Lingue e Linguaggi
Lingue Linguaggi 29 (2019), 93-119
ISSN 2239-0367, e-ISSN 2239-0359
DOI 10.1285/i22390359v29p93
http://siba-ese.unisalento.it,

VAGUE LANGUAGE IN THE MMR VACCINE CONTROVERSY A corpus-assisted discourse analysis of its functional use[1]

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Abstract – This paper explores how vague language is used in multiple forms of specialised knowledge which have contributed to triggering the ongoing debate on MMR vaccine-induced autism. The controversy has been stirred up by the publication of the Wakefield et al. paper in 1998, considered one of the most serious cases of fraud in medical history. In the current paper, contending discourses shaped by different scientific and lay agents are considered in a diachronic perspective in order to investigate how the legitimacy of the knowledge claim is disputed through the functional use of approximators, vague quantifiers, epistemic stance markers, subjective stance markers and general extenders/placeholders. Accordingly, a corpus of various text types is introduced to disclose how fraudulent scientific knowledge is produced, propagated in the public domain as a medical myth, and refuted through investigative journalism which has led to the rare practice of retraction of the 1998 research article. A corpus-assisted approach to discourse analysis is adopted to unpack the functions these vague language categories play in this evolving process of knowledge production, reception and reconstruction, which allows new controversial interpretations of the same knowledge to emerge. Quantitative and qualitative findings shed light on how the set of vague categories functionally operate to cast doubts about scientific knowledge, and strengthen its assumptions on the divide between 'good' and 'bad science'. Ultimately, the study reveals how vague language can be artfully deployed as a covert persuasive technique to undermine public confidence in the benefits of vaccination, also by drawing on the use made of vagueness by the scientific community to express uncertainty as part of the ethical practice of advancing new knowledge claims.

Keywords: vague language categories; corpus-assisted discourse analysis; specialised knowledge dissemination; MMR vaccine controversy; medical fraudulence and myths.

[1] Although this research was jointly conducted by both authors, Anna Franca Plastina is responsible for sections 1, 3 and 4.2; Rosita Maglie for sections 2, 4.1 and 5.

1. Vague language and specialised knowledge

The importance of the audience-oriented feature of vague language (VL) in knowledge claim design has been approached in several studies on medical and scientific discourse, where greater attention has been given, however, to the rhetorical device of hedging over other vague categories (e.g. Dubois 1987; Myers 1989; Salager-Meyer 1994; Plastina, Del Vecchio 2014). In this respect, Channell (1994, p. 18) proposed a taxonomy which covers three main categories of vagueness, namely vague additives, including vague approximators (e.g. *about*) and tags referring to vague category identifiers (e.g. *and stuff like that*); vagueness through lexical choice and quantifiers (e.g. *thingy*; *tons of*); vagueness by implicature in context (e.g. *six feet tall* for six feet and a quarter of an inch). Hence, VL units "can be contrasted with another word or expression which appears to render the same proposition", but are "purposely and unabashedly vague" (Channell 1994, p. 20). In a broader taxonomic view, Zhang (2015, p. 36) considers VL in terms of "stretchers", or expressions with a "fluid and elastic characteristic", and distinguishes four main lexical categories, namely approximate stretchers (approximators, vague quantifiers); general stretchers (general terms), scalar stretchers (intensifiers, softners); epistemic stretchers (epistemic stance markers).

Moreover, vagueness is a pervasive feature of natural language, which is basically connected to the semantic concept of "*underdetermination* and *openness* of meaning" (Égré, Klinedinst 2011, p. 7, original emphasis). Accordingly, VL "remains vague in context, rather than becoming precise", but "does not disrupt ease of communication" (Sabet, Zhang 2015, p. 7). More importantly, VL can be considered as an indicator of intersubjectivity (Overstreet, Yule 2002), thus differing from both indirect and inexplicit language.[2] Its feature of non-specificity is strictly related to the context-dependable variable of "shared knowledge" (O'Keeffe 2003), whereby "any social group sharing interests and knowledge employs non-specificity in talking about their shared interest" (Channell 1994, p. 193). While VL thus marks in-group membership, its use is not, however, merely "a viable communicative option in most scientific writing" (Hyland 1998a, p. 256). It is rather deliberately used in this genre as a "threat-minimizing strategy" (Salager-Meyer 1994, p. 150), serving the overall functional purpose of meeting "adequacy and acceptability conditions" (Hyland 1996, p.437). The linguistic phenomenon of VL therefore appears to play a preeminent role especially when innovative medical knowledge claims are disseminated

[2] See Cheng and Warren (2003) for a detailed distinction between indirectness, inexplicitness and vagueness.

within the scientific community through the publication of research articles. In this interactional context, VL helps negotiate the status of medical knowledge claims in an adequate manner even during the review and revision processes regarding the publication of research articles (Myers 1985). Hence, authors exploit different devices to "stretch language elastically in discursive negotiations" (Zhang 2011, p. 571) for the primary purpose of soliciting acceptance of their medical knowledge claims by an engaged community of readers (Hyland 1998b). In other words, VL allows medical scientists to design their knowledge claims in ways that attenuate criticism (Zhang 2011) and find acceptance for their speculations, while also contributing to building their reputation for the advancements made in the field of medicine both within the scientific community and beyond.

This paper then explores how different VL categories may be exploited to negotiate "moment-to-moment communicative needs" (Zhang 2015, p. 55), which account for the audience-oriented aspect of knowledge claims and their dissemination across both scientific and lay communities. The research advocates the importance of exploring "the different settings in which knowledge circulates, setting out from the supposition that science forms part of the practices of human communities" (Calsamiglia, Ferrero 2003, p. 147). Focusing on the controversial claim that the measles-mumps-rubella (MMR) vaccine is linked to the condition of autism, the study is based on a corpus-assisted discourse analysis (see Baker *et al*. 2008) of a collection of sample scientific and popular texts dealing with the issue of MMR-induced autism. The aim is to seek how varying degrees and types of vagueness are conveyed through a range of linguistic units for the peculiar unethical purpose of obscuring false scientific meaning, and also to investigate how VL categories are further deployed in popular discursive reconstructions of the same debatable knowledge claim. Two main research questions are thus addressed: 1.How do vague categories operate to obscure false scientific meanings?; 2. How are they deployed across the scientific and lay discursive communities to disseminate fraudulent specialised knowledge?

Overall, the investigation attempts to highlight how vague categories are purposively used across the two communities as different vehicles of the unique discursive practice of disseminating fraudulent specialised knowledge and propagating medical misbeliefs. It may also shed light on the ways in which VL contributes to widely conditioning parents' refusal of vaccinating their children, thus leading to the growing concern of increased MMR morbidity and mortality.

2. The MMR vaccine controversy: disseminating 'bad science'

In a diachronic perspective, the worldwide controversy on the safety of the MMR vaccine dates back to the publication of the Wakefield et al. paper in the prestigious medical journal, *The Lancet* in 1998. The article presented the case of twelve children with assumed brain disorders and specifically correlated brain damage and the onset of a new bowel syndrome (autistic enterocolitis) with the fact that they had previously received the MMR vaccine. Linguistic research has focussed on the "harms of hedging" caused by Wakefield's article (see Kolodziejski 2014). However, it has largely underestimated the "discursive gaps" created by other potential vague devices, which allow for alternate interpretations as the scientific text has passed from the medical community to public contexts. The alarming medical breakthrough prompted, in fact, the publication of new medical articles by other researchers, who failed, however, to replicate Wakefield's research and rejected his subjective claims through the conventional rhetorical use of VL to mark scientific uncertainty. Nevertheless, the "medical myth" (see Vreeman, Carroll 2007) started to spread in the public arena even thanks to a video-news release distributed by the Royal Free Hospital (Wakefield's workplace) and a science-by-press conference held by Wakefield himself.

While the use of VL in these discursive practices appeared to publicly grant Wakefield the claim to expertise, the legitimacy of the disputed claim was particularly contended by the journalist Brian Deer, who started writing newspaper articles the same year Wakefield's paper was published. In his investigations for *The Sunday Times*, and the UK *Channel 4* TV network,[3] Deer highlighted how Wakefield's findings merely relied on the memories and assertions of the sample children's parents and were not evidence-based although their presumed "regressive autism" had appeared days after receiving the MMR vaccine. Moreover, Deer found that Wakefield had been secretly payrolled by a lawyer, Richard Barr, to produce evidence against the MMR vaccine two years before the publication of the *Lancet* paper and had filed a patent on a presumed "safer" single measles vaccine, nine months before the 1997 science-by-press conference during which he called for single vaccines. Another crucial issue unearthed by Deer refers to Wakefield's deliberate tampering with results: even though the hospital's clinicians and pathology service had not detected any correlation between autism and the MMR vaccine in these children, Wakefield misreported and misrepresented their histories and diagnoses, thus acting entirely in his own

[3] See https://briandeer.com/mmr/andrew-wakefield.htm.

interests. Furthermore, the British and American anti-vaccine movements were gaining strength supported by Wakefield's claim of the link between what he called an "epidemic of autism" and the MMR vaccine, which continued to be constantly spread through conferences (e.g. "Defeat Autism Now" conference, 1998) and the media (e.g. the CBS network's 60 Minutes programme, November 2000). In parallel, Deer's investigative outcomes started to circulate extensively to the point that Wakefield's *Lancet* paper was retracted in 2004, and a professional misconduct hearing was held by the UK General Medical Council (GMC) between 2004-2010. Notwithstanding the burden of proof on his misconduct, Wakefield issued a claim for libel following the broadcast of Deer's "MMR-What they didn't tell you" in November 2004. While in 2007 Wakefield agreed to abandon his claim and to pay the defendants' costs, in 2010 the GMC found him guilty of serious professional misconduct on a number of charges and subsequently erased him from the UK doctors' register. *The Lancet* fully retracted Wakefield's paper the same year and in 2011 *The British Medical Journal* (BMJ) published three major reports by Deer on the MMR fraud. As the first investigative journalist to publish in a medical journal, Deer was named the UK specialist reporter of the year by the British Press Awards. Deer's collection of overwhelming evidence and the institutional system of retractions have alerted the scientific community, whereby "the publication of false science […] cause[d] the dramatic loss of reputation for the individual scientist associated with the falsification" (Furman *et al*. 2012, p. 278). Paradoxically, however, the "medical myth" and the anti-MMR campaign still continue to be in the spotlight; the media appear to persist in artfully taking full advantage of VL as a covert persuasive technique. Based on the premise of the evolving process of MMR knowledge production, reception and reconstruction in multiple scientific and popular text types, the present investigation thus seeks to uncover how VL contributes to constructing "bad science" and reconstructing it as "good science" in popular contexts.

3. Corpus and methodology

The corpus is composed of 64 texts (117,709 words) selected from scientific and popular web-based sources according to the criterion of different text types in which vague categories may be used to mediate the pros and cons of the MMR vaccine controversy. For present purposes, the collection was divided into two sub-corpora, namely the Scientific MMR (SMMR) subcorpus and the Popular MMR (PMMR) one. The SMMR is made up of a total of 39 texts counting 65,293 words and covers seven different text types

including scientific abstracts, Brian Deer's BMJ articles,[4] Wakefield's journal articles, the *Lancet* journal retractions, scientific journal correspondence, editorials and Wakefield's science-by-press conference;[5] the PMMR is made up of 25 texts amounting to 52,416 words, and includes seven different text types, namely a blog, press interviews, radio shows, TV interviews, internet videos, TV news and newspaper articles. The contribution of fourteen different text types is here seen as helping increase balanced corpus representativeness. A combination of quantitative and qualitative methods has been adopted in the study as "mutually supportive methodologies" (Mautner 2009), thus combining a corpus linguistic approach and critical discourse analysis for in-depth analysis and data reliability (Partington 2006). The analysis was first conducted through the basic corpus linguistic methods of frequency counts and concordance lines using Wordsmith 5.0 concordancer to identify the occurrence of vague categories in the two subcorpora, based on Channell (1994) and Zhang's (2015) taxonomies. A limited use was thus made of these corpus-based techniques to provide preliminary findings before the qualitative analysis (Baker *et al.* 2008). This was conducted to bring to light the different vague categories deployed in the representation of specialised knowledge as "bad science" and in its popular redefinition as apparently "good science". In this second step of the analysis, data was coded according to the following five categories: 1. *approximators* (smaller or bigger than the exemplar number, bigger than the exemplar number or smaller than the exemplar number); 2. *vague quantifiers* (multal, paucal, negative or neutral), whereby multal quantifiers (e.g. *many*) are intensifiers in assertive contexts, paucals (e.g. *a bit of*) are downtoners in both assertive and negative contexts, negative quantifiers (e.g. *few*) are minimisers in negative contexts, and neutral ones (*several*) are used in both contexts (Zhang 2015, p. 29); 3. *epistemic stance markers* (doubt, actuality and reality, source of knowledge, limitation of knowledge, viewpoint and perspective); 4. *subjective stance markers* (speaker's attitude toward proposition, style and manner of speaking, or imprecision/hedging); 5.*general extenders* (adjunctive or disjunctive) and *placeholders* (dummy nouns). Although these vague categories were treated together for their common pragmatic interpersonal function of sharing MMR knowledge, general extenders were understood to "have nonspecific reference or 'general' reference, and […] 'extend' otherwise grammatically complete utterances" (Overstreet, Yule 1997, p. 251) usually in clause-final position; placeholders were considered as

[4] As a scientific journalist, Deer was exceptionally asked to write three articles for the BMJ. Thus, these articles appear to belong to a hybrid genre compared to Wakefield's ones.

[5] The practice by which scientists put unusual focus on promoting their questionable research findings by turning to the media when they are unlikely to gain consensus within the scientific community (Jerome 1989).

"dummy nouns which stand for item names" (Channell 1994, p. 164). Moreover, both *adjunctive general extenders* (e.g. *and everything*) and placeholders (e.g. *something*) serve the primary function of signaling that "'there is more' to infer, thus marking assumed reciprocity of perspectives" (Overstreet 2005, p. 1855); disjunctive general extenders, instead, are "tied to indicating potential alternatives, and hence hedging on what has been said" (Overstreet 2005, p. 1855) for different functional purposes. A critical discourse analytical approach was finally adopted for interpretation and explanation of all these vague categories within their social context of use (Fairclough 2013).

4. Analysis and results

4.1. The scientific sub-corpus

4.1.1. Approximators and vague quantifiers

Approximators are not particularly used across the different subcorpus text types (*N*=42), thus suggesting that their function in scientific discourse is quite irrelevant, as shown in Table 1.

	Approximators		
Scientific Genre	*Smaller or bigger than the exemplar number* (*N*=16)	*Bigger than the exemplar number* (*N*=10)	*Smaller than the exemplar number* (*N*=16)
Abstracts (11)	Or (5) About (1) Approximately (1)	Over (2)	Almost (1) Nearly (1)
Deer's articles (21)	About (4) Or (3)	At least (3) Or so (1) Over (1)	Almost (5) Nearly (4)
Wakefield et al. papers (7)	Around (1) Or (1)	At least (1) Over (1)	Less than (2) Almost (1)
Correspondence (2)	=	=	Almost (2)
BMJ Editorial (1)	=	At least (1)	=
Lancet retractions (0)	=	=	=
Wakefield's Science-by-Press conference (0)	=	=	=

Table 1
Approximators per scientific genres in the SMMR subcorpus.

In particular, the limited use of numerical approximators appears to point to the expected scientific practice of providing exact numbers, whereby only Brian Deer, as a journalist and not a scientist, is consistently found to make a more frequent use of this category in his *BMJ* articles (*N*=21). The use of *less than* (2) in the abstract and result sections of two Wakefield et al. papers appears, instead, to be an acceptable practice in medical research articles as exact numbers can be found in other parts of the papers, as well as in the figures and tables. A*round*, *at least*, and *or* all occur only once in *The Lancet* retracted paper to approximate age, year, allele, thus assuming that there is no fixed pattern when a biological process, a disease onset or a genetic inheritance take place in human beings, as indicated respectively in Examples (1)-(3):

(1) Vitamin B12 is essential for myelinogenesis in the developing central nervous system, a process that is not complete until **around** the age of 10 years (*Wakefield et al., Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children, The Lancet, 1998)*
(2) Disintegrative psychosis is typically described as occurring in children after **at least** 2-3 years of apparently normal development (*Wakefield et al., Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children, The Lancet, 1998*).
(3) individuals inheriting one **or** two C4B null alleles may not handle certain viruses appropriately (*Wakefield et al., Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children, The Lancet, 1998*).

The more recurring use of *or* (*N*=5) in the abstracts mainly suggests that exact MMR vaccine dosage is not a factual determinant of *pervasive developmental disorder/autism*, as indicated in Example (4):

(4) Thus, no relationship was found between pervasive developmental disorder rates/autism and 1- **or** 2-dose measles-mumps-rubella immunization schedule (*Fombonne et al., Pervasive Developmental Disorders in Montreal, Quebec, Canada: Prevalence and Links With Immunizations, Pediatrics, July 2006*).

There is uniformity of context of occurrence when Deer uses *almost*, *nearly* and *about* in his BMJ articles to respectively approximate the impact of fraud research in terms of the *Lancet* children's health state (Example 5a), and the economic drive behind it (Example 5b):

(5) a. In **almost** all the children, […] the hospital's pathology service found the children's colons to be largely normal, but a medical school "review" changed the results […] And as an alternative explanation for any inflammation that was present, **nearly** all of the children had constipation with megarectum (unreported in the paper), which specialists say can cause cellular changes (*Brian Deer, Wakefield's "autistic enterocolitis" under the microscope, BMJ, 15 April 2010*).

b. It is estimated that by year 3, income from this testing could be **about** £3,300,000

rising to **about** £28,000,000 […] (*Brian Deer, How the vaccine crisis was meant to make money, BMJ, 11 January 2011*).

While in (a), the use of *smaller* approximators than the number of sample children highlights the inexactness of medical test results (*changed*, *unreported*), the calculation in (b) oscillates between a large numerical interval (from smaller to bigger), which denotes the *estimated* enormous profit Wakefield expected to gain from the study.

As for vague quantifiers, *multal* and *neutral* subtypes are the most frequent ones in the subcorpus (*N*=156) with a more meaningful occurrence of *some* in both Wakefield and Deer's works (see Table 2). In the 1998 article, Wakefield claimed the discovery of a *new* syndrome, although the exact number is used with a *neutral* value (*some cases, some children*) in order to attenuate possible criticism (Zhang 2011), as shown in Example (6a). Drawing on the importance of medical breakthroughs (*it is important to consider*), the subsequent occurrence of *some* seems to resort to its more conventional scientific function of expressing tentativeness (Hyland 1996), also strengthened by the modality of possibility (*might potentially*). This deliberate use helps build the credibility of the initial claim *soon after MMR vaccine*.

(6) a. a new syndrome has been reported in children with autism […] (autistic enterocolitis), in **some** cases *soon after MMR vaccine*. […] it is important to consider why **some** children might potentially react aberrantly to a vaccine when the majority do not (*Wakefield, Enterocolitis, autism and measles virus, Mol Psychiatry 7 Suppl., 2002*).

b. **Some** children were reported to have experienced first behavioural symptoms *within days of MMR*, but the records documented these as starting **some** months after vaccination […] there is a suggestion that **some** of his problems [child 4] may have started *before vaccination* […] **some** of the authors met and agreed that the paper, already intended for submission to the high impact journal, was accurate […] (*Brian Deer, Pathology reports solve "new bowel disease" riddle, BMJ, 9 November 2011*).

In Example (b), instead, vague neutrality is used by Deer to objectively highlight the arguable correlation between behavioural symptoms and their temporal onset, grounded in evidential proof (*records documented*), which point to *some months later*, and *before vaccination*. In spite of data manipulation, Deer further quantifies the authors as *some* to implicitly indicate the unimportance of the precise number (but at least two *met and agreed*) compared to the scandalous fact that some consent was reached on data accuracy.

	Vague Quantifiers			
Scientific Genre	*Multal* (*N*=61)	*Paucal* (*N*=1)	*Negative* (*N*=3)	*Neutral* (*N*=95)
Abstracts (6)	Number of (3)	=	=	Several (2) Some (1)
Deer's articles (59)	Many (11) Much (6) A lot of (1) A Load of (1) A Number of (1)	A bit (1)	Little (1) Few (1)	Some (28) A few (5) A couple of (2) Several (1)
Wakefield et al. papers (67)	Many (13) Numbers of (7) Much (3)	=	=	Some (37) Several (6) A few (1)
Correspondence (9)	A number of (2) Many (1)	=	=	Some (6)
BMJ Editorials (6)	Many (2) A great deal of (1) A number of (1)	=	Few (1)	Several (1)
Lancet Retractions (1)	Much (1)	=	=	=
Wakefield's Science-by-Press Conference (12)	Many (3) Much (1) A lot of (1) A great deal of (1) A number of (1)	=	=	Some (3) Several (1) Couple (1)

Table 2
Vague quantifiers per scientific genres in the SMMR subcorpus.

4.1.2. Stance markers

In five out of the seven text types analysed, epistemic stance markers were found to mostly signal *doubt* (*N*=50) and point to *actuality/reality* (*N*=19), while in four types they were also used to indicate *source of knowledge* (*N*= 27). The most recurring markers were the modal *may + be* in Wakefield et al. papers and the verb *I think* in Wakefield's science-by-press conferences and in Deer's BMJ articles, as shown in Table 3.

	Epistemic Stance Markers				
Scientific genre	*Doubt* (*N*=50)	*Actuality and Reality* (*N*=19)	*Source of Knowledge* (*N*=27)	*Limitation* (*N*=7)	*Viewpoint/ Perspective* (*N*=6)
Abstracts (3)	=	=	=	Typically (3)	=
Deer's articles (53)	(I, you etc.) think (11) Maybe (7) Probably (1)	Really (6) Actually (5) In fact (4)	According to (7) Apparently (5) Reputedly (2) Evidently (1)	Typically (1)	In (my, your etc.) view (3)
Wakefield's et al. papers (37)	May be (21) Probably (1) Most Likely (1)	Truly (1)	Apparently (5) According to (5)	Typically (2) Mainly (1)	=
Correspondence (7)	Maybe (1)	In fact (2)	According to (1)	=	In (my, your etc.) opinion (3)
BMJ Editorials (2)	Perhaps (1)	In fact (1)	=	=	=
Lancet Retractions (1)	=	=	According to (1)	=	=
Wakefield's Science-by-Press Conference (6)	Perhaps (2) I think (4)	=	=	=	=

Table 3
Epistemic stance markers per scientific genres in the SMMR subcorpus.

The modal *may* not only indicates that there is a possibility that a medical phenomenon is plausible (*majority* vs. *subgroup* of children) (7a), or is true in some circumstances (*after measles, mumps and rubella immunisation*) (7b), but it also signals the authors' presence in a text. As observed by Halliday and Matthiessen (2004, p.624), "[m]odality represents the speaker's angle", as it indicates his/her knowledge and commitment to the truth of the proposition (Palmer 2001). Wakefield et al. appear to be uncertain (7a) about the correlation between chronic enterocolitis and MMR immunisation (7b), but their mention only of the MMR vaccine discourages alternative interpretations, thus leading the reader to share their own views.

(7) a. Whether such abnormalities <u>may be</u> seen in the majority of children with autism, or are restricted to a subgroup with clear regression, remains uncertain (*Torrente et al. (Wakefield included), Small intestinal enteropathy with epithelial IgG and complement deposition in children with regressive autism, Molecular Psychiatry, 2002*).

b. a chronic enterocolitis in children that <u>maybe</u> related to neuropsychiatric dysfunction. In most cases, onset of symptoms was after measles, mumps, and

> rubella immunisation. Further investigations are needed to examine this syndrome and its possible relation to this vaccine (*Wakefield et al., Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children, The Lancet, 1998*).

While in the medical texts the author's presence tends to be minimal, in the science-by-press conference Andrew Wakefield marks his presence more explicitly using the possessive adjective *my* and the first person pronoun *I*. He uses *I think* as a way of being polite to make his statement sound less forceful but, bridging science (he as a health scientist) with conscience (he as a human being whose *mind* tells him to do what it is right), he induces the audience to strongly believe he is acting in the interests of patients' safety (8).

(8) There is sufficient anxiety in my own mind for the long term safety of the polyvalent vaccine—that is, the MMR vaccination in combination—that I think it should be suspended in favour of the single vaccines (*Wakefield, science-by-press conference, 26 February 1998*).

Instead, he is actually taking advantage of parents' state of vulnerability and of their anxious search (*looking for answers*) in the hope that their youngsters may recover (9). Under these conditions, they are thus more likely to place complete trust in what they are told by doctors. This explains Deer's detached commitment *(I do not think*) to the remote possibility of a *connection with MMR* (*only suspicion*) based on the family's uncertainty.

(9) As for a connection with MMR, there was only suspicion. I do not think his family was sure, one way or the other. When I asked why they took him to the Royal Free, his father replied: "We were just vulnerable, we were looking for answers" (*Brian Deer, How the case against the MMR vaccine was fixed, BMJ, 5 January 2011*).

Furthermore, subjective stance markers were the least frequent category found in the SMMR subcorpus with only 13 instantiations occurring in Deer's articles, Wakefield et al. papers, and correspondence (see Table 4). The feasible difficulty of explaining a medical phenomenon lies at the basis of the use of two contrasting subjective stance markers: *surprisingly* in Wakefield et al. papers and *curiously* in Deer's *BMJ* articles. The former is used to indicate the current limitation of medical knowledge without providing any evidence whatsoever of the claim that *upper gastrointestinal pathology, […], is also present in these children at a surprisingly high rate* (*Wakefield, Enterocolitis, autism and measles virus, Mol Psychiatry 7 Suppl., 2002)*. The objective of this attitude is only to cast doubt and undermine the reader's prior certainty; the latter marker is ironically used to illuminate the reader that *curiously, however, Wakefield had already identified such a syndrome before the project which would reputedly discover it* (*Brian Deer, How the case against the MMR vaccine was fixed BMJ, 5*

January 2011). The subjective stance marker is here backed up by irrefutable evidence that Wakefield made his assumption as far back as two years before the publication of the *Lancet* paper when he was secretly payrolled to find scientific proof against MMR vaccine.

	Subjective Stance Markers		
Scientific genre	*Speaker's Attitude toward Proposition* (*N*=2)	*Style Stance Marker (manner of speaking)* (*N*=8)	*Imprecision/ Hedging* (*N*=3)
Abstracts (0)	=	=	=
Deer's articles (8)	Curiously (1)	Simply (4)	Kind of (3)
Wakefield et al. papers (3)	Surprisingly (1)	Simply (1) Briefly (1)	=
Correspondence (2)	=	Simply (2)	=
BMJ editorials (0)	=	=	=
Lancet retractions (0)	=	=	=
Wakefield's Science-by-Press Conference (0)	=	=	=

Table 4
Subjective stance markers per scientific genres in the SMMR subcorpus.

4.1.3. Placeholders for sharing MMR knowledge

While no general extenders were recorded in the SMMR subcorpus, a small number of placeholders (*N*=27) was found to be used to mark that there could be more to say. The most frequently occurring placeholder turns out to be *something* in Wakefield's science-by-press conference and in Deer's articles (see Table 5). Although in both cases, there appears to be more MMR knowledge to infer, the placeholder is used for contrasting purposes, as suggested in Example 10 (a) and (b), respectively by Wakefield and Deer:

(10) a. **something** that we started after parents put us up to this back in 1998 and it was remarkable the benefit to children (*Wakefield, science-by-press conference, 26 February 1998*).

b. Did the scientific community ever really believe that 12 families had turned up consecutively at one hospital, with no reputation for developmental disorders, and make the same highly specific allegations – with a time-link of just days – and that there was not **something** fishy going on? (*Brian Deer, Piltdown medicine: the missing link between MMR and autism, BMJ online, 5 January 2011*).

In (a), Wakefield uses the placeholder *something* as a dummy noun, taking for granted that his audience shares knowledge about his research. On this common ground, he attempts to establish mutual agreement with his public by drawing on his deontological duty as a medical scientist and head of a research team, who is called to fulfil parents' impelling needs (*parents put us up to this*). Thus, the context-dependent use of the placeholder appears to help Wakefield gain public consensus, especially as the resulting *benefit to children* was *remarkable*. Yet, Deer in (b) questions Wakefield's utterance by using the placeholder *something* to signal a perceived "breach of the reciprocity of perspectives" (Overstreet 1999, p. 74), which is then overtly further marked by the negative qualifier *fishy*. The overall effect is to arouse his readers' suspicion of Wakefield's conduct against the scientific community's skepticism (*ever really believe*).

Scientific genre	*Placeholders (N=27)*
Abstracts (0)	=
Deer's articles (20)	Something (5) Anything (4) Things (4) Anybody (3) Somebody (2) Someone (1) Stuff (1)
Wakefield's et al. papers (0)	=
Correspondence (1)	Anything (1)
BMJ Editorials (1)	Anything (1)
Lancet Retractions (0)	=
Wakefield's Science-by-Press Conference (5)	Something (3) Someone (2)

Table 5
Placeholders per scientific genres in the SMMR subcorpus.

4.2. The popular sub-corpus

4.2.1. Approximators and vague quantifiers

A total of 56 vague approximators were found in the PMMR subcorpus (Table 6) with major occurrences in the newspaper article (*N*=16), the press interview (*N*=14), and the TV interview (*N*=12), thus suggesting how these categories seem to support the "audience-oriented" feature in these popular genres. In particular, the most frequent sub-type of approximator recorded was *about* (*N*=27), which was mainly used to vaguely indicate exemplar

numbers without a precise cut-off point (*smaller or bigger than the exemplar number*).

	Approximators		
Media genre	*Smaller or bigger than the exemplar number (N=29)*	*Bigger than the exemplar number (N=16)*	*Smaller than the exemplar number (N=11)*
Blog (0)	=	=	=
Press Interview (14)	About (10)	Over (1) Or so (1) At least (2)	=
Radio Show (7)	About (5) Approximately (1)	At least (1)	=
TV Interview (12)	About (5)	At least (4) Over (1)	Less than (2)
Internet Video (6)	Roughly (1)	Over (2) At least (2)	Nearly (1)
TV News (1)	=	=	Almost (1)
Newspaper Articles (16)	About (7)	At least (2)	Nearly (5) Almost (2)

Table 6
Approximators per media genres in the PMMR subcorpus.

The effectiveness of *about* in shaping meaning making can be seen in Example (11), where Wakefield approximates the number of his publications for the subtle functional purpose of impressing the public audience so as to gain recognition for his expertise, and thus indirectly, for his knowledge claim:

(11) I have now published **about a hundred thirty, one hundred forty** peer-reviewed papers looking at the mechanism and cause of inflammatory bowel disease and then of course lately, looking at how the brain and the bowel interact in the context of children with developmental disorders such as autism (*Wakefield's press interview with the alternative medicine proponent, Dr.Mercola, April 10, 2010*).

In other words, vagueness is more salient in terms of the size of the two numbers representing the interval of approximation (*a hundred thirty, one hundred forty*), and the nature of the item modified (*peer-reviewed papers*).

However, when the same approximator is employed to disseminate valid scientific knowledge in the public arena, its functional use of indicating scientific uncertainty appears to be re-established, as shown in Example (12):

(12) Larry King: What causes autism, in your opinion? If not vaccines, what does? Dr. M. Wiznitzer: Well, we know that in **about 10 percent to 15 percent** of the cases, we can identify a genetic causation… (*CNN interview, April 3, 2009*).

Despite the American TV host's question seems to solicit a subjective answer (*in your opinion*), the pediatric neurologist uses the approximator *about* to convey scientific knowledge on objective grounds, whereby the vague unit is understood to modify the exemplar percentages based on the current limitations of *the cases* known. This then allows him to gain popular credibility so that the scientific community claim (*we can identify genetic causation*) is perceived as more trustworthy.

On the other hand, 333 instantiations of vague quantifiers referring to non-numerical quantities were found in the subcorpus, thus outweighing the occurrence of approximators especially in the press interviews (*N*=76), the newspaper articles (*N*=75), and the TV interviews (*N*=66). Vague quantifiers were mainly exemplified through the use of the *multal* subtype (*N*=166) and the *neutral* subtype (*N*=122) (see Table 7).

Interestingly, the major openness of meaning which these vague quantifiers appear to create is particularly reflected in the use of the multal subtype *many* (*N*=82). As an intensifier, *many* is understood to serve two diachronic functional purposes. First, it allows Wakefield to build an assertive context in which his MMR claim is boosted without producing 'true' knowledge and offering any further precise information other than that based on parents' subjective perceptions (Example 13a); secondly, it helps influential "popularisers of science", such as the English actress Jeni Barnett, to "engage in the mystification of science" (Bauer 1998, p. 79) and perpetrate deceptive information about the risk of the MMR vaccine even after a decade or so (Example 13b):

(13) a. […] in **many cases** they [mothers] claimed it was the measles, mumps and rubella vaccine, and then had lost their … all their acquired skills, such as speech, language, developmental milestones […] We've been looking for the cause of autism in the brain for **many, many years** and yet have failed to define it (*Twenty Twenty Television interview, February 4 1998).*

b. I, however, have talked to **many** people over the years – 22 years I've lived with my daughter – and over the years **many many** people have said the same thing, that when we were little, chicken pox, you took your kid to get the chickenpox, you made sure your child was near somebody who had it (*Jeni Barnett LBC Radio Show, 7 January 2009*).

	Vague Quantifiers			
Media genre	*Multal (N=166)*	*Paucal (N=22)*	*Negative (N=23)*	*Neutral (N=122)*
Blog (2)	Most (1)	=	=	Some (1)
Press Interview (76)	Many (14) Much (6) A lot of (6) A number of (4) A great deal of (3) Loads of (1) Numbers of (1)	A bit (4) A little (1)	Few (2)	Some (28) Several (2) A few (3) A couple of (1)
Radio Show (41)	Many (6) Much (4) A lot of (4) Lots of (3)	A (little) bit of (3)	Little (6) Few (3)	Some (10) Several (1) A couple of (1)
TV Interview (66)	Many (25) Much (12) Lots of (3) A lot of (8) A number of (1)	A little (3) A bit (1)	Little (1) Few (1)	Some (11)
Internet Video (55)	Many (19) Much (3) A lot of (3) A * deal of (2) A number of (1)	A little (2) A bit (1)	Few (1)	Some (17) A few (3) Several (3)
TV News (18)	A lot of (3) A number of (2) Many (2) Much (2)	A little (2) A * bit (1)	=	Some (5) Couple (1)
Newspaper Articles (75)	Many (16) Much (7) A lot of (1) Numbers of (1) A * deal (1) A number of (1)	A little bit of (1) A little (3)	Little (5) Few (4)	Some (25) Several (6) A few (3) Couple (1)

Table 7
Vague quantifiers per media genres in the PMMR subcorpus.

The *neutral* subtype *some* as the other most frequent vague quantifier (*N*=97) was used in a similar vein as illustrated in Example (14), where Dr. Healey, health editor of *U.S. News and World Report* claims:

(14) We are all pro-vaccine… but there are **some** vaccines here – let's forget about autism - there are **some** *vaccines* here that one - a parent - can legitimately question *(Internet video, April 3, 2009).*

The seemingly loaded word here is *vaccines*, and *some* is used as a neutral quantifier to help the speaker avoid his commitment to the misleading issue of vaccine safety. In other words, the neutral quantificational term *some* deliberately helps overcome the more precise contradiction that there must

exist at least one questionable vaccine, whereby the claim would overtly result as being false. Hence, this suggests that the numerous neutral vague quantifiers in the subcorpus contribute to creating power relations in the media social situations where scientific knowledge is misleadingly popularised, thus "producing social wrongs" (Fairclough 2013, p. 8).

4.2.2. Popular stance markers

A total of 310 epistemic stance markers were reported in the PMMR subcorpus (see Table 8) with higher occurrences of the markers *I think* (*N*=84) and *really* (*N*=83).

A predominantly 'deliberate' use was made of *I think* as an interactional source, whereby it appeared to mainly function as a 'boosting' device of propositional content and to mark a greater degree of the speaker's personal involvement (Aijmer 1997), as shown in Example (15a):

(15) a. Jeni Barnett: So, **I think** they must have a certain amount of natural immunity - and I'm far, far happier for them to have developed that 'natural immunity' - than to be constantly filled with artificial substances.

b. Amanda: Then my son was born and he reacted very badly to what **I think** then was the double or triple jab (*Jeni Barnett LBC Radio Show, 7 January 2009*).

The epistemic marker allows the English actress to display her personal "epistemic access" to knowledge (K+), indicate her relative "epistemic rights" to know and claim authority of knowledge, besides marking her "epistemic responsibility" in terms of experiential knowledge (*natural immunity*) as one "type of knowables" (Stivers *et al*. 2011, pp. 10-17). As an upgrading marker of certainty of children's innate immunity (*they must have*), *I think* is deliberately placed in the initial position to orient the outcome of the negotiation process with her direct interlocutor, who is expected to respond in a way that will, perhaps, change her epistemic status from K- to K+, i.e., from uncertainty to certainty of propositional content. In Example (15b), in fact, mutual agreement is reached (*reacted very badly*) on *the double or triple jab*. Also due to her popularity, the English actress is thus treated as knowing (Stivers *et al.* 2011) in spite of the fact that she further grounds her claim in an unreliable knowledge resource. The vague quantifier *a certain amount*, in fact, persuasively functions as an additional upgrading marker of *natural immunity* in order to weaken the MMR vaccine, vaguely represented through the negative connotation of *artificial substances*.

	Epistemic Stance Markers				
Media genre	*Doubt (N=132)*	*Actuality And Reality (N= 141)*	*Source of Knowledge (N=19)*	*Limitation (N=4)*	*Viewpoint/ Perspective (N=14)*
Blog (0)	=	=	=	=	=
Press Interview (120)	I think (24) Probably (5) I guess (3) Perhaps (2) Maybe (1)	Really (52) Actually (11) In fact (10) Truly (2)	According to (3)	Typically (1)	In (my, your etc.) opinion (6)
Radio Show (45)	I think (28) Probably (2) Maybe (2)	Really (10) Actually (3)	=	=	=
TV Interview (62)	I think (25) Maybe (5) Perhaps (4) Probably (2)	Really (10) Actually (7) In fact (3) Truly (1)	=	=	From * point of view (1) In (my, your etc.) opinion (4)
Internet Video (44)	Probably (1) Perhaps (2) Maybe (3) I think (5)	Really (7) In fact (6) Actually (6)	According to (8) Apparently (2)	Typically (2)	In (my, your, etc.) opinion (2)
TV News (14)	I think (7) Probably (1)	Actually (4) Really (1)	=	Typically (1)	=
Newspaper Articles (25)	Perhaps (3) Maybe (1) (I, you, etc.) think (6)	Really (3) Actually (3) In fact (2)	Apparently (1) According to (5)	=	In * view (1)

Table 8
Epistemic stance markers per media genres in the PMMR subcorpus.

When *I think* is juxtaposed with the equally frequent use of *really*, it is possible to note how contending discourses on the legitimacy of the medical myth arise, as reported in Example (16):

(16) To be **really** accepted, novel scientific findings must be repeated by others, and relevant experts are consulted on plausibility. (*Brian Deer, Doctoring the evidence: what the science establishment doesn't want you to know The Sunday Times, August 12 2012*).

Here, the investigative journalist Brian Deer uses the adverbial stance marker *really* to express his judgment of truth, based on the evidence presupposed by the reality of the scientific community regarding *novel scientific findings*. Thus, the evidential marker *really* allows Deer to evaluate the validity of the information on the basis of its evidential source, and to express his positive judgment about the factual truth of the proposition (see Palmer 2001).

In sum, while the evidential marker *really* implicitly points to Wakefield's bogus data first exposed by Deer and helps regain confidence in the rigour of scientific findings, the epistemic marker *I think* denotes how Barnett is not held accountable to the same degree for her knowledge, and

serves to cast doubts on vaccine safety. Consistently with this negative view, more than half of the subjective stance markers (*N*=74) functioned as markers of imprecision/hedging (*N*=42) with a more significant occurrence of the two expressions *sort of* (*N*=23) and *kind of* (*N*=19) (see Table 9).

	Subjective Stance Markers		
Media genre	*Speaker's Attitude toward Proposition (N=9)*	*Style Stance Marker (manner of speaking) (N=23)*	*Imprecision/ Hedging (N=42)*
Blog (14)	=	=	Sort of (9) Kind of (5)
Press Interview (22)	Hopefully (4) Unfortunately (1)	Literally (3) Simply (2) Briefly (1)	Sort of (7) Kind of (4)
Radio Show (2)	=	=	Sort of (1) Kind of (1)
TV Interview (11)	=	Honestly (2) Sincerely (1) Frankly (1) Simply (2)	Kind of (4) Sort of (1)
Internet Video (13)	Unfortunately (1) Curiously (1)	Simply (5) Literally (1)	Sort of (4) Kind of (1)
TV News (3)	=	Frankly (1)	Sort of (1) Kind of (1)
Newspaper Articles (9)	Unfortunately (1) Hopefully (1)	Simply (2) Briefly (2)	Kind of (3)

Table 9
Subjective stance markers per media genres in the PMMR subcorpus.

In detail, the expression *sort of* is mainly introduced to strategically downplay scientific research by blurring its boundaries and making it seem less certain. This epistemic use was mostly employed to discredit scientific evidence against a link between vaccines and autism, as shown in Example (17):

(17) yet we don't have **any sort of** research to understand the potential risk of all those vaccines at once! So when someone tries to tell me that MMR alone doesn't cause autism but I take my child in for a vaccine appointment and they're getting six shots in 10 minutes, how am I supposed to feel reassured (*J.B. Handley defends Andrew Wakefield, YouTube, 6 January 2011*).

As parent of an autistic child and anti-vaccine activist, Handley here strategically uses *any sort of* to trace the somewhat fuzzy boundaries of MMR research. This intentionally helps draw a strong connection between the apparent lack of scientific knowledge and the "epistemic emotion" of the fear of the unknown (*how am I supposed to feel reassured*). The fact that fear is directed at the claimed absence of knowledge contributes to building the subjective epistemic value that MMR alone causes autism. Thus, fear appears

to be a disvalue added to the prospect of the unknown *potential risk* primarily caused by undefined research. Ultimately, the subjective stance marker acts as a trigger to significantly lower the expected desirability of receiving the MMR vaccine as the fear of its uncertain risks appears to be higher than its unstated benefits. Yet, Handley's claim is demonstrably false as vaccine safety is closely monitored.[6]

Nevertheless, Handley's blog has gained extreme popularity until the social media company Medium.com recently decided to suspend his account in accordance with its policy of avoiding the dramatic spread of pseudoscientific claims. This cultural practice was particularly backed up by Handley's followers in their posts, where the subjective stance marker *kind of* was found to co-occur with negative expressions, as shown in Example (18):

(18) Ian: I have had a personal tragedy: my daughter has autism. I know what caused it: vaccines. **No kind of** evidence could ever persuade me otherwise. Therefore, there is no point in continuing the discussion (*Handley's blog, 22 April 2009)*.

The co-occurrence of *no+kind of* points to the negative bias in the epistemic function of the stance marker. The *ad hoc* description of the blogger's *personal tragedy* serves to create the context where negativity is first introduced. Epistemic control is then covertly exercised through the deliberate use of the factive verb *I know*, which intrinsically presupposes that knowledge is constructed as the result of prior sensory experiences, or as "the basis of 'evidentials' ('I know because I see' […])" (Wierzbicka 1996, p. 49). Hence, the situational connection with negativity offers fertile ground for the strategic use of hedging, whereby *kind of* appears to be used to offset a negative reaction to scientific evidence, thus contributing to "socially shaping" (Fairclough 2013, p. 92) a negative interpretation by other bloggers.

4.2.3. General extenders of MMR knowledge

Disjunctive general extenders (*N*=70) significantly outweighed adjunctive ones (*N*=28) with a predominant occurrence of *or something* (49) followed by the adjunctive *and things like that* (26) (Table 10). No placeholders were, instead, recorded. This suggests that general extenders were mostly used in the PMMR subcorpus for the functional purpose of downgrading information, especially about people who do not entirely support the MMR-autism claim.

[6] See, for example, the numerous published studies on vaccine safety on the Centers for Disease Control website (www.cdc.gov/vaccinesafety/research/publications).

	General Extenders	
Media genre	*Adjunctive (N=28)*	*Disjunctive (N=70)*
Blog (2)	and things like that (1)	or whatever (1)
Press Interview (31)	and things like that (3)	or something (23) or anybody else (5)
Radio Show (21)	and things like that (8) and stuff like that (1)	or something (9) or anything (3)
TV Interview (10)	and things like that (4) and stuff like that (1)	or something (3) or anything (2)
Internet Video (20)	and things like that (5)	or something (7) or anything else (7) or somewhere (1)
TV News (2)	and things like that (2)	=
Newspaper Articles (12)	and things like that (3)	or something (7) or anybody (2)

Table 10
General extenders per media genres in the PMMR subcorpus.

As a case in point, Example (19) shows how Wakefield creates evasive meaning through the use of *or something*, further reinforced by the other disjunctive extender *or anything else*. The overall purpose is to publicly belittle the figure of a senior British health official, acting as a whistleblower in apparent good faith in Wakefield's concern about MMR vaccine safety with the manipulative effect of delighting his audience, as reported by Deer.[7]

(19) He described himself as a whistleblower **or something** … he had rung on two occasions previously… he would not leave his name **or anything else** and introduced himself as George *(Internet video, Wakefield, The Whistleblower, 25 August 2014).*

Thus, the disjunctive general extender seems to represent a powerful device, which is subtly employed to share apparently confidential information with the audience on emotional grounds, despite the whistleblower's story was already well known.[8]

On the other hand, the adjunctive general extender *and things like that* was mostly introduced to recall shared knowledge, and thereby extend biased views to include more objective scientific facts, as in Example (20):

[7] See http://briandeer.com/solved/whistleblower-betrayed.htm.

[8] According to Deer, "the whistleblower's story - of how two brands of the three-in-one measles, mumps and rubella vaccine (MMR) were marketed in the UK (and worldwide) after having been withdrawn in Canada-was well known at the time Wakefield spoke (*Internet video, Wakefield, The Whistleblower, 25 August 2014*).

(20) a. Jeni Barnett: Do you not think, though, that as a parent, I am allowed to make a decision about what I put in my kid's body?

b. Yasmin: Yes. And do you not think that a parent whose child has cancer and is having chemotherapy and has a much lower resistance to measles, mumps and rubella **and things like that**, has a right for their child to go to normal Primary School? (*Jeni Barnett LBC Radio Show, 7 January 2009*).

In the interactional instance in (b), Yasmin advocates the importance of herd immunity[9] for sick children by resorting to the 'there is more' principle, whereby the existence of other similar viral diseases can be easily inferred by most lay listeners. As a token of intersubjectivity, the adjunctive extender thus directly serves as a cue for radio listeners to infer further instantiations of the same disease category. More importantly, it indirectly contributes to expanding the biased argumentation in (a) so as to reveal intentionally hidden knowledge about the benefits of vaccination. As noted by Overstreet (1999, p. 74), this draws attention to the interlocutors' "social difference", rather than "affirming the participants' solidarity", thus highlighting the "dialectical *relations between* discourse and other [social] elements" beyond its internal relations (Fairclough 2013, p. 4; original emphasis).

5. Discussion and conclusion

Research findings have shown that VL use "needs to be considered with reference to contexts and situations when it will be appropriate or inappropriate" (Channell 1994, p.97). In order to account for the specific case of the autism-MMR vaccine controversy, a very wide range of vague categories has been introduced in the study to examine their functional roles in the diachronic process of (re)constructing knowledge across scientific and lay communities. In detail, the scientific subcorpus significantly revealed:

- a limited use of *numerical approximators*, exception made for Deer as a journalist, thus pointing to the conventional scientific practice of providing exact numbers; a more significant use of *vague neutral quantifiers* was found, whereby Wakefield's main purpose was to express tentativeness in order to convincingly attenuate criticisms from the scientific community, and Deer's vague neutrality was employed to objectively highlight arguable MMR-autism correlations;

[9] Herd immunity is a form of immunity resulting from the vaccination of a significant portion of a population (or herd), which provides a measure of protection for those with a weak immune system.

- *epistemic stance markers* were used by Wakefield to signal scientific doubt in medical texts as expected, whereas more subjective stances were taken in the science-by-press conference genre for the persuasive purpose of convincing the audience of his concern about patient safety; *subjective stance markers* were used more by Deer to unmask Wakefield's research procedures and thus question readers' passive acceptance of the issue;
- *placeholders* were used by Wakefield to establish mutual agreement with his public and gain consensus on his important breakthrough, while Deer's intent was to breach the reciprocity of perspectives and arouse readers' suspicion of Wakefield's misconduct.

On the other hand, the popular subcorpus showed that:

- *numerical approximators* were mostly used in the media genres to subtly impress the public audience, but were also used by medical professionals to communicate scientific uncertainty across the lay community; the more recurring use of vague *multal quantifiers* was understood to deliberately create a major openness of meaning, which allowed for alternative justifications of the fraudulent knowledge claim;
- *epistemic stance markers* were found to mainly function as 'boosting' (Hyland 1998b) devices of misleading propositional content, and to mark the epistemic right of different celebrities to claim authority of knowledge. Regardless of their lack of expertise, these figures took advantage of their popularity to actively participate in the irresponsible process of creating new persuasive interpretations of the same fake knowledge, thus showing how they were able to uncontrollably shake "public confidence in the scientific system" (Furman *et al.* 2012, p. 278); consistently, *subjective stance markers* functioned mainly as markers of imprecision to construct pseudoscientific knowledge claims with the dramatic effect of spreading fear about the uncertain risks of the MMR vaccine in the public arena so as to enhance anti-vaccination decisions;
- *general extenders* were mainly of the *disjunctive* type, and thus used for the functional purpose of downgrading information, especially about people who were not found to entirely agree with the MMR-autism claim.

Traditionally, vagueness in medical discourse "demonstrates a scholarly orderliness in th[e] representation of knowledge" (Prince *et al.* 1982, p. 96), and represents an inevitable resource used to reflect degrees of scientific uncertainty (Salager-Meyer 1994), and to protect medical writers' reputation (Hyland 1998a). This study, instead, has highlighted how a manipulative use can be made of this functionality for the deviating scope of concealing unreliable and unethical knowledge claims. Furthermore, the investigation has shown that once these claims cross the boundaries of the public domain, again VL loses its appropriateness, whereby it serves the important purpose

of adjusting complex medical knowledge to "a less scientific discourse community" (Varttala 1999, p. 192). In the present case, it was rather used as an instrumental device to propagate mystified knowledge as reliable scientific advancements, thus impacting on the major reduction in vaccination uptake, and contributing to the current concern for the increasing spread of viral diseases.

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