



A Qualitative and Quantitative Analysis of Public Health Discourse in Portuguese and Chinese

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Abstract

In today's ever evolving and complex world, the development of scientific literacy has become an essential skill, enabling individuals to critically assess scientific information and make informed decisions. This is particularly evident in the growing trend of laypeople seeking online information on public health topics such as pandemics and healthy diets. By engaging with various media, these individuals help bridge the gap between experts and the general public. Linguists agree on describing the phenomenon of Languages for Special Purposes (LSP) by integrating its components into extended horizontal and vertical models. The vertical structure of medical discourse in LSP distinguishes between internal communication among professionals and external discourse aimed at a broader audience, including patients. The aim of discourse popularisation is to ensure that scientific information is accessible to the general public, which necessitates adapting the language to accommodate different levels of understanding.

Our study is a small-scale preliminary analysisthat adopts a corpus analysis approach to provide preliminary insights., Using Sketch Engine, a widely used corpus analysis tool, we compiled two small, comparable corpora in Portuguese and Chinese scientific popularisation texts, focusing on health sciences, well-being, and diet. The texts, sourced from electronic magazines published post-January 2019, were selected based on scientific content, relevance to public health, and suitability for corpus analysis. Given the limited sample, quantitative analysis focuses on identifying the presence of paraphrastic reformulation markers, while qualitative analysis explores their contextual functions, including recontextualisation, metaphor, exemplification, and naming. This comparative pre-study aims to enhance scientific literacy by identifying effective discourse strategies for popularising scientific information in Portuguese and Chinese-speaking communities.

Keywords: Public health, popularisation, comparable corpora, discourse markers

1. Introduction

Since the latter half of the 20th century, the contribution of science and technology to our way of life has increased substantially [1]. Within this context, the scientific community must enhance its engagement with the general public, especially in the field of medical research, in order to disseminate scientific knowledge to a wider audience and fulfil its social responsibility [2]. The need for effective communication is particularly evident in the area of food and nutrition, where language plays an essential role in understanding, discussing and transmitting information. The growing availability of food options, coupled with the fast pace of modern life, emphasises the importance of delivering clear guidance on healthy eating and disease prevention.

In turn, health professionals will use a range of tools or therapies to diagnose and ideally treat eating disorders, which often involves significant aspects of communication and language use. With the advancement of society and the growing availability of food choices, promoting guidelines for healthy eating is becoming increasingly important and practical for the public. For example, providing informative advice on food selection, strategies for preventing disease through sensible food choices and considerations for dietary restrictions during illness, among others. The complexity of food choices and the fast pace of modern life emphasise the importance of clear guidance on healthy eating.

This study is motivated by the need to understand and improve science communication, especially in the context of food and nutrition. By analysing and comparing popular science texts in Portuguese and



Chinese, we seek to identify effective strategies for popularising and disseminating scientific knowledge in ways that are easily understood by diverse audiences.

2. Scientific internal and external communication

Scientific discourse can be divided into two main categories: internal scientific discourse and external scientific discourse, both aimed at scientific or specialised contexts, but with different target audiences and purposes. External scientific discourse is the focus of this study, as it is intended to communicate with a wider audience, including individuals without specific expertise in the field under discussion. Unlike internal discourse, which is aimed at specialists and requires an in-depth mastery of technical knowledge, external discourse simplifies technical terms and uses more accessible language to make information comprehensible to the general public and specialists from other fields. External discourse is aimed at a wider audience, including both non-specialists and laypeople [3]. The language used is deliberately simpler and more accessible, avoiding complex technical terms. In this type of communication, scientific concepts are often simplified and presented clearly, without too many technical details, with the aim of making the content more understandable. This type of discourse is commonly found in the popular media and in popular science texts, making it easier for the general public to engage with scientific knowledge.

3. Theoretical Framework of Common Explanation Strategies

Metaphor is "one of the semantic means of establishing links between two domains of experience, meaning or knowledge is metaphor" [4]. Metaphors facilitate the communication of scientific ideas by mapping abstract or complex concepts onto more familiar and concrete domains, such as framing the role of antioxidants in healthy eating in terms of everyday experiences.

Definitions are used to explain unknown words. "Definitions in popularisations involve a far more limited use of specialised lexis [than in scientific discourse" [5]. Gotti emphasises that the most commonly used technique for providing definitions is juxtaposition, where the specialised term is immediately followed by its periphrasis, separated by a comma, dash, parenthesis, or the disjunctive conjunction "or". Another strategy of science popularisation is reformulation, which is considered a form of simplification [1]. Reformulation is a metadiscursive operation whereby the speaker reworks an utterance (or part of it) with the intention of making their discourse more intelligible, reducing any risk of misunderstanding on the part of the interlocutor [6]. There are two types of reformulations: paraphrastic (relationship of equivalence between the source utterance and the reformulated utterance) and non-paraphrastic (correction or rectification).

In popularising communication, denomination refers to the use of specific terms to categorise and simplify complex concepts. It is possible to find abbreviations related to well-known or lexicalised acronyms (e.g. *DNA, RNA*). This is because some of these labels are also familiar to non-specialist readers [7]. Commonly, denomination is introduced by phrases such as "called" (i.e., "chamado" in Portuguese or "叫做" (jiào zuò) in Chinese), which serve to define or clarify the term being discussed. The next section will analyse the occurrence and semantic features of these strategies in the collected texts.

4. Constitution of Comparable Corpora in Portuguese and Chinese

This study employs both qualitative and quantitative exploratory analysis. The texts were analysed using Sketch Engine, a corpus analysis tool used for processing and exploring large text corpora. In line with the objectives of this study, we compiled two corpora, each consisting of 10 popular science texts in Portuguese and Chinese. Both corpora focus on the Health Sciences domain, with an emphasis on wellbeing and diet. The selected texts were drawn from electronic magazines, published after June 2022. The texts were named chronologically based on their publication dates in the respective magazines.

For the Portuguese corpus, texts were selected from *Revista Saúda (RS)*. This magazine, issued by *Farmácias Portuguesas*, has been published since 2009 and is released monthly on the *Farmácias Portuguesas* website. For the Chinese corpus, we selected texts from the electronic journal *Jiankang Zhenhao* ('Health is Good'). This journal focuses on health science and technology and is sponsored by the Henan Provincial Health and Health Commission. It is hosted by the Henan Provincial Health Central Plains Service Guarantee Centre and the Henan Provincial Medical Science Popularisation





Society. Founded in 2024, it is published three times a month. Readers can access the journal's content via PC and mobile by clicking on links or scanning QR codes.

The examples discussed were translated into English for clarity and analysis. Both corpora were processed and analysed using Sketch Engine. The texts were selected according to the following inclusion criteria: scientific content, relevance to public health and suitability for corpus analysis.

After reviewing the titles of the potential texts, we found it necessary to ensure that the chosen texts align with our study's focus—specifically, those addressing healthy diets and suitable for corpus analysis. The selected texts in both Chinese and Portuguese were numbered and stored in Sketch Engine. The analysis of the selected texts in both languages involved both quantitative and qualitative approaches:

- In the quantitative analysis, we will explore different types of explanations and determine their overall frequency.
- In the qualitative analysis, we will examine the function of the different explanation types.

5. Analysis of the Comparable Corpora

Our analysis of the comparable corpora involves keywords analysis, concordance analysis, and analysis of explanation types, focusing on denomination, definition, metaphor, and reformulation [8]. In a first step, we used Sketch Engine's Keyword extraction tool to identify significant keywords. Due to space limitations, we will only present keywords with a threshold of 10 minimum occurrences. The table below presents the most frequent keywords in the Portuguese corpus:

Keywords	Frequency	Keywords	Frequency		
Alimentos	23	Gordura	18		
Massa	17	Intestinal	11		

Table 1. Filtered the most frequent keywords in PT corpus

High-frequency keywords such as *alimentos* (food), *gordura* (fat), and *massa* (pasta), appeared in multiple texts within the Portuguese corpus, highlighting an emphasis on dietary choices and health promotion, particularly regarding food and dietary fats. This suggests that the corpus is committed to providing easy-to-understand, science-based advice to help individuals make healthier lifestyle and dietary decisions.

Keywords	Frequen	Keywords	Freque
	су		ncy
叶酸yè suān) (folic acid)	35		
山药(shān yào) (yam)	28	健康 jiàn kāng) (health)	27
胆囊 (gall bladder)	24	乳糖rǔ táng) (lactose), 药yào) (medicine)	23
结石(jié shí) (concretion)	22	喝(hē) (drink)	20
酒jiǔ) (wine)	17	阂(tàng) (heat up)	16
野菜yě cài) (wild herb)	14	牙齿(yá chǐ) (teeth), 食用(shí yòng) (eat)	13
肿瘤zhǒng liú) (tumor), 茶chá) (tea), 冑(wèi) (stomach)	11	啧(wèi yǎng) (feed), Hcy	10

Table 2. Most frequent keywords in CH corpus

The analysis of the Chinese corpus reveals varying keyword frequencies, with certain texts highlighting specific health-related topics. Keywords like "*叶酸* (folic acid), "健康 (health), and "药 (medicine) appear frequently, reflecting a focus on nutrition and emphasising particular medical conditions.

In a next step, we conducted a concordance analysis of common keywords in both corpora.



va-se que o intestino era apenas um tubo por onde passavam os alimentos não aproveita- dos pelo organismo. Hoje, a ciência já compro- v vas ao organismo ; • Energética , obtida a partir da digestão dos alimentos ; • Melhorar a absorção de minerais , como o magnésio , o cálcic s tempos de vida (amamentação , leite artificial , introdução de alimentos só lidos) ; • Medicação (em particular os antibióticos) ; • Hábi antibióticos); • Hábitos alimentares e método de confeção dos alimentos; • Ambiente e estilo de vida (exercício físico, habitação em zor o em zona rural ou urbana); • Alterações do peso corporal. Os alimentos têm um papel muito importante nessa equação. Aquilo que com 2n- ças inflamatórias intestinais. Já os prebióticos , probióticos e alimentos fermentados têm sido estudados como formas de manter a micr 10 formas de manter a micro- biota saudável. Os probióticos são alimentos que contêm microrganismos vivos : iogurtes eoutros alimentos f) alimentos que contêm microrganismos vivos : iogurtes eoutros alimentos fermentados. Também podemProbióticos , prebióticos e aliment de folha verde e legumes , frutos e oleaginosas , entre outros .Os alimentos fermentados resultam da trans-formação dos alimentos por mic tros .Os alimentos fermentados resultam da trans-formação dos alimentos por microrganismosvivos , como bactérias e leveduras . Além do 🤇 smosvivos , como bactérias e leveduras . Além doiogurte , outros alimentos fermentados incluemo kefir , pickles , o kombucha e o kimchi (c vortante ter uma dieta equilibrada , devendo incluir os seguintes alimentos : • Alimentos ricos em prote ínas , como carnes brancas ou carn 🤇 nelhas sem gordura , ovos , queijos e iogurtes magros . Estes são alimentos bastante saciantes . Para ganhar massa muscular , todas as refei ais , como quinoa , aveia , pão integral , arroz e massa . Estes são alimentos ricos em hidratos de carbono que funcionam como fonte de ene 🗌 uminosas, como grão-de-bico, feijão, lenti- lha, ervilha e soja, alimentos ricos em prote ína, hidratos de carbono e fibras, além de vitami. salmão, noz, e amêndoa, chia, linhaça, abacate e azeite. Estes alimentos ajudam a reduzir a inflamação do corpo; Igualmente importante ista de Medicina Geral e FamiliarNUTRIR 0 CORPOSaiba quais os alimentos mais adequados para suprir necessidades.s vitaminas e os mine er, os nutrientes podem ficar em défice no corpo. Saiba quais os alimentos com as principais vitaminas e os minerais que fazemfalta : 1. Vite espinafres em frutas como kiwi , morango e uvas , e também em alimentos de origem animal . No que toca aos minerais , conheça alguns de cardiovasculares e na elasticidadeda pele ; 3.Ferro. Presente em alimentos como carne , legumes , frutos secos e grãos integrais . O ferro é e

Fig. 1. Collocate condition of alimentos in PT corpus

In analysing the word *alimentos* (food) in the index lines, we observe that it is consistently associated with a range of behaviors, descriptions, and contexts related to health, diet, and nutrition. Verbs frequently co-occurring with the search word *alimentos* such as *ajudar* (help), *reduzir* (reduce), and *melhorar* (improve) often frame food in a positive perspective, emphasising its role in antiinflammatory processes or the immune system. This reflects the militant metaphors commonly found in cancer discourse, in which doctors and patients are depicted as fighting cancer (battling the cancer), but in this case, food is a tool or weapon to maintain health or fight the disease.

This dual framing of food as protector (帮助(help), 减少(reduce), etc.) and threat (障碍(obstáculo), 挑战(desafio), etc.) is consistent with the metaphorical usage of health-related language, where *alimentos* can act as both an ally in one's journey to health and an obstacle that needs to be overcome. Discussions around food also share this metaphorical battle with illness, in the same way that cancer is portrayed as an enemy that must be fought through medical intervention.

Additionally, the high frequency of the term 健康(which can mean both 'health' and 'healthy') in Chinese corpus underscores its central role in the corpus, highlighting its importance in lifestyle, diet, and personal well-being. The frequent co-occurrence of 健康 ('health') with terms related to diet, lifestyle, and prevention in the Chinese corpus illustrates how health is connected to proactive actions and behaviors, consistently positioning it as the ultimate goal of the recommendations.

6. Analysis of Most Common Explanation Strategies

The analysis of both corpora revealed a total of 11 metaphors, 6 definitions, 5 reformulations, and 3 denominations. As presented in the table, the example that does not appear in the table will be discussed in the analysis section.

Strategy	Metaphor	Definition	Reformulation	Denomination
PT corpus frequency	4	2	3	2
CH corpus frequency	7	4	2	1

Table 3. Quantitative analysis of explanation strategies

Next, we will analyze these strategies with supporting examples, beginning with a selection of metaphors:





PT1- Quando se restringe muito o valor energético ou nutrientes específicos, nomeadamente os hidratos de carbono (HC), encarados pelos defensores das dietas Low Carb como **os maiores vilões** contra a perda de peso, a consequência é induzir carências no organismo. (Translation: When energy intake or specific nutrients, particularly carbohydrates (HC), are severely restricted—viewed by proponents of Low Carb diets as **the biggest villains** in weight loss—the consequence is inducing deficiencies in the body.)

The term "vilões" (villains) is used metaphorically, placing carbohydrates in a negative, combative role. This metaphor elicits an emotional response, making the concept more accessible to the audience. Carbohydrates are anthropomorphised as adversaries to weight loss, This framing positions carbohydrates as obstacles to be overcome in the pursuit of health goals, *针对很多人喜欢的甜食和碳*

酸饮料等富含糖类的食物,如糖果、蛋糕、巧克力、冰淇淋......这些好看又甜的食物对于牙齿来说都是

糖衣炮弹(táng yī pào dàn),如果经常摄入过多的含糖甜食或饮用过多的碳酸饮料,它们很容易黏附在

牙面上,口腔中的细菌吃了糖以后,会大量繁殖并利用糖分产酸, 使牙齿受到侵蚀,极大地破坏了我们

牙齿正常的结构,引起龋病或产生牙齿敏感。

(Translation: For many people, sweets, carbonated drinks, and other foods rich in sugar, such as candy, cake, chocolate, ice cream these good-looking and sweet food for the teeth are **sugar-coated bombs**, if you often consume too much sugary sweets or drink too much carbonated beverages, they are very easy to adhere to the tooth surface, the bacteria in the mouth eat sugar will multiply and use the sugar to produce acid, causing tooth erosion, causing caries or tooth sensitivity.)

This metaphor simplifies the biochemical processes underlying dental health and makes it more accessible to a wider audience. Instead of explaining the biochemical process by which sugar breaks down into tooth-damaging acids, the metaphor provides a visual and emotional shorthand that emphasises the risks of overconsumption.

The purpose of a definition is to clearly establish the meaning of a concept, providing precision and clarity. An example of this can be seen in the definition of probiotics:

PT3- **Os probióticos são alimentos** que contêm microrganismos vivos: iogurtes e outros alimentos fermentados.

(Translation: **Probiotics are foods** that contain live microorganisms: yogurts and other fermented foods.)

This definition is followed by examples, such as yoghurt and other fermented foods, helping to root the concept in familiar, everyday items. The simplicity of the explanation helps the average viewer understand a potentially complex scientific term. The sentence also provides both an implied analogy, such as "*yogurts and other fermented foods*", which makes the technical concept easier to understand by linking it to common foods.

CH7- *間柿石症是人在空腹时一次性大量食入柿子后(这里的柿子是指做柿饼的那种柿子,而不是西红柿),由于柿子中的鞣质与胃酸作用,形成不溶于水、不能够被消化的块状物,即胃柿结石。*

(Translation: **Gastric persimmon stone disease is** when a person eats a large amount of persimmons at one time on an empty stomach (the persimmons here refer to the kind of persimmons used to make dried persimmon cakes, not tomatoes). Due to the reaction of the tannins in the persimmons with gastric acid, water-insoluble, indigestible lumps are formed.)

This example provides a step-by-step breakdown of gastric persimmon stone disease. Firstly, it explains the cause of the disease: eating large quantities of persimmons on an empty stomach. It clarifies that persimmons are the kind used to make persimmon cakes, not tomatos, to avoid confusion. Then it explains the scientific process: the tannins in persimmons react with stomach acid to form indigestible lumps. This clear explanation of the chemical reaction helps to make the concept more accessible.

Reformulation involves rephrasing an idea, enhancing its comprehensibility or refocusing it:

PT5- A perda de massa gorda ocorre quando há um balanço energético negativo diário e continuado. **Ou seja**, quando ingerimos menos calorias do que as que gastamos diariamente.

(Translation: Fat loss occurs when there is a continuous daily negative energy balance. **In other words**, when we consume fewer calories than we burn each day.)

Ou seja serves as a reformulation marker. In this case, the first sentence introduces the concept of fat loss in technical terms (continuous daily negative energy balance). The second sentence, beginning with *ou seja*, provides a more straightforward explanation: fewer calories consumed than burned.





CH5- 针对幼龄的宝宝,每天最大的任务就是吃好睡好,但是对于他们来说,更多的是给什么吃什么,作 为掌握他们饮食的是我们的家长,**也就是说(yě jiù shì shuō)**我们家长的喂养习惯对小宝宝的第一副牙 齿即(jí)乳牙发育的好坏起了决定性作用。

(Translation: For young babies, the biggest task every day is to eat well and sleep well, but for them, it is more about what they are given to eat. As the ones who control their diet, it is our parents, **that is to say**, our parents' feeding habits play a decisive role in the development of the baby's first set of teeth, **that is**, the deciduous teeth.)

Both *that is to say* and *that is* function as reformulation markers. The first elaborates on this point by linking "dietary control" to 'feeding habits", thus clarifying which aspects of parental control are important. The second functions as a reformulation marker that clarifies the general term "the baby's first set of teeth" by specifying its technical term, "deciduous teeth."

These reformulation markers help guide the reader through complex ideas by breaking them down into simpler or more familiar terms. They can also emphasise key details by rephrasing them, ensuring that the reader grasps the most important points.

Denominations focus on naming concepts or entities:

PT1- Pelo contrário, criam alterações metabólicas no organismo que boicotam o sucesso e **levam ao** chamado círculo vicioso das dietas restritivas.

(Translation: On the contrary, they create metabolic changes in the body that sabotage success and **lead to the so-called** vicious cycle of restrictive diets.)

CH7-胃柿石长期停留于胃中, 会刺激胃黏膜, 引起炎症、糜烂、溃疡, 并引起胃功能紊乱, 这种病症, 就叫做(jiào zuò)胃柿石症。

(Translation: If gastric persimmon stones stay in the stomach for a long time, they will irritate the gastric mucosa, causing inflammation, erosion, ulcers, and cause gastric dysfunction. This disease is **called** gastric persimmon stone disease.)

Both denominations have introduced terms that encompass complex concepts or situations. In PT1- it is the "vicious circle" of dieting, while in CH7 it is the medical condition associated with gastric complications. This avoids lengthy descriptions and ensures that the reader can quickly grasp the meaning behind the concepts.

In this section, we analysed the frequency and type of different explanation strategies in Portuguese and Chinese corpora. While these findings are based on a small-scale study, they suggest that explanation strategies play an important role in science communication, especially in promoting public understanding of health-related topics.

Firstly, the findings show that metaphors are used significantly more frequently in the Chinese corpus than in the Portuguese corpus. This suggests that metaphors may be a valuable tool in Chinese health communication for illustrating complex concepts, as they can engage the audience and improve comprehension. This finding is consistent with previous studies and emphasises the potential value of metaphors in scientific communication. In contrast, the comparatively higher frequency of definitions and restatements in the Portuguese corpus could indicate a tendency toward clear, direct information in Portuguese health communication.

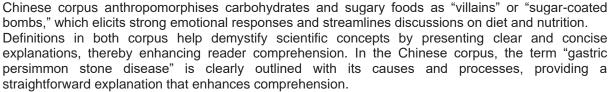
Second, these explanatory strategies are important for improving scientific literacy. Effective communication strategies can help the public better understand health information, especially during public health crises, where scientific literacy is crucial. By using strategies such as metaphors, communicators can translate complex scientific knowledge into accessible language, facilitating the dissemination and understanding of scientific knowledge among the general public.

7. Conclusions

This preliminary study explores the role of external scientific discourse in making scientific knowledge more accessible to diverse audiences. By analysing a limited sample of popular science texts in Portuguese and Chinese, we identified several effective linguistic strategies—metaphors, definitions, reformulation, and denominations—that enhance the clarity and relatability of scientific information.

According to the corpus analysis, we found that metaphors play a significant role in simplifying complex topics, evoking emotional responses, and making the content relatable. For example, the Portuguese corpus frames carbohydrates as both protectors and threats to health. Similarly, the





Reformulation markers in both Portuguese and Chinese texts, such as "ou seja" / "huàn jù huà shuō" and "isto é" / "yě jiù shì shuō," perform similar functions. "Ou seja" / "huàn jù huà shuō" is primarily used to rephrase a point, summarise preceding text, or emphasise crucial information, thereby reducing ambiguity. This method enhances clarity and facilitates reader comprehension and retention, sharpening focus and improving expressive effectiveness. Conversely, "isto é" / "yě jiù shì shuō" mainly functions to clarify, explain, provide additional illustrations, or summarise previous points. By employing these analytical reformulation markers, authors communicate more directly and concisely with readers, ensuring clearer understanding of complex or abstract concepts.

Denominations also assign specific names to complex concepts, simplifying and summarising phenomena, such as the "vicious cycle" of dieting or medical conditions like "gastric phytobezoar."

In addition, the results of this study provide insights into the practical application of public health communication. Health communicators can draw on these effective strategies to create more engaging and accessible content that enhances public acceptance and comprehension of health messages. For example, strategies such as metaphors and rephrasing can be used more frequently when developing health education materials to increase the comprehensibility and impact of the message.

While identifying these effective language strategies is an important step in promoting scientific literacy, it is also critical to apply these findings to further scientific literacy development. By translating research findings into practical communication strategies, educators, policymakers, and health communicators will be able to more effectively communicate with the public to help them understand scientific information and make more informed health decisions in their daily lives.

Overall, our analysis demonstrates how explanation strategies can promote clarity and accessibility of scientific discourse in popular science texts in Portuguese and Chinese. These strategies not only simplified the transfer of knowledge, but also ensured content coherence and emotionally engaged readers, making complex health and nutrition concepts more accessible to readers from different linguistic and cultural backgrounds. However, there are some limitations to this study, such as the fact that the analyses focused mainly on specific text types and health topics. Future research could explore interpretive strategies in other languages or domains or examine the effects of different media forms on the effectiveness of these strategies.

In conclusion, this study highlights the importance of adapting communication styles to the needs of different audiences in science communication. By deepening our understanding of the role of language in health communication, we will not only be able to better promote scientific literacy, but also provide valuable references for future communication strategies.

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