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Stylistic characteristics of scientific news

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Abstract: This essay provides a comprehensive analysis of the stylistic characteristics of scientific news. It explores the unique lexical, syntactic, and rhetorical elements that distinguish scientific news writing from other forms of journalism. The essay categorizes vocabulary into technical, semitechnical, and nontechnical words, highlighting their strategic integration in scientific reporting. It also examines syntactic features such as the use of passive voice and parallel structures, which contribute to the clarity and precision of scientific news. Rhetorical techniques like metaphors and alliteration are discussed as tools for enhancing reader engagement and comprehension. The essay underscores the importance of these stylistic elements in effectively communicating complex scientific concepts to a broad audience, emphasizing their role in bridging the gap between specialized knowledge and public understanding.

Keywords: scientific news; stylistic characteristics; EST

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1. Introduction

Scientific news refers to "scientific and informative reporting on recent technological developments and related facts," [1] encompassing new events, new situations, new progress, new theories, new phenomena, and new records in the field of science and technology [2]. It primarily addresses topics such as policies in science and technology, advancements in research, and profiles of notable figures in these fields [3]. Since the 20th century, science and technology have experienced rapid development worldwide, leading to an abundance of scientific achievements across various fields. This surge has significantly increased news information and accelerated the growth of the news industry. With scientific news becoming more prevalent, scholars globally have undertaken diverse research in this area. Current research concentrates on text analysis and content research in the realm of scientific news. A notable example is He Chunlu's exhaustive analysis of the linguistic and structural aspects of newspaper scientific news [4]. Additionally, significant attention has been paid to translation and cross-cultural communication, exemplified by Wang Guoliang's detailed summary of the unique features of scientific news translation, using "Reference News" as a case study [5]. Another critical area of focus is the exploration of issues and strategic approaches in news reporting. In this context, Ho, SS, Goh TJ, and Leung YW conducted a thorough investigation into how scientists' perceptions of fake science news impact their advocacy for measures against such misinformation [6]. Wu Ping provided an extensive analysis of the interplay between various components and societal factors in the dissemination process of scientific news, offering a multifaceted perspective on this subject [7]. However, research on the stylistic aspects of scientific news, especially from a macro perspective, is still limited. Wang Qingfeng explored the characteristics of nouns, verbs, neologisms, and word features in online scientific English news, using traditional linguistic theory and lexicological methods [8]. This paper innovatively and comprehensively analyzes the stylistic features of scientific news, covering vocabulary, syntax, rhetoric, and discourse.

As a distinct category within journalism, scientific news not only adheres to the universal attributes of news reporting but also embodies specific qualities such as accuracy

(particularly in the representation of scientific concepts), accessibility (especially regarding complex principles), and informativeness (with an emphasis on the dissemination of scientific knowledge to a broad audience). The defining characteristics of scientific news can be articulated as follows: The first characteristic is its intrinsic news value, necessitating that the information presented be contemporary, thereby setting it apart from other modes of scientific communication. The second characteristic pertains to its scientific nature. It is imperative for the news to convey information that is not only factual but also precisely articulated and anchored in robust scientific evidence. In the sphere of reporting and disseminating scientific facts, there exists an essential requirement to educate the general populace in scientific knowledge. The third characteristic is its accessibility. The formulation of scientific news demands the utilization of science popularization strategies. Employing clear and engaging language, augmented with suitable metaphors and clarifying explanations, is fundamental in rendering the content both accessible and appealing to the audience. This approach ensures that complex scientific ideas are conveyed in a manner that is both comprehensible and captivating to a diverse audience.

2. Vocabulary Characteristics of Scientific News

In the realm of scientific news, the lexicon can be systematically categorized into three distinct tiers: (1) Technical terms, which encompass specific scientific and technical jargon; (2) Semitechnical words, constituting the foundational vocabulary shared across various scientific disciplines; and (3) Nontechnical words, comprising the general language that forms the linguistic bedrock common to all fields of discourse. The composition of the vocabulary within scientific news is characterized by a strategic integration of these categories. A concise selection of technical terms forms the core, providing precise articulation of complex concepts. This core is enveloped by a more substantial layer of semitechnical words, which serve as the primary substance of the discourse, bridging the gap between specialized and general knowledge. Finally, a broad array of nontechnical words acts as the connective tissue, facilitating logical and cohesive communication that is accessible to a wider audience. This structured amalgamation of vocabulary types ensures a high degree of formality and specificity throughout the discourse. Additionally, the frequent utilization of standard abbreviations contributes to a distinctive lexical style that is both efficient and aligned with the specialized nature of scientific news. This style allows for the conveyance of sophisticated ideas in a manner that is both comprehensible and engaging, catering to the diverse needs of the readership.

3. Corpus Analysis

Considering the length of the corpus, the first three paragraphs of the corpus are used as an example:

Antibodies may curb pandemic before vaccines

Now in efficacy trials, monoclonal antibodies promise to both prevent and treat disease

While the world is transfixed by the high-stakes race to develop a COVID-19 vaccine, an equally crucial competition is heating up to produce targeted antibodies that could provide an instant immune boost against the virus. Clinical trials of these monoclonal antibodies, which may both prevent and treat the disease, are already underway and could produce signs of efficacy in the next few months, perhaps ahead of vaccine trials. "If you were going to put your money down, you would bet that you get the answer with the monoclonal before you get the answer with a vaccine," says Anthony Fauci, head of the National Institute of Allergy and Infectious Diseases (NIAID).

"Antibodies have the potential to be an important bridge until the vaccine is available," says Ajay Nirula, a vice president at Eli Lilly, one of several large companies investing in them. Likely to be more effective than remdesivir and dexamethasone, the repurposed drugs shown to help against COVID-19, antibodies could protect the highest risk health care workers from becoming infected while also lessening the severity of the disease in hospitalized patients. But producing monoclonals involves using bioreactors to grow lines of B cells that make the proteins, raising concerns they could be scarce and expensive. On 15 July, Lilly, AbCellera, AstraZeneca, GlaxoSmithKline, Genentech, and Amgen jointly asked the U.S. Department of Justice (DOJ) whether they could share information about manufacturing their monoclonals without violating antitrust laws "to expand and expedite production."

Soon after the pandemic began, researchers in industry and academia began to identify, design, tweak, and conduct lab tests of monoclonal antibodies against SARS-CoV-2, the virus that causes COVID-19. Most bind to and "neutralize" the viral surface protein, or spike, that initiates an infection. On 29 May, Lilly, working with AbCellera, launched the first human study of a monoclonal antibody—a phase I trial testing its safety and tolerability in hospitalized COVID-19 patients.

Other safety trials followed, from Lilly's Chinese partner Junshi Biosciences and Regeneron, which developed a cocktail of three monoclonals that works against Ebola.

Available at: https://www.science.org/doi/10.1126/science.369.6505.752#:~:text=Now%20in%20efficacy%20trials%2C%20monoclonal,both%20prevent%20and%20treat%20disease

Table 1. Word frequency of technical and semitechnical words

Typology	Occurrences	Frequency
Technical terms	28	8.3%
Semitechnical words	40	11.8%
Total number of words	338	/

3.1. Technical Terms as the Backbone with Frequent Use of Abbreviations

Technical terms are specialized lexicon that precisely delineate specific concepts within the domains of science and social sciences. These terms act as unique indicators, reflecting advancements in these fields, and are instrumental in documenting and articulating various phenomena, processes, attributes, relationships, states, and more. Although technical terminology constitutes only a minor fraction of the overall textual content, its role is critical, often introducing novel concepts within a paragraph or article [9].

In the corpus under examination, terms such as "COVID-19", "vaccine", "targeted antibodies", "monoclonal antibodies", "NIAID", "remdesivir", "dexamethasone", "bioreactors", "B cells", "SARS-CoV-2", "protein", and "Ebola" are identified as medical terms. Each of these falls within the ambit of technical vocabulary, exemplifying its application in the medical sciences.

Among these terms, "COVID-19" (Coronavirus Disease 2019, novel coronavirus pneumonia) and "SARS" (Severe Acute Respiratory Syndromes, also known as Infectious Atypical Pneumonia), have gained widespread recognition due to the proliferation of the associated outbreaks. Owing to their lengthy full forms, these terms are commonly abbreviated. Various acronym styles exist, including tail acronyms, middle acronyms, vowel acronyms, spacing acronyms, and lexeme-based acronyms. In the corpus, "COVID-19" and "SARS" are instances of acronyms, with "COVID-19" representing a syllabic amalgamation of initial letters, enhancing the acronym's readability. Conversely, "SARS" is an acronym formed by a combination of initial letters. The guiding principle behind the use of acronyms is to facilitate time and space efficiency while ensuring clarity in comprehension for the reader [10]. Generally speaking, abbreviations used in English scientific news can be directly abbreviated with capital letters without the need for further explanation [11]. The abbreviation of these technical terms contributes to the conciseness and precision of the text, thereby rendering it accessible to a general audience while preserving the scientific integrity of the information conveyed, without causing misinterpretation among readers.

Other technical terms within the corpus, such as "antibodies", "vaccine", "targeted antibodies", and "monoclonal antibodies", frequently serve as central words (as illustrated in Example 1) and constitute the foundational elements of the text.

[Eg1] "Antibodies have the potential to be an important bridge until the vaccine is available,"

[Analysis 1] In this instance, the term "Antibodies" exemplifies the quintessential characteristics of a technical word. It is distinct in its meaning, devoid of ambiguity, and exhibits a high degree of specialization. The connotation of this term is intrinsically aligned with the concept it represents, encapsulating the entirety of its meaning. Concurrently, "Antibodies" functions as the central word in the sentence, irreplaceable by any alternative without altering the intended context. This indispensability underscores its crucial role within the sentence structure, epitomizing the typical utilization of technical terminology in academic discourse.

3.2. Heavy Use of Semitechnical Words

Semitechnical words constitute a prevalent linguistic element in the scientific and technical genres, playing a pivotal role in the articulation of scientific concepts and technical content. These words, characterized as interdisciplinary and frequently occurring independently of more specialized jargon, predominantly originate from the core lexicon of English. While they possess specific technical connotations, they are broadly applicable across various disciplines. In contrast to fully technical terms, semi-technical words exhibit higher frequency of use, are less specialized, and are more comprehensible to a general audience. Their meanings are multifaceted, varying in relation to different specialties, disciplines, and contextual associations.

In the corpus under analysis, terms such as "transfixed", "high-stakes", "race", "instant", "immune", "boost", "virus", "clinical", "trials", "efficacy", "bridge", "repurposed", "infected", "severity", "manufacturing", "violating", "antitrust", "expand", "expedite", "pandemic", "identify", "design", "tweak", "conduct", "bind", "neutralize", "virus", "surface", "spike", "initiates", "infection", "launched", "phase", "testing", "safety", "toxicity", and "cocktail" are identified as semitechnical words. These terms, while imbued with technical significance, are also extensively prevalent in everyday language. The utilization of semitechnical words facilitates the comprehension of scientific news by the general public, bridging the gap between specialized knowledge and lay understanding.

[Eg2] Soon after the pandemic began, researchers in industry and academia began to identify, design, tweak, and conduct lab tests of monoclonal antibodies against SARS-CoV-2, the virus that causes COVID-19. Soon after the pandemic began, researchers in industry and academia began to identify, design, tweak, and conduct lab tests of monoclonal antibodies against SARS-CoV-2, the virus that causes COVID-19.

[Analysis 2] In this context, the term "virus" exemplifies a semitechnical word. Originally a medical technical term, its usage has evolved over time, becoming more prevalent in everyday discourse and thus transforming into a semitechnical word. This evolution highlights its interdisciplinary nature and polysemic character. For instance, consider the sentence, "But I never sent any multimedia messages that day, and I did not find any problem or virus with my phone." Here, the word "virus" transcends its medical connotation of biological viruses. Instead, it is employed in the realm of electronic communication, signifying a different type of threat — a computer or electronic virus. This shift in meaning from a strictly medical context to a broader technological one illustrates the dynamic and adaptable nature of semitechnical vocabulary, as well as its capacity to bridge specialized knowledge and everyday language.

[Eg3] On 29 May, Lilly, working with AbCellera, launched the first human study of a monoclonal antibody-a phase I trial testing its safety and tolerability in hospitalized

COVID-19 patients.

[Analysis 3] In this example, "tolerability" functioning as a semitechnical term, conventionally connotes "effectiveness". Here, it is used within a medical context. However, in the sentence "Tolerability outcomes were discontinuation of study drug, diarrhea, dizziness, headache, nausea, and somnolence," although still within the medical field, "tolerability" shifts its meaning from "effectiveness" to "tolerance". This refers to a state characterized by the body's reduced reactivity to a medication. This nuanced alteration in meaning demonstrates the term's polysemic nature, reflecting its adaptability and specificity within different medical contexts.

4. Syntactic Features of Scientific News

EST (English for Science and Technology) is characterized by its emphasis on rational expression of scientific and technological content, prioritizing clarity, accuracy, logic, and objectivity. This stylistic paradigm shapes the sentence structure to underscore objective facts, processes, and results, eschewing subjective influences. This ensures a concise, thoughtfully worded style, often employing passive voice to align with these tenets.

In scientific news, a frequent use of juxtaposed components merged into cohesive structures manifests, showcasing a preference for parallel constructions. This approach not only reflects the strict, hierarchical, and harmonious nature of the content but also contributes to its readability and structural integrity. Nominalization, a hallmark of rigorous and formal scientific texts (such as technical legal documents and scholarly literature), plays a pivotal role in EST. However, in less formal contexts like daily scientific texts and popular science books, there's a deliberate shift away from overusing nominalized structures. This strategy is employed to render the content more accessible, engaging, and syntactically straightforward. The corpus analyzed in this study, a popular science news article about the novel coronavirus vaccine, exemplifies this trend. Although fewer nominalized structures are employed to enhance general comprehension, the inherent complexity of the scientific and technical genre is evident in the presence of some lengthy and structurally intricate sentences.

4.1. Passive Voice

Over the past three to four decades, the stylistic approach of EST has evolved from a mechanical, conservative, and somewhat pretentious mode to one that is more natural, concise, and unembellished. In contemporary practice, English-speaking scientists and technologists often opt for first-person and active voice narratives, with a noticeable reduction in the use of passive voice. Nonetheless, in the realms of EST, where informative and objective communication is paramount, the passive voice maintains its importance as a distinguishing feature from other genres.

The renowned grammarian Johan Svartvik conducted a comprehensive study on the utilization of passive voice across various genres. This research involved comparing the frequency of passive voice usage in eight different genres, ordered by descending prevalence: science, news, arts, sports, speeches, novels, advertising, and plays. In this classification, science and news emerged as the top two genres, respectively, for passive voice usage, as highlighted in Fang Mengzhi's 2011 study. This finding underscores the enduring relevance of passive voice in scientific discourse, particularly in its capacity to convey information with objectivity and precision.

[Eg4] And in the prevention studies, the household contacts of COVID-19 cases will be much more likely to be exposed than people who typically join a vaccine efficacy study. In the prevention studies, the household contacts of COVID-19 cases will be much more likely to be exposed than people who typically join a vaccine efficacy study.

[Analysis 4] In scientific news, the passive voice is occasionally employed to enhance sentence articulation and ensure semantic coherence. For instance, the phrase "to be exposed" in a specific context implies exposure to, and subsequent infection by, the virus. This terminology pertains equally to "household contacts of COVID-19 cases" and "people who typically join a vaccine efficacy study". In such instances, the agent performing the action is not required to be specified. Given the focus on the COVID-19 pandemic, the virus in question is implicitly understood to be the Coronavirus. This is a well-established fact within the scientific discourse, obviating the need for additional explanation. Consequently, the non-specification of the agent is well-suited for passive voice construction in EST, maintaining the clarity and objectivity essential in scientific communication.

[Eg5] What's more, he notes, the elderly or people who are immune compromised may not mount robust immune responses after being vaccinated.

[Analysis 5] In the given sentence, the deployment of the passive voice serves primarily to foreground the subject, a key feature of EST writing. The subject, situated at the onset of the sentence, acts as the communicative fulcrum and anchors the predicate's narrative. This grammatical approach, known as fronting, involves repositioning a non-subject element to the sentence's beginning to achieve emphasis on that element. The passive voice facilitates this by enabling the focus on the element now acting as the subject. In this

context, the focus is on two distinct groups potentially not developing an immune response post-vaccination, a noteworthy exception in vaccination contexts that the author considers essential to communicate to the public. Hence, these groups are strategically positioned as the sentence's subjects for enhanced emphasis.

Furthermore, in the domain of scientific journalism, the agent of an action is often secondary or difficult to ascertain. Typically, the actor of an action is either generalized or so self-evident that its explicit mention becomes unnecessary. In the discussed text, the cause of "immune compromise" remains unspecified due to the multitude of factors that could lead to such a condition. Expounding on these factors would complicate the narrative, detracting from its accessibility for public comprehension. Similarly, the specifics of the agent in "being vaccinated" are irrelevant, justifying the application of the passive voice.

Thirdly, the deployment of the passive voice in these two instances enhances the continuity and coherence of the sentence, maintaining the subject without necessitating a change, thereby ensuring the smooth progression of the topic.

4.2. Parallel Structures

Parallel structure is an effective way to express complex concepts. This technique, also referred to as symmetry, involves the parallel arrangement of two or more linguistically related units that share identical grammatical functions and symmetrical structures. When skillfully employed, parallelism not only enhances the organization, hierarchy, and harmony of a sentence or speech part but also yields significant stylistic and rhetorical benefits.

In English scientific news, parallel structure is frequently utilized to meet expressive needs. This discourse is characterized by its distinct linguistic attributes: clarity, brevity, vividness, and scientific accuracy. The application of parallel structure helps in minimizing the use of connectives and transitional sentences, thus avoiding redundancy and fostering simplicity. Furthermore, parallelism is employed in listing or comparing elements, which enhances the vividness of the language and facilitates reader comprehension [12]. Moreover, English scientific news exhibits specific syntactic characteristics. It typically employs simple sentences augmented with determiners, gerunds, and homonyms, as well as prepositional phrases, participial phrases, and infinitive phrases serving similar grammatical roles. These simple sentences and their additional components often exhibit parallelism, are interconnected, or are interdependent. To achieve concise and organized descriptions, parallel structures at the levels of words, phrases, and sentences are prevalently utilized in the context of EST.

There are 53 sentences in this tech news, and the following is the frequency of occurrence of each parallel structure.

Table 2. Parallel structure statistics

	Occurrences	Frequency
Word parallelism	13	25%
Parallelism of phrases	6	11%
Total	19	36%

4.2.1. Word Parallelism

In this piece of scientific news, the text comprises 53 sentences, among which 13 exhibit parallelism at the word level.

[Eg6] Clinical trials of these monoclonal antibodies, which may both prevent and treat the disease, are already underway and could produce signs of efficacy in the next few months, perhaps ahead of vaccine trials.

[Eg7] Likely to be more effective than remdesivir and dexamethasone, the repurposed drugs shown to help against COVID-19, antibodies could protect the highest risk

health care workers from becoming infected while also lessening the severity of the disease in hospitalized patients.

[Eg8] But producing monoclonals involves using bioreactors to grow lines of B cells that make the proteins, raising concerns they could be scarce and expensive. expensive.

[Eg9] On 15 July, Lilly, AbCellera, AstraZeneca, GlaxoSmithKline, Genentech, and Amgen jointly asked the U.S. Department of Justice (DOJ) whether they could share information about manufacturing their monoclonals without violating antitrust laws "to expand and expedite production."

[Eg10] Soon after the pandemic began, researchers in industry and academia began to identify, design, tweak, and conduct lab tests of monoclonal antibodies against SARS-CoV-2, the virus that causes COVID-19.

[Eg11] On 29 May, Lilly, working with AbCellera, launched the first human study of a monoclonal antibody-a phase I trial testing its safety and tolerability in hospitalized COVID-19 patients.

[Eg12] Regeneron is now testing the efficacy of its COVID-19 cocktail, which combines a spike antibody from a person who recovered and one from a mouse given the spike protein, in three large-scale, placebo-controlled trials.

[Eg13] One treatment study run by the company aims to enroll nearly 2600 hospitalized people with severe COVID-19, whereas another, about half that size, will test the antibodies in infected people with mild or moderate symptoms.

[Eg14] Although Jenkins hesitates to make a firm prediction, she says the November-December time frame is "realistic and conservative."

[Eg15] That is likely earlier than any vaccine will prove safe and effective, researchers predict.

[Eg16] "It's much easier to take care of a few incoming virus particles than to try and resolve or cure an ongoing infection."

[Eg17] The same logic holds for treatment. "Hit the virus hard and early," Burton says.

[Eg18] If the antibodies work, a study from the Duke University Margolis Center for Health Policy estimates the United States alone could require nearly 40 million doses next year for prevention and treatment.

[Analysis] The provided examples showcase 13 instances of word-level parallelism, categorized into three types: noun parallelism (3 instances), verb parallelism (4 instances), and adjective parallelism (6 instances). Noun parallelism contributes to a more compact sentence structure and effectively emphasizes the focal point of the sentence. Verb parallelism facilitates logical reasoning in scientific and technological news, simultaneously transforming abstract concepts into more tangible, reader-friendly content. Adjective parallelism efficiently conveys the attributes of the subject, offering readers an immediate understanding of the substance's characteristics. This also aids in simplifying the complexity inherent in scientific and technological texts, enhancing reader comprehension.

4.2.2 Parallelism of Phrases

This scientific news consists of 53 sentences, which include 6 instances of parallel phrasing.

[Eg19] "If you were going to put your money down, you would bet that you get the answer with the monoclonal before you get the answer with a vaccine," says Anthony Fauci, head of the National Institute of Allergy and Infectious Diseases (NIAID).

[Eg20] Regeneron is now testing the efficacy of its COVID-19 cocktail, which combines a spike antibody from a person who recovered and one from a mouse given the spike protein, in three large-scale, placebo-controlled trials.

[Eg21] This means those trials require time and many people.

[Eg22] Vaccines are rarely 100% effective, and many people may decline a vaccine or skip immunization for other reasons.

[Eg23] Operation Warp Speed, for example, has committed $8 billion to six different COVID-19 vaccines; for monoclonals, the government has invested about $750 million, much of it in Regeneron, which will produce somewhere between 70,000 and 300,000 doses before it even has efficacy data.

[Eg24] The idea, which has not yet been tested in humans for COVID-19, is to inject people with DNA or messenger RNA that encodes a desired antibody, allowing their own cells to make it.

[Analysis] In the provided examples, a total of six instances of phrase parallelisms are identified: three are verb phrase parallelisms, two are noun phrase parallelisms, and one is a prepositional phrase parallelism. The utilization of verb phrase parallelism, as exemplified in "decline a vaccine or skip immunization" in [Eg22], serves to create a sense of continuity in action, imparting a neat and rhythmic structure to the narrative. This particular usage vividly and thoroughly depicts scenarios wherein a vaccine's efficacy is compromised. On the other hand, noun phrase parallelism, exemplified by "require time and many people" in [Eg21], contributes to the precision and specificity of the sentences, ensuring both accuracy and comprehensiveness in the description. This effectively delineates the dual necessities of time and human resources in experimental contexts. Furthermore, in [Eg24], the phrase "to inject people with DNA or messenger RNA" tells the reader that the "idea" is to inject "DNA" or "messenger RNA" into human beings. This phrase encapsulates a broad spectrum of information, thereby reflecting the trend towards making scientific news accessible and understandable to the general populace.

4.3. Reference

In EST, the relationship between one word and another where they explain and interpret each other is called reference. It uses brief references to express content that has been or will be mentioned in the context, making the text more compact in structure and forming a cohesive whole. Reference can be divided into personal reference, demonstrative reference, and comparative reference.

[Eg25] "Antibodies have the potential to be an important bridge until the vaccine is available," says Ajay Nirula, a vice president at Eli Lilly, one of several large companies investing in them.

[Analysis 25] This sentence demonstrates the cohesive device of personal reference. "them" refers back to "Antibodies" at the beginning of the sentence. The first part of the sentence explains the importance of antibodies, both as "a bridge in responding to the pandemic" and, precisely for this reason, Eli Lilly invests in antibodies. Using "them" to refer to "antibodies" avoids repetition while reflecting the implicit logical relationship within the sentence.

[Eg26] Likely to be more effective than remdesivir and dexamethasone, the repurposed drugs shown to help against COVID-19, antibodies could protect the highest risk health care workers from becoming infected while also lessening the severity of the disease in hospitalized patients.

[Analysis 26] This sentence demonstrates the cohesive device of comparative reference. By comparing antibodies with remdesivir and dexamethasone, two drugs effective against COVID-19, it highlights that the preventive effect of antibodies is even better than these two drugs. This comparison also explains why major pharmaceutical companies go to great lengths to develop antibodies.

[Eg27] "It's much easier to take care of a few incoming virus particles than to try and resolve or cure an ongoing infection." The same logic holds for treatment. "Hit the virus hard and early," Burton says.

[Analysis 27] This sentence demonstrates the cohesive device of comparative reference. In the prevention stage, eliminating the entry of the virus is simpler and easier than

cutting off infection, and the same applies in the treatment stage. Here, the use of comparative reference helps avoid repetition, making the structure more compact and the logic tighter.

4.4. Substitution

Halliday pointed out that substitution involves using a substitute to replace an element in the preceding text [13]. It represents another frequently encountered grammatical relationship within EST texts. As a common linguistic phenomenon, substitution occurs both at the syntactic level and at the discourse level [14]. This articulation method facilitates coherence in EST while effectively minimizing repetitiveness.

[Eg28] Regeneron is now testing the efficacy of its COVID-19 cocktail, which combines a spike antibody from a person who recovered and one from a mouse given the spike protein, in three large-scale, placebo-controlled trials.

[Analysis 28] This sentence employs the cohesive device of substitution. "one" is used as a substitute for the previously mentioned "a spike antibody". Without substitution, there would be numerous repetitions of "a spike antibody". In science news with a popular science nature, the frequent occurrence of specialized medical terms can actually create reading obstacles for the audience. The use of substitution not only ensures concise and fluent writing but also makes it more accessible to the general public.

[Eg29] One treatment study run by the company aims to enroll nearly 2600 hospitalized people with severe COVID-19, whereas another, about half that size, will test the antibodies in infected people with mild or moderate symptoms.

[Analysis 29] This sentence also employs the cohesive device of substitution. "that size" is used to substitute the previously mentioned "nearly 2600". Scientific news requires objectivity and accuracy, inevitably necessitating the citation of factual data. However, an overabundance of data can lead to cumbersome sentences and hinder reader comprehension. The use of substitution here, while ensuring the accuracy of data, also makes the writing more concise and the logic tighter.

4.5. Ellipsis

Ellipsis, also known as "zero substitution" in systemic functional linguistics, is an important cohesion device for constructing discourse coherence [15]. Ellipsis mainly refers to elements that have been mentioned in the context, which both parties can mutually fill in, but do not appear in specific locations [16]. The use of ellipsis as a cohesive device enables the text to avoid repetition, ensuring a clear and concise structure, and also establishes a semantically interdependent cohesive relationship between sentences.

[Eg30] One treatment study run by the company aims to enroll nearly 2600 hospitalized people with severe COVID-19, whereas another, about half that size, will test the antibodies in infected people with mild or moderate symptoms.

[Analysis 30] This sentence employs ellipsis as a connecting technique. The phrase "treatment study" is omitted after "another". From a grammatical perspective, it's necessary to fully articulate each component of a sentence when composing it. However, in this context, "another" corresponds to the previously mentioned "one treatment study", and its meaning is very clear. To avoid redundancy, there's no need for a verbose repetition, thereby making the text concise and clear.

4.6. Conjunction

Conjunction refers to the use of transitional words (conjunctions) to reflect the relationships between sentences, that is, to organically connect the various parts of a text through explicit conjunctions. In EST, the emphasis is on demonstrating the intrinsic logical relationships between scientific facts and entities, hence the importance is placed on the use of conjunctions. There are mainly four types of conjunctions used in EST: addition, contrast, cause and effect, and time.

[Eg31] But producing monoclonals involves using bioreactors to grow lines of B cells that make the proteins, raising concerns they could be scarce and expensive.

[Analysis 31] In this sentence, "But" serves as a transitional word indicating contrast. The previous text mentions that before the advent of vaccines, antibodies could be an effective means to combat the pandemic. Compared to remdesivir and dexamethasone, antibodies work better; they not only protect high-risk medical workers from infection but also alleviate symptoms in diagnosed patients. However, this sentence notes that the process of producing these monoclonal antibodies is quite complex, which may lead to their scarcity and high cost. The previous text outlines the advantages of monoclonal antibodies, while this sentence highlights the production issues. There is a clear contrast between the two, and the use of the conjunction "but" helps readers understand the shift in context, making it clear what the current market situation is for monoclonal antibodies.

[Eg32] Soon after the pandemic began, researchers in industry and academia began to identify, design, tweak, and conduct lab tests of monoclonal antibodies against SARS-CoV-2, the virus that causes COVID-19.

[Analysis 32] The phrase "Soon after" at the beginning of this sentence is a time-connecting marker, making the transition between the preceding and following sections natural and smooth. The preceding text mentions that several pharmaceutical companies are joining forces to apply for expanded and accelerated production of monoclonal antibodies. Following this, the text immediately mentions that soon after the onset of the pandemic, researchers quickly began experiments with monoclonal antibodies targeting the COVID-19 virus. Using "Soon after" to connect these contexts clarifies the timeline of actions taken in response to the pandemic.

4.7. Long and Difficult Sentences with Complex Structures

Compared to non-technical English genres, EST is distinguished by its increased lexical density, a higher frequency of long sentences, a greater prevalence of passive voice, more frequent lexical conversions, a higher incidence of non-predicate verbs, and a heightened level of specialization. A computerized corpus analysis encompassing 1.07 million words, conducted by Shanghai Jiao Tong University, reveals that the average sentence length in EST is 21.4 words. It is noteworthy that sentences comprising fewer than 7 words (inclusive) constitute a mere 8.77% of the corpus, whereas sentences exceeding 40 words represent 6.3% of the content. The stylistic minimalism, condensed linguistic expression, and rigorous structural framework characteristic of EST inherently give rise to an abundance of long and complex sentences [17].

[Eg33] While the world is transfixed by the high-stakes race to develop a COVID-19 vaccine, an equally crucial competition is heating up to produce targeted antibodies that could provide an instant immune boost against the virus.

[Analysis 33] The essence of the sentence under analysis is the concurrent global challenges posed by the development of a novel Coronavirus vaccine and the escalating competition in the production of targeted antibodies, which potentially enhance immediate immunity against the virus. The sentence incorporates several logical relationships: the adverbial clause of time, denoted by "while", synchronizes the ongoing efforts in Coronavirus vaccine development with the production of targeted antibodies, thereby contextualizing the global commitment to vaccine production. The infinitive phrase "to produce targeted antibodies" functions as a post-modifying determiner for "competition", elucidating the nature of this competitive endeavor. Moreover, the phrase "that could provide an instant immune boost against the virus" acts as a restrictive attributive clause, offering the reader a clear definition of "targeted antibodies." Despite the increased length and complexity of these sentences, they fulfill a critical role in demystifying specialized medical terms, thereby aiding in the popularization of scientific and technological news for a general audience.

[Eg34] Regardless of cost, evidence that monoclonals work as preventives could benefit everyone by giving vaccinemakers a clear sign that antibodies against the surface protein of SARS-CoV-2 are enough to protect a person.

[Analysis 34] The sentence conveys that utilizing monoclonal antibodies as a preventive strategy against COVID-19 could universally benefit people by offering vaccine manufacturers a clear indication that antibodies targeting the SARS-CoV-2 surface protein are adequate for human protection, although this is predicated on the cost being a non-factor. The logical relationships included are as follows: "Regardless of cost" serves as a conditional adverbial, laying the groundwork for the feasibility of this measure. The phrase "that monoclonal antibodies work as preventives could benefit everyone..." functions as a subject clause introduced by "that" modifying "evidence". Here, "evidence" merely serves a structural purpose without conveying any literal meaning, thus it can be omitted in translation, focusing solely on the content of the subject clause. The clause "that antibodies against the surface protein of SARS-CoV-2 are enough to protect a person" acts as a post-modifying relative clause for "a clear sign" explicating the specific meaning of this "clear sign". This showcases the capacity of complex scientific news sentences to encompass extensive information and maintain logical coherence.

5. Rhetorical Characteristics of Scientific News

Rhetoric, i.e., modifying speech, refers to the process of using language as a linguistic activity that is carried out through the use of a variety of linguistic devices in order to achieve as close as possible to the desired linguistic effect. The phenomenon of rhetoric can be divided into negative and positive rhetoric two types [18]. Negative rhetoric is based on the criteria of clarity, fluency, evenness and stability. The methods used in explanatory texts such as science and law belong to negative rhetoric. Positive rhetoric refers to the positive use of various methods of expression in response to the situation, exhausting all the possibilities of language and writing, so that what is said and written presents a concrete image, fresh and lively and moving power. All kinds of rhetorical devices are positive rhetorical methods.

5.1. Negative Rhetoric

Negative rhetoric refers to treating the entire process of composing an article as a continuous rhetorical process. This involves manipulating language, vocabulary, grammar, logic, and even punctuation to strive for linguistic perfection. Negative rhetoric is not about creating a rhetorical technique to beautify language by transcending the meaning or form of language units themselves, but rather it involves making appropriate selections from the existing linguistic repertoire and arranging them rationally, to achieve clearer and smoother expression [19]. It includes techniques such as refining words and selecting sentence structures. One of the methods of negative rhetoric is "elegant variation".

[Eg35] Regeneron's Christos Kyratsous notes that vaccine trials must wait a few weeks for a person's immune system to develop appropriate responses to shots and further weeks for "the event"-a chance exposure to SARS-CoV-2.

[Analyze 35] This case employs the technique of using a grand word for a minor purpose. The original meaning of "event" refers to "a thing that happens, especially something important", indicating a major or significant occurrence, typically used in more formal contexts. In this sentence, "event" refers to the incidental contact with the COVID-19 virus, which is actually just one part of the experimental process. However, the use of a "grand word" for this gives a sense of disproportion, like "a small head wearing a big hat", creating a novel impression and highlighting the importance of this phase in the entire vaccine trial process.

5.2. Positive Rhetoric

Positive rhetoric refers to the active use of various methods of expression in response to the situation, exhausting all the possibilities of language and writing, so as to make what is said and written present a concrete image, fresh and lively and moving power. Unlike negative rhetoric, positive rhetoric must make the reader feel something, which requires them to experience various sensations through language and text. Therefore, it is necessary to utilize all available sensory factors in the medium, such as the sound and physical form of language, while also ensuring that the meaning of the language is experiential and concrete. This means all kinds of rhetorical devices are active rhetorical methods. Within the analyzed corpus, the predominant forms of positive rhetoric include metaphor, alliteration, and parallelism.

5.2.1. Metaphors

The Wechsler Dictionary defines metaphor in this way, "a figure of speech in which one thing is likened to another, different thing by being spoken of as if it were the other; implied comparison, in which a word or phrase ordinarily and primarily of one thing is applied to another". From this, it can be discerned that metaphor, as a rhetorical device, is characterized by its approach of directly stating the tenor as the vehicle, foregoing the use of explicit comparative words. Essentially, it constitutes a form of implicit comparison [20].

[Eg36] "Antibodies have the potential to be an important bridge until the vaccine is available," says Ajay Nirula, a vice president at Eli Lilly, one of several large companies investing in them.

[Analysis 36] In scholarly discourse, the term "bridge" conventionally denotes an entity that establishes a linkage between distinct groups or disparate situations. However, in the context of this study, while the antibody is not a "bridge" in the literal sense, it metaphorically serves as a conduit between the Coronavirus and the human body, facilitating the body's defense against the virus. Metaphors, by eschewing the explicitness of similes, offer a more vivid and imaginative portrayal, thereby enhancing the comprehensibility of the antibody's function in the prevention and treatment of COVID-19.

5.2.2. Alliteration

Alliteration is a rhetorical device unique to the English. It occurs when two or more adjacent words begin with the same letter or sound, particularly in the initial syllables (or other stressed syllables). Alliteration primarily involves consonants.

[Eg37] On 15 July, Lilly, AbCellera, AstraZeneca, GlaxoSmithKline, Genentech, and Amgen jointly asked the U.S. Department of Justice (DOJ) whether they could share information about manufacturing their monoclonals without violating antitrust laws "to expand and expedite production."

[Analysis 37] The use of alliteration in "expand and expedite" enhances the rhythmic quality of the language. Moreover, as both are verbs, the alliteration vividly encapsulates the urgent desire of several pharmaceutical companies to "expand and expedite the production of monoclonal antibodies". Scientific news aims to popularize scientific knowledge among the general public. However, due to its inherently technical nature, it can pose comprehension challenges for those without a foundational knowledge base. Therefore, engaging and easy-to-remember language is employed to capture the readers' attention, with alliteration being an effective technique. For instance, this sentence and the preceding context, which involve medical knowledge, may be somewhat challenging to understand. Specifically, before the advent of vaccines, antibodies were considered a crucial means to combat the pandemic. However, producing monoclonal antibodies is difficult and costly, prompting these pharmaceutical companies to consult with the U.S. Department of Justice to "expand and expedite the production of monoclonal antibodies". The use of alliteration here, rich in rhythm, immediately draws the reader's focus to the phrase "to expand and expedite production", quickly clarifying that the ultimate goal of

these companies is to rapidly increase the production of monoclonal antibodies to better control the pandemic.

5.2.3 Parallelism

According to Webster's New Collegiate Dictionary, parallelism is the recurrence of syntactically similar structures for rhetorical effect. In other words, parallelism consists of two or more words, phrases, sentences, or even paragraphs that are structurally identical, semantically related, and tonally consistent, arranged in sequence. It demands strict structural adherence, characterized by uniform structure and consistent tone [21].

[Eg38] Soon after the pandemic began, researchers in industry and academia began to identify, design, tweak, and conduct lab tests of monoclonal antibodies against SARS-CoV-2, the virus that causes COVID-19.

[Analysis 38] The given example employs parallelism in rhetoric, neatly presenting to the public the preparatory work done by researchers for controlling the epidemic. It reads smoothly and rhythmically, and the four verbs also conform to the logical order of the experimental process, vividly showing the efforts made by researchers in studying monoclonal antibodies.

6. Discourse Characteristics of Scientific News

The discourse concept is notably expansive, encompassing both dialogic and textual forms. This term can refer to a singular word, a phrase, or an aggregation of words [22]. Scientific news possesses the characteristics of scientific discourse and also includes the functions of news. In other words, the style of scientific news is a type of writing that lies between literary language and professional scientific language. In terms of thinking, it contains elements of imaginative association found in literary language, as well as elements of logical reasoning found in professional scientific language. From the perspective of scientific discourse, it is a textual tool and carrier for achieving information communication, dissemination, exchange, and transmission [23], possessing the rigor, objectivity, and accuracy of scientific texts; from the perspective of news, it has the general function of transmitting information to the public, characterized by truthfulness and timeliness [24], while also having a certain readability, to achieve the purpose of popularizing scientific knowledge to the general public.

6.1. Reiteration

Reiteration is defined as the deliberate recurrence of an earlier element within the discourse. This technique is particularly prevalent in the context of EST, characterized by its stringent structural composition and meticulous diction. By strategically reemploying vocabulary with clear and specific definitions, it is possible to achieve a high degree of conceptual precision, thematic salience, and overall discourse coherence [25].

[Eg39] Clinical trials of these monoclonal antibodies, which may both prevent and treat the disease, are already underway and could produce signs of efficacy in the next few months, perhaps ahead of vaccine trials.

"If you were going to put your money down, you would bet that you get the answer with the monoclonal before you get the answer with a vaccine," says Anthony Fauci, head of the National Institute of Allergy and Infectious Diseases (NIAID).

"Antibodies have the potential to be an important bridge until the vaccine is available," says Ajay Nirula, a vice president at Eli Lilly, one of several large companies investing in them.

[Analysis 39] The above three sentences employ lexical cohesion through the use of reiteration. Here, "the monoclonal" is a synonymous expression for "monoclonal antibodies", and "antibodies" is a hypernym of "monoclonal antibodies". Since this news article revolves around monoclonal antibodies, there is a significant repetition of terms. The use of synonyms and hypernyms for reiteration not only ensures conceptual accuracy and

thematic prominence, making it easier for readers to understand, but also maintains the coherence of the discourse.

[Eg40] Soon after the pandemic began, researchers in industry and academia began to identify, design, tweak, and conduct lab tests of monoclonal antibodies against SARS-CoV-2, the virus that causes COVID-19.

Immunologist Dennis Burton, whose group at Scripps Research has isolated highly potent monoclonal antibodies against SARS-CoV-2 that it hopes to move into human studies.

"Hit the virus hard and early," Burton says.

[Analysis 40] The above three sentences feature the reiteration of "SARS-CoV-2". "The virus" is a hypernym for "SARS-CoV-2", but it specifically refers to the novel coronavirus causing COVID-19.

6.2. Collocation

Collocation refers to the phenomenon where words that have a certain relationship with each other appear together in discourse, or habitually co-occur, including complementary words, antonyms, etc.

[Eg41] While the world is transfixed by the high-stakes race to develop a COVID-19 vaccine, an equally crucial competition is heating up to produce targeted antibodies that could provide an instant immune boost against the virus.

Clinical trials of these monoclonal antibodies, which may both prevent and treat the disease, are already underway and could produce signs of efficacy in the next few months, perhaps ahead of vaccine trials.

Likely to be more effective than remdesivir and dexamethasone, the repurposed drugs shown to help against COVID-19, antibodies could protect the highest risk health care workers from becoming infected while also lessening the severity of the disease in hospitalized patients.

[Analysis 41] In the above three sentences, there is an abundance of specialized medical vocabulary, which often appears in collocations. For example, "antibodies", "virus", "immune", and "infected" are typically used together, as the function of antibodies is to induce immunity in the body, thereby preventing viral infections. Similarly, "prevent", "treat", "disease", and "hospitalized patients" are also commonly found in collocations, as the primary role of hospitals is to prevent and treat diseases in patients.

7. Conclusion

In conclusion, the article underscores the unique blend of vocabulary, syntax, rhetorical and textual techniques that define scientific news. It adeptly shows how the careful balance of technical and nontechnical language, alongside specific syntactic structures like the use of passive voice and complex sentences, enhances the clarity and precision of information. Additionally, the employment of rhetorical devices such as metaphors and alliteration enrich reader engagement and understanding. Techniques such as reiteration and collocation contribute to a more concise and standardized discourse. This distinct style is crucial for bridging the gap between complex scientific concepts and public comprehension, ensuring that scientific news not only conveys information accurately but also in an accessible and engaging manner, thereby playing a vital role in educating and informing a well-informed society.

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