# Freedom of thinking and neurotechnology: ensuring free thought in the age of brain-computer interfaces

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# 1 Introduction

## 1.1 Introduction

Our world is turning into a real-life depiction of what for a long time only existed in science fiction books. Smartphones allow us to access vast amounts of information from any serviced location at a moment's notice. We can communicate with almost anyone, anywhere, at any time. Advances in robotics and artificial intelligence gradually blur the line between man and machine. And with brain-computer interface technology, we have found means through which to read, enhance and alter the human mind accurately and effectively, without having to rely on pharmacological tinkering or psychosurgery.[1]

### *1.1.1 Brain-computer interfaces*

Brain-computer interfaces (hereafter: BCI) are being developed at an exponentially increasing rate.[2] On a general level, a BCI can be defined as "a system that measures central nervous system (CNS) activity and converts it into artificial output that replaces, restores, enhances, supplements, [informs], or improves natural CNS output and thereby changes the ongoing interactions between the CNS and its external or internal environment."[3] For example, for those who have lost limbs, a BCI can measure CNS activity and translate it into output to control a prosthetic. Many prominent names in the tech-industry are currently developing technology that aims to create such a man-machine symbiote, among which are Elon Musk (Neuralink) and Meta (Reality Labs).[4]

The technology is being tested for numerous medical purposes, like restoration of lost motor function, reduction of cognitive decline in the elderly and restoration of senses.[5] BCIs still very much operate in the experimental sphere; studies are being conducted at large and

[1] PR Roelfsema, D Denys and PC Klink, 'Mind Reading and Writing: The Future of Neurotechnology' (2018) 22 Trends in Cognitive Sciences 598.

[2] JJ Daly and JE Huggins, 'Brain-Computer Interface: Current and Emerging Rehabilitation Applications' (2015) 96 Archives of Physical Medicine and Rehabilitation S1.

[3] J Wolpaw and E Winter Wolpaw, 'Brain–Computer Interfaces: Something New under the Sun' in J Wolpaw and E Winter Wolpaw (eds), *Brain–Computer Interfaces: Principles and Practice* (Oxford University Press 2012).

[4] S Mitrasinovic and others, 'Silicon Valley New Focus on Brain Computer Interface: Hype or Hope for New Applications?' (2018) 7 F1000Research 1327.

[5] SN Abdulkader, Ayman Atia and Mostafa-Sami M Mostafa, 'Brain Computer Interfacing: Applications and Challenges' (2015) 16 Egyptian Informatics Journal 213; PD Ganzer and others, 'Restoring the Sense of Touch Using a Sensorimotor Demultiplexing Neural Interface' (2020) 181 Cell 763; AN Belkacem and others, 'Brain Computer Interfaces for Improving the Quality of Life of Older Adults and Elderly Patients' (2020) 14 Frontiers in Neuroscience 692.

some patients are using BCIs to assist them in movement or communication, but the use of BCIs is not standard practice in the clinical setting yet.[6] Developers have also begun considering novel applications of BCIs for non-medical purposes. In the future, we may be able to control smart home applications with our minds[7] and deploy BCIs in warfare, allowing soldiers to operate heavy machinery or drone swarms with nothing but their thoughts.[8] Extensive research is also being conducted into the enhancement of cognitive functioning in individuals above what is considered normal human functioning.[9] These developments are still in their infancy, and it will be quite some time before these technologies become entrenched in our society. However, developments in neurotechnology do suggest that BCIs will in fact become part of standard practice, just as other neurotechnologies are becoming ever more engrained in civilization. For example, the adoption of deep brain stimulation (or: DBS) – a different form of neurostimulation through electrical currents – has skyrocketed over the last few years. By 2019, DBS had been used as a therapeutic tool on over 160,000 patients worldwide.[10]

BCIs can present both great opportunity and legal and ethical conflict. As argued, BCIs may be used as viable treatment option to rehabilitate patients suffering from neurological damage, for example by restoring lost senses.[11] This would constitute an increase in autonomy, an integral part of the fundamental rights to freedom of thought and privacy, which we will return to later. On the other hand, the overall desirability of cognitive enhancement can be called into question, in part due to issues relating to equality of access and safety. A BCI that must be implanted through surgical means can pose serious health risks to the user and BCIs could produce long-term negative side-effects on the brain through the stimulation exercised.[12] Moreover, it is argued that enhancement-BCIs should be equally accessible across locations and demographics, in order to prevent defying the natural equality of all human beings. That equality is also protected under article 14 of the European Convention on Human Rights

[6] JJ Shih, DJ Krusienski and JR Wolpaw, 'Brain-Computer Interfaces in Medicine' (2012) 87 Mayo Clinic Proceedings 268.
[7] WT Lee and others, 'A Brain Computer Interface for Smart Home Control', *2013 IEEE International Symposium on Consumer Electronics (ISCE)* (IEEE 2013).
[8] IS Kotchetkov and others, 'Brain-Computer Interfaces: Military, Neurosurgical, and Ethical Perspective' (2010) 28 Neurosurgical Focus E25.
[9] J Van Erp, F Lotte and M Tangermann, 'Brain-Computer Interfaces: Beyond Medical Applications' (2012) 45 Computer 26; Kotchetkov and others (n 8); C Cinel, Davide Valeriani and Riccardo Poli, 'Neurotechnologies for Human Cognitive Augmentation: Current State of the Art and Future Prospects' (2019) 13 Frontiers in Human Neuroscience 13.
[10] AM Lozano and N Lipsman, 'Probing and Regulating Dysfunctional Circuits Using Deep Brain Stimulation' (2013) 77 Neuron 406.
[11] Ganzer and others (n 5).
[12] S Burwell, Matthew Sample and Eric Racine, 'Ethical Aspects of Brain Computer Interfaces: A Scoping Review' (2017) 18 BMC Medical Ethics 60.

(hereafter: ECHR): the prohibition on discrimination. It should be noted that article 14 ECHR constitutes a positive obligation on states to prevent, stop or punish discrimination.[13] A hypothetical advantage of enhanced over non-advanced could easily spiral into discrimination, as the privileged will be able to enjoy the spoils of cognitive enhancement while the impoverished are left dependent on the – by then subpar – functioning of their 'original' brain.[14] Such a fate may equally be imposed on those who choose not to use BCI-technology for ethical, religious, moral or other personal reasons. This sketched division between enhanced and non-enhanced may lead to individuals feeling socially pressured or coerced to be subjected to BCIs against their will, in order to keep up with the status quo and remain a functioning member of society.[15]

Moreover, it can be difficult to clearly distinguish treatment from enhancement. Cognitive enhancement can be defined as improving one's cognition to a state that is 'better' than normal, whereas treatment aims at restoring a person to a healthy state after being struck by illness, disease or other impairments. But even within those definitions, questions arise. What is considered 'normal' differs greatly across time, cultures, and demographics.[16] If a genius suffers head trauma and his cognition is brought down to the average level, would implanting a BCI be a therapeutic or enhancing procedure? Several issues may come up if we cannot confidently answer such questions, including safety risks. The use of certain tools may be deemed safe for therapeutic purposes, but not (yet) for enhancement purposes.[17] For example, a drug like Ritalin is safe to use for patients suffering from attentional disorders. The same drug is not necessarily deemed safe as a cognitive enhancer, in part because not enough research has been conducted on the drug's use for this purpose and because there is less to no control over dosage and frequency. It stands to reason that BCIs deployed in a therapeutic environment are subject to more stringent safety norms and testing. The distinction between treatment and enhancement is important to make because of the fact that certain therapies may be covered by healthcare plans, whereas enhancements may not. Equally, public funding is

[13] European Court of Human Rights, 'Guide on Article 14 of the European Convention on Human Rights and on Article 1 of Protocol No. 12 to the Convention' (Council of Europe/European Court of Human Rights 2021).
[14] Burwell, Sample and Racine (n 12); RJ Vlek and others, 'Ethical Issues in Brain–Computer Interface Research, Development, and Dissemination' (2012) 36 Journal of Neurologic Physical Therapy 94; G Tamburrini, 'Brain to Computer Communication: Ethical Perspectives on Interaction Models' (2009) 2 Neuroethics 137; Committee on Legal Affairs and Human Rights, 'The Brain-Computer Interface: New Rights or New Threats to Fundamental Freedoms?' (Council of Europe 2020) Doc. 15147.
[15] S Goering and others, 'Recommendations for Responsible Development and Application of Neurotechnologies' [2021] Neuroethics.
[16] ibid.
[17] A Erler, 'The Limits of the Treatment-Enhancement Distinction as a Guide to Public Policy' (2017) 31 Bioethics 608.

primarily allocated to treatment, not enhancement.[18] Finally, on a societal note, we can identify a threshold where we as a people are obligated to, supported by public funds, provide medical intervention for people who need them for significant medical or personal interests, but not merely to satisfy preference, taste or luxury.[19] Solidarity is expected when a burn-victim is to have plastic surgery in order to feel more like themselves again, but not necessarily when a care-free individual is somewhat dissatisfied with the shape of their nose.

BCIs may pose a significant challenge to human rights law. In addition to the previously mentioned concerns of safety, justice and fairness, the literature has defined more legal issues at the forefront of BCI-development, concerning privacy, non-discrimination and the protection against self-incrimination.[20] Additionally, there are serious concerns that BCIs will put at risk our ability to think and reason freely; the technology opens the door to surveillance and manipulation of consciousness, because its functioning is dependent on direct access to our thinking mind. This is what this thesis will focus on. This direction is chosen, because our ability to think freely is the cornerstone upon which almost all other freedoms are built.[21] We are unable to enjoy freedoms of privacy, non-discrimination or protection against self-incrimination, if our thoughts are not our own. There is no human right that is not in some way or another involved with, influenced by or dependent on our ability to think freely. Freedom of thought is an essential requirement for democratic society to function.[22] For the purpose of this thesis, the scope will be narrowed to the human rights law framework provided by the European Convention on Human Rights (hereafter: ECHR) that the 47 Member States of the Council of Europe have ratified and deemed to be fundamental.

### *1.1.2 Freedom of thought*

The right to freedom of thought is perceived to be of great importance, considered one of the foundations of our democratic society and adopted in almost every human rights treaty.[23] In the ECHR the right to freedom of thought can be found in article 9. The article reads:

1. Everyone has the right to freedom of thought, conscience and religion; this right includes freedom to change his religion or belief and freedom, either alone or in community with

[18] ibid.
[19] ibid.
[20] Committee on Legal Affairs and Human Rights (n 14).
[21] *Palko v Connecticut* [1937] Supreme Court of the United States 302 U.S. 319.
[22] *Handyside v United Kingdom* [1976] ECtHR Application no. 5493/72.
[23] *Nolan and K v Russia* [2009] ECtHR Application no. 2512/04.

others and in public or private, to manifest his religion or belief, in worship, teaching, practice and observance.

2. Freedom to manifest one's religion or beliefs shall be subject only to such limitations as are prescribed by law and are necessary in a democratic society in the interests of public safety, for the protection of public order, health or morals, or for the protection of the rights and freedoms of others.

The right to freedom of thought as laid down in article 9 ECHR is twofold. Firstly, we can identify the freedom to hold a belief, which indicates that beliefs themselves are to be free from constraints or determination and that no-one has a right to dictate another person's beliefs. This component aims to protect the inner state and autonomy of the person, the *forum internum*. This right has been given absolute protection under the ECHR, meaning that a breach thereof cannot be justified. Secondly, the right to manifesting a belief through action – the *forum externum* – is ensured. That right is not absolute, and derogation may be justified if it is prescribed by law, serves a legitimate aim and is necessary in a democratic society.[24] For example, a Turkish law preventing women from wearing headscarves in university to protect secularism was seen as a justified violation of the freedom to manifest a belief by the European Court of Human Rights (hereafter: ECtHR).[25] Article 9 seems to emphasize religion and beliefs over thoughts through its wording. Indeed, freedom of thought under article 9 has historically been seen as a tool to protect religious, moral, political and philosophical freedoms, as opposed to freedom of *thinking* at the cognitive level. From this point onwards, 'freedom of thought' will mark the right to freedom of thought as laid down in article 9 ECHR is meant. 'Freedom of thinking' will mark the ability to reason and think free of determination and surveillance, which is thus not directly contained within article 9 ECHR.

## 1.2 Problem statement

Given the absolute protection attributed to the *forum internum* under article 9 of the ECHR, one would expect the right to freedom of thought to be a binding and effective human right. Scholars argue, however, that the *forum internum* is a hollowed-out symbol, with little practical

[24] European Court of Human Rights, 'Guide on Article 9 of the European Convention on Human Rights' (Council of Europe/European Court of Human Rights 2021); P O'Callaghan and B Shiner, 'The Right to Freedom of Thought in the European Convention on Human Rights' (2021) 8 European Journal of Comparative Law and Governance 112.
[25] *Leyla Şahin v Turkey* [2004] ECtHR Application no. 44774/98.

application in the current age, in which techniques of mind-reading, mind-intervention and mind-altering are becoming more readily available to us.[26] The right is seldom applied or invoked in court and judgements are rarely based on it. The ECtHR has only handled a small number of cases regarding freedom of thought in the 62 years since its inception, pertaining almost exclusively to religion and religious matters.[27] These cases have thus not dealt with the subject matter at the core of this thesis. This is understandable though, as freedom of thought was not conceived of with neurotechnology in mind. There is very little guidance on how the right should be interpreted and its definition may be considered ambiguous.[28] Scholars argue that freedom of thought can become an able tool to protect our cognition from pervasive neurotechnological developments, extending it beyond its original purpose.[29] Considering the fact that the ECHR should be seen as a living and breathing instrument that is to be interpreted according to current, contemporary conditions, this thesis will analyze that possibility and aims to give concrete and holistic recommendations.[30]

BCIs read and act upon mental processes, and once human consciousness becomes accessible and exploitable through technological means, by definition it will no longer be possible to conceal our thoughts and emotions. This may lead to a grave violation of privacy. One can easily see how this development may also conflict with the right to remain silent and not to incriminate oneself in criminal proceedings. Moreover, as our brains become more interwoven with the digital space and our thoughts become *directly* influenced by technology, our personal identity and autonomy become at risk. If the right to freedom of thought is not developed to include freedom of thinking, it may endanger many of the other rights and liberties that we value as a society.[31]

As we know, the right to privacy ensures respect of the private life, including the notions of personal identity and autonomy. It allows anyone to pursue the development and fulfilment of their personal identity.[32] That pursuit will be in vain if one's personal identity can be *directly* predetermined by an outside source. Naturally, our identities are constantly shaped and

[26] JC Bublitz, 'Cognitive Liberty or the International Human Right to Freedom of Thought' in J Clausen and N Levy (eds), *Handbook of Neuroethics* (Springer Netherlands 2015).
[27] JC Bublitz, 'If Man's True Palace Is His Mind, What Is Its Adequate Protection? On a Right to Mental Self-Determination and Limits of Interventions into Other Minds' in B Van den Berg and L Klaming (eds), *Technologies on the stand: legal and ethical questions in neuroscience and robotics* (Wolf [u.a] 2011).
[28] S McCarthy-Jones, 'The Autonomous Mind: The Right to Freedom of Thought in the Twenty-First Century' (2019) 2 Frontiers in Artificial Intelligence 19.
[29] ibid.
[30] *Tyrer v UK* [1978] ECtHR Application no. 5856/72.
[31] Burwell, Sample and Racine (n 12).3/26/2022 10:09:00 AM
[32] *Chrstine Goodwin v UK* [2002] ECtHR Application no. 28957/95.

reshaped by our experience, but – without direct mind manipulation – we as individuals remain in ultimate control of how we act on and engage with the world. Moreover, the right to privacy is concerned with the access to and extraction of information from one's private life, possibly including one's thoughts. But the conceivable intrusiveness of BCIs extends well beyond that. Freedom of thinking is so crucially important because it touches upon all the facets of the conscious process that may be influenced by BCIs. The absolute protection of the *forum internum* includes the right not to reveal one's beliefs, not to have one's beliefs controlled and the right not to be criminalized for one's beliefs.[33] This absolute protection of beliefs does not analogously apply to all thoughts, though, and therefore does not necessarily include freedom of thinking.

The right to freedom of thought may need to be revitalized as to be fit for (a different) purpose in the modern world. This thesis aims to assess if and why the right to freedom of thought has lost any of its practical value in the modern age. It will assess the risks that BCIs pose to freedom of thinking. In the end, it will give recommendations – if found to be necessary – as to how the right to freedom of thought may be given new meaning.

## 1.3 Research questions

The main research question to which an answer will be sought is:

To what degree is article 9 of the ECHR equipped to deal with the potential legal and ethical risks associated with brain-computer interfaces, and how may further protection be provided in this context?

The right to freedom of thought will be thoroughly scrutinized, its current application contrasted against its historical context and meaning and its potential shortcomings in the ability to govern BCIs be laid bare. Then, recommendations will be given how to attribute new purpose and application to the right to freedom of thought. The answer to the main research question will be found by answering the following sub-questions:

[33] BP Vermeulen, 'Freedom of Thought, Conscience and Religion (Article 9)' in P Van Dijk and others (eds), *Theory and Practice of the European Convention on Human Rights* (4th edn, Intersentia 2006).

- What are the legal and ethical issues associated with brain-computer interfaces?
- How is the right to freedom of thought as laid down in article 9 ECHR valued and applied and how does it relate to other fundamental human rights?
- To what extent are BCIs' legal and ethical issues addressed by the right to freedom of thought?
- How could the right to freedom of thought be *reinterpreted, extended or amended* as to be able to effectively protect against the legal and ethical issues associated with brain-computer interfaces?

## 1.4 Literature review

There seems to be general consensus in academic literature that BCIs, given their nature and applications, have the potential to threaten rights and values embedded in our democratic society. Risks worth mentioning here are those to privacy, non-discrimination, dignity, fairness, safety and freedom of thought, -conscience, -religion and -expression.[34] Additionally, authoritative scholars seem to agree that the right to freedom of thought is currently not applied to safeguard freedom of thinking in light of the technological developments that allow direct access to consciousness.[35]

The literature therefore seems to accept that the right to freedom of thought in its current state is insufficiently able to protect one's cognition from the undue invasiveness of BCIs. We can identify a gap in the research that has been conducted until now, however. Whereas authors seem to agree that the disconnect exists, they do not reach consensus on a viable, concrete and practical solution to protect freedom of thinking. Different alternatives are offered throughout existing literature, such as the implementation of new human rights or the rephrasing and reinterpretation of the existing right to freedom of thought, but these options do not constitute a holistic solution, nor is there consensus in literature on the preferred approach.[36] For example,

[34] For example, see: Committee on Legal Affairs and Human Rights (n 14); T Bonaci, Ryan Calo and Howard Jay Chizeck, 'App Stores for the Brain: Privacy & Security in Brain-Computer Interfaces', *2014 IEEE International Symposium on Ethics in Science, Technology and Engineering* (IEEE 2014); Burwell, Sample and Racine (n 12); A Krausová, 'Legal Aspects of Brain-Computer Interfaces' (2014) 2 *Masaryk University Journal of Law and Technology*.

[35] For example, see: Bublitz, 'Cognitive Liberty or the International Human Right to Freedom of Thought' (n 26); McCarthy-Jones (n 28); JC Bublitz, 'My Mind Is Mine!? Cognitive Liberty as a Legal Concept' in E Hildt and AG Franke (eds), *Cognitive Enhancement*, vol 1 (Springer Netherlands 2013); MJ Blitz, 'Freedom Of Thought For The Extended Mind: Cognitive Enhancement And The Constitution' [2010] *Winsconsin Law Review*.

[36] For example, see: M Ienca and R Andorno, 'Towards New Human Rights in the Age of Neuroscience and Neurotechnology' (2017) 13 Life Sciences, Society and Policy 5; W Sententia, 'Neuroethical Considerations: Cognitive Liberty and Converging Technologies for Improving Human Cognition' (2006) 1013 Annals of the

calls are uttered that freedom of thought's scope of applicability should be extended, but no insight is given into what it should subsequently entail. Furthermore, many authors approach this problem rather one-sidedly, offering isolated recommendations. That is unfitting given the complexity of the issue at hand, which requires an equally broad approach. This thesis will therefore explore and bring together these different views to try and pinpoint how, *concretely*, the ECHR's legal framework for freedom of thought may, or may not, be changed in order to cope with the development and deployment of BCI-technology, taking a multi-faceted approach.

## 1.5 Methodology and scope

The research will primarily consist of doctrinal research of existing legislation – including but not limited to the ECHR – and case law relevant to the topic at hand. The historical application of freedom of thought will also be examined. This research will be supported by an extensive literature study into the right to freedom of thought and its current value and applicability. The literature study will also serve to illuminate threats posed by the development and expected deployment of BCIs in society. In the end, options offered by scholars to resolve the problem at the core of this thesis will be assessed, weighed and compared. This will allow concrete recommendations to be given in the concluding parts of the thesis.

The research will focus on the right to freedom of thought as laid down in the ECHR. The scope will thus be limited to the jurisdiction of the Council of Europe. To further narrow down the scope of the research, the development of BCIs specifically will be explored, though other advances in neurotechnology will be looked at to further the discussion on freedom of thought.

## 1.6 Structure

The thesis will adhere to the following structure.

*Chapter 2*

Chapter 2 will illustrate the development and state-of-the-art of BCIs and the legal and ethical issues associated therewith, both in general and specifically related to the right to freedom of thinking. Different forms and applications of BCIs will be explored here.

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New York Academy of Sciences 221; Bublitz, 'My Mind Is Mine!?' (n 35); McCarthy-Jones (n 28); Bublitz, 'Cognitive Liberty or the International Human Right to Freedom of Thought' (n 26).

*Chapter 3*

Chapter 3 will give insight into the historical development of freedom of thought and try to assess the scope of applicability of the right to freedom of thought. Additionally, the right to freedom of thought will be contextualized amidst other fundamental human rights laid down in the ECHR, like the right to privacy. The chapter will simultaneously give insight into the current status of the right to freedom of thought. This will show if and why the right to freedom of thought is not an able tool to protect freedom of thinking.

*Chapter 4*

Chapter 4 will give concrete and practical recommendations for revitalizing the right to freedom of thought in light of the risks associated with BCIs.

*Conclusion*

The conclusion will summarize the findings and give a concise answer to the main research question that is given in the introductory chapter. No new elements will be presented here.

## 1.7 Conclusion

This chapter has laid the groundwork for the research to follow. We have identified the problem that this thesis will try to solve: whether and how to revitalize the right to freedom of thought under article 9 ECHR, in order to offer adequate protection against the potential risks posed by BCIs. In order to systematically solve that problem, the concept of BCIs will have to be defined further, after which the legal and ethical risks associated with this technology can be demonstrated. Therefore, chapter 2 will give clarity on the development, state-of-the-art and modes of application of BCI-technology and provide an overview of some of the dangers inherent to this technology.

# 2 State-of-the-art and associated risks

## 2.1 Introduction

According to Tan and Nijholt, the evolution of any technology can be divided into three distinct phases. The first phase - the proof-of-concept phase - showcases the basic functionality of a technology. In the second phase - the emulation phase - the new technology is used to imitate already existing technologies and applications. In the final phase, the new technology matures and finds its own purpose and right of existence.[37]

This chapter will answer where on the continuum sketched above BCIs currently reside. It will give insight into the historical development and state-of-the-art of BCIs, to illustrate how far along this technology is and how quickly we should expect its widespread adoption into society. Afterwards, an exploration will follow on the legal and ethical risks associated with BCIs that are expected to materialize in the future, or are already looming. This will also include implications of BCI-usage for freedom of thinking.

## 2.2 Development of BCIs

The development of BCIs originates in the 1960s. The scientific discovery of reading and interpreting brain waves dates back even further. One of the technologies that allows us to perceive neural activity with clarity is called electroencephalography (hereafter: EEG) and dates back to the 1920s. Measuring electrical currents in the brain allows us to objectively measure brain activity. It lets us study cognitive functioning and is used to diagnose many neurological disorders.[38] Whereas EEG-technology is only able to measure brain activity, most BCIs subsequently interpret the recorded data to generate additional artificial neural activity to supplement or replace that of the user.

Research into BCI-precursors emerged in the 1960s and 1970s. Initially, experiments using EEG were aimed at neurofeedback techniques.[39] Subjects' brain activity would be fed back to them, through auditory and visual feedback. This would allow subjects to see directly what effect certain thoughts and actions had on their brain activity, allowing them – with enough

[37] Desney Tan and Anton Nijholt, 'Brain-Computer Interfaces and Human-Computer Interaction' in Desney S Tan and Anton Nijholt (eds), *Brain-Computer Interfaces* (Springer London 2010).
[38] Mayo Foundation for Medical Education and Research, 'EEG (Electroencephalogram)' <https://www.mayoclinic.org/tests-procedures/eeg/about/pac-20393875> accessed 31 October 2021.
[39] MA Lebedev and MAL Nicolelis, 'Brain–Machine Interfaces: Past, Present and Future' (2006) 29 Trends in Neurosciences 536.

training – to influence their own brain waves. This research paved the way for the development of EEG-based BCIs not long thereafter.[40]

Around the turn of the century, researchers were able to translate neurological data into movement of physical devices for the first time. Chapin and colleagues recorded the neural activity of rats and used the data to control a robotic device.[41] Wessberg and colleagues reproduced the experiment with primates shortly after.[42] By 2003, technology allowed the reproduction of reaching and grasping movements (characteristic of primates) in a prosthetic controlled by neurological data.[43]

The term 'brain-computer interface' was first coined by Vidal, who used it to define technology that could translate brain signals into input for external devices like computers and prostheses.[44] That definition may no longer convey the complexity and breadth of BCI-research being conducted nowadays. The plethora of BCI-applications will be touched upon in the following section. Many of these devices still deploy EEG-technology, but the scope of BCI-research has been greatly expanded.

## 2.3 State-of-the-art of BCIs

Whereas BCI-development began as an exploration into computer-assisted movement and communication, BCIs nowadays are being tested for a much wider range of purposes. For these different purposes, different classifications of BCIs can be identified too. The following section will first distinguish different types of BCIs, after which some of the most unique BCI applications under development will be discussed.

### *2.3.1 Different types of BCIs*

A first distinction can be made between invasive and non-invasive BCIs. Invasive BCIs have to be implanted into the brain through a surgical procedure and allow for a wider frequency range, higher resolution and better quality of neural signals.[45] Naturally, this type of BCI carries

[40] ibid.
[41] JK Chapin and others, 'Real-Time Control of a Robot Arm Using Simultaneously Recorded Neurons in the Motor Cortex' (1999) 2 Nature Neuroscience 664.
[42] J Wessberg and others, 'Real-Time Prediction of Hand Trajectory by Ensembles of Cortical Neurons in Primates' (2000) 408 Nature 361.
[43] JM Carmena and others, 'Learning to Control a Brain–Machine Interface for Reaching and Grasping by Primates' (2003) 1 PLoS Biology e42.
[44] JJ Vidal, 'Toward Direct Brain-Computer Communication' (1973) 2 Annual Review of Biophysics and Bioengineering 157.
[45] JN Mak and JR Wolpaw, 'Clinical Applications of Brain-Computer Interfaces: Current State and Future Prospects' (2009) 2 IEEE Reviews in Biomedical Engineering 187.

risks, as no surgical procedure is without its dangers. Non-invasive BCIs record EEG signals from the surface of the head and can therefore be used on any subject with greater ease and with minimal physical risks. The downside is that the signals recorded are of worse quality and limited bandwidth. This may result in a higher error rate.[46] Generally, invasive techniques are used for allowing precise motor control, whereas non-invasive techniques can be used for purposes like simple communication and cursor control.[47]

BCIs can further be classified as either active, passive or both. Active BCIs contribute to those purposes already mentioned, primarily motor control and communication. Passive BCIs are used for monitoring the neural state of the user. Passive BCIs extract information from the brain, specifically its view on internal and external context. Those include the direct environment, transpiring events, moods and emotions. They may also measure cognitive load and attention level.[48] This allows the technology to generate a model of the user's cognition, to which a machine can then adapt itself without requiring active input from the user or an external controller.[49] A BCI can include both active and passive components, to allow for optimal collaboration between man and machine.

BCIs are developed for varying fields of application, including: medical, neuroergonomics and smart environment, neuromarketing and advertisement, educations and self-regulation, games and entertainment and security and authentication.[50] The following subsection will give examples for some of the applications mentioned.

### *2.3.2 Examples of applications*

A selection of the most promising BCI-applications will be highlighted here, focusing on those displaying the most practical promise or technical novelty. This will display the possible merit of this technology, which can subsequently be contrasted against associated legal and ethical risks. Moreover, it will exemplify the time-frame within which we may expect BCI-adoption in society, illustrating a degree of urgency in determining if and what regulation is necessary.

One of the most important research endeavors currently being conducted is the therapeutic application of BCIs. Within that field, we can identify different modalities, like

[46] N Birbaumer, 'Brain–Computer-Interface Research: Coming of Age' (2006) 117 Clinical Neurophysiology 479.
[47] Lebedev and Nicolelis (n 39).
[48] M Alimardani and K Hiraki, 'Passive Brain-Computer Interfaces for Enhanced Human-Robot Interaction' (2020) 7 Frontiers in Robotics and AI 125.
[49] Jane E Huggins and others, 'Workshops of the Sixth International Brain–Computer Interface Meeting: Brain–Computer Interfaces Past, Present, and Future' (2017) 4 Brain-Computer Interfaces 3.
[50] Abdulkader, Atia and Mostafa (n 5).

preventive, therapeutic and diagnostic tools. An example of a therapeutic application is the treatment of patients post-stroke. A stroke can have many detrimental effects, including lost motor-, sensory-, communicative- and cognitive- functions.[51] BCIs may be used to relieve these consequences. Motor functioning can be restored through a BCI that controls prosthetic limbs. Communicative functioning may be aided as well, as a BCI is able to translate neural activity into speech for patients who are no longer able to communicate themselves.[52] These applications are already being used sparingly in clinical trials.[53] At the same time these devices can provide feedback about the ongoing brain changes associated with their use, thus displaying an active and passive component. Thereby they fulfill two roles: rehabilitation and monitoring. The same techniques are being tested for treating Parkinson's and psychiatric disorders.[54]

BCIs may also be useful for treating neurodevelopmental disorders in children. For example, BCI-based games intended for attentional training have shown to relieve, to a degree, inattentive and hyperactive-impulse symptoms in ADHD-patients. [55] BCIs have equally been shown to allow those suffering from neurodegenerative diseases greater quality of life, akin to how they assist those who have suffered stroke.[56] BCIs are particularly promising for people suffering from conditions that interfere with consciousness, like late-stage ALS patients. These people show cognitive awareness when their brain activity is measured, but have no way to reliably communicate to the physical world. BCIs can utilize these measured brainwaves to allow them to still communicate. BCIs may offer the only opportunity for these people to physically demonstrate that they are in fact still aware.[57] There are studies that show BCIs as being a potent tool in tackling addiction, allowing addicts greater control over craving through neurofeedback, leading to periods of sustained abstinence.[58] As a diagnostic tool, BCIs can be used to forecast brain tumors, seizures and epileptic attacks.[59] Many of the applications mentioned above are promising and their uptake is expected to increase in the coming years, while at present they remain used almost exclusively within the context of clinical trials.

[51] S Yang and others, 'Exploring the Use of Brain-Computer Interfaces in Stroke Neurorehabilitation' (2021) 2021 BioMed Research International 1.
[52] ibid.
[53] ibid.
[54] JE Huggins and others, 'Workshops of the Sixth International Brain–Computer Interface Meeting: Brain–Computer Interfaces Past, Present, and Future' (2017) 4 Brain-Computer Interfaces 3.
[55] CG Lim and others, 'A Brain-Computer Interface Based Attention Training Program for Treating Attention Deficit Hyperactivity Disorder' (2012) 7 PLoS ONE e46692.
[56] Belkacem and others (n 5).
[57] Daly and Huggins (n 2).
[58] F Dehghani-Arani, R Rostami and H Nadali, 'Neurofeedback Training for Opiate Addiction: Improvement of Mental Health and Craving' (2013) 38 Applied Psychophysiology and Biofeedback 133.
[59] SK Mudgal and others, 'Brain Computer Interface Advancement in Neurosciences: Applications and Issues' (2020) 20 Interdisciplinary Neurosurgery 100694.

BCIs are not only being developed for the ill or disabled, though. For example, classic video game features are being merged with BCI-technology. By users imagining movements while attached to a BCI, they can make the game respond. For instance, engineers have developed a game called Brain Invaders, based on the classic video game Space Invaders. The player is instructed to destroy invading aliens, merely by concentrating on them.[60] BCIs have also even been experimentally used to control game avatars in World of Warcraft.[61] On the passive side, a gaming-BCI could measure the player's cognitive state and thereby adjust the game's difficulty.[62]

BCIs can also be used for artistic expression, allowing users to play with animation, music and design while strapped into the machine. In a sense, this would allow artists to create art directly from their brain.[63] A striking example is the creation of BrainBrush, a BCI that allows users to paint on a blank virtual canvas through neurological activity.[64]

BCIs may furthermore be utilized for cognitive enhancement or alteration purposes. This could materialize in a number of different ways. For example, a BCI could be deployed to regulate the cognitive 'over-functioning' of highly anxious people, thereby bringing them more peace of mind. This would boil down to emotional regulation.[65] Alternatively, the technology could be used in the educational system, as BCIs may allow for better retention and recollection of memory.[66] The technique may also be used by individuals for personal gain. Any individual looking to succeed in a highly competitive corporate environment would benefit greatly from a BCI, as it may allow for improved memory, attention, situational awareness, problem solving and decision-making, all essential qualities for performance in the workplace.[67]

Returning to Tan and Nijholt's sketched continuum of technological development from the introductory paragraph, BCI-technology seems to enter the final phase of maturity. BCIs are being developed for a wide array of purposes that cannot be readily fulfilled by any other

[60] M Congedo and others, '"Brain Invaders": A Prototype of an Open-Source P300- Based Video Game Working with the OpenViBE Platform' (2011).
[61] B Van de Laar and others, 'Experiencing BCI Control in a Popular Computer Game' (2013) 5 IEEE Transactions on Computational Intelligence and AI in Games 176.
[62] Anton Nijholt, 'BCI for Games: A "State of the Art" Survey' in Scott M Stevens and Shirley J Saldamarco (eds), *Entertainment Computing - ICEC 2008*, vol 5309 (Springer Berlin Heidelberg 2008).
[63] Mirjana Prpa and Philippe Pasquier, 'Brain-Computer Interfaces in Contemporary Art: A State of the Art and Taxonomy' in Anton Nijholt (ed), *Brain Art* (Springer International Publishing 2019).
[64] B Van de Laar and others, 'BrainBrush, a multimodal application for creative expressivity' (IARIA XPS Press 2013).
[65] MM Shanechi, 'Brain–Machine Interfaces from Motor to Mood' (2019) 22 Nature Neuroscience 1554.
[66] JF Burke and others, 'Brain Computer Interface to Enhance Episodic Memory in Human Participants' (2015) 8 Frontiers in Human Neuroscience.
[67] Cinel, Valeriani and Poli (n 9); Abdulkader, Atia and Mostafa (n 5).

technology. BCIs offer novel ways in which humans collaborate with technology and may have a noticeable effect on how society develops in the coming decades.

## 2.4 Legal and ethical issues associated with BCIs

In the introduction chapter to this thesis, several legal and ethical issues associated with BCIs were briefly touched upon. The potential harm of BCIs is what spurs the ongoing debate on how we as a society should anticipate and prepare for this upcoming technology from a political, legal and societal standpoint. Some of the most pressing legal and ethical questions that bear a relation to freedom of thought will be illuminated hereafter.

### *2.4.1 Autonomy and mental self-determination*

Autonomy, part of the right to respect of the private life, constitutes the right to pursue personal identity and autonomy. It bestows on any individual the capability to act in accordance with one's mental formations and therefore involves a sense of personal agency and exercisability.[68] Mental autonomy can be defined as the ability to believe what you will, free from direct determination by outside sources.[69] An in-depth analysis of direct and indirect mind interventions follows in subsection 3.2.3. How can BCI-technology impact our autonomous behavior, both for good and for bad?

Some in society have been deprived of their sense of autonomy. Locked-in patients who have been paralyzed completely with no way of exercising their mental formations on the material world are left to the whims of those who have offered to care for them. BCIs may enable them to act autonomously again, through the control of external devices for movement and communication.[70] BCIs also pose risks to autonomy, however. There are BCIs under development that aim to function with minimal input. The user and BCI could be trained in such a way that the BCI overtakes motor functions that do not require much conscious thought. Just as we do not have to consciously think about moving our arm before doing so, a user of such a BCI would not have to consciously think about moving a prosthetic before it responds. This would allow for movement that is more akin to natural human motor functioning. This means, however, that the BCI will to a certain degree be acting of its own accord. This can be interpreted as handing over personal autonomy to the machine.

[68] K Jebari, 'Brain Machine Interface and Human Enhancement – An Ethical Review' (2013) 6 Neuroethics 617.
[69] JC Bublitz and R Merkel, 'Crimes Against Minds: On Mental Manipulations, Harms and a Human Right to Mental Self-Determination' (2014) 8 Criminal Law and Philosophy 51.
[70] Tamburrini (n 14).

BCIs likewise have the ability to increase or diminish mental autonomy, also known as mental self-determination, which is an essential component of freedom of thought, as we will see later in this thesis. Imagine a BCI-application that would be able to prevent certain mental states in the user's mind at will. The user may choose never to feel fear, depression or obsession again. This would allow them greater autonomous control, as they themselves could pick and choose what mental states would be inhibited. Practical examples include addicts whose craving for a particular substance may be greatly diminished, allowing them greater control over their life, or patients suffering from PTSD whose traumatic memories can be repressed, granting them peace.[71] However, it could also be argued that this does not actually constitute an increase in autonomy, as it presupposes a reliance on technology. If the BCI would be taken away, the subject would immediately lose the abilities provided. Then, it could be said, the autonomy was never really 'theirs' to begin with.

Moreover, the ability to induce or inhibit certain mental states may equally be used *against* subjects. The range of possibilities is endless. A sex offender may be obligated to wear a BCI that oppresses their sexual thoughts and fantasies, not too dissimilar from chemical castration, which is a practice of injecting hormonal drugs into sex offenders to reduce sexual tendencies.[72] A racist could be rid of their racist tendencies, a thief of their thieving tendencies. This is very risky ethical terrain to maneuver, as this could constitute a de-humanization of the user, if we accept that being human implies acceptance of *all* our mental states, not just the agreeable ones.

The overall desirability of the developments sketched above will be dependent on how we as a society view technology in the future, and whether or not we can accept our evolution into a species that no longer uses technology as a tool, but sees it as an inherent component of its existence.

### *2.4.2 Privacy*

Privacy is a right and principle deeply enshrined in our society, but it was not always so. Privacy originated as a right aimed to protect one's private property and physical body. This by and large changed with the seminal work "The Right to Privacy" in which Warren and Brandeis pleaded for a right to privacy to protect the private sphere of individuals, after the invention of the camera allowed reporters to intrude and publish about private events happening in

[71] Jebari (n 68).
[72] JY Lee and KS Cho, 'Chemical Castration for Sexual Offenders: Physicians' Views' (2013) 28 Journal of Korean Medical Science 171.

privileged society. Subsequently, privacy became understood as the right to be let alone.[73] The right to privacy is given pivotal importance under the ECHR, and is enshrined in article 8. Under the ECHR, the right to privacy also includes the right to data protection.[74]

The skull historically formed the most effective barrier to protect our privacy. As our society is becoming ever more subject to large scale surveillance, our privacy diminishes. One place of refuge that generally has remained private is the mind. Here, it is helpful to emphasize that mental privacy is one of several essential components of freedom of thought, alongside the aforementioned right to self-determination.[75] No one may be obligated to share the beliefs held within with the outside world, and no-one may have unauthorized access to another's internally held beliefs. Therefore, the rights to privacy and freedom of thought in unison protect our private sphere. How exactly these rights relate to each other will be analyzed in the following chapter.

BCIs are inherently designed to penetrate the mind and cognitive functioning. BCIs extract vast amounts of neurological information in order to function.[76] BCIs are unique in comparison to large-scale surveillance or other privacy-diminishing developments. Where surveillance technology provides insight into the objective day-to-day experience, BCIs allow direct access to the subjective experience of the user. This entails an invasion of privacy we have not seen before.[77] Moreover, use of BCI-technology for one specific purpose may coincidentally yield information irrelevant to that purpose, but still greatly privacy invasive.[78] BCIs may be able to reveal an individual's psychological traits and thoughts about people around them, which may greatly impair them in their day-to-day life.[79] Imperative in this regard is the role that developers of BCIs, such as Meta, play.

Meta is one of several large commercial organizations currently developing BCI-technology. Meta has communicated that it will not access our full thought spectrum using this technology, but only those thoughts that we would wish to assert. It is difficult to conceive that access to thoughts would not be exploited by Meta, who thrive on the data they collect from their customers. For them to access the subjective experience would present them with an

[73] SD Warren and LD Brandeis, 'The Right to Privacy' (1890) 4 Harvard Law Review.
[74] European Court of Human Rights, 'Guide on Article 8 of the European Convention on Human Rights' (Council of Europe/European Court of Human Rights 2021).
[75] Vermeulen (n 33).
[76] P McCullagh and others, 'Ethical Challenges Associated with the Development and Deployment of Brain Computer Interface Technology' (2014) 7 Neuroethics 109.
[77] Jebari (n 68).
[78] ML Eaton and J Illes, 'Commercializing Cognitive Neurotechnology—the Ethical Terrain' (2007) 25 Nature Biotechnology 393.
[79] E Klein and others, 'Engineering the Brain: Ethical Issues and the Introduction of Neural Devices' (2015) 45 Hastings Center Report 26.

invaluable advantage. It is not unthinkable that this prospect incentivizes companies to go beyond their mandate.[80] Furthermore, a BCI may be capable of extracting information without the user's awareness or consent, so the user has no way of knowing whether the mandate is respected.[81] It is altogether difficult to distinguish thoughts that are necessary for the technology to function from those that are not. Similarly, we may assert thoughts without fully realizing the extent to which our privacy is (or is not) protected.

Let us briefly consider a futuristic worldview, in which BCIs have become the norm. BCIs are used by everyone, to assist in even the most mundane of tasks. Who should have access to the information extracted by the BCI? BCIs could make our deepest intentions, desires and wishes public property, which in light of Warren and Brandeis's right to be left alone seems undesirable. Should employers, judges, lawyers and police officers have direct access to our inner refuge?[82] While this may seem a far-fetched notion, widespread adoption of BCIs in all layers of society is not. How we approach its dissemination is crucial, as the possible threats to privacy strikingly show.

### *2.4.3 Enhancement, treatment, societal issues*

One of the most cited intended purposes for BCI technology is to restore the mental and physical functioning of impaired people back to what is 'normal'. This notion in and of itself brings about a wide range of ethical and societal complications.

First of all, there can inherently be no consensus on what is to be considered normal functioning, as that is a subjective notion and dependent on societal, cultural and historical factors.[83] As an analogous example, consider people in the deaf community. Many do not rely on cochlear implants, because they feel that they are not in any way less than other people. They identify with their predicament and with the deaf community at large. Their deafness, they feel, is not an issue to be fixed.[84] A disabled person may not see itself as abnormal or less than others, so should a BCI used as assistive technology be seen as treatment or enhancement? The distinction is of importance because whether something will be deemed a treatment or an enhancement will influence whether or not one will have access to it under health insurance policies and whether or not funding will be allocated to it. The less-to-do people in our society

[80] S Alegre, 'Rethinking Freedom of Thought for the 21st Century' [2017] European Human Rights Law Review 221.
[81] Burwell, Sample and Racine (n 12).
[82] Jebari (n 68); MJ Farah and PR Wolpe, 'Monitoring and Manipulating Brain Function: New Neuroscience Technologies and Their Ethical Implications' (2004) 34 The Hastings Center Report 35; Eaton and Illes (n 78).
[83] Klein and others (n 79).
[84] J Clausen, 'Man, Machine and in Between' (2009) 457 Nature 1080.

may be unable to utilize this technology to its full potential. In essence then, only the rich may be able to afford brain-enhancing BCI-technology. This could further exacerbate the existing gap between the rich and the poor, as the rich will be able to seize more opportunities due to their enhanced state, whereas the non-enhanced and poor are given less prospect to compete in society. This may polarize communities and generate hostility across demographics.[85] The right to mental self-determination, being the right to autonomously decide one's own mental capacities, may become at risk here, as one may be excluded from using BCIs if they are not readily accessible. Drawing a line between enhancement and treatment generates additional ethical challenges. Stigmatization of disabled people may be exacerbated if we accept the use of BCI as treatment, as it would reinforce the idea that something is 'wrong' with anyone using the technology.

The existence of enhancement possibilities may also shift societal values. As more and more people become enhanced, pressure on those who have not undergone enhancement will increase. It may lead to a paradigm in which one will no longer be regarded a functioning member of society without enhancement. Employers may only wish to hire people who utilize BCI-enhancement and the school system may have to treat enhanced children differently from the non-enhanced.[86] This might move individuals to adopt an enhancement, not because they really desire to, but because they feel the pressure of their supervisors or peers, analogous to athletes who have felt the need to use performance enhancing drugs to keep up with the competition. Again, the right to mental self-determination might suffer in this case. It can be argued that the practice of enhancement undermines the inherent equality and dignity that is be attributed to all human beings.[87] It opens the door for discriminatory practices against the non-enhanced.[88] This goes hand in hand with issues of access, as enhancement may only be available to the well-to-do. This will be explored more in depth in subp 4.5.

Whether enhancement, through whichever means – pharmacological, neurological or otherwise – is ultimately desirable, presupposing equal access for all, is a question that cannot be thoroughly answered within the scope of this thesis. We know that in some industries, self-enhancement is to a great degree disallowed, like in professional sports. Contrastingly, in other areas, such as academic performance, a similar prohibition – for example on Adderall – is

[85] Committee on Legal Affairs and Human Rights (n 14).
[86] MJ Farah and others, 'Neurocognitive Enhancement: What Can We Do and What Should We Do?' (2004) 5 Nature Reviews Neuroscience 421.
[87] N Bostrom, 'IN DEFENSE OF POSTHUMAN DIGNITY' (2005) 19 Bioethics 202.
[88] R Yuste and others, 'Four Ethical Priorities for Neurotechnologies and AI' (2017) 551 Nature 159.

missing.[89] The development of BCI-technology will be equally interesting to the aforementioned industries. It stands to reason that any such enhancement will be banned in the sporting industry, but it appears more difficult to prohibit students from using a BCI when studying for a test. This thesis will not consider the overall desirability of enhancement any further.

### *2.4.4 Safety and security*

It is crucial to briefly mention the issues surrounding the safety and security of BCIs. As previously mentioned, the implementation of an invasive BCI would require a surgical procedure. Surgical procedures into the brain are risky procedures and many complications may arise during an operation.[90] Also, because there is no widespread BCI-dissemination throughout society yet, there is no reliable data showing the effect of BCIs on the brain long-term. Scientists argue that there is a potential for implants to damage neural tissue if they stay within the skull for a long time. Even non-invasive BCIs may cause harm to our cognition if used over long stretches of time, especially when used on the developing brains of minors.[91] This may hypothetically, irreversibly distort our freedom of thinking.

Furthermore, the mental privacy of the brain and the safety of the user can be greatly impaired if BCIs lack proper security. It has been argued that BCI-technologies in their current state do not offer adequate security protocols and are therefore susceptible to cyberattacks. These could range from attacks to extract or decrypt information, to attacks that aim to disable the BCI or parts of its functioning, which could greatly harm the users that rely on BCIs for important medical purposes.[92] It may be possible to hijack the BCI, allowing the maleficent hacker to take over control of the BCI, essentially allowing them to take possession of part of the subject's brain.[93] States could be induced into the cognition of the user, nudging them to act a certain way without them realizing they are being controlled.[94] These attacks would cause great harm to free will, human dignity, autonomy, privacy and freedom of thought and thinking.

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[89] S Sharif and others, 'The Use and Impact of Cognitive Enhancers among University Students: A Systematic Review' (2021) 11 Brain Sciences 355.
[90] J Clausen, 'Conceptual and Ethical Issues with Brain–Hardware Interfaces': (2011) 24 Current Opinion in Psychiatry 495.
[91] Burwell, Sample and Racine (n 12).
[92] T Denning, Yoky Matsuoka and Tadayoshi Kohno, 'Neurosecurity: Security and Privacy for Neural Devices' (2009) 27 Neurosurgical Focus E7; A Agarwal and others, 'Protecting Privacy of Users in Brain-Computer Interface Applications' (2019) 27 IEEE Transactions on Neural Systems and Rehabilitation Engineering 1546.
[93] SL Bernal and others, 'Security in Brain-Computer Interfaces: State-of-the-Art, Opportunities, and Future Challenges' (2021) 54 ACM Computing Surveys 1.
[94] M Ienca and P Haselager, 'Hacking the Brain: Brain–Computer Interfacing Technology and the Ethics of Neurosecurity' (2016) 18 Ethics and Information Technology 117.

## 2.5 Conclusion

This chapter has illustrated several key things. First of all, the development of BCI-technology is diverse and offers great prospects, both in medical and non-medical applications. The technology can be of great relief to those suffering from terrible illnesses, but may just as well assist healthy individuals in their day-to-day lives. BCIs are not without risks though, and there are many things to be wary of when adopting this technology in society, including risks to autonomy, privacy and safety. Many of the issues identified touch on freedom of thought and thinking in some way or another, and free thought itself is put at risk by developing BCI-technologies. The following chapter will attempt to illustrate the value of freedom of thought in historical, legal and societal context. Furthermore, the scope of applicability and purpose of this right will be determined.

# 3 Freedom of thought

## 3.1 Introduction

Chapter 3 will give insight into the historical development of freedom of thought and assess the scope of applicability of the right to freedom of thought under the ECHR. Additionally, the right to freedom of thought will be contextualized amidst other fundamental human rights laid down in the ECHR, specifically the right to privacy and freedom of expression. In order to illustrate the scope of applicability in practice, references to case law will be made.

## 3.2 Historical development and scope of applicability

### *3.2.1 Historical development*

Freedom of thought has been developed over the course of millennia. The concept dates back, in some form or other, to the classical antiquity. Under the rule of the Roman Empire, one could call upon the adage "cogitationis poenam nemo partiture", roughly translating to "no man shall be punished for his thoughts alone".[95] There was also – to a certain extent – religious freedom in Roman society.[96] This liberty expanded as the centuries passed. Beliefs were largely free from sovereign control or prosecution. This tolerance had originated in the antiquity of Greek society and endured the passing of time throughout the rise and fall of Greco-Roman societies.[97]

Throughout the Middle Ages, discussions on freedom of thought were mostly reserved for Europe's clergy. Whereas the State was responsible for keeping order and enacting criminal punishment for punishable offences, the Church took responsibility for the condemnation of the *forum internum*: whether one thought good, God-pleasing thoughts as to ensure one's ascension to Heaven. The Church played an intermediary role, responsible for 'saving souls'. Thus, the State had no authority to interfere with the *forum internum*. During the Reformation, the authority over the *forum internum* was taken from the clergy, as theologists declared that there existed a direct relationship between man and God, essentially making the intermediary role played by the Church obsolete. This liberation of beliefs from the influence of the Church allowed for true flourishing of freedom of thought. This increased tolerance was one of the main drives of the Age of Enlightenment.[98]

[95] Bublitz, 'Cognitive Liberty or the International Human Right to Freedom of Thought' (n 26).
[96] JB Bury, *A History of Freedom of Thought* (IDEBATE ed, International Debate Education Association/IDEBATE Press 2007).
[97] ibid.
[98] Bublitz, 'Cognitive Liberty or the International Human Right to Freedom of Thought' (n 26).

Several philosophers active during the Age of Enlightenment played a large role in laying the groundwork for freedom of thought's current codification in several pieces of legislation, including the ECHR. Hobbes and Spinoza observed it to be physically impossible to read or alter anyone's mind, which was in itself not a false observation – at the time. This factual impossibility inherently denied any sovereign to effectuate legal rule over one's beliefs.[99] Kant reasoned that legal intervention by the state may only be justified, if the effectuation of a right by one individual clashes with equal freedoms of other individuals. Kant concluded that freedom of the mind inherently cannot interfere with the freedoms of another and should therefore not be subject to sovereign appropriation.[100] Mill's theory of harm equally infers that liberties of subjects may only be limited to prevent harm to others.[101] Beliefs alone cannot, by their nature, harm others and should therefore not be subject to governmental control.

Throughout history, the mind has thus been cemented as being outside of the reach of sovereign intervention, in part due to the impossibility of actually accessing one's beliefs. This is especially interesting in light of the subject matter of this thesis, as this practical impossibility is becoming less certain in the age of neurotechnology.[102]

### *3.2.2 The scope of freedom of thought in the ECHR*

The adoption of freedom of thought into the European Convention on Human Rights was a matter of some debate, particularly regarding its scope of applicability. The founders of the ECHR endorsed the idea that freedom of religious practices and teachings should be guaranteed for anyone living in Member State territory. It was subsequently agreed on, after a lengthy back and forth between the Member States, that any such guarantee should also include 'freedom of thought'. The draft text that followed thus provided for 'freedom of thought, conscience and religion'. This provision mirrored article 18 of the Universal Declaration of Human Rights (hereafter: UDHR), and resembles the wording of the current article 9 ECHR.[103]

Throughout the last century, the primary question has been whether freedom of thought – both internal and external – should apply to all beliefs, or only to those of a particular nature or of a certain import. There has been a tendency to adopt a somewhat restrictive approach,

[99] B de Spinoza, *Tractatus Theologico-Politicus* (Cambridge University Press 2007); T Hobbes, *Leviathan* (Scolar P 1969).
[100] I Kant, *Die Metaphysik Der Sitten* (Suhrkamp 1997).
[101] JS Mill, *On Liberty* (first published 1859, Penguin Books 2010).
[102] JC Bublitz, 'Freedom of Thought in the Age of Neuroscience' (2014) 100 Archiv fur Rechts- und Sozialphilosophie 1.
[103] Sjors Ligthart, 'Freedom of Thought in Europe: Do Advances in "Brain-Reading" Technology Call for Revision?' (2020) 7 Journal of Law and the Biosciences lsaa048.

spearheaded by ECtHR. Freedom of thought has been reserved for those beliefs that are of significant importance to an individual's way of living, and therefore demonstrate a certain matter of "cogency, seriousness, cohesion and importance".[104] Notable examples are religions, like Christianity[105] and Buddhism,[106] convictions such as pacifism[107] and veganism[108], and even political ideologies like communism.[109] This infers that beliefs should have an identifiable formal character in order to be eligible for protection. The ECtHR has held that freedom of thought: "[..] does not extend to mere 'opinions' or deeply held feelings about certain matters."[110] The Court has uttered that article 9 is "essentially destined to protect religions, or theories on philosophical or ideological universal values."[111] Therefore, case law on article 9 ECHR has been primarily, though not exclusively, reserved for matters of religion. Regarding the *forum externum*, the Court has dealt with issues like whether or not state-imposed limitations on religious rituals were justified, like prohibitions on ritual slaughter[112] or the wearing of headscarves[113]. Pertaining to the *forum internum*, the ECtHR has considered cases of unlawful employment termination due to religious beliefs held[114] and the unjustified detention of Greek Jehovah's Witnesses because of their refusal to commit to military service.[115]

This narrow scope of article 9 ECHR, with a focus on cogency, seriousness, cohesion and importance may not be desirable if freedom of thought is to become an able tool to *also* protect freedom of thinking in relation to invasive neurotechnologies. The ECHR attributes absolute protection to this narrowly defined *forum internum*, because of the aforementioned presupposed inaccessibility of thought as determined by Locke and Spinoza and because it sees freedom of the *forum internum* as a foundational value and essential requirement of democratic society. The ECtHR has held that freedom of thought is imperative to a functioning democratic society, as democracy is dependent on "pluralism, tolerance and broadmindedness".[116] While the assumed inaccessibility of thoughts is becoming questionable, the *forum internum* remains

[104] *Campbell and Cosans v United Kingdom* [1982] ECtHR Application no. 7511/76; 7743/76.
[105] *Svyato-Mykhaylivska Parafiya v Ukraine* [2007] ECtHR Application no. 77703/01.
[106] *Jakóbski v Poland* [2010] ECtHR Application no. 18429/06.
[107] *Arrowsmith v United Kingdom* [1978] ECtHR Application no. 7050/75.
[108] *CW v United Kingdom* [1993] ECtHR Application no. 18187/91.
[109] *Hazar, Hazar, Açik v Turkey* [1992] ECtHR Application no. 16311/90; 16312/90; 16313/90.
[110] *McFeeley and others v United Kingdom* [1980] ECtHR Application no. 8317/ 78.
[111] *FP v Germany* [1992] ECtHR Application no. 18825/91.
[112] *Cha'are Shalom Ve Tsedek v France* [2000] ECtHR Application no. 27417/95.
[113] *Leyla Şahin v. Turkey* (n 25).
[114] *Ivanova v Bulgaria* [2007] ECtHR Application no. 52435/99.
[115] *Tsirlis, Koulumpas v Greece* (ECtHR).
[116] *Handyside v. United Kingdom* (n 22).

a crucial component of the ECHR's general spirit. The ECtHR may have to accept that our thoughts are no longer inherently free and that therefore, an extension of the scope of applicability of freedom of thought and its *forum internum* is required.

This revised viewpoint is supported in more recent literature on the topic.[117] The ECtHR has somewhat reconsidered its position as well, but still holds fast to a moderately restrictive approach. In a more recent judgement, it held that the wish of parents to give their child a certain name could constitute a thought eligible for protection under article 9, as "taking into consideration the comprehensiveness of the concept of thought, this wish can be deemed as a thought in the sense of Article 9".[118] This judgement allows for a more comprehensive interpretation of freedom of thought. However, according to the ECtHR, the criterion remains that thoughts need to have a major impact on a person's life and show a certain matter of cogency, seriousness, cohesion and importance.[119]

### *3.2.3 Freedom of thought dissected*

Let us now turn to a qualification of what exactly is protected under the *forum internum*. The focus is put on the internal, as neurotechnologies particularly and uniquely threaten the previously absolute impregnability of our minds. For this qualification, we can turn to a helpful distinction defined by Vermeulen. She argues that this freedom consists of three distinct elements: the right not to reveal one's beliefs, the right not to have one's beliefs manipulated and the right not to be penalized for one's beliefs.[120] Under an extended interpretation of freedom of thought as described above, this would analogously apply to all thoughts. It is valuable to contrast these elements to the emergence of neurotechnology and BCIs.

First, as BCIs are developed in such a way as to allow more accurate and invasive surveillance of our minds, the right not to reveal our thoughts (mental privacy) becomes threatened. This will be exacerbated if, due to any of the reasons touched upon in the previous chapter, we will become ever more socially coerced into using BCIs in everyday life. We may be forced to reveal our thoughts simply to gain access to certain basic services.[121] Moreover, the opaque nature of complex technologies may cause us not to realize the extent of the information we are sharing with certain technologies, meaning we do not have effective control

[117] Bublitz, 'My Mind Is Mine!?' (n 35); McCarthy-Jones (n 28); Bublitz, 'Freedom of Thought in the Age of Neuroscience' (n 102).
[118] *Salonen v Finland* [1997] ECtHR Application no. 27868/95.
[119] Ligthart (n 103).
[120] Vermeulen (n 33).
[121] McCarthy-Jones (n 18).

over the thoughts we do or do not choose to reveal. Safety risks of BCIs play a part here too, as maleficent actors may breach our mental privacy. Subsequently, any violation of our mental privacy may dampen our freedom of thinking, as knowing that one's thoughts are being surveilled constricts one's liberty to think freely.

Secondly, whether thoughts are inherently free from manipulation is subject to interpretation. More abstractly, our thoughts are always and constantly manipulated. Here, it is helpful to draw a distinction between direct and indirect mind interventions. Direct mind interventions work directly on our neural circuitry through technological, pharmacological or chemical means. BCIs fall under this umbrella. Other notable examples include memory erasure[122], deep brain stimulation[123] and chemical castration.[124] Contrastingly, indirect mind interventions are interventions that take place in the material sphere and influence us through speech, sounds, sights and other sensory triggers. An example of sensory triggers that still qualify as direct interventions is subliminal messages, as they are specifically intended to bypass conscious awareness.[125] A classic example of subliminal messaging is the 'secret frame' inserted into a video, which passes too quickly for one to consciously notice but is still registered by one's subconscious. Nearly all other sensory observations are indirect mind interventions, as they influence the receiver through conscious perception.

Not all indirect mind interventions are created equal, though. Troublesome forms of indirect mind interventions include indoctrination and propaganda practices. The primary difference between direct and indirect mind interventions is their relationship to our conscious experience. Direct mind interventions bypass our conscious perception and work directly on the neurological make-up of our minds, whereas indirect interventions allow the receiver to challenge what is presented to them, permitting them a sense of control and free will, the degree of which will vary according to the indirect intervention deployed. Direct mind interventions bypass our conscious defense-mechanisms and do not allow the receiver such agency.[126] The question as to what mind-manipulations should be permitted, and what mind-manipulations constitute a breach of our freedom of thought and thinking, are of particular interest to this thesis. Naturally, if mind interventions are consented to, they may be permitted whatever their

[122] J Han and others, 'Selective Erasure of a Fear Memory' (2009) 323 Science 1492.
[123] AM Lozano and others, 'Deep Brain Stimulation: Current Challenges and Future Directions' (2019) 15 Nature Reviews Neurology 148.
[124] T Douglas and others, 'Coercion, Incarceration, and Chemical Castration: An Argument From Autonomy' (2013) 10 Journal of Bioethical Inquiry 393.
[125] Bublitz, 'Cognitive Liberty or the International Human Right to Freedom of Thought' (n 26).
[126] T Chokrevski, 'Re-Writing Brains and Minds: Freedom of Thought for the Modifiable Self: Neuro-Technologies, Mind Control, and Human Rights' (Tilburg University 2016).

form – so long as consent is given freely and informed. But when consent is not given, perhaps a fitting boundary may be drawn between direct and indirect interventions.[127] The solution is not perfect, as it would not rule out undesirable practices like indoctrination, but it may protect us from unwanted mind-manipulations through BCI-technology. A more specified solution will be offered in chapter 4.

Finally, the right not to be penalized for one's thoughts is of evident import. If this is not provided for, we enter an Orwellian dystopia in which individuals may be punished merely for thinking the wrong thought, which is clearly undesirable. As technologies increasingly enable the accurate extraction of thoughts, we should be wary to instate any regime that would punish solely on the basis of those thoughts. Additionally, BCIs could be used to dampen undesirable mental states like pedophilic or arsenic tendencies, similar to the aforementioned practice of chemical castration.[128] This indirectly constitutes the penalization of thoughts. However, here the penalization follows physical misconduct, and therefore different norms should apply. The overall desirability of these practices, however, cannot be answered within the scope of this thesis.

## 3.3 Relationship to other human rights

As previously stated, free thought is considered to be the enabler of many other fundamental rights and freedoms. Without it, it is impossible to speak freely, enjoy the privacy of the personal life or indulge in any other related freedoms.[129] On the face of it, there seems to be significant overlap between some of the rights codified in the ECHR. For example, qualified protection is attributed to the *forum externum*: the manifestation of religion and beliefs. But the manifestation of religion and beliefs is in part actualized by projecting them outwards into physical space, through worship and rituals, but also through writing, speech and other forms of communication. Freedom of thought thereby inherently touches upon freedom of expression. Moreover, the sanctity of the *forum internum* may also be protected by the right to privacy, which ensures a space where one can be free from unwanted intrusions. Given this balance,

[127] Bublitz, 'Cognitive Liberty or the International Human Right to Freedom of Thought' (n 26); M Nowak and W Schabas, *U.N. Covenant on Civil and Political Rights : Nowak's CCPR Commentary* (3rd revised edition, NP Engel 2019).
[128] S Steinert and O Friedrich, 'Wired Emotions: Ethical Issues of Affective Brain–Computer Interfaces' (2020) 26 Science and Engineering Ethics 351.
[129] LG Loucaides, 'The Right to Freedom of Thought as Protected by the European Convention on Human Rights' (2012) 1 Cyprus Human Rights Law Review.

how should we interpret the interplay between these fundamental rights, and what role remains for freedom of thought?

### *3.3.1 Freedom of expression*

Freedom of thought is closely linked to free speech, the latter of which is found in article 10 ECHR. The two concepts are often used interchangeably, given the close relationship between the *forum externum* and freedom of expression. Bury writes that any meaningful form of freedom of thought should *include* freedom of expression, as the *forum internum* at the time of writing was free per se. Freedom of thought was only valuable to a person if it included the freedom to communicate those thoughts to the outside world.[130]

It is argued that protection of the *forum externum* of article 9 ECHR applies only to religion and beliefs. Ergo, the manifestation of non-religious thoughts would not be protected under article 9. Whether that reasoning holds, is dependent on one's interpretation of what constitutes a 'belief'. We have seen before that this concept may include philosophical, ideological and political notions. In any case, protection of manifestations of beliefs can also be found in article 10 ECHR, given that these manifestations constitute the receipt or impartment of information.[131] Subsequently, it could be argued that legal protection of the manifestation of beliefs may – under certain circumstances – be offered under both articles 9 and 10 ECHR.

The focus of this thesis is more so the *forum internum*, though. It may well be that the aforementioned tendency to use freedom of thought and freedom of expression interchangeably has contributed to the lack of interest in the *forum internum* for non-religious matters.[132] In that sense, it is of significant importance to reinstate and uphold the distinction between the right to freedom of thought on the one hand and freedom of expression on the other.

### *3.3.2 Privacy*

The right to privacy, sometimes defined as the right to be let alone, pertains to the interior and intimate aspects of one's life. It is found in article 8 of the ECHR. In the present day, the right to privacy equally serves to protect the autonomy of a person, development of the self and a sense of personhood. Naturally, a sense of personhood and self is inextricably linked to the beliefs one has, and thus to freedom of thought. As Boire accurately puts it "Indeed, without

[130] Bury (n 96).
[131] O'Callaghan and Shiner (n 24); Malcolm D Evans, *Religious Liberty and International Law in Europe* (1st edn, Cambridge University Press 1997).
[132] Bublitz, 'Freedom of Thought in the Age of Neuroscience' (n 102).

independent consciousness, no sense of self is even possible."[133] Moreover, the right to privacy specifically pertains to protection against unwanted intrusions in both "the head and the home".[134] This would entail that an interference with the liberty of consciousness constitutes both a violation of article 8 and article 9 ECHR.

There is a body of literature that suggests that freedom of thought is in and of itself obsolete in offering protection against BCI-technologies, as privacy could analogously be applied to protect the sanctity of the mind. However, the right to privacy is a qualified right, whereas the protection of the *forum internum* remains of an absolute nature. The distinction is important to make, because violations of article 8 may in certain circumstances be justified, whereas for violations of article 9(1), justification becomes impossible.[135] The margin of appreciation left to Member States for article 9 is minimal, whereas more discretion is left to Member States for violations of article 8. Given the importance of guaranteeing freedom of consciousness, this division should hold fast. Moreover, there is a certain symbolic importance to ensuring a standalone right to freedom of thought. It signifies to Member States and subjects that freedom of thought, conscience and religion is an essential quality of the CoE's jurisdiction and part of its general spirit.[136] If protection of freedom of thought would only be provided for under the right to privacy, it is at risk of becoming an afterthought. Finally, freedom of thought not only consists of mental privacy, but equally entails a right to mental self-determination and non-penalization, none of which is protected under article 8 ECHR.

### *3.3.3 An overarching right to freedom of thought*

The above indicates that protections provided by freedom of thought, freedom of expression and the right to privacy overlap in numerous ways. It could be argued that these rights, taken together, compose a more overarching right to freedom of thought. Freedom of thought in itself would be of less value if one would not be able to project those thoughts onto the outside world under the protection of freedom of expression. Freedom of thought would not truly 'be free' if the privacy of thoughts could not be guaranteed. If our inner state of mind is surveilled, we may still be able to think thoughts without predetermination, but we would feel unavoidable pressure to think thoughts that are socially acceptable, as "exposure to our thoughts would effectively

[133] RG Boire, 'On Cognitive Liberty'.
[134] J Marshall, *Personal Freedom through Human Rights Law? Autonomy, Identity and Integrity under the European Convention on Human Rights* (2009).
[135] McCarthy-Jones (n 28).
[136] *Soering v United Kingdom* [1989] ECtHR Application no. 14038/88.

alter them by pressuring us not to think certain things".[137] Therefore, in order for freedom of thought to reclaim any of its practical value, it is indeed imperative that the right to privacy and the right to freedom of expression remain fundamental liberties under the ECHR. It is an active task for the ECtHR to interpret the rights to privacy and expression in light of developing neurotechnologies, just as it should freedom of thought.

Thus, this complex of rights really should be seen as a broader spectrum within which personal development and true freedom of thought can flourish.[138] Freedom of thought is a foundational value of the ECHR and part of its general spirit. The ECtHR is held to interpreting the ECHR in such a way that its general spirit is protected. This means that the ECtHR must ensure that (1) the human rights laid down in the ECHR are given effective protection and that (2) the ideals of democratic society are respected.[139] Freedom of thought is an invaluable right that enables other fundamental freedoms and is thus imperative to the former. As to the latter, democratic society is characterized by a milieu of pluralism, tolerance and broadmindedness.[140] Again, these values would be inconceivable without the insurance of freedom of thought at its foundation.

One final important remark to make is that the provisions touched upon in this chapter place positive obligations on States. This entails that States not only must refrain from violating these rights in subjects, but also, within reasonable expectations, actively prevent others from violating rights of subjects. Given the important role played by private actors in the development of BCI-technology which may threaten our freedom of thought, States may find themselves obliged to restrict or prohibit the development or deployment of certain technologies.[141]

## 3.4 Conclusion

In this chapter we have seen how the right to freedom of thought has evolved and persisted throughout time. Despite its unwavering presence, an overarching consensus on its exact definition has been difficult to pinpoint. Throughout the 20th century, there has been much debate on how to interpret this right to freedom of thought. More specifically, whether freedom of thought should remain reserved for matters of religion and belief or whether more trivial thoughts should be eligible for protection too. The latter is what this thesis argues, as the

[137] McCarthy-Jones (n 28).
[138] O'Callaghan and Shiner (n 24).
[139] *Soering v. United Kingdom* (n 136).
[140] *Handyside v. United Kingdom* (n 22).
[141] S Alegre, 'Regulating around Freedom in the "Forum Internum"' (2021) 21 ERA Forum 591.

invasive nature of BCI-technology threatens the sanctity of the *forum internum*. The idea that the *forum internum* is free from sovereign intervention per se, and the lack of interest in the *forum internum* as it pertains to non-religious matters, is outdated in the age of neurotechnology. This implicates that a revision of our valuation of freedom of thought is necessary, to usher in the age of neurotechnology while ensuring freedom of mind, supported by the rights to privacy and freedom expression.

# 4 Recommendations

## 4.1 Introduction

The previous chapters have led to certain key findings. BCI-development is on the rise and risks to fundamental human rights are associated therewith. Freedom of thinking is at risk and freedom of thought in its current form is not an able tool to offer the necessary protection. We have seen that, in the modern age, our thoughts may not necessarily be absolutely inaccessible. This thesis aims to find a suitable tool to protect our minds and society against BCI-threats, and argues that it *can* be found within the right to freedom of thought, though not in its current form. This implies that freedom of thought is due for revision, reinterpretation or replacement. The question that remains is what approach is most desirable.

Different viewpoints on this can be identified in the literature. There are authors who call for the adoption of completely new human rights, or 'neurorights'.[142] Others argue in favor of amending the current right to freedom of thought – specifically the *forum internum* – as its absolute connotation may have been one of the main reasons behind its growing ineffectiveness.[143] And there are those whom reason that a fundamental amendment to or replacement of freedom of thought is unnecessary, and that freedom of thought should be interpreted in a manner that is consistent with the shifted paradigm: that thoughts are no longer inherently free from interference.[144] There are merits and shortcomings to all these approaches, and no holistic solution can yet be found in existing literature. This chapter will shed light on all these different viewpoints and try to find the merits and shortcomings in each. Then, recommendations will be given as to how specifically the problem at the heart of this thesis should be tackled: how greater protection of freedom of thinking can be achieved under article 9 ECHR, in light of novel BCI-technologies.

## 4.2 New human rights: neurorights

Several authors are outspoken about how the revolution of neurotechnology should be addressed.[145] These neurorights-advocates argue that new human rights are in order. They are in favor of this specific approach, as the risk posed by novel neurotechnologies are such that they require the reshaping of ethical and legal notions.

[142] M Ienca, 'On Neurorights' (2021) 15 Frontiers in Human Neuroscience 701258.
[143] Bublitz, 'Cognitive Liberty or the International Human Right to Freedom of Thought' (n 26).
[144] Alegre (n 80).
[145] Yuste and others (n 88); Ienca (n 142); Ienca and Andorno (n 36).

The developments taking place in Chilean national legislation are interesting in this respect. The Chilean Congress passed two bills in 2020 that aim to safeguard neurorights – going so far as to suggest adoption in Chile's constitution – and to advance research on neurotechnologies.[146] The proposed bills aim to guarantee equal access to cognitive enhancement, to protect free will, self-determination, personal identity, autonomy and mental privacy and to provide safeguards pertaining to automated decision-making. These efforts make Chile the first nation with a proposed neurorights framework and related constitutional amendment.[147] An analysis of this proposition will follow in subsection 4.2.2 below.

First, let us consider more in-depth some of the novel neurorights that are offered throughout existing literature.

### *4.2.1 Proposed neurorights*

The introduction of a right to cognitive liberty has been proposed by several authors, including Ienca and Adorno and Bublitz, the latter who phrases it as a right to mental self-determination.[148] Cognitive liberty is two-faced. First, it includes the freedom to alter one's own mind, including thinking what one wills. Equally, it includes the right to refuse the alteration of one's mind or determination by another. The importance of cognitive liberty is stressed, as it enables all other rights.[149] The freedom of mind and mental capacities are "necessary constitutive conditions" for anyone to be considered a legal subject.[150] This resonates to a great degree with the notion of freedom of thought that we have discussed in this thesis so far, in its role of enabling other rights and liberties. Indeed, Sententia argues that cognitive liberty is more so a conceptual update of freedom of thought than a wholly new-devised right.[151] While the authors mentioned above seem to infer that codification of a separate right to cognitive liberty would attribute greater value to it, there seems little urgency or necessity to accepting cognitive liberty as a new neuroright. It seems the right to freedom of thought can satisfy the elements of cognitive liberty through an extended interpretation. Under a broader interpretation of freedom of thought – aimed at protecting consciousness from

[146] Senado de Chile, Bulletin 13827-19; Senado de Chile, Bulletin 13828-19.
[147] R Yuste, J Genser and S Herrmann, 'It's Time for Neuro-Rights' [2021] Horizons: Journal of International Relations and Sustainable Development.
[148] Ienca and Andorno (n 36); Bublitz, 'My Mind Is Mine!?' (n 35).
[149] *Kokkinakis v Greece* [1993] ECtHR Application no. 14307/88.
[150] Bublitz, 'My Mind Is Mine!?' (n 35).
[151] Sententia (n 36).

neurotechnologies – mental self-determination, or mental autonomy, is one of the principal components of freedom of thought.[152]

Another suggestion that is offered in academic literature is the adoption of a right to mental privacy, to be considered separately from the existing right to privacy – found in article 8 ECHR.[153] It is true that advanced neurotechnologies may pose an unmatched risk to privacy. An unprecedented amount and degree of information will become available to those with access, not only of our conscious thoughts and intentions, but possibly also of the unconscious processes taking place in our brains. The necessity of an *additional* right to mental privacy, in addition to the established right to privacy and the right to mental privacy enshrined in freedom of thought, is not evident though. The right to privacy originated in part because the photo camera allowed press to document private gatherings of high-society.[154] In a sense, the right to privacy was devised to offset the consequences of developing technology. Throughout the 20th and 21st century, our understanding of privacy has developed, evolved and matured as society and technology were shaped and reshaped time and again. Moreover, we know that the ECtHR is bound to interpret and apply the convention in such a way that it offers practical and effective safeguards, seen in context of current times and circumstances. The ECtHR recognizes that "the Court must […] recall that the Convention is a living instrument which, as the Commission rightly stressed, must be interpreted in the light of present-day conditions".[155] This infers that the right to privacy can be construed in such a way as to fit in the modern paradigm of neurotechnology.

Not only is the right to privacy understood as a negative freedom, or a right to be let alone. It has become an equally important tool in protecting autonomy, particularly in effectuating control over how personal information is disseminated and processed. As noted previously, the right to privacy under article 8 ECHR includes a right to data protection. Moreover, the right to privacy is increasingly understood as the freedom to explore one's identity and personality, develop interpersonal relationships and to flourish as a human being.[156] In a sense this extended right of privacy depends on a right to freedom of thought, as free thought is essential to enjoying these concepts of identity-development, relationship-building and human flourishing. This

[152] Vermeulen (n 33).
[153] A Lavazza, 'Freedom of Thought and Mental Integrity: The Moral Requirements for Any Neural Prosthesis' (2018) 12 Frontiers in Neuroscience 82; Ienca and Andorno (n 36).
[154] Warren and Brandeis (n 73).
[155] *Tyrer v. UK* (n 30).
[156] B van der Sloot, 'Privacy as Human Flourishing: Could a Shift towards Virtue Ethics Strengthen Privacy Protection in the Age of Big Data?' (2014) 5 Journal of Intellectual Property, Information Technology and Electronic Commerce Law.

shows how freedom of thought and the right to privacy are equally considered living and breathing provisions that are to be interpreted in light of the present moment.

The right to mental privacy as proposed throughout literature primarily pertains to the issue of accessibility of thoughts. The necessity of such a right is lacking. One the one hand, the right to privacy under article 8 ECHR may be extended to protect thought-intrusions, as argued above. On the other, we have seen that freedom of thought as understood under article 9 ECHR *includes* a notion of mental privacy. After all, one of the constituent elements of freedom of thought is the right not to reveal one's beliefs.[157] It therefore seems redundant to invoke a new right of mental privacy, as the interplay of privacy and freedom of thought – especially under a novel, extended interpretation – will satisfy. We will return to this idea below.

### *4.2.2 Critique*

Based on the findings of this thesis, the notion of introducing novel neurorights like mental privacy and cognitive liberty seems unhelpful. As described above, the existing framework of human rights seems – accompanied by reinterpretation or amendment – fit to protect our freedom of mind. Moreover, there are reasons to assume that drafting new rights is more harmful than it is beneficial.

Ienca and Adorno recognize the problem of rights inflation, or "the tendency to label everything that is morally desirable as a 'human right'."[158] This can lead to the dilution of what fundamental human rights are, thereby stripping them of much of their authority and significance. Additionally, introducing novel distinct rights may lead to inconsistencies in legislation and protections offered, leading to a diminishing of legal certainty.[159] This all ties in to what Leenes defines as the Flawed Law Syndrome: '[…] the urge to call regulation outdated or flawed (disconnected) and the desire to fix the problems by addressing the law, rather than using other ways to mend the assumed gaps ('Legal Solutionism')."[160] Leenes subsequently argues that regulation spawned by this reflexive behavior is oftentimes lacking and does not adequately address the issues that led to it.[161] Instead of frantically looking for a way to out-regulate technological developments, we should instead find ways to flexibly, though certainly, accommodate for innovation on the one hand and legal protection on the other. One way in

[157] Vermeulen (n 33).
[158] Ienca and Andorno (n 36).
[159] S Ligthart and others, 'Forensic Brain-Reading and Mental Privacy in European Human Rights Law: Foundations and Challenges' (2021) 14 Neuroethics 191.
[160] R Leenes, 'Regulating New Technologies in Times of Change' in L Reins (ed), *Regulating New Technologies in Uncertain Times*, vol 32 (TMC Asser Press 2019).
[161] ibid.

which this can be achieved is through minor amendments and reinterpretation. In terms of the subject matter of this thesis, this reinterpretation presents an open task for the ECtHR. This thesis argues that the right to freedom *could* be an able tool to protect our conscience from neurotechnology, but equally recognizes that it has not historically been construed as such. The ECtHR therefore has an important role to play if it indeed accepts this new role for freedom of thought through extended interpretation, which will be touched upon more below.

One final point of criticism towards the introduction of neurorights is based on Easterbrook's notion of the Law of the Horse. In short, Easterbrook's idea is the following: any regulation that is too specific – in the case of Easterbrook's example: a law specifically about all things horses – is doomed to be shallow and devoid of overarching general principles.[162] Naturally, this proclamation should not be taken at face value, as specificity in legislation may be desirable in certain circumstances. However, in the context of human rights – which by their nature should be broad, general and overarching – it does illustrate why the introduction of neurorights may not be to the benefit of the existing framework. The existing human rights framework under the ECHR is principled, holistic, general and broadly applicable. Neurorights would constitute too great a deviation from this approach; the specificity and scope of application would simply be too narrow to fit within a framework of overarching, fundamental human rights aimed at protecting all subjects.

In the introductory paragraph, Chile's proposed neurorights framework was presented. Considering the above, the desirability of this framework can be called into question, and there is literature that is indeed critical of this approach. The identified redundancy of these novel right and the subsequent legal uncertainty it creates are valid criticisms.[163] For example, "stretching as far back as the Middle Ages, privacy rights remain privacy rights, whether threatened by a medieval abbot spying on his monks or by 21st century governments operating surveillance cameras or flying drones over people's homes", Zúñiga-Fajuri and colleagues argue.[164] Novel means by which a right is threatened, including the right to freedom of thought, do not necessarily require novel rights. They require a novel understanding of these rights.

[162] FH Easterbrook, 'Cyberspace and the Law of the Horse' [1996] University of Chicago Legal Forum.
[163] A Zúñiga-Fajuri and others, 'Neurorights in Chile: Between Neuroscience and Legal Science', *Developments in Neuroethics and Bioethics*, vol 4 (Elsevier 2021).
[164] ibid.

## 4.3 Amending freedom of thought

If we can assume that the introduction of a new complex of rights in the sense of neurorights is not necessary or desirable, three options remain to us: the amendment of the existing legal framework, the reinterpretation of the existing legal framework, or a combination thereof. Let us consider the first option now.

Arguments can be found in literature for amending freedom of thought, particularly by those who argue that freedom of thought has lost some of its significance.[165] Specifically, there are calls to abolish the absolute nature attributed to the *forum internum*. In part, this reasoning is driven by the idea that it is this absoluteness that has led to the dilution of freedom of thought in the first place. It has made us blind to what it aims to protect and has made us oblivious to why exactly it is at risk now, as freedom of thought is mostly avoided in litigation *because* of its absoluteness.[166] Freedom of thought is either not invoked at all, or interpreted so narrowly that nothing falls within its scope. As Bublitz strikingly puts it "Narrowing the scope of rights to avoid having to justify interferences is an old conjuring trick of lawyers, with the paradoxical effect that those rights that should command utmost respect are belittled and stripped of practical importance."[167] Following that train of thought, perhaps some limitations on the *forum internum* should be allowed, in the form of restrictively drafted, well-defined exceptions.[168] Interferences should then only be allowed on the basis of public interests of exceptional importance, such as catastrophes or a 'ticking-bomb' scenario. As is the case with any justification of human rights violations, a balance would have to be struck between freedom of the individual and the rights of others or society at large.

However, not all scholars subscribe to the notion that the absolute nature of the *forum internum* should be struck from the record. It is argued that the omission of absolute protection under freedom of thought leads to a dilution of our human rights and weakens the fundamental importance of the right.[169] The *forum internum*, other than the *forum externum* – or the rights to privacy and expression for that matter – was awarded absolute protection for a reason. Naturally, this primarily finds it origin in the historic inability to access the *forum internum*. However, we have also seen that freedom of the *forum internum* is a necessary condition for humans to function within a society characterized by a modern rule of law. This may lead one

[165] Bublitz, 'Freedom of Thought in the Age of Neuroscience' (n 102).
[166] Alegre (n 80).
[167] Bublitz, 'Cognitive Liberty or the International Human Right to Freedom of Thought' (n 26).
[168] ibid.
[169] Alegre (n 80).

to believe that the *forum internum* should indeed retain its absolute status. We will return to this matter in section 5.

## 4.4 Reinterpreting freedom of thought

As was argued in section 2 of this chapter, it may not always be wise to reflexively amend existing laws or introduce new ones when faced with legal disconnect. Instead, legislators – and industry, laypeople, judges, lawyers and academics – should consider how the existing body of laws can be applied to novel challenges, reinterpreted to be fit for current times.

There is considerable support for this notion in existing literature. While indeed many authors agree that freedom of thought is currently not used as an able tool in addressing the threats posed by BCI-technology, they believe that it can and should be construed as such. They see human rights as living instruments that should reflect and resonate with society in its current form.[170] As previously stated, the ECtHR has an obligation to interpret the ECHR in a dynamic and evolutive manner in the light of present-day conditions. That would entail clearly establishing the scope of the right in light of technological developments, and exploring several questions which have been left unattended until now. Some of these questions will be considered below.

First, the scope of applicability of freedom of thought would have to be widened. As argued in the previous chapters, there are calls throughout academia to broaden the notion of 'thoughts' under the current framework, to include thoughts of all kinds and degrees. This would mean abolishing the standing view that thoughts need to bear a certain matter of "cogency, seriousness, cohesion and importance" in order to be worthy of protection under the ECHR.[171] Scholars argue that, if freedom of thought is to become a useful tool in protecting subjects against mental violations, this criterion is no longer justifiable.[172] Through neurotechnology, all our thoughts – irrespective of their contents – may become available to third parties, and therefore all our thoughts are worthy of equal protection. This would broaden freedom of thought to include freedom of thinking. Moreover, granting protection to all thoughts would indirectly broaden protection awarded to beliefs, as beliefs are in their essence composed of constituent thoughts and mental constructs.

[170] ibid.
[171] *Campbell and Cosans v. United Kingdom* (n 104).
[172] L Yeremyan and D Harutyunyan, 'Freedom Of Thought Endangered In The 21st Century? Legal Protection From Manipulation' (2020) 14 WISDOM 131.

Second, we need to consider when actions should be considered violations of our freedom of thought. More specifically, recall the previously identified direct mind interventions and indirect mind interventions. We should be wary of labeling all influences on our conscience as violations of freedom of thought. But in order to reinstate practicality to this right, we do need clear context and boundaries, assessing where exactly interferences into the mind become unacceptable. It is important to re-emphasize that the following analysis concerns *unconsented* interventions. If interventions are consented to and that consent is informed and freely given, the interventions should be permitted, as the right to mental-determination determines just so.

It may be helpful to draw the boundary between the permitted and not-permitted at the neurological check and control. The subliminal means of direct mind interferences bypass our conscious discernment and exploit weaknesses in our cognition. These means target our sub- or unconscious, and therefore we do not even realize the interference is taking place.[173] We are made unable to exercise any deliberation or counterargument.[174] It could be argued that these interferences are at odds with the core idea of freedom of thought, and should therefore be abolished. On the other hand, indirect interferences and influences that still allow for conscious dissection, deliberation and counterargument may then remain permitted. As stated previously, this is not a perfect solution, as some indirect interferences may still be wholly undesirable. To offer further protection, it is worthwhile to draw on the approach taken by the European Union in its recent draft regulation on artificial intelligence, in which AI-applications that deploy subliminal techniques are outlawed, if they are "likely to cause that person or another person physical or psychological harm".[175] The approach taken here is admirable, but for it to be effective, it needs to be clearly communicated what constitutes 'harm' in this instance. The concept of harm is not defined further in the draft regulation and left ambiguous. Undesirable subliminal techniques should not be left permitted because they, for some reason or other, do not qualify as producing harm within the scope of application of the regulation. This will be important to our approach to BCI-technology, as well. We will return to this notion in the next section.

Third, there are calls in literature to re-emphasize the positive obligations that rest on states under the Convention.[176] Article 1 of the ECHR commits all Member States to secure the rights

[173] ibid.
[174] Bublitz and Merkel (n 69).
[175] European Commission, Proposal for a Regulation of the European Parliament and of the Council Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) and Amending Certain Union Legislative Acts [COM/2021/206].
[176] McCarthy-Jones (n 28).

and freedoms provided under the Convention for everyone in their jurisdiction. This commitment is two-sided. One the one hand, States must refrain from interfering with the right in question – the negative obligation. On the other, States bear responsibilities to actively protect the rights of individuals against interferences by others.[177] In assessing whether a positive obligation exists, the ECtHR will take into account the balance that has to be struck between the interest of the community and the competing private interests of the individual.[178] Scholars emphasize that, given that the looming threat posed by neurotechnologies primarily originates in the for-profit, private sector, the ECtHR should recognize the positive obligations that rest on states regarding freedom of thought.[179] It is not possible for individuals to address violations of freedom of thought by private actors before the ECtHR, as one can only sue States. Therefore, in order to provide options for redress, several authors hold that States should be held accountable under the positive obligation to fulfill. This will, according to them, simultaneously lead to more and better effective control on the development of risky neurotechnologies, as private actors and their conduct will be extensively scrutinized.[180]

## 4.5 Recommendations

The exploration above shows that there are many options offered throughout existing literature to tackle the problem at the core of this thesis: the assumed impracticality of freedom of thought as a tool to protect against pervasive neurotechnologies and how further protection may be given. We now arrive at the practical recommendations that this thesis has been working towards. Specifically, recommendations will be provided for how further protection against invasive BCI-technologies can be provided, to protect subjects of the CoE against the myriad of risks touched upon in chapter 2.

Primarily, these recommendations will pertain to reinterpretation of the *forum internum*. Freedom of thought under the ECHR was drafted in a time when accessing another's thoughts was a fiction. That is no longer the case, and thus a novel approach is required. While not initially intended as a human right to protect our minds from undue surveillance, manipulation or penalization as made possible by technology, the *forum internum* may develop to become just that. For that to happen, first and foremost we need to recognize all thoughts to fall under the scope of applicability of article 9, regardless of their nature, weight or content. This will

[177] J Murdoch, *Protecting the Right to Freedom of Thought, Conscience and Religion under the European Convention on Human Rights* (Council of Europe Publ 2012).
[178] *Dubowska and Skup v Poland* [1997] ECtHR Application no. 33590/96; 23055/96.
[179] Alegre (n 141); McCarthy-Jones (n 28).
[180] Alegre (n 141); McCarthy-Jones (n 28).

open up freedom of thought to protect all mental processes and move it away from its focus on purely religious, political or moral matters. Here, freedom of thinking becomes part of freedom of thought and the notion is waived that thoughts require a certain matter of cogency, seriousness, cohesion and importance in order to be eligible for protection under the *forum internum* of article 9(1) ECHR.

Secondly, the ECtHR needs to emphasize the positive obligation resting on Member States to protect our freedom of thought. The risks posed by developing BCI-technologies mostly find their origins in the private sector. The for-profit development and deployment of BCIs should not be left unchecked, and States need to be incentivized to exercise oversight and control into BCI-development. We have seen the implementation of privacy by design as a guiding principle in data protection legislation. It is recommended to instate the principle of freedom of thought by design by those developing invasive neurotechnologies. Corporations must be refrained from creating tools that are excessively invasive.

To that end, we need to be clear about the boundary to be drawn between permissible influences on and unjustified manipulations of our minds. Consented mind manipulation should be allowed, if consent is given freely and informed *and* the mind manipulations do not invoke harm to others. For example, a consented mind manipulation aimed at invoking pedophilic tendencies in the subject should never be allowed. If consent is not given, the ECtHR should take point and conclude that subliminal influences, aimed to bypass our cognitive defense-mechanisms should be abolished, whereas influences that allow conscious scrutiny remain permitted. Subsequently, States should oblige for-profit actors in their jurisdictions to steer clear of applications that cross this boundary. This thesis does *not* argue in line with the EU's draft AI regulation that subliminal influences should cause harm (however one would define that) for them to be prohibited, as the hypothetical harm caused is not the only issue present here. Of equal weight is the subject's unawareness and agency. If we allow subliminal techniques to be used in whatever form and for whatever purpose, we are at risk of becoming puppets to those who pull the strings. Even if the intention with which the subliminal technique is used is a holy one, it should not be permitted, as it takes away the faculties of self-determination, autonomy and free will from the subject – essential qualities on which modern society is built.

Policymakers and states should equally be mindful of preventing possible discriminatory practices between the enhanced and non-enhanced. The moment that BCIs become 'the norm' in day-to-day life, they should be readily accessible to all those who would want to use them

and no-one should be victimized for choosing not to adopt a BCI or be socially coerced into using a BCI against their original will. The right to mental self-determination dictates so.

Moreover, this thesis has not shown that the introduction of novel 'neurorights' is desirable or necessary. This thesis sides with those authors who argue that the right to freedom of thought is not currently an able tool, but can evolve into such a tool through re-application and reinterpretation. As previously stated, the introduction of neurorights is accompanied by the Flawed Law Syndrome, the Law of the Horse paradigm and may lead to the dilution of the importance of human rights. Freedom of thought may be able to offer adequate protection, if construed differently. Moreover, it can be argued that the neurorights that are proposed throughout the body of literature are already encapsulated within freedom of thought. To exemplify this, let us briefly return to the distinction provided by Vermeulen, already touched upon in chapter 3.

Freedom of thought consists of three distinct components: the right not to reveal one's thoughts, the right not to have one's thoughts manipulated and the right not to be penalized for one's thoughts. The right not to reveal one's thoughts correlates to the proposed neuroright of mental privacy and the right not to have one's thoughts manipulated satisfies the elements of the proposed neuroright to mental self-determination. To be frank, this shows how freedom of thought, if construed broadly – as this thesis suggests – is an able tool that does not require supplementation by narrowly defined neurorights.

Finally, Vermeulen's 3-step distinction is useful to address the issue of the absoluteness of the right to freedom of thought, as far as the *forum internum* is considered. As shown, there are calls to abolish the absolute protection, as it may have led to the dilution of freedom of thought in the first place. While there seems to be some logic behind this reasoning, we should not be so eager as to strike the absolute protection of freedom of thought. This classification carries a principled essence of authority that has value in and of itself. All the while, perhaps absolute protection is unsustainable in a world where thoughts are easily accessible. Therefore, this thesis proposes a moderate approach. First of all, absolute protection should remain absolute where the pre-determination of thoughts is concerned. If we start condoning unconsented direct manipulations of our experienced reality, thoughts, emotions and intentions, society will become unrecognizable to us. However, perhaps some forms of alterations of thoughts or psychological tendencies should be allowed if beneficial to the subject, for example in treating psychiatric illnesses. Just as well, penalization of thoughts should remain absolutely abolished, as thoughts in themselves cannot jeopardize the public interest or rights of others. The penalization of thoughts is a gateway to excessive censorship and restriction of basic liberties.

However, in extreme circumstances, exclusively for the protection of the public, violations of mental privacy (the right not to reveal one's thoughts) may be permitted. Here, a balancing act will have to be performed. Only in the direst of situations, like the ticking-bomb scenario, and if no other reasonable options remain, a violation of mental privacy may be agreeable. In order to effectuate this recommendation, there would have to be a minor amendment to article 9, awarding qualified protection to the mental privacy component of the *forum internum*. As is custom within the ECHR, interferences would then have to abide by three criteria: they need to be provided for by law, have a legitimate purpose and be necessary in a democratic society. The margin of appreciation left to states here should be *extremely* narrow, construed more strictly than for the related rights of the right to privacy or freedom of expression.

## 4.6 Conclusion

The aim of this chapter has been to give concrete recommendations for widening and substantiating the protection offered by the right to freedom of thought under article 9 ECHR. In order to make a valuable contribution, options offered throughout literature have been considered. Subsequently, these options were scrutinized, accepted, rejected or amended, finally coming to concrete recommendations that fit within the context of the research of this thesis. The recommendations given primarily call for a reinterpretation of the right to freedom of thought, by the ECtHR and the community. It is imperative that the boundaries of the scope of applicability are defined clearly, drawing a line between permissible interventions and unjustifiable manipulations. Simultaneously, that same scope should be widened to include all thoughts within the protection of the *forum internum*. States need to act upon their positive obligation to structure society in such a way as to allow freedom of thought to flourish, and to prevent for-profit actors from threatening our freedom of thought. The introduction of new neurorights is not advisable, nor is it necessary, as freedom of thought is already comprised of many different 'sub-rights', including mental privacy, mental integrity and non-penalization of thoughts. Finally, considering those three aspects, this thesis recommends that the absolute protection awarded to the *forum internum* remains intact for our mental integrity and our right to non-penalization of thoughts. Contrastingly, mental privacy may in extreme cases by violated, given it is used as a last resort and the interference is provided for by law, has a legitimate purpose and is necessary in a democratic society.

# 5 Conclusion

## 5.1 Introduction

This thesis has aimed to contribute to the existing body of scholarly literature on neurotechnology and human rights. Particularly, the exponential uptake of BCI-technology throughout society, both in and out of the medical sphere, gives rise to several important questions. How will BCI-technology affect our autonomy? What dangers are posed to our privacy? Is our free will at risk? Interestingly, all of these questions touch upon the concept that is the heart of this thesis: freedom of thought. This thesis was greatly inspired by the critical contributions in the literature that doubt freedom of thought's ability to offer adequate protection against pervasive neurotechnologies. In that light, the thesis attempts to contribute to the existing body of work, by presenting a concrete way forward.

## 5.2 Gap in literature

This thesis is not the first work of literature to touch upon the conjuncture of freedom of thought and developing neurotechnologies. What is lacking in current literature on the topic however, are powerful, concrete, holistic and well-substantiated recommendations on how to move forward. Moreover, some of the contributions stay on – for our purposes – too abstract a level, dabbling in philosophical considerations and principled deliberations. It must be stressed: there *is* merit to these assessments, and this thesis is not completely void of its own philosophical explorations. This work efforts, however, to go beyond the abstract and touch upon the concrete. How, *practically*, should we, policy-makers, the ECtHR, Member States and for-profit actors, behave in this future BCI-infused society? The sparing concrete recommendations that *can* be identified in the existing body of work pertain mostly to the introduction of neurorights, spearheaded by Yuste and colleagues. This thesis is not in support of that approach, and hopes to offer a viable alternative through its findings.

## 5.3 Answering the main research question

The main research question posed at the start of this work was:

To what degree is article 9 of the ECHR equipped to deal with the potential legal and ethical risks associated with brain-computer interfaces, and how may further protection be provided in this context?

Unpacking this research question, we can identify three primary components to which answers have been sought: (1) the legal and ethical risks associated with brain-computer interfaces, (2) whether article 9 ECHR is an able tool to protect the mind from pervasive neurotechnologies and (3) how further protection may be provided.

First, some of the most pressing legal and ethical concerns, particularly pertaining to human rights law, have been identified. These range from challenges to autonomy and mental self-determination, to issues relating to privacy, safety and security. Societal risks have been addressed too, like the ongoing debate on cognitive enhancement and related concerns of access and fairness. All these faculties tie in to freedom of thought, as they are either dependent *on*, form an interplay *with* or are a constituent part *of* freedom of thought. Chapter 2 has attempted to show this interrelationship, to underline the foundational importance of free thought and illustrate why adequate protection of our minds is so important in the modern age.

Second, this work has assessed whether article 9 ECHR in its current form is equipped to deal with the potential risks associated with BCI-technology. The analysis here has focused mainly on the *forum internum*, as it is of greater relevance to the subject matter. While freedom of thought protects the *forum internum* absolutely, we have seen that article 9 ECHR is not currently an able tool for our purposes. This follows logically from the fact that article 9 was not drafted with neurotechnology and its possibilities and pitfalls in mind. Article 9 ECHR has traditionally been a protector of religious freedom and freedom of belief, whereas we currently require a right to freedom of thinking (defined as such in the introductory chapter), as that freedom is currently at risk. Freedom of thought under the ECHR historically does not provide for freedom of all thinking, as the right been reserved for matters that show a certain matter of cogency, seriousness, cohesion and importance. However, this thesis has found that freedom of thought *could* in fact be a useful instrument to protect our freedom of mind from pervasive BCI-technology, if the correct way forward is found. This leads us to the third component of the main research question.

It has been the intention of this thesis to explore the options that are open to us, given that freedom of thought under article 9 ECHR is not yet an applicable or adequate tool. This work has aimed to reflect on and criticize deliberations found in existing literature and subsequently formulate *concrete*, applicable recommendations that can be used as a guideline in drafting policy. First of all, this thesis waives the notion that we are in need of neurorights. Such specificity in lawmaking is not beneficial within the realm of human rights law, which by its nature needs to be holistic, broad, general and inclusive. Moreover, freedom of thought can satisfy most, if not all, of the elements proposed by neurorights-advocates, if an extended

interpretation is accepted. Why introduce novel rights, if our current framework suffices? In order for freedom of thought to become relevant in protecting freedom of thinking, the scope will have to be widened. The idea that thoughts or beliefs need a degree of cogency, seriousness, cohesion and importance in order to be eligible for protection under the *forum internum* of article 9(1) ECHR should be abolished, and *all* thought should fall under its protection. Within the extended interpretation, the positive obligations resting on Member States to protect freedom of thought should be re-emphasized, as many of the risks spawning from BCI-technologies originate in the private sector. In that light, direct mind interventions that use subliminal influences and bypass our conscious defense-mechanisms should be disallowed, regardless of their purpose or intention. Finally, while this thesis mainly argues for an extended interpretation and explanation of freedom of thought, a minor amendment to its current codification is offered: to allow violations of the mental privacy component of freedom of thought in the direst of circumstances.

In conclusion, article 9 ECHR currently does *not* offer adequate protection against the potential risks associated with BCI-technology, but further protection may be offered if freedom of thought's scope of applicability is extended through a more comprehensive interpretation and by attributing it a newfound, relevant role.

## 5.4 Implications and final thoughts

What does all of the above imply for the future of society and who should we look to for further action and guidance? This work has tried to illustrate that BCI-technology is not an evil to be exorcised. There is true merit to this technology, as chapter 2 has shown. Many of the applications in the works today can bring true value to civilization. The aim throughout this research has been to exemplify and underline the *potential* risks associated with this technology. The technology is not entrenched in our daily lives just yet, which should signal to us that the time to think about how to regulate it is now, not later. We need to be properly prepared and instate legal frameworks that are able to deal with what comes our way when BCIs do in fact become a staple in our everyday lives. Several actors have important roles to play in this.

First, it is open task for the ECtHR to extend its interpretation of freedom of thought in line with the findings of this thesis. With additional case law from Strasbourg that reiterates the points made in this work, additional legislation or major amendments will not be necessary. The ECtHR needs to assume responsibility in explaining the Convention in light of present-day conditions. Secondly, a large responsibility is placed on private actors, as they are at the

forefront of BCI-development. They are to develop BCI-technology responsibly and ethically, and to implement freedom of thought by design, incorporating it into every development cycle from start to finish. Third, in order to effectuate real control over private actors, states will have to accept the positive obligations that rest on them resulting from their membership to the ECHR. States need to oblige for-profit actors to work with accountability and to refrain from committing practices that amount to unpermitted, direct mind interventions.

The importance of the duties laid out above cannot be understated. Freedom of thought in its broadest sense – meaning the ability to think any thought free from surveillance, manipulation and penalization – is the cornerstone of democratic society. The mystery and complexity of consciousness has led us to take it for granted. It allows us to learn, form relationships, remember, form identities and self-actualize. Freedom of thought truly is the greatest gift. Let us not waste it.

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