From neurodiversity to neurodivergence: the role of epistemic and cognitive marginalization

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Abstract

Diversity is an undeniable fact of nature (Gaston and Spicer in Biodiversity: an introduction. Wiley, Hoboken, 2004), and there is now evidence that nature did not stop generating diversity just before "designing" the human brain (Joel et al. in Proc Natl Acad Sci 112(50):15,468–15,473. https://doi.org/10.1073/pnas.1509654112, 2015). If neurodiversity is a fact of nature, what about neurodivergence? Although the terms "neurodiversity" and "neurodivergence" are sometimes used interchangeably, this is, we believe, a mistake: "neurodiversity" is a term of inclusion whereas "neurodivergence" is a term of exclusion. To make the difference clear, note that everyone can be said to be neurodiverse, but that it is almost impossible for everyone to be neurodivergent. Neurodivergence is, we claim here, a fact of society. Neurodivergent individuals are those whose cognitive profile diverges from an established cognitive norm, a norm that is not an objective statistical fact of human neurological functioning but a standard established and maintained by socio-political processes. In this paper, we describe the socio-political mechanisms that build neurodivergence out of neurodiversity which, inspired by Mihai (Contemp Polit Theory 17(4):395–416. https://doi.org/10.1057/s41296-017-0186-z, 2018), we call "epistemic and cognitive marginalization". First, we extend the traditional concept of neurodiversity, which we believe too closely tied to a neuroreductionist conception of cognition, to that of "extended neurodiversity," thereby viewing neurodiversity through the lens of 4E (i.e., embodied, embedded, extended, and enactive) cognition. Considering that human cognition depends on epistemic resources, both for their construction (diachronic dependence) and their online dynamic expression (synchronic dependence), we hypothesize that the differential access to epistemic resources in society, a form of epistemic injustice, is an overlooked mechanism that turns neurodiversity into neurodivergence. In doing so, we shed light on a type of epistemic injustice that might be missing from the epistemic injustice literature: cognitive injustices.

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1 Introduction

One of the advantages of being privileged is that what you are and how you behave sets the norms by which things are evaluated and valued. Another advantage is that you get to construct, perhaps consciously (through, e.g., laws and institutions), perhaps unconsciously (though, e.g., cultural selection), the mechanisms by which things that are valued, that is, what you are and how you behave, is preserved. This is true for epistemic and cognitive matters just as much as it is for social matters (gender, race, wealth, etc.).

The epistemically dominant group[1] that we are concerned with here is the group commonly known as "neurotypicals," that is, those whose cognitive profile corresponds to the established norm. The group (or groups) whose cognitive profile deviates from that norm and does not benefit from the same epistemic power and cognitive privilege is sometimes known as "neuroatypical", but more commonly as "neurodivergent." For example, some social "deficits" associated with autism seem to be culturally maintained because the epistemic resources that allow autistic individuals to infer the mental states of neurotypicals are not equitably accessible. As we suggest in a previous paper (Legault et al., 2019), neurodivergence is self-reinforcing: neurodiversity accompanied by epistemic injustices causes neurodivergence, which causes further epistemic injustices and so on. In this paper, we argue that there is a 4E mechanism involving epistemic injustice and marginalization that creates neurodivergence out of neurodiversity. We do not claim that all neurodivergence results from this mechanism (that may be the case but we do not argue for it here), but we believe that the mechanism we expose has been mostly overlooked until now and should be thoroughly investigated to better understand neurodivergence and its close link with epistemic injustices. Understanding the mechanism of epistemic and cognitive marginalization gives us, among other things, power over neurodivergence. The fact that human cognition is embedded in a vast network of cultural content and power dynamics probably cannot be changed, but the fact that cultural niches are set up in unjust ways can. Therefore, neurodivergence can be lessened or made to disappear by making cultural niches more epistemically just.

In the following sections, we will tell the story of how epistemic and cognitive marginalization is involved in the genesis of cognitive deficits, and is therefore implicated in the production (and maintenance) of neurodivergence. We will start in Sect. 2 by clarifying some of the terms we will be using and setting the context

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[1] Note that we could have used the term "epistemically privileged" here, but we chose instead to use "epistemically dominant" (we also use "epistemic power") to distinguish it from a concept from feminist standpoint theory (Harding, 1986; Harawy, 1988): an "epistemically privileged standpoint" is a first-person point of view on a phenomenon that gives knowledge that is neither transmitted nor shared by the dominant group.

against which our story is told. In order to shed on the hypothesised mechanism, in Sect. 3, we then show that neurodiversity is simply a form of biological diversity like many others. Natural selection does not stabilize unique and unchanging essences at any level, including neurological. We then move from neurodiversity to extended neurocognitive diversity by adopting a 4E view of cognition, which multiplies the possibilities for diversity, as physical, social and cultural variation can now be considered components of neurocognitive diversity. In Sect. 4, we show that diversity also has a firm grip on the epistemic realm, where access to epistemic resources tend to be differentially distributed. Patterns of epistemic resource accessibility depend on many factors: economic, social, but also neurocognitive, thus creating the loops of positive and negative feedback that expand neurocognitive diversity even more. Accordingly, in Sect. 5, we conclude the story by expanding on our recent proposal (Legault et al., 2019) to adopt a 4E conception of cognitive deficits and its relation with epistemic injustices. Our goal is to show that epistemic injustices not only affect neurodivergent individuals, but in fact generate neurodivergence and cognitive deficits. Finally, in Sect. 6, we draw various questions emerging from (and central to) the analysis of epistemic injustices in the context of neurodiversity.

2 Context and clarifications

The terms "neurodiversity" and "neurodivergence" are sometimes used interchangeably. This is, we believe, a mistake, as "neurodiversity" is a term of inclusion whereas "neurodivergence"[2] is a term of exclusion. To make the semantic difference clear, note that everyone can be said to be neurodiverse, but that it is impossible for everyone to be neurodivergent[3]: for someone or something to be divergent, someone or something else must be non divergent.

　Neurodiversity refers to the neurological or neurocognitive variation naturally found in the human population. The term was first introduced by Judy Singer in a book published in 1993 simply titled "Neurodiversity" as name for a growing sociopolitical movement that promotes the recognition and inclusion of natural neurocognitive diversity (see, for example, the Autistic Self Advocacy Network (ASAN), whose slogan is "Nothing About Us Without US!") in society in general, but also in areas that directly concern it (i.e., in the areas of social and economic development, health, education, and the environment). Walker (2012) describes this movement for

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[2] Our point is not to criticize those who self-identify as neurodivergent for their use of the term. On the contrary, we believe this type of usage is particularly fitting since marginalization is, as we will argue, at the core of neurodivergence. Our point is simply to note the normative nature of "neurodivergence" (as opposed to the descriptive nature of "neurodiversity").

[3] In this paper we will use terms such as "neuroatypical" and "neurodivergent", but these terms should be taken as meaning "considered neuroatypical" and "considered neurodivergent". Just as people are gendered, racialized, etc., they are "medicalized" (or better: "psychiatrized"), that is conditions that are to a great extent dependent on the society to which they belong are made into essential features of themselves as individuals. We do not wish to essentialize the normative distinction between typical and atypical, but we want to refer specifically to those groups that are marginalized because their cognitive profiles differ from the established cognitive norm.

the promotion of neurodiversity as a new paradigm (the neurodiversity paradigm) in response to the paradigm of pathology. It should be noted, however, that this movement has not been, and still is not, immune to certain mechanisms of exclusion. For example, the movement began with verbal autistic people, but although the movement has since expanded to include many conditions, autistic people (and more recently ADHD people[4]) still seem to dominate the movement. In this regard, we acknowledge both some of the advances of this movement and some of its current limitations. Although some of the authors of this article have been diagnosed as autistic and as ADHD respectively, we are in a position of privilege where we are not only verbal, but also heard and participate in the scientific dialogue, notably with this very paper. Because we are more familiar with the autistic community (for example through the creation and publication of an autism awareness webcomic[5]), we will use examples related to matters concerning this community. We believe that other aspects of neurodiversity should be included in this dialogue. We can note some progress with the recent publication of "Neurodiversity Studies: A New Critical Paradigm" (Rosqvist et al., 2020), which exemplifies the growing acceptance of this socio-political movement by the scientific community. This diversity[6] may include one or many types: in a hypothetical space of possible neurocognitive profiles, those are regions of density containing many similar individual profiles. As we use it here, we take "neurodiversity" to be a descriptive term.

Neurodivergence, for its part, belongs to a normative vocabulary. It requires a norm, which can be qualitative or quantitative, that is created, and perhaps causally set up and enforced. When one sets up criteria (perhaps arbitrarily e.g. determining thresholds in a statistical—normal—distribution) to distinguish typical from atypical neurocognitive profiles among the naturally occurring neurological variation. However, the narrative is not so simple. As we shall see, cognition is a complex and dynamic process and the simple act of making a distinction between neurotypical and neuroatypical individuals shapes, at least in part, these individuals' cognition. Individuals are *quantitatively* counted as neurodivergent when their neurological or neurocognitive profile falls on the margins of that profile's statistical distribution (in this case, the criterion is a point or threshold on the distribution); they are counted *qualitatively* neurodivergent when qualitative conditions (e.g., a set of necessary and sufficient conditions; but also conditions such as those in the DSM-5) stipulate what is considered to be a normal neurocognitive profile; that is when such conditions define "normalcy". These criteria, quantitative or qualitative are usually chosen for medical, practical, economic or moral reasons: because one type is believed to be

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[4] We will use the arguably awkward term "ADHD people" instead of "people with ADHD" to avoid non-inclusive language. This choice is inspired by a growing desire from the ADHD community to find a better suited name for their cognitive profiles. Some have suggested dropping the "D" that stands for "disorder" and simply going with "ADH", from which "ADHer" can be derived (Hulst, 2021). Others have suggested using "VAST" (Variable Attention Stimulus Trait) (Hallowell & Ratey, 2021).

[5] Freely available online at https://autismflaps.com.

[6] How many neurocognitive types there are is an empirical question which we do not want to prejudge here (no one should as we collectively have sufficient knowledge about the matter to settle the issue).

"more functional", "more adapted, evolutionarily", "easier to interact with", "less resource demanding", "more characteristic of a human life worth-living", etc.

How exactly did we come to take as descriptive what was normative? This, we believe, is the effect of a third-person narrative: that of the observer metaphorically dissecting autism as an object of medicine. But what if this object were in fact a dynamic agent rooted in the real world? We would be forced to leave our metaphorical scalpels behind and open our narrative to sociological, political and ethical considerations. This is the context that led to our hypothesis of a socio-political (and cultural) mechanism by which epistemic injustices turn neurodiversity into neurodivergence.

The socio-political mechanism at the heart of our hypothesis is what we call, inspired by Mihai (2018), "epistemic and cognitive marginalization". To better understand it, we will view human cognition through the lenses of the extended (or 4E) cognition perspective. The 4E framework, we believe, allows us to better grasp how cognitive capacities depend on what we call "epistemic resources". Epistemic resources are those external features (structures, artifacts, symbols, regularities, processes, practices, traditions, and knowledge generally) upon which cognitive capacities are scaffolded (Varga, 2019), both for their construction (diachronic dependence) and their online dynamic expression (synchronic dependence). Epistemic resources are cognitively valuable tools that one's cognitive system can not only have access to, but that they can also participate in shaping. And just as is the case with other types of resources (e.g., material or economic), some groups may benefit from a facilitated access to epistemic resources, or have a dominant role in their construction or accumulation. Asymmetrical epistemic power favours the creation of a cultural epistemic niche (i.e., a shared structure of cultural information and practices) shaped by the epistemically dominant group to cater to that group's specific epistemic and cognitive needs.

The epistemically dominant group that we are concerned with here is the group commonly known as "neurotypicals," that is, those whose cognitive profile corresponds to the established norm. The group (or groups) whose cognitive profile deviates from that norm and does not benefit from the same epistemic power and cognitive privilege is sometimes known as "neuroatypical", but more commonly as "neurodivergent." The reader may have spotted a potentially insidious form of circularity here: neurotypicals are both those who correspond to the established norm and those who establish it.[7] That is precisely the issue at the core of this paper, hence the title "From neurodiversity to neurodivergence: the role of epistemic and cognitive marginalization". For example, some social "deficits" associated with autism seem to be culturally maintained because the epistemic resources that allow autistic individuals to infer the mental states of neurotypicals are not equitably accessible.

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[7] It should be noted however that neurotypical individuals, whose cognitive profile fits with the available epistemic resources, can experience epistemic injustices in other aspects of their life: we can think of racism, sexism, cisgenderism, audism, ableism or any other form of marginalization. However, with an extended view of cognition where brain, body, environment and culture are intertwined in the complex dynamic process that we call "cognition", these other epistemic injustices can logically contribute to the fragility of cognitive resources (Pitts-Taylor, 2016).

As we suggest in a previous paper (Legault et al., 2019), neurodivergence is self-reinforcing: neurodiversity accompanied by epistemic injustices causes neurodivergence, which causes further epistemic injustices and so on.

A broader aim of the paper, one we pursue in passing, is to explore how cases of neurodivergence and/or atypical cognition can deepen our understanding of traditional epistemological issues. By defining epistemic injustices within a 4E framework, the questions surrounding epistemic injustices and cognitive deficits seem difficult to dissociate. There is a tendency in the literature on epistemic injustices to base conceptual expansion on epistemological categories (e.g., norms, agency or epistemic virtue) rather than start with cognitive (or neuroscientific) categories. It is this aspect of the relation between epistemic injustices and so-called neurodivergent cognition that we propose to explore as neurodivergent individuals are particularly prone to be subject to epistemic injustices because of various processes of epistemic and cognitive marginalization regarding cognitive diversity.

3 In the beginning there was (neuro)diversity

3.1 Diversity, biological and cognitive

Life breeds diversity and evolution is the means by which it does it (Gaston & Spicer, 2004). Life populates environments with multiple species of every shape, size and mode of living. It builds diverse ecological niches into every one of earth's nooks and crannies. Even the most forbidding of niches is populated by a variety of species. Evolution also "designs" all sorts of variabilities into species: phenotypic variability (sometimes extreme, as in insects), behavioral variability, and genetic variability. Given the overabundance of diversity, it's hard not to think of diversity as one of the building blocks of life. And yet it is often overlooked in biological textbooks and philosophical discussions of biology. Evolutionary biology has mostly focused on adaptation (and adaptations), but Darwin was equally fascinated by diversity. The first chapter of *On the Origin of Species* (1859) can be viewed as a long essay on the diversity found in, and possible for, the domestic pigeon (*Columba livia domestica*). In fact, one of the book's first reviewers suggested to the editor that Darwin write instead a short book on pigeons.

If diversity is everywhere in nature, then why do many fields still regard it as deviance? In her book *Evolution's Rainbow*, Roughgarden (2009) asks this very question (and more). She focuses on sexual and gender diversity. Many even today view sex and gender are binaries: male/female; masculine/feminine. She notes that most species reproduce sexually, and that sex, the biological notion linked to reproduction, is indeed nearly binary: males are those organisms of a species that make small gametes, and females are those that make large gametes. Some species have only one gamete size and some have three. Beyond these two near universals concerning gamete size, "diversity begins" (2004, p. 26), both in sexual characteristics and gender. In order for gender, a notion usually limited to humans and linked to culture, to apply to the whole of nature, she defines gender as "the appearance, behavior and life history of a sexed body" (2004, p.27),

where a "body becomes 'sexed' when classified with respect with the size of the gametes produced" (2004, p. 27). Thus defined, she shows that none of the gender stereotypes holds in nature: it is not true that organisms are male of females for life, that males are on average bigger than females, than females not males give birth, that males have XY and females XX chromosomes, that there are as many genders as sexes, that females and males look different, that, even in mammals, males have penises and females lactate, and so on. Sex and gender illustrate nature's (as well as culture's) pattern: abundant diversity almost everywhere. The question of why nature produces so much diversity has been taken up by Scott Page in his *Diversity and Complexity* (2010): in short, diversity is advantageous, and life has evolved mechanisms to generate and maintain diversity. To use the language of the evolutionists, diversity is an adaptation (Mayr, 1982; Dennett, 1995).

If diversity now seems a given in biology, the same is not true in the realm of human cognition: whereas biological diversity is the norm, neurocognitive diversity (i.e., neurodiversity) has yet to reach that status. In addition to a trend towards universalism, theories of human cognition appear rooted in an internalist and essentialist framework (see Pitts-Taylor, 2016). The classic debates between monism versus dualism and reductionism versus anti-reductionism have remained enclosed within internalist and essentialist frameworks. The idea of a dynamic relationship between living beings and their environment, as well as that of diversity (sexual diversity or gender diversity for example), have fallen behind when it comes to human beings. Fortunately, the (conceptual) distance is shrinking. "Biofeminism" has emerged through the works of researchers such as Fausto-Sterling (1985), who propose to detach the sex/gender concept from its traditional biological essentialism. According to feminist epistemologies (see Longino, 1994), biofeminism (Fausto-Sterling, 1985, 2000; see also Wilson and Clark, 2008) is a response to feminists' mistrust towards biological theses. One could say that the ultimate aim of biofeminism is the appropriation of the theoretical resources offered by biology in the service of feminist objectives, whereas they were traditionally at the service of the dominant (i.e., non-feminist) group.

In a similar vein, neurofeminism recently appeared as a critique of neuroscience (Bluhm et al., 2012), but, like biofeminism, it is much more than a feminist critique of neuroscience. Adopting the precepts of feminist epistemologies (Harawy, 1988; Harding, 1991), it also aims to use data and theories from neuroscience to found or justify feminist theses, especially on the nature of gender or gender differences (Dussauge & Kaiser, 2013; Fine, 2010; Fine et al., 2017; Jordan-Young, 2010). Our proposal is thus in continuity with neurofeminist research; that is to say, it takes into account the normative, social (and militant) dimensions associated with neurocognitive issues. To explicitly state our views: we reject cognitive essentialism and adopt a view of cognition as emerging from a network of reciprocal relations between the brain, the body, as well as environmental and sociocultural factors (which we generalize as "the environment" or "the world"). We believe that these views, taken together, provide a rich framework to analyze the various epistemic power dynamics at the heart of the social and epistemic exclusion of certain cognitive profiles.

3.2 Extended neurodiversity

The kind of diversity that is relevant to understand what we believe is an overlooked mechanism that transforms neurodiversity into neurodivergence not only includes biological and cognitive diversity but also epistemic diversity. It is the addition of the epistemic dimension that will allow us to shed some light on the phenomenon of differential epistemic access that leads to epistemic and cognitive injustices. Before we get to that point, we need to clarify what we understand cognition to be, since the prefix "neuro" in "neurodiversity" might lead one to overemphasize the importance of the brain (or the nervous system) in neurodiverse cognitive processes. We agree with proponents of extended cognition that the cognitive system is a dynamic system encompassing brain, body and world (Clark, 1997, 2004, 2011; Clark & Chalmers, 1998; Thompson, 2007; Varela et al., 1991). While this system might revolve around the brain, extended cognition takes it that extracranial phenomena are far more influential than is often assumed (Newen et al., 2018). We take cognition to be embodied, embedded, extended and enactive; that is, 4E (Newen et al., 2018).[8] It is partially accomplished by structures and processes external to the brain—and body—(Kiverstein, 2018). There are now a multitude of approaches that include the body and environment into cognition.

It is important to note that although 4E cognition can be opposed to *internalism*—the view that cognition occurs in, or is confined within the brain—, it does not reject the presence or even importance of internal components in cognition. Our goal is not to throw the neurological baby with the internalist bath water, but to broaden what is traditionally understood by "cognition" in order to properly understand neurodiversity before we address neurodivergence. Accordingly, our point will not be to view all dysfunction or divergence as a result of external factors, but that a certain number are (and it is an empirical question how large that number is; on the current standard view, it is presumed that that there are none).

The 4E framework views cognition as a property of an integrated brain-body-environment system, and as we shall see, many forms of divergence are the result of a mismatch between internal and external resources. There may be cases where no possible human environment could match an individual's neurological functioning (but note that very few possible human environments have been explored to date; see Jordan-Young, 2010). In this sense, moving from traditional internalist views of cognition to 4E cognition emphasizes the fuzziness of the boundary between brain, body and world. This paradigm shift is important when looking at clinical practices, for example: should we focus on medicalization or on the environment? The 4E perspective allows us to see these types of questions (medical intervention and environmental intervention) as both sides of the same coin. Another important aspect of the 4E framework is the emphasis

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[8] While we understand that the nature (and boundaries) of cognition is the subject of much debate, it is not our aim here to take an ontological stance on the matter. We are partial to the 4E view of cognition, but for the purposes of this paper, the reader can assume we take an epistemological stance on 4E cognition: In order to gain a fuller understanding of how certain epistemic injustices turn neurodiversity into neurodivergence, should consider the full dynamic range of contributors to cognition, that is, an embodied, embedded, extended and enactive view of cognition.

on the action-oriented nature of cognition (Clark, 1997). Engel et al. (2013) refer to this change in stance as a "pragmatic turn," where cognition and action are seen as inseparable. The intent is not simply of associating cognition and action, but of arguing that "cognition seems fundamentally action-based" (Engel et al., 2013, p. 203). In other words, when trying to solve a puzzle, one physically moves the pieces around instead of simply doing it mentally (Clark, 1997, p. 36). Moving pieces around to solve the puzzle should ultimately be viewed as a cognitive process. Engel et al. also propose abandoning the (traditionally internalist) terminology of representations and instead opt for the concept of "directive".

Cognition is thus described in terms of prescriptions for possible actions afforded by the environment rather than in terms of mental states (see Clark & Chalmers, 1998; Varela et al., 1991). Those "possible actions afforded by the environment" are what are traditionally referred to as "affordances." Affordances are relational properties of situation or resource (objects, states, events, etc.) in the environment: if an organism can perform a given action, and some situation or resource in the environment allows performance of that action by the organism, then that situation or resource is an affordance of that action for the organism; it *affords* the organism that action. In the case of humans, most affordances are cultural (Ramstead et al., 2016), a switch on the wall affords visibility (through illumination), a gendered pictogram on a door affords relieving one's self to assigned members of only one of these genders, and so on. Cognitive systems cooperate and build cultural niches (structured landscapes—or fields—of such affordances). Many of these cultural affordances are social in nature. They afford social interaction: a smile might afford entrance into a private dwelling, circular seminar tables afford discussion whereas traditional classroom layouts afford listening, some face movements afford expressing surprise, etc. It follows from the existing variety of human neurocognitive profiles (including their extensions) and the relational nature of affordances that we should expect a somewhat similar variety of possible affordances. Just as a ceiling affords walking for flies but not for humans, situations and resources will not afford the same possibilities for different coupled brain-body-environment systems (i.e., extended neurocognitive systems). For example, an instruction booklet written in hiragana, katakana and kanji affords assembling a specific piece of furniture to an extended cognitive system that was provided the sociocultural resources (e.g., education) to learn written Japanese. The same booklet does not afford the same thing to a cognitive system that only had access to an English education, unless said system includes devices such as smartphones with means of translating the booklet's contents.

If cognition is no longer viewed as reducible to brain modules or systems but rather as resulting from complex interactions between the brain, body and environment, we can no longer study the various cognitive profiles as intracranial and individual phenomena. Neurodiversity becomes the result of a multitude of complex dynamic systems (brain-body-environment) embedded in particular cultural niches.

3.3 A new conception of cognitive deficits

By assuming that human cognition emerges from continuous dynamic interactions between brain, body and environment, one can have a different perspective on the

issue of cognitive deficits. While cognitive deficits have traditionally been considered from an internalist perspective, the 4E framework opens up a more complex landscape of loci responsible for deficits since all cognitive performances are understood as being embedded in environments that shape and sustain them. We proposed in a previous paper (Legault et al., 2019) that by adopting an extended and predictive perspective on human cognition, cognitive deficits associated with autism can be explained primarily as inadequacies between environmental resources and the particular form of neurocognition found among autistic people.

Discussing mismatches between an individual's neurocognitive profile and current socio-cultural environments opens the door to alternative environments where autistic profiles are fully integrated into the network of cultural niches. The individualistic approach to deficits can then be replaced (or supplemented) by a more holistic approach in which society as a whole becomes responsible for implementing social policies that increase the inclusiveness of cultural niches that currently do not allow the full development of diverse cognitive profiles. This point illustrates our theoretical proximity to disability studies that reverse the individual (or medical) model of disability by instead adopting a social model of disability: society is responsible for adapting to individuals (De Jong, 1979; see Oliver, 1996 for a comparative analysis of individual and social models of disability). The social model of disability reverses the usual aims of prevention, treatment and cure and favors instead social, political and cultural analyses and policies. Although our proposal is akin to the social model of disabilities (Oliver, 1996), we believe the mechanism in question and the depth of its impact on cognition have previously been overlooked by that model. Some researchers have formulated models that are somewhat closer to our proposal.[9] For instance, Baril (2018) argues for a socio-subjective model of disability to overcome the shortcomings of the social model. Toro et al. (2020) call their model the ecological-enactive model of disability. In an attempt to integrate contributions from both the social and medical model of disability, their model "proposes to understand disability in terms of a person's embodied skills for responding to the affordances of their environment" (Toro et al., 2020, p. 2). The arrival of disability studies and

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[9] Our proposed mechanism is also related to—yet distinct from—the looping mechanism at the heart of interactive kinds (Hacking, 1995, 1999). The expression "natural kinds" refers to categories that maximize the value of inductive inference in science. If one knows that something is H2O, then one can infer that it has a number of other properties. But if one knows that something is a member of the category "things that are on my side of the room" then there are few things one may infer about that thing. But the natural kinds of physical science such as H2O are classificatory inert: they do not react or change their nature as a result of their inclusion by scientists in a particular natural kind. Hacking observed in contrast that the kinds one finds in the social and human sciences do react or change their nature as a result of being classified under a given category. They are interactive. If I learn that my boss has classified me in the category of "bad employees", then I may decide to improve my behavior or performance in ways that will make her classification false. Or I may come to view myself as a bad employee and act in ways that make the category even truer of me. Psychiatric conditions are, Hacking maintains, such interactive kinds: individuals react to their classification in a psychiatric category in ways that affect the value of the classificatory act. Although they may partly overlap, the mechanisms by which individuals react to their being classified are different from the mechanism which create neurodivergence.

4E cognition have some common grounds: they give an important role to socio-cultural—and therefore political—environments.

A relatively recent paper on autism in a predictive processing framework (Palmer et al., 2015) illustrates the difference between an internalist and a 4E view of disability. It states that autistic people have a weaker "grip" on the affordances offered by other minds (p. 386). This assumes that "other minds" and social affordances are of a single type (i.e., that of neurotypicals) and leads to the conclusion that autistic people have a social deficit (conceived in an internalistic way). In other words, it assumes that other minds (on which social affordances depend) are instances of a single natural species.

Once one has the ability to understand and predict other minds, it is assumed that one can predict them all as if there were no cognitive diversity (i.e., as if everyone experienced and interacted with the world in the same way). Palmer et al. (2015) conceive of the social characteristics of autism as an attenuated perceived presence of others. Their notion of "perceived presence" is intimately linked to the counterfactual predictions made by the cognitive system: when the system is able to predict the consequences that an object or phenomenon of the world would have on its perceptual stream, the object or phenomenon is perceived as perceptually present, that is, as having a real—metaphorically tangible—existence. Palmer et al. (2015) therefore explain autistic social traits (often characterized as social difficulties, or even deficits) by a diminished ability to make counterfactual predictions about other minds. According to them, the perceived presence of other minds is weakened in autistic people, which means that they have to voluntarily use an explicit form of mentalization instead of the more spontaneous implicit form used by neurotypicals. As we mentioned earlier, this conception assumes a form of universalism with regard to other minds. It brushes aside—perhaps unintentionally—human neurodiversity and puts the responsibility on autistic cognitive processing, claiming that autistic mentalizing fails to predict other minds.

Adopting 4E cognition, another way to see the situation would be to put the blame on the mismatch between the kind of minds that does the predicting and the kind of minds that are being predicted or, to go even further, on the interpretative (i.e., hermeneutic) resources made available to the mind doing the predicting. If there are no shared interpretation of, say, autistic people's types of gestures (e.g., stimming), neurotypical people may associate their own meaning to these gestures, leading to a misunderstanding of the autistic person's state of mind: twitching fingers as anxiety instead of concentration or avoiding eye contact as embarrassment or lying instead of avoiding an overwhelming stimulus. Perhaps the cultural niche neurotypicals have built to socially interact is not suited to the capacities of autistic persons, which could also spontaneously use implicit mentalizations if the social affordances were differently expressed. Similarly, perhaps neurotypicals have difficulties interacting with autistic persons because their capacities are not suited to the social affordances expressed by autistic persons (De Jaegher, forthcoming). In both cases, the blame is not on the individual (autistic or neurotypical) but on the mismatch (suited/not suited) between neurocognitive capacities and social affordances. Our goal is not to deny other possible types of mismatches, but to underline a narrative too often forgotten. One in which the environment is a main actor rather than a

mere extra. In this sense, although it favors broadening the traditional understanding of human cognition, the extended view that we take onboard is not immune to the notion of dysfunction or deficit.

If we want to understand all forms of human cognition, we must take diversity seriously in all aspects of cognition: both neurocognitive diversity and the diversity of potential epistemic affordances and resources. As neurofeminists and feminist epistemologists have shown, science, including neuroscience, is not immune to beliefs and biases (see Harding, 2005 for questions of standpoint and objectivity), nor to power dynamics.[10] This is also true of cultural niches in general, while they contribute to the development of varied cognitive profiles, they are not immune to the power dynamics between different groups. In the following section, we will address this particular question through the lens of epistemic injustices. For a long time, injustices were thought of as material (e.g., access to natural resources), but as feminist researchers have shown, injustices also result from differential access to epistemic resources on the basis of such properties as one's social identity. One such property is, as we hope to show, one's particular cognitive profile and as we will see in later sections, it needs not be as overtly identifiable as a social identity.[11]

4 Then came epistemic injustices

This rather naturalistic starting point might seem quite removed from the theme of epistemic injustices. Although, the extended view of human cognition forces us to insist on cognition's relational nature as a result of brain-body-environment interactions, making differential access to cognitive resources, including epistemic resources, a major explanatory factor. Epistemic injustices are situations where persons who do not belong to a dominant social group are denied (or simply not offered) access to or participation in the shared epistemic resources. The various concepts and knowledge base available do not represent their lived experience (hermeneutic injustice), and their testimony is given less weight to shape the collective epistemic resources (testimonial injustice).

When discussing epistemic injustices, the focus is—understandably—on the knowledge that allows us to understand, express and share certain realities, and the transmission and sharing of this knowledge (testimonies). Although one might wonder: what distinguishes epistemic resources from what we might call "cognitive resources" (i.e., the physical or conceptual tools and information that enables or helps cognition)? If there is a strong distinction to be made, what is the relationship between epistemic and cognitive resources? In fact, the question of epistemic injustices has made it possible to address the differential access to an intangible type

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[10] As we mentioned earlier, social movements like the neurodiversity movement are not immune either.

[11] We suspect that some of the biases and prejudices suffered by invisibly disabled people might reveal some shortcomings in the epistemic injustice literature and framework, but this is a discussion that requires more scrutiny to be included in the current paper.

of resource: knowledge, concepts, practices, etc.[12] In this sense, we see the subject of cognitive resources as a logical extension of the discourse on these intangible injustices. However, a difficulty should be noted here. Epistemic injustices are traditionally thought to begin with the identification of a person to a non-dominant social group from which prejudices derive. This starting point is important because it allows us to distinguish between structural injustices and individual—anecdotal—situations. For instance, it is possible to be unjustly distrusted, but testimonial injustices happen when one suffers an undue credibility deficit due to the identification to a non-dominant social group. By taking a further step towards intangible injustices, we believe a previously overlooked form of epistemic injustice might show itself: a form suffered by those with invisible (when undisclosed) disabilities (or marginalized cognitive profiles). Our claim is that invisibly disabled people can suffer epistemic injustices based on their specific cognitive profile without identification to that profile. Some steps have been taken in a similar, but somewhat different direction: Catala (2020) discusses logocentrism (i.e., the tendencies to focus on propositional communication to the detriment of non-propositional communication) within the epistemic injustices literature.

Recent progress in cognitive sciences, we believe, might give us a new insight in this phenomenon. As we mentioned in Sect. 3.2, affordances are possibilities of action offered by the environment depending on an organism's capacities. Stairs, for instance, do not offer the same possibilities of action to a person in a wheelchair and a person who doesn't. This is a material example, but affordances can take various forms like social affordances (a smile does not afford the same possibilities of action as a stern face) or cognitive affordances (a given the set of letters and words presumably does not afford the same possibilities of action to dyslexic and non-dyslexic people). These possibilities of action, as we might expect, are not immune to power dynamics. Considering the existence of a diverse array of cognitive systems and the importance of epistemic resources, it seems highly likely that an epistemically poorly diversified environment unfairly favors some systems to the detriment of others. We might then speak of epistemic advantage, perhaps even of cognitive privilege.

4.1 Access to cognitive resources

A short thought experiment might help us illustrate our point. Consider a society whose mathematical system is in base 12 and where, because of simple biological variability, 85%[13] of the population is born with twelve fingers (the other 15% only have ten). Let us further imagine that those who form the majority are the dominant group and have devised procedures where learning to count is transmitted through

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[12] Some even consider epistemic injustices, both testimonial and hermeneutical, as cases of distributive injustices (Coady, 2017). However fruitful such a view might be, our argument does not require subscription to it.

[13] We based this percentage on a recent report by researchers from both the Centers for Disease Control and Prevention (CDC) and the Health Resources and Services Administration (HRSA) stating that the

dactylonomy, the process of counting using fingers. In that society, the possession of twelve fingers is a cognitive resource used to teach, learn and transmit counting abilities. Let us say, furthermore, that it is frowned upon or actively discouraged to use other forms of cognitive resources like pen and paper, small props to support the process of counting or even techniques like counting finger bones in base twelve or sixty, used in ancient Egypt and parts of Asia today (Ifrah, 2000). For the sake of simplicity, we will ignore all other possible advantages or disadvantages of having ten or twelve fingers in that society. What we want to focus on here is the close relationship between sociocultural practices established and maintained by a specific group at a particular moment and its impact on the access to cognitive resources and performance.

We can imagine that in such a context, because of the way counting is taught and culturally transmitted, people with twelve fingers will have faster and easier access to that particular ability. In such a society, the ten-fingered population will certainly face delays and will likely have weaker counting skills when compared to the dominant group, whose bodily (and cognitive) profile the available epistemic resources were tailored to. The performance gap between these two groups might be further artificially maintained by socio-political mechanisms, stabilizing this population's difficulties over time, such as the creation of different classes for children with ten and twelve fingers, like those for children with learning disabilities we currently have. In the case where the latter class doesn't offer adequate alternative learning methods and simply assume an inability to learn, the difficulties are never addressed and might be solidified. One more kind of difficulty comes in the evaluation process: if one's mathematical abilities are somehow tested with methods specifically tailored to those with fingers, performance itself might be skewed. We can draw a parallel with our IQ tests, where intelligence is both defined and measured by the dominant (i.e., neurotypical) group. For example, Courchesne et al. (2016) point out that many IQ tests rely on verbal comprehension and expression skills to complete tasks (p. 143), which is problematic when assessing the IQ of non-verbal people. Language, in these tests is a cognitive resource those who take the test must draw upon. Those who do not have access to it—or those who have difficulties using it—will have difficulty performing in the test. This logocentric paradigm likely leads to consistently lower scores for non-verbal people for reasons other than their actual intellectual abilities (Simard et al., 2015). Note that alternatives are being proposed. Dawson et al. (2007) and Soulières et al. (2011) advocate for a promising paradigm using non-verbal tests instead: they use Raven's matrices, in which the participant needs to complete a logical progression in geometric patterns.

Our finger number and IQ test examples allowed us to point to mechanisms that maintain and deepen culturally constructed deficits in access to epistemic and cognitive resources. A subtler variant of this type of mechanism depends on essentialist and internalist conceptions of human nature ingrained in our culture. Fine (2012)

Footnote 13 (continued)

percentage of children aged 3–17 diagnosed with a developmental disability between 2009 and 2017 was nearly 17% (Zablotsky et al., 2019).

offers an interesting analysis of some of the effects of essentialism towards sex dif-
ferences. As Fine (2012, p. 289) notes: "scientific claims about hardwired sex differ-
ences are part of the culture that interacts with our minds" and they have important
effects on prejudices and psychological effects such as stereotype threat. Here we
see an effect on more local interactions: a person (*A*) might entertain a bias towards
a female student or coworker (*B*) in regards to, say, her mathematical skills or her
empathic abilities. If because of such biases, *A* withholds cognitive resources, for
instance, assuming *B* can't perform adequately, stops short of a complete explana-
tion (in the case of the student) or decides to do the work themself (in the case of the
co-corker), then an extended cognitive system will be temporarily prevented from
forming, preventing further learning. Furthermore, the female coworker in question
might perform poorly on a mathematical test because of stereotype threat, which
might even confirm the bias and help maintain it as a shared bias. The effects of
essentialist conceptions of sex differences also have a broader scope: it seems to lead
some to view society's status quo regarding women as fair (Fine, 2012, p. 290).

We believe that Fine's analysis also applies to what we might call cognitive
essentialism. Cognitive essentialism is the belief that cognitive performance is the
result of a set of necessary and sufficient, innate and immutable cognitive proper-
ties that are mostly independent from socio-cultural influence). Such an essential-
ism can be qualified as "internalist" when said properties are believed to be internal
to the individual who has them (in the case of cognitive properties, internalism is
mostly realized by a belief in neuroreductionism, the idea that cognitive proper-
ties are reducible to neurological properties). In parallel to Fine's analysis of gen-
der essentialism, we believe that a belief in cognitive essentialism limits access to
epistemic resources through prejudices and biases. In fact, Fine mentions studies
that "found that people's belief about intellectual ability in general—whether it is
a fixed entity (a 'gift') or incremental ('earned')—influences persistence and moti-
vation, with those subscribing to an entity view coping less well with setbacks"
(Fine, 2012, p. 289), bringing her point closer to ours. Indeed, if ideas similar to
hardwired sex differences circulate in culture concerning the cognitive abilities of
neurologically atypical individuals, the same effects (i.e., bias, prejudices, stereo-
type threat, etc.) are likely generated in that case as well. In fact, overt stereotypes
are not even needed for such effects to appear, a slight style difference in behavior
suffices to influence people's evaluation of others: Sasson et al. (2017) conducted
studies evaluating neurotypical individuals' first impressions of autistic individuals
based on short recordings (three to ten seconds) of the latter's social behaviors. They
found that neurotypical participants consistently evaluated autistic individuals in a
more negative way than other neurotypicals. This effect was even found with static
images of autistic individuals, but not with transcripts of the interactions, suggest-
ing, as Sasson et al., (2017, p. 7) put it: "that social presentation style rather than the
substantive content of social speech drove negative impression formation".

This issue has also been approached from the perspective of a double empathy
problem: a phenomenon of frequent misunderstanding between autistic and allis-
tic (i.e., non-autistic) people due to their distinct dispositions (Milton, 2012). This
idea reinforces the narrative of a mismatch, which is why Milton emphasizes that
the problem is "double" since it is found neither in one (the allistic person) nor in

the other (the autistic person), but in the common space between the interlocutors: hence the "misunderstanding". Interestingly, Milton notes that this misunderstanding is experienced differently by allistic and autistic people. Allistic people—or neurotypical people, as this might be the case for other neurodivergent profiles—are surprised by it because it departs from their expectation of a so-called "normal" social interaction. Autistic people are familiar with the situation because they face it on a regular basis.

We can thus add this socio-political narrative of differential access to cognitive resources to the biological narrative of neurodiversity. If the culture somehow includes an essentialist and internalist conception of a culturally generated learning difficulty, it might very well have a long-lasting and self-perpetuating effect and the status quo might be maintained because these learning difficulties are deemed natural, alternative learning methods might not be pursued, etc. We can even go a step further and suppose that research may be conducted to find the genetic cause of the learning difficulty in an attempt to find a so-called "cure" to this "cognitive disability". This last possibility might seem exaggerated, yet it is not foreign to the real world. One simply has to think of research surrounding the cause of autism and the controversial puzzle piece symbol used, among others, by Autism Speaks: "the puzzle piece also represents viewing us as 'puzzling' or a 'mystery'. For autistic people this is problematic, as we don't wish to be viewed as akin to a puzzle that can't be worked out" (Jessop, 2019, p. 3). Without categorically opposing all research into the causes and potential treatment options for various conditions that fall within the reach of contemporary psychiatry, we would do a disservice to those concerned not to mention the concerns raised by activist groups for neurodiversity: they tend to deplore the significant gap between efforts deployed to find causes or cures and those deployed to find appropriate and effective cultural and societal changes or even basic support.[14]

We can try to imagine what such changes would look like. We might suppose that the effort might begin with the establishment of spaces—not necessarily physical spaces—to question the epistemic resources and practices in place. To borrow from Longino's epistemology, scientific practices should favor novelty, as in favoring the emergence of new explanatory models through a certain degree of agnosticism towards established models. Longino's feminist epistemology proposes this pragmatic value along with ontological heterogeneity, complexity of relationships, applicability to human needs and diffusion of power, to mark the importance of supporting a fertile context for model building (Longino, 1994). Another major step in this deconstruction process would be to ensure the active participation of those concerned by the research. For instance, activist groups for inclusivity towards neurodiversity are calling for better representation in research: notably the Autistic Self Advocacy Network (ASAN) and the Academic Autism Spectrum Partnership in

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[14] A prominent—but local—example is a recent documentary series on life on the autism spectrum beyond 18 years old (the legal age of adulthood in Canada) titled "Autiste, maintenant majeur", which translates to "Autistic, now major". The series highlights, among other things, the lack of resources offered to autistic adults and, when relevant, their caregivers.

Research and Education (AASPIRE), the latter advocates for community based participatory research (Nicolaidis & Raymaker, 2015; Raymaker, 2016).

In the specific case of autism, Jaswal and Akhtar (2018) recently made the case that first-hand testimonies from autistic individuals have been ignored for far too long and that research on autism can only benefit from the precious and privileged insight—akin to the epistemically privileged perspective of standpoint theory (Harawy, 1988)—from those concerned by said research. In a similar fashion, Hens et al. (2018) have also proposed the consolidation of an emerging field: autism ethics, which they argue need input from the autistic population. This fits neatly into Longino's applicability to current human needs and diffusion of power virtues (Longino, 1994). In our thought experiment, we could imagine the case where those with ten fingers are expressing suffering not because of their physical condition, but because of their lack of access to learning. An insistence on uncovering, say, the genetic cause of the ten finger phenotype rather than working towards long-term social and cultural changes seems to stem from an underlying essentialist (and internalist) conception of cognitive abilities—admittedly, our thought experiment assumes a somewhat embodied notion of cognition, which is sometimes not even the case in real world situations. A shift in practices (i.e., towards social and cultural changes) might thus require a shift in conception (i.e., towards an extended notion of cognition).

4.2 Differential access to epistemic and cognitive resources

Just as the full recognition of neurodiversity as a fact of human cognition is lagging behind its counterpart in the realm of biology, the question of differential access to epistemic and cognitive resources for neurodivergent individuals needs deeper exploration. So are the specific epistemic power and cognitive privileges of neurotypicals (i.e., privileges in cognitive development and performance). Consider as a parallel the notion of white privilege. Although much work remains to be done on that front, there is widespread agreement that a wide variety of (social, economic, epistemic, etc.) privileges are maintained in contemporary societies through various structural socio-political mechanisms like systemic discrimination (in this case, systemic racism). When it comes to neurodivergence, discourse surrounding neurodivergent individuals tends to steer into discussions of their ability (or lack thereof) to access epistemic resources. Although far from being an illegitimate question, it seems to outweigh the question of resource accessibility and systemic discrimination. The question is often "are they capable of accessing resources?" rather than "are the resources accessible?".

In a way, the first question focuses on individuals' ability to access a universal resource whereas the second question focuses on the inclusivity of the resources themselves. In other words, the first question might find an answer along the lines of "people with ADHD are unable to focus during class" and the second question would give something like "classes are structured only for those with long attention spans". The former case places the cause of a reduced access to epistemic resources on an individual shortcoming while the second case points to an unfair pattern of

accessibility to the same epistemic resources. Consider the question of socio-economic differences between racialized and non-racialized groups. Although some still view the situation this way, most find it utterly absurd and outrageous to hold some sort of essentialist discourse on the source of this disparity. Instead the focus has rightfully shifted to the structural mechanisms that maintain prejudices and disparities. In fact, the internalist and essentialist tendencies of the discourse on neurodivergence are well exemplified in the prevalent emphasis on the medicalization of so-called psychiatric conditions. Note that we do not hold an anti-medicalization position, we only wish to point out the close link between cognitive and epistemic issues and the causal burden attributed to individuals rather than the structural and systematic context. That is why we stress the need for collaboration between the fields of epistemic injustices and neurodiversity. To achieve such a collaboration however, we believe a cultural shift might be necessary, at least in our conception of cognition. We will need to move away from the classical, essentialist and internalist approaches and towards frameworks like 4E cognition—or alternative frameworks that give greater explanatory weight to extra cranial factors—, which will allow us to consider the full richness of brain-body-world interactions and the inextricability of neuroscientific and socio-political considerations.

4.3 Epistemic injustices: testimonial and hermeneutical

We briefly drew a parallel between economic and epistemic resources in order to highlight the socio-political issues regarding their accessibility. However, this parallel might bring us too close to material and natural resources and the comparison shouldn't be pushed too far. In fact, we should emphasize some major differences between these two types of resources. Epistemic resources are not simply *out there* as physical objects waiting to be gathered or extracted and transformed by humans. Cognitive and epistemic resources have to be crafted, built from the ground up. They are not built *out of thin air*, but from the previous resources and experiences of those who participated in their elaboration and perhaps even in their dissemination through culture. But once they are built, they are not finite in the same way most natural resources are. They are not discrete objects, like apples, meaning that their *use* or *consumption* by one person does not imply their inaccessibility to another. To determine if the distribution of some natural resource, say apples, is equal, one would simply have to verify that each member of the group gets the same number of apples as the others—or, if one aims for equity instead, that each member's needs are met.

When it comes to epistemic resources however, the notion of an equitable distribution of access is far more complex and much less intuitive. Let us take the case of hermeneutic resources: concepts shared and understood within certain socio-cultural niches which make it possible for their members to communicate with one another, to express oneself, be understood by others, and interpret one's own experiences. If a concept for some type of experience shared by a sub-group within that socio-cultural niche is not incorporated in the common hermeneutic resources of the larger community, then the members of that sub-group will not be able—at least, not

fully—to communicate the experience in question or even to make sense of it them-selves. Fricker (2007) gives the classic example of the concept of sexual harassment. Of course, sexual harassment did not start when the term was coined. There were, in fact, specific experiences that were shared by many, but there were no resources on which to draw to raise the issue—that is, to name it, to recognize it and discuss it—before the concept was introduced by Catharine MacKinnon in a legislative context (MacKinnon, 2005). There was thus a clear case of hermeneutic injustice insofar as a group of people did not have the necessary resources to express their experience and have it recognized by others. Fricker notes that, not only were they not able to express it, but even understanding their own experience might have been compro-mised by the absence of the concept, leaving them feeling like something was wrong without being able to identify it.

It is interesting to note here that while classic examples of epistemic injustices focus on issues such as sexism (the example of sexual harassment cited above) and racism (again, Fricker's example of a racialized man whose testimony was not con-sidered during a trial), they have yet to incorporate neurodiversity. Notably, Kidd et al.'s recent handbook on epistemic injustices (2017) does not dwell on the subject. In the same book, Tremain deplores the absence of the issue of disabilities—dis-ability studies are often adjacent if not overlapping with the question of neurodiver-sity—in the epistemic injustice literature and, more generally, in feminist epistemolo-gies. Emphasizing "the critical importance of robustly intersectional approaches to epistemic injustice" (Kidd et al., 2017, p. 5) is something we can only agree with. Perhaps this omission is only a coincidence, but it might be a symptom of some deeper conceptual gap that should be explored and analyzed. Like other minority groups that fall victim to epistemic injustices, neuroatypical people diverge from a socially and culturally established (and maintained) norm, in this case a cognitive norm. They undergo hermeneutic marginalization because of their neurodivergent social position, thus they are deprived—to a certain extent—of hermeneutical power (i.e., of influence in the shaping of hermeneutical resources). As is to be expected, there is a dominant group in this situation: neurotypicals who, as we previously stated, possess the epistemic power to set the cognitive norm. The collective herme-neutic resources are therefore modeled on the neurotypical experiences.

Here lies the next step in our story: those who diverge from the established cogni-tive norm are not only epistemically marginalized, their cognitive profiles and con-ditions are considered pathological. A prominent example of this phenomenon is the assumption that autistic individuals have a deficient theory of mind or otherwise deficient social understanding (Baron-Cohen, 1997; Baron-Cohen et al., 2000). Not only does this lead to various prejudices in daily life, but it leads to flagrant testi-monial injustices in research. As Hens et al. (2018) point out, theories that assume a deficit in attributing mental states to others sometimes also assume a deficit in self-attribution of mental states. To those who subscribe to such theories, this makes any testimony from autistic individuals concerning their own experience unreliable. In an even more pernicious manner, any testimony from an autistic individual refut-ing the theoretical assumption can simply be rejected, thus shielding the assump-tion from further scrutiny. The obvious solution to this particular problem is to favor practices that not only incorporate human neurocognitive variety in their model of

human cognition, but that give greater empirical weight to testimonies than what is often the case.

Accepting testimony as potential evidence to be tested instead of rejecting it at the outset allows for a better integration of neuroatypical people in the research concerning their very own cognitive profiles. This might, in turn, provide them with greater epistemic and hermeneutical power and tip the scale ever so slightly towards equity, creating a more complete set of collective hermeneutical resources. With more hermeneutical resources, neuroatypical people might be able to better understand and express their experiences because they could rely on theories that take their reality into account, thereby increasing the credibility of their testimony and suffer from less and less epistemic injustices. This starting point is not perfect; for example, we must integrate testimonies left incomplete because of hermeneutic injustices, but we must also rethink the kinds of testimony that are deemed acceptable as data for scientific (and ethical, political, etc.). For example, although non-verbal individuals are unable to participate in current practices based on propositional knowledge and testimony, they can share knowledge by other means which are important for research on epistemic injustices (Catala, 2020).

5 A new type of epistemic injustice: cognitive injustices

In this section, we address an issue that has been lurking for a while, that is, the suspicion that the concept of epistemic injustice cannot fully account for the type of injustices exposed by the adoption of a 4E perspective on human cognition. With the assumption that this framework allows us to have (1) a richer view of the impacts of environmental resources on cognitive performance and (2) a potentially new outlook on the issue of epistemic injustices, we began to outline some of the consequences in our twelve versus ten fingers thought experiment. In that toy example, we highlighted an embodied aspect of cognition via the potential cognitive differences of bodily variations. We also hinted at a broader aspect of extended cognition: the impact of the availability (or unavailability) of cognitive and epistemic resources regarding certain cognitive tasks and cognitive development in general. We imagined a disparity in access to the learning of counting that followed from historical and socio-political mechanisms which impaired cognitive performances for a particular group of people and could lead to outright cognitive deficits (understood in an externalist manner, see Legault et al., 2019 for more on extended cognitive deficits).

This brings us to what we suspect is a fuzzy area—perhaps even a gap—in the notion of epistemic injustice. Although the phenomenon explained above is of a broadly epistemic nature, having to do with knowledge, it does not fit well into the current conceptual types of epistemic injustices. It is not a type of testimonial injustices, that is, of undue deficit of credibility, though it might lead to them. It could fall under hermeneutic injustices, but not without a little conceptual bending. Although it shares with hermeneutic injustice the idea that it is a lack in collective resources, it does not seem to be the absence of a concept. This categorization seems somewhat questionable: Should the lack of an appropriate learning method for counting

fall under the same category as the absence of a concept like the concept of sexual harassment? Is there not something deeper that distinguishes the two phenomena? A glance at the origin of the term "hermeneutic" itself begins to shed light on why it might not be appropriate to force the lack of a learning method into the category of hermeneutic injustice. "Hermeneutic" ultimately comes from "Hermes", the name of the messenger of the Greek gods. The term has a clear link to the idea of transmitting a message, of expressing oneself. Does a lack of learning methods (or other types of cognitive resources and tools) fit in the same category as a gap in collective interpretative resources (like the lack of a term for sexual harassment)?

In the former case, some shared experience is not represented in the cultural resources. The absence of such a term to identify and make sense of the experience of sexual harassment can obviously have a strong negative impact on one's life and lead to psychological distress and undoubtedly even affect cognitive performance in various contexts. However, while hermeneutic injustice may indeed have serious impacts on cognitive performance, they are not at its core. In the second case, the undue absence of a proper learning method, cognitive performance is what is directly affected by the injustice. The differential access to full cognitive development due to a lack in such a resource can have long-lasting and important consequences on an individual's life: we can think of something as simple as being rejected for a job, not on the basis of a lack of credibility or intelligibility during the interview as would be the case for an epistemic injustice, but—if we pursue our fingers example further—as the result of an unjust inaccessibility to adequate learning methods resulting in lower mathematical performance for some individuals.

We thus have a case of injustice in the epistemic realm that seems to fit into neither side of the testimonial/hermeneutical division. We believe that this points to a possible lack of epistemic resources within the epistemic injustice literature itself. We thus propose to introduce another type of epistemic injustice: cognitive injustice (note that the term "cognitive" should be understood within a 4E framework or at least one that incorporates bodily and external contributions to cognition). When the collective cognitive resources (i.e., the concepts, methods, tools, etc., that contribute to cognitive performance and development) of a society do not provide resources to a given cognitive profile, it can be considered as a case of *cognitive injustice*. We suspect this concept might be useful in the future when discussing invisible disabilities.

All is not lost, of course, as we can take inspiration from Fricker and seek to build a better future. To counter epistemic injustices, Fricker proposes epistemic virtues, that is to say, strategies that should be applied to bring forth epistemic justice. On the hermeneutical side, these virtues include suspending our judgment and questioning our own understanding when faced with something that seems unintelligible. On the testimonial side, we find measures that aim to reduce biases (Fricker, 2007). The introduction of such strategies reinforces the need to include cognitive injustices as a distinct type of epistemic injustices in order to offer more specific and hopefully better suited solutions for the type of injustices they cause. We can once again return to our thought experiment and think up potential solutions to the problem. Suspension of judgement and the questioning of biases could certainly help in that case: perhaps some of the structural issues might surface when testimonies from the concerned

groups are considered. However, we doubt that such proposals would be enough to address the core problem as it does not stem from a lack of intelligibility of credibility. It might be too early to offer concrete solutions as the concept of cognitive injustices will have to be unpacked and analyzed in more detail, but we believe that a conceptual shift towards the integration of human neurocognitive diversity as a natural phenomenon should do more good than harm.

6 Epistemic injustices and neurodiversity

An interesting aspect in the analysis of epistemic injustices in neurodiversity is the interaction between testimonial and hermeneutic injustices. Undue deficits of credibility (testimonial injustice) are intrinsically linked to the question of the hermeneutic gap (hermeneutic injustice) in collective epistemic resources to account for neuroatypical experiences. Indeed, how can one attest to one's experience when the concepts to do it do not exist? Similarly, we might wonder how can neuroatypicals bring about hermeneutic resources representing them when they are not heard or their testimony is not given credit? This also brings out the question of inclusion of neurodivergent people in research: who should be included? What should (and can) we expect from them? What are the discrepancies between a first-person experience, a first-person testimony (i.e., what can one share given the limitations in hermeneutic resources) and a third party's interpretation? These questions are equally applicable to the neurodiversity movement itself: who can (and cannot) testify for whom? Are some forms of testimony excluded from the movement? How can one share their experience when no (or little) adequate concepts are available? Let us note, however, that some conceptual progress has been made. For instance, certain terms are emerging from the movement like "stimming", "shutdown" and "masking," the latter of which being particularly important for neurodivergent women who often go undiagnosed because of it—likely because of a form of testimonial injustice.

In this paper, we approached the question of epistemic injustices and neurodivergence on the backdrop of 4E cognition, which we believe offers an interesting point of view on the link between epistemic (and cognitive) resources and cognition. Just as testimonial and hermeneutic injustices are intrinsically linked, we hypothesize that cognitive injustices are equally intrinsically linked to hermeneutic and testimonial injustices. Neurotypical cognition is considered to be the normative standard to understand human cognition in general. Deviations from this norm are mostly understood as such (i.e., deviations) and considered mental disabilities, troubles, illnesses, etc. This creates a prejudice that makes neuroatypical individuals seem like unreliable contributors to knowledge about cognition (including their own variety of cognition). The apparent lack of credibility is assumed to be based on intrinsic shortcomings and neuroatypical people are excluded from the construction of the collective epistemic resources (i.e., parts of the cultural niche). If a group comes to hold a dominant position in the construction of the cultural niche (or niches), it will likely shape the epistemic resources which are part of the affordances that constitute the cultural niche. Note that several nested cultural niches may exist, meaning that within a larger dominant cultural niche, there might be subcultures that exist with

their own particularities and resources. By "dominant cultural niche" we mean the cultural niche that influences structures and institutions, that is, the niche that was formed by those with epistemic power. We make this clarification to emphasize the fact that the formation of subcultures (or cultural niches within cultural niches) built by and for neurodivergent people is not enough to address larger structural injustices. We believe that, although the creation of subcultural niches might be beneficial for many reasons, it is merely a first step towards a larger inclusive cultural niche. In other words, the neurotypical population will also have to put in some work.

7 Conclusion

Our aim in this paper was to emphasize and clarify the distinction between neurodiversity and neurodivergence and in doing so, we were led to recognize a third type of epistemic injustice, namely cognitive injustice. As we hope to have shown, neurotypical and neuroatypical cognitive profiles are only variants in a space of natural cognitive profiles. The distinction between neurodiversity and neurodivergence is socio-culturally determined. Nature favors diversity in many forms including neurocognitive diversity (i.e., neurodiversity). Neurodivergence can be the result of differential access to epistemic power that generates epistemic injustices: neurocognitive diversity is divided according to cognitive norms that are set by those with epistemic power. One aspect of the disparities in epistemic power and resources that we believe should be explored further is that of cognitive resources. With the power to set a cognitive norm comes the power to shape cognitive tools and resources, and when these resources are tailored only to the cognitive profiles that correspond to said norm, neurodivergent individuals are bound to face cognitive injustices and, down the line, even suffer cognitive deficits. This is how we go from neurodiversity to neurodivergence by way of epistemic injustices.

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