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Evidence, defeasibility, and metaphors in diagnosis and diagnosis communication

Abstract

The paper investigates the epistemological and communicative competences the experts need to use and communicate evidence in the reasoning process leading to diagnosis. The diagnosis and diagnosis communication are presented as intertwined processes that should be jointly addressed in medical consultations, to empower patients' compliance in illness management. The paper presents defeasible reasoning as specific to the diagnostic praxis, showing how this type of reasoning threatens effective diagnosis communication and entails that we should understand diagnostic evidence as defeasible as well. It argues that metaphors might be effective communicative devices to let the patients understand the relevant defeasors in the diagnostic reasoning process, helping to improve effective diagnosis communication, and also encouraging a change in patients' beliefs and attitudes on their own experience of illness and illness' management.

Keywords

Diagnostic evidence, Defeasible reasoning, Diagnosis communication, Nonmonotonic inference, Medical metaphors

1. Introduction

The paper aims to discuss the role of metaphor as a potential useful tool to address the issue of defeasibility in diagnosis communication. From diagnosis to therapy, doctors need an expertise going beyond the specific knowledge of their own medical specialization and concerning competences both in reasoning and communication. On the one hand, doctors need to handle specific problems concerning defeasibility in diagnostic reasoning which risk to widen the gap in expertise between doctors and patients and also threaten health communication. On the other hand, doctors need specific competences in diagnosis communication, in order to achieve patient compliance in illness management. In particular, in a doctor/patient relational dimension, an inappropriate communication strategy or a lack of attention to patient's interpretation could entail a delay or refusal for therapy. In health communication experts make a large use of medical jargon in both diagnosis and treatment, i.e. technical terms to refer to specific pathologies, that may lead not only to misunderstanding (Peckham 1994; Brooke Lerner et al. 2000), but also to (undesired) emotional reactions (ex. fear, Schnitzler et al. 2017; or anxiety, Taylor et al. 2011) in most patients who are not familiar with the specific terminology used to communicate the evidence at experts' disposal (see as an example in oncological terminology, Chapman et al. 2003; O'Connell et al. 2013). Language might indeed covertly influence patients' beliefs and possible beliefs' revision, thus having an indirect impact on patients' understanding of the diagnosis and intention to follow the therapy (and finally on the clinical outcomes themselves). In this paper, we focus on everyday metaphors as communicative devices to help patients understand complex phenomena, such as those concerning diagnostic practice. From this perspective experts might be seen as "translators" (or "bilinguals" in each medical encounter, see Bigi 2016) who translate medical language into everyday language (Williams and Ogden 2004; Hadlow and Pitts 1991). Metaphor has indeed been recognized as a useful device to grasp an unknown (*target*) concept by using a (better) known (*source*) concept (Lakoff and

Johnson 1980; Bowdle and Gentner 2005), thus naming and explaining a phenomenon, i.e., illness, which otherwise would remain unintelligible.

Metaphor can provide a perspective on the illness itself, implicitly highlighting some properties of the source domain and hiding others (Hauser and Schwarz 2015; Semino et al. 2016, 2018). However, a speaker might also intentionally select a metaphor for its highlighted properties, thus entailing a specific framing effect (Entman 1993). A doctor might therefore use a metaphor precisely because of its highlighted properties, which are relevant in specific contexts of diagnosis communication. From this perspective, experts' "translation" of their specialist language into the patients' language can be an effective process if it is accompanied by an effort to align each other's salience of the highlighted properties, so that the exchanged knowledge can be relevant to diagnosis understanding and awareness, as well as the following therapy management. Of course, the highlighted properties might also change in specific medical encounters where the doctor thinks that it is required for the interaction with the patient. In such a case, the doctor might *deliberately* use a metaphor (Steen 2008, 2010, 2017), i.e. the doctor might intentionally exploit the most vital communicative dimension of a metaphor in discourse, explicitly requiring a cross-domain mapping of properties to explain, persuade, or reasoning about a topic, and more in general to change the addressee's perspective on the topic at a given moment of the ongoing speech event.¹ In other words, the doctor might use a metaphor communicative potential to make some reasons for a diagnosis clearer, to question a system of commonplaces associated with the illness and/or to urge for a belief change in the patient (Ervas et al. 2016; Ervas 2018). In this perspective, metaphor might reveal to be central to both diagnosis awareness and adherence to therapy, i.e. following medical advice, trusting the treatment and carrying it out with zeal and accuracy.

In what follows (2) diagnostic practice is conveniently addressed in terms of nonmonotonic reasoning in order to spell out a number of features that are relevant in the field of health communication. In particular, the nonmonotonic nature of diagnostic reasoning—i.e. the fact that certain conclusions can be drawn only under certain conditions—can widen the gap in expertise between the doctor and the patient, and this gap can be a potential source of misunderstandings and equivocations. Another relevant implication of diagnostic practice concerns diagnostic evidence (3). In fact, the nonmonotonic nature of diagnostic reasoning determines a conception of evidence as defeasible—i.e. it is susceptible to being undermined by further facts or evidence—, and this widens even more the gap in expertise between the doctor and the patient. Therefore, this gap in expertise is at risk of having serious implications for patients' understanding and therapy's adherence. This represents a major challenge for health communication and its role in both patient's and doctor's undertaking of responsibility in the therapeutic process. In (4) we explore the idea that metaphors can be effective in bridging the gap between the doctor and the patient. In fact, metaphors can be valuable means—compared to literal expressions—to explain difficult matters in more accessible and familiar terms, and this feature can be particularly relevant in diagnosis communication. However, recent empirical studies have shown that metaphors have framing effects which may hinder health communication with negative effects on patients' adherence to therapy (Hauser and Schwarz 2015; Semino et al. 2016, 2018). Nonetheless, in (5) we show the theoretical possibility of a positive role for the metaphorical framing effects as reasoning devices in improving health communication. In particular we provide some cases of diagnosis communication concerning nonmonotonic reasoning where the metaphorical frames can be deliberately used to convey a more accessible version of the diagnostic process.

¹ The very notion of deliberate metaphor is highly controversial and debated among metaphor scholars from different disciplinary backgrounds (see the exchange in Deignan 2011; Gibbs 2011, 2015; Müller 2011; Charteris-Black 2012).

2. Medical expertise and diagnostic reasoning

A crucial aspect of medical expertise, one useful in highlighting many high-level specificities of such expertise, concerns diagnostic praxis. Diagnosis is generally considered as one of those particular aspects that can complicate much medical profession: in particular, diagnostic procedures are exposed to a number of risks. Not only is diagnosis fallible and exposed to potential mistakes, but the risks we refer to mainly concern the refined medical skills involved in diagnosis—especially dealing with the issue of defeasibility of diagnostic reasoning²—which can be hard to grasp for the patients, and easily lead to misunderstandings and equivocations. Needless to say, such outcomes in the context of health communication can be dangerous as they may involve a failure in the preservation of shared responsibility and patients' autonomy (see for example Bigi 2016; Rossi & Macagno 2019). In order to shed light on some of these problems, it would be useful to approach them from a perspective that does not limit itself to mere knowledge of symptoms: rather than primarily focus on the doctor's expert knowledge of the way symptoms work in the identification of the correct diagnosis, we may better appreciate such an expertise in terms of reasoning. In fact, this approach would be useful in highlighting how diagnostic practice is rather peculiar and directly acknowledges the nonstandard structure of diagnostic reasoning. The contrast between standard deductive reasoning and diagnostic reasoning is useful in emphasizing how the gap in expertise between the doctor and the patient concerns (or may concern) also an underlying logical basis.

Diagnosis, in a nutshell, can be understood as a very special type of reasoning: from a given set of premises—for example, the symptoms that patients show, results of medical examinations, and further specialist analysis—the doctor can conclude, after carefully double-checking the data, that the patient suffers from a particular pathology. It would appear, at least *prima facie*, that diagnostic reasoning belongs to an old-fashioned classical scheme: given certain premises, the doctor is entitled to draw certain conclusions. However, things do not line up so nicely: to understand diagnosis and diagnostic praxis just this way would amount to a potentially dangerous mistake.

The logical relation between the premises of diagnostic reasoning and the conclusions that can be drawn on their basis, is rather different from the typical schemes of classical logic. The standard account of deductive inference, for instance, *de facto* establishes a kind of logical necessity that is in play: given certain premises *Ps*, a particular conclusion *C* necessarily follows. If “Kim is a woman,” and if “women are mammals,” it necessarily follows that “Kim is a mammal.” However, diagnostic reasoning, for a number of reasons, cannot be understood according to this general deductive model. It is, in fact, a kind of nonmonotonic—i.e., multi-premise and defeasible—type of reasoning. A certain reasoning is nonmonotonic when the presence—or absence—of a certain premise (or set of premises) is liable to crucially alter its conclusion. This means that its conclusion does not necessarily follow from certain premises.³

² Even though doctors may lack awareness or understanding of nonmonotonic reasoning in diagnostic practice, they *de facto* implicitly reason in this way, by looking at the symptoms and conditions which may defeat their main diagnostic hypothesis (see below).

³ An account that generalizes this conception of inference over the classical deductive model, under the general heading ‘material inference,’ is that developed by Robert Brandom. See Brandom 2000, 87-90; 2008, 106-109. For an approach that establishes a general connection between defeasible reasoning and scientific reasoning, especially dealing with lawful inferences, see Cartwright 1983. Her account is focused on *ceteris paribus* ‘laws’ and *ceteris paribus* ‘inferences’ in physical explanation.

Thus, the conclusion of such reasoning can be understood as bound to certain conditions. For example, a generic inference from p to q can be good and legitimate, while that from $p \ \& \ r \ \& \ s$ to q may be not, especially because of the presence of the additional premises r and s . Certain premises may interact with certain conclusions in a special way, by playing the role of *defeasors*: they are liable to make the conclusion a bad one (so it does not follow anymore) and/or to make the other premises bad (in order to draw certain conclusions). Therefore, the presence of certain additional premises can undermine the relation that usually holds between a premise (or set of premises) p and a conclusion q . For example, consider this *prima facie* monotonic reasoning: “mammals usually do not fly; Batty is a mammal; hence, Batty does not fly.” If we add certain premises, this conclusion does not follow anymore. For example, we can add to our reasoning the following additional premises: “bats are mammals; bats fly; Batty is a bat.”⁴ Very intuitively, these new premises reshape the previous reasoning, substantially altering and defeating its conclusion (which now does not follow anymore). The complete reasoning, in fact, would now involve a different series of steps: “mammals usually do not fly; Batty is a mammal; bats are mammals; bats fly; Batty is a bat; hence, ~~Batty does not fly~~.” The new facts presented in the additional premises, that Batty is a bat, that bats are mammals, and that bats fly, alter substantially the former set of premises, to the point of rejecting the conclusion that we formerly were entitled to draw (and that now does not follow anymore).⁵

Before focusing on more specific examples in the medical field, we should be aware that, in order to fully grasp these matters, we must not merely be concerned with the problems of reasoning. In particular, as we shall see more clearly by discussing some examples from actual diagnosis, these widely concern epistemic matters. Diagnosis can be approached and understood as a kind of epistemic reasoning, and medical expertise in this context has to be understood as an ability to handle special epistemic facts.⁶ The doctor must be capable of knowing and anticipating potential defeasors on the basis of the patient’s symptoms. Particularly, the meeting with the patient is devoted to ask her about the potential defeasors compatible with the symptoms that she shows.⁷ Certain facts can count as the defeasors for certain symptoms, potentially invalidating the diagnostic hypothesis that the doctor was *prima facie* induced to endorse on the basis of those symptoms. The particular feature that makes these facts (defeasors for symptoms) special is the same that makes diagnostic reasoning nonmonotonic: as the conclusion is not necessarily warranted in nonmonotonic reasoning by the presence of certain premises, so a diagnostic hypothesis based just on symptoms can be undermined by the presence of certain facts. Therefore, there is a direct connection between the logical structure of these inferences and the special role played by certain facts displayed there as premises. Here below we provide some examples taken directly from actual diagnostic praxis to show and highlight how doctors can manage epistemic and methodological resources to meet the challenges presented by this kind of defeasible reasoning.

Imagine a guy, Herbert, who tells the doctor he does not pee very often (in any case, less than before). This can count as a premise that allows for different diagnostic hypotheses depending

⁴ This example is a slight modification of one present in Antonelli 2005, 5-6. For similar examples see also Frixione 2007, 102-111.

⁵ See, for a general introduction to defeasible reasoning, Koons 2017. See also, for an overview on recent developments in nonmonotonic logic, Strasser and Antonelli 2016.

⁶ See, for the epistemic relevance of defeasible reasoning, Pollock 1970, 62-78; 1974.

⁷ This is not independent of a more general capacity of the doctor to navigate across a wider set of potential defeasors like lexical ambiguities, patients’ knowledge, bias, and contextual factors.

on the other premises that can combine with it. For example, the doctor can ask about the amount of water that Herbert usually drinks daily; if Herbert does not drink enough water, maybe there are no reasons to worry (i.e., he does not pee much because he does not drink enough water). The doctor can also ask Herbert if he plays any intensive sport and expels much water through sweating; if Herbert does play an intensive sport and sweats practicing, then there might be no cause for concern (i.e., he does not pee much because he engages in intensive physical activity) (Åstrand et al. 2003).

Alternately, if Herbert tells the doctor that he feels he does not pee enough, even though he daily consumes much water and, in addition, does not engage in intense sporting activity, then the situation may call for some concern. Taking into account this additional information, the doctor now needs to call for new examination concerning urine analysis. First, the amount of urine during 24 hours will be measured: if urine's volume is less than 400 ml, Herbert would be diagnosed with a condition known as 'oliguria.' But, if according to medical reports Herbert's urine contains an abnormal amount of blood, the diagnosis changes: Herbert does not pee enough, the exams show his urine to be rich in blood, the doctor changes her diagnostic hypothesis (taking the additional information into account) to suggest that Herbert may suffer from a post-renal cause of oliguria, like a tumor of the lower urinary tract, for instance. According to this diagnostic line, the doctor would be required to take additional symptoms into account to evaluate the compatibility of Herbert's clinical condition with this suspicion, and possibly perform further tests (e.g., ultrasound, computed tomography, etc.) in order to confirm or disprove this hypothesis.

If the exams prove, for example, that Herbert's urine contains an abnormal quantity of proteins and lipids, the diagnosis will change accordingly: Herbert does not pee enough, the exams showed his urine as containing proteins and lipids, then the doctor is allowed to modify her hypothesis to suggest that Herbert may suffer from a renal cause of oliguria, as for instance a nephrotic syndrome (Kumar, Abbas, Aster 2005). Also in this case the doctor would be required to consider additional signs and symptoms as well, and to perform further examinations in order to evaluate the compatibility of Herbert's conditions with her own diagnostic hypothesis.

Therefore, our initial premise "Herbert does not pee enough" allows to infer very different conclusions, depending on the other premises that are taken into account. So, for example, "he does not consume enough water," and "he practices intensive cycling," are additional premises that can rule out alarming diagnosis (the conclusion of the diagnostic reasoning is: "he pees less than before because he does not consume enough water and does intense cycling"). On the contrary, statements such as "he consumes sufficient water," and "he does not play any intensive sport" are alarming enough to urgently request for urine analysis. These additional premises can lead our diagnostic reasoning in different directions, depending on the results: if the urine turns out to contain much blood, then Herbert could arguably have a *post-renal* cause of oliguria; if the urine turns out to be rich in proteins and containing lipids, then Herbert could arguably have a *renal* cause of oliguria.

According to this account, the expertise of the doctor, in the context of diagnosis, consists of the ability to identify the correct connections between symptoms and analytic data, and especially a mastery in the ability of ruling out the potential defeasors for her hypotheses. Diagnostic expertise is here characterized as an ensemble of abilities and competencies concerning symptoms and examination results: the consultation with the patient permits the doctor, with specific questions, to *anticipate* (by training and experience) the possible defeasors for the symptoms;⁸ and the analytic data, together with the registered

⁸ "Each stage in a physician's differential diagnosis is like this: the inference from test result, physical finding, or symptom is surrounded by a nimbus of usually unspoken 'unless'es. And

symptomatology, permit the doctor to rule out the diagnoses for which they are actually defeating conditions (and also to identify a probable diagnosis allowed by ruling the recognized defeasors out).

3. Diagnostic reasoning and evidence in medicine

This particular aspect of diagnostic praxis has also other important implications for our understanding of medical expertise. An implication concerns the role of evidence in diagnostic praxis. Current mainstream accounts of evidence in medical praxis (Evidence Based Medicine—EBM, for instance), mainly conceive of evidence in statistical terms: here, according to EBM, evidence *is* statistical evidence.⁹ However, if we focus on the nonmonotonic nature of diagnostic reasoning, this has relevant implications for our understanding of evidence, since this turns out to be defeasible. A defeasible conception of evidence in medicine, *prima facie*, would suggest that statistical evidence is not evidence enough in diagnostic praxis.

What does it mean, exactly, that evidence is defeasible? The standard definition is the following:

A given piece of evidence is *defeasible* evidence just in case it is in principle susceptible to being undermined by further evidence in this way; evidence which is not susceptible to such undermining would be *indefeasible* evidence. It is controversial whether any evidence is indefeasible in this sense (Kelly 2014).

A prominent treatment of the connection between nonmonotonic inference and epistemic reasoning is that of John Pollock (1967, 1974, 1979), who developed former insights by Roderick Chisholm (1966). The basic idea is that we can distinguish two main kinds of defeasors: those named “rebutting” and those named “undercutting.” Rebutting defeasors are those that provide us with a *prima facie* reason to revert the conclusion of a particular inference, or just to stop believing such a conclusion: for example, Thomas says he remembers that Sarah performed badly in singing for his birthday; Dave replies to this that Thomas that day was drunk (and so his memory about Sarah’s singing is not reliable). Dave’s testimony here is a rebutting defeasor for Thomas’ claim. Undercutting defeasors are those that can directly highlight that a more general relation between certain premises and certain conclusions actually does not hold: for example, the fact that George is a pathological liar is an undercutting defeasor for the evidential connection between his testimony and what he testifies (Kelly 2014). So, to say it differently, undercutting defeasors are more revisionary in scope, while rebutting defeasors are useful in highlighting some local problems in our reasoning. With this basic distinction in place, we can now go and see certain implications for our concept of evidence.

no one supposes that such probative reasoning can always be turned into dispositive reasoning by making an explicit, exhaustive list of the potential defeasors. Certainly, reasoning in everyday life does not generally admit such completions” (Brandom 2008, 106-107). Similar examples can be found also in the computer science and IA literature about the first attempts at formalization of diagnostic reasoning. See, for example, Reiter 1987 and Antoniau 1997.

⁹ Probabilistic conceptions of evidence, however, have their own problems with many counterexamples. See Achinstein 1983; 2001. See also Glymour 1980. For an overview, see DiFate 2007. For the specific case of EBM see Clarke et al. 2013.

Consider Herbert's case again. If he does not drink enough water, this fact alone can count as evidence that his condition is not worrisome. If he practices cycling, also this fact can count as further evidence that arguably he is not suffering from a pathology. Together, these facts depict a scenario where each fact can be used to strengthen the evidence highlighted by the other. So, the evidence provided by the two statements here is *undefeated*, and the evidence highlighted by each fact fits well with that highlighted by the other. But this is just the easy case.

Let us explore some possible complications. If Herbert does not go cycling, but he does not drink enough water, the two facts do not cooperate in strengthening a particular diagnostic hypothesis (as they did in the former case). So, their disagreement fails to provide a clear diagnostic hypothesis and the doctor needs further examinations (and, by the way, *what formerly counted as evidence is now undermined*). This example points out that what counts as evidence potentially depends upon a combination of facts, and that a specific fact (e.g. that Herbert does not drink enough water) counts as decisive evidence only under particular conditions. In a sense, the conditions that the doctor finds within diagnostic procedures *make* the evidence: they can rule out that a particular fact is evidence of something, or, in the right conditions, they can strengthen the hypothesis that certain facts are evidence of something. For example, the case of the urine examination can be used in the same way. If the medical reports demonstrate that Herbert's urine is abnormally rich in blood, as we said, we have evidence that Herbert arguably suffers from a post-renal oliguria. This evidence, however, can be undermined by the presence of further factors. So, there is a clear sense in which each fact of this kind can count as evidence *per se*, but there is also a clear sense in which each fact can count as evidence only depending upon certain conditions. So, we have clues indicating that evidence is not anything like a "neutral standpoint" for our diagnostic practice: evidence provided by single facts is defeasible, and proper evidence is such if and only if it stays (at least locally) undefeated in a diagnostic reasoning. This means that evidence seems to emerge from a number of facts and conditions (many of which depend on the potential combinations of such facts). Evidence of something can be defeated by certain conditions, locally by rebutting defeasors (former evidence that Herbert's condition is not worrisome, for example, is defeated by examinations showing that his urine is rich in blood) and globally by undercutting defeasors (for example someone who discovers, in a hypothetical future, that the connection between the presence of blood in someone's urine and post-renal oliguria is only contingent depending upon certain conditions and not a general pattern—as in fact it is according to what we know).

This structured conception of evidence has many implications for both diagnostic reasoning and diagnostic communication. A first implication of it, for example, is that it is epistemologically weaker than the probabilistic/statistical notion of evidence usually assumed in EBM as the default option.¹⁰ Another worthy implication is that, together with the nonmonotonic nature of diagnostic reasoning, it poses a challenge to successful communication between the doctor and the patient/s. Indeed, the majority of patients generally do not know anything about nonmonotonic reasoning and do not properly understand how evidence provided by relevant facts in diagnosis is bound to certain conditions. On the contrary, the majority of non-expert people tend to think about reasoning in monotonic ways—even though these remarks are insufficient for a significant generalization.¹¹ Most of them, in fact, do not have an explicit concept of defeasibility (Koons

¹⁰ We will not address this complication here. This claim, however, would deserve a full exploration on its own.

¹¹ Doctors, in fact, together with people with serious interests concerning these issues, can be instead qualified patients that well understand diagnostic praxis and its nonmonotonic

2017), and hence tend to think about evidence as a property possessed by single facts and/or objects (like the cat being on the mat). So, diagnostic communication poses a series of important and interesting challenges. How can doctors successfully communicate with the patients, given the expert nature of diagnostic reasoning and this fine grained and tricky conception of evidence? In what follows, we argue that the doctors also need specific communicative competences to let patients understand the diagnostic process and at the same time make them aware of illness management.

4. Metaphors in the diagnosis communication

The diagnosis and diagnosis communication are intertwined processes that should be jointly addressed in medical consultations. Both patients' understanding of the diagnostic process and doctors' explanations, which might include medical jargon, are central to understand the nature of the disease/symptoms, as well as permitting informed decisions regarding their care and adherence to therapies. Medical terminology might indeed not only be opaque to individuals lacking medical exposure, but also misleading in the understanding of the diagnosis, therefore having a significant impact on comprehension and adherence to the prescribed treatment, and finally on the health outcomes themselves (Stewart 1995; Street et al. 2009). Moreover, doctors' communication in the diagnostic process is intrinsically linked with patient trust (Fallowfield and Jenkins 1999; Thom 2001), which might be essential not only for a successful doctor/patient relationship but also to the proper comprehension of patient's relevant symptoms for the diagnosis (O'Connell et al. 2013). Given these potential difficulties in health communication, the doctor would need, in principle, a competence in "translating" her own competencies into a format more accessible to the patients, as if they were not talking the same language (Fields et al. 2008; Bigi 2016). As shown in previous literature (Woodward-Kron 2008; LeBlanc et al. 2014), learning specialist knowledge involves the use of technical terms as well as the abstract dimension of discourse, which is often far away from the concreteness of laypeople language. Indeed, patients lack not only specialistic knowledge, but also the technical abstract terms required to communicate it. Moreover, common terms in everyday language might acquire a different meaning in the medical jargon, thus resulting in lexical ambiguous terms, which might sound misleading or even incomprehensible to patients (Rossi and Macagno 2019). The cognitive role metaphors have in everyday language use might provide an interesting improvement to communicative interactions between doctors and patients. There are several reasons to think about this as a promising option. First, metaphors are omnipresent in everyday language and they entail more cognitive benefits in terms of comprehension, persuasion, liking, and memory when compared to specialist literal terms: they are indeed more memorable, pleasant and comprehensible (Paivio, Walsh and Bons 1994; Sadoski, Goetz and Fritz 1993). Second, differently from specialist jargon, metaphors are mostly based on concrete rather than abstract terms, thus entailing the so called "concreteness effect," i.e. the advantages in processing concrete words rather than abstract words, in figurative language understanding.¹² More accurate answers and faster reaction times in a variety of lexical tasks have been observed for both typically developed and clinical population in the case of

structure, and so the points made above are limited in scope. Many thanks to an anonymous reviewer for pointing this out.

¹² Previous literature suggests that concreteness is correlated with imageability facilitating figurative expressions understanding, where imageability can be defined as how easily a word can trigger mental images (Cacciari and Glucksberg 1995; Urena and Faber 2010; but see also Dellantonio 2014 for criticism).

concrete vehicles when compared to abstract vehicles of the metaphor (Bambini et al. 2014; Cummings 2017).¹³ Third, metaphors have been described as a helpful means for creative thinking: favoring analogical reasoning, they have indeed elicited a productive style of reasoning in a number of scientific disciplines ranging from physics to biology (Hesse 1963; Kuhn 1979). Even though this aspect of metaphor mainly belongs to the genre of scientific discourse, it could be also useful in scientific popularization and, specifically, in health communication, to help doctors in explaining and patients in understanding. Fourth, metaphors in everyday language are part of common knowledge or can somehow be grasped by non-experts, whereas metaphors used in specialist language have lexicalized meanings referring to pathologies and/or their specific symptoms, which are most often exclusively part of the experts' knowledge. For instance, Lòpez-Rodríguez and Tercedor-Sánchez (2017) investigated whether metaphor can be considered a facilitator in doctor-patient communication in the field of cardiology and found what follows: the most opaque metaphors for laypeople are those lexicalized (ex. through words of Greek and Latin basis, as "coronary artery" or "ventricle"), while most of laypeople recognize (and use) metaphors based on image schemas recurrent in everyday metaphors (e.g. part-whole, containment, in-out, force, linking), such as in "heart chamber" and "heart murmur."

For these reasons, the use of everyday metaphors in medical consultations may be a good candidate to bridge the expertise gap in the communication of the diagnostic process to patients. Just to give an example of the widespread use of metaphors in doctor/patient interactions, consider the following conversation:¹⁴

MD: "Mr. T, how did it go last night?"

Mr. T: "Not so good doc. Lots of pain. Couldn't sleep. But you know me. I took some pain medicine and soldiered on."

MD: "Yeah! That's what I admire about you. You are a real fighter."

Mr. T: "Right on doc!" sounding pleased. "I am no quitter. So did you get my bone scan results back?"

MD: "Yes, I did. It was positive."

Mr. T: "Positive?" sounding hopeful. "That is good, right?"

MD: "Unfortunately, it means that the cancer has spread to your bones. In fact, your bone scan lit up like a Christmas tree."

Mr. T: "Oh... So what comes next? More chemotherapy?"

MD: "Not yet. Your albumin is only 2.2... your marrow is wiped out. The cancer has spread to your liver as well."

Mr. T: "So what happens next? Do I need a liver transplant?" looking both worried and confused.

MD: "I am talking to some other specialists to see if we can zap the bone mets first. Once you rally around we can probably restart chemotherapy again."

Mr. T: (doubtfully) "Doc, give it to me straight. How am I doing?"

MD: "Well, you are a real trooper, Mr. T and I think that given the circumstances, you are doing great. So... what do you think? Should I call the radiation oncology docs?"

¹³ However common use terms, rather than specialist jargon, are perceived as less concrete when a metaphorical rather than a literal meaning is triggered (see for instance metaphorical nouns in Reijnierse et al. 2019, even though results for metaphorical verbs are more nuanced, see for instance Lai et al. 2019).

¹⁴ The conversation is reported in Periyakoil 2008, where MD stands for the doctor and Mr. T for the patient.

Mr. T: (Cheering up) “You go for it doc! There is still some more fight left in this old body of mine. Let’s give them a run for their money.”

In the communication of the diagnosis, the literal term “positive” reveals to be misleading for the patient who takes it with the (correct) literal meaning it conventionally has in everyday language (“That is good, right?”). In medical terminology, the very same word has instead the opposite meaning, thus making the terms lexically ambiguous and possibly misleading in the conversation where doctor and patient give different meanings to the same word. As already pointed out, this is not uncommon in patient/doctor interaction: terms like “growth” have been found to be similarly confusing even to very educated group of patients and the misunderstanding of medical terms extends beyond the field of oncology.¹⁵ In the example reported above, the doctor feels that she needs somehow to translate the medical term “positive” to let the patient understand that the diagnostic results are indeed “negative” by resorting to some metaphors. To explain and let the patient understand the actual symptoms and nature of the illness, the doctor uses non-literal terms, such as similes (“your bone scan lit up like a Christmas tree”¹⁶) and especially metaphors (“your marrow is wiped out”). Interestingly, to maintain both trust and adherence of the patient to therapies, the doctor also needs to use the FIGHT metaphor¹⁷ which had indeed been first introduced by the patient at the very beginning of the conversation (“But you know me. I took some pain medicine and soldiered on”), extending it throughout the overall conversation (“You are a real fighter”, “you are a real trooper”) until the end of the dialogue, whose conclusion is again signed by the patient via the FIGHT metaphor (“There is still some more fight left in this old body”).

Recent studies in health communication have indeed drawn attention to the role of metaphor in doctor/patient interaction (Arroliga et al. 2002; Semino et al. 2016; Rossi 2016). Doctors need indeed specific communicative competences to build trust when they communicate the diagnosis to patients. The communicator credibility view suggests that communicators who use metaphors are judged more credible than ones who use literal language (Reinsch 1971; Jeong 2008; Choudalaki 2018; Brugman et al. 2019). The reason of such communicative primacy is that metaphors may point out previously unknown analogies: “This newfound appreciation of commonalities is a source of interest and pleasure to the comprehender. Impressed by the message source, the receiver returns a favorable judgment of communicator credibility” (Sopory and Dillard 2002, 385). More important in diagnosis communication, everyday metaphors might be useful to let the patient grasp an unknown target concept by using a well-known source concept linked to everyday experience, to make a phenomenon, i.e. illness, clearer and easier to understand.¹⁸ Moreover, especially in the case of novel

¹⁵ For instance, a recent study pointed out that 80% of orthopedic patients misunderstood the term “fracture” referring it to something different from a broken bone (Peckham 1994).

¹⁶ This simile has an ambiguous meaning as an American slang expression: it might have a positive meaning (to be bright, happy) and a negative meaning (to be intoxicated, drunk). Interestingly, the doctor means the negative meaning of the simile and at the same time he exploits it to give an idea of how the medical report looks like. However, he also ironically hints at the other positive meaning of the simile, downplaying the situation and echoing the double (conventional and specialist) meaning of “positive.”

¹⁷ As in previous literature on this topic, the use of small caps indicates a conceptual metaphor (Lakoff and Johnson 1980), i.e. an embodied structure of thought which might be communicated via different metaphorical expressions.

¹⁸ From this point of view, most doctors should then be aware of the extensive use of metaphors they make in conveying a diagnosis and how they get to that specific diagnosis: “your blood pressure is so high, you’re a geyser ready to blow,” or “the kidneys are the body’s

metaphors, metaphors might evoke mental images (Davidson 1978; Indurkha 2006; Carston 2010, 2018), which play a creative role in the understanding, especially when we are in front of unusual or new phenomena, as they increase the amount of available information, thanks to the possibility of representing information simultaneously as propositional descriptions and visual-related experience. For instance, metaphors such as “strawberry tongue” are broadly used in medicine as well. The strawberry tongue might be caused by different pathological conditions: Kawasaki disease, allergies, scarlet fever, Toxic shock syndrome (TTS), vitamin deficiency and the doctor might need to ask to the patient and check for some symptoms before ruling out possible causes which are not directly relevant for the diagnosis. The metaphor “strawberry tongue,” even though it is part of medical jargon and it might sound unfamiliar to patients, makes easier for the patient to imagine and therefore to understand and identify the symptoms of the pathology, i.e. having the tongue like a strawberry, exactly because it relies on some visual properties of a common object in everyday life. Therefore, metaphor might be an effective device for patients’ understanding, thus influencing also their behavior on many health issues (Semino et al. 2016; Rossi 2016). However, some studies looked at metaphor as a source of possible misunderstanding, highlighting a certain degree of mismatch between the understanding of metaphors by doctors and by patients in consultations (Skelton, Wearn and Hobbs 2002; Macagno and Rossi 2019). Moreover, patients themselves often employ metaphors to describe their own symptoms, as for instance in “a dark cloud hangs over me,” “the nausea comes in waves,” “it feels as if there is an elephant sitting on my chest,” (Hanne 2015: 36), and doctors need to interpret these metaphors for the aims of diagnosis. However, patients might use metaphors to describe not just their experience of illness, but their own interpretation of such an experience. In other words, they might use misleading metaphors, emphasizing some properties of the source which force to look at the target under the wrong perspective. Indeed, these metaphors are often scientifically inadequate, for example mistaking pulse rate for an indication of blood pressure (Banks and Thompson 1996) or relating properties of the function of the heart/circulatory system (machinery, energy, transportation, nature elements, center of life) with perceptual features, in an irrelevant or fuzzy way (even though sometimes culturally-motivated) (López Rodríguez and Tercedor Sánchez 2017). The results of many investigations on metaphors’ effects in different medical fields are indeed mixed, questioning the use of metaphors as effective communication strategies and patients’ education devices. For instance, in both the case of metaphors for cancer (Semino et al. 2016, 2018) and the case of metaphors for diabetes care (Rossi 2016), it has been argued that the specific source words used to metaphorically describe illness can radically alter patients’ understanding of the illness, of their symptoms and related behaviors, as well as the sense of the self, in positive but also desperately negative ways.¹⁹ Scholars, such as Susan Sontag, have therefore pointed out that “illness is not a metaphor, and that the most truthful way of regarding illness—and the healthiest way of being ill—is one most purified of, most resistant to, metaphoric thinking”

rubbish collectors: they are also an efficient recycling center. They filter metabolic waste products [...] whilst retaining proteins that the body can reuse” (Karl 2014, 32).

¹⁹ For instance, Semino and colleagues (2016) found that the FIGHT metaphor does not always work in the same way for all patients, it can be motivating for someone, as if the “battle” were motivating, but it has negative effects on other patients, as they do not want to play the aggressive role of a fighter who might be unable to recover after a violent “battle” against cancer, feeling that the eventual loss would be their own failure. Doctors, as well, recognize that the “military metaphors” can be harmful for patients’ care, and that “it can be challenging to find alternative expressions,” struggling to characterize patients’ illness and eventual death “with some other idiom or phrase” (Miller 2010, 20).

(Sontag 1978, 3). Consequently, the question of the superiority of metaphor over literal language in health communication remains open. Nonetheless, in what follows we argue that everyday metaphors can still have a positive role as effective devices to communicate the diagnostic process, with possible important consequences on the perspective patients may have on the disease/symptoms and the therapeutical path.

5. Metaphorical framing effect and rebutting vs. undercutting defeasors for diagnosis communication

Metaphors use might alter the comprehension of the reasoning process leading the doctor to a specific diagnosis. As argued by Kittay, through metaphors “we regard one thing in terms of another, and in so doing our understanding of the first is modified in light of the perspective gained by the second” (Kittay 1982, 394). In the transfer of meaning from the source to the target domain, some properties of the source are indeed selected to understand the target, while other properties remain neglected. A metaphor is therefore never “neutral,” as it entails a “framing effect,” i.e. the effect of implicitly providing a specific perspective to interpret the target (Burgers et al. 2016). As defined by Robert Entman (1993, 52):

To frame is to select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described.

Exposure to a metaphor framing may therefore modify how people reason about a specific problem (Thibodeau and Borodisky 2011, 2013, but see Steen et al. 2014 for criticism), also in the case of metaphors used in medical consultations (Hauser and Schwartz 2015). Metaphorical frames provide a specific perspective to interpret the disease and its development, positively or negatively influencing both doctors’ reasoning process leading to diagnosis and diagnosis communication, as well as patients’ experience of illness and perception of the prescribed therapy (Ervas et al. 2016). In this scenario, we may wonder whether metaphors are really effective devices for both doctors’ diagnostic praxis and diagnosis communication to patient or whether they simply hinder these processes, which are supposed to be based on a clear, plain, literal, and data-supported information on the diseases instead of implicit metaphorical communicated content. Also patients’ diagnosis understanding and compliance to therapies is a priority for the specific linguistic choices of the doctors, because it is a prerequisite for any care decision and behavior.

However, precisely the metaphorical framing effect has been said to elicit a creative and productive style of reasoning in science. This idea has also been extended to discourse about social policies as problem solving (called *generative metaphor* in Schön 1993: 137), where metaphor is a “process by which new perspectives on the world come into existence.” Under certain circumstances, it might turn out to be central in another genre of discourse, i.e. in doctor-patient conversation as well: “framing of problems often depends upon metaphors underlying the stories” (Schön 1993: 138) told to “the audience.” As pointed out, the framing process is “used relatively more often if knowledge about the problem is lacking in the audience,” especially “when talking about new topics [...] compared to established topics” (Burgers et al. 2016, 13). Metaphors have indeed been considered as important reasoning devices bringing to genuinely new knowledge, implicitly providing reasons in support of some conclusions that the speaker wishes the hearer to draw from some premises. In this intuitive sense, metaphor might be conceived as a condensed and implicit argument guiding the audience along a path of inferences to a conclusion, which attributes to the target concept some properties of the source concept (Macagno and Zavatta 2014; Oswald and Rihs 2014;

Wagemans 2016; Ervas et al. 2018). Max Black argued that metaphors result indeed from the interaction among source and target domains, which restructures the domains themselves, not only by selecting and suppressing, but also by emphasizing and organizing their properties (Black 1954). In doing so, a metaphor creates a new “system of commonplaces,” i.e. a set of relevant properties associated with the metaphor. New properties might emerge from the association of specific source and target domains: the contextual use of metaphors can indeed elicit emergent properties (Gineste et al. 2000; Wilson and Carston 2006), i.e. properties associated neither with the source nor with the target domain. For instance, a patient saying that “cancer is a bulldozer” might want to communicate the relevant property of “being insensitive” to her own private/intimate life, but the property of “being insensitive” does not belong to the source concept “bulldozer” nor to the target concept “cancer:” neither bulldozers nor cancer can have human feelings or personality traits such as insensitiveness. Rather, the property of being insensitive is said to “emerge” in the contextual use of the word “bulldozer.” Especially in the case of novel metaphors, the emergence of properties might be linked either to the conceptual combinations of target and source domains based on encyclopedic knowledge (Glucksberg and Estes 2000; Wilson and Carston 2006) or to the images evoked by metaphors (Davidson 1978; Indurkha 2006; Carston 2010, 2018). Not only patients’ metaphors but also experts’ metaphor use relies on emergent properties: sentences like “protein aggregates can directly damage cells by *hijacking* a cellular quality control mechanism” rely on teleological descriptions of natural mechanisms in terms of human actions (Arfini et al. 2018). As pointed out, they are anyway an irreplaceable part of the scientific language required to conceptualize the scientific problem itself:

Of course, no one literally ascribes purpose and human-like intent to molecules and cells. Teleological ascriptions [...] are simply metaphorical ways of conceptualizing complex systems in terms that correspond to human experiences. The important point is that such metaphors evidently are a necessary part of the scientist’s understanding of the world under study (Brown 2003, 158).

Thus, even in scientific explanations, metaphors are used to make things clearer, even if for just a didactic representation or for lack of a better alternative. As Donald Davidson pointed out (1978), it would also be problematic to replace a metaphor with a straightforward argument which might not prompt the same emerging properties also coming from images (non propositionally) evoked by the metaphor itself and making it more concrete, clear and immediate. In this perspective, metaphorical frames may result effective also concerning communication within diagnostic praxis, for example by simplifying the account about the ways in which symptoms, analytic data, and diagnosis interact, and at the same time providing the patient with new insights into her illness and affecting her attitudes, modifying her feelings, thoughts and actions toward illness. Metaphors may indeed be used to promote “change in attitudes that results from the exposure in communication” (Petty and Cacioppo 1986, 5). In recent decades, scholars have devoted particular attention to the role of metaphors in understanding and reasoning, leading the audience to accept the conclusions of an argument (Sopory and Dillard 2002; Thibodeau and Boroditsky 2011, 2013; Ervas et al. 2018). While the persuasive function of metaphors is well recognized, consensus on which properties affect their quality in argumentation and therefore their persuasive effect is still missing as suggested by works embracing different approaches (Sopory and Dillard 2002; Damerall and Kellogg 2016; see also Frezza 2016 for criticism of the use of metaphors in the field of scientific communication). What is rather known is that the persuasive effects of metaphors depend on how they frame the problem and make the conclusion of an argument more acceptable (Ervas et al. 2018).

However, not all metaphors necessarily involve a belief or attitude change. Most conventional metaphors directly and unconsciously activate their associated frames, without attracting people's attention. Therefore, in most cases, metaphorical frames simply maintain the implicit, shared background of knowledge people usually hold to be true. Indeed, as noted by Nelson and colleagues, "frames operate by activating information *already at the recipients' disposal*, stored in long-term memory" (Nelson et al. 1997, 225). Such information is not necessarily true: in Black's words, "from the experts' standpoint, the system of commonplaces may include half-truths or downright mistakes (as when a whale is classified as a fish); but the important thing for the metaphor's effectiveness is not that the commonplaces shall be true, but that they should be readily and freely evoked" (Black 1954, 287). Novel metaphors are somewhat different, because they represent a completely new use of language having no "system of commonplaces" already associated with the metaphor. Moreover, as mentioned above, novel metaphors work on emergent properties bringing to genuinely new knowledge, as they force the audience to look at the target from an unprecedented perspective (Steen 2008). When compared to conventional metaphor, novel metaphors (and especially similes, or direct metaphors in Steen's terminology) are indeed the most suitable candidate to be *deliberate metaphors*. These are defined as the only metaphors which are intentionally used as metaphors between a speaker and an addressee, and explicitly meant to change the addressee's perspective on a topic during a speech or a conversation, attracting the addressee's attention on a specific source from where to look at the target and necessarily requiring cross-domain mapping in online processing. Most conventional metaphors can instead be processed via lexical disambiguation (or modulation, see Carston 2002) and go unnoticed by laypeople, unless they are explicitly revitalised in discourse. Paradoxically, most metaphors are indeed processed non-metaphorically (by lexical disambiguation rather than by categorisation or by comparison of the source and the target domain) and does not involve a (tentative) change of perspective.

The notion of deliberate metaphor has been highly controversial²⁰ as it ruled out most metaphors as non-intentionally presented as metaphors and thus worthless from a communicative point of view (Gibbs 2017). However, contrasting the conceptual theory of metaphor (Lakoff and Johnson 1980), the deliberate metaphor theory (Steen 2008, 2010, 2013, 2017) has brought to the attention of metaphor scholars the idea that the communicative dimension of a metaphor cannot be reduced to its conceptual dimension, nor to its linguistic dimension. In deliberate metaphor theory, metaphors have indeed a communicative function that goes beyond the usual acknowledged metaphorical functions, i.e. the linguistic function of giving a name to experiences which cannot be expressed in literal terms (*naming*) and the conceptual function of providing a frame for interpretation (*framing*). The communicative function of a metaphor offers to the hearer an alternative perspective on the target of the metaphor (*perspective changing*). The *perspective-changing* function should not be conflated with the *framing* function of metaphors: the latter is involved in every belief structure created by metaphor, while the former is *deliberately* used to change the addressee's focus. In such a case, the speaker may *deliberately* use a metaphor—no matter whether conventional or novel—to change the addressee's perspective on the target. Of

²⁰ As pointed out at the very beginning of the paper, the deliberate metaphor theory is still debated (Deignan 2011; Gibbs 2011, 2015; Müller 2011; Charteris-Black 2012; Beger 2019) and has become one of the most heated theoretical issues in metaphor studies. A method for identifying potentially deliberate metaphor in language use has been proposed for discourse analysis (Reijnen et al. 2018), and applied to different discourse genres (Beger 2019; Rewiś-Łętkowska 2019). However, though empirical studies supporting deliberate metaphor theory are still scarce, though a very promising venue for future research (Steen 2015, 2017).

course, novel or live²¹ metaphors can serve this function more easily, because they use a completely new frame. However, also conventional metaphors might act as perspective-changer when deliberately used (Steen 2010), as they can be revitalized in conversation. In such cases, the “system of commonplaces” associated with the conventional metaphor becomes active in hearers’ minds and can be critically questioned and/or changed. A conventional metaphor indeed owns an unexploited scenario of properties, which are normally neglected as non-relevant, but that might become relevant in a new context. For instance, it has been shown that especially conventional metaphors might force the audience to find an alternative, new interpretation of the premises that guarantees a conclusion (Ervás et al. 2018). In the process, conventional metaphors are revitalized to reinterpret the logical connection between the premises and the conclusion. The renewed property of the source selected as relevant for the metaphor interpretation frames the revitalization process in two main ways: 1) it explicitly alters the relevant information that might be included in the source concept, which in turn affects the contextual assumptions and implications of the metaphor; 2) it puts forward certain expectations or even imagined scenarios which prompt backward inference from a conclusion to the premises needed to derive it (Wilson and Carston 2006; Mazzone 2015).

It has been recently argued that in specialist discourse where there is an asymmetry in expertise between the sender and the addressee (academic lectures in Molecular Biology, Beger 2019), any given metaphor might count as either deliberate or non-deliberate depending on how the participants attend to the source domain of the metaphor (for instance, the metaphorical technical term “promoter,” perceived as novel and deliberate by students but not by professors). As pointed out, “metaphorical technical terms can be non-deliberate for discourse participants who are more familiar with the subject matter and the corresponding terminology, but deliberate for participants with less expertise” (Beger 2019: 63). However, in both the case of novel and conventional metaphors used in diagnosis communication, a deliberate metaphor might achieve its purpose when the doctor intentionally highlights the target (the nature of the disease) by putting it in a new (or renewed) light and orienting patients’ reasoning to some relevant properties of the problem, which might have important consequences also on an ethical level. For instance, vaccination has been described through the live metaphor of the “umbrella,” protecting people from “rain,” i.e. infectious diseases. The “umbrella” might not only protect people carrying it in case of rain, but also those who find themselves without it during a cloudburst, either because they forgot or simply did not have it, and need to have recourse to others’ umbrella. The concept of “herd immunity” is therefore gained from the collective perspective of public health, hinting to the fact that hesitant and dissenting people too advantage from others’ vaccination, and are thus indebted to the community. Such live deliberate metaphor encourages a perspective change in the addressees, because it questions previously accepted systems of commonplaces, thus favoring critical thinking. Therefore, a deliberate metaphor acts as a “perspective changer,” when it solicits for belief and (possibly) attitude change towards care management and, specifically, vaccination adherence (see Steen 2015, for an empirically oriented description of deliberate metaphors). Such an effect in communication can be obtained also by deliberately *revitalizing* dead metaphors. For instance, Eula Biss suggests to replace the dead metaphor of a collectivity as a “herd,” with the revitalized metaphor of the “beehive,” which allows people to imagine themselves as members of an organized and cooperative

²¹ Live metaphors are new and creative use of language, not already classified in dictionaries. On the contrary, dead metaphors are lexicalized and their overuse in a linguistic community has frozen their meaning making it conventional.

group, rather than mindless as sheep among others.²² The underlying system of commonplaces is thereby “revealed” and becomes active in people’s mind, making vaccine communication free of (at least some) ungrounded beliefs (Ervas 2018).

An important feature of the use of metaphors concerns as well the ability to communicate effectively about potentially complicated diagnostic matters (and helping to say what counts as evidence in such contexts). We can imagine a very short story along these lines. For example, when talking about Joe, a kid who contracted chickenpox because he could not get vaccinated as allergic, the doctor used the umbrella metaphor with his parents. The doctor had to explain that kids who are allergic to vaccines benefit from the fact that people around them are usually vaccinated, and so there is a kind of collective protection against virus transmission that helps unvaccinated kids to stay safe. In the case of Joe, such a protection did not work because of the high rate of kids around him who are not vaccinated due to the phenomenon of vaccine hesitancy. This is a context where metaphors can help. The doctor, in fact, can explain this diagnosis in a simpler way via the umbrella metaphor introduced above. The protection provided by collective vaccination is like “an umbrella” that protects unvaccinated people from virus transmission which is like “rain.” In Joe’s case, where the collective protection did not work because of vaccine hesitancy, the situation can be described as a *big hole* in the umbrella that makes it ineffective in protecting from rain (virus transmission and contagion). Thus, the use of metaphors can be effective in communicating in a more accessible way certain matters that involve specialized medical jargon, complex diagnostic reasoning and important ethical issues.

Furthermore, this metaphor can also usefully represent the nonmonotonic reasoning behind doctor’s diagnosis. “One can be unvaccinated without getting the virus because of collective vaccination” can be paraphrased and metaphorically framed as “one can go out on a rainy day without an umbrella and stay dry because she can stay under her friends’ umbrella.” In the same way, “There is a phenomenon called vaccine hesitancy that weakens the effectiveness of collective vaccination in protecting from contagion” can be paraphrased and metaphorically framed as “there is a hole in the umbrella that makes it rather ineffective in protecting from rain.” In this specific case, the metaphor concerning the hole in the umbrella is effective in making a *rebutting defeasor* explicit for the usual protecting role of the umbrella (and for the evidence that this role alone would represent). The usual good inference from “having an open umbrella on a rainy day” to “staying dry” is defeated/rebutted by the fact that the umbrella has a big hole (which defeats the former evidence). And this can explain, in a simplified way—which can be also helpful in contrasting vaccine hesitancy—, why vaccine hesitancy is a dangerous challenge to the protection of collective vaccination. The deliberate use of the beehive metaphor can instead work as *undercutting defeasor*, requiring to revise the overall concept of herd immunity by selecting the property of “being cooperative,” which was not included in the concept/image of collectivity as a “herd.” Being a herd indeed does not necessarily imply being able to contrast vaccine hesitancy as a collective health problem. While “having a hole in the umbrella” is an emergent property which is not necessarily part of the concept “umbrella” but might come to be relevant in the specific diagnostic context, in the conventional metaphor of the beehive, “being cooperative” is widely known as a property of bees’ behavior, forcing the audience to revise the concept itself of collective immunity in light of a new perspective which was previously ignored by the source “herd.” The idea of beehive, in this context, is especially helpful in undercutting the inferential connection between “collective immunity” and non-cooperative attitudes—that was not ruled out by the use of the

²² Biss 2015. The beehive metaphor is not new in political discourse, but it is revitalized in relation to the concept of population immunity.

“herd” metaphor (nor by the use of the umbrella metaphor, possibly having a “big hole”), by specifying how giving up on cooperation undermines effective collective immunity.

6. Conclusion: a plea for a metaphor-based communicative approach in doctor-patient interactions

Diagnostic reasoning and the defeasible conception of evidence, together with epistemic gaps in terms of expertise, highlight a potentially troublesome communicative gap between doctors and patients, especially in public heated debates—e.g., anti-vaccination groups, self-published blogs, conspiracy theories, populist political movements, widespread bad epistemic policies (Cassam 2018), and so forth. This gap is a challenge for an effective communication between doctors and patients, and thus for the effectiveness of therapy itself. Both the gaps in expertise and the number of possible distortive dynamics promoting the proliferation of wrong and dangerous beliefs in patients also at collective level, suggest that doctors need new and better communicative resources than those currently at disposal. Here we proposed a tentative theoretical solution for a diagnosis communication which aims to bridge the gap in expertise between doctor and patient, by providing a distinction between metaphors as rebutting vs. undercutting defeasors in diagnostic reasoning and diagnostic communication via metaphors. The solution we proposed takes into account results coming from previous empirical research and can be tested in principle. Furthermore, empirical research may help in refining our solution itself.

The debate is of course open and concerns also other important and wider spheres of interest such as politics and education, but, as emerged in studies concerning metaphors, there already are some clues to improve the dynamics of health communication. In particular, a more skillful and aware use of deliberate metaphors in health communication, might result in improving the outcomes of the interactions between patients and doctors, precisely because of their perspective-changing function. Indeed, by focusing on a new source domain in the case of novel or live metaphors or highlighting previously neglected properties of a source domain in the case of conventional metaphors, the doctor can share with the patient a more accessible version of the reasoning path that guided the diagnostic process, resulting in a more effective comprehension of the nature of the disease itself and possibly entailing an attitudinal change which favors adherence to therapy. On the one hand, metaphors might help health professionals in explaining the evidence for disease in more accessible terms and framing the experience of illness according to patients’ specific needs, also resorting to emergent properties associated with the metaphor or revising some premises in light of a conclusion. On the other hand, the deliberate use of metaphors might encourage a change in patients’ beliefs on their own experience of illness and attitudes toward illness’ management.

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