

Memory, Neuroscience and Memory Enhancement

Marcos Alonso Fernández

Volume 3, Number 1, 2020

URI: <https://id.erudit.org/iderudit/1068759ar>

DOI: <https://doi.org/10.7202/1068759ar>

[See table of contents](#)

Publisher(s)

Programmes de bioéthique, École de santé publique de l'Université de Montréal

ISSN

2561-4665 (digital)

[Explore this journal](#)

Cite this article

Alonso Fernández, M. (2020). Memory, Neuroscience and Memory Enhancement. *Canadian Journal of Bioethics / Revue canadienne de bioéthique*, 3(1), 1–9. <https://doi.org/10.7202/1068759ar>

Article abstract

This paper advances a new and updated understanding of memory that should also change the coordinates of the memory enhancement debate. Instead of thinking of memory as a storehouse, we should think of memory from a narrative perspective. This view allows for a better understanding of the process in which we actually construct our memories by elaborating meaningful summaries, rather than adding discrete elements. I argue that this new way of thinking about memory makes most of the memory enhancement technologies we have or will have in the near future much less ethically problematic. The main idea is that (biological) memory interacts with memory enhancement in the creative and re-elaborative way it ordinarily does. To conclude, I discuss some cases to illustrate the previous points.

Copyright © Marcos Alonso Fernández, 2020



This document is protected by copyright law. Use of the services of Érudit (including reproduction) is subject to its terms and conditions, which can be viewed online.

<https://apropos.erudit.org/en/users/policy-on-use/>

érudit

This article is disseminated and preserved by Érudit.

Érudit is a non-profit inter-university consortium of the Université de Montréal, Université Laval, and the Université du Québec à Montréal. Its mission is to promote and disseminate research.

<https://www.erudit.org/en/>

ARTICLE (ÉVALUÉ PAR LES PAIRS / PEER-REVIEWED)

Memory, Neuroscience and Memory Enhancement

Marcos Alonso Fernández¹

Résumé

Le présent texte avance une compréhension nouvelle et actualisée de la mémoire qui devrait également modifier les coordonnées du débat sur l'amélioration de la mémoire. Au lieu de considérer la mémoire comme un entrepôt, nous devrions penser la mémoire d'un point de vue narratif. Ce point de vue permet de mieux comprendre le processus par lequel nous construisons réellement nos souvenirs, c'est-à-dire en élaborant des résumés significatifs, plutôt que d'ajouter des éléments distincts. Je soutiens que cette nouvelle façon de penser la mémoire rend la plupart des technologies d'amélioration de la mémoire, que nous avons ou que nous aurons dans un proche avenir, beaucoup moins problématique sur le plan éthique. L'idée principale est que la mémoire (biologique) interagit avec l'amélioration de la mémoire de manière créative et réélaborative comme elle le fait habituellement. Pour conclure, j'évoquerai quelques cas pour illustrer les points précédents.

Mots-clés

mémoire, amélioration de la mémoire, identité narrative, neurosciences, neuroéthique

Abstract

This paper advances a new and updated understanding of memory that should also change the coordinates of the memory enhancement debate. Instead of thinking of memory as a storehouse, we should think of memory from a narrative perspective. This view allows for a better understanding of the process in which we actually construct our memories by elaborating meaningful summaries, rather than adding discrete elements. I argue that this new way of thinking about memory makes most of the memory enhancement technologies we have or will have in the near future much less ethically problematic. The main idea is that (biological) memory interacts with memory enhancement in the creative and re-elaborative way it ordinarily does. To conclude, I discuss some cases to illustrate the previous points.

Keywords

memory, memory enhancement, narrative identity, neuroscience, neuroethics

Introduction

Neuroscience is still in its infancy, but its investigations are showing to be highly influential in many fields. Some of its topics, however, have been discussed for centuries. Memory is one of them, having been studied in philosophy, psychology and biology. Biology in particular only started to focus on memory “as technological advances made it feasible to move beyond description to explorations of mechanism” (1). This has also happened with neuroscience, a discipline only possible due to the recent technological developments that allowed a more precise knowledge of our brains. Among the different themes studied by neuroscience, memory is arguably one of the main topics since the creation of this field (2). However, it is only in the last few years that we have started to discuss seriously the possibility of memory enhancement. The problem with this discussion is that it has been carried out with old conceptions of memory that confuse the matter. Even though the past decades have seen an “increased interdisciplinarity among philosophers working on memory” (2), the truth is that many philosophical debates – particularly ethical debates regarding identity – are still carried out with old concepts and categories.

I will begin by showing why this old understanding of memory is flawed. Specifically, current neuroscientific research shows that memory does not work the way most philosophers have argued it does. It is thus necessary to try new explanations and elaborate new metaphors regarding memory that better match the scientific data. This new comprehension of memory is key to tackling issues with memory enhancement, as I will show. After this discussion on memory, I will then turn to some cases that demonstrate how the proposed new comprehension of memory should affect the memory enhancement discussion.

Reconsidering memory in the light of neuroscience

Before getting to memory enhancement and the announced case discussion, it is paramount to first understand memory. The predominant and intuitive view of memory is to think of it as a storage system, an idea that “has always been at the center of the Western understanding of memory” (3, p.1). As Schechtman explains, this view of memory is based upon “the ‘storehouse’ concept, arguably held by Plato, Augustine, Hobbes, Hume, and Locke himself, to name just a few. On this view, memory is seen as a sort of warehouse in which our ideas and experiences are laid away for later retrieval in their original form” (4, p.6). The basic idea is that our *conscious experiences* are somehow kept somewhere in our brain, ready to be retrieved when needed. The question “do you remember X?” is usually understood as a petition to search for specific information that you store and can share voluntarily. This widespread conception of memory is what most philosophers, until the last century, have conceptualized, validating this interpretation. For over a century now, psychology has fought this understanding of memory (5,6). In recent decades, neuroscience has been deconstructing this notion with more precise data about the brain and its inner workings. These investigations show that the common, stereotypical view of memory does not hold, for two main reasons: strictly speaking, human biological memory does not store anything, and what we recall is never the same thing that we first saw or experienced.

Humans, as any other biological organism, are concerned with survival (7), and our memory is focused on that: on being functional, not on being truthful or extensive¹. In fact, both of these characteristics (truthfulness and comprehensiveness) can be detrimental in many contexts, as cases that of Solomon Shereshevsky show (8). Our memory is concerned with meaning, not data, and this implies an emphasis on creation, rather than storage. As Quian Quiroga explains, memory is “based on the construction of meaning, an interpretation of the outside world that relies on selecting a minimum of information and making abstractions – while discarding a multitude of detail” (9, p.48)².

Even if a full, technical description of how memory works would take us too far, it is necessary to at least explain the basics of its functioning. Philosophical theories should be sound and try to not directly contradict these scientific findings. The philosophical account on memory I will put forward should also respect this principle. In order to give a brief contextualization, it is useful to attend to the classic taxonomy of memory that divides it into declarative and nondeclarative memory. The declarative memory is divided into semantic memory (dedicated to facts) and episodic memory (dedicated to events). Nondeclarative memory is related to skills, dispositions and other practical related aspects of memory (2). This classification, while widely accepted and relatively useful, is insufficiently nuanced for the understanding of memory we are trying to reach.

Neuroscience, on a more concrete level, explains that memory is related to the strength of neuronal synapses (10, p.98). This current understanding is based on the work of E. Kandel, who discovered a particular kind of neuron, modulatory neurons, which can strengthen the synapses between sensory and motor neurons (10, p.95). Modulatory neurons carry out a chemical process that adds a phosphate molecule (3, p.95-96); this phosphorylation delays the connection between sensory and motor neurons from disappearing, strengthening their connection and making their future connections easier. When phosphorylation is temporary, it produces short-term memory; when it is stable (because gene induced), it produces long-term memory. This depends primarily on the number of times the modulatory neurons repeat the process, which in turn depends on the number of times the action triggering the modulatory neuron is repeated (10, p.96-97).

Squire, in his comprehensive review of the last decades of neuroscientific studies on memory (1), seems to embrace this interpretation were he explains that one of the latest and most promising schema on memory is that “retrieval of a memory provides an opportunity for updating or modulating what was originally learned” (1, p.12712). This process, in which a memory becomes long-term, is referred to as reconsolidation. The bottom-line reflection, again, is that forming memories is not about storing, but rather going through a previously walked path, reinforcing that act and making it easier to repeat in the future. The main conclusion we should take from this is that the storehouse metaphor regarding memory is flawed. As Liao and Sandberg put it, “While it is common to speak of memory’s being ‘stored’, memories are not spatially localized. They are spread across different structures, likely as distributed networks of potentiated synapses” (11, p.87). And even though it could be said that memories are “stored” in distributed connectionist networks, this way of thinking the storage process is completely different to what philosophers have for the most part thought and explained. One of the first philosophers to identify this problem was Marya Schechtman (4). This author carries out a very insightful critique of this “storehouse” model of memory that serves as a basis for psychological views on identity. She argues that while some memories could be considered simple reproductions of the past, much of what we call memories are far less concrete ideas or beliefs that cannot be located and precisely described (4, p.7). As she explains,

Memory, on this view, is not always or only a reproduction of past experiences or a simple connection between two discrete moments of consciousness. It is also a way of weaving the facts about ourselves and our histories into a coherent and intelligible story, expressive of the overall contours of our characters and our lives; our autobiographical memory is, that is, more like a biography than a photo album (4, pp.12-13).

Schechtman, who has developed a very interesting philosophical inquiry on personal identity, was able to clarify the shortcomings of the “storehouse” model of memory. However, her conclusion is that there still is something true and compelling with these theories, and that what is indicated “is not a rejection of memory-based accounts of identity, but an attempt to give such an account with a structure which can accommodate memory in all of its complexity” (4, pp.13-14). I do not fully agree with this conclusion, and think rather that these misleading ideas should be dismissed. As we have seen, nothing in the way our brain works resembles this “storehouse” conception, and even if we are used to thinking in those terms, we must abandon them and search for better interpretations of memory³. As we will see in the case discussion section, abandoning the storehouse model of memory has decisive consequences for the memory enhancement discussion. Mainly, it means that enhancing memory can no longer be understood as improving any sort of storage capacity. It also means that, in a way, human memory, due to its creative nature, has always been enhanced. Human memory and enhanced memory turn out to be, under this comprehension, synonyms. I will further explain these ideas in the last section of the article.

¹ This reference to survival or the biological goals of memory is simply to point out its evolutionary origin. Memory, as with many human attributes and capacities, is used for many non-survival related purposes. But the point, in this part of the discussion, is to understand its evolutionary origin and why it functions the way it does.

² Konrad et al. go into more detail, explaining that “Organic memory has four different strategic biases. First, people tend to remember more positive than negative events (38). Second, negative details of individual events are forgotten more than positive details (39). Third, there is an emotional asymmetry in the time course of past events with negative affect fading more rapidly than positive affect (40). Finally, the ways that people view past events become less self-focused over time, indicating adaptive distancing from negative experiences (41).” (36, p.2).

³ Even if not the topic of this paper, this objection to the storehouse model goes beyond its neuroscientific inaccuracy. As Brockmeier notes, “memories are transindividual or collective phenomena” (3, p.2). Further, memory could also be argued to be an extended or distributed reality that reaches objects and technologies to which we are intertwined (20).

Overall, however, we must be realistic about the possibilities of overturning the accepted view of memory. Brockmeier is right when he states that this new way of understanding memory will not, at least in the short term, replace the established conception of memory, and the reason for it is that “the archival model is deeply moored in Western cultural traditions. Sedimented in science, philosophy, literature, and language there are numerous metaphors and models of memory that for a long time have given shape to our ideas of remembering and forgetting” (3, pp.22-23). This is very true, but it is also true that we cannot refrain from putting these changes into motion, even if this kind of shift, like the one we I propose regarding memory, takes a lot of time and effort. Next, I will analyse memory enhancement more concretely and in the last section I will delve into some case discussions to show how many of the criticisms directed at memory enhancement are based on the old, flawed comprehension of memory that I have argued is unsustainable.

Memory enhancement and its ethical implications

If giving a definition of memory is difficult, giving a definition of memory enhancement is even more complicated. The classic understanding of memory as a container makes this task easy: if normal memory allows us to store 100 memories, memory enhancement would allow us to store 1000 memories. However, as has been argued, this way of thinking about memory is wrong, and so too is an understanding of memory enhancement based on this conception. From my proposal, memory enhancement could be one of two things. A first way could be to see it as an enhancement of the neural workings of our brain, so that it is easier to reactivate a certain neural path when needed. A second possible understanding of memory enhancement could be to consider it as an improvement of the functionality of memory; not so much enhancing memory but manipulating it in different ways so that it serves better its objectives. I will draw on both of these comprehensions, although the second one will be the less problematic and the one to which I will mostly refer.

One point should also be addressed regarding these definitional issues. Memory is a polysemic and problematic word, as we already know; but the same is true for enhancement. Distinguishing between therapy and enhancement usually proves to be more difficult than expected; but even at a conceptual level it is hard to establish clearly why something can be called enhancement, to what standard level of performance we are referring, and if it truly enhances some capacity or simply changes it altogether. This complicated point has been tackled by Erler, who distinguishes memory editing from memory enhancement, saying that “By memory editing, I shall understand all methods of modifying memory in a desirable way that do not involve enhancing it – at least not directly” (12, p.240). Although he states clearly this distinction, he also points out that some forms of memory modification can end up being memory enhancement.

Although the motivations and usefulness of this classification are clear, ultimately, I cannot follow this distinction between memory editing and memory enhancement, especially after the previous discussion on the neuroscience of memory. Memory editing, in my framework, would be a redundancy, as our memory is always and continuously being edited, even without any technology involved. Giving a clear-cut definition of memory enhancement is, nonetheless, extremely difficult; and part of this difficulty is that, as I shall argue, the enhancement of human memory has been a constant through millennia. This familiarity with enhancement makes it very difficult to draw a line between non-enhanced and enhanced memory. Are the narratives about the origins of a tribe, repeated over and over again through generations, non-enhanced or enhanced memory? Is labelling different herbs and spice bottles a form of non-enhanced or enhanced memory? Memory enhancement is so natural and old to humankind that it is intrinsically difficult to distinguish it from a supposedly pure, non-enhanced, human memory. In this paper I focus on the new technologies that enhance memory; but bearing in mind that memory has been enhanced in humans since their origin as a species, with old technological realities such as language, writing or music as notable examples.

Modern bio-medical memory enhancement has been a major scientific goal in the last decades, in great part because of dementia related diseases, but also as a way to enhance ourselves cognitively. Techniques to treat post-traumatic stress disorder (PTSD) by erasing or weakening specific memories have also been quite important (13, p.70). It would be simply impossible to give a comprehensive account of all the different types of memory enhancers (for one such comprehensive account see (14)). These new enhancements can be technological (15), genetic (16) or pharmacological (17,18). I cannot delve into each of these technologies, but there are a couple of important points that should be raised. The first is that in many cases, the external difference between these technologies is not very relevant, as the effects produced are essentially the same⁴. But it is true that pharmacological, and even more so genetic enhancement, could imply physiological changes that would radically alter the way memory functions. It is difficult to elaborate further on this possibility as we really do not know that much of the genetic underpinnings of memory. We know more about the effects of some drugs, but this knowledge is mostly casuistic and not a comprehensive understanding of the relationship between drugs and memory.

We can hypothesize, for example, that some form of biological intervention could turn temporary phosphorylation into stable phosphorylation, giving us the power to create long-term memories out of short-term memories at will. This kind of intervention may change the way we experience the act of remembering. An even more drastic intervention could be one in which Shereshevsky's condition (1) is emulated by discovering the genetic configuration that propitiated it, making our memory more similar to what the storage house conception of memory proposes. These kinds of enhancement are, at the moment, out of the realm of possibility, so they will not be addressed. In any case, the only thing that can be said for sure at the moment is

⁴ Technological memory enhancements can be more problematic, because “some components of our autotopography are mere triggers to biorecognition, whereas other components are constitutive parts of one's autobiographical memory systems” (42, p.1840). Distinguishing these two types of enhancers is impossible without a case by case consideration; but it is still important to be aware of this double aspect.

that memory enhancement by techno-bio-medical means is already feasible and, even though these procedures are still quite “crude and weak” (13, p.70), it is foreseeable that they will be perfected and expanded in the near future.

If we focus on the ethical implications of memory enhancement, the first thing to realise is that these ethical concerns are usually thought of in connection with personal identity issues. Here, I will very briefly present a defence of narrative identity, the approach I consider to be the most solid and comprehensive theory on identity. Explaining and justifying these points adequately would take us too far; however, it is crucial to at least delineate this position in order to properly address the cases discussed in the next section.

From what I have argued previously, it should be clear that we cannot advocate for any of the psychological views regarding identity. Psychological theories are heavily based on what I consider the mistaken storage house conception of memory. The psychological view, enunciated by John Locke in the 17th century and recuperated in the last decades by authors like Derek Parfit, understands personal identity as consisting in the continuity of mental states connected by memory. The basic idea is that our identity consists of the unity of many distinct memories that we can retrieve at any moment, forming a virtual chain that would amount to our identity. This theory has innumerable problems (4, p.7-8), something that, however, does not prevent it from being the theory most people hold intuitively. The point, as we will see, is that it correctly points to a life-continuity which is very near and dear for all of us. But the way it is described is mistaken and based on 17th century scientific knowledge (19). Much more accurate and richer is the narrative view of identity, which also points to the aforementioned continuity as the core of our identity but does so in a more complex and nuanced way. What proponents of narrative identity theories defend is that our identity, *who* we are, is the result of the story we (and our context) tell of ourselves. We could say, following this metaphor, that we are the main character of this story. Memory is, of course, central for this vision of identity. But the idea of memory it is based upon is not the storage memory displayed in the psychological theories, but an autobiographical memory comprised of much more general ideas, emotions and summaries (4, p.7).

However, even though this paper aligns itself clearly with narrative theories, I believe that these kinds of theories must be very firmly rooted in our biological, social and technological nature. We must understand how exactly our biology produces and demands narratives; how our social context also demands, reinforces and creates individual and collective narratives; and how our technological environment (20, p.3140) also contributes crucially to the creation of our narrative identity by reinforcing, solidifying and evoking certain ideas, emotions and moods that form human narrative memory. The point is that, even though I believe that the best framework to comprehend memory is the one provided by the narrative model, we should not fall into a subjectivist understanding of this model. Such subjectivist understandings, which might imply a certain degree of arbitrariness, should be discarded in favour of an understanding that emphasizes the importance of our biology, our social constitution and our technological condition, all factors that greatly limit the creative freedom of our memory.

Returning to the point about the ethical implications of memory enhancement, I agree with DeGrazia that memory enhancement critiques are usually directed at how it would affect our identity, and more precisely our narrative. DeGrazia distinguishes identity – which he defends as basically our body – from our narrative (21, p.232). From my perspective this distinction is somewhat unwarranted: our identity and our narrative are completely intertwined. However, I would agree with DeGrazia in that no change to our narrative can directly and only by itself imply a change in our identity. I can change my narrative, deciding I no longer want to be a philosopher, but instead desire to be a journalist. Whatever my decision is, I would still be *me*, who was a philosopher and is now a journalist. Even when we see people who undergo deeper changes, like a killer who becomes an NGO leader, we still think this is the same human being who was a murderer and is now a good person. DeGrazia believes this is the case because no change in our narrative can lead to a sufficiently drastic bodily change. For my position, this is also true, but not completely.

The key point for us is that narratives are very flexible, and it is very difficult, almost impossible, to imagine an event that we could not incorporate into our autobiographical narration and that would imply the start of a new identity. Because when this happens, we do not talk of a new identity or an identity change, we consider it a disruption of our identity that should be addressed by psychiatry. If I suddenly started to say that I am Julius Caesar – even if I acted, spoke and thought in a way that showed full conviction about it – nobody would say that I had become a different person (a different *I*); they would simply say that I went crazy. If I changed from being a charitable, goodhearted and nice person to a selfish, evil and despicable person, they would assume that the same person (that is, *me*), probably had undergone some horrible event or situation that created these changes in me, looking for a narrative reason that would explain the transformation.

These reflections on personal identity, which as I noted and we will see are crucial to addressing the possible ethical problems of memory enhancement, can and should receive some illumination from the initial neuroscientific discussion. As I have defended, the narrative model of memory matches much better the latest neuroscientific findings on memory, and this also applies to narrative identity theories. If this were to be true, it would further support my thesis that new biomedical memory enhancement does not bring something essentially new to the table. One of the main points is that, even if we are not used to seeing it this way, as a matter of fact, all narrative modifications influence our brain and cause physical (synaptical) changes. This, however, does not mean that our identity changes: the margin of variability in which these changes take place is perfectly within the explanatory range of a sufficiently subtle biological definition of human identity (19). Synaptical changes do not turn us into another person. The important point here regarding memory enhancement is that our brain is very accustomed to functioning in direct relationship with all sorts of memory enhancers. If the new enhancers do not directly interfere with or radically change this neuro-synaptical infrastructure, then we could argue that their moral treatment should be the same as old

enhancers with similar effects⁵. For instance, if we find acceptable/unacceptable to use psychotherapy to blunt the vividness of a victim of child abuse, we should also accept/reject modern memory enhancers that involve technology or pharmacology (12).

Case discussion

To conclude, I will go through some examples that will hopefully clarify the position I have defended, i.e., that memory is a creative and reconstructive endeavour that is not fundamentally affected by memory enhancement technologies. What this means is that we do not face new ethical implications for memory enhancement. The new conception of memory I have presented, a conception that neuroscience seems to confirm, makes it so that memory enhancement brings no substantial or radically new ethical implications. I will further explain this thesis with some cases and examples. The kind of thought-experiments I discuss here are, however, substantially different from science-fictional thought experiments in that the conditions are part of our current realm of possibility, or very close to it. Most of these cases, it should be noted, have to do with the discussion surrounding memory erasure or memory blunting in PTSD patients, for which among other means, the beta-blocker Propranolol has already proven successful (22). The examples and cases that could be examined are many, but I will leave aside the easiest ones in favour of those that are the most problematic.

First, let's tackle the case of Martin Luther King (23), which goes as follows: "If Martin Luther King had blunted or forgotten his memories, he would not have become the civil rights champion he got to be". An analogous case would be the "mourning husband" case, in which a husband decides to erase the memories of his dead wife to overcome the pain of losing her. In both cases I would argue that there is a false assumption that these memories are pernicious. In a sense, it is clear that Martin Luther King and the husband are not "happy" to retain their memories: it is painful to remember a wife's loss or to feel again the racism suffered as a child. But they can arguably still value those memories as a key part of their narratives, as a key part of their self-projects⁶. This is very different, however, to the cases of memories that hold no value. In these cases, people may not want their life to be defined by those valueless memories, as could be the case of children abused during their infancy. In this kind of case, I do not see the problem with blunting or erasing those memories. Our brains naturally erase or at least bury undesirable memories. As was shown above, remembering is a creative action in which information is continuously re-elaborated. Also, at a more conscious level, we sometimes simply elect to not make those memories a central part of our narrative. The point is not that memories and narrative are not essential to identity, but that no specific memory or narrative is essential, at least in principle, for anyone. Only retrospectively can we have the illusion that an event of our life was necessary, or that the narrative we effectively constructed is the only one we could have crafted. But the truth is that there is no necessity in any of these: there are always many ways in which events could have unfolded and there are many different narratives that can be elaborated⁷. Technology does not change this fundamentally, and that is why it does not raise radically new problems.

Another typically discussed case is the possibility of erasing a murderer's memories⁸. In Erler's opinion, "There is something seriously disturbing about a murderer who lives his life believing that he has never done much harm to anyone. Also, it is plausible to think that Carl owes it to his victim to remember that he has shot him dead" (12, p.244). We may intuitively agree with this, but if we think about it, we have to ask ourselves what we really pursue with incarceration, punishment and the penitentiary system. Because, if we go beyond our emotions and intuitions, we might find that there really is nothing wrong with erasing a murderer's memory. We have to ask ourselves if there is any good reason to maintain a murderer's memory other than the impression that doing so would be disrespectful or dishonourable to the relatives (or the society as a whole). "Keeping the memory" of our victims is probably very important, but this does not necessarily collide with erasing a criminal's memories. We could, as a society, remember the crime, even build memorials, but nonetheless erase the murderer's memory and send him to another city, state or country so that he can start a new life (similar to what happens in witness protection cases). But even if we end up determining that there are good reasons to maintain a murderer's memory, we would have to balance those reasons with the arguably enormous social benefit of removing a dangerous criminal from society (arguably with much less adverse side-effects than currently used methods) and the also formidable gain of re-orienting a person away from a criminal life into a life of goodness. All this presumes that memory erasure of this kind becomes feasible and that their effects would be the ones described here, conditions that, of course, may never become reality.

This proposal, however, could be socially and ethically problematic if we take into consideration the deterrent power of punishment. From this perspective, a potential criminal would be encouraged to commit a crime if he understands that possible punishment is soft or inexistent. This is a fair concern, but it can be disputed. One point is that losing your memories arguably implies losing a key part of your identity, which is not negligible. For many potential criminals, however, this could be a more than acceptable trade-off. This line of reasoning, though, also carries important problems. Understanding deterrence as the main goal of criminal legislation could force us to endorse a hardening of punishment that seems contrary to the tendency that

⁵ This argument, even though not entirely equal, is similar to Levy's ethical parity principle (43), which argues that internal and external enhancers should be treated equally.

⁶ The point here is to understand that no concrete memory is valuable in itself, but always depends on the general narrative in which an actual person is immersed. Martin Luther King's memories of racism had value for him, as the champion of human rights he wanted to become and became. For a quiet housewife that has no political preoccupations and only wants to have a peaceful life, the memories of a particular incident in which she received some racist insults could hold much less value or not be valuable at all.

⁷ The only problem with these kinds of procedures, as we will see with another of the examples, is that the social and objectual component of memory would still be there, in most cases, which would result in an unsustainable situation if that component is not also taken into account for the procedure.

⁸ We should be careful and say, more accurately, that those memories would not be erased. It would be more precise to talk about a prevention of the recreation of certain memories. But, for the sake of simplicity, I will simply acknowledge that "erasing a memory" is a metaphor just as when we talk about "the rising sun".

legislation has exhibited over the last centuries. If our goal is to create a better society and strive for criminals' reintegration, it is quite possible that erasing murderers' memories is the best way to achieve such goals, as it would presumably prevent them from reverting to their murderous narrative. This might be thought of as a "hard bullet to bite", but the underlying reasoning does not seem completely implausible. Greene and Cohen (24), among others, have defended such a consequentialist justification, criticizing the retributivist, common-sense view.

In any case, if we accept the creative nature of memory I have been defending throughout the paper, it could even be argued that this memory erasure procedure should not necessarily imply a reduction of the criminal's sentence. Under a retributivist paradigm, there could be reasons to still make the murderer undergo the suffering of being incarcerated as a reparation for the rest of the community. Erasing the criminal's memories would not be, in this regard, so much an alternative form of punishment but a way of creating the conditions for the criminal's true reinsertion in society. Incarceration, on the other hand, would be maintained as the criminal's punishment and as a way of repaying society. Furthermore, it could be right to erase memories even without consent. This could raise problems of bodily integrity – "a right to be free from physical interference" (25, p.241) – and cognitive liberty – "the right to mental self-determination, defined as the right to change his or her own mind and choose the means by which this change occurs" (26, p.295). These are legitimate concerns that should be addressed, but we already have examples of both that could serve as precedents. Bodily integrity is not respected in penalties of chemical castration for sexual criminals. Cognitive liberty, aside from being a very a problematic concept, is arguably not respected with many of the obligatory reinsertion courses (psychological, psychiatric, motivational, etc.) that are designed to completely change the way the criminal thinks and feels. And, in general, it could be argued that mere incarceration involves the disposal of the body and mind of the convict. This reflection is another example of how the proposed new understanding of memory could help us see these memory interventions in a different light, maybe even concluding that we are not in completely new territory.

These cases and the associated discussions, inadvertently raise one important problem with these types of memory erasure procedures: that, for the new narrative to successfully settled, no one of the subject's personal environment should know or remember him as a murderer (or racism victim, or widower), which could prove to be quite difficult. Narratives are external in many ways. Liao and Sandberg have noticed this problem, explaining that "If everyone else around you remembers what in fact has happened, you may be constantly told of this even if you removed certain memories. The social nature of remembering can put a limit to how inconsistent or false memories can be" (11, p.91). However, social environments also (slowly) evolve; and it wouldn't be out of the question to think that society could grow to understand and tolerate these cases of memory erasure and blunting, trying not to contribute to recreating those harmful memories, or even undergoing the same memory erasure procedure.

Memory, however, is not only external in a social, collective way. Memory is also external in an objectual, technological way. Heersmink has developed an interesting framework in which extended or distributed mind accounts merge with narrative identity theories showing how artefacts are a constitutive part of our mind, narratives and identities (20). As this author claims, personal identity can neither be reduced to psychological structures instantiated by the brain nor to biological structures instantiated by the organism, but should be seen as an environmentally-distributed and relational construct. In other words, the complex web of cognitive relations we develop and maintain with other people and technological artifacts partly determines our sense of self (20, p.3135).

The relative solidity of this artefactual component of memory is, in some respect, more problematic than the social component of memory previously discussed. People can change their minds, or simply forget collectively about certain things. But the objects that surround us and that are an integral part of our memory seem less malleable. However, the same argument as before is applicable. If we want to display an effective memory enhancement, we should take into account the objectual component of memory and make sure that it will not contradict our enhancing purpose.

These previous cases also raise one typical issue brought up by memory enhancement critics, which is that these memory erasing procedures "might cause a loss of empathy if we would habitually erase our negative experiences, and because it would violate the human duty to remember and oppose crimes and atrocities" (27, p.287). I would say that this argument is flawed, as I tried to show with the examples above. Such an appeal to our emotions is quite dangerous and misleading. The justice system does not work thanks to emotion; on the contrary, justice was born when instead of following our instincts and falling into vengeance's wheel, we approached crimes and faults rationally, creating the institutions and laws that we thought would promote what we considered a fairer and better society. The argument above seems to imply that by blunting or erasing memories, our rational capacities would be disrupted, and we would start thinking that murder, racism or child abuse are fine – something that is highly unlikely. While it is true that we are not pure rational beings, and that our rationality is profoundly mixed with irrational and emotional elements, we should address these kinds of problems via laws and institutions, which should be as rational as possible.

For the sake of discussion, I would like to explore two other examples. The first one is about Sara, a hard-core fan of *Casablanca* who is offered a memory erasing procedure to make her forget about the film, so that she can experience the pleasure of watching it again for the first time. The second example involves Phil, a lonely office worker who is having some

⁹ Greene and Cohen similarly argue and recommend "a shift away from punishment aimed at retribution in favour of a more progressive, consequentialist approach to the criminal law". (24, p.1775)

serious confidence problems and has become too insecure to approach any women. He is offered a memory implantation procedure by which his narrative would be rewritten to remember many past romantic successes, which would plausibly reinforce his confidence. As with the cases of Martin Luther King and the mourning husband, the important point here is the value each individual assigns to any specific memories, and how those memories relate to their self-project. The corollary is that our assessment of memory enhancement inevitably must be case dependant. We cannot, on principle, determine whether a memory enhancement intervention is positive or negative. It will always depend on the intentions and consequences of the acts involved; a conclusion that reinforces our thesis that memory enhancement does not constitute a novelty for our understanding of memory, identity and ethics.

Erasing a good memory, as in the case of the hardcore fan of *Casablanca*, could be a loss, in some way; but if the expected benefit derived from being able to watch it again for the first time is greater than the loss, I do not see any reason why it would be ethically problematic. The lonely office worker case could become problematic in the same sense as we discussed before: the social environment could render the memory implantation ineffective. However, this is not a given, and if implemented wisely and proportionately, memory implantations of this kind could be highly beneficial.

I have argued throughout the paper that memory enhancement does not bring a radical novelty to memory, because human memory is and has always been an enhanced reality. However, new technologies such as computers and smart phones do seem to drastically improve our memory in ways no other previous technology has ever done. Do these technologies entail new and important ethical problems? A recent experiment can answer this question. The theoretical problem this experiment addresses is the following: “Some may believe that enhancing memory or cognition means that the memory trace will be irrevocably etched in our brain and/or everything we hear, smell, see, etc. will be equally encoded and stored, making our brain a wasteland of non-interpretable junk memory traces, as Rose implies” (28, p.188). This is the scenario of the chapter “The story of my life” from the TV Show *Black Mirror*, a chapter where little bean-sized implants let us record every experience we go through. In any case, the severe downside of not being able to forget (discussed long ago by Nietzsche in the second treatise of his *On the Genealogy of Morality*), is not even a hypothesis, as the case of Solomon Shereshevsky shows how impairing is this condition (1).

Since the 2000s, some authors have explored this preoccupation about the possibility of total recall (29-31). The issue could consist of a real – not only conceptual – confusion or, better put, appropriation of biological memory by computer-like memory. Furthermore, this scenario is far from science-fictional, because, as Clowes explains, “Whereas drugs that may produce cognitive enhancements or more direct brain-machine interfaces garner great academic and popular attention, it almost seems as though Cloud-Tech is already becoming so widespread and everyday that we scarcely bother to examine it deeply.” (32, p.264). The compulsory question, therefore, is: “What are the cognitive implications of relying heavily on these particular technologies [Google, Wikipedia and the ever growing panoply of smart phones, personal gadgets, devices and software technologies] which fulfil tasks and functions that we once would have performed either with our brains alone, or with radically different set of cognitive artefacts?” (32, p.264).

Clowes shows that there is already an important literature on the topic (33-35), but all these theoretical approaches can benefit now from a recent and very illuminating experiment carried out by A. Konrad and his colleagues. In their article “Technology-Mediated Memory: Is Technology Altering Our Memories and Interfering With Well-Being?” (36), they ask themselves a concrete question: “Do we benefit from revisiting rich digital records of our past, or are some details best forgotten?” (36, p.2). The question is phrased this way because “psychological theories show that everyday organic memory presents a non-veridical view of our past that benefits our well-being” (36, p.2). The experiment involved the creation of an application, “Echo”, which allowed participants to record in great detail their daily lives and their retrospections about it (36, p.8-13). The results showed that the application improved well-being (36, p.13), and crucially, that this external memory enhancer “can also manifest exactly the same adaptive memory biases as organic memory, including overall positivity as evidenced in emotion ratings, content words, and ratio of positive to negative posts. Furthermore, the content of posts became more positive over time, suggesting rosy retrospection” (36, p.22). Even though there are other studies with divergent conclusions (37), this particular experiment clearly shows that (biological) memory interacts with memory enhancement in the creative re-elaborative way I have presented, and that memory enhancers can in fact promote well-being by helping to build up our narrative in a better way. This conclusion, even if not definitive, constitutes a clear support of the main thesis of this paper: that memory enhancement does not substantially change the way our memory works, and that, therefore, its ethical implications are not significantly different. Arguing that devices and applications such as “Echo” distort our memory is ignoring the creative way in which human memory has always worked. Concluding that such technologies will necessarily diminish our well-being is unwarranted, as the above experiment shows. This, again, does not mean that technological interventions on memory are free of ethical issues. It just means that its ethical implications – that is, authenticity concerns, responsibility issues – are basically the same as the ones related to “non-enhanced” memory.

Conclusion

To conclude, I would like to say that, if there is one thing that should always be remembered about human enhancement, and even more so regarding memory enhancement, is that we must be cautious in our assessments. I have defended the position that memory enhancement does not introduce radical novelty in the way memory affects human identity – at least with the current state of memory enhancement techniques. Memory enhancers do not change the way our biological memory works,

because it is mainly creatively. Neuroscience has shown beyond a doubt that memory is not a storehouse but instead a restless factory that never ceases to construct and reconstruct memories. Also, memory is and has always been external (socially and objectively), so enhancement devices also are not a substantial innovation. In the memory enhancement cases presented here, I could not find strong enough arguments to reject a responsible and autonomous use of memory enhancement. This means that memory enhancement does not raise special ethical implications. But none of these conclusions are set in stone: new scientific investigations might change our understanding of human identity and memory; new technological creations might transform our way of being in the world. In any case, philosophy shall keep thinking from and through these scientific investigations and technological creations, making sure our ethical understanding keeps pace with techno-scientific development.

Conflits d'intérêts

Aucun à déclarer

Conflicts of Interest

None to declare

Responsabilités des évaluateurs externes

Les recommandations des évaluateurs externes sont prises en considération de façon sérieuse par les éditeurs et les auteurs dans la préparation des manuscrits pour publication. Toutefois, être nommé comme évaluateurs n'indique pas nécessairement l'approbation de ce manuscrit. Les éditeurs de la [Revue canadienne de bioéthique](#) assument la responsabilité entière de l'acceptation finale et de la publication d'un article.

Peer-reviewer responsibilities

Reviewer evaluations are given serious consideration by the editors and authors in the preparation of manuscripts for publication. Nonetheless, being named as a reviewer does not necessarily denote approval of a manuscript; the editors of [Canadian Journal of Bioethics](#) take full responsibility for final acceptance and publication of an article.

Édition/Editors: Marleen Eijkholt & Aliya Afddal

Évaluation/Peer-Review: Anonymous & Anonymous

Affiliations

¹ Liberal Arts Faculty, Adolfo Ibáñez University, Chile

Correspondance / Correspondence: Marcos Alonso, marcs.alonso@gmail.com

Reçu/Received: 19 Feb 2019 **Publié/Published:** 20 Jul 2020

Les éditeurs suivent les recommandations et les procédures décrites dans le [Code of Conduct and Best Practice Guidelines for Journal Editors](#) de COPE. Plus précisément, ils travaillent pour s'assurer des plus hautes normes éthiques de la publication, y compris l'identification et la gestion des conflits d'intérêts (pour les éditeurs et pour les auteurs), la juste évaluation des manuscrits et la publication de manuscrits qui répondent aux normes d'excellence de la revue.

The editors follow the recommendations and procedures outlined in the COPE [Code of Conduct and Best Practice Guidelines for Journal Editors](#). Specifically, the editors will work to ensure the highest ethical standards of publication, including: the identification and management of conflicts of interest (for editors and for authors), the fair evaluation of manuscripts, and the publication of manuscripts that meet the journal's standards of excellence.

References

1. Squire LR. [Memory and brain systems: 1969–2009](#). The Journal of Neuroscience. 2009; 29(41):12711–12716.
2. Kourken M, Sutton J. [Memory](#). The Stanford Encyclopedia of Philosophy. Edward N. Zalta (ed.), 2017.
3. Brockmeier J. Beyond the archive: memory, narrative, and the autobiographical process. Oxford Scholarship Online. 2015. DOI: 10.1093/acprof:oso/9780199861569.001.0001
4. Schechtman M. [The truth about memory](#). Philosophical Psychology. 1994;7(1):3-18. DOI: 10.1080/09515089408573107
5. Miller MD. [What college teachers should know about memory: a perspective from cognitive psychology](#). College Teaching. 2011;59(3):117-122, DOI: 10.1080/87567555.2011.580636
6. Baddeley AD. Human memory: Theory and Practice. Boston: Allyn & Bacon; 1998.
7. Blatti S. [Animalism](#). The Stanford Encyclopedia of Philosophy, Edward N. Zalta (ed.); 2019.
8. Luria AR. The mind of a mnemonist: A little book about a vast memory. Harvard: University Press; 1987.
9. Quiroga R. The forgetting machine: memory, perception, and the “Jennifer Aniston neuron”. Dallas: BenBella Books; 2017.
10. O'Shea M. The Brain. A very short introduction. Oxford: Oxford University Press; 2005.
11. Liao SM, Sandberg A. [The normativity of memory modification](#). Neuroethics. 2008;1:85–99.
12. Erler A. [Does memory modification threaten our authenticity?](#) Neuroethics. 2010;4:235–249.
13. Levy N. [Neuroethics: ethics and the sciences of the mind](#). Philosophy Compass. 2009;4(1):69–81.
14. Bostrom N, Sandberg A. [Cognitive enhancement: Methods, ethics, regulatory challenges](#). Science and Engineering Ethics. 2009;15:311–341.
15. Spiers HJ, Bendor D. [Enhance, delete, incept: Manipulating hippocampus-dependent memories](#). Brain Research Bulletin. 2014;105:2–7.
16. Jacobs S, Tsien JZ. [Genetic overexpression of NR2B subunit enhances social recognition memory for different strains and species](#). Plos one. 2012;7(4):1-11.
17. Glannon W. [Psychopharmacological enhancement](#). Neuroethics. 2008;1:45–54.
18. Maslen H, Faulmüller N, Savulescu J. [Pharmacological cognitive enhancement - how neuroscientific research could advance ethical debate](#). Frontiers in Systems Neuroscience. 2014;8:Article 107.

19. Boniolo G. [The Ontogenesis of human identity](#). Royal Institute of Philosophy Supplement. 2005;80(56):5.
20. Heersmink R. [Distributed selves: personal identity and extended memory systems](#). Synthese. 2017;194:3135–3151. DOI 10.1007/s11229-016-1102-4
21. DeGrazia D. Human Identity and Bioethics. New York: Cambridge University Press; 2005.
22. Pitman RK, Delahanty DL. Conceptually driven pharmacologic approaches to acute trauma. CNS Spectrum. 2005;10:99–106.
23. Vaiva G, et al. [Immediate treatment with propranolol decreases posttraumatic stress disorder two months after trauma](#). Biol Psychiatry. 2003;54:947–9.
24. Greene J, Cohen J. [For the law, neuroscience changes nothing and everything](#). Philosophical Transactions of the Royal Society. B. 2004;359:1775–1785. doi:10.1098/rstb.2004.1546
25. Feldman D. Civil Liberties and Human Rights in England and Wales, Oxford University Press; 2002.
26. Weissenbacher A. [Defending Cognitive liberty in an age of moral engineering](#). Theology and Science. 2018;16(3):288-299. DOI: 10.1080/14746700.2018.1488476.
27. Bolt LLE. [True to oneself? broad and narrow ideas on authenticity in the enhancement debate](#). Theoretical Medicine and Bioethics. 2007;28:285–300.
28. Gerlai R. [Memory enhancement: the progress and our fears](#). Genes, Brain and Behavior. 2003;2:187–190.
29. Bell C, Gemmell J. Total recall: how the E-memory revolution will change everything. Dutton; 2009.
30. Sellen AJ, Whittaker S. [Beyond total capture: A constructive critique of lifelogging](#). Communications of the ACM. 2010;53(5):70–77.
31. Mayer-Schönberger V. Delete: the virtue of forgetting in the digital age. Princeton University Press; 2011.
32. Clowes R. [Thinking in the cloud: the cognitive incorporation of cloud-based technology](#). Philos. Technol. 2015;28:261–296.
33. Carr N. The shallows: how the Internet is changing the way we think, read and remember. London: Atlantic; 2010.
34. Greenfield, S. ID: the quest for identity in the 21st Century. London: Sceptre; 2008.
35. Turkle S. Alone together: why we expect more from technology and less from each other. New York: Basic; 2011.
36. Konrad A, Isaacs E, Whittaker S. [Technology-mediated memory: is technology altering our memories and interfering with well-being?](#) ACM Transactions on Computer-Human Interaction. 2016;23(4):Article 23.
37. Sas C, Whittaker S. [Design for forgetting: disposing of digital possessions after a breakup](#). Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, Paris, France. ACM. 2013.1823–1832.
38. Walker WR, Skowronski JJ, Thompson CP. [Life is pleasant—and memory helps to keep it that way!](#) Rev. Gen. Psychol. 2003;7:203–210.
39. Mitchell TR, Thompson L, Peterson E, Cronk R. [Temporal adjustments in the evaluation of events: The “rosy view”](#). J. Exp. Soc. Psychol. 1997;33:421–448.
40. Walker WR, Skowronski JJ. [The fading affect bias: But what the hell is it for?](#) Appl. Cogn. Psychol. 2009;23:1122–1136.
41. Campbell RS, Pennebaker JW. [The secret life of pronouns: Flexibility in writing style and physical health](#). Psychol. Sci. 2003;14:60–65.
42. Heersmink R. [The narrative self, distributed memory, and evocative objects](#). Philos Stud. 2018;175:1829–1849.
43. Levy N. Neuroethics: Challenges for the 21st Century. Cambridge: Cambridge University Press; 2007.