

Cognitive Foundations of Society: The Concept of Schemata in Cell, Gene, and Tissue Therapies

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Interpreting how people accord meaning to life situations is an old challenge in sociology. Emphasis has been given to values shared within social groups; other sociologists have stressed the discursive or communicative dimensions of society. This paper seeks an alternative interpretation by combining sociological inquiry and insights from cognitive linguistics. It explores the concept of schema, which points to the unconscious identification of patterns in human experiences, enabling people to assimilate concepts such as FORCE, CONTAINMENT, and others. This paper focuses on discourses and views around advanced therapies: medicinal products based on genes, cells, or tissues. These therapies are frequently understood via two alternative schemata. The CURE schema foregrounds therapies' long-term potential to revert disease and tends to underpin metaphoric reasoning; the IMPAIRMENT schema highlights specific limitations brought about by disease, being frequently associated with metonymic reasoning. Schemata underpin broader initiatives and decisions, including those adopted by regulatory and government agencies. As they constitute basic and socialized understandings, their study enables the identification of the cognitive and linguistic foundations of society.

Introduction: society and its cognitive pillars

Are the productions and relations that constitute society only related to complex and conscious activities, or can their source be found in more fundamental and unconscious levels of understanding? To address this question, this paper focuses on a specific sphere of social life, which is frequently the object of debates: the development of, and access to, therapies. More specifically, it focuses on the field of *advanced therapies*.

The latter are cutting-edge products based on genes, cells, or tissues. Frequently, these therapies are manufactured with starting materials collected from the patient's body—such as cells and tissues—which enables the production of personalized therapies (Pearce *et al.* 2014; de Wilde *et al.* 2016; Medcalf 2016). For this reason, they have been explored to tackle diseases with no available treatment (Brower 2015). This has been the case for some types of cancer (Brower 2015; Wang and Rivière 2016), eye diseases (Newcastle University 2019), and heart conditions (Brooke *et al.* 2009), but a large range of diseases can potentially be tackled by means of these therapies.

At the same time, current advanced therapies are still being developed or refined, and are sometimes associated with serious adverse reactions (Black et al. 2020; Santomasso et al. 2021).

Highlighting some linguistic aspects of these therapies, this paper reinforces a stream of studies on creative linguistic practices around medical technologies (Domaradzki 2018; Estrella 2020; Michaelson et al. 2018; Semino et al. 2017, 2018; Woodside 2018; Tay 2020). Here, however, it is aimed to go beyond the specific realm of linguistic practices and identify those practices that come to be diffused and *normalized*, thus helping constitute society in its cognitive dimension. For as claimed by Lakoff (2005), the adoption of a certain medical technology, in a certain place, always entails some cognitive anticipations and adjustments. Therefore, this paper contributes towards unravelling the cognitive and linguistic bases of collective life.

In sociology, these bases have been recognized in two ways. On the one hand, various sociological strands have assumed that social life involves the assimilation of certain mental or knowledge skills, be it in the form of economic rationales (Simmel 1950 [1903], 1997 [1900]; Weber 1921/1978), practical knowledge (Luckmann 1989; Berger and Luckmann 1991), socially shared values and representations (Durkheim 1925), ideologies and discourses (Gramsci 1948/2005; Wright 2010), or cultural notions (Lévi-Strauss 1964; Geertz 1973).

On the other hand, some sociological analyses, especially since the 1970s, have pointed out the communicative, discursive, or linguistic pillars of society. In this group, one can include Bourdieu's (1977) field theory and Cicourel's (1974) cognitive sociology, which were highly influenced by Chomsky. For sure, Habermas' (1987, 1996, 2008) theory of communicative actions can also be included here, along with its reverberations in sociologists such as Benhabib (1996), Fraser (2009), and a whole school of thought known as deliberative democracy.¹ This is by the way the theoretical approach we adopted in previous publications (Bicudo 2014, 2019).

In a sense, the approaches mentioned above focus on the human ability to engage in formal reasoning. As a consequence, they tend to ignore creative operations taking place at unconscious levels. An alternative route will be taken in this paper, in an approach that combines sociological interpretation with insights from cognitive linguistics. The goal is to highlight how the constitution and consolidation of society draw on basic and unconscious processes with which people make sense of social life—including their social relations, their contacts with the built environment, and hence their bodily experiences. An intense conversation between sociology and cognitive linguistics, as proposed here, can evidence the central role played by such creative capacities as pillars of social life.

In order for such a conversation to be fruitful and precise, this paper analyses discourses about advanced therapies, their potentialities, and their challenges. Here, the concept of discourse draws on a sociological, Gramscian view according to which certain arguments and explanations, when properly mobilized by social players, can convince other social players, secure political power, and support certain initiatives with social consequences. Through this process, a particular social group manages to put in place 'practical and theoretical activities', in such a way that it '[...] not only justifies and maintains its dominance, but manages to win the active consent of those over whom it rules [...]' (Gramsci 1948/1999, p. 504).

In this vein, this paper aims to offer two kinds of contributions. From a linguistic point of view, it seeks to further illuminate the socialized or normalized dimensions of language, claiming that language and concepts exist not only when assimilated and used by individuals but also when shared in social groups and mobilized in political debates. From a sociological point of view, it seeks to demonstrate that political and governance debates are not separated from the cognitive processes through which people frame concepts, elaborate discourses, and understand their everyday life.

The analysis of advanced therapies enables us to contend that cognition involves not only mental skills or brain deeds. As stressed by cognitive linguistics: 'Our acts of reasoning and deliberation are not wholly independent of the nonpropositional dimension of our bodily experience' (Johnson 1987, p. 64). Indeed, it will be claimed that the ways in which therapies are used and talked about depend on the ways in which they participate in patients' bodily experiences.

For undertaking this analysis, this paper is organized as follows. The initial section focuses on theory, highlighting the concept of schema. In the subsequent section, our research methods are outlined. We move on to scrutinize the two schemata used for understanding advanced therapies:

the CURE schema, generally associated with metaphoric reasoning, and the IMPAIRMENT schema, generally associated with metonymic understandings. Some sociological consequences of the construction and diffusion of these two schemata are then highlighted. The conclusion reinforces how the concept of schema underpins a dialogue between sociology and cognitive linguistics, pointing out the interpretive benefits of this dialogue.

The concept of schema

In cognitive linguistics, it is claimed that human experiences are understood by means of categorization of experiences. For example, social participants know how to behave in particular situations by categorizing them as a commercial encounter, a personal relation, a job conversation, and other classifications. Such a categorizing task has been interpreted with different concepts, including the concepts of the frame (Fillmore 1985) and script (Abelson 1981).

The analysis undertaken here draws on the concept of schema, which was thoroughly developed by Johnson (1987). This concept stresses that human activities are endowed with patterns or recurrences, enabling people to formulate concepts about experiential aspects that are repetitive or at least undergo minor variations. For example, the concept of *containment* is most dependent on (i) people's experience of the body as a container for the 'self' or the 'soul'; (ii) their interaction with objects that are containers and/or can be contained; and (iii) their experience of being inside or outside places or rooms. 'In each of these cases there are repeatable spatial and temporal organizations. In other words, there are typical schemata for physical containment' (Johnson 1987, p. 21).

Another feature of schemata is their figurative nature; for this reason, Johnson actually calls them 'image schemata'. Every schema can be represented by means of an image with identifiable components. For instance, let us consider the very common and widespread PATH schema, illustrated in Figure 1.

This PATH schema has three main components: a point or location A; a point or location B; and a vector uniting them. This schema '[...] is a recurrent structure manifested in a number of seemingly different events, such as: (a) waling from one place to another, (b) throwing a baseball to your sister, (c) punching your brother, (d) giving your mother a present, (e) the melting of ice into water' (Johnson 1987, p. 28).

With the mobilization of schemata, people can therefore provide events and experiences with a sort of basic meaning. An experience apprehended via schemata becomes meaningful, in the sense that patterns can be recognized and coherence can be grasped (Johnson 1987).

Based on Johnson's points, two aspects can be further explored. On the one hand, schemata can be combined, as seen in Figure 2.

In this case, the PATH seen in Figure 1 appears *inside* a boundary, which corresponds to the CONTAINMENT schema. This combined schema may be useful for interpreting, for example, a

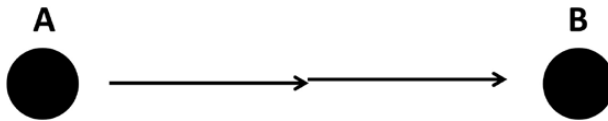


Figure 1: The PATH schema.

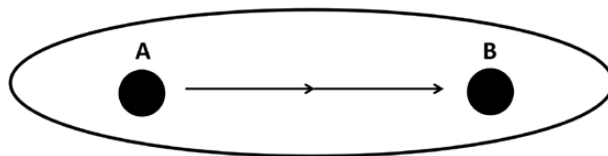


Figure 2: Blending the PATH and the CONTAINMENT schemata.

journey within the boundaries of a country or the movements of players on a football pitch. This combination of schemata is a confirmation that '[...] human beings are exceptionally adept at integrating [...] different inputs to create new emergent structures, which result in new tools, new technologies, and new ways of thinking' (Fauconnier and Turner 2002, p. 27).

On the other hand, Johnson stressed the role played by schemata in metaphors. In his collaboration with Lakoff, he showed, for example, how people frequently mobilize the PATH schema to frame a love relation or a verbal argument as a journey, with moves, barriers, passages, and turns (G. Lakoff and Johnson 1980). However, much remains to be explained in terms of how schemata participate in the construction of metonymies. For as claimed before, metaphors and metonymies constitute key 'strategies of conceptualisation' (Jakobson 1956; Dirven and Pörings 2003; Yu 2009; Kövecses 2010), which is also valid for social debates and ideologies.

In this paper, it will be claimed that advanced therapies are frequently framed and talked about with the activation of two schemata: CURE and IMPAIRMENT. Moreover, it will be argued that the CURE schema often leads to metaphoric reasoning, whereas the IMPAIRMENT schema is often associated with metonymic understandings. Before providing this explanation, our study's research methods are outlined in the following section.

Research methods

This analysis derives from a research project called 'Biomodifying technologies: governing converging research in the life sciences', which was conducted from 2019 to 2021 at the School of Global Studies, University of Sussex, in collaboration with researchers based in the University of York and the University of Oxford. The project's main goal was to identify key regulatory and social challenges in the development of, and access to, advanced therapies—as defined in the beginning of this paper.

Our research methods were reviewed and approved by the university's Research Ethics Committee. In addition to a literature review and the collection of some quantitative data, the study was decisively based on qualitative interviews with various stakeholders involved in the development or study of advanced therapies. Table 1 brings a summary of the interviews conducted.

The identification of interviewees was based on the relevance of their institutions or companies for the field of advanced therapies. When a company or agency was identified, employees responsible for advanced therapies were approached and invited to participate.

As interviewees had a varied range of expertise, the issues addressed in each conversation also varied. However, all the interviews dealt with a common set of topics: regulatory difficulties or uncertainties in the domain of advanced therapies; the social impacts of advanced therapies, as

Table 1: Summary of qualitative interviews

Interviewee	Number of interviews
Staff of regulatory agencies/ Regulatory advisors	12
Patient representatives	9
Academics	8
Hospital staff	5
Biotech companies	4
Employees of government agencies	4
Patent attorneys	2
Total	44

detected by the interviewee; the roles to be played by the state and companies in governing these therapies; the changes brought about by advanced therapies to the delivery and organization of health care.

All interviews were recorded with consent from the interviewee. Transcripts of whole interview recordings were prepared by a transcription firm working under the terms of a non-disclosure agreement. All transcripts were read and analysed. Different interview parts received labels based on the topics being discussed so that emergent themes could be identified. This identification of themes followed two patterns. On the one hand, it was based on some points that appeared, over and over again, in interviewees' speech. For example, several people talked about how advanced therapies can bring about cure for patients, which made us create a 'promotion of cure' label. On the other hand, when it became clear that our interview materials lent themselves well to a cognitive interpretation, the theory suggested some labels. For example, a label was created for 'use of metaphors', with metaphorical occurrences being identified as explained below. In this way, the interview analysis sought to promote a dialogue between the theory—which provides a framework for our interpretation—and the interview materials—which reinforces, and sometimes challenge, the theory.

Because of the questions being asked in this paper, the interviews with patient representatives proved particularly useful. In these interviews, the experiential aspects of advanced therapies could be explored more thoroughly. Frequently, patient representatives suffer from, or have relatives suffering from, the disease focused on by their institutions. For example, it is not rare to find, on the direction boards of cancer-related organizations, people with a child or parent living with cancer. Even when this is not the case, patient representatives are generally in constant contact with patients. In this way, they are aware of several everyday issues faced by patients, scientific trends in their disease area, and the development of advanced therapies for fighting such conditions, including the conduct of clinical trials testing new therapies. However, what was claimed by interviewees other than patient representatives is also seriously taken into account here. In this way, this analysis sheds some light on the creation, diffusion, and implications of schemata for the everyday interpretation of advanced therapies.

Schemata in the understanding of advanced therapies

One of the main challenges of sociology is to explain how social players accord meaning to social life. Cognitive linguistics bring about crucial clues, stressing the worth of categorization and conceptualization. It is via these two resources that people come to identify 'important' components of their experience, classifying and remembering them (G. Lakoff and Johnson 1980).

The concept of schema helps comprehend such categorizing activity. In the domain of advanced therapies, two alternative and recurring schemata can be identified, as analysed below.

The CURE schema

Let us consider three examples. The first one comes from the commercial domain. Luxturna, a product derived from gene therapy techniques, aims to fight eye diseases by tackling defects in a specific gene. On its website,² the manufacturer, Spark Therapeutics—a biotech company acquired by Roche in 2019—claims:

LUXTURNA works to restore the visual cycle. The visual cycle is a process that allows you to see. LUXTURNA provides a working RPE65 gene to act in place of a mutated RPE65 gene. This working gene has the potential to make the visual cycle work properly again.

The second example comes from the academic literature. Muhammad Abbas, based in Queensland University of Technology, Australia, analysed intellectual property issues around Kymriah, a CAR-T cell product, which derives from gene editing techniques and fights resistant cancers. This is how the therapy is described:

In addition to its therapeutic value, Kymriah has societal value too because not only many of the patients treated with this therapy will be able to achieve and sustain their health-related quality of life but also their parents and caregivers will be able to return to their normal life (Abbas 2020, p. 3)

The third example is from the interview with patient representative number 2. This interviewee talked about the ways in which the state could reimburse biotech companies:

We have to think whether there's a different way to pay for these [advanced therapies], and maybe it's about adding in the financial markets into it as well. It's not just simply the health-care services of a country paying directly to a company for a treatment that is going to provide a lifetime cure.

In these three examples, there is the idea of restoration, the possibility to 'make the visual cycle work properly again' (lines 3-4), the prospect of enabling patients and relatives 'to return to their normal lives' (lines 7-8), the opportunity 'to provide a lifetime cure' (line 12). Sometimes, these accounts are more enthusiastic, like in some passages of the interview with patient representative 2, who described, for example, the preliminary outcomes of a clinical trial for a neuromuscular disease:

[...] it does look quite miraculous when you see it. You see these children who were once permanently attached to a ventilator and they're now breathing in air. That is miraculous.

Here, more than restoration and cure, the concept invoked is that of miracle (lines 13 and 15).

The idea of 'restoration' is not always very elaborate in these utterances. Roughly speaking, one could identify three fundamental ways in which restoration can be framed. First, people can have recourse to biological or biochemical notions. In the case of Luxturna, there are data from clinical trials supporting the claim that the medicine enables the sick eye's cells to regain their capacity to produce the missing enzyme. Second, as in the example from Abbas above (lines 5-8), people can think about social skills and activities, stressing that because of the therapy's efficacy, patients and relatives can resume activities once impeded by the disease. Finally, people can simply mobilize what has been called 'folk theories' or 'folk models' (Lakoff 1987; Kövecses 2010), that is, simple everyday notions about health and illness. For example, if a patient ceases to be dependent on a medical device, this is seen as a sign of improved health, as described in the interview cited above (lines 13-15).

These and similar claims express the mobilization of the CURE schema, which can be represented as follows:

As explained above, schemata frequently derive from the combination of simpler schemata. In the case of Figure 3, we are dealing with a complex mixture, with the presence of various schemata (PATH, GROWTH, REDUCTION, BARRIER, and DEVIATION) and the emergence of the following views:

- a) The patient's health is framed as a vector following a certain trajectory. This invokes the PATH schema (present, for example, in vector A).
- b) With the passing of time, the patient's 'quantity of health' decreases rapidly. Hence, the presence of the REDUCTION schema (vectors A and C).
- c) The therapy is viewed as another vector, which is brought in to intercept vector A. This is captured by the BARRIER schema (the intersection between vector A and the dashed line).
- d) When the patient and therapy meet, the health trajectory is changed, which is captured by the DEVIATION schema (vector A, dashed line, and vector B).
- e) Thanks to the therapeutical intervention, health is restored and 'increases'. The outcome is reflected in the GROWTH schema (vector B).³

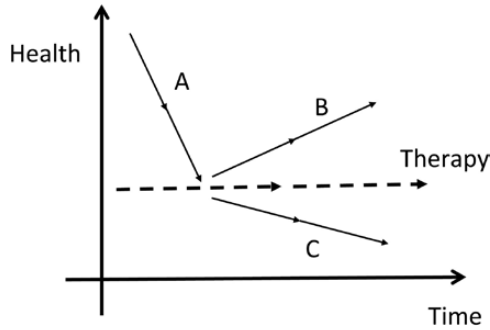


Figure 3: The CURE schema of advanced therapies.

As already explained, schemata result from human experiences that repeat themselves, although with variations. Indeed, the CURE schema is easily understood by anyone who recalls, for example, having a headache, taking some painkiller, and noticing the pain gradually fade away. However, in the domain of advanced therapies, one deals with conditions that are much more serious and complex than headaches. It is then expected that, on some occasions, the therapy will not enable an actual cure (vector B of Figure 3) but will at least slow down the march of disease (vector C). Or as regulator 12 put it: ‘Most treatments and most health technologies do manifest their benefits in one of those forms: either the life increases [vector C] or the quality of life goes up (or both) [B]’. Even though C is not exactly cure, it also belongs in this schema, as explained below.

The axis for time that appears in Figure 3 indicates that in the CURE schema, the results people want to see are frequently not immediate. This issue emerged in the interview with patient representative 7:

[...] a substantial proportion of it [the disease], the cause, is due to genetics, so they do know it runs in families and they do know that it might affect their children and their grandchildren [...].

In this example, disease is framed as a trouble that goes beyond an individual’s lifetime and affects whole ‘families’ (line 17), being transmitted, via genetic processes, to ‘children’ and ‘grandchildren’ (line 18).

Therefore, an understanding emerges where the process of Figure 3 ceases to pertain to an individual patient and begins to relate to groups or generations of patients. In the long term, it can become possible to move from vector A to C and, with still more years of research and development, to vector B. We are dealing with a reasoning where ‘[...] all of our analysis of values, valuation and payment scenarios is about “the articulation of the future”’ (Faulkner and Mahalatchimy 2018, p. 231).

This reasoning has underpinned the rationales of medical experimentation and the statistical tricks of clinical trials pointed out by some authors (Busfield 2006; Abraham 2007; Petryna 2009). As claimed by Jain (2010), the scientific rationality of clinical trials continues to prevail even in the face of research subjects’ deaths. Eventually, therapy development becomes subject to ‘statistical laws that look like brute, irreducible facts’ (Hacking 1990, p. 3).

In this way, an understanding is consolidated, which is abstract or *estranged*—because increasingly disconnected from individual and specific clinical experiences. Eventually, the CURE schema underpins a reasoning that is ‘valid beyond the reach of human sense experience’ (Arendt 1998, p. 263). With these features, this schema tends to come in tandem with an abstract linguistic practice: metaphor.

Metaphors and the CURE schema

Metaphor implies understanding one kind of phenomenon or experience in terms of another kind of phenomenon or experience (G. Lakoff and Johnson 1980; Sweetser 1990; Kövecses 2010; Tay 2013). For example, a metaphor is employed when it is claimed that TIME IS MONEY. Metaphors have been the focus of several studies, including two relatively recent handbooks (Gibbs 2008; Semino and Demjén 2016). In the field of medicines and healthcare, more specifically, a series of studies have focused on the use of metaphors in health-related issues (Appleton and Flynn 2014; Domaradzki 2018; Michaelson et al. 2018; Semino et al. 2017, 2018; Woodside 2018; Tay 2020).

Metaphors always involve some abstract thinking because one needs to grasp the similarities between two domains with no obvious relation or similarity. This effort may be minimal when a 'conventional metaphor' is invoked (such as TIME IS MONEY). Considerable creative effort may be needed, though, in the case of newly created metaphors. In cognitive linguistics, it is assumed that metaphors are used not only by artists; metaphoric reasoning is rather '[...] pervasive in everyday life, not just in language but in thought and action' (G. Lakoff and Johnson 1980, p. 3).

In our study, some metaphors could be identified in our interviewees' speech. To recognize those metaphors, the method proposed by the Pragglejaz Group (2010) was used, which consists of three steps: 1. Identify the relevant lexical units of a sentence; 2. Understand those units' meaning in their specific context; 3. Ask whether some specific unit (for example, the verb 'block' in 'block therapies from coming to market') has a more basic meaning in other contexts (such as the physical meaning of the verb 'block'), in which case we are dealing with a metaphorical use of that specific unit.

Being formed by several, more basic schemata, and fostering a long-term view that transcends the experiences of particular patients, the CURE schema tends to underpin the construction of several metaphors related to advanced therapies. For example, in Figure 3, the therapy appears as a vector with a direction. This image motivates the MEDICINE (OR THERAPY) IS A MOVING OBJECT metaphor, through which medicines are seen, not as fixed entities, but as objects following a pathway and having a story. Hence, the idea of phases *through which* any therapy must pass, including pre-clinical studies, clinical trials, and post-marketing assessments. One of the phases of this movement is the evaluation performed by a Health Technology Agency (HTA), which decides whether the product will be reimbursed by the health system. As claimed by the member of a UK government-funded initiative:

[...] as a researcher or developer, you really need to think carefully and plan ahead for these things and especially in circumstances where you do end up getting an accelerated review from the regulatory perspective. It also means that you need to [...] be in touch with HTA bodies to say "Look this thing is happening and it might be coming your way soon".

According to this interviewee, the HTA agency should be prepared to receive the product, which is moving towards the assessment body (line 23). It is also considered that the product may be granted an 'accelerated' assessment (line 21). The idea of speed is a smooth development of the image of an object moving in time and space. In this vein, Patient representative 6 claimed that '[...] [...] there has definitely been an acceleration of the innovation, which is now coming through at a faster pace than before'.

In this cognitive framework, THE MARKET (OR THE PATIENT) IS A TARGET constitutes another recurrent metaphor. Or, as claimed by patient representative 6: 'Well, this tendency is basically trying to push through the pipeline greater and greater flow of products and to bring them into the market sooner and quicker and earlier'. If in this example, the product is ushered into the market, it can also be made to reach patients. According to Patient representative 7: '[...] a lot of them [patients] say, 'Oh, it [the therapy] will never get to me in my lifetime [...]']'.

One may find it curious that the product can reach either the patient or the market, two concepts that are apparently unrelated. However, in the highly privatized domain of advanced therapies, these concepts are oftentimes merged. In order for therapies to be made available to patients, they first need to be approved, that is allowed into the market. Even when the therapy is not purchased by the patient—being instead acquired by the state and made freely available to patients—such state acquisition is only possible after a marketing authorisation has been issued. In this sense, reaching the market is a prerequisite for the therapy to reach patients.

In this vein, Patient representative 6 suggests how the medicine, in its movement, can target patients. The interviewee described some work conducted by the European Medicines Agency, which involved patient representatives and was aimed to produce guidelines for therapy developers. This guidance is said to be important, '[...] so that the product actually has a successful passage through health technology appraisals and eventually reaches patients, and hopefully as fast as possible'.

If therapies are travelling, there may be barriers blocking their *progress*. REGULATION IS A BARRIER emerges, then, as another frequent metaphor underpinned by the CURE schema. It has been noted that a growing demand for stem cell therapies '[...] may metamorphose into political demands for change in the governance of stem cell innovation to enable the earlier delivery of new treatments' (Salter *et al.* 2017, p. 80). This issue emerged in the interview with patient representative 6:

Reflecting that thought process in legislation [...] for how we go forward with things like bioprinting [...], it could be a very important thing that that's legislated towards, to make sure the things are safe but at the same time that it's not blocked from coming to market.

While some regulations can block the therapy's advancement, others can speed it up. Two possibilities are then assumed, as depicted in the following Figure 4.

In this reasoning, the therapy can follow two trajectories—which would be the case, for example, if it is reviewed by the regulatory agencies of two different countries. When enabling regulations are in place, the therapy's advancement is not only permitted but also reinforced. In the alternative case, regulations act as a barrier, blocking therapy development.

However, the CURE schema does not fully dominate the cognitive landscape of advanced therapies. In the literature and our interviews, an alternative schema proved equally frequent and relevant, as explained below.

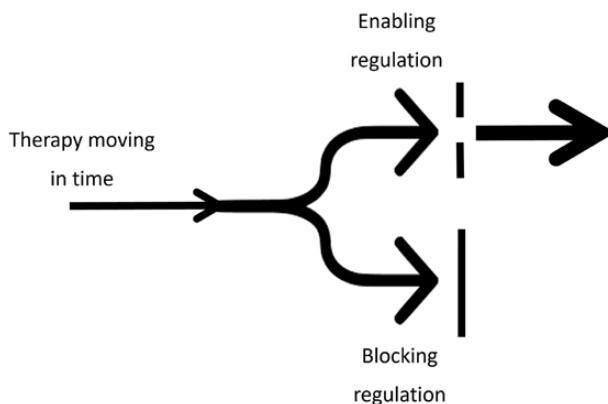


Figure 4: Understandings about the interaction between therapies and regulations.

The IMPAIRMENT schema

Another recurrent schema in advanced therapies can be represented as follows:

This schema combines two basic schemata (PATH and CONTAINMENT), conveying the following understandings:

- The PATH schema (the arrow) represents the health trajectory, with an 'amount of suffering' that may increase or decrease.
- The subject experiencing health, or lack thereof, is obviously the patient but also the group of relatives and friends around the patient.
- The vector cannot move freely, as it is severely circumscribed. There emerges a RESTRICTION schema—the combination between the arrow suggesting progression and the box impeding that progression.
- The limits experienced by the patient are imposed not only by the disease but also by the therapy itself, as explained below.

Once again, there is an axis for time, which is a typical cognitive feature of the domain of advanced therapies. However, the abstract notion of disease (present in the CURE schema) is replaced with the concrete and corporeal notions of impairment and suffering, which point to the pain or discomfort endured by patients. Our interviewees repeated, countless times, the idea that patients are not looking for a cure but would be satisfied with the simple alleviation of their physical suffering. For example, patient representative 2 was asked whether gene therapies bring about big hopes in patients.

While they may not be a massive miraculous cure, anything that provides a degree of improved strength could completely alter our patients' [...] lives. If you could get someone from 24 hour ventilated to 12 hour ventilated or if you could get someone from not being able to eat to being able to eat a little bit, or if you could get someone from having limited hand movement to being able to manage their own keyboard...

In [Figure 5](#), the main vector represents 'somebody', a person with limits or impairments represented by the box. The notion of impairment is less than abstract here and is constructed in two ways. First, the patient has an impaired experience of the built environment. For example, patient representative 2 was asked whether patients' families were especially concerned with the limitations created by the Covid 19 pandemic.

They are, but families with a child with a neuromuscular disorder, they just live in their own pandemic anyway. We always live a life where we wash our hands, we don't have people come into our house who might have any sort of respiratory virus, we're careful about what we touch when we're out and about [...]

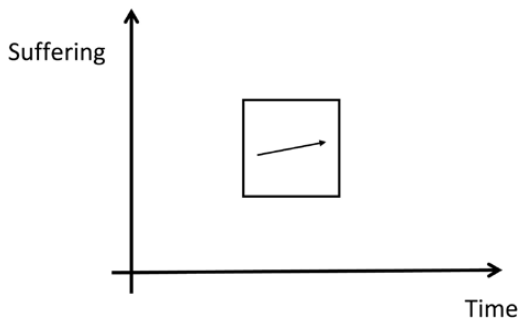


Figure 5: The IMPAIRMENT schema of advanced therapies.

According to Patient representative 8, the diagnosis of a severe condition is a life-changing event, insofar as '[...] you're going to have to sell your house, move your family, get to a school where there's no stairs, totally recalibrate your life'. Therefore, the disease can spring out of the patient's body, so to say, and reverberate in the patient's bodily contacts with the built environment.

Second, patients feel to be dependent on the physical manifestations of therapy, which can take the form of pills, devices, wheelchairs, ventilators, routine visits to clinical settings, and so on. For example, patient representative 1, who suffers from a respiratory condition, declared to be concerned about forgetting or losing inhalers on a long-distance journey. Thus, the material forms of therapies make the impairment concrete and visible.

In [Figure 5](#), the box keeps the vector in a certain range of the Suffering vector but also in a certain range of the Time axis. This reflects the circumstance that for many patients, disease implies procedures and experiences that repeat themselves for years or decades and can even accompany people throughout their lives. For example, patient representative 6, who suffers from a genetic disorder, recalled:

[...] they decided to wait until my haemoglobin started dropping, and then to start me on regular transfusions, blood transfusions with red cells. And this happened about... around the age of four years old, and that's when I started having transfusions and from that day on, I have continued until today to have transfusions on an almost-monthly basis.

Therefore, the idea of time gains a different shape in this schema. When the impairments caused by disease are too serious, the limiting box shrinks and time seems to lag or even stop. In this cognitive framework, life, when it is not eventful, seems to be paralyzed. When a sick boy is unable to play with his mates, he is not realizing his childhood and *moving forward in time*. Interestingly, the deterioration of disease, by generating more impairments, can even cause somebody to go back in time.

One may have the impression that in [Figure 5](#), the therapy is not represented. In fact, it is there; it is one of the elements that form the limiting box. For as claimed by patient representative 6: '[...] every product or every therapy that is authorised, or is in clinical trial, is bound and usually will have a set of adverse events or contraindications or will have some side effects [...]']

In the domain of advanced therapies, many products are still being honed. At the same time, they are often aimed to fight so-called orphan diseases—those for which no therapy has been found yet ([Farkas et al. 2017](#); [Ham et al. 2018](#)). Considering the severity of some diseases, developers and regulators have decided to deliver some therapies that are still being refined, in spite of all the uncertainties pertaining to clinical outcomes, which can sometimes result in severe adverse events. CAR-T cell therapies, for example, may generate several adverse reactions, the worst of them being Cytokine Release Syndrome (CRS) ([Pillai et al. 2020](#); [Santomasso et al. 2021](#)). '[...] CRS is a systemic illness that closely mimics sepsis. Patients typically develop a fever, which may be followed by haemodynamic instability, capillary leak and multiorgan failure in severe cases' ([Pillai et al. 2020](#), p. 4).

At times, therapy delivery itself requires considerable sacrifices from the patient. For example, interviewee 5 is a patient representative for Parkinson's disease. This person, who suffers from Parkinson's, was invited, but refused, to join a clinical trial where the investigators:

[...] drill little holes in [in the subject's skull] and they put a tube in and every so often they can... I think it's once a month or once every three months, they put in the... one of the drugs that goes straight into the bit [of the brain] that's going to affect... that causes the Parkinson's, yes.

This is a clear example where therapy becomes another source of physical discomfort or suffering.

To be sure, the CURE schema and its associated metaphors suggest that sometimes therapies can only alleviate patients' suffering. However, the long-time scale implied by that schema brings about the *hope* that at least in the long term, therapies will be improved and cure made

possible. In its turn, the IMPAIRMENT schema focuses, almost crudely, on the experiences of specific patients or research subjects, as well as ‘their embodied sense of suffering’ (Therond *et al.* 2020, p. 456). In this way, talking about cure may sound like undue abstraction or escapism.

Precisely because of this denotative emphasis on particular bodies and experiences, the IMPAIRMENT schema opens up much space for metonymic references.

Metonymies and the IMPAIRMENT schema

Generally speaking, metonymy is employed when part of an event, subject, or object is selected to refer to the whole event, subject, or object (Dirven and Pörings 2003; Kövecses 2010; Panther and Thornburg 2010; Wilkerson 2016). An example comes from Dirven (2003, p. 83): ‘He’s got a good head on him’, where ‘head’ makes metonymic reference to intellectual skills, not only to the physical part of the body, although this part is certainly necessary for intellection. Metonymies are used in several situations, including medical contexts, as demonstrated by some studies (Rundblad 2016; Camp *et al.* 2020; Tseng and Zhang 2022).

Figure 5 is clearly more complex than Figure 3. This happens because the IMPAIRMENT schema condensates different things into the same cognitive units. The vector represents the patient, but also relatives and friends around the patient, whereas the box represents all the limitations created by disease, but also the suffering and restrictions entailed by clinical treatment itself. Thanks to such condensations, the IMPAIRMENT schema fosters metonymic reasoning in at least three ways.

First, it is recognized that disease affects not only one’s physical existence but has broad life implications, as mentioned by patient representative 8:

[...] you have to deal with the emotional repercussions of the diagnosis, but you’re also told [by the medical staff] that the life you thought you were going to be living is not going to happen, so you’re going to have to sell your house, move your family, get to a school where there’s no stairs, totally recalibrate your life.

We are dealing with the DISEASE FOR THE LIFESTYLE metonymy whereby the concept of *disease* is the part that makes reference to the whole—all the impairments brought about by the disease, which can be social, emotional, geographical, and others. The concept of *cancer*, for example, would refer to a disease but also, and more importantly, a way of living, comprising social relations, housing, food, and life expectations. The ideas of physical impairment, social impairment, geographical impairment, and housing impairment are lumped together. The outcome is a combination of concepts of the sort that Encrevé *et de Fornel* (1983, p. 13) described as ‘referential networks’ (e.g. the MEDICINE FOR THE DISEASE, the PATIENT FOR THE DISEASE, the HOUSE FOR THE DISEASE, and so on). It also reminds of what Dirven (2003, p. 86) described as ‘metonymic chain’ (e.g. the MEDICINE FOR THE DISEASE, the DISEASE FOR THE PATIENT, the PATIENT FOR THE FAMILY, the FAMILY FOR THE SICK LIFE STYLE, and so on).

Second, it was explained that the vector in Figure 5 represents ‘somebody’. This ‘somebody’ is certainly the patient but through some metonymic references, the concept can involve carers, friends, and relatives. An example comes from the interview with patient representative 8:

[...] in order to survive every day, to see my son with [this disease], I have to suppress what that disease is doing, I have to ignore it, I have to hide it away. I can’t deal with the reality of [this disease] because it’s so painful.

In this case, ‘what the disease is doing’ (line 54) has been done to the sick child but also to the interviewee. The reaction is a sort of psychological denial toward the disease, and an attempt to ‘ignore it’ or ‘hide it away’ (line 54). The pain directly endured by the sick person is assimilated with the ‘painful’ experience of relatives (line 51). Eventually, there emerges the PATIENT FOR THE SOCIAL GROUP metonymy whereby the concept of patient is a part that makes reference

to a familial or social whole. In Patient representative 8's direct words: 'This isn't just a disease that affects the patient, it ricochets out in a sort of cluster bomb-type effect to the whole family and beyond'.

Finally, a (FAULTY) GENE FOR THE (SICK) BODY metonymy can be identified. In order to make reference to the *whole* body and being, people can mobilize an improbable bodily *part*: the gene. For example, patient representative 4 explained that patients contact the institution from time to time.

People [patients] will have picked up on the fact that there's a clinical trial going on somewhere and they'll want to know a bit more about it [...] Sometimes they contact and just say: 'Oh, this is my gene, this is the gene fault I've got or this is the faulty gene in my condition. [...] Is gene therapy going to be likely for that gene?'

Via this unexpected metonymic reference, one 'takes revenge' on the CURE schema by using an abstract concept—gene—to make reference to one of the most concrete and experiential notions—the body.

This is not to say, however, that the IMPAIRMENT schema and metonymic references constitute 'good' linguistic practices as opposed to the 'bad' CURE schema and their metaphoric entailments. It has been noted that metonymies may entail biases and prejudices. Lakoff and Johnson (1980, p. 39) give the example of a sentence pronounced in a restaurant: '[...] when a waitress says "The ham sandwich wants his check," she is not interested in the person as a person but only as a customer, which is why the use of such a sentence is dehumanizing'. In advanced therapies, such dehumanizing effects can be more drastic, as patients may be reduced to their conditions via the DISEASE FOR THE PATIENT metonymy. As claimed by patient representative 1, '[...] we're real people [...], we have jobs and houses and lives, you know, we're not just a thing with a disease [...]'.

However, even patient representatives may fall prey to the reductions of the DISEASE FOR THE PATIENT metonymy. For instance, patient representative 5 declared: '[...] every Parkinson person has their own journey; no two people are the same'. Ironically, this statement denies what it tries to affirm. Although the interviewee meant that every patient is unique, the metonymic reference ('Parkinson person') realizes a classification that denies patients' uniqueness, taking them as mere personifications of a certain condition.

To summarize, discourses about advanced therapies can express metonymic or metaphoric reasonings, which emerge as discursive developments of either the IMPAIRMENT or the CURE schemata, respectively. By the way, our analysis proceeded, to a great extent, by retracing the cognitive pathway followed by discourses. That is, it was, for example, by identifying the THERAPY IS A TRAVELLER metaphor that it was possible to grasp the (more basic and schematic) notion according to which the therapy is a vector moving in time—as seen in Figure 3. Equally, it was, for example, by acknowledging the interviewees' metonymic chains depicting patients' restrictions that it was possible to conclude that a sort of cage or frontier was part of the IMPAIRMENT schema—the box in Figure 5. In this way, metaphors and metonymies are the outcomes of cognitive processes but also interpretive supports for those willing to uncover more basic layers of those cognitive processes.

These linguistic practices are not just discourses. They have key practical implications, briefly outlined below.

Sociological implications of the cognitive schemata for advanced therapies

Cognitive schemata are processed unconsciously and without the intervention of words. Although having such non-lexical or nonpropositional nature, they help to form interpretations and understandings that underlie social and political debates. 'It is a matter of great significance [...] that

patterns such as these, which exist preconceptually in our experience, can give rise to rational entailments (which we describe propositionally)' (Johnson 1987, p. 22).

The final stage of this cognitive process is the emergence of discourses, understood as a range of stories, arguments or theories which, when voiced by social players, can convince other people, and thus give support to particular initiatives. We are dealing with discursive tools that, when used skilfully, can help some people join the cognitively dominant social group. In the conditions of contemporary societies, as explained by Gramsci, this dominance is not secured exclusively through violent means but also, and mainly, through hegemonic discourses that secure the '[...] "spontaneous" consent given by the great masses of the population to the general direction imposed on social life by the dominant fundamental group [...]' (Gramsci 1948/1999, p. 145). In this sense, the cognitive processes analysed in this paper contain not only the seeds of human understanding but also the seeds of political life itself.

The domain of advanced therapies is also marked by this search for cognitive affirmation. Two aspects of this political process are highlighted in the next subsections.

Schemata in the economic side of advanced therapies

In the CURE schema, therapies are said to play a decisive—or even miraculous—role, which creates much marketing potential. This enables a discourse that can entice funders of biomedical research, who like to think that their investments 'make a difference' or 'have real-world impact'. For example, patient representative 7, involved in fundraising for research, explained that in order to attract potential funders' attention, it is key to foreground potential cures. 'I don't think we're trying to raise expectations that aren't realistic [...] we have a way of speaking which is: "yes, help us find a cure, we're talking about beating [...] disease." It's all about... it's a fundraising messaging'.

The large sums of financial investments into developing advanced therapies are one of the reasons why such products have the high or skyrocketing prices pointed out in some studies (Malik 2014; Marsden et al. 2017). Sustainable reimbursement schemes to cover these costs, as well as arguments to justify reimbursement decisions, have been looked for by Health technology assessment (HTA) agencies, such as the UK National Institute for Health and Care Excellence (NICE), which decides whether therapies will be reimbursed in the UK healthcare system.

The member of a UK government-funded initiative for advanced therapies explained how HTA bodies reason: 'What they're looking at is: "okay [...], what we're looking to understand is the improvement in patient outcomes; does that warrant the increase in costs?"' This 'improvement' has to do with the slope of the curve after therapy delivery (Figure 3). The agency would be willing to reimburse the therapy if the latter yields a *satisfactory increase of health in a satisfactorily short length of time*.

One of the corollaries of this understanding is the concept of quality-adjusted life years (QALYs). This indicator—aimed to measure how long and well a patient lives after administration of a given therapy—has become widely used in healthcare, particularly oncology (Gafni 1997). The interviewee quoted above explained how the QALY concept has been used by NICE:

So, if you're looking at NICE's methodology, if you can add ten, so called, quality-adjusted life years to a patient and a patient who would otherwise have died, say, within six months, you can... they are willing to accept a price of £500,000 for that.

The interviewee describes a 'methodology' (line 61) whereby the agency accepts a price (line 63) based on the recognition that the therapy enables a health restoration process for a patient that 'would otherwise have died' (lines 62–63).

The QALY concept focuses on individual patients but some analysts advocate for a more encompassing and more abstract approach that would consider the benefits which the therapy brings to the social group (Nord 1994). This consideration, which would include long-term benefits, is in line with the reasoning fostered by the CURE schema.

This reasoning is sometimes contested by those who favour the IMPAIRMENT cognitive schema. For them, calculations and measurements such as the QALY tool fail to capture the worth of therapies and patients. Hence, some discussion on the limits of QALYs (La Puma and Lawlor 1990). In the words of patient representative 8:

I think it's a very crude tool and I think the QALY system is difficult because it doesn't... there are certain things that are excluded, for instance [...] impact on the family [...].

The QALY system negates the metonymic reasoning motivated by the IMPAIRMENT schema, for whom certain cognitive associations are key, such as that between patients and their 'family' (line 67).

This cognitive approach is heavily concerned with patients' bodily experiences and physical suffering, as seen above. As a consequence, it tends to be very reluctant to the 'commodification of the body' (Scheper-Hughes 2000, p. 193) and technical rationales applied to healthcare. The QALY system, as well as other technical tools, are said to conflate qualities and quantities, an operation considered as deplorable because, as the argument goes: '[...] one cannot appraise qualities as diverse as beauty, human life, and industrial profit in any common currency, and to even attempt such comparisons degrades the human condition' (Mazur 1985, p. 27).

Such concerns are intensified by the expanding operation of middle-sized and large private companies, which have been responsible for the final steps of advanced therapy development. Underpinning those concerns are cases of previous medical harms, such as examples of drugs being commercialized for some time and then withdrawn from the market because of severe adverse reactions (Busfield 2006; Fisher 2009; Petryna 2009).

These cognitive divergences have also to do with the ways in which different social players regard regulations, as explained below.

Schemata in the regulatory side of advanced therapies

In sociology, laws and regulations have been interpreted as the result of people's meaning-according activity (Weber 1921/1978), expectations (Luhmann 2014), and communicative efforts to reach agreements (Habermas 1996). The analysis presented here enables an alternative interpretation where the shape of regulations depend on the ways in which risks, technologies, and policies are understood at the very basic level of cognitive schemata.

The CURE schema frames regulations as potential barriers to research and development. Indeed, it has inspired much criticism against the use of 'Strict regulation to limit the diffusion and utilization of medical technologies [...]' (Oh et al. 2005, p. 75). In the domain of advanced therapies, more specifically, this approach foregrounds the lack of therapies for many conditions and introduces an extreme preoccupation with the putatively slow ways in which regulators assess risks and issue authorisations. For, it is claimed: '[...] when treatment is delayed, social value is lost for both patients and manufacturers [...]' (Snider et al. 2019, p. 380). A liberal stance is then fostered by means of the REGULATION IS A BARRIER metaphor, which springs from the CURE schema.

The motivation of metaphors by the CURE schema was explained above. When the THERAPY IS A TRAVELLER, THE PATIENT IS A TARGET, and REGULATION IS A BARRIER metaphors are combined, the notion emerges that regulations can be designed so as to *speed up* scientific *advancement* and serve patients in a timely way. Reinforcing this understanding, the US Food and Drug Administration launched the Expedited Programs for Serious Conditions⁴; and the European Medicines Agency explains that its PRIME program aims '[...] to optimise development plans and speed up evaluation so these medicines can reach patients earlier⁵'. This program was thematised by Patient representative 6, according to whom PRIME outlines '[...] what needs to be done in order for the product of the development to have a higher success rate of completing the course to marketing authorisation'.

We are dealing with a technical approach where regulations are seen as tools to be manipulated and refined towards a goal. If this is not carefully done, technology *advancement* can be

blocked. Such barriers may be imposed by regulators but also by bodies such as health technology agencies. According to Patient representative 4, '[...] we can't say to NICE for sure somebody's still going to have their vision in 20 years' time when they otherwise would have lost it, because of course that data doesn't exist yet. So that's a challenge. That's a potential barrier'.

In the IMPAIRMENT schema, regulations assume a different image. If, as this schema suggests, therapy delivery may *increase the amount of suffering* endured by patients, then it is necessary to provide them with shields against the *curative* actions of scientists and companies. This point was made by regulator 9:

[...] we are regulators and the idea behind regulation and why drug regulation started is really to protect patients [...] As soon as [...] products are going to be administered to patients with the idea to cure, to restore a function, we'll have to create a framework where we are able to ask pertinent questions to the developers and have really a good understanding about the activity of the product, and the safety of it.

Therefore, the IMPAIRMENT schema tends to frame regulations as a way to 'protect patients' (line 69). In Patient representative 3's words:

[...] legislation is made in a very broad brush approach but the way I see it working in medicines and devices is that there are... there is protection for individuals as well. So, you know, having proper clinical trials done, having the drug or device regulated and checked often, being honest and transparent about how the drugs are treated, you know. So, I see that as much more on the side of the public and patients.

In this regard, there is in this schema some component of *compassion*, as defined by Arendt. Not only would people stress patients' suffering, they would also display that 'human capacity to lose oneself in the sufferings of others' (Arendt 1963, p. 76). Based on this capacity, one would be willing to strengthen regulations and, consequently, prevent any unnecessary suffering that might result from faulty therapies.

To be sure, it is recognized that regulations cannot remove all the uncertainties inherent to medical experiments and clinical practice (Will and Moreira 2010), which tend to fall, especially, on vulnerable people's shoulders (Shah 2006; Petryna 2009). Nevertheless, regulations can still be framed as possible protections against too abusive experiments and clinical interventions.

The analysis of these regulatory issues, as well as the economic issues reviewed above, reveals important aspects of social organization. Ideologies depend on structural and formal aspects such as regulatory capacities, institutional affiliation, economic power, and financial interests. Additionally, and more fundamentally, social players cluster around particular understandings and discourses, which derive from cognitive schemata and are initially articulated via linguistic practices such as metaphors and metonymies.

This is not to say, however, that schemata are always mutually exclusive, as explained in the next section.

Combining schemata

At a discursive level, people can combine the CURE and IMPAIRMENT frameworks quite freely. For instance, patient representative 4 talked about a therapy for treating a genetically caused sight loss, produced by Novartis:

We don't know the cost, exact cost that was agreed for this one, but yes, they are really costly. But they're a one-off and they have the potential... if given early in life, they have the potential to change the trajectory, if you like, of somebody's entire life, because if you preserve somebody's vision, you've made a massive difference to their future productivity and wellbeing, those things

we were talking about earlier. And if you treat a child and they end up with a completely different educational trajectory because you save their sight, the cost of that is almost impossible to quantify really, but could be enormous.

This citation is presented without cuts so it is possible to perceive how concepts are connected. The CURE schema is clearly activated, with references to changing ‘the trajectory’ (line 86) of ‘somebody’s entire life’ (line 83), to preservation of vision (line 73), and to impacting on patients’ ‘future productivity’ (84). At the same time, but in a more subtle way, the IMPAIRMENT schema is also activated, with references to ‘wellbeing’ (84) and to providing patients with ‘a completely different educational trajectory’ (86) and hence less limitations, as well as a refusal to quantify health and illness (87). A much more compact cognitive combination appears in Therond and colleagues (2020, p. 257) who claim that patients face ‘[...] difficulties and daily efforts to manage suffering while sustaining hope in the goal of the drug [...]’. Here the idea of ‘suffering’ is combined with *curative* references to future times—‘hope’—and the notion of therapy as a vector following a trajectory—‘the goal of the drug’.

At an even more fundamental cognitive level, these mixtures can be very interesting. For example, a certain therapy, administered to a certain patient, may have no effect, in addition to causing some adverse reactions. Yet this patient may feel a substantial improvement. From a medical point of view, this would be seen as a manifestation of the placebo effect. From a sociological and cognitive point of view, this shows that the patient is experiencing the IMPAIRMENT schema while understanding the situation in light of the CURE schema. There are here two *possible* and *complementary* descriptions of the same events.

If this interpretation sounds too heterodox, let us consider what was claimed by patient representative 4 when asked whether some people experience health improvements in clinical trials:

[...] yes, I have spoken to people who think they’ve improved. A lot of the time people aren’t sure, especially after a gene therapy trial. It takes a bit of time and they’re not sure if and when they’re going to see that improvement.

Therefore, a certain patient may be injected with a gene therapy and spend days or weeks without knowing whether the medicine will cause either health improvements or severe adverse reactions. In this condition, the patient plunges into a sort of dubious experience, for the waiting time may be understood, at the same, as an experience of cure and an experience of impairment. In other words, combinations of the CURE and the IMPAIRMENT schemata become possible or unavoidable at least for some time. Given that for some advanced therapies, clear signs of clinical success or failure may take months to manifest themselves, patients can spend considerable time experiencing, through body and cognition, the ‘bipolar structure of language’ (Jakobson 1956, p. 78).

These hybrid situations can cause much anxiety to patients, relatives, and friends. Furthermore, it can cause much confusion to analysts and theoreticians, who may see only one rationale instead of grasping the twofold nature of linguistic practices.

Conclusion

The ways in which people understand their experiences have long interested sociologists, or at least the interpretive, communicative, and cognitive strands of sociology. In these sociological traditions, the basic assumption is that members of social groups ‘[...] form their own personal representations of an event, with their own perspective, interests, evaluation, emotions, and other elements based on their unique personal history or their current subjective experience’ (van Dijk 2009, p. 6).

In the beginning of this paper, a sociological interpretation of advanced therapies was announced. Reaching this concluding section, some readers may have the impression that the

promise has not been kept, because cognitive processes have been highlighted, with little attention given to ideologies, power struggles, social divisions, and other issues that, one might expect, sociology should deal with. It is then crucial to explain that a sociological interpretation that seeks a dialogue with cognitive linguistics is *not extinguished* in the analysis of cognitive schemata; however, such sociology necessarily *includes* the analysis of schemata.

The political and ideological issues generally focused on by sociologists are not possible without the elaboration of understandings at the most basic level, that of cognitive schemata. In other words, it is justifiable to look at '[...] the conceptual/propositional content of an utterance, but only insofar as we are aware that this propositional content is possible only by virtue of a complex web of nonpropositional schematic structure that emerge from our bodily experience' (Johnson 1987, p. 5).

The communicative dimension of the human body, as a material carrier or signs, has long been recognized (Bucholtz and Hall 2016). By advancing the foundational ideas of cognitive linguistics, Lakoff and Johnson (1980, 1999) also pointed out the relevance of embodied experience, in addition to emphasizing the concepts of cognition and understanding, an explanatory emphasis which was reinstated more recently (Anderson 2003; Ibarretxe-Antuñano 2008; Zanutto et al. 2008). The field of advanced therapies reveals new facets of this relation, as embodiment notions are now entangled with genetic and cellular concepts that become gradually widespread. In this way, the body is surely key, but so too are the theories or ideas that people come to internalize or incorporate.

Furthermore, it is crucial to stress that cognitive schemata are not individual creations that remain relevant to only their individual creators; rather, they are understandings which result from individual experiences but come to be normalized and largely shared. In health-related domains, this normalization is possible not only because everybody experiences sickness—either directly or through friends and relatives—but also because the cognitive and discursive tools used to frame sickness—concepts, metaphors, metonymies, stories—are widespread. Hence, the sense of naturalness or obviousness that one may feel while reading some of the utterances and quotes presented across this paper. In conclusion, the study of schemata unravels the cognitive roots of social life for sociologists and other analysts interested in collective life.

It has been claimed here that in the domain of advanced therapies, two schemata are frequently mobilized. The CURE schema is furnished with abstract concepts and tends to focus on long-term processes. As it derives from a rich combination of more basic schemata, the CURE schema associates various conceptual domains and opens up much space for metaphoric reasoning. The IMPAIRMENT schema focuses on short-term experiences of pain and discomfort, highlighting the limitations endured by patients. Because of its emphasis on the body and close social relations, it tends to underpin a dynamic metonymic reasoning.

Figures 3 and 5 reveal the complexity of the CURE and the IMPAIRMENT schemata, as both result from a combination of more basic schemata. For this reason, some readers might conclude that these schemata are more than what Johnson calls 'image schemata' and should be rather considered as 'cognitive schemata', 'conceptual models', 'frames' or 'scripts'. However, in the definition given by Johnson, the main characteristic of schemata is not their simplicity but the fact that they give a '[...] pattern and order to our actions, perceptions, and conceptions. A *schema* is a recurrent pattern, shape, and regularity in, or of, these ongoing ordering activities' (Johnson 1987, p. 29).

It is beyond the scope of this paper to provide a classification of schemata, as well as identify the level of complexity at which a schema ceases to be a schema and turns into a more complex cognitive construct. However, it can be said that the two schemata described above do not invoke any 'concrete rich image or mental picture'; rather, they correspond to an 'abstract structure of an image', which makes it possible to apply them to 'a vast range of different experiences' (p. 2). In other words, the CURE schema considers general features of sickness and therapies; and although the IMPAIRMENT schema does insist on specific illnesses, symptoms, therapies, and biological effects, it also gives rise to a discourse that can accommodate a broad range of specific examples. This is why they are described here as schemata, not as rich images that would amount to frames or narratives.

We are not simply dealing with mental or cerebral processes, though. Cognition always involves the body, practical considerations, and specific decisions. It has been quickly argued

that the CURE schema lies behind the economic considerations of health technology assessment agencies. In its turn, the IMPAIRMENT schema has provided regulators and patient associations with much inspiration in terms of bringing regulatory or legal protections to the field of advanced therapies. Even though the connections between cognitive processes and practical initiatives have not been the main focus of this paper, it is key to make clear that they do exist.

The main argument being voiced here is twofold. On the one hand, schemata are surely assimilated by individuals but they are not fully realized until they underpin concepts that are largely shared and debates pertaining to the management of collective resources.⁶ On the other hand, these social debates, which often reach high degrees of complexity and abstraction, depend on schemata whose elaboration draw on very concrete social and bodily experiences. Social life is nourished by this constant loop between concrete experience and abstract reasoning.

A dialogue between sociology and cognitive linguistics can bring about major theoretical contributions for those interested in interpreting the current configuration of medicine, science, society, and the globalized and financialised economic system. For the understanding of social relations depend on the emergence and diffusion of certain schemata, as well as on the divisions between the metaphoric and metonymic rationales. In the field of advanced therapies, with the development of increasingly complex products, which are applied in the treatment of challenging diseases, the emergence of various social debates is to be expected. This involves questions such as the viability of gene modification for treating disease, the naturalness or artificiality of the human body, and the private appropriation of bodily parts. The proper interpretation of such social debates requires, and will continue to require, the full consideration of basic cognitive processes, including the elaboration, normalization, and activation of schemata.

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Notes

¹ The deliberative democracy approach proposes that social actors can resolve disagreements, and therefore reach consensus, by exchanging arguments and reasons, until the point in which the best argument would win out and appease tensions.

² <https://luxturna.com/about-luxturna/#how-does-luxturna-work>

³ One might claim that the CURE schema, as represented in Figure 3, is too complex for a schema. Actually, the CURE schema might also be represented by Figure 1, with location A representing sickness, the vector representing the change provoked by the therapy, and location B representing health. However, Figure 3 is used as a more detailed representation, so that our explanation can be clearer. In addition, it makes no sense to isolate the components of Figure 3. The concept of cure requires the concrete experience of cure, which involves sickness, time, therapeutic interventions, and all the phenomena depicted in Figure 3. Therefore, when it comes to conceptualizing CURE, all the components of Figure 3 belong in the same cognitive level.

⁴ <https://www.fda.gov/regulatory-information/search-fda-guidance-documents/expressed-programs-serious-conditions-drugs-and-biologics>

⁵ <https://www.ema.europa.eu/en/human-regulatory/research-development/prime-priority-medicines>

⁶ It is beyond of the scope of this paper to investigate whether the CURE and the IMPAIRMENT schemata can be identified in various languages and cultures. Given the advanced globalization of the pharma and biotech industry, as well contemporary medicine, there are reasons to believe in the global occurrence of these schemata. However, this cannot be methodically confirmed in our study, as we did not intend to form a corpus of analysable discourses from several languages and countries.

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