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Get the metaphor right! Cancer treatment metaphors in the English and Spanish press[1]

(¡*Acierta con la metáfora*! Las metáforas de los tratamientos contra el cáncer en la prensa inglesa y española)

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Resumen: Este estudio explora el uso de la metáfora en la presentación de terapias contra el cáncer en un corpus de 300 artículos de divulgación publicados en cuatro periódicos, *The Guardian, The Times, El País* y *El Mundo,* de la prensa inglesa y española. En concreto, se investiga la forma en la que los tratamientos actuales se presentan frente a los que siguen en desarrollo. Los términos empleados de forma metafórica se identificaron según el 'Metaphor Identification Procedure' MIP desarrollado por el Grupo Pragglejaz (2007), teniendo en cuenta también las mejoras presentadas por el procedimiento más elaborado del MIPVU. El análisis muestra que se emplean tres dominios fuente en la conceptualización de los tratamientos contra el cáncer: ARMAS, ROPA y COMIDA Y CÓCTELES. Del análisis contextual se desprende que las metáforas son empleadas frecuentemente con una función persuasiva y evaluativa en los textos tanto por periodistas como científicos.

Palabras clave: Metáfora. Discurso de divulgación. Función persuasiva y evaluativa. Tratamientos contra el cáncer.

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Abstract: This study explores the use of metaphor in the presentation of cancer therapies in a corpus of 300 popularisation articles in four quality newspapers, *The Guardian, The Times, El País* and *El Mundo,* in the English and Spanish press. More specifically, it seeks to investigate the ways in which currently available cancer treatments are portrayed as opposed to those still under development. Metaphorically used words were identified primarily according to the 'Metaphor Identification Procedure' MIP developed by the Pragglejaz Group (2007) but also taking into account the developments presented by the more elaborated procedure MIPVU. The analysis revealed three major source domains that conceptualise cancer treatment: WEAPON, GARMENT and FOOD AND COCKTAILS. Contextual analysis showed that these metaphors are often used by both journalists and scientists with persuasive and evaluative functions in the text.

Key words: Metaphor. Popularisation Discourse. Evaluative and Persuasive Functions. Cancer Treatment.

1. Introduction

> Few things can cause so much trouble, especially in scientific discourse, as metaphor. The world is full of nitpickers and literalists who take perverse delight in pointing out inconsistencies between some obscure or trivial aspect of the metaphor and its counterpart […]. Yet we persist in using metaphor, particularly when we try to explain or justify scientific research to the general public, because the power of metaphor is so great. Metaphors allow us to bypass jargon and connect what we do with the everyday experience of the public who pay for our research and trust that what we do will help, not harm them. Get the metaphor right and we can mobilize public support even for the biggest and most expensive projects (Petsko 2001: comment1007.1).

Although I may be accused on 'nitpicking', the aim of this paper is to analyse the metaphors that are used in the presentation of advances in cancer treatment to the lay audience. Metaphors are generally seen as a useful resource for journalists in the recontextualisation of scientific knowledge for the benefit of a lay audience.

But, as the biochemist Gregory A. Petsko points out in the above quotation, scientists also consciously draw on the trope when explaining their work to society at large, and the author proposed the metaphor of the 'Rosetta Stone' as a suitable image that captures the essence of scientific enterprise in the popularisation of the Human Genome Project (Petsko 2001). Burns (2009) has called for the use of the 'stem cell superhero' as a substitute for the older metaphors of 'magic bullets', 'Holy Grails' and 'miracle cures' to capture the uniqueness of stem cells and their application (see also Larson 2009).

The ways in which science is framed via metaphor both in scientific journals and in the media is a growing field of inquiry in the social sciences because of the limitations in understanding that a given metaphor may present, and also because the use of a particular metaphor can lead to an unrealistic portrayal of the outcomes of scientific investigations (Chew & Laubichler 2003). Thus, scholars have called for a closer examination of the promotional metaphors used by scientists (Nelkin 1994) and the monograph, *Communicating Biological Sciences. Ethical and Metaphorical Dimensions* (Nerlich *et al.* 2009), is devoted to reviewing the ethics of science reporting from the standpoint of metaphor.

Science holds a privileged place in society because it is usually perceived as an objective and trustworthy enterprise. Yet, like any human activity, it is associated with people's particular interests. Scientists, therefore, need to be skilful when presenting their research to the wider public to justify their research and attract funding and in this task the role played by metaphor should not be underestimated.

It is now generally acknowledged that metaphors are pervasive in language (Lakoff & Johnson 1980). In the language of science and science popularisation they are particularly important because of their pedagogical potential through which they make a highly abstract or poorly delineated subject (target domain) accessible via a more familiar domain (source domain). In the terms of Conceptual Metaphor Theory, metaphor involves the mapping of source domain knowledge onto a target domain. The nature of such mapping is partial and inevitably certain aspects of the target will be highlighted and others will remain hidden (Lakoff & Johnson 1980: 10), leading to a particular view of the target domain which may include specific attitudes or evaluations (Semino 2008: 32).

In recent years, scholars working in the fields of the sociology of science and science communication (Nerlich *et al.* 2009) have started to carry out a critical examination of the role played by metaphor in the popularisation of science and

have called for a more responsible use of the trope since certain images, as Petsko has pointed out, can result in the excessive hyping of the research:

> The wrong metaphor oversells what we do and raises hopes unfairly in people who trust us to make their lives better. The right metaphor helps them to understand the torturous path between basic scientific discoveries and medicines or products, without robbing them of the hope that such a path will eventually be traversed (Petsko 2001: comment1007.2).

Journalists also draw heavily on metaphor when recontextualising scientific news in the press. The process of recontextualising is far more complex than was originally envisaged in the canonical view of popularisation in which the journalist is considered a mere translator. Fahnestock (1986) studied the shift in genre that takes place between a scientific paper and its popularised counterpart and concluded that whilst the former is "largely concerned with establishing the validity of the observations" (1986: 278), the latter is aimed at celebrating rather than validating science. Fahnestock claims that in order to transmit the excitement and to celebrate science, journalists make use of the 'wonder' and 'application' appeal (1986: 279). As Tim Radford, former science editor in *The Guardian,* puts it:

> To do my job, I must convert these [scientific papers] into narratives calculated to make people not just read, but as they read, to experience a sensation of excitement, amusement, alarm, disgust, or delight, because if I do not offer this reward of sensual experience, they will not read what I write (Radford 2009: 148).

In this conversion, metaphors prove valuable to the journalists when framing scientific issues since metaphor helps to portray the abstract and complex scientific issues in a familiar and appealing way for the public. Therefore, in addition to helping to explain science to the public, the metaphors used in the press for popularisation play a more rhetorical role in science communication. Whereas scientists need to justify their research and to portray it under a positive light to attract funding, journalists need to make their articles appealing so that they are selected by newspaper editors. What is often criticised is that in their zeal to 'sell'

their work, both scientists and journalists may end up overrating the importance of the scientific development being reported. On the other hand, Radford (2009: 146) claims that "understatement is synonymous with no statement at all". Thus, in the popularisation of science it is difficult to strike a balance between a realistic portrayal and exaggeration. Recently, concern has been expressed about the portrayal of cancer treatments in the media because the accounts often convey an unrealistic and over-optimistic view of the efficiency of the therapies (Fishman *et al.* 2010).

Since much of the ground-breaking biomedical research – wherever it is produced – is published in the top-tier English language journals, the popularisation of science in the Spanish press almost inevitably passes through and English-Spanish filter. As noted by Charteris-Black and Ennis (2001), who examined the metaphors in Spanish and English financial reporting, there is a lack of contrastive studies for this language pair on the use of metaphor in the recontextualisation of knowledge in specific fields. It is, therefore, of interest to investigate whether, with reference to cancer and cancer treatment, Spanish journalists use the same metaphors as their English counterparts or whether they draw on different images that may be culture-specific.

Against this background, this paper aims to examine the metaphors through which oncological treatments are promoted both in the English and Spanish print media. More specifically, it seeks to investigate the ways in which currently available cancer treatments are portrayed as opposed to those still under development.

2. Cancer, cancer therapies and metaphor

The binomial cancer and metaphor calls for a careful examination. Metaphors used for the conceptualisation of this disease have received increasing attention since the publication of Susan Sontag's *Illness as Metaphor* (1978). Her essay raised awareness concerning the WAR metaphors used and the author advocated a metaphor-free view of the disease as she believed that certain images could potentially be harmful to cancer patients. However, current approaches to metaphor (e.g. Semino 2008: 11) generally agree on the essential role performed by metaphor not only in language, but also potentially in thought and action. Furthermore, within the genre of scientific popularisation articles, metaphors are crucial in the recontextualisation of scientific knowledge for the lay public (Williams Camus 2009).

The debate surrounding cancer metaphors opened up by Sontag more than 30 years ago remains controversial, since newspaper columns and internet blogs continue to discuss the appropriateness of militaristic jargon in discourses on cancer. For instance, the writer Mike Marqusee, who had been diagnosed with multiple myeloma, wrote a column for *The Guardian* stating: "I don't need a war to fight my cancer, I need empowering as a patient" (2009). Dana Jennings (2010), a journalist for *The New York Times,* entitled an entry in his *Well* blog from the aforementioned newspaper: "With Cancer, Let's Face it: Words are Inadequate". Jennings, who had been diagnosed with and treated for cancer, said that the words 'fight' and 'battle' made him 'cringe and bristle' and acknowledged that he never thought of cancer as a battle, but rather as a "journey, a quest out of Tolkien, or a dark waltz". Psychologist Ellen Ormond (2009) complained about the press framing cancer in terms of a war, arguing that if patients do not win the 'battle', the implication is that they are 'losers'. She also mentioned a patient whose tumour was progressing despite having been treated aggressively. The woman felt pressured by her family to not give up and to go on receiving more chemotherapy even though she felt it would be useless. If we assume that metaphor can have an impact not only on the ways in which the disease is talked about, but also on how it is perceived, structured and experienced (Semino 2008: 176), we need to ask what kinds of metaphors are used in the discourses of cancer and what implications these may have.

Cancer treatment relies on surgery, chemotherapy and radiotherapy. Both chemotherapy and radiotherapy act in a nonspecific way and harm both cancerous and healthy cells (Spector 2010: 27). The treatments currently being developed are based on the growing knowledge gathered from the Human Genome Project and aim to treat the above-mentioned abnormalities but to avoid harming healthy cells. This promise has been branded as 'personalised medicine', 'tailored medicine' and more recently 'precision medicine' (Smith 2012). Leaving nomenclature issues aside at this point, the underlying rationale is that treatments will be designed to be compatible with the patient's genetic material in order to avoid as far as possible any undesirable side effects. The field of research devoted to the development of these treatments is pharmacogenetics or pharmacogenomics.[2] But advances

[2] The scientific community cannot seem to agree on the actual meaning of the terms. Many authors do not distinguish between the two and hold them to by synonymous (Hopkins *et al.* 2006). For the purpose of this study the same will apply. Hedgecoe (2003) provides an interesting analysis and

towards personalised medicine imply a change in the pharmaceutical business model, which instead of creating a few big blockbuster drugs to be used on a large population, will have to produce many different drugs each of which will be suitable for a small number of people. This also implies a rise in the cost of treatments so that pharmaceutical companies can maintain their level of profit.

The term 'personalised medicine' as it is understood today appeared in 1999 (Jørgensen 2009). *The Wall Street Journal* featured an article auguring a new era in the practice of medicine (Langreth & Waldholz 1999). But according to experts, little progress has been made to date (Jørgensen 2009). Hedgecoe (2004: 4) argues that expressions such as 'personalised medicine' or 'tailored-made medicine' have been favoured in public communication, perhaps by the pharmaceutical industry, because they are not only less obscure, but they are also "stripped of any obvious terminological link to potentially off-putting words such as 'genetics'. Other related expressions such as 'personal pill', 'designer drugs', 'targeted treatments', 'magic bullets', or 'smart drugs' have also been criticised for being potentially misleading as they may generate false expectations and hopes (TA-SWISS supervisory group 2004; Drews 2006; Spector 2010). The TA-SWISS supervisory group is particularly critical and advise their colleagues to curb their use of metaphors emphasising the individualising nature of future treatments (TA-SWISS supervisory group 2004: 26).

While a great deal of research still needs to be done, a few of the so-called targeted treatments are already being applied to specific types of cancers. For instance, Imantinib (traded as Glivec) is a treatment that has consistently been hailed as a 'magic bullet' for chronic myelogenous leukaemia and gastro-intestinal stromal tumours. However, it does not appear to be the ultimate cure for these conditions. In the experts own words: "Using Paul Ehrlich's weaponry metaphor, the magic bullet stuns but does not cure, leaving behind resistant cancer cells to challenge the host on another occasion" (Li-Wan-Po *et al.* 2010: 369). Content studies carried out on the reporting of trastuzumab (commercialised as Herceptin), a drug used in breast cancer and also presented as a magic bullet, concluded that the portrayal of this therapy in the United Kingdom national newspapers was uncritical and that frames such as 'wonder drug' and 'magic bullet' downplayed and

explains that pharmacogenomics is a variation on the term pharmacogenetics. He views the former as a rhetorical device which was favoured to obtain policy makers' and funders' support.

obscured the fact that trastuzumab can, in fact, result in adverse effects such as pulmonary toxicity and infusion reactions (Wilson *et al.* 2008). Although these therapies represent an advance in the field of oncology, they appear not to be as magical as originally claimed because they are often associated with adverse effects and, therefore, do not constitute the ultimate cure.

In addition to the potential side effects of these new treatments, access to them by cancer patients is not guaranteed given their elevated cost. In a recent article published in the journal *Blood* (Kantarjian *et al.* 2013), a group of about 120 chronic myeloid leukaemia experts have strongly criticised the spiralling prices of targeted cancer drugs in recent years. Although this situation is particularly critical in places with no universal health coverage, countries with public health services like England or Spain are also presented with the conundrum of deciding which new cancer treatments they should or can incorporate and who is to benefit from them.

In view of the metaphorical nature in the framing of these new biotechnologies, this paper examines the metaphors through which oncological treatments are promoted both in the English and Spanish print media, with special emphasis on the portrayal of current cancer treatments compared with those still under development.

3. Corpus and methods

The study was carried out on a bilingual English and Spanish corpus of 300 popularisation articles presenting scientific advances in cancer and its treatment. The texts were drawn from the electronic sites of four newspapers: *The Guardian* (75 articles, 41,510 words), *The Times* (75 articles, 43,005 words), *El País* (75 articles, 53,127 words) and *El Mundo* (75 articles, 56,704 words). Metaphors related to cancer treatment were identified using the metaphor identification procedure (MIP) proposed by the Pragglejaz Group (2007) for the identification of indirect linguistic metaphors in texts and were analysed within the framework of Conceptual Metaphor Theory (Lakoff & Johnson 1980). MIP involves reading the entire corpus to establish a general understanding of the meaning and to determine the lexical units in the texts. For each lexical unit the analyst must determine its meaning in a particular context and decide if this differs from a more basic contemporary meaning of the lexical unit in other contexts. If the contextual meaning contrasts with a more basic meaning, the lexical unit is marked as

metaphorical. Within MIP basic meanings are defined as more concrete, related to bodily action, more precise or historically older (Pragglejaz Group 2007).

A major pitfall that I have encountered with the application of MIP to my data is that it does not account for directly-expressed linguistic metaphors, that is metaphors that involve an explicit cross-domain mapping such as A is like B. In order to overcome this problem, the developments for metaphor identification for this particular issue introduced by MIPVU have been taken into consideration (Steen *et al.* 2010).

A distinction was drawn between the metaphors used for therapeutic options currently available for patients and those used to present new treatments that are being investigated. A detailed contextual analysis was carried out to determine the evaluative component implied in the use of metaphorical expressions in the texts.

4. Results

The analysis identified metaphorical expressions used to present cancer therapies that could be grouped under three broad source domains that I have labelled WEAPONRY, GARMENTS and FOOD AND COCKTAILS.[3] The following subsections illustrate how the metaphorical expressions from these three groups are realised in popularisation articles and discuss the implications. Table 1 summarises the source domains that are attributed to conventional and new therapies and provides a sample of the metaphors that instantiate these domains in the English and Spanish texts.

Therapy	Therapy characteristics	Source domain English subcorpus	Source domain Spanish subcorpus
Conventional - Chemotherapy - Radiotherapy - Surgery	Non-selective	WEAPONRY - blunt instrument - bomb - carpet-bombing tactics	WEAPONRY - *palizas* - *bomba* - *estallar* - *cañonazos*
New Pharmaco-	Based on concept	WEAPONRY	WEAPONRY

[3] Within the CANCER IS WAR conceptual metaphor, treatments represent the physician's arsenal so that WEAPONRY was taken as an appropriate label. In the case of personalised medical practice, treatments can be seen to be elaborated like clothes or food and drink to individual specifications. Thus, GARMENTS and FOOD AND COCKTAILS were selected as labels in these cases.

genomics	of using whole-genome information to predict drug action	- magic bullet - laser-guided smart weapons - targeted GARMENT - tailored treatment FOOD AND COCKTAILS - cocktail - dolly mixtures	- *bala mágica* - *sitiar* - *proyectiles dirigidos* GARMENT - *de diseño* - *a medida* FOOD AND COCKTAILS -*a la carta*

Table 1 Representation of conventional and novel therapies in the English and Spanish press

As we shall see, these metaphorical expressions depict current or potential cancer treatment in a particular way and, in doing so, they carry a specific evaluation of the therapy under consideration, which in certain cases may be problematic.

4.1. WEAPONRY source domain

This group of metaphors can be seen as a subset of the WAR, VIOLENCE AND AGGRESSION source domain, which is pervasive in biomedical discourse in general (Annas 1995) and in the popularisation of cancer in the press in particular (Williams Camus 2009). The WEAPONRY source domain is exploited in the press to conceptualise both conventional cancer treatment – surgery, chemotherapy and radiotherapy – and new therapeutic approaches under investigation. However, there is a difference in the manner in which this source domain is realised linguistically to account for current and potential new treatments.

4.1.1. WEAPONRY in the English subcorpus

Conventional treatments are said to be the *old treble line of attack* or the *standard arsenal* against cancer, and chemotherapy is characterised as a blunt instrument (5 instances) in the English press:

> (1) Dr White said: "Chemotherapy is a very *blunt instrument*. It makes people sick, and its effects are very inconsistent. Identifying genes that make chemotherapy

> drugs more potent at lower doses is a first step toward alleviating these effects in patients" (ti46)

Thus, it is portrayed as a tool lacking precision and causing carnage by the leading scientist of a study investigating ways to make chemotherapy more effective.

Chemotherapy and radiotherapy are also directly set in contrast with novel treatments which are – or will be – more 'selective' or 'personalised'. A number of metaphors or elaborated analogies are exploited in this case. In the following example, conventional treatments are presented through a rather violent analogy in a direct quotation from the scientist:

> (2) Conventional chemotherapy treatments are cytotoxics – they poison the cancer but can also poison the patient at the same time. By contrast the newer drugs have been designed to attack the pathways, or wiring, of the cancer cells. '*It's a bit like the difference between trying to break into a house by throwing a bomb in the front door, which will get you in but will have done some damage, and picking the lock on the side door*' (gu67)

In (2), conventional cancer therapy is equated to *throwing a bomb*, and novel approaches in treatment is presented as *picking the lock*, emphasising the potential precision and efficiency of the latter while highlighting the devastating and random effects of the former.

Novel therapies are also described in terms of the WEAPONRY source domain, but it should be noted that there is a significant difference in the nature of the *weapons* employed, as the following example from the lead of an article illustrates:

> (3) Cancer treatment remains broadly reliant on three rather *blunt instruments*. A tumour can be cut out with a scalpel, burnt away with radiation, or poisoned with chemotherapy. All can have brutal side-effects, and their lack of precision makes it hard to predict which is most likely to work.
> The great promise of cancer genomics is to replace these *carpet-bombing tactics* with the equivalent of *laser-guided smart weapons*. By identifying the precise genetic mutations that are driving a tumour, it should be possible to *attack* these with *targeted* therapies that are much more effective (ti74)

Although the contrast established by the metaphorical expressions in (3) may help to explain the potential advantages of treatments under development, it could be argued that the main purpose of this framing is rhetorical: it not only helps to open the article in a dramatic and vivid way to capture the readers' attention but it also serves to present novel therapies in a positive light. However, since chemotherapy is already associated with high levels of fear and anxiety (Bell 2009: 170), a degree of caution should be exercised with the metaphors employed when popularising research findings as most cancer patients will not have immediate access to the highly selective novel therapies and will have to cope with currently available treatment, which is portrayed so negatively in the media.

Other metaphorical expressions used to convey new 'personalised' therapies that draw on the WAR, VIOLENCE AND AGGRESSION source domain are more conventional. A recurrent way to refer to these new approaches in English in the specialised literature is with the term *targeted* therapy*,* which emphasises the fact that they are aimed specifically at cancer cells. These targeted therapies are also portrayed as *weapons* (17 instances) increasing the *arsenal* (4 instances) against cancer. Note the use of modals in the examples below which make the statements more tentative:

> (4) The research could lead to new *weapons* in the *arsenal* of anti-cancer drugs (gu24)
> (5) Common ginger may be the next *weapon* in the *battle* against ovarian cancer, scientists have suggested (gu31)

The treatments that were presented through the *weapon* metaphorical expression included the use of viruses (3 texts), different compounds in food (3 texts), targeted drugs in general (3 texts), the immune system (3 texts), the process of apoptosis, an abortion drug and Glivec.

The portrayal of the above mentioned treatments as *weapons* is perhaps a way of helping the readers visualise how basic scientific discoveries will potentially translate into actual treatments. Although it has been argued before that certain WEAPONRY expressions (*blunt instrument*, *carpet-bombing*) evaluate the target negatively, in this context the use of the generic term *weapon* has positive connotations by following the logic that in a war scenario, the larger the arsenal, the better. In addition to the evaluative function, most of the *weapon* metaphorical expressions appear in texts

showing a high density of metaphorical items from the WAR, VIOLENCE AND AGGRESSION source domain, thus contributing to the overall lexical cohesion of the text.

A fairly recurrent metaphorical expression identified in the English data is that of the *magic bullet*. This expression is not new in biomedicine. Paul Ehrlich, a German physician and scientist, coined the equivalent German expression *Zauberkugeln* in the early twentieth century to frame his approach towards pathogenic microorganisms. Essentially it refers to a compound that would act in the desired location, eliminating the cause of the disease whilst leaving the rest of the organism unharmed. The notion of medicines as a *projectile weapon* has been traced further back to Thomas Huxley, who in 1881 envisaged that pharmacology would develop drugs that would treat physiological functions in the desired way:

> It will, in short, become possible to introduce into the economy[4] a molecular mechanism which, like a very cunningly contrived *torpedo*, shall find its way to some particular group of living elements, and cause an *explosion* among them, leaving the rest untouched (Huxley 1881: 276, quoted in Parascandola 1997: 78, my emphasis).

In reality, however, no real magic bullet has ever been found since all drugs have side effects to a greater or lesser extent, and patient response to the drug also varies (Aldridge 1998: 27).

The lexical metaphor of *bullet* is fairly frequent in the English corpus (11 instances) and was premodified by adjectives 'magic' (9 instances), 'gold' and 'silver' (1 token each). The *magic bullet* is a metaphor often exploited by the media or by journalists when presenting cancer treatments. Given its undoubted appeal, it has proved useful in attracting the interest of legislators and policy makers (Hellman 2005); however, the underlying implication that a single treatment will be able to deal with cancer is, in the light of current scientific knowledge, implausible. Thus, the image creates false expectations. Of the 8 articles containing this metaphor, in 2 texts[5] the scientist explicitly presents the treatment under development as a potential *magic bullet*:

[4] In this context 'economy' is used figuratively with the meaning of organisation in the body.
[5] Both articles cover the same news and both include the same quote from the lead researcher.

> (6) "I would describe this development as the equivalent of ultra-specific *magic bullets*. This could mean that a patient coming in for treatment of bladder cancer would receive an injection of the cloaked antibodies" (ti49) (gu50)

In another article (gu14) dealing with the development of a therapy based on nanotechnology, the journalist alters the conventional expression of the *magic bullet* and refers to *gold bullet*, which is a topic triggered metaphor (Koller 2003), motivated by the fact that the molecule used in this nanotherapy is coated with gold.

However, the representation of treatments as if they were (*magic*) *bullets* is often questioned by both scientists and journalists. One scientist said that "the reality is that there is never going to be one 'magic bullet' that cures all cancers" (gu67). In (ti39) the team of researchers are quoted indirectly to warn that it would be premature to regard the treatment as a *silver bullet* cure. In another article, although the notion of the magic bullet is not argued against, the journalist, through an indirect quote from a scientist, warns that "they may be too magic for their own good" (ti03) as the treatments are extremely expensive. Finally, another journalist claimed that, although magic bullets tend to make the headlines, the lives of patients can also be improved by minor developments (ti11). Thus, the *magic bullet* framing is a powerful notion that has inspired the process of drug discovery since the beginning of the 20th century. It seems unlikely, however, that such ammunition will ever be developed. The examples concerning this metaphorical expression show that, although some scientists still draw on the image when presenting their therapeutic developments to the lay public, other researchers and journalists are more cautious with the use of the phrase when popularising advances in cancer treatment.

4.1.2. WEAPONRY in the Spanish subcorpus

In the Spanish press, conventional treatments are also conveyed through negative metaphorical expressions. For instance, chemotherapy was described by a scientist as giving *palizas* ('hidings' or 'beatings') to patients receiving treatment:

> (7) [Massagué] ha recordado que muchos pacientes se siguen curando "a base de ***palizas*** de quimioterapia que tendremos que ir aprendiendo a sustituir por otros fármacos más eficientes" (em63)[6]

In the following examples, from the Spanish subcorpus, the imagery is also rather violent as chemotherapy is said to cause the cancer cells to *estallar* ('explode') or to represent *cañonazos* ('cannon fire'):

> (8) Su tratamiento no se basaba en hacer *estallar* las células cancerosas con violenta quimioterapia o radiación (ep34)[7]
> (9) Con el conocimiento que se tenía de la célula hasta hace poco solo se podía *atacar* al cáncer a *cañonazos*: tanto la quimioterapia como la radioterapia matan las células malignas pero también a las sanas (ep13)[8]

In one of the articles, the journalist quotes an analogy established by the researcher, who compares normal cells to *coches normales* ('ordinary cars') and cancer cells to *coches de carreras más blindados* ('armoured racing cars') and explains that conventional treatment is not too specific. Thus, chemotherapy and radiotherapy are described as effective but not as efficient since these therapeutic approaches result in undesirable collateral damage:

> (10) *a diferencia de los coches normales* [las células sanas según el símil de Soengas] *los coches de carreras están "más blindados", y es más difícil destruirlos*. Los tratamientos anticancerígenos habituales (quimioterapia, radioterapia) no son muy específicos "*es como tirar una bomba al coche: se destruye el de carreras, pero también los que están alrededor del aparcamiento*" (ep46)[9]

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[6] [Massagué] reminded us that many patients are still being cured "by means of chemotherapeutic *hidings* that we will have to learn how to replace with other more efficient drugs".
[7] Their treatment was not based on making cancerous cells *explode* with violent chemotherapy or radiation.
[8] With the cell knowledge available until recently it was only possible to *attack* cancer with *cannon fire*: both chemotherapy and radiotherapy kill not only malignant but also healthy cells.
[9] U*nlike normal cars* [healthy cells according to Soengas' simile] *racing cars are "armoured", and it is more difficult to destroy them*. Regular anticancer treatments (chemotherapy, radiotherapy) are not very specific "*it is like throwing a bomb at the car: the racing car is destroyed, but so are those which are around in the car park*".

As with the English subcorpus, in the Spanish articles chemotherapy and radiotherapy are also set in contrast with potential personalised treatments by means of metaphorical expressions from the WEAPONRY source domain; these highlight the destructive character of the former while emphasising the precision of the latter. In other words, there is a marked difference in the nature of the weapons associated with conventional and novel therapies, as illustrated in (11):

> (11) "*En vez de lanzar una bomba vamos a sitiar la ciudad*". Así ha ilustrado este martes la nueva tendencia que se prevé para la *lucha* contra el cáncer Ana Rodríguez Quesada [...] "al contrario de lo que ocurre con la radioterapia tradicional, que actuaba como una *bomba eliminando* las células tumorales pero también otras que estaban en el organismo", evitará la proliferación de los habituales efectos secundarios. [...] ha afirmado Rodríguez Quesada, en defensa de una "terapia personalizada" con "*proyectiles* dirigidos a la célula tumoral" (em69)[10]

In this example, a scientist is quoted to explain how the tendency in cancer treatment is foreseen. She mentions a change of strategy – instead of the indiscriminate *launching* of *bombs*, the cancer will be *besieged*. She argues that therapies will be 'personalised' equating them with *targeted projectiles*. It should be noted that the expression *proyectiles* dirigidos is related to the notion of *targeted* therapy or treatment. In Spanish, however, the term normally used is 'terapia *dirigida*' or 'tratamiento *dirigido*' which loses its militaristic associations. By using the term *proyectiles* the researcher is not only being consistent with the militaristic frame that she is using, but she also conveys the future treatments in a more evocative way.

The notion of the *bala mágica* ('magic bullet') in the Spanish subcorpus is infrequent (2 instances). In one of the articles, it is used by the journalist to refer to Glivec, and in the other text, it is the scientist who explains the mechanism of targeted therapies by drawing on this image:

[10] "*Instead of launching a bomb attack, we'll besiege the city*". This is how Ana Rodríguez Quesada illustrated on Tuesday the new trend foreseen in the *fight* against cancer. [...] "in contrast to what happens with conventional radiotherapy, which acted like a *bomb eliminating* not only tumour cells but also other cells in the organism", [the new therapies] will avoid the proliferation of the usual side effects, [...] claims Rodríguez Quesada, who advocates a "personalised therapy" with "*projectiles targeted* at the tumour cell".

> (12) "Si identificamos las alteraciones moleculares responsables de un tumor", añade, "podemos *atacarlas* con medicamentos especialmente diseñados. Por tanto, esas alteraciones se convierten en dianas y las nuevas terapias son auténticas *balas mágicas* de gran eficacia y prácticamente libres de efectos tóxicos" (ep44)[11]

Metaphorical expressions drawn from the WAR, VIOLENCE AND AGGRESSION source domain are pervasive in the discourse of cancer reporting in the English and Spanish press. Thus, to present cancer treatment as a weapon may help to structure this type of discourse coherently. However, scientists and journalists should be careful not to present in a gratuitous manner currently available cancer therapies through violent and aggressive imagery since this is the type of treatment that patients will most likely receive and in general it can be assumed that the public is aware of the devastating side effects of these treatments. In addition, although the metaphor of the *magic bullet* is a powerful concept driving drug discovery, it is controversial in the context of popularisations, as our examples have shown and as Hellman (2005: 621) has also pointed out: "the risk of over-promise implied in the 'magic bullet' concept is great, and the resulting cost for creating such illusions is subsequent public disillusionment with cancer research and treatment".

4.2. GARMENT source domain

As mentioned earlier, in 1999 *The Wall Street Journal* featured an article announcing the new era of personalised medicine. Right at the beginning of the article, the old and new approaches in pharmacology are placed in contrast by means of the sartorial metaphor:

> The pharmaceutical industry makes billions of dollars a year selling one-size-fits-all medicines. But now the race is on to come up with tailor-made drugs that will treat people based on their individual genetic makeup (Langreth & Waldholz 1999: 426; republished in *The Oncologist*).

[11] "If we identify the molecular alterations responsible for a tumour", he adds, "we can *attack* them with specially designed drugs. Therefore, these alterations become *targets* and the new therapies are authentic *magic bullets* that are highly effective and practically free of toxic effects".

Metaphorical expressions from the GARMENT source domain are exclusive to potential new therapies. As mentioned above, the aim of these new therapeutic approaches which draw on the knowledge gathered from the Human Genome Project is to provide 'personalised' treatment for cancer patients. According to this metaphor, doctors are seen as the *tailors* who craftily design the treatment (*garment*) which will *fit* each individual patient.

4.2.1. GARMENT in the English subcorpus

In the English subcorpus metaphors from the GARMENT source domain are frequent, but they are not particularly varied. This source domain is primarily realised through the verbal form to *tailor* which is highly conventional (table 2).

	The Guardian	*The Times*	Total
to *tailor*	7	11	18
tailor-made	2	1	3
tailor	0	1	1
Total	9	13	22

Table 2 Metaphorical expressions based on the lemma tailor in the English subcorpus

This kind of therapy is conventionally referred to as ***tailored*** treatment. As shown in the examples below, it is often combined with expressions from the MOVEMENT FORWARDS source domain (*opening the way*, first *step*) to evaluate the outcomes of a scientific investigation:

> (13) A gene that determines the severity of breast cancer has been discovered, *opening the way* to *tailored* treatments for the disease (ti16)
> (14) "This significant and strategic project is aimed squarely at providing the *first step towards tailored* cancer therapy" (ti60)

In most of the examples the metaphor remains 'closed'[12], but in one article the tailoring metaphor is creatively elaborated at the beginning and at the end of the

[12] Knudsen (2003) draws a distinction between 'closed' and 'open' metaphors in science communication. The former corresponding to more conventional uses of metaphorical expressions in specialised genres and the latter to those instances where a closed metaphorical expression is creatively elaborated and developed for the benefit of a lay audience.

text to achieve particular rhetorical effects. Thus, the metaphorical frame serves not only to bracket the text but also to mark the distinction between current and future approaches to cancer treatments.

> (15) IF CANCER PHYSICIANS were in the *retail clothing business*, they would all hope to be *bespoke tailors*. At the moment, unfortunately, they are all working at the *chain-store end of the market* — which means that the treatment "*suit*" they offer will take little account of the fact that the patient's particular cancer has the equivalent of *short legs, a large waist and one shoulder higher than the other*. New research suggests that this may soon change (ti09)

The journalist has drawn on the metaphorical notion of tailored treatment and has creatively elaborated it to explain how we stand today in relation to cancer treatment and what may lie in store in the future. At the end of the article, he draws on the metaphor again to conclude:

> (16) It is still early days for this research, but in the not too distant future physicians could be *measuring* patients for a treatment that really ***fits*** (ti09)

4.2.2. GARMENT in the Spanish subcorpus

In the Spanish subcorpus, metaphors from the GARMENT source domain are less frequent and are only included in four texts (table 3).

		El País	*El Mundo*	Total
a medida	bespoke	3	4	7
traje	suit	2	1	3
confeccionar	to tailor	1	1	2
sastre	tailor	0	1	1
de diseño	designer	0	1	1
Total		6	8	14

Table 3 Metaphors from the GARMENT source domain in the Spanish subcorpus

In (17) the journalist employs the metaphor in the headline to an article reporting on a case in which a treatment using the patient's own immune system to treat cancer had proved successful. At a later point in the text, the author refers

back to the image and further develops it to explain the characteristics of the treatment:

> (17) Autovacunas *de diseño* para matar al cáncer
> [...] Y es que los autores de esta investigación han *confeccionado* el tratamiento como si fueran *sastres* que llevan a cabo un *traje a medida*. Este consiste en infundir cantidades masivas de linfocitos T CD4+, cultivados a partir de una muestra sanguínea propia, programados para reaccionar ante un antígeno tumoral con el fin de atacarlo como si fuera un patógeno similar a una bacteria o un virus (em46)[13]

It should be noted that, although in this particular case the patient had been 'cured', the article acknowledges that this therapeutic procedure is complex and extremely expensive.

The GARMENT source domain holds a number of advantages over the representation of cancer treatment as a *weapon*. It is not only a more patient-friendly image as no violence is implied, but it also presents the patient as an active *customer* rather than a *battle field*.[14] Nevertheless, these therapies are still under development and so the metaphor ought to be used with caution in order to avoid false expectations.

In addition, concern has been raised within the field of bioethics since these so-called tailored treatments, which are often presented as available for everyone, will most likely be aimed at groups with a specific genotype for which a given drug works, as pointed out by Smart and co-workers (2004: 323):

> While its proponents initially claimed that 'personalised' medicine would replace the current 'one-size-fits-all' paradigm of drug development and usage, it now seems more likely that

[13] *Designer* self-vaccine to kill cancer.
[...] The authors of this investigation have *tailored* the treatment is if they were *tailors* making a *bespoke suit*. This entails infusing massive quantities of CD4+ T lymphocytes, cultured from one of his own blood samples and programmed to react against a tumour antigen so as to attack it as if it were a pathogen like a bacterium or virus.

[14] It should be noted, however, that the customer frame can also prove controversial. In Spain, the privatisation of the management of some hospitals has given rise to critical voices condemning the mercantilisation of healthcare (see also Segal 2005: 115-132).

> pharmacogenetics will tend to direct drugs toward genetically defined *groups*; if you like, 'off-the-peg' prescribing to genotype groups rather than individually 'bespoke' medicine (highlighting as in original).

The authors also question whether these treatments will be available for people with lower incomes: "Will expensive tailored medicine be the preserve of the wealthy or educated, while others make do with 'cast-offs' and 'hand-me downs'?" (Smart *et al.* 2004: 333).

4.3. FOOD AND COCKTAILS source domain

The last set of metaphorical expressions is also used to present therapies under development, although it should be noted that this domain is only represented by isolated examples in the corpus. Within the frame of the FOOD AND COCKTAILS metaphor, scientists and doctors stand for the *chefs* or *bartenders* who prepare the *order* (treatment) requested by the *customer* (patient).

> (18) "In future, cancer drugs will be *tailor-made* for the patient," he said. "The doctors will screen the patient, identify the genetic defects that are allowing cancer to develop, and *order up* a *cocktail* of drugs that pinpoint those defects" (ti03)

In (18), expressions from two different source domains are combined to emphasise the individualised nature of future treatments. As mentioned in the previous section, *tailor-made* is a fairly conventional expression in English; however, the notion is clarified in the following statement by specifying what it means in a biomedical context. Once the patients' genetic information is available, the text implies that they will receive a special kind of 'room service' as a *cocktail* of drugs will be *ordered up* to deal with the defects identified.

The excerpts below (19 and 20) have been taken from the only two texts in the Spanish subcorpus where metaphorical expressions from this source domain were present.

> (19) "Aunque sigamos utilizando la quimioterapia convencional, los nuevos fármacos son los que van a marcar la diferencia. Además, no son excluyentes, unos son el *menú* para todos y otros, el *servicio a la carta*" (ep08)[15]
> (20) Los expertos avanzan que el cáncer de mama contará con tratamientos *a la carta*
> [...] Sevilla ha acogido, entre ayer y hoy, el VI Simposio del Geicam. Más de 400 oncólogos se han reunido para abordar el "tratamiento individualizado" del cáncer de mama. El futuro de los tratamientos se perfila "*a la carta*", según los genes de cada paciente. "Hasta ahora recibían tratamientos según el tamaño y la extensión del tumor y no de su naturaleza", dice el doctor Manuel Ruiz Borrego, del Hospital Virgen del Rocío, pero la verdad es que "los fármacos que se aplican no son igual de eficaces en todas las pacientes" (ep46)[16]

The metaphorical expressions in examples (19) and (20) frame future treatments as *à la carte* service to emphasise the personalised nature of these treatments, which will cater for the individual needs of the patient. In (19), the scientist is predicting and sharing his vision of what he believes that future therapy will be like. However, what they could specify more explicitly is how far ahead that future lies and acknowledge that not all patients will have direct access to this 'haute cuisine', since it is likely to be expensive. In addition, the framing of treatments as *food* also hides the possibility of adverse reactions.

Indeed, in another example from the English subcorpus, a scientist questions this kind of 'soft' portrayal. Although he acknowledges the potential of experimental cancer medicines, he argues that it is wrong to depict them as if they were innocent confectionary:

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[15] "Although we continue to use conventional chemotherapy, it is the new drugs that will make the difference. Moreover, the two are not mutually exclusive, the former are the *set menu* for everyone and the latter the *à la carte service*".

[16] Experts announce that breast cancer will have *à la carte* treatments.
[...] Between yesterday and today Seville will host the 6th Geicam Symposium. Over 400 oncologists have met to approach "individualised treatment" of breast cancer. The future of treatments is outlined as *à la carte,* according to each patient's genes. "Until now they have received treatment according to tumour size and extension and not according to its nature," says Doctor Manuel Ruiz Borrego, of the Virgen del Rocío Hospital, but the truth is that "the drugs used are not equally effective in all patients".

> (20) 'It would be wrong to portray experimental cancer medicines as *dolly mixtures* that will cure everyone. They're not,'... 'However, they are exciting new treatments, which are targeting the lesions that cause cancer' (gu67)

Metaphorical expressions from the FOOD AND COCKTAILS source domain can be seen to share the advantages presented by those from the GARMENT source domain in that they are not aggressive and confer a more active role on the patient. Thus, the doctor-patient relation in the choice for the treatment is analogous to the waiter-customer interaction in discussing the order from a menu. There is further room for development within this scenario, for instance by pointing out that the "food" may produce an "allergic reaction" (side effect) in certain customers. However, the corpus data suggest that journalists and scientists use it to highlight the positive side of the therapies. Thus, the portrayal of cancer treatment as *food* or *cocktails* could be said to be too bland as it obscures the potential secondary effects that the therapies may have.

5. Sample analysis and discussion

To illustrate how the metaphors from different domains appear in actual texts, I have chosen an extended fragment from text (ti09), where the journalist explains the potential of personalised cancer treatments that are being developed. The example shows (A) the headline, (B) the lead, (C) the first of four examples illustrating how the recent advances could help to overcome some of the hurdles in present cancer treatments; (D) an evaluation of the examples presented, and (E) the conclusion.

> (A) Medicine on *target*: new cancer hopes
>
> (B) IF CANCER PHYSICIANS were in the *retail clothing business, they would all hope to be bespoke tailors*. At the moment, unfortunately, *they are all working at the chain-store end of the market — which means that the treatment "suit" they offer will take little account of the fact that the patient's particular cancer has the equivalent of short legs, a large waist and one shoulder higher than the other*. New research suggests that this may soon change.
> (C) For instance, one of the biggest challenges facing a cancer physician is knowing whether the tumour is going to spread

> (metastasize). Most cancer deaths are caused not by the original cancer but by the effects when it *colonises* other parts of the body. Whether the cancer spreads had been thought to be largely a matter of chance, so most cancers are treated equally *aggressively*, just in case.
> However a team at the Dana-Farber Cancer Institute in America recently found the gene *signature* in tumours that seems to predict the probability of metastasizing. This particular gene *signature*, which involves 17 genes, is a pattern that shows up in breast, prostate and some brain tumours. "This strongly supports the idea that some primary tumours are preconfigured to metastasize and that this is detectable at the initial diagnosis," says Dr Sridhar Ramaswamy, of the institute.
>
> [4 paragraphs including 2 examples]
>
> (D) These and other genetic *signatures* — such as one that predicts which children with Wilms' tumour are more likely to relapse — look like finally fulfilling the longstanding promise of the Human Genome Project to *target* all sorts of medical treatments more accurately. Many patients could avoid treatments that are ineffective and debilitating.
> (E) It is still early days for this research, but in the not too distant future physicians could be *measuring* patients for a treatment that really *fits*.

In addition to the metaphorical expressions from the WEAPONRY and GARMENTS source domains, this text also includes instances of other conceptual metaphors: TUMOUR CELLS INVADE AND COLONISE, CANCER IS WAR, and A GENOME IS A TEXT (van Rijn-van Tongeren 1997). However, these metaphors perform different functions in the discourse.

As we have seen in the preceding sections, new therapies are characterised by their precision and the author draws the reader's attention by alluding to this now familiar conceptualisation within the WEAPONRY domain (Medicine *on target*) in the title (A). Of greater interest, however, is the tailoring theme, which appears in both the lead (B) and conclusion (E). The journalist creatively elaborates the sartorial

motif in an explanation of the long-term goal of cancer research (*bespoke tailoring*), but at the same time conveys a realistic picture of where this type of research stands today (*chain-store end of the market*). This motif provides a circular framework for the text and brings the topic closer to the audience.

In the body of the text (C), the author addresses some of the difficulties facing cancer researchers and physicians. Metastasis, a major problem, is conceptualised through the conventional metaphor of *colonisation* and the response to this, which forms part of the CANCER IS WAR imagery, is *aggressive* treatment. In addition, the promising new research is based on the discovery of a pattern of genetic mutations that could allow differentiation of a susceptible population from those that are not and thus lead to more precise treatment. This discovery is portrayed through the GENOME IS A TEXT metaphor, but the particular instance gene *signature* is considered so conventional that the journalist does not even define it.

The examples not shown in the sample text also explicitly or implicitly exploit these same three source domain manifestations (*colonisation, aggression* and *signature*) before the author brings all four together in his evaluation (D), which also provides the connection between the *signature* motif and *target* image from the title (A). In his conclusion (E), the journalist returns to the *bespoke tailoring* frame but points out that this *customised* treatment (*measuring* patients for a treatment that really *fits*) is still some way off.

From this analysis it is clear that the journalist is using the various domains in different ways. While he draws on the three conventional 'closed' metaphors taken from expert genres, his creative vivid use of the GARMENT scenario in the lead serves both a pedagogical purpose and to attract the reader's attention. By picking this metaphor up in the concluding statement, the author not only establishes the link with the precision of the selective targeted approach, but persuasively underlines the added value of the more recent shift towards individualised treatment for cancer patients.

Both journalists and scientists draw on metaphors in order to communicate with, and bring science closer to, the general public. However, metaphors are not only used for explanatory purposes. In the case of journalists, they also resort to them to make their article newsworthy for the newspaper editors. In the case of scientists, they also exploit metaphors to justify their research and to attract funding. In this way, the metaphorical expressions chosen may be too optimistic and hyped up.

Wilson *et al.* (2008), in their study of the coverage of trastuzumab in the UK national newspapers, question whether we are:

> witnessing patient pester power or quasi direct-to-consumer advertising, where awareness is raised about new products and patients, charities and indeed clinicians then demand that these products be made available? If this is the case we need to know more about who is driving this particular type of marketing, its actual impact on clinician and consumer behaviours and whether it is permitted within the existing regulatory code of practice (Wilson *et al.* 2008: 131).

Since the metaphors discussed may create unrealistic expectations which, as evidenced in those examples where the metaphors are contested, science is still not able to meet, there is a continuing need for writers to strike an adequate balance between the use of metaphor to recontextualise science in an accessible way for the reader, while avoiding the creation of hype.

Drews (2006) suggests that Paul Ehrlich might have borrowed the notion of 'magic bullets' from *Der Frischutz*, a romantic opera which became popular in the nineteenth century. In this opera a young man sells his soul to the devil for a number of magic bullets which allow him to win the hand and heart of his beloved. In the end, the young man not only conquers the lady's heart but also regains his soul (Drews 2006: 639). It would be good if the search for and presentation of a 'magic bullet' for cancer was done by soulful scientists and journalists who take into consideration the expectations and disillusionments that are at stake in the presentation of cancer therapies to the public.

Conclusion

This article contributes to the growing body of knowledge on the use of metaphor in the popularisation of science. In particular, it illustrates the different source domains – WEAPONRY, GARMENTS and FOOD AND COCKTAILS – that are used for the presentation of cancer therapies in the English and Spanish press, with no major differences found between these languages in the corpus studied. A distinction has been drawn between the metaphorical expressions employed to represent conventional cancer therapies and the so-called 'personalised' treatments that are being developed. Metaphorical expressions from the WEAPONRY source

domain were identified for both conventional and personalised treatment. But whereas the former is conveyed by means of violent imagery, the latter is explained through highly specific types of weapons. The metaphor of the *magic bullet* has been shown to be controversial since journalists and scientists question the accuracy of this representation. The same is largely true of the metaphorical expressions from the GARMENTS and FOOD AND COCKTAILS source domains. Although the examples from these two groups share the advantage of being more patient-friendly, they have also been questioned for being misleading or unrealistic in their portrayal of personalised treatments.

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