Sci Eng Ethics (2019) 25:1125–1145
https://doi.org/10.1007/s11948-018-0058-9

ORIGINAL PAPER

The Distinction Between Curative and Assistive Technology

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Received: 23 October 2017 / Accepted: 6 April 2018 / Published online: 1 May 2018

Abstract Disability activists have sometimes claimed their disability has actually increased their well-being. Some even say they would reject a cure to keep these gains. Yet, these same activists often simultaneously propose improvements to the quality and accessibility of assistive technology. However, for any argument favoring assistive over curative technology (or vice versa) to work, there must be a coherent distinction between the two. This line is already vague and will become even less clear with the emergence of novel technologies. This paper asks and tries to answer the question: what is it about the paradigmatic examples of curative and assistive technologies that make them paradigmatic and how can these defining features help us clarify the hard cases? This analysis will begin with an argument that, while the common views of this distinction adequately explain the paradigmatic cases, they fail to accurately pick out the relevant features of those technologies that make them paradigmatic and to provide adequate guidance for parsing the hard cases. Instead, it will be claimed that these categories of curative or assistive technologies are defined by the role the technologies play in establishing a person's relational narrative identity as a member of one of two social groups: disabled people or non-disabled people.

Keywords Assistive technology · Bioethics · Neuroethics · Philosophy of medicine · Brain–computer interface · Relational narrative identity · Disability

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Introduction

In *The Minority Body*, Elizabeth Barnes supports her Value Neutral Model of Disability with an arsenal of testimony from disabled people claiming, perhaps surprisingly to many outside observers, their disability has increased their well-being rather than made them worse off (Barnes 2016). Some go even further and say they would reject a cure that would remove their disability.[1] Yet, at the same time, many of these same individuals recognize the benefits assistive technology can offer them. Indeed, they often advocate for a social policy of shifting the social, economic, and political resources currently devoted to the development of curative technology toward improving the quality and accessibility of assistive technology to increase human flourishing. For example, a well-known essay by Laura Hershey laments that the Muscular Dystrophy Association, which she once served as a poster child for, funnels the lion's share of funds raised by their telethon into scientific research aimed at finding a cure for Muscular Disability. In opposition to this approach, she argues that she "would expect MDA to provide a motorized wheelchair for anyone who wants one. Such a chair can boost a disabled person's quality of life enormously. Instead, MDA has very restrictive criteria for determining who receives a motorized wheelchair" (Hershey 1993).

This paper is not focused on whether there is a valid argument for favoring assistive technology over curative, or vice versa, either as personal preference or as social policy. Instead, it examines a major assumption that such an argument would need to first establish: that there even is a coherent and defensible distinction between curative and assistive technology in the first place. Without such a distinction, it would be unintelligible to hold any view that favors either assistive technology or curative technology because it would be impossible to identify which is which. Further, any specific reasons for favoring one sort of technology over the other would need to, at least in part, rest on such a distinction because these reasons could not be equally applicable to each kind of technology.

To be sure, there are some paradigmatic examples of both curative and assistive technology. An antibiotic that dispels a case of bacterial pneumonia is paradigmatically curative. A wheelchair that a paraplegic person uses to get around her community or screen reading software a blind man uses to check his email are paradigmatically assistive. However, there are other sorts of technology that are much more difficult to classify as either curative or assistive.

The cochlear implant (CI) comes quickly to mind as one such hard case. CIs are electronic devices consisting of an external microphone and internal electrodes that are surgically implanted beneath a person's skin and skull. Together, they bypass the organic process of hearing by receiving sound waves with the microphone and transmitting them to the electrodes as digital signals that stimulate the cochlear nerve to produce a sound-like sensation in the brain. When this technology first came on the

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[1] Specifically, see pages 75–76, 115–116, 119, and 143 of *The Minority Body* for references to the testimony of disabled people who would explicitly reject a cure for themselves and sometimes argue against a social policy of seeking cures for most disabilities generally.

scene, it was widely lauded in the popular media as a cure for deafness. At the same time, CIs were regarded with deep suspicion by members of Deaf culture who also saw them as curative and, thus, a threat to their way of life.[2] More recently, there is an emerging group of people who identify as culturally Deaf and use American Sign Language (ASL) as their primary language, but who also have a cochlear implant to augment their ability to communicate in social spaces where ASL is not the norm.[3] To these individuals, their CI seems much more analogous to a wheelchair or a screen reader than an antibiotic.

One might think that the CI is an anomalous case and that this general issue of designating a technology as curative or assistive is almost never that ambiguous. However, as technology advances, it seems likely that more hard cases will present themselves. Consider a genetic technology being developed by the pharmaceutical company Biomarin. They are currently conducting clinical trials on a drug that is meant to treat the most common form of dwarfism, achondroplasia, by suppressing the expression of the gene in children and adolescents, so that the growth plates in their long bones do not fuse as quickly and their limbs grow closer to average proportions.[4] As with the initial reactions of the Deaf community to the CI, members of the support and advocacy group Little People of America have regarded Biomarin's project with deep skepticism, as it is being presented as a "treatment" for achondroplasia and, thus, regarded as a curative technology.[5] Yet, even if this drug is successful at chemically lengthening the limbs of children with achondroplasia, those children will continue to have the achondroplastic genotype and it's reasonable to expect that they will retain many of the other phenotypic traits associated with

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[2] See the National Association of the Deaf's original position statement on CIs released in 1991 that argued: "There is now abundant scientific evidence that, as the deaf community has long contended, it comprises a linguistic and cultural minority. Many Americans, perhaps most, would agree that as a society we should not seek the scientific tools nor use them, if available, to change a child biologically so he or she will belong to the majority rather than the minority—even if we believe that this biological engineering might reduce the burdens the child will bear as a member of a minority." http://audismfreeamerica.blogspot.com/2009/06/nads-1991-position-statement-on.html (Accessed August 17, 2017).

[3] In response to this shift, see the National Association for the Deaf's updated position statement on CI from 2000 that states: "Cochlear implants are not appropriate for all deaf and hard of hearing children and adults. Cochlear implantation is a technology that represents a tool to be used in some forms of communication, and not a cure for deafness…. The NAD recognizes the rights of parents to make informed choices for their deaf and hard of hearing children, respects their choice to use cochlear implants and all other assistive devices, and strongly supports the development of the whole child and of language and literacy." https://www.nad.org/about-us/position-statements/position-statement-on-cochlear-implants/ (Accessed August 17, 2017).

[4] Albarazi, Hannah. 2016. "Can Dwarfism Be Treated? BioMarin Pharmaceuicals Thinks So." *CBS SFBayArea*. April 20, 2016 5:24 p.m. http://sanfrancisco.cbslocal.com/2016/04/20/can-dwarfism-be-treated-biomarin-pharmaceuticals-thinks-so/ (Accessed August 17, 2017).

[5] See Little People of America's "Genetic Biotechnology Research Position Statement" that warns: "LPA has never actively promoted medical research aimed at treating or curing dwarfism. While individual members have participated in research studies over the years, LPA has maintained that its organizational role is best understood as one of social support and advocacy…. As medical science moves forward, we hope researchers will be mindful of our above mentioned commitment to the value of dwarfism as it contributes to human biological, social, and cultural diversity." http://www.lpaonline.org/genetic-biotechnology-research-position-statement (Accessed August 17, 2017).

achondroplasia, like the facial features. So, it's hard to conceive of such an intervention as clearly and firmly fitting into the category of being a cure for dwarfism in the same way that a paradigmatic example like penicillin might be a cure for a bacterial infection.[6] But, it surely is not an assistive technology either.

The point is, any distinction between curative and assistive technology is already vague and will become even less clear as technology advances. One such technological advancement that will challenge the dominant characterizations of this distinction will be the emergence of more sophisticated and reliable Brain–Computer Interfaces (BCI). Building on the technologies of the cochlear implant, a BCI is a device that communicates information directly with a portion of a user's brain via the exchange of digital signals and brain waves. BCIs can receive information from some source and "transmit" it to the brain; receive information from the brain and transmit it elsewhere; or, a Bi-directional Brain–Computer Interface (BBCI), can both send and receive information. While this technology has not yet been adopted by the mainstream to a significant degree, its potential uses are profound and broad in scope. Some of these uses have already been demonstrated in the lived experience of disabled people and in the laboratory setting, including: people with Parkinson's disease can sometimes use a BCI that produces deep brain stimulation to reduce or even eliminate the tremors associated with the condition and spinal cord injured people have been able to use a BCI to control a cursor on a computer monitor or a mechanical arm. Future goals for BCI usage include using BBCIs to restore a spinal cord injured person's bladder and/or bowel control; control prosthetic limbs that proffer the sensations of touch; "bypass" spinal cord injuries entirely to reanimate limbs or entire regions of the body, with full sensation; or restore communication between different parts of the brain that have been separated by stroke or some other brain injury.

Most fundamentally, this paper asks and tries to answer the question: what is it about the paradigmatic examples of curative and assistive technologies that make them paradigmatic and how can these defining features help us clarify the hard cases like cochlear implants, Biomarin's "treatment" for achondroplasia, or the myriad of possible and actual uses of BCI technology? The analysis will commence with an argument that, while the most common views of the distinction between curative and assistive technology adequately explain the paradigmatic cases, they fail to accurately pick out the relevant features of those technologies that make them paradigmatic. Thus, none provide adequate conceptual guidance for parsing the hard cases. After clearing the way for the main claim of the paper in this fashion, the argument will be made that the distinction between curative and assistive technology has nothing to do with the form or function of the technology itself, but that these categories are defined by the role the technologies play in establishing a person's relational narrative identity as a member of one of two social groups: disabled people or non-disabled people. That is, assistive technology confers the narrative group

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[6] This drug may be a curative technology that is not effective at providing a complete cure. Another example of an incomplete cure might be maintenance chemotherapy that slows the growth and spread of a patient's incurable cancer. Below, cases of incomplete cure will be discussed in greater detail.

identity of disability in a way that curative does not. The distinction being defended will then be tested by applying it to the hard cases. Finally, the essay is concluded by arguing that this conception of assistive technology can also help clarify another, separate, but related distinction: the distinction between assistive technology and the features of universal design.

Curative Technology as Restoring Normal Functioning

In her chapter “A Fatal Attraction to Normalizing: Treating Disabilities as Deviations from ‘Species Typical Functioning,’” Anita Silvers highlights how Norman Daniels’s enormously influential theory of healthcare justice gives a special priority to curing disease and disability, categorically framing assistive technology as second best.

The reason is that, as Silvers argues, Daniels prioritizes restoring the mode in which one functions over the level. In her view, when Daniels famously argues that justice requires the provision of a basic level of health care because health—defined as species typical or normal function—is necessary, but not sufficient, for equality of opportunity in the Rawlsian framework of Justice, “we should notice that at least two aspects of functioning, the mode and the level, affect whether the performance of a function is normal” (Silvers 1998a, 101). She defines the mode of function as “the way it is accomplished” and offers the example of reading with sight as normal in mode and with braille or a screen reader as not normal in mode. Level of function, on the other hand, seems to have something to do with efficacy and efficiency for Silvers, who, still discussing reading with braille or a screen reader, maintains, “These alternative or adaptive modes may support a normal level of functioning. If an individual is adept, she may still read at normal speed and comprehension. Or she may function in the alternative mode above or below the normal level” (101). She goes on to argue that Daniels wrongly prioritizes restoring a person’s mode of function to normal levels because other alternative modes of function that maximize a person’s level of function are to be provided, if and only if, restoring the mode is impossible. She quotes him as arguing “The medical goal is to cure the diseased organ or limb when possible. When a cure is impossible, we try to make function as normal as possible, through corrective lenses or prosthesis and rehabilitative therapy” (101).

Setting aside Silvers’s claim that Daniels’s theory treats disabled people unfairly by prioritizing the restoration of mode over level of function, she has clearly and forcefully articulated one common view of the distinction between curative and assistive technology. After all, Daniels can only prioritize the “medical goal” of cure over these other alternatives if a coherent distinction exists between them. For Daniels, this distinction is drawn along the lines of Silvers’s concepts of normal mode and level of function. According to this view, technology is curative if it restores, at least partially, both the mode and level of function to what is statistically normal for members of the human species. In contrast, technology is assistive if it improves one’s level of function, by way of a different mode.

This view has substantial explanatory power when evaluating the paradigmatic cases of curative and assistive technology. For example, by dispatching the bacterial infection in a person's lungs, an antibiotic cures bacterial pneumonia as it restores the normal mode and level of function to those lungs. After a successful course of antibiotic treatment, one breathes in the typical way, say, without the use of an oxygen tank or ventilator. Likewise, one breathes with the typical ease and efficiency of someone that does not have pneumonia. In contrast, this view explains that a wheelchair is an assistive device because, while it may allow a paraplegic person to function at the same level as those that ambulate on two feet, the chair user is clearly mobilizing via a different mode of function that is not normal for the human species. Thus, the person still clearly has a spinal cord injury and has not been cured, but has availed herself of an assistive device.

However, this view that curative technology restores both mode and level of function begins to have difficulty explaining things as it moves away from the paradigmatic cases. Imagine, a hypothetical case in which a quadriplegic, in the near future, is implanted with a Bi-Directional Brain–Computer Interface that "bypasses" their spinal cord injury and fully reanimates all of their limbs and other body parts below their point of injury, with full sensation. Further, all of the mechanical and electrical components of this idealized BBCI are embedded within the person's physical body such that it is entirely unapparent to the outside observer. Finally, imagine that the BBCI is completely reliable and functions without any maintenance and is equipped with batteries that have a lifespan greater than any human's who would be using the device.

In such a hypothetical case, after being implanted, a spinal cord injured person could move about the world for a lifetime without ever again experiencing any impaired mobility or sensation. Further, they would not be identifiable by any third party as having a spinal cord injury and thus, would never be discriminated against based on their disability. It is hard to swallow the notion that this person is *not* cured of their spinal cord injury. They don't experience this form of life either directly via impairment or indirectly via social discrimination. So, in what way have they not been cured?

Yet, Daniels' view of the assistive/curative distinction entails that a person equipped with this idealized BBCI would not at all be cured of their spinal cord injury because, according to this view, the BBCI is an assistive technology. The hypothetical BBCI may restore the person's level of function to a normal level, but it is surely via an alternative mode. It is not any more biomedically normal for a member of the human species to feel and control the vast majority of their body with brain signals that are being relayed by a computer chip than it is for them to mobilize via a wheelchair.

One might object that the hypothetical BBCI described above does actually restore a person's mode as well as their level of function. After all, phenomenologically, the user of this device would *move* and *feel*. However, this would be a misreading of what Daniels means by normal function. For Daniels, normal function is not about one's experience, but, rather, their anatomy. Normal function is another way of talking about health and health is "the absence of disease, and diseases (I include deformities and disabilities that result from trauma) are *deviations from the* *natural functional organization of a typical member of the species*" (Daniels 1985, 28). Such deviations in "natural functional organization" clearly include deviations in anatomy for Daniels: "dysfunctional noses count as diseases, since noses have normal species functions and normal functional organization (or, simply, normal anatomy)" (30–31). The idealized BBCI described above would surely *not* restore normal anatomy or, in Silvers's language, a normal mode of function.

Even still, someone with Daniels's view might object that the hypothetical BBCI does actually restore both mode and level of function and, thus, constitutes a cure, if function is conceptualized at the correct "level of analysis."[7] While the mode of the function of a BBCI equipped spinal cord may not be normal at the cellular level, it may qualify as normal if considered as an anatomical system. That is, the nerve fibers of the BBCI equipped person may still be damaged, but their nervous system as a whole is functioning at the normal level, in the normal mode.

However, this kind of defense would require some sort of justification for using any particular level of analysis to evaluate any given technology. Say, for example, that someone had to have the Anterior Cruciate Ligament (ACL) in their knee reconstructed after a sports related injury. Such a reconstruction would entail small anatomical changes like the replacement of the patient's original ACL with their hamstring ligament and the addition of some screws to keep everything in place in their knee. Surely, though, like the hypothetical BBCI described above, the function of the knee as a system would regain its normalcy of mode and level and the person's torn ACL might be considered cured. Let's say, in a number of years, the reconstructed knee deteriorates and the patient needs knee replacement surgery. The anatomical differences of a replaced knee would be much more drastic than those of a repaired knee. After all, the entire joint would be made of metal or plastic. Yet, as a system, the person's leg would function via the normal mode, at the normal level. Finally, imagine that, during the knee replacement surgery, this patient contracted a severe infection that required their leg be amputated and replaced by an advanced prosthetic that was equipped with a BBCI so that it mimicked normal leg function almost exactly. Indeed, if the human body is analyzed as the system in question, the prosthetic leg ensures the restoration of the normalcy of that body's mode and level of function.

A proponent of the "level of analysis" defense of Daniels's view, would be hard pressed to justify switching between levels of analysis as they consider whether the knee repair, knee replacement, and leg replacement ought to count as normal in their mode of function and, thus, curative rather than assistive. The question in need of an answer would be: why analyze the ACL surgery at the "knee system" level to consider it normal in mode of function and curative, but not analyze the BBCI prosthetic leg at the "body system" level to consider it normal in mode of function and curative? Without such a justification, the possibility that ACL surgery is an

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[7] For another discussion about assistive technology that deploys the similar notion of "level of description," please see: Wasserman, David and Stephen M. Campbell. "A More 'Inclusive' Approach to Enhancement and Disability." In *The Ethics of Ability and Enhancement*. London: Palgrave Macmillan. (forthcoming).

assistive technology and bionic legs are a curative technology would be left open, depending on which level of analysis the defender of Daniels's view happens to be deploying.

Curative Technology as Incorporated Into the Body

As an alternative to the view that can be excavated from Daniels's writing and Silvers's interpretation of it—that curative technology restores both the level and mode of normal function and assistive technology provides a different mode—one might argue that the distinction between curative technology and assistive technology is actually that a cure is fully incorporated as a part of a person's body, whereas an assistive device is an external instrument that the person uses.

At first blush, this view seems to explain the paradigm cases and do a better job at parsing the hard cases than the normal functioning distinction. One might argue that the antibiotic that eliminates a patients' bacterial pneumonia does its work by being incorporated into their body via ingestion or injection, as opposed to a wheelchair or screen reader that remains separate from the person using it. One is not an "end user" of an antibiotic any more than they are an "end user" of their own lungs because the antibiotic is *a part of* them in the same way that their lungs are a part of them. Further, one might explain that the reason the idealized BBCI should be considered curative for a spinal cord injury, rather than an assistive device, is that it is not a "device" at all, but a fully incorporated body part. This technology may not restore the normal mode of function in the technical sense, since it is not a part of a normal anatomy. However, it is, nevertheless, part of the person's body who has been implanted with it and not an external contrivance like a screen reader or wheelchair. Such interventions cure disabilities for the same reason that a donated liver cures liver disease: both have been incorporated and are not separate from the "end user." Thus, according to such a view, the distinction between curative and assistive technology may be drawn as such: assistive technology is never incorporated into the body, but curative technology always becomes an integrated body part of the one cured.[8]

However, a difficulty arises for this incorporation view because it seems to merely kick the conceptual can down the road by raising what might be an even trickier matter of distinguishing between technologies that should be considered incorporated into the body and those that should not. As Sean Aas and David Wasserman note when thinking about the moral implications for whether a BCI is considered part of the body, "It is an open question just what exactly it takes for something to be incorporated" (Aas and Wasserman 2016, 38).

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[8] According to this view, being incorporated (or not) seems like a necessary, but not sufficient condition for being considered curative or assistive. Of course, to be curative or assistive, a technology would also need to meet other criteria. Incorporation is merely being floated as the particular criterion that the curative/assistive distinction may rest upon.

There are, for example, the "body conservatives" who they say "argue that there is a large gulf between even transparently used tools and genuine body parts" (Aas and Wasserman 2016, 38). This means, in order to be considered a part of the body, it is not enough for something to be functionally integrated and transparent in use. As they explain, "My fork functions, like my fingers, to bring food to my mouth… My thought when eating is simply to spear the food, not to 'move the fork so the food is speared'. Thus, my control of the fork seems to be 'direct', in some important sense. My fork also gives me sensory feedback, in some of the same ways my fingers do—when fork touches food, I feel the touch at the tip of the fork; not (or not only) where my fingers hold the fork" (38). In contrast, there are "body radicals," who "take our sense of ownership to be much more flexible—to be determined, not solely by whether an object fits into a single privileged schema representing a bionormal body, but rather, for example, by the extent to which it is processed by many different cognitive systems that seem to involve some representation of the bodily self" (38).

Settling this complex, entrenched disagreement is well beyond the scope of this paper. However, it is enough to show that such a disagreement exists. If the curative/assistive distinction rests on the idea of "incorporation in one's body," then the use of a fork seems to constitute a hard case and that means there will be a proliferation of much harder cases. Amidst such disagreement, it seems unlikely that this criterion could serve as a way to determine whether any of the myriad of actual or possible uses of BCI technology are curative or assistive.

Assistive Technology as Disability Identity Conferring

Despite not actually focusing on the assistive and curative distinction, Richard Ladner gestures toward a crucial aspect of assistive technology that separates it from curative technology. He observes that "all technology is assistive, making tasks possible or easier to do … Nonetheless, the moniker 'assistive technology' has come to mean specialized technology for persons with disabilities" (Ladner 2010, 25).[9] Aas and Wasserman, specifically writing about Brain–Computer Interfaces, imply a similar view of what assistive technology is, juxtaposed to the more prevalent category they designate as *tools*, "This technology [BCI] may, therefore, eventually offer almost everyone a way to move objects at a distance, by exercising cognitive control of a mechanical device. At that point, BCIs may be seen less as an assistive technology for disabled people, and more as a tool, like the internet, which can benefit all users" (Aas and Wasserman 2016, 37).

Ladner, Aas, and Wasserman are all, rightly, defining assistive technology, at least in part, as technology that is *only* used by disabled people. However, it is unclear what kind of explanatory power this view would have. That is, *why* is assistive

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[9] It should be noted that, ultimately, Ladner is sharply critical of the *term* Assistive Technology as being both conceptually redundant and problematic in that it "has the ring of paternalism, a view that people with disabilities need lots of extra help, are dependent and are not capable human beings" (26).

technology only used by disabled people and how does this observation help us to parse the hard cases?

To be sure, assistive technology *can* be used by non-disabled people. Recall the 2013 advertisement for Guinness beer in which a group of six friends are shown playing a competitive game of wheelchair basketball; up until about the 40 s mark, when all but one of the athletes unstraps from their wheelchair and stands up as the group of friends go to the pub together to have a Guinness. So, it can't be literally meant that only disabled people use assistive technology.

Thus, it is not that one must be disabled in order to use assistive technology but, rather, it is the use of assistive technology that identifies a person as disabled. Indeed, the view being defended in this paper is that assistive technology can be distinguished from curative technology as any technology that confers the disability group identity on the user. The shock value of the Guinness ad was propelled by the revelation that only one of the athletes was actually disabled and this was conveyed by his continued use of the wheelchair off of the basketball court. It was the cultural meaning of the wheelchair as an assistive device that conferred the disability identity on all of the athletes at first. When five of those athletes stood up and walked, leaving the assistive devices behind, they were no longer identified by the viewer as disabled. In contrast, the sixth member of the group who used the chair at both the gym and the pub was identified as disabled by his use of the assistive technology.

In sum, this paper argues that the distinction between assistive and curative technology can be made in the following way: assistive technology confers disability group identity on the user, whereas curative technology does not.

To further explain and refine this claim, there is the concept of relational narrative identity, as it has been robustly articulated by Hilde Lindemann's book *Damaged Identities, Narrative Repair.* In it, she explains,

> Identities are constituted from the first-person perspective through the loosely connected stories we weave around the things about us that matter most to us: the acts, experiences, and characteristics we care most about, and the roles, relationships, and values to which we are most deeply committed. In the course of this narrative construction, we draw on stock plots and character types that we borrow from the familiar stories embodying our culture's socially shared understandings – the stories that I have been calling master narratives. Equally necessary to our identities is the narrative activity that takes place from the third person perspective: other people weave the things about us that matter most to *them* into stories that also constitute our identities. Important too is our membership in various social groups, whose identities are themselves narratively constructed. (Nelson 2001, 71)

Thus, Lindemann argues that who we are is a function of both who we understand our selves to be and who others take us to be, all within the context of shared cultural understandings. For the purposes of this analysis, it is notable that she specifically emphasizes how membership in social groups plays a key part in the narrative construction of a person's identity.

For Lindemann, *master narratives* do quite a bit of the heavy lifting when constructing our relational narrative identities, both in how we conceive of ourselves and how others understand who we are. These master narratives are "the stories found lying about in our culture that serve as summaries of socially shared understandings … consisting of stock plots and readily recognizable character types" (Nelson 2001, 6). To explain how master narratives contribute to the construction of personal identities by providing the raw materials for interpretation, Lindemann uses Nisbett and Ross's concept of a *schema*: "a category that forms an important basis for inference … once the interpreter has categorized an event or person as being of a certain type, she readily assigns to it or to him or her a number of characteristics in addition to those she perceives directly, inferring (usually correctly) that these characteristics are in fact present" (83). For example, upon first meeting an English literature professor, one might infer that they are well read in the classics because of the master narrative attached to English literature professors, even if the observer knows nothing of the scholar's actual reading habits.

Not only do master narratives help people understand who others are, they can also provide "the plots we employ to structure the elements of our own stories" (Nelson 2001, 84). After completing my undergraduate degree in philosophy, I worked full-time for a number of years in an office before returning to graduate school. As my identity shifted from "student" to "office worker" and back again, how I structured my eating habits, sleep patterns, and leisure time all shifted in ways that would have been predictable to anyone familiar with the master narratives of these identities. As summaries of socially shared understandings, master narratives are essential to relational narrative identity construction and "if a person were to dissociate herself from them completely, she would no longer be able to understand either herself and the people around her or the workings of her society" (85).

These master narratives seem to be of particular importance when a person tries to understand himself and is understood by others as a member of a social group. By moving in and out of the student's role, I was moving in and out of a social group and, as Lindemann tells us, "Master narratives … constitute the identities of social groups as well as individuals, and members of the group draw a part of their identity from how the group identity is narratively constructed (Nelson 2001, 85). So, who I understood myself to be and who others understood me to be as a student, as opposed to an office worker was, at least in part, shaped by these master narratives.

By arguing that assistive technology confers the identity of "disabled person" on its user, this paper is making a claim about the specific master narratives that constitute the identity of disabled people as a social group. Namely, it is being claimed that there is a kind of technology that is itself culturally significant in the stories about disabled people that are "found lying about in our culture that serve as summaries of socially shared understandings." That is, the shared cultural understanding of disability includes the usage of assistive technology. To be sure, it is not necessary for one to use assistive technology to be a member of the social group. That is, there are certainly disabled people who do not use assistive technology. However, while its use is not necessary for inclusion in this group, using assistive technology seems to be sufficient for conferring the disability identity,[10] given how embedded

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[10] This is true, of course, just so long as there are no counter indications also present. For example, Lady Gaga was not identified as disabled when she wheeled herself on stage in a wheelchair while wearing a mermaid tale costume during a 2011 performance in Australia. http://www.dailymail.co.uk/

it is in the master narrative of disability, from the walking stick of the crone to the peg leg of the pirate to the hand-cycle of the Paralympian.[11] To use the language of Nisbett and Ross in the way that Lindemann does, the use of this sort of technology categorizes a person into the schema of "disability" so that all manner of inferences about what they are like can then be made. Whether or not the inferences are accurate, it is the cultural significance of the technology that often does the work of categorizing the person into the schema.

Lindemann's relational narrative view of personal identity aims to strike a balance between the stories we tell about ourselves from the first-person point of view and those told by others about who we are. It turns out, assistive technology plays an important role in the construction of both self-narratives and how one is identified by others.

There is an empirical literature from the rehabilitative sciences exploring why some people are non-compliant with the use of assistive technology. Not surprisingly, much of this non-compliance is caused by a desire to distance oneself from the negative features of the master narratives of disability and all of the stigma they entail. Indeed, assistive technology is so tightly bound to the master narrative of disability that, by using it, a person is almost forced to identify themselves as a disabled person, and so a resistance to its use is often a resistance to this self-identification. Jan Miller Polgar raises this issue when reviewing some of this empirical literature on non-compliance, "Some people will avoid the use of [assistive] technology and either not go to certain community locations or, if they do so, will limit what they do because they do not want to be seen as someone with a disability. The following quote from a 25-year-old social worker illustrates this point: 'The other night … I chose to like suck it up and walk the best I could without my cane, because I would rather them not see me like that" (Polgar 2010, 21). For this social worker, by eschewing the use of this assistive technology, they were able to disassociate themselves from the master narrative of the disability social group and, thus, avoid being forced to include disability in their self-identifying narrative.

While it is clear that someone's first person narrative about their own disability identification is impacted by the usage of assistive technology, the role of the first-person perspective in constructing relational narrative identity should not be overstated when thinking about how the disability identity is conferred by assistive technology. For example, one might believe that the individual's self-identification has ultimate authority in deciding whether a technology is curative or assistive because they can decide for themselves whether the technology confers the disability identity upon them or not. Take the example of cochlear implants and how they can be

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Footnote 10 (continued)
tvshowbiz/article-2014423/Lady-Gaga-slammed-disability-groups-performing-stage-wheelchair.html (Accessed August 17, 2017).

[11] While the use of AT is probably sufficient for conferring the disability group identity, this paper deliberately leaves the matter of the ontology of disability as an open question. That is, it does not take a position about whether self-identifying as disabled and being identified by others as disabled is enough to actually *be* disabled. For a careful treatment of this question regarding the metaphysics of disability, see the first chapter of Barnes' *The Minority Body*.

understood in drastically different ways by their users. For a deaf or hard of hard-of-hearing child that has been raised by parents hoping for a cure to their deafness, a CI may be understood as a partial cure that gives them access to the hearing identity and distances them from the disability identity and the Deaf community. In contrast, Deaf individuals who use CIs as occasional aids to improve access to the hearing world may regard CIs as affirming and supporting their Deaf identities and, thus, an assistive technology. Finally, there may also be ambivalent users, uncertain if they want to embrace a Deaf identity or be cured. They may not be able to even say whether a given use of their CI serves to affirm or deny the Deaf identity.

However, it is wrong to think that whether or not a technology is understood as conferring the disability group identity on the user is determined solely by the user of that technology. In other words, it would be mistaken to believe that the individual user of something like a CI determines whether it confers the disability identity on them because of the meaning it holds for them alone. This is just not how identity works. Specifically, the meaning a particular technology holds for the user's identity is always *relational* because it is a *shared* meaning. As Lindemann explains:

> There is something in the very concept of identity that gives us a reason why our own self-constituting stories don't automatically trump the narratives other people use to recognize us…. it [a personal identity] cannot be intelligible only to me. To suppose that it could is to treat an identity as a kind of private language whose rules and syntax need not be accessible or meaningful to anyone else. That supposition misses the fundamentally social nature of systems of meaning. Since my identity arises from the interaction of narratives that constitute my self-conception with the narratives that constitute others' understanding of me, my view doesn't automatically prevail…. languages are social practices that can't just be changed on an individual whim. Because the narratives that construct a personal identity likewise have relatively fixed social meaning, I can't change these on a whim, either. (Nelson 2001, 103).

This view that personal identity is fundamentally relational because meaning is fundamentally relational gives a ready reason for thinking that it just isn't up to the user of assistive technology to decide for themselves whether using that technology means that they are disabled or if it is a cure that distances them from the disability group identity. Rather, it is the master narrative of disability that determines if a particular technology confers the disability group identity on the user.

Returning to our example of the cochlear implant, a CI user who wishes to understand their CI as curative may try to pass as non-disabled, perhaps by growing out their hair so that the external portions of the device are obscured from view. However, it remains the case that, should others catch a glimpse of the CI, because of how this technology has been absorbed into the master narrative of disability, the CI user is likely to be quickly identified as a disabled person using an assistive technology and not a "normal," hearing person. This is true regardless of how the CI user understands the role their CI plays in their own formation of self-identity.[12]

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[12] This is probably true of many kinds of assistive technology. For instance, an amputee may not want to think of themselves as being disabled and always wear long pants to hide their prosthetic leg from view because they don't self-identify in this way. Regardless, prosthetic legs remain assistive technol-

It must be further noted that not all technology that disabled people use to increase their ability to function is assistive technology, according to the view being advanced here. That is, technology does not become assistive merely by virtue of its use by a disabled person. After all, disabled people and non-disabled people both use some of the same tools for the same tasks. Recall how this argument began by citing Aas and Wasserman's distinction between mere tools and assistive technology: "This technology [BCI] may, therefore, eventually offer almost everyone a way to move objects at a distance, by exercising cognitive control of a mechanical device. At that point, BCIs may be seen less as an assistive technology for disabled people, and more as a tool, like the internet, which can benefit all users (Aas and Wasserman 2016, 37). A search engine doesn't become assistive technology when it is used to find funny dog videos just because the person doing the searching has a service dog.

This paper's articulation of what assistive technology is seems to be consistent with Aas and Wasserman's way of parsing between it and mere tools, but may offer more in the way of explanatory power. Namely, it isn't just that assistive technology is for disabled people, whereas tools are for everyone. Rather, assistive technology is understood to be for disabled people by both its users and those who observe its use because of the way in which it is imbued with cultural meaning by the master narrative of disability and, hence, confers a disability identity on its user.

An illustration of how this paper's conception of assistive technology helps explain Aas and Wasserman's distinction between it and mere tools would be useful. Many people with dwarfism have difficulty walking lengthy distances because of pain in their legs and spine. Thus, it is not uncommon for many of them to use motorized mobility scooters when they are in public spaces that would require then to traverse such distances. However, when the Razor scooter—a non-motorized, compact folding scooter that many non-disabled people use for both recreation and mobility over long distances—was released in 2000, many of these mobility impaired people with dwarfism adopted their use instead. While the motorized mobility scooters and the Razors served a similar functional use for this group, it's likely that most people who could use the Razors preferred to do so, at least in part, because they are not understood as assistive technologies that confer disability identity on their users. Indeed, with over 5 million units sold within the first 6 months of their production,[13] the Razor scooter was "seen less as an assistive technology for disabled people, and more as a tool, like the internet, which can benefit all users (Aas and Wasserman 2016, 37). Like a search engine, it would be a mistake to characterize a Razor scooter as assistive technology when used by a disabled person and a tool when used by a non-disabled person. This gets the relationship backwards. It is not the narrative group identity of the user that confers the status of assistive

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Footnote 12 (continued)

ogy because of how they are associated with the master narrative of disability and confer the disability identity. In fact, it is this disability identity conferring property of the technology that *motivates* this sort of behavior.

[13] https://www.razor.com/about-razor/corporate-history/ (Accessed August 17, 2017).

technology on a device, but the status of a device as an assistive technology that confers the narrative group identity of disability on the user.

Of course, this distinction that has been drawn between curative and assistive technology is something of a moving target. Whether a particular technology is assistive or curative is not a universal truth but a historically and culturally contingent social fact. That is, it can be determined whether a particular technology is assistive by determining whether it confers the disability group identity on the user, but this can only be done within a particular historical and cultural context. Different contexts would produce different results. This is because the master narrative of disability is itself historically and socially contingent,[14] so which particular technologies are embedded within it and the cultural meaning of those technologies will vary with time and place. However, there are many artifacts that can only be categorized in historically and culturally contingent ways.[15] Whether this is a problem for the distinction's ability to support arguments prioritizing assistive technology over curative (or vice versa) is beyond the scope of this paper.

Testing the Hard Cases

Fundamentally, it is being argued that the disability identity conferring feature of assistive technology is not merely an incidental social side-effect of its use, but actually its defining property. This distinction fits the paradigmatic cases in a clear way and can help sort through the murkier ones as well. In as far as a technology confers the disability identity onto its user because of how it is associated with the master narrative of the disability social group, it is assistive and not curative.

Recall how the Deaf community feared the CI when it was first unveiled because it was regarded as a cure, but later took a more nuanced and tolerant view of the technology that was sometimes used by folks in tandem with sign language. This shift can be explained by way of the master narrative of deafness. That is, while CIs may have improved some people's level of auditory function, it turns out that the master narrative of deafness absorbed CIs as a visible symbol of hearing loss that conferred the deaf identity on the user and did not at all preclude the culturally Deaf identity. That is, CIs identify the user as having hearing loss and this is why they have been regarded by both the Deaf community and hearing culture as, ultimately, an assistive and not a curative technology.

Next, consider the pharmaceutical technology being developed by Biomarin that may partially suppress the achondroplasia gene and chemically lengthen the limbs of the user. While, if it proves effective, those who have been given this drug may retain several of the features of achondroplasia other than the disproportionately

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[14] It's a good thing this is the case because many master narratives about oppressed groups, including disabled people, are deeply damaging to those groups. In fact, much of Lindemann's book is devoted to describing how these damaging master narratives can be reformed with what she calls *counterstories.*

[15] Whether or not a pleated, plaid skirt is masculine formal wear or a pudding made of a sheep's heart, liver, and lungs and encased in its stomach is a culinary delicacy depends on one's historical and cultural context, for instance.

short limbs, it would be odd to say that this intervention confers the dwarf identity on the user. If anything, it at least partially distances the user from the master narrative of dwarfism. So, while it may not be a *cure* for achondroplasia in the same way that an antibiotic is a cure for pneumonia, it is unambiguously not an assistive technology according to the criterion this paper has developed.[16]

Finally, BCIs are much less of a monolithic category than the previous two examples, but this conception of assistive technology can still be effective in these cases, as well. As already noted, the uses currently being developed for BCI technology are already quite diverse and the potential uses are myriad. Thus, whether any particular use of BCI technology ought to be regarded as curative or assistive will vary sharply on a case by case basis. In each case, to make the determination, the question should be asked: does this technology confer the disability identity onto its user because of how it is associated with the master narrative of the disability social group?

It seems like this answer can be answered in one of three ways. First, the answer may clearly be "yes," as when a person with a spinal cord injury uses a BCI to control a cursor on a computer monitor to send an email, a robotic arm to feed themselves soup, or a prosthetic hand that senses heat to test their infant's bath water. These three uses of BCI would identify someone as disabled, at least in reference to the current master narrative of disability. There are some other uses of BCI that wholly cure the person's disability because they remove the disability identity from the user by distancing them from that master narrative. Such examples would include a BCI that is completely internal and reanimates a person's paralyzed limbs or restores someone's cognitive function by bypassing a brain injury. Finally, there are uses of BCI that are clearly not assistive in that they do not confer the disability group identity on the user, but, like perhaps the Biomarin pharmaceutical, are only partially curative in that they distance the user from the disability social group's master narrative without disassociating the person from it completely. These might be thought of as cases of curing some of the "symptoms" of a person's disability. They would include a person with Parkinson's disease using a BCI that produces deep brain stimulation to reduce or even eliminate the tremors associated with the condition, but which, in turn, may produce slurred speech; or using a BCI to restore a spinal cord injured person's bladder and/or bowel control, without reanimating any of their limbs.

On the whole, this analysis of the hard cases shows how this criterion for distinguishing between curative and assistive technology yields results that have both coherence and explanatory power. It is a technology's capacity to confer the disability identity onto its user because of how it is embedded within the master narrative of the disability social group that makes it paradigmatic of assistive technology and this is a feature of non-paradigmatic cases that can be evaluated. Ultimately, it can be determined whether a particular technology is assistive rather than curative by

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[16] Perhaps it can be thought of as a partial cure for achondroplasia in as far as it partially removes the disability identity from the recipient by distancing them from the master narrative of dwarfism that includes disproportionately short limbs.

determining whether it confers the disability group identity on the user like the paradigmatic cases do.

Assistive Technology and(as) Universal Design

One might object that, while the conception of assistive technology being defended is effective in distinguishing it from curative technology, it creates a new conceptual muddle between assistive technology and the features of universal design. Noteably, Wasserman and Aas argue that BCIs, the same technologies being used as hard test cases for the distinction between assistive technology and cures, are likely to make the distinction between assistive technology and universal design hopelessly ambiguous. They proceed by offering definitions of both assistive technology and universal design and then describe uses of BCIs that would be nearly impossible to fit cleanly into either. They define assistive technology as: "devices designed for or usable by people with disabilities to enable them to engage in activities that are limited by their impairments" and explain how "these devices will often be individual tools, such as canes, walkers, and wheelchairs" (Wasserman and Aas 2016, 126). On the other hand, "'Universal' design (UD) modifies the built environment to make it accessible to, and usable by, people with as wide as possible a range of variation in form and function. The most familiar of these improve access for people with physical impairments, e.g., ramps, curb-cuts, flashing smoke detectors, and acoustic crossing signals" (126). The idea is that a curb cut lets both wheelchair users and parents pushing strollers or shoppers pushing grocery carts get on and off the sidewalk more easily. While such environmental features make the world more user friendly for disabled people, they actually do this for a wide variety of non-disabled people as well.

However, Wasserman and Aas then go on to point out that there are features of the social and built environment that increase access for disabled people but are not universally useful to everyone. As one poignant example of this, they offer Braille signage in public spaces like elevators. They then describe a catalog of hypothetical, but plausible uses of BCI technology that, like Braille signage, offer access to disabled people but are built into the environment and not devices owned by any one individual. Ultimately, they argue that "AT and UD can be distinguished by the location of the feature—on the individual in the environment—or by the design and marketing of the feature for people with impairments" and whether a particular use of BCI is understood as AT or UD is controversial, but morally salient in a variety of ways that are beyond the scope of this paper (Wasserman and Aas 2016, 126).

In light of Wasserman and Aas's observations, it can be argued that the conception of assistive technology being defended here actually eliminates a great deal of the ambiguity in the distinction between assistive technology and universal design, rather than contributing to it. First, there is no reason why this conception of assistive technology depends on the technologies' location with the individual or in the environment. Instead, all that is needed for a technology to be assistive is for it to confer the disability group identity on its user, regardless of where it is located. So, if there is a feature of the built environment that is only useful to someone with an impairment, like the example of Braille signage, then it ought to be considered an assistive technology because using it will confer the disability identity on the user. Conversely, even if a wheelchair user finds a curb cut *more* useful than a parent with a stroller because the chair would be unable to surmount the curb at all without it (Wasserman and Aas 2016, 127), it isn't the use of the curb cut that confers the disability identity, but the use of the wheelchair. Thus, the curb cut can be regarded as a matter of universal design and the wheelchair as assistive technology, but this is not at all determined by the technology's location.

The second way one might distinguish between assistive technology and universal design, according to Wasserman and Aas, is that assistive technology is designed and marketed for people with impairments (Wasserman and Aas 2016, 126). At first blush, one might think that this is just a restatement of the view being defended in this paper. After all, it may be the case that assistive technology confers the disability identity on the user *because* it is designed for and marketed to disabled people. However, for a technology to confer disability identity, its meaning must be deeply embedded in the culture's master narrative of disability. For this to be the case, it's not enough that disabled people are *intended* as the end users of a technology, but rather, it must be that *anyone* who uses it is regarded as disabled.

As an example that highlights the difference between the distinction being made here and the one Wasserman and Aas describe, take automatic doors that operate via push button and are widely found on the outside of Americans with Disabilities Act (ADA) compliant buildings. Unlike the previous example of the curb cut, which was the result of disability rights activism but is not necessarily "marketed" toward disabled people, it is clear to all that disabled people are the intended users of these push buttons. Indeed, the buttons are almost always marked by the wheelchair stick figure that is the International Symbol of Access and is found on everything from accessible parking spaces to bathrooms. Like the curb cut, using the push button to activate the automatic door may be *especially useful* to someone with a disability, but its use does not, by itself, designate a person as disabled. Imagine someone has an impairment in their hands or arms that is not apparent to a third-party observer and uses the push button to open a door that they would have otherwise struggled with. It is unlikely that this person, who otherwise passes as non-disabled, would be "outed" by using this technology in the same way that someone with low vision would be regarded as disabled merely by using Braille signage to decide which elevator button to press. Ultimately, designing a particular technology for disabled people and marketing it to them may do *some* of the work needed to embed that technology in the master narrative of disability, but whether it is an assistive technology is more effectively determined by ascertaining if its actual use designates a person as disabled, whether the technology being analyzed is Braille signage, curb cuts, automatic door buttons, or BCIs.

Normative Implications of AT as Disability Identity Conferring

Up until this point, little has been said about the normative implications of this analysis of the concept of AT. One might worry that conceptualizing AT as technology that confers disability group identity on the user might validate or otherwise reinforce harmful stigmas that often accompany that disability group identity and isolate, dominate, devalue, and generally oppress disabled people. If, as this view contends, the defining feature of AT is that it is embedded in the master narrative of disability group identity, then it might be argued that folks ought to, at least when they can, avoid the use of the concept altogether because of the deeply oppressive features of the master narrative of disability group identity.

This seems to be roughly Richard Ladner's ethical stance toward the concept of assistive technology. As noted above, he agrees that "Assistive Technology" has come to designate technology that is specifically for the use of disabled people, but uses this as a reason for why the concept should be abandoned altogether when possible. After pointing out that many advocacy and support organizations controlled by disabled people tend not to use the term assistive technology, Ladner argues, "the term 'assistive' when used with 'technology' emphasizes a person's need for extra assistance. It has the ring of paternalism, a view that people with disabilities need lots of extra help, are dependent and are not capable human beings" (Ladner 2010, 26). To be sure, one of the most common and most oppressive stereotypes regarding disabled people is that they are, as Ainta Silvers describes and then challenges on philosophical grounds, in "a definitively needy state of being" (Silvers 1998b, 96). As Lindemann carefully argues at length, one important way that master narratives harm people is that they can diminish their agency (Nelson 2001). Thus, it seems plausible to interpret Ladner's critique of the concept of AT as an argument that conceptualizing technology as "for disabled people" because it is "assistive" contributes to the aspect of the master narrative of disability that tells us that disabled people are, by definition, needy. In turn, while there isn't space in this paper to lay out a stepwise argument for this, many readers will likely share the intuition that being regarded with a presumption of inevitable neediness could severely diminish a person's agency and do them harm.

As a remedy, while he recognizes that it will be difficult to entirely replace a term like assistive technology where it is already deeply entrenched, like in the rehabilitative or medical fields, Ladner suggests that newer fields just beginning to develop technology with disability in mind, like computer science, adopt the alternative term "accessible technology." He argues that accessible technology is his preferred nomenclature "because it focuses on alternative approaches to achieving goals rather than the paternalistic notion of needing assistance." (Ladner 2010, 28).

This paper will not offer any kind of principled argument against replacing the term "assistive technology" with "accessible technology" to denote the concept being analyzed. Perhaps, changing the term used may shed some of the negative cultural connotations that AT carries currently, as Ladner hopes. However, the problem Ladner has identified runs much deeper than the choice of which particular word is used to refer to the concept in question. That is, it is quite likely that these technologies, whatever they are called, would remain deeply embedded in the master narrative of disability, with all of its stigmatizing cultural power. It is not as if referring to a wheelchair or a cane as accessible rather than assistive technology is going to, by itself, divorce these technologies from the master narrative that tells us that disabled people are needy, helpless, incompetent, or suffering.

Instead, it would be better both strategically and morally to strike at the heart of the problem: the harmful features of the master narrative of disability that constrain disabled people's agency. Luckily, Lindemann has provided us with resources that can be used to do just this: counterstories. Lindemann argues that "the master narratives' morally degrading representations must be resisted" and that this can be done with counterstories that "root out the master narratives in the tissue of stories that constitute an oppressive identity and replace them with stories that depict the person as morally worthy" (Nelson 2001, 150).

Following Lindemann's lead, resisting an oppressive master narrative that says disabled people who use certain technologies are needy, helpless, incompetent, and suffering would be best done with counterstories that represent the users of AT as capable and flourishing. It seems like AT could and should be at the heart of some of these counterstories, since it is what often empowers disabled people to be capable and flourishing. Celebrating AT as aesthetically beautiful is one way to center this technology in such a counterstory; and this has been done recently at New York's Cooper Hewitt, Smithsonian Design Museum with the exhibition "Access + Ability." A mainstream media source reported when the exhibition opened that "eye-catching objects designed for, and by, people with physical and other disabilities" are on display, including "more than 70 exhibits, including colorful prosthetic leg covers jeweled earrings that are also hearing aids" (Gabriel 2018). Of course, this is just but one example of an attempt to shift the cultural meaning of AT by challenging the damaging features of the master narrative of disability that it attaches to. This paper isn't the place to fully explore all of the ways AT could help tell a counterstory about disability and all of the philosophical implications of such a strategy for liberating disabled people. Yet, hopefully readers see the enormous potential of using AT to tell counterstories about disability that shatter the oppressive features of the disability master narrative and work to repair the relational narrative identity, and thus empower the agency, of disabled people as a group.

Ultimately, it is being argued that conceptualizing AT as any technology that confers disability group identity on the user need not reinforce the harmful stigmas that attach to that group identity because AT actually can and should be used to directly challenge this oppressive master narrative.

Conclusion

In sum, the conception of assistive technology as any technology that confers the disability group identity on the user because of how it is embedded in the master narrative of disability effectively draws a clear distinction between assistive and curative technology, even in the hard cases, including those that are likely to be generated by quickly advancing BCI technology. Further, this conception of assistive technology is also effective in drawing a clear distinction between it and features of universal design. Finally, it would be worth exploring the liberatory potential of AT not just as a set of practical tools that disabled people can use to live well, but as a narrative device that disabled people can use to claim their agency with counterstories about lives well lived.

Acknowledgements Funding for this research was provided by the National Science Foundation (Grant No. #EEC-1028725). The author would also like to thank his research assistant, Albert Dumaran, as well those who provided feedback on earlier drafts, including: Hilde Lindemann, David Wasserman, Sean Aas, Stephen M. Campbell, members of the "Ethics Thrust" of the Center for Sensorimotor Neural Engineering (especially Sara Goering and Eran Klein), members of the University of California San Diego Transdisciplinary Disability Studies Reading Group (especially Cassandra Hartblay, Brian Goldfarb, and Jason Dorwart), and participants in the "Spectrums of (Dis)ability" seminar at the 2017 American Comparative Literature Association Annual Meeting.

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