication regarding the conflict… (*Discourse & Communication*)
-A total of 11,649 people have been resettled… (*Discourse & Communication*)
-A total of 1,903 participants completed the survey… (*Lingua*)

Linguistics favors hedges and evidentials and tends to avoid code glosses and boosters. It aims to analyze a certain phenomenon in an accurate and objective manner. Hence, it is rather reserved in the use of boosters since accuracy and objectivity do not allow expression of high confidence levels.

Parallel to LinRAs, LitRAs employ a similarly high frequency of hedges and evidentials. Lexical hedging devices, especially *more,* and downtoners, particularly *only*, and epistemic hedges (*most*) show high recurrences. Parentheses are also common reflecting need for faithful documentation, an echo of the LinRAs. *More* and *most* are used to avoid clear judgment. *Only* serves to decrease sentence force and parentheses serve to present honesty in writing as in:

-Unigwe is thus more critical of women's (mistreatment)…
-Using a more extensive selection of Hutcheon's words…
-Munos more particularly addresses the way the author…
-This child can only be read as abject, in Kristeva's (1982).
-…Harris (2017) is not only an unconvincing attempt to expand the meaning…
-Perhaps only God knew what lights and shadows were (Schreiner, 2015/1926)
- …a long-running Ishiguro theme that Gillian-Harding Russel (2002) reads as most fully realized. (All from the *Journal of Commonwealth Literature)*

Boosters come third in frequency. Unlike LinRAs, amplifiers are followed by emphatics and universal pronouns. For example:

-Even Banks himself must conform to…
-This is made clear in the final chapter of the novel.
-This is clearly the case for Chikwava's "hero"…
-With all his heart he wants to believe this.

Finally, code glosses provide wider and further interpretations. For example:

-Forget the past; never by a word or a sign (Schreiner, 2015)
-Anti-Semitism as signifying an abject gap or discontinuity…
-…embodies the anti-woman, that is, a woman who does not act…
-The haunting ghost that is finally tamed by Dostoevsky's writings…

-authors from the diaspora such as Sefi Atta, Helen Oyeyemi…(All from the *Journal of Commonwealth Literature)*

ChRAs endow evidentials with the highest frequency. This is expected because chemistry is a science dealing with authentic material and facts and must refer to the original sources of such material. This is a precondition for scientific content. In chemistry, no content is based on any personal opinion. Because natural science offers no room for subjectivity or points of view, scientific discourse must be based on either credible sources or experimental observations. *Springer Nature*/ *Communications Chemistry* stipulates a particular format for sources of information. They are expressed by numbers in the text, each number referring to the source in a list of references. Examples of numeric evidentials are as follows:

-While methods such as gas chromatography-mass spectroscopy (GC-MS) 3, enzyme-based biosensors 4–6, chemiresistors 7–9, and surface acoustic wave (SAW) sensors can be used for the detection of nerve agents. (*Communications Chemistry*)

ChRAs manifest the use of parentheses to refer to experiment-based figures, which stands for a source of information:

-The proposed mechanism involved the reaction of the primary alcohol to form a phosphate ester, followed by cyclisation to give pyridinium salt 1 (Fig. 1)
-The as-prepared film was found to be non-emissive when excited at 365 nm (note that 2 does not absorb at this wavelength) (Fig. 3a, curve i)

Hedges come next. This is also expected because science means carefulness and exactness. ChRAs manifest a high frequency of epistemic hedges especially *potential(ly).* The device aims to decrease the force of the content:

-Acid is a potential interferent in fluorescent sensing.
-P-O splitting patterns are potentially attributed to…

Lexical hedges, especially *more*, serve to avoid clear indications of findings or judgments as in:

-why UTP labeled SARS—COV-2 proteins more effectively…
-DCP would be more susceptible to hydrolysis…

Downtoners, *only* in particular, diminish the tone or force of the content:

-only a few molecular dynamics stimulations….

-Paracetamol similarly can only be structures… (All from *Communications Chemistry*)

Boosters come in at third rank. The universal pronoun *all,* the emphatic *total* and the amplifier *highly* are endowed with the highest distributions. For example

All crystal lattices were subject to…
- Total amount of solid…total concentrations of NCM…
-Highly efficient blue phosphorescent…highly successful in controlling human immunodeficiency. (All from *Communications Chemistry*)

Boosters do not seem to harmonize with purely scientific discourse. Though ChRAs are not overrepresented with boosters, at 6.6 per 1000 words, this proportion needs to be diminished because showing confidence and certainty are not compatible with the skeptical nature of scientific investigations.

Code glosses come last. This is expected because paraphrasing material does not correspond with the concise nature of scientific discourse. *Or* shows considerable frequency and is mostly used to offer options for wider interpretations as in:

-Amounts were below or above the protein concentration…
-Visualize the presence or the absence of the isotopic mass…
-To indicate the open or closed equatorial portal are in Angstroms...
-Work with containing compounds with or without hydroxyl group… (All from *Communications Chemistry*)

MedRAs display an expected high numbers of hedges followed by evidentials, contrary to ChRAs which reverse that order. Lexical hedges, epistemic hedges and adverbs of frequency show high distributions. Hedges are used to ensure the careful representation of medical content. For example:

-…at a cell density of 10 ml. (*Nature Immunology*)
-…at a concentration of 1pg ml. (*Nature Immunology*)
-A potential approach to counteract mutant KRAS… (*Nature Cancer*)
-Immune cells could potentially affect… (*Nature Cancer*)
-Most cancers are driven by… (*Nature Cancer*)

-Anemia is the most common hematologic… (*Nature Immunology*)
-Data are four and five mice per group… (*Nature Immunology*)

Reference to sources is the predominant evidential device, which is an epitome of MeRAs' focus on authentic facts. MedRAs in Springer *Nature* refer to sources by numbers in the text, and identify tables and figures via parentheses because they are treated as being sources of information. This echoes ChRAs. Examples of evidentials, number-indicated sources and parentheses include:

-Mutations in RAS genes and the resulting deregulated signaling events are responsible for one-third of all human cancers 4. (Fig. 1) (*Nature Cancer*)
-RIOK2 is a little-studied atypical serine–threonine protein kinase23 encoded by RIOK2 at 5q15 in the human genome. (Extended Data Fig. 1a) (*Nature Immunology*)

Code glosses and boosters are the third and the fourth in rank, ChRAs show a reversed order. *Or* and *such as* the dominant code glosses. *Or* is mostly used to offer wider options, similar to ChRAs. For example:

-…uninfected in the presence or absence of… (*Nature Cancer*)
-…isolated or accompanied by additional cytogenetic…(*Nature Immunology*)
-T Cell hyperactivation such as… *(Nature Cancer*)

Boosters are the final category. The emphatic *total*, the universal pronoun *all* and the amplifier *well* are of prominent frequency. *Total* and *all* are of due frequency in MedRAs, which may manifest a tendency of scientific discourse towards the use of *total* and *all* to express high degrees of confidence:

-Total bacteria was centrifuged… (*Nature Immunology*)
-All antibodies used… (*Nature Cancer*)
-Despite the well-established importance of T-Cells…(*Nature Cancer*)

Conclusion

Hedges are endowed with the highest distribution in the whole corpora. This is evidence of the skeptical nature of academic discourse. Evidentials are subsequent to hedges, which relates to the need of academic writing to emphasize its credibility of academic writing. Code glosses and boosters are under-represented in the four corpora, which is associated with academic discourse's features of conciseness, preciseness and objectivity. As to their use of the four categories of metadiscourse, analysis manifests that humanities exceed natural sciences. Regarding hedges and evidentials, the humanities surpass natural science with a gap wider than those for code glosses and boosters. The humanities seem to be more cautious and more concerned with documentation of multiple sources than natural science.

LinRAs show a high frequency of hedges, lexical hedges and downtoners in particular. Evidentials, specifically parentheses, are highly distributed so that third-party material may exactly be documented. Code glosses and boosters are under-represented. LinRAs are far more concerned with expressing precision and objectivity than displaying redundancy and exaggerated confidence. For that reason, hedges and evidentials are predominant in LinRAs. LitRAs are similar to LinRAs as to the high distribution of hedges, evidentials and the sub-categories over-represented within both metadiscourse devices. LinRAs and LitRAs differ when it comes to code glosses, in which use LinRAs are higher, and boosters, in which use LitRAs are higher. This implies that linguists do not favor any manifestation of full confidence when writing. Linguists, accordingly, appear to more objective because using assertive terms may be a sign of subjectivity. This subjectivity seems to be preferred by writers in literary studies who choose to project their confidence in their assertions via boosters. Linguists seem to restate the content more than literary studies writers do, which may have negative effects on their writings, in case such restatements are over-represented.

ChRAs also have a high frequency of evidentials and hedges, as might be expected. Science depends on pure authentic facts and accuracy when interpreting these facts. So, evidentials and hedges are part and parcel of scientific discourse. The results suggest that generic conventions such as number-indicated sources should be added to the list of evidential sub-categories. Boosters are found to be used less because the nature of scientific discourse does not support the use of pompous terms. Code glosses are few, which is suitable for ChRAs. *Or* is used to combine opposite dimensions for extensive interpretation.

MedRAs have the expected high occurrence of hedges and evidentials and low frequencies of code glosses and boosters. MedRAs seem to be more balanced than ChRAs due to MedRAs even lower use of boosters. Both show high frequencies of number-indicated sources, *total* and *all*.

Table 22: *Ranking According to Metadiscourse Category*

Ranking according to Hedges	**1st: Linguistics**	**2nd : Literature**	**3rd: Medicine**	**4th: Chemistry**
Ranking according to Boosters	1st: Medicine	2nd: Literature	3rd: Linguistics	4th: Chemistry
Ranking according to Evidentials	1st: Literature	2nd: Medicine	3rd: Linguistics	4th: Chemistry
Ranking according to Code Glosses	1st: Linguistics	2nd: Medicine	3rd: Literature	4th: Chemistry

Table 22 shows that linguistics is the most cautious discipline; chemistry the least cautious one. Linguistics is also the discipline which is most concerned with re-explaining content; chemistry is the least. Medicine is the discipline with the highest frequency of terms showing certainty; chemistry is ranked the last. Literature shows the highest frequency of evidentials; chemistry the least.

Table 23. *Ranking According to Discipline*

Linguistics	Hedges	Evidentials	Code glosses	Boosters
Literature	Hedges	Evidentials	Boosters	Code glosses
Chemistry	Evidentials	Hedges	Boosters	Code glosses
Medicine	Hedges	Evidentials	Code glosses	Boosters

Table 23 proves the similarity between LinRAs and MedRAs. Linguistics and medicine seem to share the same method of preferring hedges and evidentials to boosters and code glosses. Though the two disciplines have nothing in common regarding content, they are similar regarding the research technique. The humanities prove to be more careful than natural science as to language use and citation of sources.

Finally, this paper investigated four metadiscoursal devices in four disciplines, namely, linguistics, literature, medicine, and chemistry. It would help students of these fields get acculturated into the devices and features distinctive of academic writing in their respective disciplines. However, the paper focused on a limited number of metadiscoursal devices and disciplines. Future studies need to examine more metadiscoursal devices such as, for example, frame markers, endophoric markers, and attitude markers and so on. Future studies need also to deal with more disciplines in humanities, as well as social and natural sciences.

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Appendix

Corpora Identification

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