REVIEW ARTICLE

CONTENTS

Words from the wards: Paronyms in medical article titles

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ABSTRACT

Aim: To examine the presence of paronyms in medical article titles, analyze their stylistic features and pragmatic potential, and provide relevant guidelines for EAP students and early career writers.

Materials and Methods: We examined the occurrence of paronyms in medical article titles sourced from the PubMed database using its Advanced Search Builder ("search term[Title]" queries). The study relied on the methods of quantitative examination, stylistic, structural, etymological, and contextual analyses, using The Oxford Dictionary of Literary Terms (Baldick, 2015), Writing with Clarity and Style: A Guide to Rhetorical Devices for Contemporary Writers (Harris, 2016), Latin-Ukrainian Thesaurus of Clinical Terms (Bieliaieva, 2016), and Latin-Ukrainian Medical Encyclopedic Dictionary (Bieliaieva, Zhdan & Tsisyk, 2020). The study identified 43 paronymic pairs, 6 paronymic triads, and 1 paronymic tetrad across 207 medical article titles.

Conclusions: By examining how paronyms are used in article titles, EAP students and early career writers can develop a deeper understanding of the subtle distinctions between paronymic lexemes and subsequently use them correctly, recognize the rhetorical devices and employ the pragmatic strategies in academic writing, thus enhancing their language proficiency and developing critical thinking skills. This will ultimately promote mastery of the skills needed to create engaging and compelling titles, which can increase the visibility and impact of research articles.

KEY WORDS: paronyms, article titles, medical discourse, English for Academic Purposes, rhetorical devices, pragmatic functions

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INTRODUCTION

In the fields of linguistics and language teaching, the focus on article titles presents an abundant area for exploration and analysis [1-3]. Titles serve as the initial point of contact between the reader and the research, shaping the reader's expectations and influencing their decision to delve further into the study. Scholars have extensively explored the role of titles in scientific discourse, emphasizing their impact on article visibility, citation rates, and even acceptance rates [4, 5]. Indeed, in the age of digital information overload, effective titles play a particularly crucial role in making research more discoverable and attracting potential readers [2]. Hence, our interest in article titles stems from the considerable pragmatic potential of this aspect of academic writing. The study of article titles not only enriches our understanding of language use but also promotes effective pedagogical practices aimed at educating proficient writers, which renders this research relevant.

In designing article titles, various strategies can be employed to effectively capture the essence of the research while attracting readers' attention [2]. Each of these strategies serves to enhance the communicative impact of the title, contributing to its effectiveness in conveying the significance of the research. One approach involves using noun phrases, which succinctly encapsulate the main topic and key findings of the study, providing a clear and informative preview of the content. Another strategy in designing article titles involves the use of semicolons, particularly in titles where multiple concepts or aspects need to be distinguished, providing clarity and facilitating comprehension for the reader (e.g., "Devic's opticomyelitis: a case report from the authors' clinical practice" [6]; "Alarmism vs eschatology: a conceptual analysis" [7].

Sentence-based titles, on the other hand, incorporate verbs and present the research in a narrative style. The increasing use of interrogative titles is one more notable tendency [1]. In particular, there is a recurring trend of using popular culture references such as song titles, to stand out in the competitive publishing setting, as exemplified by the title "Should I Stay or Should I Go?" [8].

Meanwhile, titles with stylistically marked expressions, such as puns, rhymes, alliteration, etc., can inject

Table 1. Paronymic "noun + noun" pairs in article titles from PubMed

No.	Paronymic pairs	Examples from PubMed
1.	**Access (n) – excess (n)**	• "Access without excess" (J Med Philos, 1992) • "We need access, not excess" (Kans Med, 1992) • "Access versus excess: value-based cost sharing for prescription drugs" (Health Aff, 2004) • "Access, excess, and ethics--towards a sustainable distribution model for antibiotics" (Ups J Med Sci, 2014) • "Antibiotics: achieving the balance between access and excess" (Lancet, 2016) • "Access to excess" (JAAPA, 2017)
2.	**Apposition (n) – opposition (n)**	• "Nursing philosophy and nursing research: in apposition or opposition?" (Nurs Res, 1982)
3.	**Bite (n) – byte (n)**	• "Byte by bite: Use of a mobile bite counter and weekly behavioral challenges to promote weight loss" (Smart Health (Amst), 2017) • "From bite to byte: Dental structures resolved at a single-cell resolution" (J Dent Res, 2021) • "Can a byte improve our bite? An analysis of digital twins in the food industry" (Sensors (Basel), 2021) • "Bite by byte: Can fitness wearables help bariatric patients lose more weight after surgery?" (Surg Endosc, 2023)
4.	**Break (n) – brake (n)**	• "A break in the brake mechanism in diabetes: a cause of postprandial hyperglycemia" (Diabetes Care, 2008) • "Fast break on the fat brake: mechanism of peroxisome proliferator-activated receptor-delta regulation of lipid accumulation in hepatocytes" (Hepatology, 2008) • "ATP puts the brake on DNA double-strand break repair: a new study shows that ATP switches the Mre11-Rad50-Nbs1 repair factor between signaling and processing of DNA ends" (Bioessays, 2014) • "Editorial overview: Cardiovascular and renal: Putting the brake on heart-breaks: emerging targets and treatment strategies for cardiovascular and renal disorders" (Curr Opin Pharmacol, 2017)
5.	**Flower (n) – flour (n)**	• "From flour to flower: how Polycomb group proteins influence multiple aspects of plant development" (Trends Plant Sci, 2003)
6.	**Patience (n) – patients (n)**	• "Patients, patience and provocations" (RN, 1950) • "Perthes' disease: stretching the patients' patience" (Nurs Mirror, 1978) • "Pain in chronic pancreatitis. Patients, patience, and the impatient surgeon" (Gastroenterology, 1984) • "It's just me: patients, patience, and parents" (Can Fam Physician, 2008) • "Patients, patience, and the publication process" (Proc Natl Acad Sci USA, 2010) • "Testing patients' patience" (Nurs Manag (Harrow), 2012) • "Incorporating musculoskeletal ultrasound into your radiology practice: patients, patience, and why your department cannot do without it" (Skeletal Radiol, 2019)
7.	**Plague (n) – plaque (n)**	• "Letter: A plague of plaque" (Br Dent J, 1975) • "Plague (tuberculosis) and plaque (atherosclerosis)" (N Engl J Med, 1977) • "Genes for tight adherence of Actinobacillus actinomycetemcomitans: from plaque to plague to pond scum" (Trends Microbiol, 2001)
8.	**Waist (n) – waste (n)**	• "Research quarterly for exercise and sport lecture. Statewide physical fitness testing: A big waist or a big waste?" (Res Q Exerc Sport, 2009) • "Waist circumference: A waste of time?" (Heart, 2010) • "Less waste on waist measurements: Determination of optimal waist circumference measurement site to predict visceral adipose tissue in postmenopausal women with obesity" (Nutrients, 2018)
9.	**Weight (n) – wait (n)**	• "Intermittent fasting: Is the wait worth the weight?" (Curr Obes Rep, 2018) • "From REM to orexin: Clinical progress in narcolepsy – was it worth the wait? Was it worth the "weight?" (Arq Neuropsiquiatr, 2021) • "Worth the wait? Preconception weight reduction in women and men with obesity and infertility: A narrative review" (Fertil Steril, 2022)

Source: compiled by the authors of this study

creativity and humor into the title, potentially increasing its appeal [9]. The latter strategy can be particularly effectively implemented through the use of paronyms, i.e., words with similar morphemic composition but different meanings [10]. In our previous studies, we have explored the prevalence and functions of medical paronyms in healthcare professional settings [10, 11].

Table 2. Paronymic "noun + adjective" pairs in article titles from PubMed

No.	Paronymic pairs	Examples from PubMed
1.	**Board (n) – bored (adj)**	• "Is your secretary on board – or just bored? (Tex Hosp, 1978) • "A busy board is never bored" (Health Serv Manager, 1979) • "On board or bored stiff? How to run effective board meetings" (MGMA Connex, 2003) • "Bored of the board?" (J Calif Dent Assoc, 2005) • "Bored in board-and-care and other settings: Perspectives of Latinos with schizophrenia" (Psychiatr Serv, 2016) • "Don't push your luck! Educational family board (not bored) game for school-age children living with chronic conditions" (J Pediatr Nurs, 2017) • "From bored games to board games: Student-driven game design in the virtual classroom" (J Microbiol Biol Educ, 2021)
2.	**Course (n) – coarse (adj)**	• "Time course of visual perception: coarse-to-fine processing and beyond" (Prog Neurobiol, 2008) • "The last course of coarse coding: Hemispheric similarities in associative and categorical semantic processing" (Brain Lang, 2022)
3.	**Deer (n) – dear (adj)**	• "Dear deer? Maybe for now. People's perception on red deer (Cervus elaphus) populations in Portugal" (Sci Total Environ, 2020) • "Oh dear, SARS-CoV-2 in deer mice" (Lab Anim (NY), 2021)
4.	**Duel (n) – dual (adj)**	• "Top pop(ulation)s: dual, duo or duel?" (Nat Biotechnol, 2007) • "The duel between dual antiplatelet therapies" (N Engl J Med, 2013) • "Bringing back targets to "IMPROVE" atherosclerotic cardiovascular disease outcomes: the duel for dual goals; are two targets better than one?" (Circulation, 2015) • "Dual organ duel: The hepatorenal axis" (Adv Chronic Kidney Dis, 2017) • "Dual RNA-sequencing to elucidate the plant-pathogen duel" (Curr Issues Mol Biol, 2018) • "Fungal duel between Penicillium brasilianum and Aspergillus nomius results in dual induction of Miktospiromide A and Kitrinomycin A" (J Nat Prod, 2023)
5.	**Fare (n) – fair (adj)**	• "Fair-weather fare: Tips for smart eating during outdoor events (Diabetes Forecast, 2012)
6.	**Hole (n) – whole (adj)**	• "A whole new way to make a hole – or a whole new wheel?" (Catheter Cardiovasc Interv, 2005) • "Whole not hole: Expert face recognition requires holistic perception" (Neuropsychologia, 2010) • "The hole and the whole" (Br Dent J, 2013) • "Treating the whole not the hole: Necessary coupling of technologies for diabetic foot ulcer treatment" (Trends Mol Med, 2014) • "Whole-hearted for the hole-hearted" (Mil Med, 2015) • "The hole and the whole: Lessons from manipulation of Nipbl deficiency" (PLoS Biol, 2016) • "Strategies for achieving health equity: Concern about the whole plus concern about the hole" (Ethn Dis, 2019) • "Management of caustic injury: Better to evaluate patient as a "whole" rather than only through a "hole"! (Endoscopy, 2021) • "Whole versus hole: Enabling community nurses to implement holistic wound care" (J Wound Care, 2023)
7.	**Principle (n) – principal (adj)**	• "Changing Principals, Keeping Principles" (N Engl J Med, 2019); • "States of ignorance and ignorance of states: Examining the Quantum Principal Principle" (Stud Hist Philos Sci, 2021)
8.	**Reel (n) – real (adj)**	• "Real life and reel life" (Perspect Psychiatr Care, 2003) • "From reel time to real time: patient simulation for chaplain interns" (J Pastoral Care Counsel, 2008) • "Genetics in Hollywood: from real to reel" (Clin Genet, 2010) • "Social attention with real versus reel stimuli: toward an empirical approach to concerns about ecological validity" (Front Hum Neurosci, 2012) • "Bollywood's cancer: disconnect between reel and real oncology" (Lancet Oncol, 2015) • "Jack Nicholson: A reel and real-life contribution to neurosciences" (World Neurosurg, 2017) • "Involuntary arm movements post-pacemaker insertion - real or reel syndrome?" (Acta Cardiol, 2023) • "Social attention patterns of autistic and non-autistic adults when viewing real versus reel people" (Autism, 2023)

Table 2. Cont.

9.	**Vein (n) – vain (adj)**	• "Serotonin (5-HT) in veins: not all in vain" (J Pharmacol Exp Ther, 2007) • "In the vein but in vain" (Paediatr Anaesth, 2008) • "DES in saphenous bypass grafts: A treatment in vain?" (Catheter Cardiovasc Interv, 2008) • "Examining the jugular vein is never in vain" (Circ Heart Fail, 2010) • "Congenital extrahepatic portocaval shunt: growth in vain" (J Pediatr, 2013) • "Evaluation of the diagnostic value of a venous phase in CT angiography of the extremities in the setting of trauma: is vein imaging in vain?" (Emerg Radiol, 2017) • "Function of TGFbeta (transforming growth factor-beta) receptor in the vein is not in vain" (Arterioscler Thromb Vasc Biol, 2022) • "Commentary: Operating on fewer veins in vain" (JTCVS Open, 2022)
10.	**Week (n) – weak (adj)**	• "Variation in intensive care unit outcomes by day of week: no weak-end" (Intensive Care Med, 2004) • "A week seems to be weak: tailoring duration of antibiotic treatment in Gram-negative ventilator-associated pneumonia" (Crit Care, 2013) • "No weak days? Impact of day in the week on surgical mortality" (ANZ J Surg, 2016) • "Do gastroenterologists have a "weak" day? Impact of day of the week on the quality of outpatient screening colonoscopies" (J Clin Gastroenterol, 2022)

Source: compiled by the authors of this study

AIM

This paper aims to examine the presence of paronyms in medical article titles, analyze their stylistic features and pragmatic potential, and provide relevant guidelines for EAP students and early career writers.

MATERIALS AND METHODS

We examined the occurrence of paronyms in medical article titles sourced from the PubMed database using its Advanced Search Builder ("search term[Title]" queries). The study relied on the methods of quantitative examination, stylistic, structural, etymological, and contextual analyses, using The Oxford Dictionary of Literary Terms [12], Writing with Clarity and Style: A Guide to Rhetorical Devices for Contemporary Writers (Harris, 2016), Latin-Ukrainian Thesaurus of Clinical Terms [13], and Latin-Ukrainian Medical Encyclopedic Dictionary [14]. The study identified 43 paronymic pairs, 6 paronymic triads, and 1 paronymic tetrad across 207 medical article titles.

ETHICS

This review article is based on an analysis of publicly available scientific data published in peer-reviewed journals, clinical guidelines and databases. No patient-identifying data was used during the work, nor was there a need to obtain approval from an ethics committee, as the study did not include new clinical interventions or initial collection of patient information.

REVIEW AND DISCUSSION

The study detected 43 paronymic pairs (Table 1 - 8), 6 paronymic triads (Table 9), and 1 paronymic tetrad (Table 10) in 207 medical article titles. In this paper, we deliberately chose not to include proper medical paronyms such as "mucus – mucous", "affect – effect", etc., which we have examined in our previous studies [10, 11].

This intentional omission stems from the understanding that while these pairs of words have distinct medical meanings, their usage in titles might not provide the same stylistic nuance or playful ambiguity as other paronyms. In other words, the use of proper medical paronyms is dictated by the need to express accurate medical information in titles, rather than to form stylistically marked expressions, given the specific and precise nature of the medical context. Therefore, in this study, we chose to focus specifically on neutral (general English) paronymic lexemes that can effectively leverage wordplay with their counterparts from medicine to enhance the stylistic features and pragmatic implications of medical article titles, thus providing valuable insights for EAP instructional settings.

The detected paronymic pairs have been categorized by their grammatical properties, which revealed several notable patterns. Hence, the most common occurrences of paronyms are "noun + adjective" and "noun + verb" categories, represented by 10 pairs each. They are followed by 9 "noun + noun" pairs, 5 "verb + adjective" pairs, and 4 "verb + verb" pairs. Paronymic "noun + adverb" and "verb + adverb", "noun + conjunction" and "verb + conjunction", and "adjective + adjective" categories are the least common instances, with 1 pair in each case. It is necessary to point out that 7 paronymic lexemes ("waste", "wait", "break", "brake", "fare", "wear", and "weather") exhibit dual functionality, serving both as nouns and verbs across various contexts. Consequently, lexemes "break" and "brake" form 3 paronymic pairs:

Table 3. Paronymic "noun + verb" pairs in article titles from PubMed

No.	Paronymic pairs	Examples from PubMed
1.	**Brake (n) – break (v)**	• "Activation of the JNK signaling pathway: breaking the brake on apoptosis" (Bioessays, 2003)
2.	**Cell (n) – sell (v)**	• "Stem cells – a hard sell to investors" (Nat Biotechnol, 2005) • "The stem cell hard sell: Report from a clinic's patient recruitment seminar" (Stem Cells Transl Med, 2017)
3.	**Dye (n) – die (v)**	• "To die or not to dye. Poisoning from arsenical pigments in the 19th century" (Pharm Hist (Lond), 1996) • "What cells can do when they die (and how we can dye it)" (Cytometry A, 2010) • "It's not the dye, but the "die" in dialysis: which coronary revascularization strategy really is best?" (Catheter Cardiovasc Interv, 2010)
4.	**Flu (n) – flew (v)**	• "Rapid action by Chandigarh: Flew away the threat of bird flu" (Indian J Med Microbiol, 2016)
5.	**Heel (n) – heal (v)**	• "Heel ulcers don't heal in diabetes. Or do they?" (Diabet Med, 2005) • "Non-surgical way to heal severe heel pain. A new twist on an old exercise might bring relief from chronic plantar fasciitis" (Duke Med Health News, 2006) • "When a heel won't heal: an important differential to consider" (J Am Podiatr Med Assoc, 2014) • "Heel ulcers do heal in patients with diabetes" (Int Wound J, 2017) • "Heal or no heel: Outcomes of ischaemic heel ulcers following lower limb revascularization from a multi-ethnic Asian Cohort in Singapore" (Int Wound J, 2020)
6.	**Lead (n) – led (v)**	• "Don't be 'mis-led': few herbal products have been implicated in lead poisoning" (J Gen Intern Med, 2009) • "High-fat diet in mice led to increased severity of spermatogenesis impairment by lead exposure: perspective from gut microbiota and the efficacy of probiotics" (J Sci Food Agric, 2023) • "Lead and copper led to the dysregulation of bile acid homeostasis by impairing intestinal absorption in Bufo gargarizans larvae: An integrated metabolomics and transcriptomics approach" (Sci Total Environ, 2023)
7.	**Meat (n) – meet (v)**	• "Meet your meat: The argument for increasing education and public outreach regarding the regulation and safety of animal biotechnology" (Food Drug Law J, 2013) • "Meet meat: An explorative study on meat and cultured meat as seen by Chinese, Ethiopians and Dutch" (Appetite, 2017) • "Meet the meat alternatives: The value of alternative protein sources" (Curr Nutr Rep, 2020) • "Meet your meat: The effect of imagined intergroup contact on wanting and liking of meat" (Appetite, 2022) • "Tissue engineering challenges for cultivated meat to meet the real demand of a global market" (Int J Mol Sci, 2023) • "Meet the meatless: Demand for new generation plant-based meat alternatives" (Appl Econ Perspect Policy, 2023)
8.	**Sea (n) – see (v)**	• "Marine microbes see a sea of gradients" (Science, 2012) • "To see the sea and the shore" (Am Ann Deaf, 2021) • "What Darwin could not see: island formation and historical sea levels shape genetic divergence and island biogeography in a coastal marine species" (Heredity (Edinb), 2023)
9.	**Waist (n) – waste (v)**	• "Wait for weight or "waste" the waist: the benefits of early intervention in childhood obesity" (J Am Coll Cardiol, 2009) • "Waste the Waist": The development of an intervention to promote changes in diet and physical activity for people with high cardiovascular risk" (Br J Health Psychol, 2012) • "Sleep doesn't waste time, it's good for the waist line" (Sleep, 2015) • "Waste the waist: A pilot randomised controlled trial of a primary care based intervention to support lifestyle change in people with high cardiovascular risk" (Int J Behav Nutr Phys Act, 2015)
10.	**Weight (n) – wait (v)**	• "Wait for weight or "waste" the waist: the benefits of early intervention in childhood obesity" (J Am Coll Cardiol, 2009) • "Don't wait for the weight" (Resuscitation, 2017) • "Childhood obesity: How long should we wait to predict weight?" (J Pediatr Endocrinol Metab, 2018)

Source: compiled by the authors of this study

Table 4. Paronymic "verb + adjective" pairs in article titles from PubMed

No.	Paronymic pairs	Examples from PubMed
1.	**Bear (v) – bare (adj)**	• "Can we bear another bare-metal stent study?" (Catheter Cardiovasc Interv, 2013)
2.	**Blew (v) – blue (adj)**	• "Code Blue: how a hot medical stock blew up" (Fortune, 1998)
3.	**Fare (v) – fair (adj)**	• "Giving medicine a fair trial. It needs to be established whether patients really fare better in trials" (BMJ, 2000) • "The fat ones fare well – but is it fair to compare?" (Crit Care Med, 2006)
4.	**Knew (v) – new (adj)**	• "Myocardial viability: what we knew and what is new" (Cardiol Res Pract, 2012) • "Headache – what we knew and what is new: From a physician who is also a patient" (Neurol India, 2021) • "Cancer and neurofibromatosis type 1 – confirming what we knew and telling us something new" (JAMA Netw Open, 2021)
5.	**Lose (v) – loose (adj)**	• "Too loose to lose: an investigation into endoscopic anastomotic reduction to reestablish weight loss" (Gastrointest Endosc, 2018)

Source: compiled by the authors of this study

Table 5. Paronymic "verb + verb" pairs in article titles from PubMed

No.	Paronymic pairs	Examples from PubMed
1.	**Appose (v) – oppose (v)**	• "Incomplete stent apposition: should we appose or oppose?" (JACC Cardiovasc Interv, 2010)
2.	**Break (v) – brake (v)**	• "To break or to brake neuronal network accelerated by ammonium ions?" (PLoS One, 2015)
3.	**Cease (v) – seize (v)**	• "Brain seizes, heart ceases: a case of ictal asystole" (J Neurol Neurosurg Psychiatry, 2000)
4.	**Wring (v) – ring (v)**	• "Publication and citation in ophthalmology: glaucoma and the water-provocation test – wring out the old and ring in the new?" (Clin Exp Ophthalmol, 2008) • "The dynamic vortex of a beating heart: wring out the old and ring in the new!" (J Am Coll Cardiol, 2014) • "To ring or wring the bell?" (J Palliat Med, 2011)

Source: compiled by the authors of this study

"break" (*n*) – "brake" (*n*); break" (*v*) – "brake" (*n*); break" (*v*) – "brake" (*v*), whereas the remaining 5 words form 2 paronymic pairs each. The distribution of paronymic pairs across different parts of speech highlights the versatility of English in creating wordplay and puns, with certain structures being more prevalent than others.

Table 1 presents paronymic "noun + noun" pairs in the analyzed research articles.

As can be seen from Table 1, paronyms in medical article titles underlie deliberate wordplay, conveying contrasting concepts through juxtaposition. Through such linguistic devices, these titles not only convey the subject matter but also engage readers and evoke thought on relevant medical topics. The stylistic devices present in these titles include paronomasia, or puns (e.g., "Is the ***wait*** worth the ***weight***?"; "Testing ***patients' patience***"; "The Consular ***Corps(e)***"), antithesis (e.g., "A ***corps***, not ***corpse***"; "***Patients, patience***, and the im***patient*** surgeon"), rhyme (e.g., "Was it worth the ***wait***? Was it worth the "***weight***?"; "***Patients, patience*** and provocations"), alliteration (e.g., "***Byte*** by ***bite***"; "From ***bite*** to ***byte***"; "***Patients***, ***patience***, and parents"), rhetorical questions ("A big ***waist*** or a big ***waste***?"), and metaphorical language (e.g., "Putting the ***brake*** on heart-***breaks***"; "Stretching the ***patients' patience***"; "***Plague*** (tuberculosis) and ***plaque*** (atherosclerosis)", i.e., tuberculosis as the white "plague" of the 19th century vs. atherosclerosis as the white "plague" of the 20th century).

Table 2 presents paronymic "noun + adjective" pairs in the analyzed articles.

The stylistic devices present in these titles include paronomasia ("Variation in intensive care unit outcomes by day of ***week***: no ***weak***-end"; "A ***week*** seems to be ***weak***"; "***Whole***-hearted for the ***hole***-hearted"; "A busy ***board*** is never ***bored***"; "From ***bored*** games to ***board*** games"), alliteration ("The last ***course*** of ***coarse*** coding";

"***Dear deer***?"; "Top pop(ulation)s: ***dual***, ***duo*** or ***duel***?"; "***Dual*** organ ***duel***"), metaphors ("***Fair***-weather ***fare***"), antithesis (***Whole*** versus ***hole***"; "Changing ***principals***, keeping ***principles***"; "***Real*** life and ***reel*** life"), rhyme ("A busy ***board*** is never ***bored***"), and rhetorical questions ("***Bored*** of the ***board***?"; "On ***board*** or ***bored*** stiff?"; "A ***whole*** new way to make a ***hole*** – or a ***whole*** new wheel?"). These devices add creativity, humor, and depth to the titles, making them more engaging and memorable for the readers. One can observe several wordplays on the phrases "on board" and "board games", which create a sense of linguistic creativity, capturing the reader's attention and engaging them with the titles. Both "on board" and "board games" typically refer to being actively involved or participating, whereas the titles juxtapose these phrases to quite the opposite "***bored*** stiff" and "just ***bored***" expressions, which enhances the stylistic effect by introducing a playful and witty tone. These puns effectively attract readers' interest and make the titles stand out amidst a plethora of existing literature.

Table 3 presents paronymic "noun + verb" pairs in the analyzed research articles.

As one can observe from Table 3, paronyms underlie the following stylistic devices: paronomasia ("Don't be 'mis-***led'***: few herbal products have been implicated in ***lead*** poisoning"; "Don't ***wait*** for the ***weight***"), alliteration ("***Meet*** the ***meat*** alternatives"; "***Meet*** the ***meatless***"; "To ***die*** or not to ***dye***"; "***Heal*** or no ***heel***"), antithesis ("What cells can do when they ***die*** (and how we can ***dye*** it)"; "It's not the ***dye***, but the "***die***" in dialysis"), metaphor ("Stem ***cells*** – a hard ***sell*** to investors"; "The stem ***cell*** hard ***sell***"), and rhyme ("When a ***heel*** won't ***heal***"; "***Wait*** for ***weight*** or "***waste***" the ***waist***"; "Don't ***wait*** for the ***weight***"; "Sleep doesn't ***waste*** time, it's good for the ***waist*** line"). Table 3 also features several wordplays on the idiom "a hard sell", meaning something that is difficult to promote. Meanwhile, "To ***die*** or not to ***dye***" is a wordplay on the famous Shakespearean phrase "to be or not to be" from *Hamlet*, and "***meet*** your ***meat***" is a play on the idiom "meet your match", which means to encounter someone or something that is as good as or better than oneself.

Table 4 presents paronymic "verb + adjective" pairs in the analyzed articles.

In the titles from Table 4, the stylistic devices relying on paronyms include paronomasia and alliteration ("Can we ***bear*** another ***bare***-metal stent study?"; "Code ***Blue***: how a hot medical stock ***blew*** up"; "Too ***loose*** to ***lose***"), metaphor ("Giving medicine a ***fair*** trial"), rhyme ("What we ***knew*** and what is ***new***"), and rhetorical questions ("The fat ones ***fare*** well – but is it ***fair*** to compare?"). It is necessary to observe that the title "Too ***loose*** to ***lose***" is a wordplay on the idiom "too good to lose/miss" implying that something is valuable and should not be lost.

Table 5 presents paronymic "verb + verb" pairs in the analyzed articles.

The examples in Table 5 employ paronomasia, alliteration, and rhetorical question ("Should we ***appose*** or ***oppose***?"; "To ***break*** or to ***brake*** neuronal network accelerated by ammonium ions?"; "***Wring*** out the old and ***ring*** in the new"), which prompt reflection and invite the readers to ponder the dilemma posed by the titles. Moreover, the titles with the phrase "***Wring*** out the old and ***ring*** in the new" are a wordplay on the idiom "out with the old, in with the new", applied to emphasize the importance of a paradigm shift in the context of publication and citation practices in ophthalmology and in optimizing diagnostic and therapeutic interventions in cardiology, respectively. One can also observe rhyme and antithesis ("Brain ***seizes***, heart ***ceases***"), enhancing both the rhythmic pattern and subject matter of the title.

Table 6, Table 7, Table 8 present paronymic "noun + adverb" and "verb + adverb", "noun + conjunction" and "verb + conjunction", and "adjective + adjective" pairs, respectively.

The titles in Table 6 largely employ alliteration ("Who should ***w*ear *w***hat, ***where***, and ***w***hen" and "Tooth ***wear*** – ***where*** are ***w***e now?"). The repeated use of the "w" sound creates a catchy title, drawing attention to the subject matter of the paper, adding emphasis and rhythm to the phrase.

Rhetorical questions ("***Whether weather*** affects arthritis"; "***Whether*** the ***weather*** influences pain?"; "***Whether weather*** matters") engage readers by prompting them to consider the topic and its implications. It is also necessary to point out that the "weather – whether" puns rely on wordplay on a popular tongue twister "We'll weather the weather whatever the weather", enhancing the memorability, and increasing the appeal of the article titles. Furthermore, wordplay and repetition ("***Whether*** the ***weather*** will help us ***weather*** the COVID-19 pandemic") exploit the versatility of the word "weather", which can function both as a noun and a verb, thus enhancing the overall impact of the title.

These titles employ paronomasia ("***Complementary*** medicines are not always ***complimentary*** in Down syndrome"), highlighting the discrepancy between the expectation of something being favorable and the reality that it may not always be beneficial, as well as rhetorical questions ("Should we be ***complimentary*** about ***complementary*** therapies?") to engage the reader and prompt consideration of the topic being discussed.

Table 6. Paronymic "noun + adverb" and "verb + adverb" pairs in article titles from PubMed

No.	Paronymic pairs	Example from PubMed
1.	**Wear (n) – where (adv)**	• "Tooth wear – where are we now?" (Br Dent J, 2023)
2.	**Wear (v) – where (adv)**	• "Medical guidance for respiratory protection: Who should wear what, where, and when?" (Ann Am Thorac Soc, 2023)

Source: compiled by the authors of this study

Table 7. Paronymic "noun + conjunction" and "verb + conjunction" pairs in article titles from PubMed

No.	Paronymic pairs	Examples from PubMed
1.	**Weather (n) – whether (conj)**	• "Whether weather affects arthritis" (J Rheumatol, 1985) • "Medical meteorology: Whether weather influences admissions" (Mayo Clin Proc, 2001) • "Whether the weather influences pain? Results from the EpiFunD study in North West England" (Rheumatology (Oxford), 2010) • "Whether subarachnoid hemorrhage depends on the weather?" (World Neurosurg, 2013) • "Whether the weather drives patterns of endemic amphibian chytridiomycosis: a pathogen proliferation approach" (PLoS One, 2013) • "Whether weather matters: Evidence of association between in utero meteorological exposures and foetal growth among Indigenous and non-Indigenous mothers in rural Uganda" (PLoS One, 2017) • "Whether conversion and weather matter to roundabout safety" (J Safety Res, 2018) • "Whether the weather will help us weather the COVID-19 pandemic: Using machine learning to measure twitter users' perceptions" (Int J Med Inform, 2021) • "Whether weather matters with migraine" (Curr Pain Headache Rep, 2024)
2.	**Weather (v) – whether (conj)**	• "Whether the weather will help us weather the COVID-19 pandemic: Using machine learning to measure twitter users' perceptions" (Int J Med Inform, 2021)

Source: compiled by the authors of this study

Table 8. Paronymic "adjective + adjective" pair in article titles from PubMed

No.	Paronymic pair	Examples from PubMed
1.	**Complimentary (adj) – complementary (adj)**	• "Complementary and complimentary neurology" (Arch Neurol, 2000) • "Perioperative nursing: complementary or complimentary" (AORN J, 2005) • "Academic and commercial genetic testing laboratories: complementary if not complimentary" (Per Med, 2007) • "Should we be complimentary about complementary therapies?" (J Clin Nurs, 2008) • "Complementary medicines are not always complimentary in Down syndrome" (J Pediatr, 2018)

Source: compiled by the authors of this study

Table 9 presents paronymic triads in the analyzed article titles.

As one can observe, the "ward – word – world" triad is one of the most productive paronymic combinations, with 20 examples in the analyzed article titles. The titles in Table 9 demonstrate a consistent use of puns, such as "***Peek*** a ***peak***", "***plain*** and ***pain*** talk", "One ***word*** can mean a ***world*** of difference", and "***Word*** and ***world*** knowledge". Rhetorical questions are utilized to engage the audience and stimulate curiosity, as seen in "Mesocolic ***plane*** surgery: just ***plain*** surgery?" and "Multiplanar reformations...is it ***plain*** which ***plane*** to use?", prompting readers to consider the implications or uncertainties surrounding the topics addressed. Additionally, the titles often employ alliteration, as in "***Rain, reign, rein***", ***peek-peak-pique***", "Over-***sight*** on op-***site***", "From ***words*** to ***wards***", and "***Word*** and ***world*** order", which reinforces the memorability of the titles. Furthermore, some titles incorporate antithesis to juxtapose contrasts or emphasize unexpected connections, such as "Big ***words***, halved brains and small ***worlds***" and "Mediating ***words***, mediating ***worlds***". One can also observe several metaphors ("The ***world*** is their ***ward***", "***Word*** and ***world*** meet", "to enter the labour ***ward world***") and rhymes ("Hard ***words*** from the ***wards***", "A novel ***site*** comes into ***sight***", "***Cite*** with a ***sight***"). These titles make strategic use of collocations and idiomatic expressions, such as "word order" and "world order", "word knowledge" and "world knowledge", "plain sight", "hiding in plain sight", and "sight unseen" to capture

the readers' attention, and highlight key points of the studies.

Table 10 presents a paronymic tetrad in the analyzed article titles.

The stylistic devices present in these titles include paronomasia largely based on the phrase "rite of passage" ("***Write right*** – or *left*"; "Residency training: ***rite*** of passage, but is it ***right*** today?"; "Authorship: ***rite***, ***right***, or ***write*** of passage?"; "Freud's writing: his ***(w)rite*** of passage and its reverberations"), antithesis ("It's more than a computer can deliver: gross anatomy – a ***rite*** of passage and a ***right*** to learning"; "Screening pelvic examinations: ***right***, wrong, or ***rite***?"), alliteration ("***Wright*** was ***right***"; "***Write right!***"), rhyme ("Informed consent and patient's rights documents: a ***right***, a ***rite***, or a re***write***?"), repetitions ("Nurses: The ***right*** and ***rites*** to ***write***, ***right***?"), and rhetorical questions ("***Right*** or ***rite***?"; "Was ***Wright right***?").

Moreover, the paronymic tetrad "Right – rite – write (*v*) – Write (*eponym)*" presents an interesting linguistic phenomenon. These paronyms are among the most prolific lexemes found in the *PubMed* article titles (23 examples). Furthermore, the inclusion of "Write" as an eponym, referring to Sewall Wright (1889 – 1988), an American geneticist celebrated for his contributions to the field of evolutionary theory, further enriches the semantic landscape, adding a layer of historical significance. Hence, the paronymic tetrad in Table 10 encapsulates the complexity and versatility of language, showcasing how a single word can transform in different contexts and interpretations.

In this context, it is necessary to emphasize that eponyms play a crucial role in medical discourse by honoring the contributions of individuals to medical knowledge and providing concise ways to reference diseases, conditions, anatomical structures, and medical procedures [15, 16]. However, their usage can pose challenges due to potential misspelling due to the lack of awareness, thus leading to confusion among healthcare professionals and students [15]. Therefore, additional instruction and guidance are necessary at medical universities to ensure proper understanding, spelling, and use of eponyms in clinical practice and academic discourse [15]. This instruction helps maintain clarity and accuracy in communication within the medical field while paying homage to the historical figures who have made significant contributions to medicine.

Furthermore, Tables 1-10 demonstrate several notable tendencies in terms of paronyms' etymological features. Out of the total number of detected paronyms, 40 lexemes can be traced back to classical and medieval Latin, – frequently through Old French and sometimes after having undergone substantial spelling transformations in modern English [17]. Within this subgroup, 28 words with Latin roots form paronymic pairs and triads in English ("access"/"excess", "opposition/apposition", "oppose/appose", "complementary/complimentary", "dual/duel", "flour/flower", "patience/patients", "plague/plaque", "principal/principle", "cease/seize", "vain/vein", "core/corps/corpse", "pain/plain/plane"). For instance, the words "corps" and "corpse" originate from the Latin word "corpus", meaning "body", but have diverged in meaning over time, with "corps" taking on a figurative, collective sense, and "corpse" specifying the literal, deceased body [13]. Similarly, "apposition" and "opposition" stem from the Latin "positio", meaning "placing", yet they have branched off in meaning due to the prefixes attached to them ("ad-" (towards, in addition) and "ob-" (against), which alter the base meaning of the word they precede, with "apposition" denoting the addition of elements side by side, and "opposition" indicating contrast or conflict [13]. Hence, despite shared etymological roots in Latin, numerous words in modern English developed different meanings in the process of language evolution.

In addition, Latin-based and Old English words can also form paronymic pairs and triads due to coincidences in spelling, leading to potential confusion in understanding their meanings and usage. In our study, 12 Latin-based words ("reign", "rein", "real", "site", "cite", "fair", "rite", "waste (*n,v*)", "cell", "flu", and "course") form paronymic pairs and triads with lexical units stemming from Old English: "rain", "reel", "sight", "fare", "right/write", "waist", "sell", "flew", "coarse"). These linguistic convergences highlight the complexity and the rich history that has shaped the English language, with Latin contributing substantially to its vocabulary and evolution.

Indeed, the enduring significance of Latin, with its profound influence on English and other modern European languages cannot be underestimated [17]. The vast layer of English vocabulary is rooted in ancient Latin and Latinized Greek [17]. This underscores the importance of a solid foundation of Latin instruction for medical students and medical writers. It is a practical necessity for achieving clarity and precision in professional communication within the medical field, and for the effective exchange of knowledge. A thorough instruction in Latin helps medical students understand the meanings and origins of lexemes, avoid potential mistakes, and communicate with greater accuracy and specificity [17].

It is also necessary to observe that paronomasia (or pun) adds a significant layer of complexity and creativity to article titles. These linguistic devices can be

Table 9. Paronymic triads in article titles from PubMed

No.	Paronymic triads	Examples from PubMed
1.	**Core (n) – corps (n) – corpse (n)**	• "The core and corps of audiology" (Br J Audiol, 1989) • "The Consular Corps(e)" (Med Leg J, 1990) • "Disease intervention specialists as a corps, not corpse" (Sex Transm Dis, 2008) • "Heroism. A core value of the Army Nurse Corps" (Nurs Leadersh Forum, 2001)
2.	**Peak (n) – peek (v) – pique (n)**	• "Peek a peak: a glance at statistics for quantitative label-free proteomics" (Expert Rev Proteomics, 2010) • "Peek-peak-pique: Repeating motifs of subtle variance are targets for potent malaria antibodies" (Immunity, 2018)
3.	**Pain (n) – plain (adj) – plane (n)**	• "Mesocolic plane surgery: just plain surgery?" (Colorectal Dis, 2009) • "Multiplanar reformations in the measurement of renal length on CT: is it plain which plane to use?" (AJR Am J Roentgenol, 2015) • "Plain and pain talk in palliative and hospice care: multidirectional knowledge transfer and shared decision making" (Adv Skin Wound Care, 2015) • "Pain psychology: "Psychosomatic medicine, behavioral medicine, just plain medicine" (Pain Med, 2016) • "Plain radiograghs of lumbar spine in patients with low back pain" (Arch Osteoporos, 2018) • "Fascial plane blocks in thoracic surgery: a new era or plain painful?" (Curr Opin Anaesthesiol, 2020) • "In plain sight: neurosyphilis presenting with back pain" (Intern Med J, 2023) • "Ambroxol for neuropathic pain: hiding in plain sight?" (Pain, 2023)
4.	**Rain (n) – rein (n) – reign (n)**	• "Rain, reign, rein – the tyranny of IT" (Endocr Pract, 2003)
5.	**Sight (n) – site (n) – cite (v)**	• "Over-sight on op-site" (J Dermatol Surg Oncol, 1981) • "Never cite sight unseen" (Am J Obstet Gynecol, 1998) • "A novel site comes into sight" (Elife, 2013) • "Cite with a sight" (J Phys Chem Lett, 2014) • "A new sight to explore site-specific N-glycosylation in donkey colostrum milk fat globule membrane proteins with glycoproteomics analysis" (Food Res Int, 2022)
6.	**Ward (n) – word (n) – world (n)**	• "From words to wards. 2. Communication or conflict?" (Lancet, 1961) • "From words to wards. 3. The planning process" (Lancet, 1961) • "From words to wards. 5. Effect of alterations" (Lancet, 1961) • "Air Force flight nurses. The world is their ward" (RN, 1969) • "Word and world order: semantic, phonological, and metrical determinants of serial position" (Cogn Psychol, 1993) • "Words in wards: language, health and place" (Health Place, 1999) • "Words and wards: a model of reflective writing and its uses in medical education" (J Med Humanit, 2006) • "Synthetic biology: discovering new worlds and new words" (EMBO Rep, 2008) • "Big words, halved brains and small worlds: complex brain networks of figurative language comprehension" (PLoS One, 2011) • "Waiting for permission to enter the labour ward world: first time parents' experiences of the first encounter on a labour ward" (Sex Reprod Healthc, 2011) • "Mediating words, mediating worlds: Interpreting as hidden care work in a South African psychiatric institution" (Transcult Psychiatry, 2013) • "Observation "services" and observation "care" – one word can mean a world of difference" (Health Serv Res, 2014) • "Word and world knowledge among deaf learners with and without cochlear implants" (J Deaf Stud Deaf Educ, 2014) • "World atrial fibrillation awareness day – high time to spread the word" (J Atr Fibrillation, 2014) • "From a word to a world: the current situation in the interdisciplinary field of synthetic biology" (PeerJ, 2015) • "Hard words from the wards: Images of violence and violation in hospital poetry" (Perspect Biol Med, 2018) • "Single word reading in the real world: Effects of transposed-letters" (J Cogn. 2021) • "Mapping word to world in ASL: Evidence from a human simulation paradigm" (Cogn Sci, 2021) • "The pluriverse of intoxication: Words, lives, worlds in Islamicate history" (Soc Hist Alcohol Drugs, 2022) • "Where word and world meet: Language and vision share an abstract representation of symmetry" (J Exp Psychol Gen. 2023)

Source: compiled by the authors of this study

humorous, thought-provoking, or used for rhetorical effect, making them a valuable aspect of language and communication. However, paronomasia can also pose challenges for non-native speakers of a language. Since puns often rely on wordplay and cultural nuances of language, they can be difficult to understand. As a result, incorporating the teaching of puns into language learning curricula can help non-native speakers develop a deeper understanding of the language, its nuances, and its cultural context. It not only enhances students' linguistic skills but also fosters creativity, critical thinking, and cultural awareness. By analyzing paronomasia, students gain insight into the multiple meanings of words and phrases, as well as the cultural references embedded within language. Moreover, puns can make language learning more engaging and enjoyable, motivating students to actively participate in the learning process. Hence, integrating the study of paronomasia into language curricula can enrich students' language proficiency and cultural literacy, empowering them to communicate effectively and fluently in diverse linguistic contexts.

In this context, the majority of detected paronyms formed a basis for homophonic puns (i.e., relying on words that sound the same but have entirely different meanings). Indeed, out of the total 43 paronymic pairs identified in the study, a significant majority (36 pairs) were found to be homophones, sharing identical pronunciation despite differing in spelling and meaning ("bite – byte"; "break (*n,v*) – brake (*n,v*)"; "flower – flour"; "waist – waste (*n,v*)"; "weight – wait (*n,v*)"; "complimentary – complementary"; "wring – ring"; "board – bored"; "course – coarse"; "deer – dear"; "duel – dual"; "fare (*n,v*) – fair"; "principle – principal"; "reel – real"; "vein – vain"; "week – weak"; "hole – whole"; "cell – sell"; "die – dye"; "flu – flew"; "heal – heel"; "lead – led"; "meet – meat"; "see – sea"; "bear – bare"; "blew – blue"; "knew – new"; "wear (*n,v*) – where"; "weather (*n,v*) – whether"). The remaining 6 paronymic pairs differ by one sound ("access – excess"; "appose-oppose"; "apposition – opposition"; "cease – seize"; "lose – loose"; "patience – patients"), and 1 pair ("plague – plaque") stands out by differing in two sounds. Among the 6 paronymic triads, 3 were homophonic ("peak" – "peek" – "pique"; "rain" – "rein" – "reign"; "sight" – "site" – "cite"). The paronymic tetrad also relies on the homophonic features of paronyms. Hence, as the provided examples demonstrate, authors extensively employ the rhetoric potential of homophones.

It is also necessary to observe that among the 43 paronymic pairs identified in the research, 25 pairs differ by just one letter ("access – excess"; "appose-oppose"; "apposition – opposition"; "bite – byte"; "cell – sell"; "complimentary – complementary"; "coarse – course"; "dear – deer"; "duel – dual"; "heal – heel"; "hole – whole"; "knew – new"; "lead – led"; "lose – loose"; "meet – meat"; "plague – plaque"; "reel – real"; "see – sea"; "vein – vain"; "weather (*n,v*) – whether"; "week – weak"; "wear (*n,v*) – where"; "wring – ring"). At the same time, 18 paronymic pairs exhibited more pronounced variations, differing by two or more letters ("bear – bare"; "blew – blue"; "board – bored"; "break (*n,v*) – brake (*n,v*)"; "cease – seize"; "die – dye"; "fare (*n,v*) – fair"; "flower – flour"; "flu – flew"; "patience – patients"; "principle – principal"; "waist – waste (*n,v*)"; "wait (*n,v*) – weight").

Consequently, when dealing with paronyms, careful attention to spelling is crucial, as demonstrated by several examples found in *PubMed*. For instance, in the study "Evaluation of the effect of garlic tablet as a ***complementary*** treatment for patients with diabetic retinopathy" (*Randomized Controlled Trial J Diabetes Res*, 2022) the word "complementary" was misspelled in the article text: "Purpose: The aim of this study was to investigate the effectiveness of garlic (Allium sativum L.) tablets as a ***~~complimentary~~*** ***complementary*** herbal medication in diabetic macular edema" [18]. These misspelling instances emphasize the importance of meticulous attention from authors and editors to ensure accuracy, clarity, and precision in medical communication [19]. This is particularly relevant when using words that are similar in sound but differ in meaning to avoid unintended misinterpretations and maintain the integrity of scientific literature.

This potential confusion emphasizes the necessity for additional instruction on paronyms in educational settings. Such instruction could encompass strategies for distinguishing between closely related terms, highlighting their distinct meanings and contexts. In particular, targeted instruction on the spelling and use of paronyms in medical curricula is crucial to prevent a decrease in the overall quality of medical writing, where clarity and precision are paramount. Exploring paronyms not only enhances students' proficiency in medical language but also fosters their motivation and interest in learning a foreign language, as they engage with the intricacies of linguistic variation [20]. By engaging students in interactive learning experiences, educators can ensure that future healthcare professionals develop the necessary skills to communicate accurately and effectively in their medical writing [20, 21].

In curricular activities, instructors can incorporate dedicated lessons focusing on paronyms, providing students with theoretical knowledge, practical examples, and exercises to enhance their comprehension

Table 10. Paronymic tetrad in article titles from PubMed

No.	Paronymic tetrad	Examples from PubMed
1.	**Right (n, adj) – rite (n) – write (v) – Write (eponym)**	• "Write right" (Occup Health Nurs, 1970) • "Informed consent: right or rite?" (CA Cancer J Clin, 1979) • "Write right – or left: a practical approach to handwriting" (J Learn Disabil, 1983) • "Right or rite? Is "informed consent" really just a pipe dream?" (Can Doct, 1986) • "Nurses' note. Six ways to write right" (Image J Nurs Sch, 1987) • "Write right" (Can Nurse, 1989) • "Write, right now: a guide for the novice nurse author" (Gastroenterol Nurs, 1989) • "Was Wright right?" (Science, 1991) • "Write right! (matching the manuscript with a journal)" (J Holist Nurs, 1994) • "Write right now: a commitment, an idea, a plan" (Nurs Staff Dev Insid, 1994) • "Informed consent and patient's rights documents: a right, a rite, or a rewrite?" (Ethics Behav, 1999) • "Authorship: rite, right, or write of passage?" (J Nucl Med, 2000) • "Freud's writing: his (w)rite of passage and its reverberations" (J Am Psychoanal Assoc, 2002) • "It's more than a computer can deliver: gross anatomy – a rite of passage and a right to learning" (WMJ, 2003) • "Residency training: rite of passage, but is it right today?" (Obstet Gynecol Surv, 2004) • "Spatial differentiation for flower color in the desert annual Linanthus parryae: was Wright right?" (Evolution, 2007) • "Was Wright right? The canonical genetic code is an empirical example of an adaptive peak in nature; deviant genetic codes evolved using adaptive bridges" (J Mol Evol, 2010) • "Write right": The GSAHS Clinical Documentation Project" (Health Inf Manag, 2010) • "Screening pelvic examinations: right, wrong, or rite?" (Ann Intern Med, 2014) • "Nurses: The right and rites to write, right?" (Creat Nurs, 2015) • "Write right, quite right: Orthography in Latin anatomical terms" (Clin Anat, 2018) • "Ceremonial purification: which rite is right in liver failure?" (Intensive Care Med, 2023) • "Wright was right: Leveraging old data and new methods to illustrate the critical role of epistasis in genetics and evolution" (Evolution, 2024)

Source: compiled by the authors of this study

and usage of these linguistic nuances in academic writing. Additionally, the inclusion of paronyms in language proficiency assessments and examinations can serve as a valuable tool for evaluating students' understanding and mastery of these concepts. Educators can implement various tasks and activities to address this issue effectively, such as word matching exercises, where students pair paronyms with their correct definitions, contextual writing assignments to practice using paronyms accurately, and group discussions to explore the shades of meaning between similar terms [11]. By providing healthcare professionals with a deeper understanding of language subtleties, medical education can enhance clarity and precision in communication, which is indispensable for effective clinical practice and scholarly excellence within the field.

For EAP and medical writing instruction, educators may incorporate title analysis activities in which students examine published article titles for rhetorical and linguistic effects of paronym use. In addition, learners can engage in tasks that involve creating their own research titles using contextually appropriate paronyms, followed by peer feedback and justification of lexical choices. These exercises not only promote lexical awareness but also enhance students' understanding of audience expectations and disciplinary tone. To deepen critical engagement, instructors might assign comparative exercises where students revise overly playful or ambiguous titles into more conventional forms – or vice versa – to explore the balance between creativity and clarity. Group discussions on the potential ethical or professional implications of humorous or pun-based titles can further prompt reflection on disciplinary norms. For assessment, instructors may use rubrics evaluating clarity, appropriateness, and communicative effectiveness of pun-based or paronymic titles. Such activities can encourage critical engagement with genre conventions in medical and academic writing.

Outside the classroom, extracurricular activities such as academic writing workshops, colloquia, or language clubs can offer additional opportunities for students to explore paronyms, exchange insights, and practice their skills in a collaborative and supportive environment. Furthermore, developing additional resources such as online glossaries specifically tailored to paronyms can facilitate self-directed learning and further reinforce students' proficiency in this area. Tables 1-10 can serve as a valuable learning oppor-

tunity for language learners and writers to expand their vocabulary and deepen their understanding of word usage and context. Hence, by integrating this language aspect into both formal instruction and informal learning experiences, medical universities can empower future healthcare professionals with the linguistic competence necessary for effective communication in the medical field.

This study has several limitations. The dataset, drawn exclusively from PubMed-indexed articles, while comprehensive, may not fully represent the full spectrum of biomedical writing globally. Future studies could address this by incorporating additional databases or region-specific corpora to ensure a more diverse and representative sample. Additionally, the recognition and appreciation of paronyms and wordplay in medical titles may be influenced by cultural and linguistic background. Non-native English speakers may face greater difficulty in interpreting such titles, which could affect their comprehension or perception of the work's credibility. To mitigate this, future research might involve reader-response studies or cross-cultural surveys to better understand how different audiences interpret paronym-based titles. These steps would enhance the generalizability and applicability of the typology across broader linguistic and cultural contexts.

CONCLUSIONS

Thus, mastering the skills of creating engaging and compelling article titles is highly important for writers who aspire to publish internationally, as it is one of the factors that enhance the visibility and impact of their studies. The corpus of analyzed medical article titles demonstrated an extensive utilization of paronyms, serving as the foundation for various stylistic devices, such as paronomasia (puns), figurative language (metaphors), alliteration, antithesis, rhetorical questions, repetition, and rhyme. All these devices contribute to the dynamic tone and appealing rhythmic effect of the title structure, engage the reader's attention, evoke emotions and vivid imagery, highlight paradoxical issues, introduce ambiguity or multiple interpretations into the title, convey cultural connotations. The use of paronyms in medical article titles makes the reading more memorable, exerting an intriguing and thought-provoking impact and prompting the audience to think critically or interpret the title in different ways and to explore the article further.

Our findings have several implications for English language learners and early career writers, as they emphasize the complexity of the English language, where subtle distinctions in pronunciation and spelling can have significant implications for communication and comprehension within specialized fields. First of all, the prevalence of homophones among the identified paronymic pairs demonstrates the importance of mastering this language phenomenon and understanding the context to avoid confusion in spoken communication. Secondly, our findings highlight the importance of precise spelling in distinguishing between paronyms. For language learners, this prioritizes the need for careful attention to linguistic variations to ensure clarity and precision of their writing.

Early career writers can adopt several strategies to avoid errors when using paronyms. Firstly, it is essential to conduct thorough proofreading to detect any instances of confusion between similar-sounding or -spelled words. Secondly, consulting reliable language references or dictionaries can provide clarity on the proper usage of specific paronyms, helping writers ensure accuracy in their discourse. Additionally, seeking feedback from peers or mentors can offer valuable insights into potential ambiguities or misunderstandings in the use of paronyms, allowing writers to make necessary adjustments for clarity.

The analysis of paronyms in article titles can be effectively integrated into EAP educational settings at universities and help language learners achieve several significant outcomes. By examining how paronyms are used in article titles, EAP students and early career writers can develop a deeper understanding of the subtle distinctions between paronymic lexemes and subsequently use them correctly, recognize the rhetorical devices and employ the pragmatic strategies in academic writing, thus enhancing their language proficiency and developing critical thinking skills.

Beyond its relevance to medical writers and educators, the typology and analysis presented in this study have potential interdisciplinary value. A range of fields, including pharmacy, nursing, public health, life sciences, psychology, and veterinary medicine, all of which are well represented in PubMed-indexed literature, share similar communicative goals and stylistic conventions. Researchers in these fields may benefit from a deeper understanding of how lexical choices, including paronym-based wordplay, affect audience engagement, clarity, and rhetorical impact. Thus, by offering a structured approach to evaluating and employing paronyms in article titles, this study provides a foundation for broader applications across the domain of biomedical communication.

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CONFLICT OF INTEREST

The Authors declare no conflict of interest

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