

Algorithmic Mediation, the Digital Era, and Healthcare Practices:

A Feminist New Materialist Analysis

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Résumé:

Les cultures numériques et algorithmes sont loin d'avoir laissé intouchées les champs de la santé et des soins et services de santé. On pourrait même dire que depuis leur inception, ces cultures ont interagi et intra-agi de multiples manières avec les pratiques et les conceptions variées de la santé, du bien-être et des soins et services. Plus particulièrement, ces cultures offrent des manières jamais imaginées auparavant de concevoir et de rendre la santé et les soins. Toutefois, alors qu'elles regorgent de promesses, au coeur des pratiques et de la recherche en soins et services de santé, trop peu se dit ou s'explore concernant les effets épistémologiques et ontologique qu'entraînent ces cultures, notamment les nouveaux outils ou les nouvelles pratiques, de même que les nouveaux modes d'incarnation ou de corporalisation, qui viennent s'ajouter à nos mondes pour ne plus les quitter. Mobilisant les approches critiques des nouveaux matérialismes féministes, cet article propose un nouvel appareil conceptuel pour étudier de manière critique ces cultures et leurs effets divers. Plus particulièrement, il pose la question et demande à réfléchir à: quel(s) monde(s) désire-t-on habiter, alors que nos sociétés, et ce, de manière extrêmement différenciés, progressent à une vitesse lumière vers les cultures de la numérisation et de l'algorithmisation, puisqu'une fois que nous serons engagé-es, il n'y aura plus de retour en arrière, mais seulement une progression vers l'avant.

Mots-clés: algorithmes; culture numérique; nouveaux matérialismes; féministes; performativité; santé; soins et services de santé

Digital and algorithmic cultures have not left the field(s) of health and healthcare untouched (e.g., Lupton, 2016, 2014a, 2014b, 2014c; Mittelstadt & Floridi, 2016). It is even possible to say that different conceptions and practices of health have been intersecting with digital and algorithmic cultures since their onset. These new cultures notably offer previously unimagined and even hard- or

impossible-to-imagine ways to render and improve one's health, as well as to render and improve our healthcare systems, here being attentive to the various and, at times, mutually conflicting conceptions and practices of what one's health means. Specifically, these cultures promise to optimize one's health, or wellbeing, through specifically biomedical and quantified conceptions of health and the human body. They even go so far as to promise to optimize one's *capacity* for health, through its objectification and quantification (Lupton, 2016; Swan, 2013; Pink & Lanzeni, 2018).

Digital and algorithmic cultures also hold many promises for biomedical practices of health, such as new and infinitely minute ways to capture health metrics or ways to rationalize and optimize medical and institutionalized healthcare practices. Think, for example, of new practices such as “personalized health” or “precision medicine”, or the promises of the electronic patient record and e-health (e.g. Anisimowicz *et al.*, 2017; Bates *et al.*, 2014; Kitchin, 2014; Mittelstadt & Floridi, 2016. See also Markham, 2018; Markham *et al.*, 2018); and they hold many more promises for health and healthcare research. For example, they promise to optimize and rationalize practices and performance, to find answers to hard questions, to improve care and care responsiveness, to solve new health concerns. This notably through advanced computerized techniques, crossing and “enhancing” quantified or digitally rendered data, infinitesimal data. Finally, these processes are also celebrated for helping in identifying patterns of illness or disease among individuals or sub-population groups, or, at the level of research, and in supporting novel, expedited, and large scale to explore health issues, notably using novel techniques to collect, store, treat, link, and analyze large amount of data — *big data* (Kitchin, 2014; Mittelstadt & Floridi, 2016). But what is it that these cultures do to the practices of health and healthcare, specifically as these are practised in mainstream culture, i.e. the health care system, institutionalized care, and health research? And, how are those cultures examined, thought of, and encountered by the actors in these practices, i.e. providers, policy-makers, but also researchers? Or, rather — *are they* considering them, and how?

This paper aims to explore some of the effects that digital and algorithmic cultures have and have had on practices of health and healthcare in Western societies, specifically in Canada, i.e. its mainstream and hegemonic practices of health and healthcare (e.g., biomedicine, primary health care, hospital-based care). This exploration and reflection emerges out of the past four years of involvement in the field of healthcare research of a scholar trained in feminist epistemology and socio-political theory — myself. During those years, I worked as a qualitative healthcare researcher in national and international primary health care collaborative research studies. In this paper, I mobilize my expertise in the critical feminist epistemologies (e.g. feminist science studies, feminist science and technologies studies, and feminist new materialism) to explore and reflect on the effects and roles of digital and algorithmic cultures on the practices of health and healthcare as well as research in these fields. I am interested in the ontological¹ and epistemological transformations algorithmic cultures bring about, and, more precisely, the intertwining of these transformations (i.e. how our epistemology informs ontological approaches as well as enacts ontological effects, transformations, and *vice versa*). Specifically, I follow insights from feminist new materialism that posits the inseparability of the fields of ethics, politics, epistemology, and ontology.

Feminist new materialism argues that there is an inherent entanglement between these dimensions, that they are intrinsic and indissociable and mutually affect one another, imbricated, intertwined, entangled (Barad, 1996, 2007). To do this, I ask: what world(s) do we want, as our societies move rapidly within the cultures of digitalization and algorithms, for my claim is that, once we are set, there will be no going back, but only going forward.

1. Healthcare practices and research

Digital and algorithmic cultures are gaining substantial interest and momentum in the fields of health and healthcare research, policy and practices and among a variety of stakeholders such as policy-makers, clinicians, health professionals and service providers, researchers, caregivers and patients, community members, and citizens, because they offer promising hopes and exhilarating possibilities to “solve” many health and healthcare issues. When it comes to health and healthcare practices, digital and algorithmic cultures appear to have a lot to offer: personalized medicine, reduced duplication in health care practices, reduction of errors, integrated care (i.e. integration of public health, health services, and social services in clinical practices), prescriptive analysis, genomic sequencing, algorithmic matching (e.g. organ donation), medical imaging, patient-centred health, increased patient autonomy (i.e. “democratization” of health; e.g. self-management with mobile apps and devices), e-consulting and remote monitoring (e.g. via digital applications and online conferencing), and so forth (Mittelstadt & Floridi, 2016; Ruckenstein & Schüll, 2017; Swan, 2013). Needless to say, a quick review of the literature and of health research “in action” (the latter including an examination the requirements of funding research bodies such as provincial and federal research councils), one can attest that the mediation brought about by digital and algorithmic cultures — the “Big Data” culture — has already drastically contributed to changes in the ethics of health and healthcare research as well as the ethics and practices of care and healthcare (*c.f.* Fiore-Gartland & Neff, 2015; Kitchin, 2014; Mittelstadt & Floridi, 2016; Neff, 2013).

Ethical considerations and concerns in these fields are many and manifold. For one, the culture of “Big Data” contributes to the emergence of new health issues tied to the usage and proliferation of digital and algorithmic cultures, i.e. their introduction in various, if not all, aspects of human living, such as new ways of living, of embodiment, or of using digital technologies (*c.f.* Lupton, 2014a, 2014b, 2014c, 2016; Pink & Lanzeni, 2018). This mediation brings about new modes of embodiment, of subjectivity, of personhood formations, of political activity, of relationships; new health issues (e.g. including mental, emotional, or psychological ones); new health and healthcare practices, individual, collectively, or institutional. Digital platforms such as social media, online web browsing, internet searches, forums interactions, as well as data input through smart phone applications (e.g., myfitnesspal, food diaries) also provide access to new types of data that is rendered through digital and computerized processes, hence quantified: new types of data *renditions* thus, or rather aspects of the “human”, or the human body perhaps, understood and rendered biologically. Let us emphasize that biology itself is rendered digitally and is not left untouched by the advent of digital and algorithmic cultures. This is a good reminder of what Donna Haraway coined the “situatedness” of knowledge, where she regards knowledge and knowledge practices as inherent and necessarily partial, i.e. social, cultural, gendered, racial and racialized, classist, nationalist, and so forth (Haraway, 1997; See also Haraway, 2001).

The goal of such calculations (or, rather, *renditions*; quantifications) is to seek and establish the optimal “configuration” for the human body, from which maximum human productivity could be achieved. This echoes Michel Foucault’s work on the self, i.e. the culture of caring for the self as a way to craft the self (1984; See also 1967). Here, considerations regarding one’s “optimal configuration” as understood and achieved using digital metrics (*renderings*) are also integral to other dimensions that are political, economic, and social, notably those linked to discourses surrounded by neoliberal capitalist constructs such as “productivity” and “efficiency” (*c.f.* Lupton, 2016; Pink & Lanzeni, 2018).

The culture of Big Data in health care practices and research, thus, is about being progressively driven toward questions such as, what are the best configurations of human bodies, their various processes, organs, and functions? However, some of the questions that orient the focus of this paper are, rather: how is healthcare practice and research transformed, or perhaps *subsumed*, by digital and algorithmic cultures? How is health, illnesses, the human body, healthcare practices, and research, transformed, reconfigured, defined, in this new era? What matters or not—and how? What is the data that matter or not? How is data made? And what does not get made? These are all questions that require careful considerations by society, and, while these questions will not be all fleshed out in this paper, by mobilizing the particularly highlighting tools of feminist thought and feminist new materialism, I initiate what I hope is a novel reflection, and an *ethico-onto-political-epistemological* practice, to analyze digital and algorithmic cultures in healthcare practices and research.

2. Ontological effects of digital and algorithmic cultures: the contribution of feminist thought, science studies, and new materialism

2.1. *The Material Effects of Discursive Practices: Butler's concepts of "performativity" and "citationality"*

In her work on *performativity*, Queer thinker Judith Butler explored the practices of embodiment and the material effects of discourses, i.e. discursive practices in the context of queer embodiment (1980, 1993). She examined how discourses are practices that participate in shaping matter (e.g. human bodies) that has no transcendental existence, or a fixed "essence", but rather is a process of materialization that acquires stability (that sediments) over time. Thus, an essence is effectively made, over time; it is, thus, not pre-existent or transcendent (Butler, 1993, p. 9).

This "essence" is made, attained, through embodied practices, i.e. reiterated and repeated processes that, over time, mark the body. Butler describes these embodied practices as practices of "citationality" (Butler, 1993). She explains that culturally and socially, a person emerges in world(s) that preexist her, i.e. she becomes the person/who she is, and crafts a/her body, by mimicking and repeating other (others') practices, which preexist "her". It is through these citations that a person comes to exist, *to be*, who and how she is, which speaks to what it is to be "human", or rather, a human person, that is, what it is and means *to be* is to participate to the ongoing *ontology-making* process that is a "world-with-others", human and nonhuman. A person *becomes* a person through embodiment, embodied actions and practices, *bodily performances*.

Discourses/discursive practices, thus, preexist bodies and persons; but human bodies/persons materialize *through* the act of citing/performing them. These are repeated bodily motions that sediment overtime, mark bodies, *make matter* (Butler, 1993).² This is, thus, why Butler speaks of the *material* effects discourses have, echoing Foucault's work. Discursive practices have ontological effects; they make bodies, shape them, and thus participate in shaping the person, the subjectivity, that emerges from them, *with* them (a.k.a., bodies). Discursive practices can also inform and transform what is considered, among a given group or society, a "healthy" or a "healthy body"; and, as Foucault showed, the making of a clinical practice, for example, is indissociable from politics of nationalism, racism and gender (1967). Hence, discursive practices participate in defining what "the human" and "human bodies" are, but they also actively participate in the making, materially, of both.

2.2 *The Ontological Shift in Science Studies:*

The Contribution of Feminist New Materialism

Emerging in the 1980s and 1990s, in response to what was seen as a marginalization of materiality in the humanities and social sciences following the “linguistic turn” (*c.f.* Rorty, 1992. See also Barad, 1996; Haraway, 1997), feminist new materialism, as a field, emerged. This field bridges feminist science studies and feminist environmental ethics to introduce critical considerations from the humanities and social sciences into the natural sciences. Feminist new materialists warn that the sciences need the “check and balances” provided by the social sciences and humanities, especially as they continue to operate with and be dominated by positivist and representationalist paradigms, which contend the possibility of science’s neutrality, distance, and objectivity, and the existence of a fixed Ontology. Without the social sciences, feminist new materialists insist that the sciences would continue to intervene in the “ongoing ontological process” that is the world, a practice that folds together epistemological considerations with ethical and political ones (Barad 1996, 2007; Haraway 1997, 2001). Furthermore, the sciences would continue to assert their apolitical stance and their putative stance of the “view from everywhere and nowhere” (Haraway, 1997).

Using new developments in hard sciences such as physics and biology, feminist new materialists show that although 1) it is still possible to acquire and develop knowledge about the world and about matter 2) our epistemology, our conceptions of our methods and of the scientific method must be reviewed (Barad, 1996, 2007; Haraway, 1997). As their works show, there is no science, no knowledge approach, that leaves the object of its study untouched. Rather, knowledge practices work by way of actively and intimately *intervening* in the processes of ontic, which is moving, dynamic, relational and always in-the-making rather than inert, given, fixed, or awaiting to be painted, drawn (a.k.a. ontology of Presence in the Western philosophical and scientific tradition) (*c.f.*, Barad, 2007). Knowledge practices *can work* but this is because (rather than in spite of) they are *in* the world but also *of* the world (Barad, 1996, 2007), i.e. of a world that, *itself*, wants to know, seeks articulation and configuration, but dynamically so, meaning that there is no configuration that is permanent, fixed forever, or preexistent. The ontic remains open, dynamic, and fluid, always, and so much our ontology, i.e. the ontological conception and approach we use to know it (all the while co-participating in its configuration, stabilization, so knowledge can be gained about it but thus participating in its ongoing and future-oriented only “becoming”) (Barad, 1996, 2003, 2007).³

Feminist new materialists thus show how the sciences work, as always and irrevocably embodied, cultural, situated. The sciences can never hope to embody a position detached from the object(s) they study. Rather, to know (scientifically) means to intervene — even to *become one with* one’s object of knowledge. This object then acquires a configuration, an “identity”, *with* the process of knowledge, and even from the onset, conceptual and theoretical work take place. Hence, theories of knowledge too, are practices of knowledge, i.e. always already actively engaged in intervening in the ontology-making processes that are “the world”, i.e. reality (Barad, 1996, 2003, 2007; Haraway, 1997).⁴

The singularity of feminist new materialist’s contribution, as opposed to social constructivists or poststructuralist thinkers, is that the world (nonhuman matter) does not “sit still” nor is it inert in this “picture” (pun intended). The world is rather conceived as agential, i.e. participating and endowed with an *agential* capacity, and, thus, capacious (researchers being *of* the world rather than merely *in* it). This conception of the world emerges from recent scientific developments, notably those of quantum physics (albeit not exclusively) that concur that there is no fixed ontic or

ontology (i.e. fixed essences to various material matters); rather, materially, “things” (i.e. objects of study) are made *with* the practices that attempt to know them (Barad, 1996, 2007). To establish this, Barad, a feminist theoretical physicist, works with the work of quantum physicist Niels Bohr. Bohr concurs that 1) sciences do work (i.e. acquire or develop knowledge); 2) the scientific method is possible, valid, and effective; but 3) that we need to rethink it in important ways related to its: a) ontology and b) epistemology.

Through scientific methods, Bohr explains (rendered by Barad) that sciences do not give us an object that would exist independently of time or space. This is not possible as there are no things “in and of themselves” in the world, but only things that are situated, and irrevocably so, to their ‘context of emergence and habitation’: Things in context, and things *in relation* (c.f. Barad, 1996, 2007). In fact, more like complex networks and agencies of relations. Not “things” in and of themselves, but only things in context, relational, which means that, to know well (a.k.a. “accurately”) a particular object, one has to pay attention to 1) the thing’s relations, i.e. its relational network; and 2) its context—specifically its context of emergence (i.e. what and which practices participate in its emergence as an object of study). Hence, put simply, Bohr indicates that methods are indissociable from the results, or the instruments observing an object indissociable from the object, the essence and identity given to it. There is no object without them, methods or instruments of measure. The methods intervene in ongoing processes of *mattering*, as Barad (2007) puts it.⁵ Indissociable from the “essence” of the made object, i.e. the identity of the object.

This means that there is nothing such as “pure or raw” data that speaks the “essence” of a world, of reality, because there is no such thing as a fixed ontology or a fixed and transcendental reality (Barad, 2007). Of course, this is a stark contrast with how “Big Data” is depicted, and used.^{vi} This is also what prompted feminist new materialists to insist on how there is no knowledge practices that can claim to “innocence” or “neutrality” (Haraway, 1997; Barad, 1996, 2007). All practices are necessarily embodied, and embedded, socially, culturally, political; gendered, racial, and so forth. They are irrevocably situated, or *embarked* as Blaise Pascal put it.

Thus, these approaches are helpful, needed, and innovative in the fundamental (*ethico-politico-onto-epistemological*) shift they bring about, where ethics, politics, epistemology, and ontology, as practices, are irrevocably entangled, linked, and co-constitutive (Barad, 1996, 2007). Their proposal leads to drastic and major ramification in how ontology is done and understood, notably in Western societies. The concern with the ways that mainstream sciences continue to operate is that there is a denial, refusal, or rejection, of the idea that scientific practices are actively intervening, that they affect ontology — that this is how they work. The same goes for the digital and algorithmic cultures. In both spaces/practices, there is a denial of this role and there is a commitment to the ideas of “representationalism” and “positivism” in sciences; the idea that “nature” or “matter” exist *as such*, transcendently, independently of time or space, and that both can be represented in their “true and unique form”. This assumes there is a fixed nature “nature” or “materiality of matter” somewhere, inert and passively awaiting discovering.

From this, one can hint to how the culture of Big Data replicates this idea/ideology of a fixed and inert ontology, of a “knowable as representable” nature. The ideology of Big Data reproduces the precepts that grounded positivist science and denies the roles its practices such as analytics data mining and extraction using digital tools and digital/ized data are *data-making* and *reality-making*. There is a lack of accountability and responsibility (as well as responsiveness) in how the digital and

algorithmic cultures participate in the production of *one* real (which is agential, if we follow feminist new materialism; but I will come back to this idea later).

Any practice, including theories of knowledge, is a material-discursive in the sense that, first, it has material effects (i.e. real, tangible) and, second, these effects are always and already complexly entangled (relational, contextual), notably with the discursive (i.e. concepts, words, discourses) (Barad, 1996, 2003, 2007). From this conception of ontology (i.e. fluid, dynamic; *open*), it is true that “material matter” (or the materiality of matter) is to be conceived as open and malleable; but this malleability of material matter nonetheless matters, or *ought to*⁷ Any practice enacts or is an enactment, meaning that practices leave marks (e.g. traces, scars) on material matter, a.k.a. an object of study. This is how the scientific method works and operates.⁸ These enactments (e.g. marks, scars) are called as such because they are irreversible, and indelible (Barad, 2007). They stay, but it is through the traces that the sciences can be reproduced, a condition of the scientific method. Furthermore, like the object that does not have a fixed identity, essence, because there is no fixed ontology, the traces, too, are not *permanently fixed*. They can—and will—become otherwise, in futures-to-come. They are “material-discursive configurations”, i.e. entanglements—think of its “network of relations” to which I refer earlier (*c.f.* Barad, 1996, 2007).

2.3. *Open and Agentic Matter as Plastic*

It is helpful to think of the materiality of matter, at an ontological level, as *plastic*. The property of “plasticity” refers to how an object can take new and multiple forms, although not an infinite number of ones. More importantly, “plasticity” means that an object retains all traces of past enactments, as traces. These stay on the material matter, even as it goes on to take new configurations in the future (i.e. materiality is not fixed or transcendent). But these traces, too, act/can act, that is, they can and will participate in future enactments, becoming part of the “agencies of observation” through which objects of knowledge, as well as the agencies themselves, are made/acquire a configuration. They too, thus, participate in determining the “possible and impossible” configurations of materiality. These traces come to form a “lively archive” that Barad describes as a mode of ongoing *re-member-ing*, a concept that combines the process of “memory” and “remembering” with the material enactment of “putting together members” or parts (*c.f.* Barad, 2007, 2017).

Any enactment matters in a discursive and a material sense. Even bodies, human and nonhuman, forever bear the marks and traces of the past. How these bodies can (and will) become, is informed by these past enactments, yet not (ever) determined by them, fixed, *fixated* (*c.f.* Barad, 2007). There are always many possible futures, of *mattering*, discursive and material materialization, but not an infinite number of them. More importantly, as discursive entanglements, they are intricately tied to ethical and political considerations. In other words, how something matters *materially*, i.e. its materiality is indissociable from how it matters *discursively*, i.e. symbolically, meaningfully.

3. Digital and Algorithmic Cultures Meet Feminist New Materialism

3.1. *The Ontological Ramifications, Bodily Matters, and Irreversibility*

Upon review of the main conceptual tools of feminist new materialism, the implications of digital and algorithmic cultures emerge quite clearly: first, the lack of responsiveness, accountability, and

responsibility of the ethico-politico-onto-epistemological precepts upon which these cultures operate and that they contribute to impose and enforce in our jointed worlds; second, the ontological effects of these cultures at the level of healthcare practices and research. For one, there is a strong tendency among proponents of the digital and algorithmic cultures of Big Data to describe the digital processes and tools, or Big Data itself, as “neutral” and “objective”, innocent, detached from the “human”, or specifically, devoid of human bias. Yet it is perhaps actually quite the contrary. Various critical data and data science scholars have exposed the concerning opacity behind digital and algorithmic processes and cultures, invoking the figure of the “black box” (*c.f.* Fiore-Garland & Neff, 2015; Kitchin, 2014), and the undeniably human factor/involvement that goes into the design, implementation, usage, and constant transformation of Big Data’s tools and processes (i.e. AI, deep learning, machine learning, data extraction processes, data treatment platforms, digitalizing processes, and so forth). Furthermore, equipped with the tools of feminist new materialism, there is a further critical point we can advance: it is possible that the ontological effects of these cultures are acknowledged within these very cultures and that, yes, they recognize and acknowledge that they do, actively, participate in changing the world and its futures (i.e. supposedly improving it, or better yet — *optimizing* its inner, “transcendental” potential).

Yet there is not as much a sense of the necessarily *irreversibility* and a qualitative assessment of these effects. This is what it means to say that effects are ontological: there is no going back. In fact, as Rouvroy argues, too (*c.f.* 2011a, 2017; Rouvroy & Stiegler, 2015), many of the changes these cultures have brought about have already transformed the ontological fabric of the human, i.e. the human capacity for agency. What human agency is has disappeared, i.e. is virtualized? Hence, the digital and algorithmic cultures raise critical and urgent questions for each one of us: how do we (i.e. each one of us; various communities, social groups, cultures) want to live... and die, or want our worlds to be and become? What are humans and the nonhuman world, with its manifold richness and complexity, to become... and be to *matter*, both materially and discursively; material-discursive entanglements? In the context of health care practices, AI or digital-related new tools and processes are being introduced at rapid pace such as the move to the digitalization of patient records and the use of new data entry platforms to input data. This, at times, leaves little time or space for different health professionals and workers to reflect on the manifold effects of these tools, for example, how they transform clinical practice at the ontological level, patient-provider relationships, or conceptions of health and illnesses (Lupton, 2016).

In a piece from 2009, Lisa Parks reflected on the ontological (embodied) effects of the “security” measures that followed the events of 9/11 in U.S. airports. She attended to the creation and implementation of a panoply of new measures, techniques and tools such as x-rays and detectors, and also attended to the creation of a new category of surveillance agents (and their hiring). These agents, she explains, now receive training in techniques aiming to detect and to assess the level of threat of various (if not all) objects, bodies, in airport. They, too, once in the field are being developed, refined, and emerged (Parks, 2009). Her piece highlights how bodies were transformed through these new practices, the bodies of travellers but also, and perhaps mainly, those of security agents, who were trained in these new surveillance techniques and with whom (or—*with which*) “the world” started to emerge, to configure itself along the lines of the theme of “in/security”; things and bodies, *persons*, began to emerge in the world and participate in it, as “objects of insecurity or security” (Parks, 2009).

Her work echoes Butler’s, specifically her conception of matter as a “process of materialization that sediments over time” (1993, p. 9), and her insistence on the material effects of discursive practices (1993). In similar veins, the sociologists and anthropologists of sciences and

techniques, such as Latour (1987, 1999, 2004a, 2004b), Myers (2015), and Law & Lien (2010, 2011, 2013), have documented how *scientists* (rather than solely the sciences or the objects of sciences) are made. In “How to talk about the Body”, Latour describes the bodily transformations that are necessary to do sciences, i.e. how scientists’ bodies have to be crafted and trained to see and to practice science. He gives the example of the nose of the sommelier, a nose that must be made, that does not already exist, and he explains how the making of the sommelier’s nose activates certain bodily possibilities and, in the process, virtualizes others, meaning that other possible trajectories of “bodily configurations” and relationality vanish (Latour, 2004b). As these authors show, the world, which is an ongoing, dynamic and open process, becomes *with*, i.e. alongside these practices and these crafted and tailored bodies. In the case of Parks’s analysis, bodies participate in the production/configuration of worlds of in/security (2009). In the case of the entanglement of digital and algorithmic cultures with health care practices and research, the production/configuration of *digitalized* worlds, quantified worlds, include the human and what it may mean to be human.

3.2. *Effects on Healthcare Practices: Accountability and Renditions*

Consider the following examples in healthcare practices. The advent of digital and algorithmic cultures and the prospects and promises of “Big Data” have notably led to the passage of patient records from paper to digital form and administrative accountability of healthcare providers and organizations. These cultures promise greater accountability and savings, error reduction, and systematization of healthcare practices. From the viewpoint of governance and accountability, thus, the transition from paper to digital processes enables enhanced processes of “service performance” and “accountability” that were previously only imagined. Yet, it is healthcare workers and professionals who are responsible for using these new devices and techniques of accountability and adjusting the care they can provide in light of these introductions (i.e. revising their routines, re-normalizing their processes).

Secondly, it is not always clear whether the clinicians or healthcare workers in general participate in the design or the specifications of these new tools i.e. what data are collected? What metrics are used? How are these metrics or data conceived? Providers (and patients) notably deplore how digital processes have introduced a screen between them and the patient; that providers look at the screen and input data as they discuss with their patients; or, they “neglect” the attention necessary to properly input their data, as they focus their attention, their *visage* on patients (e.g. Graveland, 2017). Then, in the context of exploring 1) what is the “big data” that exists/comes to exist out of all such processes (each health worker doing their own “bit” in terms of data input and not necessarily aware of the scope of it, even less of the digital processes that can treat (organize and analyze) the data); and 2) if (and how) the data is used (and by whom),⁹ what emerges first is an important lack of awareness and knowledge about the overall data that is collected (a.k.a “made”) and how it is treated and used.

Finally, this lack of knowledge and awareness can affect the quality of the data—is it complete, and “representative”, for one thing? In other words, seeing the benefits of such processes is not necessarily or directly available to those *on the ground* who are, however, responsible for data input.

3.3. *Effects on Healthcare Research*

In the context of healthcare research, digital and algorithmic cultures take the form of incentives (and, at times, injunctions) to use computer-assisted software or data-driven tools and processes, such as digital data systems or data sharing policies and platforms, thereby creating open data sets. This has the effect, although rarely acknowledged, of configuring the type and nature of research projects, and informing how research is done or can be done; for example, how data is made (collection, measures used, systems or platforms used to collect data) and analyzed. All of these are epistemological considerations, but, as feminist new materialists highlight, epistemology has ontological effects. In health research, there has been an undeniable push toward increased adherence and responsiveness to the new “digital and algorithmic cultures”.

Funding bodies and governmental institutions are increasingly pushing for the usage, in research projects, of new technologies to support data collection, extraction, linkage, sharing, and analysis. They are also encouraging research projects that examine the effects of these new cultures or their tools or that incorporate components of these cultures.¹⁰ Funding bodies as others concur, play important ethical, political and epistemological, but also ontological, roles in research, from the ways research is conceived, designed and conducted to the types of research projects that happen, i.e. are funded, or even to what counts as valid research, i.e. what is “fundable” (*c.f.* Buikema & van der Tuin, 2013). Thus, the culture of “Big Data” definitely acts at the level of the imagining and creating research; the tools and hopes it offers or promises are particularly enchanting, mesmerizing and alluring; in other words, they seduce but also can saturate one’s realm, i.e. one’s (i.e. research’s) field of vision, and thus inform research and its epistemologies.¹¹

3.4. *Effects on Healthcare and Clinical Practices*

In the context of healthcare/clinical practice (i.e. not only data input but actual care), care is transformed but *in practice* rather than at a prior/conceptual level. For example, telemedicine is about having providers located in one place when patients are located in another place.¹² They are no longer in the same place, or time, as consultations can also happen asynchronously (e.g. video recording). Usually, however, patients are accompanied by on-site nurses or caregivers. As healthcare intersects and transforms in the contact with technologies of information and communication, more and more is being written on the *sensory* aspect of the clinical profession (*c.f.* Maslen, 2016, 2017).¹³ It is only through their interaction with telemedicine that such deep reliance on the senses have become visible to many clinicians (*idem*); and telemedicine effectively means relearning how to practice care *without* direct sensory contact, or, rather, through a *redistribution* of the sensory work, which now has to be largely done by either the patient themselves or the nurses or accompanying caregiver physically in the room with the patient.

Moreover, beyond tele-medicine, with new digital tools and processes, clinicians are prompted to think in new ways—and to move in new ways—and to know. For example, they must increasingly stand and mimic gestures they ask patients to reproduce. Rather than through touch, it is now through movements, which are rendered as a 2D image, that clinicians observe their patient. Plus, clinicians and other care professionals rely increasingly on the senses of other, remotely situated with patients, caregivers or on-site nurses to know. Thus, clinicians are asked to move their bodies and to do so in new ways, ways that support their epistemic capacity but that also transform their epistemological practice itself. These are ways in which technologies of information and communication interact with bodies and knowledge in unpredictable and unforeseeable ways, and it is by interacting with them that new knowledge and practices are made, rather than up-stream, i.e. the conceptual level. Here, again echoing the contribution of feminist new materialist thinkers, the

material and the discursive are constituted together and irrevocably entangled, and in manifold ways, so many of which cannot be planned for.

This again reverberates with the work of sociologists and anthropologists of science and technology, such as Latour (1987, 1999, 2004a), Law and Lien (2010, 2011, 2013), and Myers (2015). For example, in his work on laboratory of sciences, Latour notably demonstrates that the world has always already been a research laboratory; that there is no laboratory away, at a safe distance, from a world that would remain intact. The laboratory is an ontology-making space, where “worlds” and the entities within them are made (Latour, 1987, 2004a).

In healthcare practices, as new tools such as telemedicine and e-remote consultations are being introduced, these are tested in practice, which means *necessarily* figuring out how they work, i.e. how they can support remote consultations and “care at a distance”, and people are becoming aware, first, of the complex effects and transformations the introduction of such technologies has on care, bodies, concepts, personalities, and personhood (*c.f.*, Pols, 2012; see also Cherba *et al.* 2019); and second, of greater concern/distress is perhaps the gross lack of attention and consideration for the vast array of transformation and effects the introduction of elements or processes of the digital and algorithmic cultures have. In the example above (Cherba *et al.*, 2019), health providers only discovered *while using the tools* 1) how they are/have been practising their clinical care; and 2) how they have to do it differently, think and, often, use their bodies—and others’! (i.e. the nurse’s, who is located remotely, with the patient; or the patient’s) (Cherba *et al.*, 2019).

Conclusion

The ontological (or, rather, ethico-politico-onto-epistemological) effects of digital and algorithmic cultures in healthcare practices and research (and beyond) are very much real and already much being felt. The exhilarating feelings—joy, hope, fascination—that accompany these cultures ought to raise questions and worries—what is the pace at which we move into these cultures? What are the effects? Are we OK with how these transform what it means to be a person, to be with others, to live and die with others? And what of the possibilities *and impossibilities* of these world-ings? ¹⁴

In this paper, I aimed to introduce readers to the approaches (i.e. conceptual tools and contributions) of feminist new materialism as a particularly enlightening field of study and thought to critically attend to the effects these cultures have. This critical examination could take place in an array of fields. I used healthcare practices and research as a viewpoint because this is the field in which I currently do research (although my research exceeds it too, *c.f.* Dionne, 2019). I also consider healthcare practices and research to be fields that demand particularly astute attention and care, given that the argument can easily be made that digital and algorithmic cultures are complexly intertwined and actually dominate in healthcare practices and research.

Indeed, if these cultures aim to produce a “picture” (quantified rendering) of the “human”, and propose to individuals that they can use these data to work toward the “care of their self”, i.e. hope to optimize their human possibilities and capacities but also optimize them in light of what their putatively objective and unique Truth would be, the argument can be made that healthcare practices and research are at the forefront of these novel cultures.

A feminist new materialist theoretical framework allows us to explore effects of these cultures that fail to be included in the mainstream conversations, debates, or practices that enforce digital and

algorithmic practices in healthcare practices and research and beyond. *Ethico-politico onto-epistemological* effects. Health (or “health”) is positioned as a particular lens of inquiry and design of these cultures. As discussed in this paper, these cultures operate within the paradigm of positivist science that holds a representationalist nature of scientific tools and aims to “draw an accurate picture” of the human self or body, with the prospect of unique optimization. Underneath this discourse, the idea survives that there exists a teleological goal inscribed within each human. The question, thus, remains—is this what humans want their world to become?

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Notes:

1. I define ontology as that which pertains to the reality of things, of matter, i.e. its putative "essence" or identity. As feminist new materialists argue (Alaimo & Sullivan (eds) 2008; Barad 2007; Haraway 2008, 2015), along with poststructuralist philosophy, object-oriented ontology, and other new materialisms, there is no fixed or given reality or matter. Matter is a "process of materialization that stabilizes overtime" (Butler, 1993, 9). It is affected to become what it will become through discursive practices (Barad 1996, 2007; Butler 1993; Foucault 1967, 1984;). Thus, ontologically, there is no "matter", that is, given and knowable "things". And yet matter, of course, does exist, and gain determinacy... at some point. An identity. But it does only temporarily so, and in context. For other Feminist new materialism works, see. Barad 2010, 2012, 2017; Bennett 2010; Coole & Frost (Eds) 2010.

2. “Practices of citationality”, for Butler, are akin to what Jacques Lacan aimed to say when he positioned that the speaking subject is not quite the subject who speaks, *i.e.*, who masters language and uses words to achieve his or her ends. Insofar as all of us make use of a language that preexists us and that has been used and formed by generations of speakers and practices before us, when we use language, due to the manifold meanings it carries, the historic practices that are embedded in it (*i.e.* words, languages, and meaning), it is rather *languages that speak subjects*, rather than the reverse.
3. This also echoes the work of Lorraine Code (1987, 1991) on the notion of the “second person”. Inspired by the work of child psychologist Annette Baier, Code explains how each person can be more appropriately conceived of as, first, a *second person*, *i.e.* a person who emerges as who she is through mimesis practices of her careers. For more, see Code 1987.
4. There is no space nor is it the topic of this paper to expand on the ontology behind feminist new materialism; For more information see Barad’s work, specifically 1996, 2003, 2007, 2010, 2012, 2014, 2015, and 2017.
5. Barad’s approach is conceived as an *agential realism*, to this effect. (For more information, see Barad 1996, 2003, 2007).
6. Here contrasting with Butler’s depiction of matter of process of *materialization*. For Barad, there is no pure matter; processes of materialization always and already encompass processes of valuation and signification. The two go hand in hand, are indissociable. Specifically, this means that even concepts, words, are contextual, relational — and *material* (for more information, see Barad 1996, 2007).
7. Another important mention is that the methods themselves, practices of knowledge, either, do not pre-exist the moment of the scientific experiment, for example. The methods, the practices, *even the researchers*, are what “they are” only when considering the whole of the relationships, the event, the situation, which is the study itself. They are all linked but also what they are as part of their relations. This is why Barad speaks of *intra-action* rather than *interaction*, where the latter term conveys the ideas that things preexist their relation, their encounter, that they have a pre-existing essence. Barad does not so much deny that as she clarifies that these were simply *other things*, knowable, meaningful, materially and discursively, as part of another “phenomena”, the concept she uses to talk about the situation of the encounter where “objects of observation” and “agencies of observation” (formerly the object and subject of research) emerged together *and* apart, distinct, but both together at once and entangled. For more, see Barad 1996, 2007.
8. The pun is intended; the concept of “matter” here refers to the process of attributing value or meaning to something; to count, to be important, valued. For more on the concept of “matter”, see the work of Barad (2007).
9. For more information, see Barad 1996, 2007.
10. This is part of an ongoing study, a *Canadian Institute of Health Research*-funded comparative policy and program analysis, National Principal Investigator Jeannie Haggerty. See also the Canadian Data Sharing platform (the *Health Data Research Network Canada*, URL: <https://www.hdrm.ca>) (see also Guttman 2019) and the 2015 *Council of Canadian Academies* (CCA) report on Accessing Health and Health-related Data in Canada (URL: <https://cca-reports.ca/reports/accessing-health-and-health-related-data-in-canada/>).
11. For example, see the website of the *Canadian Institutes of Health Research* funding opportunities, URL: <https://www.researchnet-recherchenet.ca/>
12. On the epistemological and ontological roles played by research ethic boards and funding bodies, see Buikema and Thiele (2018).

13. The recent situation of the pandemic of Covid-19 speaks to the acceleration of the implementation of telemedicine, notably in primary health care practices.
 14. Sensory work refers to the reliance of clinicians on their physical senses (e.g. touch, sight, smell) to provide care. See Haraway, 2015, 2016 on the concept of “worldings”.
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