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Learning Disability and the Extended Mind

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Abstract

In his critique of the extended mind hypothesis, Robert Rupert suggests that we have no reason to move from the claim that cognition is deeply embedded in the environment to the more radical claim that, in some cases, cognition itself extends into the environment. In this paper, I argue that we have strong normative reasons to prefer the more radical extended mind hypothesis to Rupert's modest embedded mind hypothesis. I take an agnostic position on the metaphysical debate about the ultimate nature and location of the mind, and instead argue in favor of the extended mind framework on the basis of its ability to better capture normative concerns about the way we evaluate the cognitive capacities of learning disabled individuals. In light of the commitments of the embedded and extended mind frameworks, defenders of the embedded mind framework are committed to conclusions about learning-disabled individuals that we have good normative reason to reject, whereas the extended mind framework avoids such problematic conclusions. Thus, if we find these normative concerns persuasive, we have good reason to prefer the extended mind position.

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1. CLARK AND CHALMERS' EXTENDED MIND

The extended mind hypothesis, first defended by Andy Clark and David Chalmers, suggests that the mind is not contained exclusively within the brain, but rather extends into the external world. Proponents of extended cognition (also known as transcranial cognition) suggest that cognitive processes rely so heavily on the recruitment of resources in the body and the external environment that those resources ought to be considered part of cognition¹. Furthermore, they argue, the traditional “intracranial” conception of the mind, according to which cognition takes place wholly within the brain, rests on unfounded assumptions about what constitutes cognition, and we ought to reject such assumptions in favor of a framework that does not discriminate among neural, bodily, and environmental resources. Rather, we should think of the mind as being distributed over all of these resources. Crucially, defenders of extended cognition do not claim that *everything* has cognitive status, but when environmental and bodily resources are paired with with neural resources in the right sort of way, cognition extends into those resources.

In their seminal paper “The Extended Mind” (1998), Clark and Chalmers suggest that there is no principled reason to draw the boundaries of cognition at the brain. Their argument in favor of extended cognition relies heavily on an idea that has come to be known as the parity principle, which they state as follows:

If, as we confront some task, a part of the world functions as a process which, were it done in the head, we would have no hesitation in recognizing as part of the cognitive process, then that part of the world

is ... part of the cognitive process. (Clark and Chalmers 1998, p. 29)

They defend this claim in the context of a thought experiment in which an Alzheimer's patient named Otto carries around a notebook everywhere he goes, jotting down notes and recruiting information about names, dates, locations, etc. as needed. Clark and Chalmers argue that the information in Otto's notebook functions in the same way that neural memory functions in most people, and so there is no principled reason to differentiate between the cognitive status of neural memory and that of the information in Otto's notebook. Their parity principle is meant to point to a kind of cognitive chauvinism in the way that we think about where the mind exists and what it's made of, suggesting that our practice of limiting attributions of cognitive status to just those processes that take place exclusively in the brain ought to be abandoned.

2. EXTENDED OR EMBEDDED?

This thesis that the mind at least sometimes extends beyond the boundaries of skin and skull has had many outspoken critics. The most salient challenge for my project comes from Robert Rupert, who argues that there is no clear reason why we should make the move from what he calls the Hypothesis of Embedded Cognition (HEMC) to the Hypothesis of Extended Cognition (HEC) (Rupert 2004). HEMC holds that

...cognitive processes depend very heavily, in hitherto unexpected ways, on organismically external props and devices and on the structure of the external environment in which cognition takes place. (Rupert 2004, 393)

HEC, on the other hand, maintains that these environmental features are so integral to cognitive processes that they should be considered part of these cognitive processes. Rupert explains:

HEMC is significantly less radical than HEC. According to HEMC, we can properly understand the traditional subject's cognitive processes only by taking into account how the agent exploits the surrounding environment to carry out her cognitive work. In contrast, HEC implies that, for many purposes, we should set aside our focus on the traditional subject: the unit of analysis should be the organism and certain aspects of its environment treated together, as a single, unified system. (Rupert 2004, p. 8)

Rupert resists the move from HEC to HEMC, arguing that while the environment plays an important explanatory role in cognition, it does not, itself, instantiate cognition. Though HEMC is sympathetic to the claim that the environment plays a crucial role in cognitive processes, and thus the organism cannot simply be studied in a vacuum if we hope to gain a true understanding of the mind, it is ultimately an intracranial position. That is, Rupert's claim that one could recognize the indispensability of studying an agent's environment for understanding her cognition without conceding that the environment is actually a part of her cognition reveals deep intracranial commitments about what really constitutes the mind, despite the similarities between the two frameworks. Rupert argues that we can explain all of the relevant phenomena that cognitive scientists are interested in by using HEMC alone, and thus the move to HEC is both unwarranted and unnecessary. He argues that "If HEC does not [offer superior explanations for these

phenomena], then all other things being equal, we should endorse HEMC over HEC, by dint of the methodological principle of conservatism.” (p. 9)

Clark and others who defend the extended mind thesis have responded to such challenges by pointing out that this begs the question against HEC by using intracranial processes as the standard against which other processes' cognitive status is measured, committing the fallacy of privileging intracranial processes that their parity principle was originally created to combat. Clark may be correct that this challenge begs the question against extended cognition, and thus cannot serve as the basis of an outright rejection of the extended thesis. However, we are left with something of an open choice between embedded and extended cognition, and it is difficult to determine how we ought to adjudicate between the two. Rupert's challenge is a strong one, and the task of showing why one ought to prefer the extended thesis to the embedded thesis proves quite difficult. At its heart is a deep metaphysical debate about what ought to count as part of the mind. Though the hypothesis of embedded cognition is sympathetic to the spirit of extended cognition, which emphasizes the importance of the body and environment in understanding mental processes, its underlying commitments are still in line with intracranialist conceptions of the mind, as the embedded hypothesis still maintains that the mind itself is only realized by neural underpinnings.

The central question that Rupert's challenge addresses, and one that is most often debated in this field is this: what kind of stuff is the mind made of, and where does that stuff reside? However, in contrast to many who are engaged in the dialogue surrounding extended cognition, I do not wish to take up a metaphysical debate about where, precisely, the mind resides or what it is made of. Since the sciences of the mind are still largely in their infancies, and the field of

cognitive science is especially new and immature, it is unlikely that we currently have the resources to arrive at a definitive ontology of mind and cognition. Furthermore, since cognitive science does not have a clearly defined procedure for determining the boundaries of its own domain of inquiry, I have no commitments about what counts as a cognitive process and where such a process must occur. Rather, I shall take my cue from Ross and Ladyman (2010), who argue that minds are not, as a matter of fact, located anywhere at all. They suggest that our commonsense intuition that minds are located “in the head” results from faulty folk metaphysical notions of containment, according to which the matter that makes up the universe is organized into entities that “contain” smaller and more fundamental entities, which themselves contain smaller and more fundamental bits of matter, etc. Ross and Ladyman argue that the physical sciences give us good reason to reject this metaphysical picture as a description of the ultimate nature of the universe, and, since the metaphysics of mind is in the business of describing the ultimate nature of the world of mentation and cognition, we ought not import this faulty metaphysical machinery into our philosophy of mind. Rather, they argue, the idea of the mind being located here or there should be thought of as a useful metaphor, but one that will ultimately be replaced by a more precise and mature cognitive science. Thus, they suggest, the rigorous metaphysical debate about where the mind is located that has occupied this field for so long is misguided. As they explain, “To talk about the location of the mind is simply to resort to metaphor. We don’t object to using metaphors, but we do object to arguing over whose metaphors are literally true.” (Ross and Ladyman 2010) I will follow suit, taking on board this assumption that characterizations of the location of the mind are, at best, metaphorical. Ross and Ladyman (and I) find it plausible that such a mature description of the processes that underpin cognition will recruit a variety of

resources that will span brain, body, and environment. However, at our current level of sophistication in this young science, we simply do not have the resources to offer such a description. Therefore, in adjudicating between the extended and embedded mind hypotheses, we ought to turn our attention to different kinds of questions.

In this project, I will take up a different sort of argument in favor of the extended mind hypothesis, situating my examination of the debate between embedded and extended cognition in the context of research in learning disability studies. I will explore some normative concerns in the disability literature about how we ought to conceptualize and respond to cognitive diversity and cognitive capability, arguing that the extended cognition framework better captures these normative commitments than the embedded framework. Because the academic and clinical study of the mind has historically marginalized individuals with atypical cognitive abilities, and this marginalization has had harmful effects on the experiences of LD individuals, the way that we conceptualize cognitive diversity has significant ethical consequences. It shapes our clinical research, our educational practices, our social attitudes, and the opportunities that are afforded to citizens based on our perceptions of their capabilities. If our theory of cognition naturally leads us to conclusions about LD individuals' cognitive capacities or functioning that we have reason to be skeptical of, then that gives us good reason to revise our theory of cognition. Therefore, if the extended cognition framework offers a way of conceptualizing cognitive diversity that is less marginalizing of LD individuals than an intracranial framework, we have serious ethical reasons to consider adopting it.

Furthermore, though I will discuss normative claims that are embraced by many in LD research, I will remain agnostic

about whether or not these claims should, in fact, be embraced. I suspect that they do have merit, but my project is not to defend the truth or desirability of these normative claims; I will simply explore whether the extended or embedded cognition framework best captures them. Then, I will argue that *if* they are claims that we find persuasive, and *if* the extended mind best captures them, *then* we have good normative reason to adopt the extended mind framework. Finally, though it is possible that the phenomena I describe could also be accommodated by a purely intracranial framework, this should not lead us to reject the extended mind framework. A common argument by skeptics of the extended cognition paradigm is that if both an intracranial and transcranial framework can capture a given set of data, we ought to opt for the more intuitively metaphysically conservative intracranial picture. However, since, following Ross and Ladyman, I submit that we have reason to be skeptical of the accuracy of our metaphysical intuitions and of their bearing on this discussion, this particular argument is not relevant here. Thus, in this exploration of the normative merits of intracranial vs. transcranial cognitive frameworks, these metaphysical intuitions ought not play a role in determining whether the extended cognition picture should be adopted.

3. PROTECTING THE MIND

My project of giving normative reasons to prefer the extended cognition framework is not the first of its kind. One way of attempting to advocate for the extended mind position through appeal to normative considerations is by arguing that it suggests better protection against harm to the mind than the embedded framework does. Some (Levy 2007; Clark and Drayson forthcoming) have argued in favor of the extended cognition thesis with respect to ethical questions that arise from the field of neuroethics about

protection of and alterations to the mind. It does seem that, in light of the fact that we do *not*, in fact, consider environmental scaffolding to be part of the mind, we are less likely to protect the environmental tools from harm in the same way that we protect the biological agent from harm. Indeed, it has been argued that insufficient attention has been paid to the importance of environmental scaffolding for the cognitive functioning of Alzheimer's patients, and this neglect can lead to traumatic consequences when they are carelessly removed from their environments and placed in new ones (such as assisted living centers) (Drayson and Clark forthcoming). Thus, under the extended mind thesis, the minds of disabled people who rely heavily on environmental tools are more vulnerable to harm than those who do not rely as heavily on them precisely because we have failed to recognize those tools as part of the mind. Therefore, our resistance to considering and thus protecting environmental tools as part of the agent's mind leads us to neglect what *ought* to be protected as part of the mind of a disabled individual, thus placing them in greater danger of cognitive harm.

If the mind is simply embedded, and the bio-external scaffolding does *not* constitute part of the mind, then the sorts of protections that we afford brains vs. those we afford environmental tools might differ significantly. On the other hand, if both are seen as part of the mind, then external scaffolding ought to be protected from harm or damage in the same way that we protect brains from harm and damage. Neil Levy (2007) captures this idea by offering a complementary principle to Clark and Chalmers' parity principle, which he dubs the Ethical Parity Principle (EPP). According to the strongest version of the EPP, alterations to the bio-external parts of a cognitive system are ethically equivalent to alterations to the brain. A weaker version of the EPP claims that alterations to the bio-external environment

are ethically on a par with alterations to the brain insofar as the reasons we have for objecting to the latter are transferrable to cases of the former.

Zoe Drayson and Andy Clark (forthcoming), echoing Levy, note that one could accept the weak version of the EPP while still maintaining that the mind is merely embedded and not extended. That is, the weak EPP only maintains that the *reasons* for which we object to alterations of internal resources must be transferrable to external resources, not the way we actually conceptualize the cognitive status of those resources. Thus, with respect to the protections we afford external scaffolding, we need not accept that such scaffolding is part of the mind in order to recognize the need to protect such external tools when protecting an individual from mental harm. Therefore, arguments from the protection of bio-external scaffolding do not offer sufficient reason to prefer the extended mind framework over the embedded mind framework. The proponent of the embedded framework may be able to maintain, based on the weaker version of the EPP, the claim that we ought to afford special protection to the bio-external tools that cognitively vulnerable individuals utilize. Thus, Levy suggests that there is no practical difference between the embedded and extended mind frameworks with respect to the employment of the EPP, since all that matters is that we recognize the importance of the role of the external environment in thought.

Levy's account of the EPP focuses on alterations to and protection of the mind, suggesting that internal and external resources are ethically on a par with one another with respect to these alterations and protections. However, as Levy explains, it seems that the embedded mind defender can still account for this kind of parity without conceding that external resources partly constitute the mind. Therefore, this

sort of appeal to the protection of the mind from alterations does not, itself, establish sufficient normative reasons for preferring the extended mind framework.

Though the EPP might not give us reason to prefer the extended mind framework with respect to the protections we afford to external resources, there are other sorts of normative reasons for preferring the extended over the embedded hypothesis. In what follows, I will offer a different normative argument in favor of the extended mind framework by illustrating problematic commitments about the cognitive capabilities of LD individuals, arguing that the extended mind position avoids these conclusions. The extended mind framework holds that both bio-internal and bio-external resources can instantiate cognition. If this is true, then we ought not attribute normative priority to either internal or external resources when evaluating the cognitive capabilities of an extended cognitive system. This normative neutrality is more difficult for the embedded mind defender to maintain; according to the embedded framework, bio-external resources are not eligible to count as capable of performing cognitive activity, so evaluations of the cognitive capabilities of an individual must attribute special status to neural resources that cannot be attributed to non-neural resources. The extended mind framework, on the other hand, is committed to no such position. If both bio-internal and bio-external resources can instantiate cognition, then no normative priority need be assigned to either one in evaluations of cognitive capability. As I will argue, we have good reason to evaluate the capabilities of LD individuals paired with the assistive technologies they use with the sort of neutrality that only the extended mind position can maintain, and thus my account offers strong normative reasons to prefer the extended mind framework.

4. THE CASE OF DANA

Since I am situating this project in the context of LD individuals and the assistive technologies they use to facilitate cognitive processes, let us consider a paradigm case of the use of such environmental tools for LD individuals: graphic organizers. Graphic organizers are visuospatial representations of ideas or information designed to make the relationships among the concepts more salient (a facet of learning that is often difficult for people with LD). There are many different kinds of graphic organizers (cognitive maps, venn diagrams, flowcharts, etc.), and different types are helpful for different LD individuals. For many LD individuals, graphic organizers aid in understanding and evaluating the relationships among concepts that might otherwise be puzzling to them, and these sorts of visuospatial representations of information have been shown to be helpful cognitive tools for learning, problem solving, and planning (Sturm and Rankin-Erickson, 2002; Dexter et al., 2011).

Consider someone with a learning disability, Dana, who requires a graphic organizer of potential decisions in order to evaluate which decision is best. In this example, let us imagine that Dana has a very difficult time comparing the relevant factors when she must evaluate them solely “in her head,” but when allowed to create and utilize a visual diagram of the various possibilities, her decision making skills are just as good as anyone’s. In this case, she needs a particular physical configuration of information in order to be able to perform a cognitive process like comparing and choosing among potential courses of action, and without the aid of these external resources, it would appear that she is incapable of performing this cognitive action. But we certainly would not want to conclude that she cannot make complex decisions; she is quite capable of doing so, but she

requires a different sort of environmental scaffolding than others do. She is only unable to complete the task when she is denied the ability to use particular tools (in other words, when her learning environment makes particular demands that are incompatible with her biology). According to certain conceptions of disability, most notably the social model of disability (Barnes 2009), Dana's learning disability is a function of a mismatch between her biological makeup and the setup of her learning environment. That disability is contingent on the particular environment, since in a different environmental context (namely, one in which she has access to graphic organization tools), she no longer faces the same difficulties or limitations. Thus, properly understanding Dana's cognitive capacities, and therefore her learning disability, depends on properly understanding her environmentally situated cognitive processes.

Furthermore, the kinds of cognitive capabilities that I am discussing in this project are mental states, skills, and processes that we would intuitively attribute to the person herself (i.e. language production, decision making, beliefs and memories, mathematical computation, critical thinking, etc.). Thus, insofar as our evaluation of what Dana's mind is capable of depends on understanding her environment, our understanding of her capabilities as a person likewise depend on this. It is possible that the distinction between Dana's capabilities and her mind's capabilities would become more important when considering cases of environmental scaffolding and its relationship to unconscious processes, or processes that we do not clearly identify with higher-order thought. In such cases, we may not as readily attribute such processes to the person herself. However, since the cognitive processes I discuss are features of higher-order cognition that operate at the level of personhood, in the context of this project, Dana's mind's capabilities are also Dana's capabilities.

5. REPAIRING THE MIND

Though an understanding of Dana's cognitive capacities depends on an understanding of her environmental surroundings, this does not yet provide reason to prefer the extended mind over the embedded mind; both positions maintain the importance of understanding the environment. Levy suggests that, at least with respect to our attitudes toward alterations to the mind, it doesn't ultimately matter whether we adopt the embedded or extended frameworks, as long as we recognize the importance of external scaffolding in thought. Drayson and Clark, however, argue that the embedded and extended mind frameworks have importantly different ethical implications. These ethical implications become clearer upon a closer analysis of what the embedded mind framework is committed to saying about the cognitive capabilities of neuroatypical individuals. In order to make this case, Drayson and Clark consider two different approaches to cognitive rehabilitation, the process of improving an individual's impaired ability to process information and thereby improve everyday functioning. There are two main strategies of cognitive rehabilitation, restorative and compensatory, where the former focuses on restoring damaged neural systems and the latter focuses on adaptive strategies that recruit both internal and external resources to improve cognitive functioning. Some view compensatory rehabilitation as a kind of second-best option, a strategy that we must resort to in light of our limited understanding of neuroscience, but one that will ultimately be discarded in favor of neural restoration once our technology and understanding is sufficiently advanced. Until then, many suggest, compensatory strategies are an effective way of enhancing functional capacities, but are simply a "useful substitute" for neural repair, which is seen as the only *true* way to restore the mind. Drayson and Clark argue that the extended mind thesis allows us to view

compensatory strategies as an equally legitimate way of restoring or improving the mental capacities of neurally damaged individuals, offering more than a simple second-best option to neural regeneration. They suggest, in fact, that the extended mind thesis offers a different way of conceptualizing the distinction between rehabilitation and compensation. Rather than limiting cases of true rehabilitation only to those in which neural circuits are restored, we ought to evaluate rehabilitation based on the functional capacities of extended cognitive systems.

The embedded mind thesis, on the other hand, must maintain the traditional distinction between restorative and compensatory rehabilitation. If cognition is located exclusively in neurons, then the only way in which a damaged mind could truly be rehabilitated is if the neural circuits are restored. But it seems particularly odd to remain committed to the identity between neural and mental activity with respect to these rehabilitative approaches when one considers technologies that are likely to be used in the future of cognitive rehabilitation. Andy Clark, in response to Jerry Fodor's critique of the extended mind thesis, examines a case of the restoration of a damaged neural circuit with silicon "neurons" in order to illustrate the problem with this commitment:

Let's start small. There is a documented case (from the University of California's Institute for Nonlinear Science) of a California spiny lobster, one of whose neurons was deliberately damaged and replaced by a silicon circuit that restored the original functionality: in this case, the control of rhythmic chewing...But now imagine a case in which a person (call her Diva) suffers minor brain damage and loses the ability to

perform a simple task of arithmetic division using only her neural resources. An external silicon circuit is added that restores the previous functionality. Diva can now divide just as before, only some small part of the work is distributed across the brain and the silicon circuit: a genuinely mental process (division) is supported by a hybrid bio-technological system...If you imagine a case, identical to Diva's, but in which the restored (or even some novel) functionality is provided – as it easily could be – by a portable device communicating with the brain by wireless, it becomes apparent that actual wiring is not important. If you next gently alter the details so that the device communicates with Diva's brain through Diva's sense organs (piggybacking on existing sensory mechanisms as cheap way stations to the brain) you end up with what David Chalmers and I dubbed 'extended minds'. (Clark, 2009)

If cognition can truly only occur in neurons, then even rehabilitative approaches that directly address the structural integrity of neural circuits, but rely on silicon structures rather than biological ones, could not count as true restoration. Thus, the kind of "hybrid bio-technological system" that Clark describes could not truly be a case of cognitive restoration, even though it is precisely the neural circuits that are being reconstructed.

The extended mind framework, however, can much better accommodate this kind of rehabilitative strategy, and it would have no problem considering such a strategy to be a restoration of the mind. Furthermore, since the extended

thesis allows for a heterogeneous array of possible physical underpinnings of cognitive processes, the strategies for rehabilitating cognitive capabilities need not directly address neural circuits at all. Thus, the extended thesis allows for much broader possibilities regarding what counts as the restoration of cognitive abilities than does the embedded hypothesis. This becomes particularly important with respect to the use of assistive technologies in LD individuals. There is a similar distinction in LD research between “remedial” strategies and compensatory strategies to addressing learning difficulties (Garner and Campbell, 1987), the former of which attempt to directly address the individual’s impairment and improve their ability to perform a particular task in the same way a non-disabled individual would, whereas the latter attempts to “circumvent” the impairment and help the individual perform a task using assistive technology. If we are to understand remedial strategies for LD as being analogous to restorative strategies in cognitive rehabilitation, the embedded mind thesis suggests that remedial strategies are the only way to truly enhance an LD individual’s cognitive capabilities. The compensatory approach, on the other hand, is simply a way of helping the individual get around her impairment and complete the task. However, the extended mind thesis allows us to say that even compensatory strategies for addressing learning disabilities are genuine ways of improving or increasing an LD individual’s cognitive capabilities, not simply circumventing an impairment. If the bio-external scaffolding that LD individuals who use compensatory assistive technologies use can, in some cases, be considered to be part of their cognitive systems, then an individual using such technologies has, in a robust sense, improved cognitive capabilities.

One might object that this is an unfair characterization of the commitments of the embedded mind thesis, and that,

contrary to what I have suggested, it can actually allow that compensatory strategies are genuine strategies for repairing or improving the mind. The defender of the embedded mind thesis could argue that an agent's environment plays an indispensable role in that evaluation of his cognitive abilities, in the same way that a mechanic's tools play an indispensable role in our evaluation of her ability to fix a car. Therefore, insofar as those environmental tools play such a significant role in our cognitive capabilities, rehabilitative or compensatory strategies that target those environmental tools likewise ought to play a significant role in rehabilitating cognitive damage or addressing learning difficulties. The fact that the embedded mind thesis resists the conclusion that bio-external tools are part of cognition does not entail a resistance to rehabilitative strategies that target those tools.

But if we maintain the embedded mind thesis, what *are* we to make of the neural differences between a disabled vs. non-disabled person? If we maintain that only neurons really constitute the mind, there must be something like an inverse relationship between the extent to which an individual relies on external scaffolding and the extent to which we ought to say that her mind is really doing x , where x is some cognitive process. That is, something like the following principle is implied by intracranialism: neural activity thoroughly determines mental activity. Therefore, diminished neural activity means diminished mental activity. If that's correct, then it's difficult to see how one could resist the conclusion that neural impairment necessarily entails cognitive incapacity. It's not clear how one could deny that diminished neural capacity amounts to diminished mental capacity, and thus neural impairment entails a *cognitive* deficit, regardless of what sort of external scaffolding is available. In the case of Dana, it seems that the intracranialist has to say something like the following: because Dana's cognitive makeup relies

more heavily on external scaffolding (and thus less heavily on her neurons), there is an important sense in which Dana's mind is capable of *less* than someone who could perform the same task relying exclusively on neural machinery. If all that really counts as the mind is the neural underpinnings, someone with non-diminished neural systems is more cognitively capable than someone with diminished neural systems. On the other hand, if there is *not* the same equivalence between neural activity and mental activity, and mental activity is determined by heterogenous physical underpinnings, then diminished neural activity does not entail diminished mental activity. The conclusion that less neural activity equals less cognition is no longer necessary, and thus compensatory strategies of cognitive rehabilitation are perfectly legitimate ways of restoring a damaged mind.

6. IMPROVING THE MIND

I have argued that the embedded mind thesis is committed to an identity between mental activity and neural activity. If that's the case, then an LD individual who relies on assistive technology to complete cognitive tasks is only "doing" as much as her neurons are doing. That is, if her cognition is exclusively located in his neurons, then within a given task, whatever work is being done by the bio-external tools is *not* done by her. The more heavily integrated the assistive technology into a cognitive process, the less cognition the person is performing. Thus, if the embedded thesis is right, it commits us to saying that LD individuals who rely heavily on assistive technologies are cognitively capable of less than non-LD individuals.

But this seems wrong. Assistive technologies are tools that help LD individuals do *more*, not less. When Dana uses her graphic organizer to aid in strategic planning or decision making, it seems that the tools make her capable of *more*

than she was able to do without them. Indeed, this is precisely how many LD individuals understand their relationship to assistive technologies. LD individuals who have consistent access to assistive technologies in the classroom report feeling less anxious, more independent, and more confident in their own abilities (Day and Edwards 1996). Rather than making them feel as if the more they use technologies, the less they can do “themselves” (the picture of cognitive capability that the embedded thesis predicts), well-assisted LD individuals report feeling as if they are capable of doing more, and with an increased sense of independence and self-reliance. Testimonial reports of the impact of access to assistive technology on LD individuals’ self-concept further supports the suggestion that LD individuals see themselves in this way. In one study, students reported that the ability to learn using these technologies increased their confidence in their own intelligence, their ability to do as much as their non-LD classmates are able to do, and their motivation (Young and Specht 2011). In fact, some students describe the impact of these technologies in a way that even more explicitly indicates that they see their relationship to them in the way I have suggested. One student explained, “I have a better view of myself. My self-confidence goes up, my self esteem goes up, and I’m not always like ‘Man, I failed this. I’m such an idiot.’” (Young and Specht 2011) Another student asserted, “I have more confidence in my schoolwork. I feel that I am capable of completing it.” (Young and Specht 2010, 2011). The language that many students use to describe the impact of assistive technologies directly indicates that it is *their* capabilities that have been improved through use of the technology. Still other testimonies indicate that students view themselves as increasingly self-reliant, and the technologies allow them to “help themselves”; as one student explained, “I have less need to rely on others to complete the task, so I don’t ask for them to help me as

much.” Another said, “I feel more independent. I can do things by myself, whereas before I couldn’t.” (Young and Specht 2010, 2011). These testimonies all indicate that many LD individuals who have access to assistive technologies view themselves as being more cognitively capable with the technologiesⁱⁱ.

Day and Edwards (1996) discuss this kind of improved capability in the context of LD individuals who use word processing or spell-check technology in writing, tools that enable them to write unencumbered by difficulties with the “mechanics” of writing:

When not preoccupied with the mechanical aspects of writing, persons with LD have a greater opportunity to focus on making meaning. This is of particular importance for those individuals who have developed a fear of translating their thoughts into written language as the result of a history of writing problems and the criticism that often follows. Knowing that they can simply generate language and correct errors later may reduce their anxiety, liberate their writing abilities, and ultimately facilitate written expression at a level commensurate with their intelligence.
(30)

In this case, the assistive technology does not simply do extra work for the individual that can be neatly separated from her own capabilities. On the contrary, the technology simply provides support for the individual so that she, properly coupled with this support, can develop her *own* capacities. In fact, the technological support seems to *liberate* the individual’s capacities by removing an impediment to their development and expression. This belief

that assistive technologies help LD individuals do more rather than less is one that the extended mind position can better account for than the embedded mind framework. If the cognitive capabilities of the LD individual are limited only to what her neurons can do, then any increased capabilities that result from the use of assistive technologies must be attributed to the technology itself rather than the individual. On the other hand, if the extended mind hypothesis is correct, and therefore cognitive capabilities are attributed to extended organism-plus-environment systems, then it is true that the assistive technologies help the individual do more rather than less.

At this point, the defender of the embedded mind framework might object that I have mischaracterized the inability of the embedded position to accommodate this belief. It is perfectly consistent with their position, one might argue, that assistive technologies do, in some sense, help LD individuals do more rather than less. That is, even the embedded mind defender would likely maintain that Dana's graphic organizer helps her arrive at more carefully and clearly considered decisions (rather than detracting from her ability to do so). However, the crucial difference between the embedded and extended frameworks is in what, precisely, it means under each framework to "do more". It can't simply mean "achieve better outcomes", since the embedded mind framework is consistent with the claim that improving the environmental tools available to a cognizing individual helps her achieve better outcomes. The relevant difference between the two positions is this: the embedded framework must assert that assistive technologies enable Dana to achieve more *qua competent tool user*, where the individual and the tool she is using are neatly separable. The extended mind framework, on the other hand, can assert that the assistive technology allows Dana herself, *qua cognizer*, to do more. In the latter case, there is no such clear distinction between the individual

and the tool she is using to complete the task, and thus the increase in ability cannot solely be attributed to the tool itself.

An analogy will help clarify this distinction. Consider a professional baker, Frank, whose job it is to make large quantities of bread. He must knead each batch of dough by hand, which takes a great deal of time and energy. Frank is then given a handheld dough scraper, a tool that makes it easier to pick up, turn, and portion the dough when kneading it. This tool allows Frank to knead greater quantities of dough in a given amount of time, and so in some sense, enables Frank to do more than he could do by hand. But the tool hasn't enhanced Frank's abilities in any deep sense that we could attribute to Frank himself; Frank isn't a better baker *himself*, given his access to the tool. With the tool, Frank can do precisely the same things that he could do without the tool, only much more efficiently. His skills and capabilities *qua* baker are the same as they were before, but he is able to achieve better outcomes than he was without the tool.

Now consider a runner, Frances, who usually runs barefoot. Because she runs without shoes, her feet and legs tend to get fatigued after a few miles. She is then given a pair of high-quality running shoes with padded arch support and grip soles. Because of the design of these shoes, Frances can run more efficiently and with less fatigue than before, allowing her to run longer and faster. With these shoes, Frances is able to run on new and different sorts of terrain, spend more time training, increase her endurance, and run more frequently. It seems in this case that, although the shoes are in some sense a "tool" for running, they enable Frances to improve her capabilities *as a runner*. She isn't using the shoes as a tool to run in the same way that Frank uses the dough scraper as a tool for kneading dough; she, in her shoes, is simply

running, and running better than she could without them. The shoes allow her to enhance *her* capabilities qua runner.

It seems that the proponent of the embedded mind view can accommodate the belief that assistive technologies help LD individuals do more rather than less, but only in the sense that someone like Frank can, using a tool, achieve better outcomes than he could without the tool. If cognition is located exclusively in neurons, then a bio-external tool does, in some sense, help an LD individual produce a particular *result* better than she could without it. But we want to say more than that about how assistive technologies help LD individuals; we want to account for their belief that assistive technologies help LD individuals *think better*. The extended mind framework, which conceptualizes the coupled system of an LD individual and her assistive technology as a single and unified cognitive system (in the same way that Frances and her running shoes are a single and unified running system), better captures this belief that *her* cognitive capacities are improved than does the embedded mind framework, which maintains a clearer separation between the capabilities of the individual and the work being done by the tool.

The embedded mind framework can account for the fact that assistive technologies do, in some sense, help LD individuals “do more” than they could without them by characterizing them as cases of tool use. But as long as the defender of the embedded mind position is committed to the intracranialist definition of cognition that underlies it, according to which cognition can only be realized by neurons, there must remain a clear delineation between the mental activity of the individual and the non-mental contributions of the technology. It cannot account for the fact that, for instance, LD individuals’ belief that word processors and spell checkers help them think and communicate better. On the

embedded view, the more that the underlying computation of generating language is distributed across neural and non-neural mechanisms in LD individuals, the less capable the LD individual is *qua cognizer* of generating language. The extended mind framework, on the other hand, has no trouble accounting for LD individuals' belief that word processors help them *think better* rather than simply *produce better results*. Cognition itself is distributed across the extended system of the brain, body, and technology, and so the mental capabilities of the individual are improved through the coupling of the neural resources with non-neural resources.

One way the embedded mind defender might respond is by conceding that it is correct to say that an LD individual using an assistive technology is doing less than a non-LD individual, but only in a restricted sense. That is, it might be right to say that an LD individual using a spell checker or word processor is thinking less, but she is only thinking less *about spelling*. However, that doesn't mean she is thinking less *overall*. In fact, the way I have characterized this case seems to suggest just that; by reducing the amount of mental energy the individual needs to use on thinking about spelling, the assistive technology frees up that mental energy for simply "making meaning". Thus, the embedded mind defender might simply deny that the reduction in cognitive activity with respect to one narrow feature of a task (like spelling in the task of writing) entails an overall reduction in cognitive processing or capability with respect to that task.

This objection might be apt in the case of a spell checker, where the feature of the task that the assistive technology is meant to address (spelling) is relatively neatly separable from the central task (communicating ideas). Furthermore, spelling is a rather minor mechanical feature of writing, and so it's easy to argue that alleviating the work required for this minor mechanical feature does not really detract from

the overall cognitive activity involved in the task of writing. However, this distinction becomes less clear in the original case I presented of Dana and the graphic organizer. Recall that the purpose of graphic organizers is to make salient the relationships among concepts and aid LD individuals in understanding and evaluating those relationships. These assistive technologies help LD individuals in problem solving, critical analysis, and decision making. In this case, it is much more difficult to separate the “work” done by the assistive technology from the central cognitive task. The relationships among concepts are central to tasks like problem solving and decision making, and helping LD individuals understand those relationships amounts to more than simply alleviating a minor mechanical burden. In this case, the function of the assistive technology is integral to the overall cognitive task. Therefore, one cannot point to the work being done by the assistive technology and say that the LD individual is doing less thinking about *that* but not thinking less about the overall task, as one can in the spell checker case.

One cannot argue that, with a graphic organizer, Dana is doing less cognitive work but *only* with respect to understanding the relationships among ideas and *not* with respect to the task of problem solving or decision making; the two are inextricably tied up. Because this distinction cannot be easily made in the case of Dana and the graphic organizer, I maintain that the embedded mind defender must be committed to saying that Dana’s reliance on such technology entails diminished cognitive capabilities with respect to tasks like decision making and problem solving.

The difference between the graphic organizer case and the spell check case does, however, illuminate a challenge for the future of this debate. Since there are a wide variety of kinds of learning disabilities and therefore of kinds of

assistive technologies, what the embedded and extended mind positions are committed to saying in each case might also vary. Because of this, the relative compatibility of each position with how LD individuals conceptualize their relationship to the assistive technology might be different, and thus the embedded mind framework might be able to capture some cases better than others. However, I argue that in many cases it fails to do so, and thus the extended mind framework merits serious attention in its ability to capture such cases.

7. CONCLUSION

I have argued that the embedded mind thesis is committed to an identity between neural activity and mental activity, and thus entails that LD individuals who rely heavily on external scaffolding to complete cognitive tasks must have diminished cognitive capabilities compared to non-LD individuals. Furthermore, I have argued that, according to the embedded mind thesis, assistive technologies that encourage the integration of bio-external tools into cognitive processes function to detract from an LD individual's cognitive capabilities rather than enhance them. I then suggested that we have strong reason to reject such conclusions based on the limitations those conclusions place on the possibility of cognitive rehabilitation and improvement, the incompatibility of those conclusions with our intuitive understanding of the purpose and function of assistive technologies, and the testimonial data we have about how LD individuals who use assistive technologies understand their own capabilities. The extended mind position, however, avoids these conclusions and better captures the way we ought to understand LD individuals' cognitive capabilities. Thus, I concluded, we have good reason to prefer the extended mind framework to the embedded mind one.

One might object that our framework for understanding cognition need not capture all of our intuitions about how our minds work. Indeed, much research in cognitive science has illustrated the ways that folk intuitions about the mind turn out to be quite false. Thus, one might argue that the incompatibility of a theory of the mind with our intuitions about our minds is not strong evidence that the theory is wrong. However, since I am evaluating the compatibility of these two frameworks with what LD individuals believe about their own capabilities, and I argue that those beliefs ought to have normative weight in our theorizing about the mind, this discussion is precisely where such considerations ought to have weight. My claim is that if the embedded mind thesis lead us to conclusions about the capabilities of LD individuals that we have good normative reason to reject, then we have reason to discard the embedded thesis in favor of the extended thesis. LD individuals' concept of their own capabilities ought to play a significant role in our general understanding of their capabilities, and thus a theory of cognition that conflicts with that testimony ought to be reconsidered.

Learning-disabled individuals and the assistive technologies they use bring to light new normative questions regarding how we ought to conceptualize the mind. Since the scientific study of the mind is still relatively immature, and the domain of cognitive science lacks clear boundaries, those who engage with traditional metaphysical questions in the debate about the extended mind hypothesis can easily find themselves in a stalemate of competing intuitions about what ought to count as cognition. The examination of the normative implications of the embedded and extended mind frameworks, particularly for people with atypical cognitive makeups, can provide a new way of gaining traction on the debate.

NOTES

ⁱ In this discussion, I will use “mind” and “cognition” interchangeably. This may not be appropriate in all contexts, but since the features of the mind and the types of mental states that I will be considering in my discussion are higher-level cognitive states and processes (language production, decision making, mathematical computation, etc.), I will not differentiate between the two.

ⁱⁱ Though there is evidence that points to the fact that LD individuals conceptualize their relationship to assistive technologies in this way, it is indirect evidence. The claim has not, to my knowledge, been tested directly, and thus more research needs to be done to determine the extent to which LD individuals conceive of themselves and their assistive technologies this way. However, since there is some indirect evidence that this is true, for now, I will conditionalize on this claim. My argument can be understood to suggest that *if* it is true that LD individuals view their capabilities and relationship to assistive technologies in this way, which there is evidence that they do, then the extended mind framework better captures this belief.

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