Stem Cells and (Pseudo)Science: Discursive Aspects of the Stamina Case as Seen in *Nature*

Alessandra Vicentini

DOI: http://dx.doi.org/10.7358/lcm-2018-001-vice

Abstract

This study examines the Stamina case, one of the most controversial mediatic incidents of the last years in Italy, from an applied linguistic perspective. Through the analysis of a small corpus of texts published on the online version of *Nature* (*Nature.com*) between 2013 and 2014, it investigates how scientists, political and health institutions, the media, the patients and the public interact when faced with (pseudo)scientific news that may be relevant from a public health perspective. Based on selected sociological models of science communication (Bucchi 1998; Bucchi and Neresini 2008; Trench 2008; Hetland 2014; Metcalfe 2014; Neresini 2015), combined with methodological tools from critical discourse analysis (Fairclough 1995, 2003; Eisenhart and Johnstone 2008; Wodak 2013), argumentation theory (van Eemeren *et al.* 2004), and making reference to science popularisation studies (Calsamiglia 2003; Garzone 2006), the qualitative analysis shows how the communication pattern of scientific news with public health relevance is changing. Power relations are on the move and so are the aims, the communicative strategies and the genres employed. These are in fact influenced by a growing interaction between bottom-up pressures (patients, families, the public, the media) and a top-down diffusion of information (scientists, political and healthcare institutions, the media) with the latter prevailing over the former. From the data collected, it seems crucial that the dissemination and popularisation of scientific issues should be further spread. Scientists must counter propaganda and hysteria on (social) media, as well as engage more directly with people (Hunter 2016) in order to oppose pseudoscience.

Keywords: bioethics and pseudoscience; discourse analysis; online news discourse; public health; science popularisation.

1. Background

This study looks at the so-called Stamina case, one of the most controversial mediatic incidents of the last years in Italy, from an applied linguistic perspective. The Stamina method is a therapy invented by Davide Vannoni, an Italian former professor of psychology, founder and president of Stamina Foundation. This therapy, mainly aimed at neurodegenerative diseases, is said to rely on the conversion of mesenchymal stem cells into neurons; it is still kept secret by its promoters and lacks any scientific validity. The episode was particularly relevant from a news discourse (Cotter 2010; Catenaccio *et al*. 2011; Peters 2012) and a science communication viewpoint (Calsamiglia and López Ferrero 2003; Moirand 2003; Vicentini and Grego forthcoming 2018), as the Italian parliament, pressed by a growing public demand through the media, authorised and funded a clinical trial for testing the method, although the scientific community had "pointed out many times [that] there [was] no evidence that the claimed therapy work[ed], and indeed it could be harmful" (*Nature*, 13/12/2013; Piga 2013).

To understand the multiple implications of this incident, it is worth listing and describing the facts in brief (*Table 1*).

Table 1. – Chronology of the facts.

Date	Who	What
2004	Vannoni	Is hospitalised in Ukraine for a facial palsy by transplantation of stem cells, getting partial health benefits.
2009	Vannoni and Stamina foundation	Start experimenting in Italy on stem cells collected from human bone marrow (*Nature*, 09/07/2017).
2010	Vannoni	Deposits a patent application in the US, which is rejected in 2012.
2012	Vannoni	Starts to administer the therapy on patients (included several children) affected by serious neurodegenerative diseases at Brescia 'Spedali Civili' hospital, Italy.
2012	Italian Medicines Agency (AIFA) and National Institute of Health (ISS)	Close down the Brescia laboratory after an inspection, as the "facilities could not be trusted to produce contamination-free preparations" (*Nature*, 26/03/2013).

January 2013	TV programme *Le Iene*	Shows how children with various neurodegenerative, incurable diseases were treated with the Stamina therapy and argued that they were being denied a "supposedly important treatment" (*ibidem*).
March 2013	Italian health minister Renato Balduzzi	Decrees that the treatment could continue to be administered, following weeks of media pressure to authorise the compassionate use of the therapy.
May 2013	Italian government	Approves a clinical trial to test the method.
May 2013	Scientists	Highlight their concerns, declaring that the method lacks safety and there is no evidence of efficacy.
July 2, 2013	*Nature*	Suggests that the images used in the 2010 patent application in the US were duplicated from previous, unrelated papers.
July 9, 2013	*Nature*	Publishes an editorial calling on the Italian government not to proceed with the experimentation, as it is not justified by any scientific reason.
October 10, 2013	First scientific committee set up by health minister Lorenzin	Rejects the Stamina therapy as dangerous for the health of patients (*ScienceMag.org*, 11/10/2013).
December 2013	Vannoni	Appeals in court against the commission responsible for experimentation, accusing an alleged lack of impartiality.
December 2013	Second scientific committee set up by health minister after the court's ruling	Is appointed. It then unanimously rejects the method, concluding that "in no case the transformation of cells into neurons was achieved" (Ferraris and Molinari 2011; Mandelli 2014).
2015	Vannoni	Is condemned for criminal conspiracy, fraud and trade and administration of hazardous medicines.
April 26, 2017	Vannoni	Is arrested again after being accused of continuing the practice abroad and is now under house arrest.

So far, research has addressed the case from a medical law (Casella *et al*. 2013; Tassi 2013; Buzzi e Tassi 2014), a media (Spalletta 2015; Fattori 2016) and a political economy (Salter *et al*. 2017) perspective, whereas its linguistic and discursive aspects appear to be unexplored. This study investigates how scientists, political and health institutions, the media, the patients and the public interact when faced with (pseudo)scientific news that may be relevant from a public health perspective. It looks at the following research questions: how is the debate around these issues structured? What is the role of the various actors involved in this type of context? How do science and scientists communicate to the entire scientific community as well as to patients and the general public?

2. Corpus and method

A preliminary quantitative search was conducted to verify to what extent the news was covered in the non-specialised and specialised UK and US online press in the period 2013-2014. Findings revealed that newspapers were not interested in the case (apart from 1 text in the US *Huffington Post*), while journals and magazines did focus on the incident (22 texts) [1]. In particular, *Nature* published 9 texts, which alone constitute 40% out of all the specialised articles issued in the period under scrutiny. These are especially significant for the crucial role the journal played in the debate, as it exposed deep concerns over the safety and efficacy of the method and conducted an investigation that was fundamental to reveal its lack of scientific basis. The analysis of such texts may allow for looking at the episode from a specific angle, that is from the perspective of the scientific community, which entered the fray and got involved in the discussion actively. This is in line with a quite recent science communication paradigm, whereby scientists are increasingly speaking up and participating in the public debate (Roland 2005; Eilks *et al*. 2014; Dudo 2015) on the one hand, while the public is making sense of and participating in societal decisions about science and technology on the other (Haywood 2014). It is a process where the role of the media and that of public communication is of paramount importance, also because the "still dominant assumption that science literacy is both the problem and the solution to societal conflicts" is being challenged (Nisbet and Scheufele 2009, 1767).

[1] Specifically, *Nature* (9), *ScienceMag* (7), *New Scientist* (5), *Scientific American* (1).

For all of these reasons, this study examines the small corpus of 9 online texts on the Stamina case published on *Nature* between 26/03/2013 and 16/06/2014 (a-i below).

(a) "Stem-cell ruling riles researchers", Alison Abbott, *Nature*, News, 26/03/2013.
(b) "Italian stem-cell trial based on flawed data", Alison Abbot, *Nature*, News, 02/07/2013.
(c) "Trial and error. Italian officials should not go ahead with expensive clinical tests of an unproven stem-cell therapy that has no good scientific basis", *Nature*, Editorial, 09/07/2013.
(d) "Italian court rules science advisers unlawful", Alison Abbott, *Nature*, News, 04/12/2013.
(e) "Italy blocks controversial stem cell therapy", Anna Meldolesi, *Nature*, News, 06/12/2013.
(f) "Stem-cell fiasco must be stopped. In the public interest, the Italian health minister should resolve the ongoing uncertainty over a government trial of a controversial therapy", *Nature*, Editorial, 13/12/2013.
(g) "Leaked files slam stem-cell therapy", Alison Abbott, *Nature*, News, 07/01/2014.
(h) "Row over controversial stem-cell procedure flares up again", Alison Abbott, *Nature*, News, 30/01/2014.
(i) "Stem cells: Taking a stand against pseudoscience", Elena Cattaneo and Gilberto Corbellini, *Nature*, Comment, 16/06/2014.

A mixed methodology combining critical discourse analysis (Fairclough 1995, 2003; Eisenhart and Johnstone 2008; Wodak 2013) for its focus on the relationship between language, social context and its actors, English for Medical Purposes (Salager-Meyer 1994, 2006; Sarangi and Roberts 1999; Gotti 2005) and popularisation studies (Calsamiglia 2003; Moirand 2003; Calsamiglia and van Dijk 2004; Garzone 2006) was adopted, aimed at producing a qualitative analysis. Some tools from argumentation theory (van Eemeren and Grootendorst 2004) were also considered to account for the various discussion stages enacted in the public debate. Finally, the results were discussed and interpreted in the light of the literature on science communication models (Bucchi 1998; Sturgis and Allum 2004; Bucchi and Neresini 2008; Trench 2008; Metcalfe 2014).

3. Linguistic analyses

3.1. *General discursive strategies*

All texts present with a mix of specialised and non-specialised language. This is the result of the genre (i.e. the news article) chosen to provide the information on and discuss about the Stamina method (i.e. *Nature*'s news webpages).

Quite a small number of technical/specialised terms are employed without decoding them for the public, taking it for granted that they are clearly understood. This is because it is assumed that the type of readership is interested in the news and has the background to be able to comprehend it properly (see Gregory and Miller 1998; Henriksen and Frøyland 2000; Allan 2002; Garzone 2006 and Gotti 2014 on the role of scientists in the dissemination process of research findings to the layman). Such terms mostly regard the scientific description of the therapy:

[1] his therapy, which uses the *mesenchymal stem cells* from *bone marrow* (a) [2]

[2] whereas Vannoni's patent says that the transformation involved *incubating cultured bone-marrow cells* for two hours in an *18-micromolar solution of retinoic acid dissolved in ethanol*, Schegelskaya's paper uses a *retinoic acid solution with only one-tenth of that concentration*, and incubates the cells for several days (b)

On the other hand, there are numerous examples of non-specialised lexicon:

[3] Stamina had been treating seriously ill patients, mostly children (f)

[4] helping non-scientists to grasp the value of evidence (i)

Tabloid strategies are used to emphasise certain aspects of the incident over others, such as (a) the use of evaluation to express an opinion on the therapy [5, 6, 7] or on the patients [8]:

[5] expose deep concerns over the safety and efficacy of the *controversial* stem-cell therapy (g)

[6] children with incurable diseases such as spinal muscular atrophy were being denied *supposedly* important treatment (a)

[2] Letter references in brackets correspond to *Nature*'s texts as listed in section 2. Emphasis is added in all examples.

[7] the *scanty* methods in his 2010 US patent application (c)

[8] *Desperate* patients will always be *vulnerable* to exploitation (i)

(b) hyperboles/exaggerations:

[9] Leaked files *slam* stem-cell therapy (g)

(c) metaphors [10] and idioms [11]. The idiom 'playing cat and mouse' [11], in particular, exemplifies in popular terms how the scientific community had to confront with the Italian government, but also how the public/patients pressed the government through the media in order to take action:

[10] But questions raised over the patent that underpins the methodology needed for the trial could be *political dynamite*. (b)

[11] Clinics that offer unproven stem-cell treatments often end up *playing cat and mouse* with health regulators. (a)

Disgust and shock emerge semantically in most texts, emphasising how the scientific community reacted to the government's decisions of starting out a clinical trial:

[12] The unexpected decision on 21 March *has horrified* scientists (a)

[13] Italian health minister's support for a controversial treatment *appals* the country's scientists (h)

Several indefinite quantifiers and vague figures are employed to refer to the actors involved in the debate. They are a typical feature of popularising discourse, which contribute to increasing the scope of what is happening, making it even more newsworthy:

[14] *Hundreds* protested in Rome on 23 March (a)

[15] equally fervent opposition from *many* scientists who say that his treatment is unproven. (b)

[16] *well over 100 people* with conditions ranging from Parkinson's to motor neuron disease to coma – *nearly half of them* children – have already signed up to participate in the government-sponsored trial. (b)

All this is interspersed with linguistic strategies that by all means pertain to a specialised genre: nominalisation and long pre-modified noun phrases [17, 18, 19], depersonalisation with passive voice [20, 21], modality for hedging purposes [22]:

[17] *government-sponsored clinical trial* (f)

[18] *unproven stem-cell treatments* (a)

[19] *Brescia-based nonprofit Stamina Foundation* (e)

[20] A clinical trial to assess the treatment formally *was approved* (g)

[21] the *government-sponsored trial* was intended as a pragmatic attempt (c)

[22] This *may* seem a good idea, but it is venturing onto dangerous ground (f)

Such discursive strategies testify to how *Nature*'s status of scientific authority combines with its aim of reaching out to a larger audience. Dissemination about the Stamina case is carried out through its own news web channel, which anybody interested in the topic can access. Therefore, discursive features of both the intra-/inter-specialist (scientific journal) and the popular (mass media) genres intermingle in the texts, serving the function of maintaining the specialist *vs* non-specialist interaction.

3.2. *Discursive strategies for argumentation*

The analysis of selected linguistic choices that were grouped under several discursive strategies (terminology, evaluation, nominalisation, depersonalisation, hedging, see Salager-Meyer 1994; Calsamiglia and López Ferrero 2003; Hunston and Thompson 2003; Garzone 2006; Fraser 2010) is not limited to describing only how the news was conveyed, but it is also aimed at considering the entire ensuing debate from the perspective of the scientific community, which is represented by *Nature*, looking at the actors involved (Fairclough 2003) and the discussion stages followed (van Eemeren and Grootendorst 2004).

Six main lead actors emerged as conducting the debate:

1. the scientific community: *Nature* and other specialised journals, Italian and international scientists, research centres, research organisations, etc. (SC);
2. Davide Vannoni and his Stamina method (DV/S);
3. the Italian government: the Health minister Renato Balduzzi, the Heath Minister Beatrice Lorenzin (IG);
4. the media (M);
5. the patients and their families (P/F);
6. the public (P).

3.2.1. Scientific community (SC)

In all the texts a number of self-referential citations contribute to placing the focus of what is being discussed on the agent (*Nature*), and on its authoritativeness [23, 24]:

[23] *Nature has independently confirmed that* a key micrograph in that patent application, depicting two nerve cells that had apparently differentiated from bone-marrow stromal cells, is not original. (b)

[24] *As Nature and independent experts have pointed out many times*, there is no evidence that the claimed therapy works. (f)

Science and scientists are discursively constructed so as to appear reliable. Scientists are active actors that need to get the public to know the truth about the Stamina method. Since August 2012 they began alerting patients, politicians and the press, writing articles and giving several interviews every week. They argued that the method lacked both regulatory precedent and scientific rationale and did not qualify for compassionate use. They got actively involved in the battle against Vannoni and his therapy to manage and save the reputation of science and safeguard the patients, their families and any individual who could potentially be involved in this or similar treatments lacking scientific validity. In the texts under scrutiny they engage with different actors – other scientists in Italy and worldwide (SC), the Italian government (IG), the media (M), the patients and their families (P/F) and the public (P).

Several quotations and/or citations from diverse scientists and experts in the field are reported, enacting a confrontation within the scientific community itself which includes those against [25-31], those in favour [32] and those neither against nor in favour [33] of the Stamina method:

[25] "Unregulated clinical offerings are a worldwide problem; what's particularly distressing here is that Stamina's infusions have been done in public hospitals for years", argues Paolo Bianco, a stem cell researcher at the University of Rome. (e)

[26] "In fact no-one has ever been able to convincingly show that bone-marrow cells can be converted into nerve cells", says Elena Cattaneo, a stem-cell researcher who studies Huntington's disease at the University of Milan, Italy. (b)

[27] "The alleged treatment with supposedly mesenchymal stem cell medicinal products was being administered in violation of both national and European laws, and from our inspection several major deviations were

discovered", says Luca Pani, director general of Italian Medicines Agency (AIFA), the national drug regulator. AIFA suspended operations at the Brescia laboratories in 2012 after discovering manufacturing irregularities. (e)

[28] And at the end of December, cell biologist Carlo Redi of the University of Pavia, Italy, stem-cell biologist Giulio Cossu at University College London and Francesca Pasinelli, director-general of the Italian grant-giving charity Telethon, all resigned from the Cure Alliance, a lobby group for speeding up translational medicine that Ricordi launched.
The scientists who resigned say that they were dismayed by Ricordi's insistence that the value of Stamina's therapy had not yet been proved or disproved, as well as his offer to test and possibly improve it in his Miami facilities. (g)

[29] On 23 December, Carlo Croce, a cancer researcher at the Ohio State University in Columbus, resigned from the scientific committee of one of the initiatives, the Ri.MED Foundation, a publicly funded regenerative-medicine institute being built in Palermo, Italy. Croce has called for Ricordi to be removed as Ri.MED's president. (g)

[30] As Irving Weissman, director of the Stanford Institute for Stem Cell Biology and Regenerative Medicine in California, says: "If the Italian government uses money that could have gone to research that will deliver real stem-cell therapies in the future, a whole cohort of people will die because these therapies had not yet been invented". (c)

[31] But Ruggero De Maria, science director of the Regina Elena National Tumour Institute in Rome, says: "Tests on samples have already been carried out independently at the University of Modena in Italy. I feel offended when I see Ricordi praising Stamina and attacking experts". (g)

[32] Ricordi, who works on diabetes at the University of Miami in Florida, has in the past called Stamina's method "safe" and "promising". (g)

[33] Mauro Ferrari, who heads the Institute for Academic Medicine at the Houston Methodist Hospital in Texas, is the Italian government's nominee to chair a committee on the controversial Stamina Foundation. [He] told journalists that he was neither "for nor against" the Stamina method. (h)

The neutral verb 'say' is mostly used as a quoting verb [26, 27, 28, 30, 31]; no verbs deviating from the norm (Cotter 2010, 149; Vicentini and Grego forthcoming 2018) are employed for quotation, which means that the experts' opinion is neither reinforced nor diminished. It is given for granted that they have the credibility to provide opinions based on specialised knowledge.

Not only, one of the texts (i) is authored by Elena Cattaneo, an influential Italian stem cell researcher, who conducted, along with other colleagues, a campaign aimed to raise awareness of the risks of the Stamina therapy. In August 2013, the Italian President Giorgio Napolitano appointed her and the Nobel-prizewinning physicist Carlo Rubbia as senators for life in the upper house of the legislature – positions that are usually reserved for politicians. These appointments were part of an effort to strengthen science in Italy, and gave scientists greater access to politicians, thus reinforcing their investigations on the Stamina method (i). This text features a high number of first plural inclusive pronouns 'we' to refer to the entire scientific community, which includes Cattaneo and all those who actively took action to fight for science and truth. They had to speak up and reaffirm their credibility and authority. To do this, they addressed the public at large, even those who were not much conversant with science. At first they were *shocked* [13, 34] and *disgusted* [12], but they also *hope(d)* and *learned* [36] and then became the leading actors in the battle aimed at unmasking Vannoni's lies. This active phase is highlighted by the verbs employed to describe their actions [e.g. *find*, *begin*, *collect*, *distribute*, *avoid*, *spend*, *write*, *prepare*, *share*, *exchange*, *establish*, *resign* (g)], which are dynamic verbs in active voice constructions, also used in combination with the lexicon of war [35 we reviewed the *battlefield*; 36 join the *fight*].

[34] The judgement – a ruling on an appeal by Stamina – *shocked* scientists in Italy and should *shock* scientists elsewhere. (f)

[35] Every morning, *we reviewed the battlefield* in detail. (g)

[36] We *hope* that sharing our experience – and we *learned* some lessons the hard way – will help other investigators to *join the fight*. (i)

3.2.2. Vannoni/Stamina (DV/S)

Vannoni is addressed with judgmental expressions and overtly evaluative terms [37]. His method is repeatedly labelled as 'controversial' (see headlines (e), (f), (h) and examples [5, 13]). Various negative statements [38 has *not* been scientifically proven, 39 is *not* a qualified doctor, 41 he has *not* published outcomes] are employed to give adverse judgements about his therapy.

[37] Stamina Foundation president Davide Vannoni, *a psychologist at the University of Udine*, says that *the publicity around the treatment has won him 9,000 new patients*. He hopes that further modifications to the law will allow him to expand the therapy. (a)

[38] The Stamina therapy, which *has not been scientifically proven to be effective in a clinical trial* (h)

[39] Vannoni *is not a qualified doctor*, but a teacher of general psychology at the University of Udine. (i)

[40] Vannoni *claims to be executing cures that he prefers to conduct without oversight by independent parties*. (i)

[41] Vannoni acknowledges that *he has not published outcomes* but says that the method is far from alchemy. (a)

[42] Vannoni maintains that he is innocent of this and other charges. (i)

Moreover, he releases statements that attest he does not have any serious scientific background [40, 41], he declares himself innocent of the various charges ascribed to him [42] and states he will continue to administer the therapy.

3.2.3. Italian government (IG)

Nature and the entire scientific community engage with the Italian government in all the texts. This is carried out with a strong argumentative stance that emerges already from the texts' headlines. In the headline of text (c), "Trial and error. Italian officials should not go ahead with expensive clinical tests of an unproven stem-cell therapy that has no good scientific basis", the negative adjective 'unproven' and the absolute negation 'has *no* good scientific basis' provide a clear-cut evaluation of the therapy, thus reinforcing the call on the Italian government. The evaluative adjective 'expensive', moreover, highlights the journal's negative opinion about the Italian government's conduct. This is recommended, through deontic modality ('should'), backing out of its decision of funding a costly clinical test.

Again, in the headline of text (f), "Stem-cell fiasco must be stopped. In the public interest, the Italian health minister should resolve the ongoing uncertainty over a government trial of a controversial therapy", the journal (SC) addresses the Italian health minister Beatrice Lorenzin, urging her to end the trial planned for testing the therapy. The deontic modal 'should' strengthens the illocutionary force of the verb 'resolve'. The passive construction 'must be stopped' with another deontic modal, along with the negative term 'fiasco', a loanword from Italian that means 'complete disaster', does not leave any space to alternatives. The modal 'must' may also be seen as an epistemic or propositional evidential which implies a logical

deduction of facts, given the known facts or evidence – which have been regularly published in *Nature*.

Political institutions, on the other hand, 'decree' [43], 'respond', 'announce' [44], etc., but do not have the power to respond to the judges, to whom Vannoni constantly appeals [45, 46]. They are seen in endless confrontations and negotiations with various actors (Vannoni, the Italian judges [45], scientists [47], the media and the public [45]).

[43] The country's health minister, Renato Balduzzi, has *decreed* that a controversial stem-cell treatment can continue in 32 terminally ill patients. (a)

[44] The decision was *announced* by Health Minister Beatrice Lorenzin (e)

[45] In October, the committee's report prompted health minister Beatrice Lorenzin to halt plans for the clinical trial. That led to public protests in support of Stamina, and, after an appeal by Vannoni, a court ruled in early December that the expert committee was unlawfully biased. Some members had previously expressed negative opinions of the method, the ruling said. As a result, Lorenzin appointed a new committee on 28 December, reopening the possibility of a clinical trial. (a)

[46] Vannoni insists that Stamina will not make a profit. He has also said that, in the opinion of the court, the committee "had neither the right nor competence" to comment on the protocol. (a)

[47] Setting himself against his own regulatory agencies, *Balduzzi had* earlier *angered scientists* when, on 7 March, he authorized continued therapy for a three-year-old child with the deadly disease metachromatic leukodystrophy (a)

3.2.4. The media

The media play a paramount role in the whole case. Their position is a delicate one, as they can change and orient not only public opinion, but also political and healthcare institutions [49]. They contribute to carrying on with the various discussion stages of the incident (i.e. confrontation, acceptance or non-acceptance of a standpoint, upholding non-acceptance of a standpoint, van Eemeren and Grootendorst 2004). They amplify the news about the decision taken by the government to continue with the compassionate use of the therapy and to set up an experimental trial to evaluate the method. In the corpus they are linguistically framed as irrational, chaotic [50 *a renewed media frenzy*, 52 *media outlets*] and superficial [51 *no one […] had bothered to dig*]. Hedging strategies [48 *supposedly*] are

used to cast doubts on the real value of a treatment the media are promoting and defending. Scientists have to defend themselves against their influential pressure, staying "vocal, lucid and rational" [52].

[48] A month ago, an investigatory television programme, *The Hyena*, reported that children with incurable diseases such as spinal muscular atrophy were being denied *supposedly* important treatment [...]. (a)

[49] The decision followed weeks of *media pressure* to authorize compassionate use of the therapy, which was developed by the Brescia-based Stamina Foundation and has been repeatedly banned in the past six years. (a)

[50] Top scientists in Italy have called on the health minister Beatrice Lorenzin to reconsider the composition of the new scientific advisory committee she has proposed to assess a controversial stem-cell therapy offered by the Stamina Foundation.
Their move follows *a renewed media frenzy around the affair*, prompted by statements made to the press and television by the committee's proposed president, Mauro Ferrari, shortly after he was nominated on 28 December. (h)

[51] *But no one – not the journalists, public-health authorities or hospital physicians – had bothered to dig*. We began talking daily with officers in the health unit of the Italian police. (i)

[52] By early 2013, those of us objecting to Stamina *were being vilified by Vannoni and by some media outlets* as keeping children from life-saving treatments. The evidence, which a small group of us had spent months collecting and distributing, *was largely ignored*. We knew that there can be no compassion without safety and efficacy, and that we needed to stay *vocal, lucid and rational*. (i)

3.2.5. Patients, their families and the public (P/F and P)

The patients and their families are seen as an irrational mass of people protesting without being aware of the scientific and health implications of their actions. They are not described as single, different individuals with their own personal stories. Hence, the indefinite quantifiers and vague figures employed to refer to them [14, 16].

At times they are framed as active actors through progressive verb forms [53 *are pushing*] to show that they could literally change and orient the government's and scientists' actions [54 *patient pressure*] by resorting to the media or to the legal system [55]. During the various stages of the case, they sided either with Vannoni against scientists – who had to defend

themselves, even physically – or with scientists against Vannoni. All this highlights a complex net of relationships aimed at discussing and negotiating the various standpoints unravelling through the whole incident (van Eemeren and Grootendorst 2004).

[53] Now, patient groups *are pushing* for the treatment to be available to anyone with an incurable illness. (c)

[54] Now those scientists want the Italian government to pull out of a €3-million (US$3.9-million) clinical trial of the therapy that it promised to support in May, after bowing to *patient pressure*. (b)

[55] Patients and families turned to the *legal system* to allow treatments to continue as compassionate use; many of the courts concluded that it was a patient's right to receive treatment and that health services must offer it. (a)

Scientists engage with the general public as well. They intend to relate to a wider audience, making their voices and reasons heard by – and in defence of – the public. To do this, they resort to the media to inform and persuade the readership. On the other hand, the public does not have at disposal the comments to the news articles and editorials, thus their voice cannot be heard directly and is instead mediated by the journal.

4. Discussion and conclusion

The analysis highlighted how the six actors identified in the corpus (cf. section 3.2) appear and interact from the perspective of the scientific community embodied by *Nature*. The news is conveyed through the specific genre of online news stories, whose nature and purposes (i.e. reaching out to an audience larger than the scientific community) determine the texts' linguistic features. Linguistic strategies are employed by actors in quite hybrid ways, i.e. using those typical of popular genres along with features of specialised discourse (cf. section 3.1). A complex net of relationships and attitudes emerges from the debate, which is polarised between those in favour and those against the Stamina method.

In particular, the discursive strategies employed in the texts (e.g. evaluation, hedging, de-personalisation, citation/quotation, etc.), the use of specialised *vs* non-specialised terminology and specific syntactic constructions contribute to framing and characterising the various discussion stages enacted by the actors involved in the debate as seen through *Nature*, which

can be detailed as follows (see *Table 2*) (cf. van Eemeren and Grootendorst 2004; Vicentini and Grego 2016; Vicentini and Grego forthcoming 2018).

Table 2. – Discussion stages in the Stamina method debate as seen in Nature.

Stage nr.	When	Debate step	Discussion stage	Actors enacting the stage	Where in *Nature*
1	May-July 2013	Reaction of scientific community with involvement in public debate after therapy is allowed for compassionate use	Argumentation - Advancing argumentation / Acceptance or non-acceptance of argumentation	SC P P/F M	(a), (b), (c)
2	October 2013	Reaction to appointment of a scientific committee and to rejection of method	Argumentation and confrontation	IG SC P/F M	(d), (e)
3	December 2013	Appeal to court	Confrontation - Acceptance or non-acceptance of a standpoint, upholding non-acceptance of a standpoint	DV	(d)
4	December 2013	Final rejection of method	Concluding Acceptance or non-acceptance of a standpoint	IG SC DV/S	(e), (f), (g), (h)
5	2014	Focus returns to science: establish results and future plans	Concluding	SC IG	(i)

Each discussion stage triggers the replies of the actors and thus presses the debate forward, with the scientists, Vannoni, the Italian government, the media, the patients and their families as the actors and the reading public as the audience.

The distinctive role played by the scientific community in this case study, along with the various discussion stages within the debate, shows how the pattern of communication of scientific news with public health relevance is on the move, especially when bioethical issues with all their manifold implications are at stake. This is increasingly being influenced by bottom-up pressures and interference, thus presenting a more multifaceted scenario of communication. The traditional pattern of communication (Deficit model), which implied that the public was uninformed and had to be educated, was replaced by a pattern that assumed the public's understanding of science (Public Understanding of Science model). This was then superseded by a paradigm that promoted the idea of engagement and critical, inclusive dialogue (Dialogue model) and, finally, by a model where meanings had to be actively negotiated between different participants (Participation model) (Bucchi 1998; Bucchi and Neresini 2008; Trench 2008; Hetland 2014; Metcalfe 2014; Neresini 2015).

In the incident under scrutiny, in particular, pseudoscientific news reaches the public through the media, bypassing the experts. These, in turn, strongly and unanimously oppose the method, but at first fail to reach out to the public effectively. Any detailed explanation of why the method is unscientific on the part of the scientific community proves to be useless when compared to reality TV, which features interviews with the mother of a terminally ill child who has no other options left. All this both highlights the power of the media in shaping public opinion and shows how cases built on emotions are more powerful than those derived from evidence-based facts (Hunter 2016). Not only, the media campaign turned into protests with people marching through the streets of many Italian cities with shocking actions, which means that public opinion does have power. In fact, a regional court declared that the committee set up by the government to review the case was not objective and its composition should be changed. Hundreds of judges ordered that public hospitals should provide the Stamina treatment to patients.

In order to prevent carrying out a 3-million-euro clinical trial for a therapy with no scientific validity, scientists had to reach out to the national and international scientific community as well as to the public at large through suitable media channels (*Nature*'s news webpages) and popularising discursive strategies. The discussion stages enacted in the debate (*Table 2*) point out that the communication pattern employed in order to demarcate pseudoscience and lay public knowledge is a combination of the Public Understanding of Science and the Dialogue models. These can provide scientific information to and educate the public as well

as make the scientific community listen to the public's perspectives on health/medicine.

The usability and availability of data and sources have unquestionably increased the laypersons' participation (Grundmann 2017; Nichols 2017; Wynn 2017) in the public debate on bioethical topics. They demand to have a say even in specialised issues, sometimes totally distrusting institutions and experts, whose roles are called into question, and preferring trusting pseudoscientists like Vannoni. "Citizens [are] enter[ing] the laboratory, whilst scientists [are] tak[ing] to the streets" (Bucchi 2009, 49), which highlights today's blurring of the expert/lay divide. However, scholars are wondering whether the present complex institutional (health) policy decisions coincide with the needs of a participatory democracy and whether the two sides are even equipped to talk to each other. To be truly participatory, a communication science model would imply that the public should be suitably informed and educated since their early school years. Scientists, on the other hand, should more effectively communicate risk and uncertainty with lay audiences (Kahan, Jenkins-Smith, and Braman 2011), since social-psychological factors play an important role in how people respond to information (Slovic and Västfjäll 2010). This could help science communicators avoid the pitfalls of unintentionally activating unwanted responses and further distancing their audiences (Markowitz *et al.* 2013; Martin 2016).

Against such an intricate scenario, a more critical and responsible attitude on the part of the media is required, which are often viewed as the ultimate mediators between the different actors involved in the debate. The way science is reported in mainstream and social media has raised concerns about its implications for the relationship people have with science. Mainstream media, such as television (either traditional or digital) newspapers and magazines remain the major source of scientific information for many lay audiences. Despite their important role in providing scientific news to the public, their portrayal of science has been blamed for problems with public attitudes towards science (Martin 2016).

To conclude, in the communication of scientific news with public health relevance, power relations are changing and so are the aims, the communicative strategies and the genres employed. The analyses highlighted an ever growing interaction between bottom-up pressures (patients, families, the public, the media) and a top-down diffusion of information (scientists, political and healthcare institutions, the media), with the latter prevailing over the former. It seems crucial that the dissemination and popularisation of scientific issues should be further spread. Scientists must

counter propaganda and hysteria on (social) media, as well as engage more directly with people (Hunter 2016). In particular, being open about uncertainties and questions could help earn public trust in science and eventually unmask pseudoscientists. Scientists have the paramount role of explaining what is not clear, reassuring the public by asserting their authoritativeness and credibility and persuading institutions to take action in order to oppose pseudoscience, which can be carried out only through targeted discursive and argumentative strategies (cf. section 3.2.1). All this makes it significant to continue exploring these media cases and to do so from multidisciplinary angles.

References

Allan, Stuart. 2002. *Media, Risk and Science*. Buckingham - Philadelphia: Open University Press.

Bucchi, Massimiano. 1998. *Science and the Media: Alternative Routes in Scientific Communication*. London: Routledge.

Bucchi, Massimiano. 2009. *Beyond Technocracy: Science, Politics and Citizens*. New York: Springer.

Bucchi, Massimiano, and Federico Neresini. 2008. "Science and Public Participation". In *New Handbook of Science and Technology Studies*, edited by Edward J. Hackett *et al*., 571-597. Cambridge (MA): MIT Press.

Buzzi, Fabio, e Giacomo Tassi. 2014. "La supremazia dei giudici, la sudditanza della scienza medica e la cedevolezza della governance amministrativa e politica in materia di trattamenti sanitari impropriamente qualificati cine compassionevole". *Rivista Italiana di Medicina Legale (e del Diritto in campo sanitario)* 2: 417-430.

Calsamiglia, Helena. 2003. "Popularization Discourse". *Discourse Studies* 5 (2): 147-173.

Calsamiglia, Helena, and Carmen López Ferrero. 2003. "Role and Position of Scientific Voices: Reported Speech in the Media". *Discourse Studies* 5 (2): 147-173.

Calsamiglia, Helena, and Teun A. van Dijk. 2004. "Popularisation Discourse and Knowledge about the Genome". *Discourse and Society* 15 (4): 269-289.

Casella, Filomena, Marianna Longo, Pietro Ferrara, Raffaele Di Guida, and Raffaele Landi. 2013. The "Stamina Case: Bioethical Issues". Paper presented at the UNESCO Chair in Bioethics 9th World Conference *Bioethics, Medical Ethics and Health Law*. Napoli, Italy, November 19-21, 2013.

Catenaccio, Paola, Coleen Cotter, Mark De Smedt, *et al*. 2011. "Towards a Linguistics of News Production". *Journal of Pragmatics* 43 (7): 1843-52.

Cotter, Coleen. 2010. *Investigating the Language of Journalism*. Cambridge: Cambridge University Press.

Dudo, Anthony. 2015. "Scientists, the Media, and the Public Communication of Science". *Sociology Compass* 9 (9): 761-775.

Eilks, Ingo, Jan Alexis Nielsen, and Avi Hofstein. 2014. "Learning about the Role and Function of Science in Public Debate as an Essential Component of Scientific Literacy". In *Topics and Trends in Current Science Education: Contributions from Science Education Research*, edited by Catherine Bruguière, Andrée Tiberghien, and Pierre Clément, vol. 1, 85-100. Dordrecht: Springer.

Eisenhart, Christopher, and Barbara Johnstone. 2008. "Discourse Analysis and Rhetorical Studies". In *Rhetoric in Detail: Discourse Analyses of Rhetorical Talk and Text*, edited by Christopher Eisenhart and Barbara Johnstone, 3-21. Amsterdam - Philadelphia: John Benjamins.

Fairclough, Norman. 1995. *Critical Discourse Analysis: The Critical Study of Language*. London - New York: Longman.

Fairclough, Norman. 2003. *Analysing Discourse*. London: Routledge.

Fattori, Virginia. 2016. *Caso Stamina tra emotività e scienza. Analisi della rappresentazione mediatica dei pazienti e dei loro familiari nella trasmissione televisiva Le Iene Show*. Canterano: Aracne.

Ferraris, Gianluca, and Ilaria Molinari. 2011. *Le cellule della speranza*. Milano: Sperling & Kupfer.

Fraser, Bruce. 2010. "Pragmatic Competence: The Case of Hedging". In *New Approaches to Hedging*, edited by Gunther Kaltenböck, Wiltrud Mihatasch, and Stefan Schneider, 15-34. Bingley: Emerald.

Garzone, Giuliana. 2006, *Perspectives on ESP and Popularisation*. Milano: CUEM.

Gotti, Maurizio. 2005. *Investigating Specialized Discourse*. Bern: Peter Lang.

Gotti, Maurizio. 2014. "Reformulation and Recontextualization in Popularization Discourse". *Ibérica* 27: 15-34.

Gregory, Jane, and Steve Miller. 1998. *Science in Public Communication, Culture and Credibility*. Cambridge (MA): Basic books.

Grundmann, Reiner. 2017. "The Problem of Expertise in Knowledge Societies". *Minerva* 55 (1): 25-48.

Haywood, Benjamin K. 2014. "A 'Sense of Place' in Public Participation in Scientific Research". *Science Education* 98 (1): 64–83.

Henriksen, Ellen K., and Merethe Frøyland. 2000. "The Contribution of Museums to Scientific Literacy: Views from Audiences and Museum Professionals". *Public Understanding of Science* 9: 393-415.

Hetland, Per. 2014. "Models in Science Communication: Formatting Public Engagement and Expertise". *Nordic Journal of Science and Technology Studies* 2 (2): 5-17.

Hunston, Susan, and Thompson Geoff. 2003. *Evaluation in Text: Authorial Stance and the Construction of Discourse*. Oxford: Oxford University Press.

Hunter, Philip. 2016. "The Communications Gap between Scientists and Public: More Scientists and their Institutions Feel a Need to Communicate the Results and Nature of Research with the Public". *EMBO Reports* 17 (11): 1513-1515.

Kahan, Dan M., Jenkins-Smith, Hank, and Donald Braman. 2011. "Cultural Cognition of Scientific Consensus". *Journal of Risk Research* 14 (2): 147-174.

Mandelli, Franco. 2014. *Curare è prendersi cura*. Milano: Sperling & Kupfer.

Markowitz, Ezra M., Slovic, Paul, Västfjäll, Daniel, and Sara D. Hodges. 2013. "Compassion Fade and the Challenge of Environmental Conservation". *Judgment & Decision Making* 8 (4): 397-406.

Martin, Victoria Y. 2016. *Science Engagement from the Audiences' Perspective: Can Participatory Marine Science Communication Increase Public Engagement in Science?* PhD Thesis. Southern Cross University, Lismore (NSW): ePublications@SCU.

Metcalfe, Jenni. 2014. "The Theory Needed to Support Science Communication Practice". Paper presented at the 13th International Public Communication of Science and Technology Conference, Salvador, Brazil, May 5-8, 2014.

Moirand, Sophie. 2003. "Communicative and Cognitive Dimensions of Discourse on Science in the French Mass Media". *Discourse Studies* 5 (2): 175-206.

Neresini, Federico. 2015. *Scienza, Mass Media e Società*. PDF presentation. Padua: University of Padua.

Nichols, Tom. 2017. *The Death of Expertise: The Campaign against Established Knowledge and Why It Matters*. Oxford: Oxford University Press.

Nisbet, Matthew C., and Dietram Scheufele A. 2009. "What's Next for Science Communication? Promising Directions and Lingering Distractions". *American Journal of Botany* 96 (1): 1767-1778.

Peters, Hans Peter. 2012. "Scientific Sources and the Mass Media: Forms and Consequences of Medialization". In *The Sciences' Media Connection – Public Communication and its Repercussions*, edited by Simone Rödder, Martina Franzen, and Peter Weingart, 217-239. Dordrecht: Springer.

Piga, Antonella. 2013. "About Patients, 'Inventors', Journalists, Scientists and IRBs (to Say Nothing of the Institutions): CCSVI and MS". Paper presented at the UNESCO Chair in Bioethics 9th World Conference *Bioethics, Medical Ethics and Health Law*. Napoli, Italy, November 19-21, 2013.

Roland, Marie-Claude. 2005. "The Changing Paradigm of Science Communication: Challenges for Researchers. From a 'Deficit' Model to a 'Democratic' Model". In European Commission, Bruxelles, Belgium, *Communicating European Research 2005: Proceedings of the Conference*. Bruxelles, November 14-15, 2005, edited by Michael Claessens, 63-67. Dordrecht: Springer.

Salager-Meyer, Françoise. 1994. "Hedges and Textual Communicative Function in Medical English Written Discourse". *English for Specific Purposes* 13 (2): 149-171.

Salager-Meyer, Françoise. 2006. *Advances in Medical Discourse Analysis: Oral and Written Contexts*. Bern: Peter Lang.

Salter, Brian, Yinhua, Zhou, and Saheli Datta. 2017. "Governing New Global Healthcare Markets: The Case of Stem Cell Treatments". *New Political Economy* 1 (22): 76-91.

Sarangi, Srikant, and Celia Roberts, eds. 1999. *Talk, Work and Institutional Order: Discourse in Medical, Mediation and Management Settings*. Berlin: Mouton de Gruyter.

Slovic, Paul, and Daniel Västfjäll. 2010. "Affect, Moral Intuition, and Risk". *Psychological Inquiry* 21 (4): 387-398.

Spalletta, Marica. 2015. "Medical Issues in Italian Journalism: The Journalistic Coverage of 'Stamina'". *The International Journal of Communication and Health* 5: 66-76.

Sturgis, Patrick, and Nick Allum. 2004. "Science in Society: Re-evaluating the Deficit Model of Public Attitudes". *Public Understanding of Science* 13 (1): 55-74.

Tassi, Giacomo. 2013. "From Bonifacio's Serum to Stamina Method: The 'Overpromising' of Alternative Therapies". Paper presented at the UNESCO Chair in Bioethics 9th World Conference *Bioethics, Medical Ethics and Health Law*. Napoli, Italy, November 19-21, 2013.

Trench, Brian. 2008. "Towards an Analytical Framework of Science Communication Models". In *Communicating Science in Social Contexts: New Models, New Practices*, edited by Donghong Cheng, Michel Claessens, Nicholas R.J. Gascoigne, Jenni Metcalfe, Bernard Schiele, and Shunke Shi, 119-138. Dordrecht: Springer.

van Eemeren, Frans H., and Rob Grootendorst. 2004. *A Systematic Theory of Argumentation: The Pragma-dialectical Approach*. Cambridge: Cambridge University Press.

Vicentini, Alessandra, and Kim Grego. 2016. "'Vaccines Don't Make your Baby Autistic': Arguing in Favour of Vaccines in Institutional Healthcare Communication". In *Argumentation and Reasoned Action: Proceedings of the First European Conference on Argumentation*. Lisboa, 9-12 June 2015, edited by Dima Mohammesald and Marcin Lewiński, vol. 2, 999-1020. London: College Publications.

Vicentini, Alessandra, and Kim Grego. Forthcoming 2018. "'Meat Gives you Cancer': The Popularisation of Scientific News with Public Health Relevance". *Lingue e Linguaggi* 26.

Wodak, Ruth, ed. 2013. *Critical Discourse Analysis*. London: Sage.

Wynn, James. 2017. *Citizen Science in the Digital Age: Rhetoric, Science, and Public Engagement*. Tuscaloosa (AL): The University of Alabama Press.