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Discourse-motivated variation in metaphor use in Spanish: The case of SPACE metaphors in popularised scientific discourse on breast cancer

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Metaphor has been shown to display a great degree of variation in terms of types, functions and characteristics depending on contextual and discursive factors. This paper carries out a corpus-based comparison of SPACE metaphors in specialised communication and popular science texts on breast cancer in Spanish. The aim is to explore the interaction of contextual and metaphor-inherent factors in bringing about variations in metaphor use. Results point to a complex interaction of both factors, with specific source and target domains proving especially productive in each type of discourse. In particular, popular science texts display a greater variety of metaphorical expressions built around the target-domain lemma célula [cell], which help visualise the disease at the microscopic level by representing cells as humans or animals endowed with intentionality and agency. In specialised discourse, the medically relevant target domains of TREATMENT and PATIENT prove more productive, leading to terminological metaphors that characterise the disease based on its location/extension.

Keywords: Corpus-Based Metaphor Studies; Metaphor in Cancer Discourse; Popular Science Discourse; SPACE Metaphors; Spanish

1. Introduction

Metaphor has been shown to display a great degree of variation in terms of types, functions and characteristics depending on contextual and discursive factors (e.g., Deignan et al., 2013; Kövecses, 2009; Semino, 2008, 2011). In scientific texts in English, variation in metaphor use has been linked to the identity and role of participants, with significant differences observed between expert-to-expert communication and popular science (e.g., Skorczynska & Deignan, 2006). In the latter, the specific cognitive needs and interests of lay audiences have been associated—among other things—with a greater number and variety of metaphors (e.g., Knudsen, 2003), simplification of the target domain, and revitalisation of terminological and theory-constitutive metaphors (Deignan et al., 2013) to create extended, more explicit and creative metaphorical expressions. Furthermore, as a linguistic phenomenon, metaphors have been shown to carry evaluations, which can in turn shape perceptions of the concepts expressed, an aspect which is especially relevant

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in the case of science communication and popularisation in the media, as has been shown with the impact of WAR metaphors in discourse about COVID-19 (e.g., Garzone, 2021; Semino, 2021).

While discourse-motivated metaphorical variation has received considerable attention for the English language, the topic lacks systematic accounts for Spanish. The only exceptions are (to the best of our knowledge) the contrastive analyses in Williams Camus (2015, 2016) and the study on WAR metaphors in breast cancer discourse in Pontrandolfo and Piccioni (2022).

This article builds on the methodology of this latter study to draw a corpus-based comparison of metaphorical uses in specialised vs. popularised communication in Spanish. The aim is to provide both a quantitative and qualitative characterisation of metaphorical language in popularised discourse, by identifying the features that differentiate it from expert-to-expert communication.

In what follows, a brief introduction is offered on the existing literature on the role and characteristics of metaphor in science (§2), with special focus on studies that have explored discourse-motivated variation in metaphor use in popular science (§2.1) and in discourse on cancer (§2.2). Section 3 is devoted to a corpus-based comparison of SPACE metaphors in specialised and popular science discourse on breast cancer in Spanish: after illustrating the corpora and the methodology used for the comparison (§3.1), §3.2 offers quantitative insights into the frequency and variety of metaphorical expressions in both types of discourse. The qualitative analysis that follows illustrates shared characteristics of specialised and popularised discourse in terms of uses and functions of metaphors (§3.3), before moving on to illustrate the specific traits of metaphor in specialised (§3.3) and popularised discourse (§3.4) respectively. The conclusions reflect on the factors triggering variation in metaphor use and their implications for the characterisation of both metaphor and popularised discourse.

2. Background: Metaphor in science

Although metaphor has traditionally been associated with literary language and its texts, in recent decades its role in specialised communication has received a considerable amount of attention, especially with regards to its role in medical and scientific communication. Following the precepts of Conceptual Metaphor Theory (CMT) (Lakoff & Johnson, 1980), the definition of metaphor as a "figure of thought" has allowed its characterisation as a cognitive instrument of great importance in the development and communication of scientific theories. As conceptual constructs, metaphors have been shown to promote the understanding of "difficult, complex, abstract, or less delineated concepts [. . .] in terms of familiar ideas" (Gibbs, 1994, p. 6), by mapping

abstract and indeterminate target domains onto more concrete and physically perceptible source domains (Kövecses, 2002; Lakoff & Johnson, 1980). The mapping contributes to giving concrete structure to complex abstract domains, making them cognitively accessible and, thus, more easily comprehensible.

Metaphors used in science or scientific discourse have been associated with three main functions, corresponding to different types of metaphors. The first type corresponds to *theory-constitutive* (Boyd, 1993) or *modelling* (Henderson, 2000) metaphors, that play a role in the conceptualisation of new theories, especially during their development and definition. One such case is provided by the gate control theory developed by Ronald Melzack and Patrick Wall in 1965 to explain pain perception (cf. Deignan et al., 2013). In the conceptualisation they elaborate, the gate metaphor explains the complex neurological mechanisms that regulate how we perceive pain (by allowing the pain *in* or *shutting it out*) in terms of the everyday experience that we all have of opening and closing doors. In this way, the metaphor promotes a new conceptualisation of the target domain of PAIN by mapping it onto a simple, concrete and familiar source domain, thus contributing to the development of a new model or theory (Semino, 2008).

The second type refers to *pedagogic* (or *exegetical*) (Boyd, 1993) metaphors, which provide a metaphorical representation of concepts which are already known within existing theories or hypotheses (Knudsen, 2003), one example being when we speak of cells as if they were buildings with doors and locks (e.g., "insulin [. . .] unlocks the cells of the body, allowing glucose to enter and fuel them").

Theory-constitutive and pedagogic metaphors correspond to creative or innovative uses that arise from the speaker's conscious effort to understand and be understood. In comparison with these, a third type of metaphor, called *terminological* metaphors (Henderson, 2000; Skorczynska & Deignan, 2006), identifies uses that are accepted and shared within and outside the scientific community. Once their use becomes widespread and is no longer perceived as metaphorical, they become conventionalised, dead metaphors and their meaning is assumed as one of the literal senses of the word(s) in question: *genetic code*, *blood vessels*, *DNA transcription and translation* are all examples of terminological metaphors.

A final aspect of conceptual metaphor that proves relevant for the description of medical and scientific discourse is its ability to highlight and/or hide specific features of the target domain depending on the source domain selected for the mapping (Knowles & Moon, 2006). Research in this field has focused—among other things—on the potential benefits and/or drawbacks of the use of different metaphors to talk about a given disease. One point in case is the widespread use of WAR metaphors in cancer discourse (e.g., Demmen et al.,

2015; Semino et al., 2018), COVID-19 communication (Garzone, 2021; Semino, 2021) and personal narratives on obesity patient forums (Padley, 2022), where the conceptualisation of the disease as a battle highlights the violent, competitive aspects of the experience, with the possibility of producing both motivating and discouraging effects, potentially generating a sense of guilt and defeat when the "battle cannot be won." On a practical level, these studies reveal how the ideological power of metaphor (Lakoff, 1996) can be used in medical/scientific discourse to change the perceptions, attitudes and emotions that the public associates with a given phenomenon, becoming a useful instrument of patient empowerment.

2.1. Discourse-motivated variation in metaphor use: The case of metaphor in popular science

The conceptual nature of metaphor does not make it exempt from discourse-motivated variation, as has been shown in a number of studies that analyse metaphor use in different genres and registers in English (e.g., Deignan et al., 2013; Semino, 2008).

An important axis of variation is observed in the comparison of expert-to-expert communication and popular science discourse. Popularised discourse is considered to be the result of a process of re-contextualisation of expert knowledge, whose discursive features are determined, among other things, by the necessity to meet the (social, cognitive, communicative) needs of lay audiences, as well as by the restrictions of the medium where communication happens (cf. Bondi, 2015; Garzone, 2020; Gotti, 2014; Myers, 2003; Pontrandolfo & Piccioni, 2022). As such, science popularisation constitutes an ideal testing bed for analysing discourse-motivated variation in metaphor use as it provides insights into how metaphor is used as an explanation mechanism that allows lay audiences to relate new, complex knowledge to old, familiar concepts (cf. Anesa & Fage-Butler, 2015; Calsamiglia & Van Dijk, 2004).

Previous characterisations of metaphor use in popularised genres (cf. Beger & Smith, 2020) highlight significant differences in the frequency, variety and function of these metaphors when compared to those found in expert-to-expert communication. For the English language the main findings can be summed up as follows:

1) Popularised discourse uses a higher number of metaphors than specialised communication (Knudsen, 2003; Semino, 2011);
2) Popularised discourse uses a greater variety of source domains (Williams Camus, 2009) and of metaphorical linguistic expressions, while expert-to-expert communication tends to repeat more

frequently a smaller set of stereotyped metaphorical expressions (Skorczynska & Deignan, 2006);

3) Popularised discourse relies more on pedagogic metaphors, while specialised discourse is associated with a higher number of theory-constitutive metaphors (Skorczynska & Deignan, 2006);

4) In popularised discourse, terminological (dead) metaphors are revitalised (Knudsen, 2003) and 'opened up' (Deignan et al., 2013; Semino, 2008, 2011) in order to fulfil a pedagogic function (Nerlich et al., 2002). The evidence provided by these studies indicates that metaphors can emerge as theory-constitutive metaphors in specialised communication, where they contribute to the development of new theories, and are later adopted in popularised communication for pedagogic purposes.

5) In popularised discourse, metaphor also plays a textual function (contributing to text cohesion) and communicative functions, especially with persuasive goals (cf. Williams Camus, 2009 on cancer metaphors and Deignan et al., 2013 on climate change discourse).

For the Spanish language, Pontrandolfo and Piccioni (2022) drew a corpus-based comparison of WAR metaphors in specialised communication and in popularised press articles on breast cancer. It showed that popularised discourse is associated with a higher incidence and greater variety of metaphorical expressions, as well as with the use of creative expressions, including personifications and extended metaphors, mainly with pedagogic and expressive functions. Specialised communication displayed a higher frequency of terminological metaphors and promoted an exploration of the WAR domain beyond the violence metaphors observed in the popularised corpus, placing greater emphasis on concepts related to *vigilance*, *control* of the disease and (therapeutic) *alliances*. Overall, the findings confirmed a functional specialisation of metaphor in popularised discourse that responded to the needs and interests of lay audiences.

This paper draws on this latter study to verify if the results obtained for WAR metaphors hold true also for spatial metaphors, and whether discursive variation affects different conceptual metaphors in the same way.

2.2. Metaphor and cancer

The role of metaphor in cancer communication has been given extensive consideration within the fields of psychology (e.g., González Gutiérrez et al., 2006; Hauser & Schwartz, 2014) and health sciences (e.g., Southall, 2012;

Vargas Mondaca, 2020). In linguistics, the literature (in English and, to a lesser extent, in Spanish) has tended to focus on the following aspects:

- Identification of the main (conceptual) metaphors used to talk about cancer (e.g., Alcíbar, 2000; Gallardo, 2012; Magaña, 2020; Magaña & Matlock, 2018; Navarro, 2016; Semino et al., 2018; Williams Camus, 2009, 2010, 2015, 2016);
- Variation in metaphor use according to communicative factors (e.g., Deignan et al., 2013; Demmen et al., 2015; Navarro, 2016; Semino et al., 2018);
- (Ideological) role of metaphor in the representation and perception of the illness (Demjén & Semino, 2017).

The first aspect is probably the most studied and has highlighted the ubiquity of the WAR metaphor (CANCER IS WAR)[1] and its extensions (e.g., TREATMENTS ARE WEAPONS, PATIENTS/CELLS/DOCTORS/NURSES ARE SOLDIERS, etc.). The second most commonly used metaphor is generally the JOURNEY metaphor, although a number of less frequent and more creative uses are also mentioned, which promote less common conceptualisations of the disease (e.g., CANCER IS A RIDDLE, THE BODY IS A BUILDING/MACHINE, PHYSIOLOGICAL MECHANISMS ARE COMMUNICATION, etc.).

This paper focuses on SPACE metaphors and compares them with findings on variation in the use of WAR metaphors in Pontrandolfo and Piccioni (2022), in order to explore the interaction of contextual factors and metaphor-inherent mechanisms (e.g., the choice of specific source/target domains) in bringing about variation in metaphor use.

3. SPACE metaphors in popular science discourse on breast cancer in Spanish: Aims and hypothesis

This section presents the results of a corpus-based study that compares the use of SPACE metaphors in specialised communication and in popularised discourse on breast cancer.

The focus will be on metaphorical expressions based on a source domain associated with location (in the body) and movement (through the body), including expressions indicating progression of the disease through the conceptual metaphor THE BODY IS A SPACE and its extension DISEASE PROGRESSION IS MOVEMENT THROUGH SPACE.

Based on findings in Pontrandolfo and Piccioni (2022), the following hypotheses are put forward:

1) Popularised discourse uses a higher number of metaphors and greater variety of metaphorical expressions than specialised discourse;
2) Metaphors in popularised discourse present a functional specialisation to respond to the needs of lay audiences.

3.1. Corpus and method

The analysis compares metaphorical expressions in two subcorpora of the WebLesp corpus (*Corpus de comunicación digital especializada en español*, (Piccioni & Pontrandolfo, 2021)), a Spanish corpus covering four domains of knowledge (medicine, economics, environmental science, law), where each domain consists of two subcorpora, corresponding to specialised expert-to-expert communication and, respectively, popularised discourse. The corpus is available—along with other corpora—for free consultation on a Nosketch Engine platform (Rychlý, 2007) on the portal *Corpora e comunicazione specializzata @ Unich*.[2]

The subcorpora used for this study are MED_DIV (popularised communication) and MED_ESP (specialised communication), both comprising texts focusing on the topic of breast cancer (see Table 1 for further details on corpus makeup).

Table 1
Genres and Size of MED_DIV and MED_ESP Corpora

Corpus	Genre	Size
MED_DIV	general press	745,976 tokens
	websites	143,106 tokens
	popular science magazines	19,771 tokens
		TOT. 908,853 tokens
MED_ESP	research papers	373,351 tokens
	abstracts	197,572 tokens
	clinical guidelines	145,777 tokens
	PhD dissertations	161,693 tokens
	expert-to-expert blogs	47,067 tokens
		TOT. 925,460 tokens

Metaphorical expressions were identified by combining a number of corpus-based procedures for metaphor analysis (cf. Semino, 2017), as follows:

1) Selection of target domain lemmas: a number of high-frequency lemmas associated with the target domain of CANCER were identified

among the 100 most frequent lemmas in both MED_DIV and MED_ESP. A total of 11 lemmas were selected and grouped into the following semantic categories: DISEASE (*cáncer* [cancer], *enfermedad* [disease], *tumor* [tumour]), TREATMENT (*tratamiento* [treatment], *quimioterapia* [chemotherapy], *terapia* [therapy]), PATIENT (*mujer* [woman], *paciente* [patient], *persona* [person]). The lemmas *célula* [cell] and *diagnóstico* [diagnosis] were not included in any particular semantic category and are analysed separately.

2) Identification and selection of metaphor candidates: these are identified from the list of collocates of each target-domain lemma selected in Step 1 above in MED_DIV and MED_ESP. Collocation extraction considered a 5-word span of the node lemma, using MI as statistic measure and a frequency cut-off of 5. Examination of collocates lists allowed the selection of metaphor candidates using the Metaphor Identification Procedure proposed by the Pragglejaz group (Pragglejaz Group, 2007; Steen, 2007; Steen et al., 2010). According to this procedure, a lexical unit can be considered metaphorical if it is used with a meaning that contrasts with a more "basic" existing meaning of the same word. Based on the criteria set out within the CMT (cf. §2), a meaning is "more basic" if it is related to bodily activity or if it is more concrete (because it evokes concepts that are easier to imagine, see, hear, smell, taste, etc.), more precise and historically antecedent to another meaning (Pragglejaz Group, 2007). An example is provided by the noun *lecho* [bed], which in our corpora is used to indicate tumour location (e.g., *lecho del tumor*, *lecho tumoral* [tumour bed]), a usage which contrasts with an earlier, more "basic," concrete and precise meaning, corresponding to "a large, rectangular piece of furniture, often with four legs, used for sleeping on" (Cambridge Dictionary). Using these criteria, lexical items used in an abstract and general sense were classified as metaphorical when they have an earlier, more basic and concrete meaning (e.g., *abordaje de la enfermedad* vs. *abordaje de un barco* [boarding/tackling a disease vs. boarding a ship]). Violation of a semantic solidarity was also considered indicative of metaphorical use, as in the case of personifications (e.g., *reclutar células* [to recruit cells vs. soldiers/human beings]). By way of illustration, the lemma *migración* [migration] as a collocate of the lemma *célula* [cell] was considered a metaphor candidate, giving rise to uses such as *la migración de células de cáncer de mama* [the migration of breast cancer cells]. The metaphoricity of ambiguous collocates was verified through concordance analysis.

3) Source domain identification: metaphor candidates were grouped into semantic classes, corresponding to the source domains of the underlying metaphors. The source domains identified include (among others): WAR; SPACE; LIVING ORGANISM (e.g., "una proteína que mantiene *dormidas* las células metastásicas del cáncer" [a protein that keeps cancer metastatic cells *asleep*], MED_DIV); COMMUNICATION (e.g., "un tumor mamario puede mandar señales que impidan la metástasis en otras zonas" [a breast tumour can send signals that inhibit metastases in other areas], MED_DIV); FAMILY (e.g., "En los tumores hay unas células madre cancerígenas" [tumours host mother cancerous cells], MED_DIV), etc. (see Pontrandolfo & Piccioni, 2022 for the complete list of source domains identified).

As mentioned, this study focuses on metaphorical expressions based on the source domain SPACE for each of the target domains reported above. In order to maximise the number of metaphor candidates considered, metaphorical collocates include a great variety of lemmas related with the concept of SPACE, including nouns indicating space or place (e.g., *ambiente* [environment], *borde* [edge], *mapa* [map]), verbs of movement and their nominalisations (e.g., *viajar* [travel], *contracción* [contraction], *propagación* [propagation]), adjectives indicating movement or position (e.g., *circulante* [circulating], *circundante* [surrounding], *cercano* [close]), words related to the concept of JOURNEY or itinerary (e.g., *etapa* [stop/leg of a journey], *viaje* [journey], *vía* [way]), space prepositions (e.g., *a través de* [through], etc.). It should be noted that the method used to trace metaphorical expressions only identifies explicit metaphors, in which both target and source domains are verbally expressed. Implicit metaphors in which only the source domain is verbally expressed are therefore excluded from analysis (e.g., "[. . .] *mientras que no sea así vamos a seguir como el Quijote, luchando y buscándola y vamos a tener presente a todas las que ya no están"* [as long as this is not the case, we will go on like Don Quixote, fighting and searching for it, and we will keep in mind all those who are no longer here], WebLesp).

3.2. Frequency and variety of SPACE metaphors in MED_DIV and MED_ESP

Table 2 shows the absolute and normalised frequencies of metaphors using the source domain SPACE in MED_DIV and MED_ESP in combination with each of the target domains considered. The data show that spatial metaphors have a similar incidence in the two corpora, with no significant differences for any of the target domains. The marginally higher frequency of metaphors in relation to the target domain PATIENT in MED_ESP can be explained by the higher frequency of lemmas associated with this conceptual domain in the specialised corpus.

Table 2
Absolute and Normalised Frequencies of Metaphors Using the Source Domain SPACE in MED_DIV and MED_ESP in Combination with the Target Domains Considered

Target domains	MED_DIV		MED_ESP	
	f	*fx*10,000	*f*	*fx*10,000
ENFERMEDAD [DISEASE]	1004	11.32	975	10.54
Célula [cell]	233	2.63	152	1.64
Diagnóstico [diagnosis]	--	--	--	--
TRATAMIENTO [TREATMENT]	229	2.58	207	2.24
PACIENTE [PATIENT]	136	1.53	165	1.78
	1602	--	1499	--

The equal distribution of spatial metaphors in MED_DIV and MED_ESP seems to be a property characteristic of the SPACE source domain, which is in stark contrast with frequencies observed in Pontrandolfo and Piccioni (2022) for the source domain WAR, which was 3 times more frequent in the popularised corpus than in the specialised one (Table 3).

Table 3
WAR and SPACE Metaphors in MED_DIV and MED_ESP

SOURCE DOMAIN	MED_DIV		MED_ESP	
	f	*fx*10,000	*f*	*fx*10,000
WAR	3948	43.44	1298	14.03
SPACE	1602	17.63	1499	16.2

Further differences between the WAR and SPACE domains regard the variety of metaphorical expressions each gives rise to. Table 4 shows the number of different metaphorical lemmas belonging to the WAR and SPACE source domains in MED_DIV and MED_ESP. This figure is considered indicative of the variety of metaphorical lexical items associated with each source domain. As shown in the Table, the WAR metaphor is expressed by a consistently greater variety of lemmas in MED_DIV than in MED_ESP across all target domains; this means that popularised texts express the WAR metaphor not only more frequently, but also through many different metaphorical lexical items that allow greater exploration of the source domain regardless of the target domain lemmas considered. In the case of SPACE metaphors, different target domains yield different results. While the two corpora do not display major differences for the DISEASE target domain, for the TREATMENT and PATIENT domains MED_ESP seems to give rise to a greater variety of metaphorical expressions, while for

the lemma *célula* the opposite seems to be the case, with more varied metaphorical expressions in the MED_DIV corpus.

Table 4
Number of Different Metaphorical Lemmas Belonging to the WAR and SPACE Source Domains in MED_DIV and MED_ESP

Target domains	Source-domain lemmas	Corpora	*f*	Examples
DISEASE (*cáncer*, *enfermedad*, *tumor*)	WAR	MED_DIV	47	*enemigo* [enemy], *batalla* [battle], *bomba* [bomb]
		MED_ESP	9	*avanzar* [advance], *ocupar* [occupy], *vigilancia* [vigilance]
	SPACE	MED_DIV	38	*ambiente* [environment], *mapa* [map], *terreno* [ground]
		MED_ESP	36	*vía* [way], *desplazar* [move], *base* [base]
TREATMENT (*tratamiento*, *quimioterapia, terapia*) & PATIENT (*mujer*, *paciente*, *persona*)	WAR	MED_DIV	23	*agresivo* [aggresive], *resistir* [resist], *víctima* [victim]
		MED_ESP	3	*fallar* [fail], *fallo* [failure], *vigilancia* [vigilance]
	SPACE	MED_DIV	15	*acelerar* [accelerate], *frenar* [brake], *orientar* [orient]
		MED_ESP	26	*blanco* [target], *abandono* [leaving], *progresar* [progress]
célula	WAR	MED_DIV	25	*asesino* [killer], *ejército* [army], *invasión* [invasión]
		MED_ESP	3	*agresivo* [aggressive], *eliminar* [eliminate], *contra* [against]
	SPACE	MED_DIV	28	*barrera* [barrier], *borde* [edge], *torrente* [stream]
		MED_ESP	12	*sitio* [space/spot], *microambiente* [microenvironment], *superficie* [surface]

In sum, the first hypothesis about the higher frequency of metaphors in popularised discourse does not hold true for SPACE metaphors, which display similar frequencies in both MED_DIV and MED_ESP. This suggests that the

incidence of metaphors does not depend uniquely on discourse-related factors, such as the difference between specialised vs. popularised discourse, but rather on the different productivity of specific source domains in different registers or genres. WAR metaphors seem to be especially productive in popularised communication, while SPACE metaphors are generally frequent in language, but do not display a special association with a specific register. Furthermore, in the case of SPACE metaphors a target domain effect is also observed, with the TREATMENT and PATIENT domains giving rise to a greater variety of metaphorical uses in MED_ESP than in MED_DIV, while the lemma *célula* proves significantly more productive in popularised discourse. This can be explained through the relevance of the respective target domains in each type of discourse.

The following sections will provide a qualitative characterisation of metaphorical expressions found in both corpora (§3.3) and subsequently of those found exclusively in MED_ESP (§3.4) and in MED_DIV (§3.5), providing further evidence for both the source- and target-domain effects revealed by quantitative data so far.

3.3. Use and function of SPACE metaphors in MED_DIV and MED_ESP

SPACE metaphors found in both corpora characterise the human body as a space in which the development of the disease is interpreted either as an itinerary or as a process of expansion. In the first case, the disease initially has a *curso* [course] (1) characterised by *estadios* [stages] (2), *etapas* [phases] (3) and *estados* [states] (4), with possible *recaídas* [recurrence] (5):

(1) El **curso** de esta enfermedad es caracterizado por una resolución lenta (MED_ESP).[3]
[The **course** of this disease is characterised by slow resolution]

(2) Los niveles de expresión de miARN-21 son significativamente más altos en pacientes con cáncer de mama con enfermedad en **estadio** III y mal pronóstico (MED_ESP).
[miRNA-21 expression levels are significantly higher in breast cancer patients with **stage** III disease and poor prognosis]

(3) Finalmente, ante cáncer recurrente o enfermedad en **etapa** clínica IV el objetivo del tratamiento oncológico es prolongar la supervivencia y mejorar la calidad de vida (MED_ESP).
[Finally, in the case of recurrent cancer or clinical **stage** IV disease, the aim of cancer treatment is to prolong survival and improve quality of life]

(4) Cerca del 30 % de las mujeres con cáncer de mama en **estado** inicial tiene riesgo de desarrollo de metástasis (MED_DIV).
[About 30% of women with early **stage** breast cancer are at risk of developing metastases.]

(5) Ondas para evitar la **recaída** en el cáncer de mama (MED_DIV).
[Waves to prevent breast cancer **recurrence**]

When the disease is presented as an expanding entity, spatial metaphors focus mainly on the *zonas* [zones] to which the cancer moves from the place of origin, reproducing the metaphor of the body as a physical space:

(6) [. . .] zonas **alejadas** de la lesión o tumor de **origen** a las que el cáncer se ha **extendido** (MED_DIV).
[areas **away** from the original lesion or tumour to which cancer has **spread**]

The development of the disease corresponds to its spread, while the control of the disease coincides with its permanence in the place of origin:

(7) La **diseminación** del cáncer **más allá del** tumor original, conocida como metástasis, es el aspecto más mortal de la mayoría de los cánceres (MED_DIV).
[The **spread** of cancer **beyond** the original tumour, known as metastasis, is the most deadly aspect of most cancers.]

(8) Las pacientes con cáncer de mama **localizado** que reciben hormonoterapia adyuvante presentan mayor sobrepeso (MED_ESP).
[Patients with **localised** breast cancer who receive adjuvant hormone therapy are more overweight.]

Furthermore, spatial metaphors are used to describe the morphology of the cancer, in terminological metaphors such as *borde del tumor* [edge of the tumour] and *lecho del tumor* [cancer bed].

When associated with the TREATMENT target domain, spatial metaphors represent treatment as a journey with a direction, or an action with a goal or a target:

(9) [. . .] no es un tratamiento **dirigido** específicamente a las células cancerígenas (MED_ESP).
[not a treatment that specifically **targets** cancer cells]

(10) Hoy en día existen numerosas terapias **dirigidas** a **dianas** específicas, a alteraciones que son particulares de cada tumor (MED_DIV).
[Today there are numerous therapies **directed** at specific **targets**, at alterations that are particular to each tumour.]

3.4. Use and function of SPACE metaphors in MED_ESP

Spatial metaphors used exclusively in specialised texts comprise a series of verbs and nouns that designate lack of movement and progression of the disease, focusing on the concept of *estabilización* [stabilisation]:

(11) Se logró **estabilidad** de la enfermedad (MED_ESP).
[Disease **stability** was achieved]

(12) [. . .] el 53% de las pacientes presentaron **estabilización** de las metástasis óseas (MED_ESP).
[53% of patients showed **stabilisation** of bone metastases]

(13) Se obtuvo una respuesta parcial según criterios RECIST 1.1 en 7 (9.9%) pacientes y enfermedad **estable** en 59 (83.1%) (MED_ESP).
[Partial response according to RECIST 1.1 criteria was achieved in 7 (9.9%) patients and **stable** disease in 59 (83.1%).]

These uses, which are characteristic of MED_ESP, can be associated with the related concepts of *control* and *vigilancia* [vigilance] identified in relation to WAR metaphors (Pontrandolfo & Piccioni, 2022), thus confirming the greater complexity with which disease management is discussed in specialised discourse. While in popularised accounts therapeutic objectives tend to be explained simply in terms of the dichotomic distinction cure/death, expert-to-expert communication focuses also on less polarised outcomes with greater emphasis placed on prolonged survival, disease stability and quality of life improvement.

Another defining feature of spatial metaphors in MED_ESP is their terminological function, which characterises them as classification or definition devices. Such function is associated mainly with NOUN + ADJECTIVE collocations (e.g., *enfermedad residual extensa* [residual extended disease], *cáncer de mama localmente avanzado* [locally advanced breast cancer], *tumores multifocales o multicéntricos* [multifocal or multicentric tumours]), NOUN + NOUN disjunctions (e.g., *terapias blanco* [target therapies]) or synapses of the type NOUN + PREPOSITION + NOUN (e.g., *tumor a distancia* [tumour at a distance]). The terminological (dead) metaphors typical of

MED_ESP also include terms designating the morphology of the tumour or, more generally, organs or parts of the body (*base del tumor* [tumour base], *tracto digestivo* [digestive tract], *vías billares/moleculares* [bile/molecular ways]).

3.5. Use and function of SPACE metaphors in MED_DIV

In the popularisation corpus, SPACE metaphors tend to correspond to JOURNEY metaphors, which are mainly used to talk about the development of the disease, focusing in particular on the appearance of the cancer, its spread or reduction, disappearance and reappearance—all concepts relevant to the reader's cognitive horizon and interests:

(14) La mayoría de las muertes causadas por este tipo de enfermedad derivan de la **propagación** del tumor hacia los pulmones (MED_DIV).
[Most deaths caused by this type of disease result from the **spread** of the tumour to the lungs.]

(15) ¿Por qué algunos tumores de mama **remiten** con taxol y otros no? (MED_DIV)
[Why do some breast tumours **regress** with taxol and others do not?]

Interestingly, a number of collocates of the target-domain lemmas analysed semantically express the idea of TIME through adjectives and verbs that refer to the pace of disease progression (or movement through the body):

(16) [L]os estudios animales con tumores inducidos y el uso de dietas basadas en grasas vegetales del aceite virgen extra han "demostrado que se **enlentece** el crecimiento del tumor del cáncer de mama y se **retrasa** el **curso** clínico de la enfermedad [. . .]" (MED_DIV).
[Animal studies with induced tumours and the use of diets based on vegetable fats from extra virgin olive oil have 'shown that breast cancer tumour growth is **slowed** and the clinical **course** of the disease is **delayed**'.]

Another aspect highlighted by metaphors in MED_DIV is the environment in which the tumour develops (17-18) and the location of the disease (19-21). Location, in particular, contributes to the formation of terminological metaphors based on the concept of CLOSENESS/DISTANCE:

(17) Estas células, conocidas como fibroblastos asociados al cáncer (CAFs, por sus siglas en inglés), forman parte del **ambiente** que **rodea** al tumor y constituyen una **población** heterogénea (MED_DIV).

[These cells, known as cancer-associated fibroblasts (CAFs), are part of the **environment surrounding** the tumour and constitute a heterogeneous **population**.]

(18) [El] amoníaco se acumula en el **entorno local** del tumor hasta alcanzar concentraciones que resultarían tóxicas para muchas células (MED_DIV).
[Ammonia accumulates in the **local environment** of the tumour reaching concentrations that would be toxic to many cells.]

(19) Un porcentaje pequeño de pacientes presentan metástasis en los ganglios linfáticos **regionales** (axila) y más rara aún es la **extensión** del tumor a otras **zonas distantes** del cuerpo (MED_DIV).
[A small percentage of patients present with axillary **regional** lymph node metastasis and even rarer is the **spread** of the tumour to other **distant areas** of the body.]

(20) Estos nuevos **focos** de enfermedad son las "metástasis," o enfermedad "**diseminada**" o "**a distancia**," o "secundaria," en contraposición al **foco inicial** del tumor, que se designa como tumor "primario" o "primitivo" (MED_DIV).
[These new **foci** of disease are "metastases," or "**disseminated**" or "**distant**" or "secondary" disease, as opposed to the **initial focus** of the tumour, which is designated as the "primary" or "primitive" tumour.]

(21) [. . .] de estos tumores cerca del 70% estarán en **estadios** poco **avanzados** (tumor **in situ** y de **estadio** 1) (MED_DIV).
[of these tumours about 70% will be in low **advanced stages** (**in situ** and **stage** 1 tumours).]

In a considerable number of cases, the disease is attributed agentivity or intentionality through personifications in which the development of the disease is associated with intentional actions of cancer cells that entail some kind of displacement. In some instances, (e.g., 23), personifications have become established as terminological (dead) metaphors:

(22) En tiempo reciente, Neta Erez y su equipo, de la Universidad de Tel Aviv, han descubierto que este tipo de tumor **atrae** células madre **provenientes** de la médula ósea [. . .] (MED_DIV).
[Recently, Neta Erez and her team at Tel Aviv University have discovered that this type of tumour **attracts** stem cells **coming** from the bone marrow.]

(23) [E]l ADN **circulante** contiene las mutaciones genéticas que son específicas para cada tumor (MED_DIV).
[**Circulating DNA** contains the genetic mutations that are specific to each tumour.]

(24) [. . .] dando lugar a la formación de una especie de "jaula protectora" que impediría a las células cancerosas **escapar** del tumor y **viajar** a otros **rincones** del cuerpo, dando lugar a las temidas metástasis (MED_DIV).
[resulting in the formation of a kind of "protective cage" that would prevent cancer cells from **escaping** from the tumour and **travelling** to other **corners** of the body, leading to the dreaded metastases.]

Among the personifications, the most frequent are those referring to the lemma *cell* in combination with verbs of movement. Interestingly, the frequency of verbs is much higher in the popularised than in the specialised corpus, as verbal lemmas represent 54% of all metaphorical lemmas in MED_DIV as opposed to only 2% in MED_ESP, thus configuring an interesting lexicogrammatical pattern that will be worth exploring in future studies.

Verbs contribute to enriching the metaphorical scenario of SPACE and MOVEMENT with a wealth of semantic elements that describe the action of cells in terms of a journey. Thus, cells can travel more or less rapidly, alone or in groups like flight flocks (25-26), inwards or outwards, maintaining a direction or deviating, loaded with other substances to transport them towards destinations such as stations (27), etc. The following examples underline the metaphorical extensions that help to qualify the journey of cells through the body:

(25) Además de células que **circulan en solitario**, los linfomas pueden dar lugar a agregados multicelulares en los tejidos (MED_DIV).
[In addition to **solitary circulating cells**, lymphomas can give rise to multicellular aggregates in tissues.]

(26) [. . .] demuestra que la capacidad de las células tumorales para **propagarse** y generar metástasis se ve enormemente facilitada cuando las células **migran agregadas como "bandadas,"** en lugar de hacerlo **en solitario** (MED_DIV).
[demonstrates that the ability of tumour cells to **spread** and metastasise is greatly facilitated when cells **migrate in aggregate as "flocks," rather than solo**]

(27) […] que se comporta como una célula maligna y **viajará** hacia la primera **estación** ganglionar (MED_DIV).
[which behaves like a malignant cell and will **travel** to the first ganglion **station**.]

The metaphorical scenario of movement through space allows the creation of extended metaphors in which cells are personified and animalised, acquiring typically human and/or animal intentionality and agentivity. The following fragment provides an example of the use of spatial metaphors in combination with other personifications to create a very detailed scenario of a journey of a cell endowed with human-like skills and intentions (e.g., the ability to *convince*, acting *as it pleases*, etc.), *nesting* in a new environment to be shared with potentially *hostile companions*:

(28) Para que una célula maligna **escape** de un tumor de mama, o de cualquier otra forma de cáncer conocida, **anide** en un órgano vital y forme ahí un nuevo tumor, es imprescindible que adquiera **un conjunto de habilidades muy concretas** y que van más allá de las que definirían a una célula tumoral cualquiera. Es decir, no basta con que sea inmortal, con capacidad para dividirse indefinidamente o incluso de inducir la formación de nuevos vasos sanguíneos que alimenten al **incipiente** tumor. También debe ser capaz de **atravesar** con éxito los capilares, **sobrevivir a las turbulencias** del **torrente sanguíneo**, **adherirse** a un tejido hasta entonces **hostil** y **convencer** de algún modo a los componentes de su nuevo **entorno** de que la permitan desarrollarse **a su antojo**, originando un nuevo tumor (MED_DIV).
[For a malignant cell to **escape** from a breast tumour, or any other known form of cancer, **nest** in a vital organ and form a new tumour there, it is essential that it acquires **a set of very specific skills** that go beyond those that would define a typical tumour cell. In other words, it is not enough for it to be immortal, with the ability to divide indefinitely or even to induce the formation of new blood vessels to feed the **nascent** tumour. It must also be able to successfully **pass through** capillaries, **survive the turbulence** of the **bloodstream**, attach itself to previously **hostile tissue**, and somehow **convince** the components of its new **environment** to allow it to grow **as it pleases**, giving rise to a new tumour.]

The function of such a dense metaphorical scenario is to make it easier for the lay reader to understand the very complex mechanisms involved in the spread of cancer.

In the case of metaphors referring to the target domain of TREATMENT, the focus seems to be on the direction and goals of the journey that inform the choice of a particular treatment regime:

(29) Una investigación en marcha en Valencia abre nuevas **vías** a futuros tratamientos contra el cáncer de ovario seroso de alto grado (MED_DIV).
[Ongoing research in Valencia opens up new **avenues** for future treatments against high-grade serous ovarian cancer]

(30) [. . .] en beneficio del diagnóstico y la **orientación** de los posibles tratamientos para cada paciente (MED_DIV).
[for the benefit of the diagnosis and **orienting** possible treatments for each patient]

(31) [. . .] si los ganglios estaban inflamados, a pesar de que con la quimioterapia haya una buena respuesta en la mama, las pacientes sí que deberían **pasar** por una cirugía en la axila (MED_DIV).
[if the nodes were swollen, even if chemotherapy has a good response in the breast, patients should still **undergo** axillary surgery]

Finally, the MED_DIV corpus displays only one case of a spatial metaphor that identifies the disease as a formative and self-discovery journey for the patient (e.g., 32). This is a pedagogic metaphor widely observed in other studies focusing on patient narratives (e.g., Moreno, 2022; Semino et al., 2018) and yet prove rare in our corpus, pointing to a further element of discourse-motivated variation:

(32) Sus tatuajes son la última **etapa** para estas pacientes que han **recorrido** el largo **viaje** del cáncer de mama (MED_DIV).
[Their tattoos are the last **leg of the journey** for these patients who have **travelled** the long **journey** of breast cancer.]

4. Conclusion

This article has proposed a corpus-based comparison of metaphorical expressions in specialised vs. popularised science discourse on breast cancer in Spanish, with a view to exploring discourse-motivated variation in metaphor use. Based on previous research, two hypotheses were put forward:

1) Popularised discourse uses a higher number of metaphors and greater variety of metaphorical expressions than specialised discourse.

2) Metaphors in popularised discourse present a functional specialisation to respond to the needs of lay audiences.

The first hypothesis was not confirmed, as quantitative evidence gathered from our corpora offers a more nuanced picture than previously observed. Distribution of spatial metaphors suggests the existence of both a source and target domain effect in metaphor use across different types of discourse. The source domain effect motivates variation in metaphor frequency in terms of the productivity of specific source domains: our data show that WAR metaphors seem to be especially productive in popularised communication and markedly less so in specialised discourse, while SPACE metaphors are generally frequent in language, but do not display a special association with a specific register. While most WAR metaphors are highly conventionalised and have lost their resonance (Garzone, 2021), their more frequent use in MED_DIV can be explained by virtue of their capacity to yield an emotional response in the highly sensationalised media discourse aimed at lay audiences. SPACE metaphors, on the other hand, do not carry the same evaluative strength and do not therefore display such a skewed distribution.

The target domain effect was observed in the variety of metaphorical expressions used in MED_DIV and MED_ESP, with the target-domain lemma *célula* yielding a greater variety of linguistic expressions in MED_DIV, while metaphors associated with the TREATMENT and PATIENT domains display more varied lexical realisations in MED_ESP. The findings point to a functional specialisation of metaphors, the use of which closely reflects the purposes and interests of the participants in the communication. More specifically, in popularised discourse, the effort to explain to readers the cellular mechanisms associated with the disease leads to the creation and use of a greater variety of metaphors associated with the lemma *célula*, a phenomenon that is not observed in relation to the other target domains analysed. The TREATMENT and PATIENT target domains, on the other hand, are more frequent in the specialised corpus, reflecting the focus and goals of this type of communication, which results in greater lexical variety of the metaphorical expressions used.

With regard to the differences between popularised and specialised metaphors, a thematic and functional specialisation of metaphorical use has been observed, thus confirming the second hypothesis of the study. At the thematic level, the specialised corpus displays greater emphasis on the concept of disease stabilisation, which, together with the concepts of control and vigilance expressed by WAR metaphors, indicates the greater importance that professionals attach to these aspects as part of the objectives of their work. In the popularisation corpus, on the other hand, the emphasis falls on metaphors that refer to the appearance of cancer, its spread or reduction, disappearance and reappearance, in particular in association with the concept of time, which

plays a central role in determining prognosis and guiding treatment. These aspects interest lay readers given that they affect their life or that of their loved ones.

On a functional level, the specialised corpus abounds in terminological metaphors that characterise the disease according to its location (e.g., *enfermedad residual extensa* [residual extended disease], *tumor a distancia* [tumour at a distance], etc.), along with dead metaphors from general medical language that use the concept of SPACE to describe human anatomy (e.g., *tracto digestivo* [digestive tract], *vías billares/moleculares* [bile/molecular ways], etc.). Terminological metaphors are also observed in the popularised corpus, especially those associated with the concepts of CLOSENESS/DISTANCE (e.g., *recidiva regional* [regional recurrence]; *tumor in situ* [tumour in situ], etc.). However, the discourse directed at lay audiences displays a great number of metaphors that have a pedagogic function and help to visualise the disease at the microscopic level by representing cells as humans or animals endowed with intentionality and agency in their movement through the body.

A final aspect that describes discourse-motivated variation in the use of spatial metaphors is an almost complete lack in our corpora of metaphors that represent the disease as a formative journey for patients and their carers, a metaphor which has been described as very frequent in previous studies focusing on (patients') narratives (e.g., Moreno, 2022; Semino et al., 2018). While this peculiarity observed in MED_DIV may depend on the specific methodology adopted (that focuses on explicit, rather than implicit metaphors), it can also be associated with the specific genres included in our corpus, whose aim is to inform the general public on research advances rather than giving voice to the personal experiences of patients and their carers.

Overall, results point to a complex interaction between discursive and metaphor-inherent factors in determining variation in metaphorical use, with specific source and target domains proving especially productive in either popularised or specialised discourse.

Notes

1. In keeping with standard practice in corpus-based metaphor studies, small caps are used to indicate conceptual domains and italics to indicate lemmas.
2. corpora.unich.it/sito/index.html & corpora.unich.it/weblesp/#open
3. Translations from Spanish into English provided here and elsewhere in the article are (where possible) strictly literal in order to convey the metaphorical expressions of the original.

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