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Mental Privacy in the Age of Neurotechnology

Author: Shannon Brenda Bothof

Supervisor: Sandra Friberg

Abstract

Recently, it has been argued that the current international human rights framework is inadequate to address the risks posed by neurotechnology. Within this debate, it is suggested that we need a new human right to mental privacy. But do we really need it? Or are existing human rights, such as the right to freedom of thought, flexible enough to provide adequate protection? We are entering the era of neurotechnology, and more specifically of Brain-Computer-Interfaces (BCIs), which is a technology that connects people's brains directly to machines, such as computers and mobile phones. This has enormous consequences, for the brain is not just an organ. It is the organ that generates all our mental and cognitive activity; it touches the core of our being. This thesis examines to what extent the right to freedom of thought in the European context offers protection against the potential risks posed by BCIs to mental privacy. To this end, a legal doctrinal study was conducted. This thesis will argue that the right to freedom of thought is flexible enough to protect mental privacy. This fits within the “living-instrument doctrine”. Interpreting the law in the light of present-day conditions is daily practice in the world of law. This thesis therefore concludes that a new human right to mental privacy is not necessary.

Acknowledgments

The present research on mental privacy in the age of neurotechnology is written with the idea that we are entering the age of neurotechnology, in which man and machine are slowly becoming one. I truly believe that Brain-Computer-Interfaces will change society and we have to be prepared for that. Moreover, this research is the result of many years of personal interest in the field of human rights and technology.

I would like to thank the *Global Campus of Human Rights* for giving me the opportunity to work on my main interest: human rights and technology, for the past few months. I am extremely grateful to the *Global Campus of Human Rights* for the past year, which has been by far the most interesting and enjoyable year of my life. I hope this will be the starting point of a great career in the field of human rights and technology.

I would also like to thank the *VSB Fund* for making this year possible. Without my scholarship, my dream of studying human rights at the *Global Campus of Human Rights* in Venice (and hopefully becoming a human rights defender) would never have come true.

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Shannon Brenda Bothof

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List of Abbreviations

AI	Artificial Intelligence
ALS	Amyotrophic Lateral Sclerosis
BBIs	Brain-to-Brain Interfaces
BCIs	Brain-Computer interfaces
BRAIN	initiative Brain Research through Advancing Innovative Neurotechnology's
CBI	Computer-Brain-Interface
CoE	Council of Europe
DARPA	Defence Advanced Research Projects Agency
EEG	Electroencephalography
ECFR	Charter of Fundamental Rights of the European Union
ECHR	European Convention on Human Rights
EComHR	European Commission of Human Rights
fMRI	functional Magnetic Resonance Imaging
HBP	the Human Brain Project
HCR	Human Rights Committee
ICCPR	International Covenant on Civil and Political Rights
MEG	Magnetoencephalography
TMS	Transcranial Magnetic Stimulation
OAS	Organisation of American States
UDHR	Universal Declaration of Human Rights
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization

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Introduction

Exactly 20 years ago, Francis Fukuyama stated in Our Posthuman Future that 'the main threat of contemporary biotechnology is the possibility that it will change human nature and thereby bring us into a posthuman phase of history'.[1] Moreover, it could change our understanding of what it means to be human, according to Fukuyama.[2] Today, this threat is closer than ever. Rapid advances in human neuroscience and neurotechnology have brought society to a point where a transhumanist future, and eventually even the posthuman state, is in sight.[3] In the last two decades, technological advances in neuroscience, combined with the translation of neurotechnological innovation to extra-clinical sectors (e.g. judiciary, military and consumer), have led to growing public interest and academic reflection on the ethical, social and legal implications of technologies that interact with the human brain.[4]

Imagine a situation in which a computer hacker could access the neural information of the President of the United States and reveal the nation's next military objectives.[5] Or even worse, a situation in which the hacker would sell this neural information to a hostile country.[6] These situations seem unthinkable, but with neurotechnology's, such as brain-computer interfaces (BCIs)[7], we are closer than ever to making them a reality.

These developments will have unprecedented implications for our (mental) privacy. In the following Chapters of this thesis, the concept of "mental privacy", and more importantly how to protect it, will be further explored. But for now, it suffices to say that "mental privacy" is

[1] F. Fukuyama, *Our posthuman future consequences of the biotechnology revolution*. New York, Farrar, Straus and Giroux, 2002, p.7.
[2] Fukuyama, p.7.
[3] D. A. Borbón Rodríguez, L. F. Borbón Rodríguez, and M. A. León Bustamante, 'NeuroRight to Equal Access to Mental Augmentation: Analysis from Posthumanism, Law and Bioethics', *Revista Iberoamericana de Bioética*, no. 16, 2021, p. 3.
[4] M. Ienca, 'On Neurorights', *Frontiers in Human Neuroscience*, vol. 15, no. 701258, 2021, p. 1.
[5] P.B. Usieto and J. Minguez, 'Avoiding brain hacking - Challenges of cybersecurity and privacy in Brain Computer Interfaces', *Bitbrain* [web blog], 21 November 2018, https://www.bitbrain.com/blog/cybersecurity-brain-computer-interface, (accessed 9 February 2022).
[6] P.B. Usieto and J. Minguez, 'Avoiding brain hacking - Challenges of cybersecurity and privacy in Brain Computer Interfaces', *Bitbrain* [web blog], 21 November 2018, https://www.bitbrain.com/blog/cybersecurity-brain-computer-interface, (accessed 9 February 2022).
[7] L.F. Nicolas-Alonse and Gomez-Gil, 'Brain Computer Interfaces, a Review', *Sensors*, vol. 12, no. 2, 2012, p. 1211-1279.

the expression commonly used to describe the right of people against the unauthorised intrusion by third parties of their brain data, and against the unauthorised collection of that data.[8] The subject of this thesis is therefore mental privacy in the age of neurotechnology.

We are entering the era of neurotechnology, and more specifically BCIs, which is a technology that connects people's brains directly to machines, such computers and mobile phones.[9] More precisely, neurotechnology, including BCIs, is a form of technology that can record, interpret or change brain activity.[10] They can be invasive (and located in a person's skull) or non-invasive (such as a helmet worn over the head).[11] Neurotechnology makes possible what used to be science fiction. As noted by Yuste et al. 'companies and governments are developing devices that would allow people to communicate by thinking, to decipher other people's thoughts by reading their brain data, and to have access in their minds to all the databases and compatibilities of the Internet'.[12]

BCIs thus make it possible to connect the brain directly to a machine. This has enormous consequences, for the brain is not just an organ. It is the organ that generates all our mental and cognitive activity. It touches the very core of our being: all our thoughts, perceptions, imagination, memories, decisions and emotions are generated by the orchestrated firing of neural circuits in our brains.[13] For the first time in history, we are faced with the real possibility that human thoughts can be decoded or even manipulated by means of neurotechnology.[14] Furthermore, BCIs have a characteristic that makes them unique and sets them apart from all other technologies: they have access to the human brain, to our brain data.[15] This is extremely sensitive information, because of its association with the deep, private thoughts of human

[8] Ienca, 2021, p. 7. See also: F. X. Shen, 'Neuroscience, Mental Privacy, and the Law', *Harvard Journal of Law & Public Policy*, vol. 36, no. 2, 2013, p. 654-713; M. Ienca and R. Andorno, 'Towards new human rights in the age of neuroscience and neurotechnology', *Life Sciences, Society and Policy*, vol. 13, no. 5, 2017a, p.1-27; M. Ienca and R. Andorno. 'A New Category of Human Rights: Neurorights', Research in progress blog [web blog], 26 April 2017b), http://blogs.biomedcentral.com/bmcblog/2017/04/26/new-category-human-rights-neurorights/, (accessed 3 May 2022); R. Yuste, J. Genser, and S. Herrmann, 'It's Time for Neuro-Rights', *Horizons*, vol. 202, no. 18, 2021, p. 154-155.
[9] L.F. Nicolas-Alonse and J. Gomez-Gil, 'Brain Computer Interfaces, a Review', *Sensors*, vol. 12, no. 2, 2012, p. 1211-1279.
[10] Nicolas-Alonse and Gomez-Gil, p. 1211-1279.
[11] S. Goering et al. 'Recommendations for Responsible Development and Application of Neurotechnologies', *Neuroethics*, 2021, vol. 14, p. 366.
[12] Yuste et al. 2021, p. 155.
[13] Yuste et al. 2021, p. 155.
[14] Yuste et al. 2021, p. 155.
[15] Nicolas-Alonse and J. Gomez-Gil, p. 1211-1279.

beings.[16] If neurotechnology causes our thoughts to cease to be our own, this could mean the end of privacy.

Returning to the previously mentioned situation of the President of the United States, are we prepared for such situations? And what are the implications for our mental privacy? While neurotechnology, BCIs, offer crucial opportunities for both scientific and medical breakthroughs, and they will open up a huge new area for economic development, they also have unprecedented implications for human rights.[17] Neural information, all of our thoughts and emotions, may cease to be secret, fuelling an unregulated trade in neural data worth millions.[18]

In the present situation, privacy plays an important role in the application of neurotechnology. The question that arises is what are the implications of the use of BCIs for our mental privacy? Therefore, this research explores the legal implications of emerging neurotechnology's, more specifically of BCIs. With the aim to determine whether there are currently sufficient legal safeguards to protect our mental privacy when these BCIs enter the market on a large scale, or whether new safeguards may be needed in the form of new human rights. This research project is the result of many years of personal interest in human rights and technology; I find the interaction between humans and technology extremely interesting.

In this thesis, I will focus on a specific form of neurotechnology, namely BCIs, as this form of neurotechnology is currently at the centre of international debate.[19] There is currently heavy investment in BCIs by companies such as Facebook[20] and Elon Musk's *Neuralink*[21]. It is

[16] S. Rainey et al., 'Is the European Data Protection Regulation sufficient to deal with emerging data concerns relating to neurotechnology?', *Journal of law and the biosciences*, vol. *7*, no. 1, 2020, p. 1-19.
[17] Goering et al., p. 366.
[18] P.B. Usieto and J. Minguez, 'Avoiding brain hacking - Challenges of cybersecurity and privacy in Brain Computer Interfaces', *Bitbrain* [web blog], 21 November 2018, https://www.bitbrain.com/blog/cybersecurity-brain-computer-interface, (accessed 9 February 2022).
[19] Ienca and R. Andorno, 2017a, p.1-27.
[20] 'Brain-to-text technology under development at Facebook', *E&T editorial staff*, 20 April 2017, https://eandt.theiet.org/content/articles/2017/04/brain-to-text-technology-under-development-at-facebook-s-building-8/,(accessed 25 March 2022); Nick Statt, 'Facebook acquires neural interface startup CTRL-Labs for its mind-reading wristband', (The Verge, 23 September 2019) < https://www.theverge.com/2019/9/23/20881032/facebook-ctrl-labs-acquisition-neural-interface-armband-ar-vr-deal> accessded 15 March 2022.
[21] Crunchbase, 'Neuralink', 2019. Neuralink, https://www.crunchbase.com/organization/neuralink#section-overview, (accessed 4 May 2022).

expected that BCIs will soon be widely available on the market.[22] There are even authors who claim that we are at the beginning of a neuro-technological revolution and that, in the near future, BCIs will be as common as smartphones.[23] In addition, in this thesis I will limit myself to the risks of the use of BCIs with regard to mental privacy.

Recently, it has been argued that the current international human rights framework is inadequate to address the risks posed by neurotechnology. Three positions can be distinguished in this discussion:

(i) traditional human rights and freedoms do not protect sufficiently: new human rights are therefore necessary;[24]
(ii) traditional human rights and freedoms do not provide sufficient protection: they must therefore be adapted[25]; and
(iii) depending on their interpretation, traditional human rights and freedoms may offer sufficient protection: new human rights or adaptations are therefore not necessary.[26]

According to the first approach, a new human right to mental privacy should be developed.[27] In this context, it has been argued that the right to freedom of thought should be revised to make it "fit for the future" again.[28] But do we really need this? Or are existing human rights,

[22] For some examples of investments that have been made, see: Neurotech Reports, 'The Market for Neurotechnology: 2018–2022', *Neurotech Reports*, 2018, http://www.neurotechreports.com/pages/execsum.html, (accessed 4 May 2022).
[23] D. Bavelier, S. Schurle and A. Fernandez, 'The Neurotech Revolution Could Lead To 'Frankenstein' Brains. Here's How We Avoid It', *Fobes*, 4 August 2017, https://www.forbes.com/sites/worldeconomicforum/2017/08/04/the-neurotech-revolution-could-lead-to-frankenstein-brains-heres-how-we-avoid-it/?sh=2cc6f28d7d2d, (accessed 4 May 2022); Q. Terry, 'When Can We Expect Brain-Computer Interfaces to Replace Touch Screens?', medium, 22 February 2022, https://medium.com/@quharrison/when-can-we-expect-brain-computer-interfaces-to-replace-touch-screens-f1f231f1ef2e, (accessed 19 May 2022).
[24] Ienca and Andorno, 2017a, p.1-27.
[25] S. McCarthy-Jones, 'The Autonomous Mind: The Right to Freedom of Thought in the Twenty-First Century', *Frontiers in Artificial Intelligence*, vol. 2. No. 19, 2019, p. 1-17
[26] S. Michalowski, 'Critical Reflections on the Need for a Right to Mental Self-Deter- mination', in A. von Arnauld, K. von der Decken & M. Susi (eds.), *The Cambridge Handbook of New Human Rights*, Padstow: CUP 2020, p. .404-412; S. Ligthart, T. Kooijmans, and G. Meynen. 'Neurorechten: Wat doet Nederland ermee?' *Nederlands Juristenblad* , no. 22, 2021, p.1790-1797.
[27] Ienca and R. Andorno, 2017a, p.1-27.
[28] McCarthy-Jones, 2019, p. 1-17. See also: Alegre, 2017, p. 221-233; J.C. Bublitz,, 'Freedom of Thought as an International Human Right: Elements of a Theory of a Living Right', in M.J. Blitz and C. Bublitz (eds.), The Law and Ethics of Freedom of Thought, Palgrave Macmillan, 2021, p. 49-101; P. O'Callaghan. and B. Shiner, 'The Right to Freedom of Thought in the European Convention of Human Rights', *European Journal of Comparative Law and Governance*, vol. 8, no. 2-3, 2021, p. 140; S. Lighthart, 'Freedom of thought in Europe: do advances in 'brain-reading' technology call for revision?', Journal of Law and the Biosciences, vol, 7, no. 1,

such as the right to freedom of thought, flexible enough to provide sufficient protection? This thesis will investigate whether the right to freedom of thought in the European context offers sufficient protection to safeguard our mental privacy (i.e. mental privacy refers to the freedom of the mind). This fits in with the broader discussion on whether or not new human rights are needed as a result of neuro-technological developments.

In other words, this thesis explores the legal implications of emerging neurotechnology's, in particular BCIs, for mental privacy from a human rights perspective, with the aim of answering the following research question:

To what extent does the right to freedom of thought in the European context safeguard against the potential risks to mental privacy posed by neurotechnology, and more specifically by brain-computer interfaces?

To answer the central question, the following methodology and research methods are used. In general, this thesis consists of legal doctrinal research[29]. For information on neurotechnology, and more specifically on BCIs, academic literature in these fields is used. The "snowball method"[30] is used. In this method, one publication on a particular subject leads to multiple publications, by looking at the citations of the first publication.[31] In order to identify the risks of BCIs in relation to mental privacy, I will then take a closer look at the concept of both privacy and mental privacy. This will also be examined on the basis of the literature review using the "snowball method"[32]. Once the risks related to mental privacy have been identified, the logical question that arises is how to protect ourselves from these risks.

As already mentioned, the literature in this context mainly refers to the right to freedom of thought.[33] The meaning and scope of the right to freedom of thought is determined by

2020, p.1-27; A. Lavazza, 'Freedom of Thought and Mental Integrity: The Moral Requirements for Any Neural Prosthesis', *Frontiers in Neuroscience*, vol. 12, no. 82, 2018, p. 1-10.

[29] J. B.M. Vranken, 'Methodology of legal doctrinal research', in M. A. A. Hoecke (eds.), *Methodologies of legal research. Which kind of method for what kind of discipline*, Oxford, Hart Publishing, 2010, p. 111-112.

[30] C. Wohlin, 'Guidelines for Snowballing in Systematic Literature Studies and a Replication in Software Engineering', *ICPS Proceedings*, no. 28, 2014, p. 1-10.

[31] Wohlin, p. 1.

[32] Wohlin, p. 1.

[33] Alegre, 2017, p. 221-233; McCarthy-Jones, 2019, p. 1-17; J.C. Bublitz,, 'Freedom of Thought as an International Human Right: Elements of a Theory of a Living Right', in M.J. Blitz and C. Bublitz (eds.), The Law and Ethics of Freedom of Thought, Palgrave Macmillan, 2021, p. 49-101; P. O'Callaghan. and B. Shiner, 'The Right to Freedom of Thought in the European Convention of Human Rights', *European Journal of*

conducting doctrinal research using primary and secondary sources. These include the genesis (intention of the drafters), the limited jurisprudence in this area, scholarly journals and commentaries by legal scholars, as well as a recent report[34] by the Ahmed Shaheed, UN Special Rapporteur on Freedom of Religion or Belief. By consulting these sources, the meaning and scope of the right to freedom of thought is established. This information is then used to assess whether the right to freedom of thought is sufficiently capable of guaranteeing mental privacy in the age of neurotechnology. Opinions on this issue differ in the literature. Bublitz[35], Alegre[36], McCarthy-Jones[37] and Lighthart[38] are currently the leading authors in this discussion on the applicability of the right to freedom of thought in relation neurotechnology. This thesis therefore builds on the work of the aforementioned authors.

Finally, this information, concerning mental privacy, is used to return to the overarching theme of this thesis: do we have new human rights or not? This thesis attempts to contribute to this overarching discussion by examining the proposed right to mental privacy, from a human rights perspective. Do we need a new human right to mental privacy or is this right already protected by other human rights such as the right to freedom of thought? The answer to this question will thus contribute to the broad discussion on whether or not neuro-technological developments require new human rights. Moreover, this thesis hopes to raise awareness on the use of neurotechnology and more specifically BCIs, because I believe that BCIs will change society and that we must be prepared for that. As this thesis will show, we are entering an era in which man and machine are gradually becoming one.

The overall structure of this thesis is in the form of six Chapters, excluding the Introduction and the Conclusion. This thesis started with an Introduction, which contained the main question of the research. Chapter 1 discusses in more detail what BCIs are. Chapter 2 discusses the concept of privacy and the concept of mental privacy. Chapter 3 then discusses the risks to mental privacy associated with BCIs. Chapter 4 discusses the legal framework of the right to

Comparative Law and Governance, vol. 8, no. 2-3, 2021, p. 140; Lighthart, 2020, p.1-27; A. Lavazza, 'Freedom of Thought and Mental Integrity: The Moral Requirements for Any Neural Prosthesis', *Frontiers in Neuroscience*, vol. 12, no. 82, 2018, p. 1-10.

[34] UN Special Rapporteur on Freedom of Religion or Belief, *Report on the Freedom of Thought*, 5 oktober 2021, A/76/380.

[35] J.C. Bublitz, 'Freedom of Thought in the Age of Neuroscience', *Archiv für Rechts-und Sozialphilosophie*, vol. 100, no. 1, 2014, p. 1-25.

[36] Alegre, 2017, p. 221-233.

[37] McCarthy-Jones, 2019, p. 1-17.

[38] Lighthart, 2020, p.1-27.

freedom of thought in a European context. Chapter 5 then addresses the question of the extent to which the right to freedom of thought in a European context protects against the risks associated with BCIs in relation to mental privacy. Finally, Chapter 6 returns to the broad discussion on whether new human rights are needed as a result of neuro-technological developments. Lastly, the Conclusion summarises the main findings of the thesis.

Chapter 1

Brain-Computer-Interfaces

''BCIs are devices that connect the human brain to a computer or to another device outside the human body.''

Yuste et al. – 2021[39]

The aim of this Chapter is to explain the technology of BCIs by, among other things, giving examples of BCIs. Moreover, the different types of BCIs are considered, that is: invasive BCIs and non-invasive BCIs. Some knowledge on this topic is required to fully grasp its implications.

1.1 Introduction

Neurotechnology encompasses a wide range of technological advances, from the effective use of past methods to breakthrough new approaches and applications; such technological advances address long-standing challenges and shape new frontiers in neuroscience, medicine and biomedical engineering.[40] Most probably, BCI research began in 1973 at the University of California, where researchers described a series of experiments designed to prove that direct brain-computer communication is possible.[41] In 1973 Jacques Vidal published a paper on brain-machine communication entitled 'Toward direct brain-computer communication'.[42] In this paper, the term "brain-computer interface" or BCI was coined for the first time and a prototype of a direct communication channel between the brain and a computer was presented.[43]

[39] Yuste, et al., 2021, p.154-155.
[40] V.H.C de Albuquerque, A. Athanasiou and S. Ribeiro, 'A brief introduction to neurotechnology: old challenges and new battlegrounds', in V.H.C de Albuquerque, A. Athanasiou and S. Ribeiro (eds.), *in Neurotechnology Methods, advances and apllications*, London, The Institution of Engineering and Technology, 2020, p. 1.
[41] Vidal, p. 157-180.
[42] Vidal, p. 157-180.
[43] Vidal, p. 157-180.

Since then, researchers in both academia and industry have made great efforts to turn this hypothesis into a promising new technology. According to Kotchetkov et al, advances in both the supporting technologies (computational neuroscience and computer processing such as Artificial Intelligence (AI)) and our understanding of the cortical map (i.e. how our brains work) have led to improvements in BCIs and a wide range of BCI applications.[44]

These developments have been stimulated by a number of major global neuroscience initiatives, including the US-based Brain Research through Advancing Innovative Neurotechnology's (BRAIN) initiative[45], the Human Brain Project (HBP) in Europe[46], and other coordinated research projects around the world, including China, Japan, South Korea, Australia and Canada.[47] At the same time, governments around the world (e.g., the US) are developing non-medical neurotechnology for military and surveillance purposes, which has not been fully explored or regulated by either national legislation or international treaties.[48] For example, a major source of funding for the development of new BCI technologies is the United States Department of Defence, and in particular the Defence Advanced Research Projects Agency (DARPA).[49] While most of the focus has been on restoring lost function for people injured in combat, there is also a lot of interest in function enhancement to increase survivability, coordination and lethality for the US military.[50] These BCIs will eventually be used to control a soldier's cognitive workload, control a drone swarm, or connect to a prosthetic device, among other examples.

Stimulated by US President Barack Obama's 2013 BRAIN initiative, which funded government research for the development of neurotechnology and artificial intelligence, countries around

[44] I. S. Kotchetkov et al., 'Brain-computer interfaces: Military, neurosurgical, and ethical perspective', *Neurosurg Focus*, vol. 28, no. 5, 2010, p. 1-6. See also: A. Tiwary et al., 'Internet of things (IoT): Research, architectures and applications', *International Journal Future Revolution in Computer Science and Communication Engineering*, vol. 4, no. 3, 2018, p. 2454-4248; O. Landau, R. Puzis, and N. Nissim. 'Mind Your Mind: EEG-Based Brain-Computer Interfaces and Their Security in Cyber Space', *ACM Computing Surveys,* vol. 53, no. 1, art. 17, 2020, p. 1-38.
[45] L.A. Jorgenson et al., 'The BRAIN Initiative: developing technology to catalyse neuroscience discovery', *Philosophical Transactions of The Royal Society B,* 2015, vol. 370, no.1668, p. 2.
[46] 'Welcome to the Human Brain Project', (*Human Brain Project*) < https://www.humanbrainproject.eu/en/> accessed 24 March 2022.
[47] Goering et al., p.365.
[48] C. N. Munyon, 'Neuroethics of Non-primary Brain Computer Interface: Focus on Potential Military Applications, Frontiers in Neuroscience, vol. 12 no. 696, 2018, p. 1.
[49] Munyon, 2018, p. 1.
[50] A. Binnendijk, T. Marler, E. M. Bartels, *Brain-Computer Interfaces U.S. Military Applications and Implications, An Initial Assessment,* Santa Monica, California: RAND Corporation, 2020, p.3.

the world have thus begun to heavily fund similar research projects.[51] And in parallel with the advances in scientific laboratories and governments, neurotechnology development is increasingly taking place in the private sector, to the extent that in the US, the private sector is now allocating more money than the federal government for the development of new neurotechnology's.[52] In fact, over $19 billion has been invested in more than 200 neurotechnology companies worldwide in the past 20 years.[53]

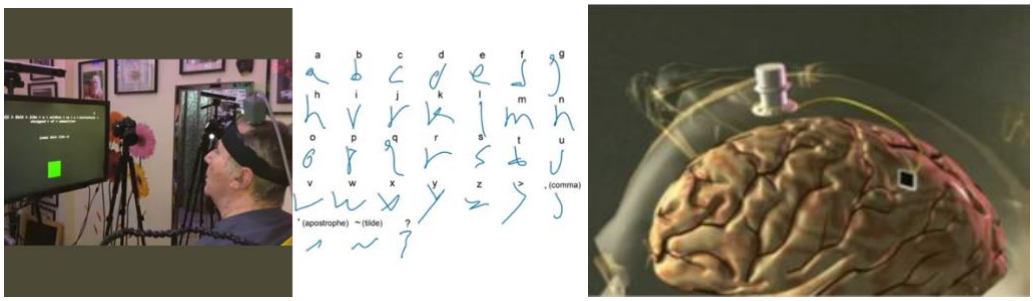
At the heart of neurotechnology are BCIs: the devices that connect the human brain directly to a computer or to another device outside the human body.[54] According to Vallabhaneni et al., 'BCIs establish a direct communication pathway that allows BCI-users to control an external computer device exclusively with brain activity, bypassing the peripheral nervous and muscle systems'.[55] In other words, using only thoughts to communicate with others or to perform certain tasks.[56] BCIs use a device that records and analyses the activity of the brain and translates it into the requested output.[57] BCIs thus enable a two-way communication between the brain and the outside world, outputting data about the brain or changing brain activity, and they can work in two different ways.[58] As noted, they can be invasive (and located in the skull of a person) or non-invasive (such as a helmet worn over the head).

1.2 Invasive BCIs

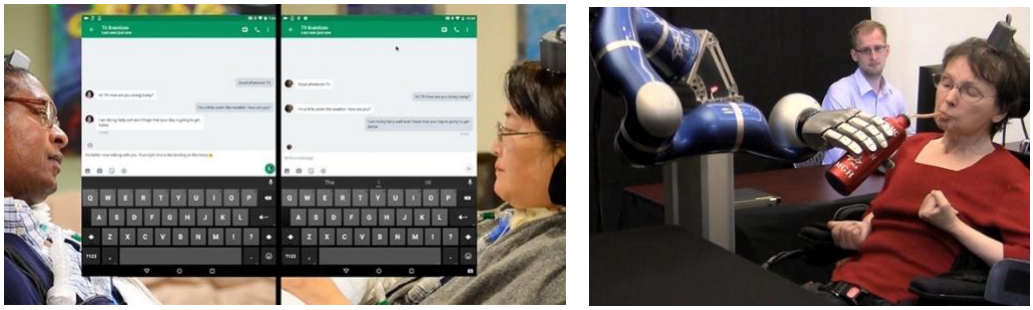
Invasive BCIs require surgery to place electrodes directly into a person's brain.[59] The electrodes send the brain data to a computer, where it can be analysed and decoded.[60] Invasive BCIs have been used in conventional medicine for many years; some well-known examples of invasive BCIs are cochlear implants, or deep brain stimulators that can help people with Parkinson's disease regain their mobility.[61] Scientists around the world are developing neurotechnology that could lead to new therapies for mental and neurological disorders, such as Alzheimer's

[51] Yuste et al., 2021, p. 157-158.
[52] Yuste et al., 2021, p. 157-158.
[53] Yuste et al., 2021, p. 157-158.
[54] Yuste et al., 2021, p. 154-155.
[55] Vallabhaneni, A., Wang, T., & He, B. (2005). Brain–computer interface. In Neural Engineering (pp. 85–121). New York: Springer. See also: J. R. Wolpaw et al., 'Brain-computer interface technology: a review of the first international meeting', *IEEE Transactions on Rehabilitation Engineering*, vol. 8, no. 2, 2000, p.164-173.
[56] See Figure 1.
[57] J. R. Wolpaw et al., 'Brain-computer interface technology: a review of the first international meeting', *IEEE Transactions on Rehabilitation Engineering*, vol. 8, no. 2, 2000, p.164-173.
[58] Wolpaw et al., p.164-173.
[59] Wolpaw et al., p.164-173.
[60] Wolpaw et al., p.164-173.
[61] Ienca, 2021, p. 1.

disease, schizophrenia, stroke, post-traumatic stress disorder, depression or addiction.[62] Scientists have also shown how invasive BCIs can help people with missing or damaged limbs to feel heat and cold through their prostheses.[63] According to Vilela and Hochberg, 'BCIs have the potential to improve the quality of life of individuals with severe motor disabilities'.[64] The same authors note that 'BCIs capture the user's brain activity and translate it into commands for the control of an effector, such as a computer cursor, robotic limb, or functional electrical stimulation device'. A schematic representation of the control of a robotic limb is shown in Figure 1d below.



(a) (b)



(c) (d)

Fig. 1. *BrainGate* examples of invasive BCIs. Invasive BCI by *BrainGate* lets paralysed man "write" his thoughts down with 94% accuracy (a). Representation of the *BrainGate* technology, a type of invasive BCI (b). BCI enables these persons with paralysis to control tablet devices and communicate with each other (c). A clinical trial of the

[62] Ienca, 2021, p. 1.
[63] D. Gil, 'The Ethical Challenges of Connecting Our Brains to Computers', *Scientific American* [web blog], 26 December 2020, https://www.scientificamerican.com/article/the-ethical-challenges-of-connecting-our-brains-to-computers/, (accessed 24 May 2022).
[64] M. Vilela and L. R. Hochberg, 'Applications of brain-computer interfaces to the control of robotic and prosthetic arms', in N. F. Ramsey and J. del R. Millán (eds.), *Brain-Computer Interfaces (Handbook of Clinical Neurology, Volume 168),* Amsterdam, Elsevier Publisching, 2020, p. 87-00.

cortical implant '*BrainGate*' demonstrates how a person with paralysis is able to control a robotic arm using just their thoughts (d).[65]

The figure above shows examples of BrainGate's invasive BCIs. For example, Figure 1a shows how a person with Amyotrophic Lateral Sclerosis (ALS) who previously could not speak or move, implanted with an invasive BCI, can now write and send emails, google random questions and shop on Amazon using an off-the-shelf Android tablet.[66] In the coming years, it is even expected that invasive BCIs will be able to provide even blind people with effective visual prostheses that will enable them to see the world around them again.[67]

While there have been many notable applications in medicine, invasive BCIs can also be used in other ways. In 2018, the MIT Media Lab used an invasive BCI to transcribe human thoughts into typed messages.[68] And *Neuralink*, owned by Elon Musk, announced that it is developing a wireless implantable chip to link human minds to computers to create "superhuman" cognition by empowering humans with AI.[69] The company indicated earlier this year that it is preparing to test microchips in human brains.[70] *Neurolink*, which has already successfully implanted artificial intelligence microchips in the brains of animals, is now recruiting for a "clinical trial director" to conduct tests of the technology in humans.[71] Back in 2016, Musk

[65] Braingate, 'Braingate in the Media', 2022, https://www.braingate.org/braingate-in-the-media/, (accessed 20 June 2022).
[66] Braingate, 'Assistive Communication', 2022, https://www.braingate.org/research-areas/assistive-communication (assessed 20 June 2022); F. R. Willet et al., 'High-performance brain-to-text communication via handwriting', *Nature*, no. 593, 2021, p. 249-254.
[67] S. Niketeghad and N. Pouratian, 'Brain Machine Interfaces for Vision Restoration: The Current State of Cortical Visual Prosthetics', *Neurotherapeutics*, vol.16, 2019, p. 134–143; M. Ptito et. Al., 'Brain-Machine Interfaces to Assist the Blind', *Frontiers in Human Neuroscience*, vol. 15, no. 6388872021, p. 1-19; Z. Sheikh et al., 'Noninvasive imaging system for visually impaired people', ICCSIT, vol. 9, 2010, p. 1-6.
[68] Larry Hardesty, 'Computer system transcribes words users "speak silently"', *MIT News*, 4 April 2018, https://news.mit.edu/2018/computer-system-transcribes-words-users-speak-silently-0404, (accessed 9 March 2022).
[69] Debbie White, 'Elon Musk's Neuralink prepares to test microchips in human brains', *The Times*, 21 January 2022, https://www.thetimes.co.uk/article/elon-musks-neuralink-to-start-clinical-trials-to-implant-microchips-into-human-brains-38q5hql0n, (accessed 9 March 2022).
[70] Debbie White, 'Elon Musk's Neuralink prepares to test microchips in human brains', *The Times*, 21 January 2022, https://www.thetimes.co.uk/article/elon-musks-neuralink-to-start-clinical-trials-to-implant-microchips-into-human-brains-38q5hql0n, (accessed 9 March 2022).
[71] Debbie White, 'Elon Musk's Neuralink prepares to test microchips in human brains', *The Times*, 21 January 2022, https://www.thetimes.co.uk/article/elon-musks-neuralink-to-start-clinical-trials-to-implant-microchips-into-human-brains-38q5hql0n, (accessed 9 March 2022).

promised that the technology 'will enable someone with paralysis to use a smartphone with their mind faster than someone using thumbs'.[72]

Finally, a remarkable study, Ramirez et al. published a study in the prestigious journal *Science* showing how false memories can be implanted in mice using invasive BCIs.[73] While a mouse performs an action, such as eating, the scientists can use invasive BCI to record data from the brain.[74] This data can then be used to reactivate and stimulate the same parts of the mouse's brain that were previously recorded, and make the mouse eat again - even if it did not want to eat.[75] The same process is also used to implant artificial memories and images into the brain of a mouse.[76] This then creates hallucinations and false memories, which, relevantly, are indistinguishable from the real world. In the researchers' words: 'Memories can be unreliable; we have created a false memory in mice by optogenetically manipulating memory-engram-bearing cells in the hippocampus'.[77] Are we heading for a time in which we can no longer trust our own memories?

1.3 Non-Invasive BCIs

Non-invasive BCIs do not touch the brain, but rest on a person's head. As Ienca and Haselager note 'non-invasive BCIs interface brain signals via neuroimaging technologies such as electroencephalography (EEG) and electromyography (EMG), which record brain activity via electrodes placed on the outside of the skull'.[78]

Non-invasive BCIs are also used for Brain-to-Brain Interfaces (BBIs). In the words of Jiang et al.: 'BBIs are interfaces which combine neuroimaging and neurostimulation methods to extract and deliver information between brains, allowing direct brain-to-brain communication'. In a recent publication, Jiang et al. presented the first multi-person non-invasive direct BBI, in which three people used an interface called BrainNet to solve a task together that resembled a Tetris game. As noted by Hildt, 'BBIs consist of two components: a brain-computer interface

[72] Debbie White, 'Elon Musk's Neuralink prepares to test microchips in human brains', *The Times*, 21 January 2022, https://www.thetimes.co.uk/article/elon-musks-neuralink-to-start-clinical-trials-to-implant-microchips-into-human-brains-38q5hql0n, (accessed 9 March 2022).
[73] S. Ramirez et al., 'Creating a false memory in the hippocampus', *Science*, vol. 341,6144, 2013, p. 387-391
[74] Ramirez et al., p. 387-391.
[75] Ramirez et al., p. 387-391.
[76] Ramirez et al., p. 387-391.
[77] Ramirez et al., p. 387-391.
[78] M. Ienca, P. Haselager, 'Hacking the brain: brain–computer interfacing technology and the ethics of neurosecurity', *Ethics and Information Technology*, no. 18, 2016, p. 117-129.

(BCI) that detects neural signals from one brain and translates them into computer commands, and a computer-brain interface (CBI) that delivers computer commands to another brain'. While the idea of a network of brains communicating directly with each other via BBIs may sound like science fiction to some, nowadays it is not. Moreover, Hildt points out that although the technology is still in its infancy, BBIs come with a number of unresolved ethical dilemmas. In my opinion, the same could be said for the widespread use of (non-)invasive BCIs.

Currently, non-invasive BCIs are not as far advanced as invasive BCIs. However, this will probably be the case in the near future given the large amounts of investments in non-invasive BCIs. For example, Facebook's "Brain to Text" project, launched in 2017, is building a non-invasive BCI to decode human thoughts at a rate of 100 words per minute and write them on a computer screen.[79] In addition, Facebook acquired CTRL-Labs in 2019 for reportedly between $500 million and $1 billion, to make the wristband that can convert electrical signals from the brain into computer input.[80] Furthermore, Figure 2a below shows the "Kernel Flow": a helmet that can map brain activity with unprecedented accuracy and resolution. This is a non-invasive BCI developed by the start-up *Kernel* in the autumn of 2020 that will be on the market for consumers in 2024.[81]

[79] 'Brain-to-text technology under development at Facebook', (*E&T editorial staff,* 20 April 2017) <https://eandt.theiet.org/content/articles/2017/04/brain-to-text-technology-under-development-at-facebook-s-building-8/ > accessed 25 March 2022.
[80] Nick Statt, 'Facebook acquires neural interface startup CTRL-Labs for its mind-reading wristband', (*The Verge*, 23 September 2019) < https://www.theverge.com/2019/9/23/20881032/facebook-ctrl-labs-acquisition-neural-interface-armband-ar-vr-deal> accessded 15 March 2022.
[81] Kernel Flow <https://www.kernel.com/products> accessed 20 April 2022. See also: A. L. Hood, 'Startup builds brain-reading helmet that scans your brain in infrared: would you use it?', (*Futurism.com,* 13 March 2021) < https://futurism.com/neoscope/brain-reading-infrared-helmet > accessed 20 April 2022; W. Yakowicz, 'Kernel's Brain-Imaging Helmet Approved For Clinical Trial On Patients Using Ketamine', (*Forbes.com*, 31 October 2021) < https://www.forbes.com/sites/willyakowicz/2021/10/31/kernels-brain-imaging-helmet-approved-for-clinical-trial-on-patients-using-ketamine/?sh=493a76d36c15 > accessed 20 April 2022.

(a) (b)

Fig. 2. Examples of non-invasive BCIs by Kernel and Emotiv. The ‘Kernel Flow’, this is a non-invasive BCI, that can be used for recording real time cortical hemodynamics to establish precise patterns of brain activity (a). The aim of the company is to ‘’make measurements of the brain and mind mainstream’’. Another example of non-invasive BCI: EMOTIV EPOC, a type of non-invasive BCI, which allows users to gain an accurate insight into their cognitive and emotional state in real-time by means of electroencephalography (EEG). EMOTIV's analyses can be used to improve your performance and develop new applications and services in neuroscience research, health and wellness, automotive, consumer research, education and entertainment (b).

1.4 Concluding Remarks

As the above examples show, the application of neurotechnology is very far-reaching and may even involve potential violations of human rights. As companies and governments continue to invest in and develop neurotechnology, it is reasonable to conclude that unexplored ethical and legal dilemmas will continue to arise. As a relatively new field, BCI presents a number of challenges that have not been encountered before, and which must be addressed before they become more widely available on the market. One such challenge concerns privacy, and more specifically mental privacy. This is discussed in more detail in the next Chapter.

Chapter 2

Privacy and the Notion of Mental Privacy

''We must realistically admit that there is no protection of privacy anymore - it was merely a historical curiosity that lasted for some 200 years and now must go as a new cooperative data community gains ground.''

Jeremy Rifkin – 2014[82]

This Chapter takes a closer look at the concept of privacy and mental privacy. First, both the concept of privacy and the concept of mental privacy will be discussed. Then the main characteristics of mental privacy in relation to BCIs will be discussed.

2.1 Introduction

The first consistent conceptualisation of the modern right to privacy dates back to a ground-breaking paper published in 1890 by Warren and Brandeis. In this paper, privacy was conceptualised as 'a right to be left alone'.[83] Subsequently, this specific case of privacy was further developed by Westin and other authors into the broader concept of "information privacy", i.e. the control of information about oneself. According to Westin, information privacy can be defined as the right of every person to determine when, how and to what extent personal information is disclosed to others.[84]

Currently, international human rights law formally recognises a right to privacy. To begin with, the 1948 Universal Declaration of Human Rights (UDHR) states that 'no one shall be subjected to arbitrary interference with his privacy, family, home or correspondence, or to attacks on his honour and reputation. Everyone has the right to protection by the law against such interference

[82] J. Rifkin, *The Zero Marginal Cost Society: the Internet of Things, the Collaborative Commons, and the Eclipse of Capitalism*, New York, Palgrave Macmillan, 2014.
[83] L. Brandeis, and S. Warren, 'The right to privacy', *Harvard Law Review*, vol. 4, no. 5, 1890, p. 193-220.
[84] A. F. Westin, 'Privacy and freedom', *Washington and Lee Law Review*, 1968, vol. 25, no. 1, art. 20, p. 166-170.

or attacks'.[85] In addition, the 1950 European Convention on Human Rights (ECHR) states that 'Everyone has the right to respect for his private and family life, his home and his correspondence'[86] and specifies that this right includes 'protection against telephone tapping, the collection of personal data by state security services and publications which infringe personal privacy'.[87]

In today's digital world, the right to privacy has become relevant to entirely new domains, such as the brain-mind domain, where neurotechnology's operate to reveal information about a person's mental processes (neural activity).[88] According to Ienca, this category of privacy challenges consists of 'both the predictive analysis of primary neural data, such as brain images, and inferences based on secondary data (e.g., phenotypic, or behavioural data) using techniques such as affective computing'.[89] As an example, Yuste et al. argued that 'an extraordinary amount of personal information can already be obtained from people's data traits' and that 'citizens should have the option – and the right – to keep their neural data private'.[90]

2.2 Mental Privacy

The above is related to what is nowadays referred to as "mental privacy". Mental privacy is the expression commonly used to describe the right of people against the unauthorised intrusion by third parties of their brain data, and against the unauthorised collection of that data.[91] In other words, the right to keep one's brain data private and safe from unwanted access. As argued by Laurie et al. privacy can be analysed in terms of bodily privacy, information privacy, decision privacy and property privacy.[92] Mental privacy (thus, the idea that we should have control over informational access to our brain data), in turn, is often not presented as a fifth privacy dimension, but rather as part of one of the other four.[93]

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[85] Article 12 UDHR.
[86] Article 8 (1) ECHR.
[87] Article 8 ECHR.
[88] M. Ienca, 'On Neurorights', *Frontiers in Human Neuroscience,* 2021, vol. 15, no. 701258, p. 4.
[89] M. Ienca, 'On Neurorights', *Frontiers in Human Neuroscience*, 2021, vol. 15, no. 701258, p. 4.
[90] R. Yuste et al. 'Four ethical priorities for neurotechnologies and AI', 2017, *Nature*, vol. 551 no. 7679, p. 160.
[91] F. X. Shen, 'Neuroscience, Mental Privacy, and the Law', *Harvard Journal of Law & Public Policy*, vol. 36, no. 2, 2013, p. 654-713; Ienca and R. Andorno, 2017a, p.1-27; M. Ienca and R. Andorno. 'A New Category of Human Rights: Neurorights', Research in progress blog [web blog], 26 April 2017), http://blogs.biomedcentral.com/bmcblog/2017/04/26/new-category-human-rights-neurorights/, (accessed 3 May 2022); Yuste 2021, et al., p.154-155.
[92] G. Laurie et al., 'Managing Access to Biobanks: How Can We Reconcile Individual Privacy and Public Interests in Genetic Research?', *Medical Law International,* vol. 10, 2010, p. 315 - 337.
[93] A. Wajnerman Paz, 'Is Your Neural Data Part of Your Mind? Exploring the Conceptual Basis of Mental Privacy', *Minds & Machines,* 2021, < https://doi.org/10.1007/s11023-021-09574-7 > accessed 25 April 2022.

2.3 Key Characteristics

2.3.1 Introduction

Goering et al. distinguished three characteristics of privacy in relation to neurotechnology: (1) the intimate and uncontrollable nature of brain data, (2) the general trend of increased intrusions into privacy via technology and (3) the relative inaccessibility of the brain to privacy intrusions without neurotechnology's.[94]

2.3.2 The intimate and uncontrollable nature of brain data

First, brain data (understood, in the line with Goering et al., 'as all data recorded from the activity of brain tissue'), could provide access to highly intimate information related to a person's identity.[95] It touches the core of who we are as human beings. Brain data reveals unique and personal, and to a large extent uncontrollable, aspects of a person that were previously undetectable.[96] Such data is particularly sensitive because it contains information that comes directly from the mind.[97] More importantly, this information, which comes from neuro-technological means, 'has not passed through executive controlled sensory or motor systems, meaning that it potentially lacks the mechanisms by which humans usually control the information they convey to the world'.[98] In other words, we cannot choose what information we share and what we do not, as we usually do through speech for example. According to Goering et al., 'people often do have some control over what they say, their facial expressions, and other ways in which they present themselves behaviourally to the world'.[99] At the same time, the authors point out that some unintentional actions may reveal certain information, however, the collection of brain data may offer new ways to circumvent even this limited control.[100] This information can include intentions and emotions. Hiding unsanctioned emotions and/or simply choosing not to speak out is a common strategy for maintaining

[94] Goering et al., p. 371.
[95] Goering et al., p. 371.
[96] Report Committee on Science and Law, 'Are your thoughts your own? Neuroprivacy and the legal implications of brain imaging', 2005, New York: National Bar Association.
[97] M. Christen et al. 'On the compatibility of big data driven research and informed consent: The example of the human brain project', *The ethics of biomedical big data*, 2016, p. 199-218; P. Kellmeyer, 'Big Brain Data: On the Responsible Use of Brain Data from Clinical and Consumer-Directed Neurotechnological Devices', *Neuroethics*, 2021, vol. 14, p. 83–98.
[98] Goering et al., p. 371.
[99] Goering et al., p. 371.
[100] Goering et al., p. 371.

privacy, which may be threatened by this new way of collecting personal data.[101] In addition, such access can reveal facts that affect how one sees oneself, for example, by revealing unconscious tendencies and biases.[102] The most intimate aspects of the individual that are personal and otherwise relatively hidden from others may become accessible by means of neurotechnology.

2.3.3 The general trend of increased intrusions into privacy via technology

Second, the pressure on individual privacy has increased drastically in recent years. On the one hand, this has to do with the enormous expansion of government surveillance worldwide, and on the other, with the fact that we currently live in a "Data Economy".[103] According to Lammi and Pantzar, the term "Data Economy" refers to the development of a digital economy in which data are collected *en masse* by everyone and in which data circulate faster than ever.[104] Today, we pay with data for services and goods. According to Rainey et al. this most likely will be the business model for brain data as well.[105] As is well known from the way smartphones are used, especially in mainstream apps and social media, people readily consent to their data being recorded and used if they get something useful in return.[106]

Consequently, both the commercial sector and government agencies have unprecedented access to people's personal data, such as location data, video surveillance, commercial preferences, and behavioural data. Social media companies can discern the social, political, religious and consumer affiliations of their users, and use or exchange that information to enable selectively targeted information dissemination[107]. As pointed out by Goering et al, 'questions about the privacy of brain data thus arise against a backdrop of reduced privacy in other contexts'.[108] With so many aspects of people's private lives accessible through data, brain data represents the final frontier for direct access to even more intimate data, which, according

[101] Goering et al., p. 371.
[102] Goering et al., p. 371.
[103] See among others: M. Lammi and M. Pantzar, 'The data economy: How technological change has altered the role of the citizen-consumer', *Technology in Society*, vol. 59. no. 101157, 2019; World Economic Forum, *Unlocking the Value of Personal Data: from Collection to Usage*, Switzerland, 2013; OECD, *Exploring the Economics of Personal Data: A Survey of Methodologies for Measuring Monetary Value*, OECD Publishing, OECD Digital Economy Papers, No. 220, 2013.
[104] M. Lammi and M. Pantzar, 'The data economy: How technological change has altered the role of the citizen-consumer', *Technology in Society*, vol. 59. no. 101157, 2019, p. 1.
[105] Rainey et al., 1-19.
[106] Rainey et al., 1-19..
[107] E. Steel, and G. A Fowler, 'Facebook in privacy breach', *The Wall Street Journal*, 18 October 2010. See also: W. Akkapon, M. A. Vadillo, and V. Curcin, 'Researching mental health disorders in the era of social media: Systematic review', *Journal of Medical Internet Research*, 2017, vol. 19, no. 6, p. 1-17.
[108] Goering et al., p. 371.

to the same authors, 'could profoundly deepen already robust personal data profiles'.[109] There are even authors such as Jeremy Rifkin who go so far as to say that: 'We must realistically admit that there is no protection of privacy anymore - it was merely a historical curiosity that lasted for some 200 years and now must go as a new cooperative data community gains ground'.[110]

2.3.4 The relative inaccessibility of the brain to privacy intrusions without neurotechnology's

Third, brain data is perhaps one of the few remaining domains where the most substantial invasions of privacy have not yet been realised.[111] It may already be too late for the acquisition of location data/video surveillance, commercial preferences and behavioural data via smartphones and computers, among others, but not yet for the large-scale acquisition of brain data via neurotechnological devices, such as BCIs, from millions of users. However, this could change with large-scale investment with public and private capital in neurotechnology's in different markets (i.e. medical, military and consumer).[112]

2.4 Concluding Remarks

The first conceptualisation of the modern right to privacy dates back to 1890 and was conceptualised as 'the right to be left alone'. In today's digital world, the right to privacy has become relevant to entirely new domains, such as the brain-mind domain, where neurotechnologies are used to reveal information about a person's mental processes. In the light of contemporary neuro-technological developments, I would conceptualise mental privacy as 'the right to be left alone in the brain-mind domain'.

[109] Goering et al., p. 371.
[110] J. Rifkin, *The Zero Marginal Cost Society: the Internet of Things, the Collaborative Commons, and the Eclipse of Capitalism*, New York, Palgrave Macmillan, 2014.
[111] Goering et al., p. 372.
[112] For some examples of investments that have been made, see: Neurotech Reports, 'The Market for Neurotechnology: 2018–2022', *Neurotech Resports*, 2018, http://www.neurotechreports.com/pages/execsum.html, (accessed 4 May 2022); Crunchbase, 'Neuroscience companies – Leaderboard', *Crunchbase*, 2019, https://www.crunchbase.com/hub/neuroscience-companies/top/org_top_rank_delta_d30_list#section-leaderboard, (accessed 4 May 2022); Department of Defense, 'Department of Defense Fiscal Year (FY) 2019 Budget Estimates', *Department of Defense*, 2018 p. 51, https://www.darpa.mil/attachments/DARPAFY19PresidentsBudgetRequest.pdf, (accessed 4 May 2022); Crunchbase, 'Neuralink', 2019. Neuralink, https://www.crunchbase.com/organization/neuralink#section-overview, (accessed 4 May 2022); C. Metz, 'With $1 billion from Microsoft an AI lab wants to mimic the brain',SundayGuardianLive, 2018, https://www.sundayguardianlive.com/tech/1-billion-microsoft-ai-lab-wants-mimic-brain (accessed 4 May 2022).

This relates to what is nowadays referred to as “mental privacy”. In my opinion, this is the last form of privacy we have left. Mental privacy is the expression commonly used to describe the right of people against the unauthorised intrusion of their brain data by third parties, and against the unauthorised collection of such data. Brain data can be understood as all data recorded from the activity of brain tissue, and it could give access to very intimate information about a person's identity. It goes to the heart of who we are as human beings. Brain data is perhaps one of the few areas where the most serious invasions of privacy have not yet occurred. However, this could change with large-scale investment with public and private capital in neurotechnologies in different markets.

This Chapter has shown that mental privacy is more relevant than ever. When neurotechnology’s, such as BCIs, will be widely used in society, will the existing legal safeguards provide sufficient protection, or might new safeguards be needed. Before I discuss this further in Chapter 6, the next Chapter will look at the risks to mental privacy posed by the use of BCIs.

Chapter 3

Mental Privacy Challenges Posed by Brain-Computer-Interfaces

'Dubito ergo cogito, cogito ergo sum''

(I doubt therefore I think, I think therefore I am)

René Descartes – 1637[113]

This Chapter aims to identify the privacy risks associated with the use of BCIs.

3.1 Introduction

A large number of BCIs are currently under development, or being proposed, for both medical and non-medical applications. A major concern related to the widespread use of neurotechnology, more specifically BCIs, is privacy. Data privacy has long been a general problem. This stems from technological access to personal data through electronic devices such as smartphones and computers. This problem, according to Georing et al, will be greatly exacerbated 'as the data it generates and manipulates reflects the neural activity of the individual'.[114] Access to personal data will no longer be through electronic devices such as smartphones and computers, but through neurological devices such as BCIs, directly from the human brain.

As the use of computers in human life have increased tremendously over the last years, the security threats have also increased significantly. Computer and information technologies can be used by malicious actors for purposes, such as hacking, fraud, identity theft, financial theft and information warfare. The wide range of criminal activities resulting from the misuse of computers and networks is called cybercrime. Halder and Jaishankar define cybercrime as: 'Offenses that are committed against individuals or groups of individuals with a criminal

[113] René Descartes, 1596-1650, *Discourse on Method (1637).* New York, London, Macmillan, Collier Macmillan, 1986.
[114] Goering et al., p. 370.

motive to intentionally harm the reputation of the victim or cause physical or mental harm to the victim directly or indirectly, using modern telecommunication networks'.[115] Originally, the activities of cybercriminals were limited to personal computers and associated computer networks, however this will change with emerging neurotechnology's, such as BCIs. Recent findings have shown that BCIs are potentially vulnerable to cyber criminality.[116] This opens the prospect of what Ienca and Halslager refer to as "neurocrimes": extending the range of computer-crime to neural devices.[117]

3.2 Risks to Mental Privacy posed by BCIs

The literature review revealed that, in summary, four privacy risks associated with BCIs can be distinguished. Goering et al. identified four specific privacy concerns related to brain data, which will be addressed below.

(a) Unauthorised Access – "Brain-Hacking" by Implementing Spyware in BCIs

Goering et al. note that the first risk is related to the fact that brain data could be accidentally – or not – stolen or released, and thus become accessible to unauthorised persons. Neurotechnology companies, such as *Emotiv* and *NeuroSky*, have applied the concept of BCI "App Stores" to expand BCI applications.[118] Relevant to note, is that most of the applications included provide unrestricted access to brain data, specifically to the users' raw electroencephalogram (EEG) signals.[119] Moreover, at the USENIX Security Symposium 2012, Martinovic et al. presented the first malicious software designed to detect users' private data using a BCI.[120] They called this "brain spyware". The authors successfully used BCIs to reveal private and sensitive information about its users, such as their PIN codes, bank memberships, months of birth, ATM numbers, home location and faces of known people.[121] Research by

[115] D. Halder, and K. Jaishankar, *Cyber crime and the victimization of women: Laws, rights, and regulations*, Hershey, IGI Global, 2011.
[116] For a detailed overview of the risks, see: O. Landau, R. Puzis, and N. Nissim. 'Mind Your Mind: EEG-Based Brain-Computer Interfaces and Their Security in Cyber Space', *ACM Computing Surveys*, vol. 53, no. 1, art. 17, 2020, p. 1-38.
[117] M. Ienca, P. Haselager, 'Hacking the brain: brain–computer interfacing technology and the ethics of neurosecurity', *Ethics and Information Technology*, no. 18, 2016, p. 117-129.
[118] Goering et al., p. 372.
[119] H. Takabi, A. Bhalotiya and M. Alohaly, 'Brain Computer Interface (BCI) Applications: Privacy Threats and Countermeasures', *2016 IEEE 2nd International Conference on Collaboration and Internet Computing (CIC)*, 2016, p. 102-111.
[120] I. Martinovic et al., 'On the feasibility of side-channel attacks with brain-computer interfaces', *2012 Presented as part of the 21st USENIX security symposium (USENIX Security*), 2012, p. 143-158.
[121] I. Martinovic et al., 'On the feasibility of side-channel attacks with brain-computer interfaces', *2012 Presented as part of the 21st USENIX security symposium (USENIX Security*), 2012, p. 143-158.

Bonaci et al. suggests that there is currently little to no way to resist these attacks.[122] Moreover, recent results from the study by Luber et al. show that attempts at deliberate deception can themselves be detected by a person's neural signals.[123] Going a step further, the same authors show that non-invasive BCIs, which emit imperceptible direct current electrical currents, can be used to make a user's reactions noticeably slower when he attempts to lie.[124]

(b) Individual Consent to Share Brain Data and Mind ''Reading''

The second risk that Goering et al. address concerns individual consent for the collection and use of brain data. They point out that for personal data, the model of individual consent generally applies, but this model is not without flaws.[125] This has to do with the fact that if a person agrees to share their data – even if that consent is based on language hidden deep in the licence agreement, or if a person has no realistic chance of understanding how their data will be used - then the other party can do whatever they want with that data; after all, there is consent. Hence, that party can collect, combine, use and transfer the data according to the agreement. In this flawed consent model, individuals often unwittingly give permission to share their personal data with companies that provide more and perhaps unwanted insight into their personal customer profile. According to Goering et al, these problems cannot be solved, if the individual consent model remains as it is, allowing companies to make commercial use of information with sparse, difficult to understand consent procedures. Moreover, consent agreements also determine what happens to the data after it has been collected. In this context, the authors point to the recent field of "neuromarketing". The latter can reveal important new data about human preferences and emotional responses by measuring customers' brain activity using magnetoencephalography (MEG) and wearable EEG.[126] This data can then be used to predict the choices of future consumers and thus have a high resale value.[127]

[122] T. Bonaci, R. Calo and H. J. Chizeck, 'App stores for the brain: Privacy & security in Brain-Computer Interfaces', *2014 IEEE International Symposium on Ethics in Science, Technology and Engineering*, 2014, p. 1-7.
[123] B. Luber et al., 'Non-invasive Brain Stimulation in the Detection of Deception: Scientific Challenges and Ethical Consequences', *Behavioral Sciences & the Law*, vol. 27, no. 2, 2009, p. 191-208.
[124] B. Luber et al., 'Non-invasive Brain Stimulation in the Detection of Deception: Scientific Challenges and Ethical Consequences', *Behavioral Sciences & the Law*, vol. 27, no. 2, 2009, p. 191-208.
[125] See also: Rainey et al., p. 1-19.
[126] Goering et al., p. 372.
[127] H. Plassmann, T. Z. Ramsøy, and M. Milosavljevic, 'Branding the brain: A critical review and outlook' *Journal of Consumer Psychology*, vol. 22, no. 1, 2012, p. 18-36.

As for "mind-reading", it has been suggested that current technological "mind reading" has substantial limitations and therefore it poses no real threat to mental privacy. These applications can often only decode a very limited set of predetermined mental states from neural activity, lacking unlimited real time access to just any content of the mind.[128] However, the refusal to legislate on the basis of current technological limitations is arguably an instance of the so-called "delay fallacy".[129] If we wait for this technology to be fully developed before deciding how to regulate it, by the time it is already developed, the technical features and social practices associated with it may become too culturally entrenched to be easily modified.

(c) "Writing" into the Brain and Consent

The third risk is related to the fact that neurotechnology's make it possible to "'write" information into the brain. By "writing" is meant the many ways in which electrical activity can be administered to the brain to specify certain outcomes.[130] Neuroscientists are already able to "write" a kind of hallucination into the brains of animals.[131] Neurotechnology's offer the prospect of making changes to brain processes by encoding (or to put it differently by "writing") new information into the brain. A carefully placed electrode can induce a feeling of fear or a memory (or a sense of *déjà vu*), which is distinct from the typical ways in which the subject experiences changes in his mental state (e.g. when seeing a scary movie, when seeing an old photograph).[132] Technologically mediated changes in mental states can be psychologically disturbing or alienating. Therefore, according to Goering et al., 'a robust consent to undergo such changes should be a prerequisite'.[133]

(d) Power Imbalances

The last risk relates to the fact that there is a significant power imbalance between the person whose brain data is obtained and the large entities that may want to collect, analyse, use and share that information.[134] Goering et al. wonder in this context whether, even in the case of

[128] G. Meynen, 'Ethical issues to consider before introducing neurotechnological thought apprehension in psychiatry', *AJOB neuroscience*, vol. 10, no. 1, 2019, p. 5-14.
[129] G. Mecacci and P. Haselager, 'Identifying criteria for the evaluation of the implications of brain reading for mental privacy', *Science and Engineering Ethics*, vol. 25, no. 2, 2019, p. 443-461.
[130] Goering et al., p. 372.
[131] L. Carrillo-Reid et al., 'Controlling visually guided behavior by holographic recalling of cortical ensembles', *Cell*, vol. 178, no. 2, 2019, p. 447-457.
[132] W. Deeb, et al., 'Fornix-region deep brain stimulation–induced memory flashbacks in Alzheimer's disease', *New England Journal of Medicine*, vol. 381, no. 8), 2019, p. 783-785.
[133] Goering et al., p. 372.
[134] Goering et al., p. 373.

clear consent, persons in a situation of power imbalance are able to exercise their refusal options. Citing the general example of the employee (where there is a clear power disparity), they argue that many employees agree to considerable surveillance within – and even outside – their work environment.[135] Where there is a power imbalance, it may be difficult for a person to refuse consent. Returning to the example of the employee, someone considering refusal may be rightly concerned that they may lose their job as a result.

In the context of collecting brain data from consumer technologies, Goering et al. point to a portable EEG system for closed-loop interaction with software content on social media (as pursued in Facebook's previously mentioned "brain typing" project).[136] The authors note that vulnerable individuals such as teenagers or others may be pressured by fear of social alienation or exclusion from peer groups if they do not participate in these "services". Some studies suggest that for social media users, the actual (or perceived) psychological rewards of using the services often seem to outweigh the potential threats to privacy.[137] A study comparing concerns about privacy issues online in 2002 and then in 2008 found that expressed concerns had increased significantly.[138] This may be due to the increase in the number of cases of fraud and identity theft, as well as news of large-scale privacy breaches.

3.3 Concluding Remarks

As the above shows, a major concern related to the widespread use of neurotechnology, specifically BCIs, is privacy. Access to personal data will no longer be through electronic devices such as smartphones and computers, but through neurological devices such as BCIs, directly from the human brain. There is thus a growing need to address the risks to mental privacy associated with neurotechnology's. Therefore, it will be necessary to determine the most appropriate way to safeguard mental privacy in relation to BCIs.

As Descartes famously stated in 1637: 'I think therefore I am'.[139] What are we if we cannot think for ourselves? To be able to think what we want and, more importantly, to be able to keep

[135] Goering et al., p. 373.
[136] E. Strickland, 'Facebook announces "typing-by- brain" project' *IEEE Spectrum*, 20 April 2017, https://spectrum.ieee.org/facebook-announces-typing-by-brain-project, (accessed 20 June 2022).
[137] B. Debatin, et al., 'Facebook and online privacy: Attitudes, behaviors, and unintended conse- quences', *Journal of Computer-Mediated Communication*, vol. 15, no. 1, 2009, p. 83-108.
[138] N. Minielly, V. Hrincu, and J. Illes, 'Privacy challenges to the democratization of brain data, *Iscience*, vol. 23, no. 6, 2020, p. 1-4.
[139] René Descartes, 1596-1650, *Discourse on Method (1637).* New York, London, Macmillan, Collier Macmillan, 1986.

those thoughts private, mental privacy is needed. In this context, the literature often refers to the right to freedom of thought. But is this right really capable of guaranteeing mental privacy? To answer this question in Chapter 5, I will first discuss the legal framework of the right to freedom of thought as enshrined in Artikel 9 ECHR in the next Chapter.

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Chapter 4

Legal Safeguards for Mental Privacy Through the Right to Freedom of Thought

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''…the right to freedom of thought, conscience and religion denotes only those views that attain a certain level of cogency, seriousness, cohesion and importance.''

S.A.S. v. France – 2014[140]

The aim of this Chapter is to set out the legal framework relating to the right to freedom of thought in a European context. What is the exact meaning and scope of the right to freedom of thought? This will be examined on the basis of the (limited) literature and case-law in this area.

4.1 Introduction

Scholars seem to agree that the right to freedom of thought is an underdeveloped right.[141] There is much case-law and academic analysis on the right to freedom of religion, belief and conscience[142], but freedom of thought seems to have been forgotten. One possible explanation for this is the assumption that thoughts are actually intangible and beyond the reach of unwanted interference.[143] They take place in our brain and are therefore beyond the reach of

[140] *S.A.S. v France* App no 43835/11 (ECHR GK, 1 July 2014).
[141] Lighthart, 2020, p.1-27.
[142] M. Evans, *Religious liberty and international law in Europe*, Cambridge University Press, 1997; C. Evans, *Freedom of Religion Under the European Convention on Human Right*, Oxford University Press, 2001; P. Taylor, *Freedom of Religion: UN and European Human Rights Law and Practice*, Cambridge University Press, 2005; D. J. Harris et al., *Law of The European Convention on Human Rights*, Oxford University Press, 2018; B. Vermeulen and M. Roosmalen, 'Freedom of thought, conscience and religion,' in F. Van Dijk et al. (eds.), *Theory and Practice of the European Convention on Human Rights*, 4th Edn., Cambridge: Intersentia Press, 2006. P. 751–772.
[143] Bublitz, 2014, p. 1-25; McCarthy-Jones, 2019, p. 1-17; Vermeulen and Roosmalen, p. 751–772; Alegre, 2017, p. 221-233.

others. In other words, since a person's inner thoughts are largely exercised in his mind,[144] with which interference is considered impossible, the limits of the concept of "thought" in the sense of the right to freedom of thought simply did not need to be discussed in depth until now.[145]

Recent advances in the field of neurotechnology[146] seem to be changing the traditional boundaries of thought, and raising new questions in the context of the right to freedom of thought. With these rapid advancement in neurotechnology, the assumption that thoughts are intangible is no longer so self-evident. The question arises what this means for our mental privacy and whether the right to freedom of thought is sufficient to guarantee our mental privacy in the age of neurotechnology.[147] This Chapter will therefore set out the legal framework relating to the right to freedom of thought in a European context. The next Chapter will examine the extent to which this legal framework is applicable to safeguard mental privacy in the age of neurotechnology.

4.2 The Right to Freedom of Thought: Meaning and Scope

4.2.1 Introduction

In a European context, the right to freedom of thought is guaranteed by Art. 9 of the European Convention on Human Rights (ECHR). Art. 9(1) ECHR reads as follows:

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

However, the same right is guaranteed by Art. 10(1) of the Charter of Fundamental Rights of the European Union (ECFR). According to Art. 52(3) of the Charter, the meaning and scope of Art. 10 ECFR and Art. 9 ECHR are similar. Therefore, this Chapter concentrates on the more elaborate literature and case law on Art. 9 ECHR. In addition, in a more international context, the right to freedom of thought is enshrined in Art. 18 of the Universal Declaration of Human Rights (UDHR) and in Art. 18 of the International Covenant on Civil and Political

[144] Harris et al., p. 574-575; D. Gomien, *Short Guide to the European Convention on Human Rights*, Council of Europe Publishing, 2005, p. 95.
[145] Bublitz 2014, p. 1-25; Alegre, 2017, p. 221-233; at 221; McCarthy-Jones, 2019, p. 25.
[146] See Chapter 1.
[147] See Chapter 2 and 3.

Rights (ICCPR) and is directly linked to freedom of opinion in Art. 10 of the ECHR and Art. 19 of the ICCPR, which is also considered an absolute right.[148]

It is relevant to note that the right to freedom of thought is an absolute right. This means that there can be no legitimate justification for restricting or violating it. The Human Rights Committee (HCR), in its 1993 General Comment No. 2221 on Art.18, explains the scope and absolute nature of the right:[149]

> "1. The right to freedom of thought, conscience and religion (which includes the freedom to hold beliefs) in article 18(1) is far-reaching and profound; it encompasses freedom of thoughts on all matters, personal conviction and the commitment to religion or belief, whether manifested individually or in community with others. The Committee draws the attention of States parties to the fact that the freedom of thought and the freedom of conscience are protected equally with the freedom of religion and belief. The fundamental character of these freedoms is also reflected in the fact that this provision cannot be derogated from, even in time of public emergency, as stated in article 4(2) of the Covenant.
>
> […]
>
> 3. Article 18 distinguishes the freedom of thought, conscience, religion or belief from the freedom to manifest religion or belief. It does not permit any limitations whatsoever on the freedom of thought and conscience or on the freedom to have or adopt a religion or belief of one's choice. These freedoms are protected unconditionally, as is the right of everyone to hold opinions without interference in article 19(1). In accordance with articles 18(2) and 17, no one can be compelled to reveal his thoughts or adherence to a religion or belief."

In doing so, the HRC has made it very clear that freedom of thought and freedom of expression are absolute rights and that there can be no legitimate justification for restricting or violating them. As mentioned in the Introduction, this thesis examines the right to freedom of thought in a European context. Therefore, the following paragraphs will focus on the right to freedom of thought as enshrined in Art. 9 of the ECHR.

Freedom of thought, together with one's conscience and faith, is considered part of one's *forum internum* – the inner space of our minds[150] – where mental faculties are developed, exercised

[148] Art. 9 ECHR does not apply to the manifestation of thoughts. Nevertheless, thoughts may be "manifested" through acts, mainly through speech and expression, which are covered by Art. 10 ECHR and art. 19 ICCPR. See, Evans 1997, p. 285; J. Murdoch, *Protecting the Right to Freedom of Thought, Conscience and Religion under the European Convention on Human Rights*, Council of Europe, 2012, p. 16.
[149] United Nations Human Rights Committee, General Comment No. 22: The Right to Freedom of Thought, Conscience and Religion (Art. 18), 1993, https://www.refworld.org/docid/453883fb22.html (accessed 18 June 2022).
[150] Alegre, 2017, p. 221.

and defined.[151] Accordingly, the right to freedom of thought consists of an internal and an external dimension: the *forum internum* and *the forum externum*.[152] While the right to freedom of thought, conscience and religion belongs to the internal dimension, the right to manifest one's religion and convictions belongs to the external dimension.[153] This difference in dimensions means, on the one hand, that infringements of the *forum externum* can, under certain circumstances, be justified via Art. 9(2) ECHR.[154] On the other hand, the Council of Europe guidelines on Art. 9 ECHR clarify that the right to freedom of thought in the *forum internum* is absolute and unquestionable, i.e. it may never be restricted; any infringement necessarily constitutes a violation of the right.[155]

The "founding fathers" of Art. 18 UDHR also stressed the importance of the *forum internum*. The drafting history of the UDHR shows that some delegates, including Lebanese delegate Charles Malik, considered the free exercise of mental faculties within the *forum internum* essential for the protection of the 'most sacred and inviolable possessions' of the human person, which enable us 'to perceive the truth, to choose freely and to exist'.[156] Freedom of thought was deliberately placed first in Article 18(1) of the UDHR and was characterised by the French delegate René Cassin as 'the origin of all other rights'.[157]

According to the Council of Europe *Human Rights Handbooks*, the *forum internum* of Art. 9 ECHR aims, at its most fundamental level, to 'prevent the indoctrination of individuals by the State by permitting the holding, development, refinement and possible transformation of personal thoughts, consciences and religion'.[158] In line with the Council of Europe *Human Rights Handbooks*, Vermeulen and Roosmalen note that the internal dimension of Art. 9 ECHR

[151] UN Special Rapporteur on Freedom of Religion or Belief, *Report on the Freedom of Thought*, 5 oktober 2021, A/76/380, para 2.
[152] Harris et al., p. 573; Vermeulen and Roosmalen, p. 738.
[153] Harris et al., p. 573; Vermeulen and Roosmalen, p. 738.
[154] Art. 9(2) ECHR: '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'.
[155] Council of Europe Guide to Article 9: Freedom of Thought, Conscience and Religion, http://echr.coe.int/Documents/Guide_Art_9_ENG.pdf (Accessed 18 May 2022).
[156] Commission on Human Rights, Summary Record of the Fourteenth Meeting, New York, 1948, https://undocs.org/Home/Mobile?FinalSymbol=E%2FCN.4%2FSR.14&Language=E&DeviceType=Desktop&LangRequested=False, E/CN.4/SR.14, p. 3, (accessed 19 May 2022), cited in UN Special Rapporteur on Freedom of Religion or Belief, *Report on the Freedom of Thought*, 5 oktober 2021, A/76/380, para. 2.
[157] Commission on Human Rights, Summary Record of the Sixteenth Meeting, New York 1948, https://undocs.org/Home/Mobile?FinalSymbol=E%2FCN.4%2FSR.60&Language=E&DeviceType=Desktop, E/CN.4/SR.60, p.10, (accessed 19 May 2022), cited in UN Special Rapporteur on Freedom of Religion or Belief, *Report on the Freedom of Thought*, 5 oktober 2021, A/76/380, para. 2.
[158] Murdoch, p. 18.

guarantees that the State may never interfere in the most intimate and inner sphere of its citizens, for example by prescribing what someone must believe or by taking coercive measures to make an individual change his convictions, for example by "brainwashing".[159]

As Ligthart points out, in addition to the prohibition of state interference without consent that governs the holding of a particular thought, conscience or religion, Art. 9(1) ECHR also protects against coercive measures to make one's thoughts, conscience or religion known.[160] The *forum internum*, as Vermeulen and Roosmalen argue, prohibits any form of coercion to express thoughts or make one's religion known; it guarantees that states may never use inquisitorial methods to find out one's personal thoughts and beliefs.[161] Lighthart notes, that his view can be traced back to the origins of Art. 9 ECHR, when its "founding fathers" held that the right to freedom of thought, conscience and religion is intended to protect 'not only against confessions imposed for state reasons, but also against those abominable methods of police enquiry or judicial process which rob the suspect or accused of control over his intellectual faculties and of his conscience'.[162] A similar position is taken in the previously cited General Comment on Art. 18 of the ICCPR: 'No one can be compelled to reveal his thoughts or adherence to a religion or belief'.[163] According to Alegre, freedom of thought is an essential pillar of the international human rights framework.[164] She points out that 'unlike many other rights, such as the right to private life, which allow for restrictions in certain circumstances, there is an absolute right to think what one wants in the *forum internum*'.[165] This inviolable freedom of thought in the *forum internum* has been described in *Nolan v. Russia* as 'the foundation of democratic society'.[166]

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[159] Vermeulen and Roosmalen, p. 738. See also: Harris et al., p. 573-575; Evans 1997, p. 294.
[160] Ligthart 2020, p. 7. See also: Harris et al., p. 574-575; Murdoch, p. 18; Taylor, p. 120. See also: *Dimitras and others v Greece* App no 42837/06, 3237/07, 3269/07, 35793/07 and 6099/08 (ECHR, 3 June 2010); *Sinan I¸sik v Turkey* App no 21924/05 (ECHR, 2 May 2010); *Alexandridis v Greece* App no 19516/06 (ECHR, 21 February 2008).
[161] Vermeulen and Roosmalen, p. 738. See also: Taylor, p. 202.
See also: *SinanI¸sik v Turkey*, App no 21924/05 (ECHR, 2 May 2010).
[162] Ligthart 2020, p. 7, cited in European Commission of Human Rights, Preparatory work on Article 9 of the European Convention onhuman rights, 1959, para. 4, https://www.echr.coe.int/LibraryDocs/Travaux/ECHRTravaux-ART9-DH(56)14-EN1338892.pdf, (accessed 20 June 2022).
[163] United Nations Human Rights Committee, General Comment No. 22: The Right to Freedom of Thought, Conscience and Religion (Art. 18), 1993, para. 3, https://www.refworld.org/docid/453883fb22.html (accessed 18 June 2022).
[164] Alegre, 2017, p. 221.
[165] Alegre, 2017, p. 221.
[166] *Nolan v Russia* (2011) 53 EHRR 29.

4.2.2 Viewpoints from the literature and case-law

As mentioned in the introduction to this Chapter, scholars seem to agree that the right to freedom of thought is an underdeveloped right. There is much literature and case-law on the right to freedom of conscience and religion,[167] but literature and case-law on the precise meaning and scope of the right to freedom of thought in this context is rather scarce.[168] Nevertheless, this section reviews the limited literature and case-law in this regard. To begin with, there seems to be general agreement that the right to freedom of thought, within *the forum internum*, falls into three core elements. In addition, Ahmed Shaheed, United Nations Special Rapporteur on Freedom of Religion or Belief, points to a fourth element. A schematic representation of the four core elements of the right to freedom of thought is given below.

The core elements right to freedom of thought within the *forum internum*:

(A) the right not to reveal one's thoughts;

(B) the right not to have one's thoughts altered or manipulated, and;

(C) the right not to be punished for his thoughts.[169]

To this Ahmed Shaheed, United Nations Special Rapporteur on Freedom of Religion and Belief, adds:

(D) a positive obligation of States to shape society in a way that ensures freedom of thought.[170]

Fig 3. The core elements of the right to freedom of thought within *forum internum*.

Similarly, the exact meaning and scope of the term "thoughts" is rather unclear.[171] According to Bublitz and Lighthart, for example, it is unclear whether the right to freedom of thought

[167] Evans 1997, p. 105; Evans 2001, p. 105; Taylor, p. 105; Harris et al., p. 139; Vermeulen and Roosmalen, p. 105.
[168] Evans 2001, p, 52; Taylor, p. 119; McCarthy-Jones, 2019, p. 1-17; C. Bublitz, 'The Nascent Right to Psychological Integrity and Mental Self-Determination', in A. von Arnauld, K. von der Decken and M. Susi (eds.), *The Cambridge Handbook of New Human Rights: Recognition, Novelty, Rhetoric*, Cambridge University Press, 2020, p. 394-395; Ligthart 2020. P. 104.
[169] Vermeulen and Roosmalen, p. 752.
[170] UN Special Rapporteur on Freedom of Religion or Belief, *Report on the Freedom of Thought*, 5 oktober 2021, A/76/380, para. 40-41.
[171] Evans 2001, p. 52; Taylor, p. 119; McCarthy-Jones, 2019, p. 1-17; Bublitz 2020, p. 394-95; Ligthart 2020, p. 8.

protects from forcible disclosure of every state and content of thoughts, or whether only certain thoughts fall within the scope of Article 9 ECHR.[172] In this respect, De Jong discusses three central approaches to the interpretation of the concept of "thought", focusing on:

1. religion: covering only thoughts and convictions that originate from religion;
2. conscience: covering only thoughts and convictions (including religions) that have a major impact on one's way of living and
3. thought: covering any thought, without additional requirements.[173]

It is clear that the first interpretation is too limited. This is because political, scientific and philosophical thoughts also fall under the right to freedom of thought, as laid down in Art. 18 UDHR, Art. 18 ICCPR and Art. 9 ECHR.[174] The relationship between the second and third interpretation is, however, subject to debate. Lighthart et al. note that 'especially in the older literature, a somewhat limited interpretation seems to be preferred, in which the emphasis is on thoughts that play an important role in the way we shape our lives'.[175] The same authors cite philosophical, cultural and social views, political views and scientific ideas as examples.[176]

In the case of *F.P. v. Germany*, the European Commission of Human Rights (EComHR/Commission) ruled that Article 9 ECHR 'is primarily designed to protect religions, or theories of philosophical or ideological universal values'.[177] The Court has adopted a relatively restrictive approach in assessing the type of beliefs that are protected by art. 9 ECHR.[178] To fall within the protection of art. 9 ECHR, personal beliefs must 'attain a certain level of coherence, seriousness, consistency and importance' and be such that they can be

[172] Ligthart 2020, p. 8; Bublitz 2020, p. 394-95.
[173] C. D. de Jong, *The Freedom of Thought, Conscience and Religion or belief in the United Nations (1946–1992)*, Intersentia, 2000, p. 23; Ligthart 2020, p. 8.
[174] S. Ligthart, *Coercive brain-reading in criminal law: An analysis of European human rights law*, Ph.D. Diss., Tilburg, Studio 2021, Tilburg University, 2021, para. 5.2.2; Ligthart 2020, p. 13.
[175] S. Ligthart, A. Buyse, and G. Meynen, ''Het recht op vrijheid van gedachte: Nieuwe internationale ontwikkelingen en nationale uitdagingen', *Rechtsgeleerd Magazijn Themis*, vol. 2022, no. 3, 2022, p. 108. See also: Evans 2001, p. 52; De Jong, p. 33; Evans 1997, p. 289-295; K.J. Partsch, 'Freedom of Conscience and Expression, and Political Freedoms', in L. Henkin (eds.), *The International Bill of Rights: The Covenant on Civil and Political Rights*, New York: Columbia University Press, 1981, p. 209-245; B. Rainey, P. McCormick and C. Ovey, *The European Convention on Human Rights*, New York: Oxford University Press, 2021, p. 462.
[176] Ligthart, Buyse and Meynen, p. 108.
[177] *F.P.v Germany* App no.19459/92 (Commission Decision, 23 March 1993).
[178] For example: *Folgerø and Others v Norway* App no. 15472/02 (ECHR, 29 June 2007); *Campbell and Cosans v UK* App no 7511/76 and 7743/76 (ECHR, 25 February 1982).

considered compatible with respect for human dignity.[179] In other words, the belief must relate to an 'important and essential aspect of human life and behaviour' and be considered worthy of protection in European democratic society. [180] A well-known example is the intention to vote for a particular political party, which is typically qualified as a thought within the meaning of Art. 9 of the ECHR.[181] This approach thus assumes that art. 9 ECHR does not protect just any belief.

In a rare example of case-law touching on freedom of thought, the EComHR ruled in *Salonen v. Finland* that, given the "comprehensiveness of the concept of thought", a parent's wish to name his child would fall within the scope of the right to freedom of thought.[182] This case suggests a broader concept of "thought". Whereas in the earlier case-law, for example the case of *F.P. v. Germany*, the Commission took a rather restrictive approach. Namely, that Art. 9 ECHR protects only religions and theories of philosophical or ideological universal values. With *Salonen v. Finland*, however, the Court underlines the all-encompassing nature of "thoughts", whereby even the wish of a person to give a child a certain name is covered by the concept of "thought".

The latter approach is followed in the more recent literature, which, largely in response to neuro-technological developments, argues for a broader interpretation of the concept of "thought", whereby virtually any thought is entitled to absolute legal protection.[183] This broader interpretation also seems to be guiding the report of the UN Special Rapporteur, Shaheed. In the concluding words of his report, he writes: 'Freedom of thought is simultaneously "profound and far-reaching". It protects thoughts on "all matters", whether about conscience, religion or belief or other topics, and results in one's beliefs, opinions and expressions, whether vocalized or not'.[184]

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[179] *S.A.S. v France* App no 43835/11 (ECHR GK, 1 July 2014); *Izzettin Doğan and others v Turkey* App no 62649/10 (ECHR GK, 26 April 2016)
[180] *Campbell v United Kingdom* (1982) 4 EHRR 293.
[181] *Georgian Labour Party v Georgia* App no 9103/04 (EHRM, 8 July 2008); Russian Conservative Party of Entrepreneurs and Others v Russia App no 55066/00 55638/00 (EHRM,11 januari 2007).
[182] *Salonen v Finland* App no.27868/95 (Commission Decision, 2 July 1997).
[183] J. C. Bublitz, 'Freedom of Thought as an International Human Right: Elements of a Theory of a Living Right', in M.J. Blitz and C. Bublitz (eds.), *The Law and Ethics of Freedom of Thought*, Palgrave Macmillan, 2021, p. 49-101; Alegre, 2017, p. 221-233; S. Alegre, 'Regulating around freedom in the "forum internum"', *ERA Forum*, vol. 21, 2021, p. 591-604; S. McCarthy-Jones, 2019, p. 1-17; P. O'Callaghan and B. Shiner, 'The Right to Freedom of Thought in the European Convention of Human Rights', *European Journal of Comparative Law and Governance*, vol. 8, no. 2-3, 2021, p. 140.
[184] UN Special Rapporteur on Freedom of Religion or Belief, *Report on the Freedom of Thought*, 5 oktober 2021, A/76/380.

4.3 Concluding Remarks

In conclusion, Art. 9 (1) ECHR has an internal component (*forum internum*) and an external component (*forum externum*). The internal component of this right is absolute, so that any interference constitutes a violation. However, the scope of this right is currently limited. From the founding history, the literature and the limited jurisprudence, one can deduce that Art. 9 ECHR only concerns thoughts and convictions that have a major impact on the way a person interprets his life, such as philosophical, religious, political and scientific views. With this, the case law of the Court seems to show sympathy for the second approach of de Jong: Article 9 ECHR only concerns thoughts and beliefs (including religions) that have a major impact on a person's way of life, i.e. thoughts that reach a certain level of coherence, seriousness, consistency and importance.

Everyday thoughts, emotions and intentions thus seem to fall outside the scope of this right. For this reason, there have recently been calls to adopt De Jong's third approach: Article 9 covers every thought, without additional requirements. They argue that the current right to freedom of thought offers insufficient protection against new neuro-technological developments that could lead to the identification or adaptation of more mundane states of mind. Against this background, it has been proposed to extend the scope of this right to any state of mind, regardless of its content. In other words, the right to freedom of thought should, according to some, be upgraded so that it is suitable now and, in the future, to protect us from the neuro-technological challenges of the 21st century. But is this really necessary? The next Chapter explores this in more detail.

Chapter 5

Application of The Right to Freedom of Thought in the Age of Neurotechnology

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"… mental privacy is a core attribute of freedom of thought.''

Ahmed Shaheed, UN Special Rapporteur on Freedom of Religion or Belief - 2021[185]

This Chapter considers the applicability of the right to freedom of thought with regards to mental privacy in the age of neurotechnology. In other words, does the right to freedom of thought offer sufficient protection to ensure mental privacy in relation to the risks posed by BCIs?

5.1 Introduction

The previous Chapter briefly touched upon the fact that a shift seems to be taking place with regard to the concept of "thought" in light of rapid neuro-technological developments. This Chapter examines the more recent literature regarding the right to freedom of thought in more detail.[186] With the aim to examine whether the protection of mental privacy falls within the scope of art. 9 ECHR. In other words, is our mental privacy sufficiently protected by the right to freedom of thought? And what exactly is meant by "thought" in the 21st century? And what kind of "thought" should be protected in the age of neurotechnology?

[185] UN Special Rapporteur on Freedom of Religion or Belief, *Report on the Freedom of Thought*, 5 oktober 2021, A/76/380.
[186] Bublitz, 2014, p. 1-25; Alegre, 2017, p. 221-233; McCarthy-Jones, 2019, p. 1-17.

Recently, Ahmed Shaheed, United Nations Special Rapporteur on Freedom of Religion or Belief also shed light on this issue. At the end of 2021, Shaheed presented a report[187] in which he said that the 'content and scope of freedom of thought is largely unclear and unknown' and that this must change.[188] In his report, he notes that many stakeholders have also reported that freedom of thought is under pressure now and in the future.[189] He further states that: 'Advances in digital technology, neuroscience and cognitive psychology may pose new challenges to the protection of our personal, innermost thoughts'.[190]

In addition to Shaheed's report for the United Nations, the Council of Europe (CoE), the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the Organisation of American States (OAS) are also actively considering how human rights should protect thoughts, emotions and other mental properties, especially in light of emerging neuro-technologies.[191]

5.2 The Right to Freedom of Thought: Mental Privacy

5.2.1 Introduction

There is currently an international debate on the meaning and scope of the right to freedom of thought in the light of rapid neuro-technological developments, such as the emergence of BCIs.[192] As the previous Chapter has shown, the right to freedom of thought within the *forum*

[187] In the report, the Special Rapporteur on freedom of religion or belief, Ahmed Shaheed, examines the theoretical scope and potential violations of the first right in article 18 (1) of the International Covenant on Civil and Political Rights: freedom of thought.
[188] Statement by Ahmed Shaheed Special Rapporteur on Freedom of Religion or Belief, 76th session of the General Assembly, Third Committee, Item 74 (b), 19 October 2021, New York, ohchr.org/EN/Issues/FreedomReligion/Pages/freedom-of-thought.aspx, (accessed 22 June 2022).
[189] UN Special Rapporteur on Freedom of Religion or Belief, *Report on the Freedom of Thought*, 5 oktober 2021, A/76/380, para. 5.
[190] Statement by Ahmed Shaheed Special Rapporteur on Freedom of Religion or Belief, 76th session of the General Assembly, Third Committee, Item 74 (b), 19 October 2021, New York, ohchr.org/EN/Issues/FreedomReligion/Pages/freedom-of-thought.aspx, (accessed 22 June 2022).
[191] Committee on Bioethics of the Council of Europe, 'Strategic Action Plan on Human Rights and Technologies in Biomedicine (2020-2025)', Council of Europe, 2019, https://rm.coe.int/strategic-action-plan-final-e/1680a2c5d2, (accessed 25 June 2022); International Bioethics Committee, 'Report of the International Bioethics Committee of UNESCO (IBC) on the ethical issues of neurotechnology', UNESCO, 2021, https://unesdoc.unesco.org/ark:/48223/pf0000378724, (accessed 25 June 2022); Inter-American Juridical Committee, 'Declaration of the Inter- american Juridical Committee on Neuroscience, Neurotechnologies and Human Rights: New Legal Challenges for the Americas', CJI/DEC. 01 (XCIX-O/21), OAS, http://www.oas.org/en/sla/iajc/docs/CJI-DEC_01_XCIX-O-21_ENG.pdf, (accessed 25 June 2022).
[192] Alegre, 2017, p. 221-233; McCarthy-Jones, 2019, p. 1-17; J.C. Bublitz,, 'Freedom of Thought as an International Human Right: Elements of a Theory of a Living Right', in M.J. Blitz and C. Bublitz (eds.), The Law and Ethics of Freedom of Thought, Palgrave Macmillan, 2021, p. 49-101; P. O'Callaghan. and B. Shiner, 'The Right to Freedom of Thought in the European Convention of Human Rights', *European Journal of Comparative Law and Governance*, vol. 8, no. 2-3, 2021, p. 140; Lighthart, 2020, p.1-27; A. Lavazza, 'Freedom

internum has so far remained underexposed. It has long been assumed that our thoughts are intangible, because they take place in our brains. But this seems to be slowly changing.

One of the leading actors in this debate is the beforementioned Ahmed Shaheed, United Nations Special Rapporteur on Freedom of Religion or Belief. He first notes that, apart from the absolute protection of the right to freedom of thought, little is known about what he calls the "attributes" of the right to freedom of thought within the *forum internum*.[193] These attributes (core elements) are schematically represented in Figure 3 of the previous Chapter. Figure 3 shows that in addition to the three core elements of the right to freedom of thought within the *forum internum*, the Rapporteur has added a fourth "attribute" or core element.[194] In doing so, the Rapporteur points to the positive obligation of States to protect freedom of thought, including through adequate laws and regulations that also regulate the activities of corporations. This follows, among other things, from the UN Guiding Principles on Business and Human Rights, which stipulate that companies themselves are also obliged to respect human rights.[195]

The Rapporteur also points to developments in the field of neurotechnological "brain reading" as discussed in Chapter 3. He states that these constitute a clear threat to the freedom not to share thoughts with third parties.[196] In addition to the use of this type of technology by companies, the Rapporteur expresses concern about its use by governments to punish citizens for certain feelings or thoughts, including in the context of risk assessment and memory sanctions in criminal law.[197]

In this context, the Rapporteur argues that the right to freedom of thought includes the right to mental privacy. In paragraph 26 of his report, he states that the protection of mental privacy

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of Thought and Mental Integrity: The Moral Requirements for Any Neural Prosthesis', *Frontiers in Neuroscience*, vol. 12, no. 82, 2018, p. 1-10.

[193] UN Special Rapporteur on Freedom of Religion or Belief, *Report on the Freedom of Thought*, 5 oktober 2021, A/76/380, para 26.

[194] UN Special Rapporteur on Freedom of Religion or Belief, *Report on the Freedom of Thought*, 5 oktober 2021, A/76/380. See Figure 3, element D.

[195] UN Special Rapporteur on Freedom of Religion or Belief, *Report on the Freedom of Thought*, 5 oktober 2021, A/76/380, para 26.

[196] UN Special Rapporteur on Freedom of Religion or Belief, *Report on the Freedom of Thought*, 5 oktober 2021, A/76/380. See Figure 3, element A.

[197] UN Special Rapporteur on Freedom of Religion or Belief, *Report on the Freedom of Thought*, 5 oktober 2021, A/76/380. See Figure 3, element C.

falls under the first core element ‘the right not to disclose one's thoughts’.[198] The Rapporteur argues that, ‘when discussing freedom of thought in General Comment No. 22, the HRC stated that “in accordance with Articles 18(2) and 17 ICCPR, no one can be compelled to reveal his thoughts” which, according to the Rapporteur, implies that 'mental privacy' is a core element of freedom of thought’.[199]

5.2.3 A review of the positions in the literature

In the literature, opinions differ as to what exactly should be protected within the *forum internum* and what should not. In what follows, I will discuss three perspectives that serve to strengthen the position of the right to freedom of thought in response to the neuro-technological developments, such as BCIs. These perspectives are offered successively by Jan Christoph Bublitz[200], Susie Alegre[201] and Simon McCarthy-Jones[202]. They are currently leading actors in the international debate on the right to freedom of thought in relation to the developments mentioned by the Rapporteur, namely digital technology, neuroscience and cognitive psychology.

(a) The position taken by Bublitz

Already in 2014, lawyer Jan Christoph Bublitz published the paper ‘Freedom of Thought in the Age of Neuroscience: A Plea and a Proposal for the Renaissance of a Forgotten Fundamental Right’.[203] He was one of the first to address the developments in neuroscience in relation to the right to freedom of thought. His paper discusses the various forms of psychological influence, including techniques (e.g. Transcranial Magnetic Stimulation (TMS)) that can identify, and more importantly, change thoughts and memories.[204] He also mentions more traditional forms of mental influence, namely neuromarketing[205] and involuntary psychiatry[206]. According to Bublitz, these forms of mental influence raise fundamental questions about the meaning and scope of the right to freedom of thought.[207] He argues that

[198] UN Special Rapporteur on Freedom of Religion or Belief, *Report on the Freedom of Thought*, 5 oktober 2021, A/76/380, para. 26. See Figure 3, element A.
[199] UN Special Rapporteur on Freedom of Religion or Belief, *Report on the Freedom of Thought*, 5 oktober 2021, A/76/380, para. 26.
[200] Bublitz, 2014, p. 1-25.
[201] Alegre, 2017, p. 221-233.
[202] McCarthy-Jones, 2019, p. 1-17.
[203] Bublitz, 2014, p. 1-25.
[204] Bublitz, 2014, p. 4.
[205] Bublitz, 2014, p. 9.
[206] Bublitz, 2014, p. 19.
[207] Bublitz, 2014, p. 19.

this mainly concerns the second core element of the right to freedom of thought within the forum internum, 'the right not to have one's thoughts changed or manipulated'.[208] In this context, Bublitz argues for a broad interpretation of the concept of "thought". According to the author, "thinking" should refer both to thoughts in the broad sense of any mental representation (that which one thinks, dreams or worries about), and to "thinking" as a mental process (including the many processes involved in thinking).[209]

In addition, Bublitz discusses the absolute nature of the right to freedom of thought. Under certain circumstances, he argues, it should be possible to limit the right to freedom of thought.[210] However, Bublitz argues that an interference is only justified if its ultimate goal is to increase the person's freedom of thought.[211] Only interference that undermines or circumvents another's control over thoughts and thought processes qualifies as a violation of the right to freedom of thought, according to Bublitz.[212] Hence, Bublitz argues for a broad interpretation of the concept of ''thought'', but at the same time he questions the absolute nature of the right to freedom of thought.

(b) The position taken by Alegre

It is relevant to note that both Alegre and McCarthy-Jones build on Bublitz's work as discussed above. In her article 'Rethinking Freedom of Thought for the 21st Century', human rights lawyer Susie Alegre argues for a stronger position of the right to freedom of thought in the regulation of emerging technologies.[213] As for her interpretation of the concept of "thought", she interprets it broadly. According to Alegre, the concept of "thought" is potentially broad and includes such things as emotional states, political opinions and trivial thought processes.[214] 'My decision on what colour socks to wear, how I think about Monday mornings or my thoughts on the death penalty can all fall under freedom of thought', says Alegre.[215]

Moreover, unlike Bublitz, Alegre cites the absolute nature of the right to freedom of thought as one of the article's strongest points. According to her, the right to freedom of thought should not be able to be restricted under any circumstance.[216] Alegre notes that recent developments in technology offer more and more novel possibilities to approach, change and manipulate our

[208] Bublitz, 2014, p. 22. See Figure 3, element B.
[209] Bublitz, 2014, p. 19..
[210] Bublitz, 2014, p. 24..
[211] Bublitz, 2014, p. 24. See Figure 3, element D.
[212] Bublitz, 2014, p. 1-25.
[213] Alegre, 2017, p. 221-233.
[214] Alegre, 2017, p. 224.
[215] Alegre, 2017, p. 224.
[216] Alegre, 2017, p. 221.

thoughts. One example she cites is Behaviour Microtargeting, whereby (groups of) users of digital services are given targeted information in order to manipulate their thoughts and influence their choices.[217] In line with the UN Special Rapporteur, she points to the danger of this strategy being used for political purposes, as happened during the Brexit campaign and Trump's election campaign in 2016. Alegre argues that our increasing interaction with technologies that constantly monitor where we are, what we say, how we look, what we do, what we read, what we like and what we (almost) buy allows third parties to construct a detailed picture of who we are and what we think - without us always being aware of it.[218]

She argues that the constant recording and analysis of our digital activities threatens not only the right not to have our thoughts recorded and sanctioned[219], but also the freedom to develop our thoughts independently and not to have them manipulated.[220] In addition, similar to the Rapporteur, she notes the positive obligation of states to protect freedom of thought[221], including through adequate laws and regulations that also regulate the activities of businesses. Alegre thus argues that there is an urgent need to examine and define the scope of the right to freedom of thought in the light of this new technological reality. According to Alegre, stronger legal frameworks need to be developed to protect our freedom of thought for the future.

(c) The position taken by McCarthy-Jones

The psychologist Simon-McCarthy-Jones, in his paper 'The Autonomous Mind: The Right to Freedom of Thought in the Twenty-First Century', also argues in favour of strengthening the right to freedom of thought.[222] In line with Alegre, he points to the ways in which the structural registration of our digital behaviour provides insight into the thoughts, feelings and sexual or political preferences of citizens and consumers, and into their manipulation.[223]

Moreover, McCarthy-Jones underlines the relevance of current developments in the field of neuro-technological "brain reading", as discussed in Chapter 3. While this Chapter has demonstrated that it is very difficult to determine what a person is thinking from brain activity, enormous advances are being made in decoding the human brain. Chapter 3 also revealed that huge investments are being made in this field, both by governments and by private companies such as *Facebook, Microsoft* and *Neuralink*. They are striving, for example, to ensure that

[217] Alegre, 2017, p. 228.
[218] Alegre, 2017, p. 226.
[219] See Figure 3, elements A and C.
[220] Alegre, 2017, p. 221-233. See Figure 3, element B.
[221] See Figure 3, element D.
[222] McCarthy-Jones, 2019, p. 1-17.
[223]McCarthy-Jones, 2019, p. 2. See Figure 3, elements A and B.

consumers can operate their digital devices no longer by hand, but by using their brains, by means of BCIs. The UN Rapporteur also points to the developments in the field of neurotechnological "brain reading", which, in his opinion, poses a clear threat to the freedom not to share thoughts with third parties.[224]

In this context, McCarthy-Jones argues that the contours of the right to freedom of thought must urgently be defined in the light of these 21st century technological threats to the right to freedom of thought. And that this includes a 21st century interpretation of the notion of "thought". According to the author, the right to freedom of thought should also cover external behaviour that is substantially related to the development of thought, such as reading, writing and various forms of Internet behaviour.[225] McCarthy-Jones argues that 'the right to freedom of thought must be developed with the clear understanding that its purpose is to secure mental autonomy'.[226] He argues that 'when we lose sovereignty over our minds, we lose our dignity, our democracy, and even ourselves'.[227] He calls this sovereignty mental autonomy. And he argues that mental privacy is necessary for mental autonomy. Therefore, according to McCarthy-Jones, mental privacy can also be understood as protected by Article 9 of the ECHR.[228]

Besides the threats, McCarthy-Jones points to the advantages of digital and neuroscientific technologies that can help identify thoughts and intentions, for example in the context of criminal law. Against this background, McCarthy-Jones wonders whether the right to freedom of thought, with mental autonomy at its core, should be an absolute right. Or would a balancing of different interests be justifiable in some cases, such as the protection of children from sexual abuse and the fight against terrorism?[229] In such cases, the author suggests, many will prefer a relative approach: a human right that can be restricted under certain circumstances. McCarthy-Jones ends his paper with a call for a public and scholarly debate on the absolute nature of the right to freedom of thought in the light of the neuro-technological developments of the 21st century.

[224] See Figure 3, element A.
[225] McCarthy-Jones, 2019, p. 6.
[226] McCarthy-Jones, 2019, p. 3.
[227] McCarthy-Jones, 2019, p. 1.
[228] McCarthy-Jones, 2019, p. 10.
[229] McCarthy-Jones, 2019, p. 8.

5.3 Concluding Remarks

What the authors discussed above have in common is that they all argue for a stronger position of the right to freedom of thought. They also all argue for a broad interpretation of the concept of "thought". However, there are also clear differences. These differences mainly concern the absolute nature of the right to freedom of thought. Bublitz and McCarthy-Jones, for example, criticise the absolute nature of the right to freedom of thought. According to Bublitz, an infringement of the right to freedom of thought would be justified if that infringement was ultimately intended to increase the freedom of thought of the person concerned.[230] This is clearly different from McCarthy-Jones' approach, which suggests that freedom of thought might be limited by, for example, security considerations. Alegre, on the other hand, argues that the absolute nature of the right to freedom of thought must be maintained. In her view, it should never be possible to violate the right to freedom of thought. According to Alegre, this is precisely what makes the right to freedom of thought so powerful, unlike, for example, the right to privacy, which can be restricted under certain circumstances.

At the beginning of this Chapter, I asked myself the question: does the right to freedom of thought offer sufficient protection to safeguard mental privacy in the face of the risks posed by BCIs? The answer to that question is 'yes'. This is evident both from the findings of the report by Ahmed Shaheed, United Nations Special Rapporteur on Freedom of Religion or Belief, and from the literature. According to the Rapporteur, mental privacy is a core element of freedom of thought. Moreover, McCarthy-Jones argues that mental privacy can also be understood as protected by Article 9 of the ECHR'.

However, according to McCarthy-Jones, the right to freedom of thought needs to be further developed in light of 21st century neuro-technological developments. This fits into a broader discussion on whether new or adapted human rights are needed. For example, there are voices claiming that, as a result of rapid neuro-technological developments, new human rights are needed in the form of so-called "neurorights". However, opinions on this are divided. I will elaborate on this debate in the next Chapter.

[230] McCarthy-Jones, 2019, p. 1-17.

Chapter 6

Are New Human Rights Needed?

''The Convention is a living instrument which … must be interpreted in the light of present-day conditions''.

Tyrer v. United Kingdom - 1978[231]

This Chapter aims to give an overview of the neurorights debate. As well as to indicate the three alternative positions in this debate. Moreover, this Chapter returns to the overarching theme of this thesis: are new human rights needed? The results of the previous Chapters will be used to answer this question.

6.1 The Neurorights Debate

There is currently much debate as to whether we need new human rights to protect us from emerging neurotechnology's. For some years now, the international literature has been debating whether traditional human rights and freedoms offer sufficient protection against these emerging neurotechnology's that can interfere with our "mental life".[232]

This issue has gained importance in light of recent studies by authors such as Yuste and Ienca. In 2017 professors Marcello Ienca and Roberto Andorno, suggested that existing human rights may not be sufficient to respond to the emerging challenges posed by neurotechnology, and they proposed four new human rights: the right to cognitive freedom, the right to mental privacy, the right to mental integrity, and the right to psychological continuity.[233]
Later, in November 2017, a group of researchers led by Rafael Yuste and Sara Goering published an article on neurorights in the prestigious journal Nature.[234] The authors raise their

[231] *Tyrer v United Kindom* App no 5856/72 (ECHR, 25 April 1978).
[232] For example, Ienca, M., 'On Neurorights', *Frontiers in Human Neuroscience*, vol. 15, no. 701258, 2021, p. 1-11; M. Ienca, 'COMMON HUMAN RIGHTS CHALLENGES RAISED BY DIFFERENT APPLICATIONS OF NEUROTECHNOLOGIES IN THE BIOMEDICAL FIELD', Council of Europe, 2021, https://rm.coe.int/report-final-en/1680a429f3, (accessed 26 June 2022).
[233] Ienca and R. Andorno, 2017a, p.1-27.
[234] R. Yuste et al. 'Four ethical priorities for neurotechnologies and AI', 2017, *Nature*, vol. 551 no. 7679, p. 160.

voices about the potential ethical implications of the development of neurotechnology's. While the authors acknowledge that neurotechnology's offer promising possibilities for treating neurological diseases and improving general well-being, they also argue that "the technology may also exacerbate social inequality and provide companies, hackers, governments or whoever else with new ways to exploit and manipulate people".[235]

In this same vein, Yuste, Goering and their team note the existence of four ethical priorities that need to be addressed: privacy and consent, identity, augmentation and bias.[236] Therefore, the researchers propose that, among other things, our mental integrity and our ability to choose our actions should be protected as fundamental human rights: "we recommend that clauses protecting such rights ("neurorights") be added to international treaties, such as the 1948 Universal Declaration of Human Rights".[237]

Consequently, Columbia University, the National Science Foundation, and Rafael Yuste held a 3-day workshop with a group of leaders from different fields of science, ethics and lawyers. On these meetings, the NeuroRights Initiative, now called the NeuroRights Foundation, was built. Then, in 2019, they formulated five specific neurorights: the right to personal identity, the right to free will, the right to mental privacy, the right to equal access to mental augmentation, and the right to protection from algorithmic bias.[238] Currently, the Foundation is led by Columbia University's Neurotechnology Center, with Yuste as director.

Several countries are now on the verge of actually recognising specific neural rights in their national constitutions. On 14 July 2021, the president of the Government of Spain presented the Digital Rights Charter *(La Carta de Derechos Digitales)*.[239] In addition to specific rights focused on digital environments and artificial intelligence, the Charter also includes some rights to regulate the use of emerging neurotechnology's.[240] With this, Spain is the first

[235] R. Yuste et al. 'Four ethical priorities for neurotechnologies and AI', 2017, *Nature*, vol. 551 no. 7679, p. 160.
[236] R. Yuste et al. 'Four ethical priorities for neurotechnologies and AI', 2017, *Nature*, vol. 551 no. 7679, p. 160; See also: Yuste 2021, et al., p.157-158.
[237]R. Yuste et al. 'Four ethical priorities for neurotechnologies and AI', 2017, *Nature*, vol. 551 no. 7679, p. 160; See also: Yuste 2021, et al., p. 157-158.
[238] 'The NeuroRights Foundation: New Human Rights for the Age of Neurotechnology', (*The NeuroRights Foundation*) < https://neurorightsfoundation.org > accessed 26 March 2022.
[239] La Moncloa,'The Government adopts the Digital Rights Charter to articulate a reference framework to guarantee citizens' rights in the new digital age', 2021, https://www.lamoncloa.gob.es/lang/en/gobierno/news/Paginas/2021/20210713_rights-charter.aspx, (accessed 26 June 2022).
[240] La Moncloa, 'The Government adopts the Digital Rights Charter to articulate a reference framework to guarantee citizens' rights in the new digital age', 2021, https://www.lamoncloa.gob.es/lang/en/gobierno/news/Paginas/2021/20210713_rights-charter.aspx, (accessed 26 June 2022).

European country and the second country in the world that is actively working on codifying and thereby recognising neural rights. Pioneer Chile is also working on including neurorights in the Constitution in order to prevent the misuse of AI and neurotechnology.[241] This amendment to the Constitution was approved by the Chilean Senate on 16 December 2020. Both countries were advised on this by the aforementioned NeuroRights Initiative, led by Rafael Yuste.

The aforementioned shows that the potential risks of neurotechnology, such as BCIs, as discussed in Chapter 1,2 and 3, have led to calls for action from neuroscientists, lawyers and ethicists who are urging lawmakers to create new legislation to cover the risks of neurotechnology's. They propose new human rights, neurorights, which should fill the alleged gaps in current international human rights law. These studies have led to the question of whether existing human rights are indeed insufficient to cover the risks of emerging neurotechnology's, such as BSIs, or whether existing human rights are flexible enough to cover these risks. In other words, do we need new human rights? In summary, three positions can be distinguished in this discussion:

(i) traditional rights and freedoms do not protect sufficiently: new rights are therefore necessary;[242]
(ii) traditional rights and freedoms do not provide sufficient protection: they therefore need to be adapted,[243] and;
(iii) depending on their interpretation, traditional rights and freedoms may offer sufficient protection: new rights or adaptations are therefore not necessary.[244]

In what follows, the core arguments of the three alternative positions in the neurorigths debate will be discussed.

[241] H. L. Guzmán, 'Chile: Pioneering the protection of neurorights', UNESCO, 21 March 2021, https://www.unesco.org/en/articles/chile-pioneering-protection-neurorights, (26 June 2022).
[242] Ienca and R. Andorno, 2017a, p.1-27.
[243] McCarthy-Jones, 2019, p. 1-17.
[244] S. Michalowski, 'Critical Reflections on the Need for a Right to Mental Self-Deter- mination', in A. von Arnauld, K. von der Decken & M. Susi (eds.), *The Cambridge Handbook of New Human Rights*, Padstow: CUP 2020 , p. .404-412; S. Ligthart, T. Kooijmans, and G. Meynen, 'Neurorechten: Wat doet Nederland ermee?' *Nederlands Juristenblad* , no. 22, 2021, p.1790-1797.

6.2 Three Alternative Positions

6.2.1 Position 1: New Neurorights are Necessary

As described in the previous chapters, our mental life today is susceptible to all kinds of external technological influences. According to this first approach, traditional rights are insufficiently equipped to protect against these technological influences.[245] Therefore, new human rights in the form of neural rights would be needed. The ethicist Ienca and the jurist Andorno argue in their article "Towards new human rights in the age of neuroscience and neurotechnology" that the existing human rights may not be sufficient to meet the emerging challenges of neurotechnology, and they propose four new human rights: the right to cognitive freedom, the right to mental privacy, the right to mental integrity, and the right to psychological continuity.[246] The last two rights are also explicitly included in the Spanish and Chilean (proposed) legislation mentioned above.

Recently, the previously discussed NeuroRights Foundation published a report entitled International Human Rights Protection Gaps in the Age of Neurotechnology about the alleged gaps in the human rights system.[247] Its central finding reads, "Our report ultimately concludes that the existing body of international human rights treaties, general observations and jurisprudence is ill-equipped to protect neurorights" (p. 5).[248] On this basis, it makes several recommendations to international stakeholders and the United Nations on law reform.

However, the introduction of neurorights is also criticised. As noted by Ligthart et al, the central argument in this regard relates to "rights inflation".[249] The authors interpret this concept as "the

[245] Ienca and R. Andorno, 2017a, p.1-27; J. Genser, S. Hermann and R. Yuste, 'International Human Rights Protection Gaps in the Age of Neurotechnology', *The NeuroRights Foundation*, 2022, https://static1.squarespace.com/static/60e5c0c4c4f37276f4d458cf/t/6275130256dd5e2e11d4bd1b/1651839747023/Neurorights+Foundation+PUBLIC+Analysis+5.6.22.pdf, (accessed 11 May 2022).
[246] Ienca and R. Andorno, 2017a, p.1-27.
[247] J. Genser, S. Hermann and R. Yuste, 'International Human Rights Protection Gaps in the Age of Neurotechnology', *The NeuroRights Foundation*, 2022, https://static1.squarespace.com/static/60e5c0c4c4f37276f4d458cf/t/6275130256dd5e2e11d4bd1b/1651839747023/Neurorights+Foundation+PUBLIC+Analysis+5.6.22.pdf, (accessed 11 May 2022).
[248]J. Genser, S. Hermann and R. Yuste, 'International Human Rights Protection Gaps in the Age of Neurotechnology', *The NeuroRights Foundation*, 2022, p. 5, https://static1.squarespace.com/static/60e5c0c4c4f37276f4d458cf/t/6275130256dd5e2e11d4bd1b/1651839747023/Neurorights+Foundation+PUBLIC+Analysis+5.6.22.pdf, (accessed 11 May 2022).
[249] S. Ligthart, T. Kooijmans and G. Meynen. 'Neurorechten: Wat doet Nederland ermee?' *Nederlands Juristenblad* , no. 22, 2021, p. 1793.

tendency to qualify everything that is morally desirable as a human right".[250] And they argue that this is undesirable: "by seizing upon every social development in order to introduce new human rights, we eventually dilute the core idea behind those rights: the protection of some truly fundamental interests, not the regulation of everything we would consider desirable in an "ideal world", the authors say.[251] There is widespread concern about the "inflation" of human rights: postulating too many human rights will, it is said, lead to their devaluation.[252] At the same time, there are also authors such as Leenes who argue that these gaps often turn out to be the result of a lack of understanding of the law.[253] Leenes calls this phenomenon the 'Flawed Law Syndrome'.[254]

6.1.2 Position 2: Existing Human Rights Deserve Adjustment

The second approach argues that, as a result of neuro-technological developments, existing rights should be adjusted.[255] As with the first approach, the argument is that traditional human rights are insufficiently equipped to offer protection against external neuro-technological influences. Only the proposed method is different.

This approach concentrates on the right to freedom of thought, which is discussed in Chapters 4 and 5.[256] In these Chapters, the meaning and scope of the right to freedom of thought in the light of mental privacy was discussed. Chapter 4 showed that the scope of this right is limited. From the founding history, the literature and the limited jurisprudence, it can be deduced that this right currently applies only to thoughts and convictions that have a major impact on the way a person interprets his or her life, such as philosophical, religious, political and scientific views.[257] Emotions, everyday thoughts and intentions are therefore outside the scope and thus

[250] S. Ligthart, T. Kooijmans and G. Meynen. 'Neurorechten: Wat doet Nederland ermee?' *Nederlands Juristenblad* , no. 22, 2021, p. 1793.
[251] S. Ligthart, T. Kooijmans and G. Meynen. 'Neurorechten: Wat doet Nederland ermee?' *Nederlands Juristenblad* , no. 22, 2021, p. 1793.
[252] J.T. Theilen, "The Inflation of Human Rights: A Deconstruction", *Leiden Journal of International Law*, vol. 34, no. 4, 2021, p. 831–854.
[253] R. Leenes, 'Regulating New Technologies in Times of Change' in L. Reins (eds), *Regulating New Technologies in Uncertain Times*, The Hague, T.M.C. Asser Press, 2019, p 3-17.
[253] J.T. Theilen, "The Inflation of Human Rights: A Deconstruction", *Leiden Journal of International Law*, vol. 34, no. 4, 2021, p. 831–854.
[254] R. Leenes, 'Regulating New Technologies in Times of Change' in L. Reins (eds), *Regulating New Technologies in Uncertain Times*, The Hague, T.M.C. Asser Press, 2019, p 3-17.
[254] J.T. Theilen, "The Inflation of Human Rights: A Deconstruction", *Leiden Journal of International Law*, vol. 34, no. 4, 2021, p. 831–854.
[255] McCarthy-Jones, 2019, p. 1-17.
[256] McCarthy-Jones, 2019, p. 1-17; Alegre, 2017, p. 221-233; Bublitz, 2014, p. 1-25.
[257] Lighthart, 2020, p.1-27.

outside the protection of this right.[258] Chapter 5 shows that, according to some authors, this should change. Against this background, they propose to extend the scope of this right to freedom of thought to any state of mind. Chapter 5 has also shown that the concept of "thought" must be interpreted broadly in this approach. For example, according to McCarthy-Jones, behaviour that says something about our state of mind, such as internet behaviour, should also fall within the scope of this right.[259]

However, this second approach is also subject to criticism. Lighthart et al. note that if almost every state of mind were to fall within the scope of this absolute right, everyday forms of influence would suddenly be infringed.[260] As an example, the authors cite advertising messages that unsolicited influence mental states: for example, they try to evoke someone's desire for a certain snack.[261]

Moreover, according to the same authors - and in agreement with Bublitz and McCarthy-Jones discussed in the previous chapter - there can sometimes be good reasons to determine and/or change the mental states and memories of third parties by force.[262] For example, in criminal law or in forced psychiatry, such as the obligation of a witness to reveal his memory of a certain event under oath in a criminal case or, one step further, the forced administration of medication in forensic psychiatry.[263] For these reasons, according to these authors, some infringements of the (still absolute) right to freedom of thought should become permissible.[264] This second approach thus argues for a broad interpretation of the right to freedom of thought, while at the same time denouncing the absolute character of the right.

6.1.3 Position 3: Existing Human Rights are Sufficient

In contrast to the previous two approaches, according to the latter approach, the current human rights system is sufficiently equipped to provide adequate legal protection against the risks of

[258]McCarthy-Jones, 2019, p. 1-17; Alegre, 2017, p. 221-233.
[259] McCarthy-Jones, 2019, p. 1-17.
[260] S. Ligthart, T. Kooijmans and G. Meynen. 'Neurorechten: Wat doet Nederland ermee?' *Nederlands Juristenblad* , no. 22, 2021, p. 1793.
[261] S. Ligthart, T. Kooijmans and G. Meynen. 'Neurorechten: Wat doet Nederland ermee?' *Nederlands Juristenblad* , no. 22, 2021, p. 1793.
[262]S. Ligthart, T. Kooijmans and G. Meynen. 'Neurorechten: Wat doet Nederland ermee?' *Nederlands Juristenblad* , no. 22, 2021, p. 1793; McCarthy-Jones, 2019, p. 1-17; Bublitz, 2014, p. 1-25.
[263] McCarthy-Jones, 2019, p. 1-17; Bublitz, 2014, p. 1-25.
[264]S. Ligthart, T. Kooijmans and G. Meynen. 'Neurorechten: Wat doet Nederland ermee?' *Nederlands Juristenblad* , no. 22, 2021, p. 1793.; McCarthy-Jones, 2019, p. 1-17; Bublitz, 2014, p. 1-25.

emerging neurotechnology's.[265] In this approach, the focus is mainly on Articles 8, 3 and 10 of the ECHR.[266] Moreover, the emphasis is not on a single legal standard, but on the coherence of the various legal standards.[267] Where one falls short, the others can supplement it, is the idea. According to Michalowski, for example, Articles 8 and 3 of the ECHR offer sufficient protection against undesired interventions that aim to bring about and/or change mental states.[268] Furthermore, Harris et al. refer to art. 10 of the ECHR, the right to (not) share opinions, ideas and other information with third parties.[269]

To return to the NeuroRights Foundation report discussed in the first approach. Lighthart and Bublitz have criticised the NeuroRights Foundation report in a blog post.[270] In short, they argue that it is still too early to draw conclusions about gaps in the current human rights system.[271] Moreover, they argue that when current human rights, such as the right to privacy, physical and mental integrity, security of the person, freedom of thought, freedom of expression and human dignity, are reasonably interpreted, the scope of these established rights includes potential neurotechnological interventions.[272] The same authors conclude that 'in general, the current human rights framework seems well equipped to meet the challenges of neurotechnology's'.[273] What needs to happen, according to these authors, and in this respect it

[265] S. Michalowski, 'Critical Reflections on the Need for a Right to Mental Self-Deter- mination', in A. von Arnauld, K. von der Decken & M. Susi (eds.), *The Cambridge Handbook of New Human Rights*, Padstow: CUP 2020 , p. .404-412; S. Ligthart, T. Kooijmans and G. Meynen. 'Neurorechten: Wat doet Nederland ermee?' *Nederlands Juristenblad* , no. 22, 2021, p. 1793.
[266] S. Ligthart, T. Kooijmans and G. Meynen. 'Neurorechten: Wat doet Nederland ermee?' *Nederlands Juristenblad* , no. 22, 2021, p. 1793.
[267] S. Ligthart, T. Kooijmans and G. Meynen. 'Neurorechten: Wat doet Nederland ermee?' *Nederlands Juristenblad* , no. 22, 2021, p. 1793.
[268] S. Michalowski, 'Critical Reflections on the Need for a Right to Mental Self-Deter- mination', in A. von Arnauld, K. von der Decken & M. Susi (eds.), *The Cambridge Handbook of New Human Rights*, Padstow: CUP 2020 , p. .404-412
[269] D. J. Harris, D.J. et al., *Law of The European Convention on Human Rights*, Oxford University Press, 2018, p. 595.
[270] S. Lighthart and J.C. Bublitz, 'Are New Human Rights Needed for Neurotechnologies? (Guest post by Ligthart & Bublitz)', Neuroethics & Law Blog [web blog], 2022, https://kolber.typepad.com/ethics_law_blog/2022/06/are-new-human-rights-needed-for-neurotechnologies-by-ligthart-bublitz.html (accessed 27 May 2022).
[271] S. Lighthart and J.C. Bublitz, 'Are New Human Rights Needed for Neurotechnologies? (Guest post by Ligthart & Bublitz)', Neuroethics & Law Blog [web blog], 2022, https://kolber.typepad.com/ethics_law_blog/2022/06/are-new-human-rights-needed-for-neurotechnologies-by-ligthart-bublitz.html (accessed 27 May 2022).
[272] S. Lighthart and J.C. Bublitz, 'Are New Human Rights Needed for Neurotechnologies? (Guest post by Ligthart & Bublitz)', Neuroethics & Law Blog [web blog], 2022, https://kolber.typepad.com/ethics_law_blog/2022/06/are-new-human-rights-needed-for-neurotechnologies-by-ligthart-bublitz.html (accessed 27 May 2022).
[273] S. Lighthart and J.C. Bublitz, 'Are New Human Rights Needed for Neurotechnologies? (Guest post by Ligthart & Bublitz)', Neuroethics & Law Blog [web blog], 2022,

is in line with the report, is 'that these rights should be interpreted in a reasonable way and adapted to new circumstances'.[274] They conclude by stating that this is the daily practice of the law.[275]

All in all, according to this approach, existing human rights are sufficient to provide protection against emerging neurotechnology's that interfere with mental life. According to this approach, such technologies do not require new or adapted rights, but a contemporary interpretation and development of existing human rights.

6.3 Concluding Remarks

Let us now return to the overarching theme of this thesis: do we need new human rights? Based on the above analysis and on my analysis in the previous Chapters, I conclude – in line with Lighthart et al.[276] – that the third approach has important advantages and is therefore, in my opinion, the right one. First, this approach argues that the rise of neuro-technologies does not require new or adapted human rights, but rather a contemporary interpretation of existing human rights.[277] As the Special Rapporteur also did with regard to mental privacy and the right to freedom of thought.[278] Therefore, in my view, no new human right to mental privacy is needed, simply because mental privacy is already guaranteed by the right to freedom of thought, as Chapter 5 shows. Secondly, this approach is in line with the "living-instrument doctrine" of the ECHR. In the words of the Council of Europe:[279]

https://kolber.typepad.com/ethics_law_blog/2022/06/are-new-human-rights-needed-for-neurotechnologies-by-ligthart-bublitz.html (accessed 27 May 2022).

[274] S. Lighthart and J.C. Bublitz, 'Are New Human Rights Needed for Neurotechnologies? (Guest post by Ligthart & Bublitz)', Neuroethics & Law Blog [web blog], 2022, https://kolber.typepad.com/ethics_law_blog/2022/06/are-new-human-rights-needed-for-neurotechnologies-by-ligthart-bublitz.html (accessed 27 May 2022).

[275] S. Lighthart and J.C. Bublitz, 'Are New Human Rights Needed for Neurotechnologies? (Guest post by Ligthart & Bublitz)', Neuroethics & Law Blog [web blog], 2022, https://kolber.typepad.com/ethics_law_blog/2022/06/are-new-human-rights-needed-for-neurotechnologies-by-ligthart-bublitz.html (accessed 27 May 2022).

[276] S. Ligthart, T. Kooijmans and G. Meynen. 'Neurorechten: Wat doet Nederland ermee?' *Nederlands Juristenblad* , no. 22, 2021, p. 1793.

[277] S. Ligthart, T. Kooijmans and G. Meynen. 'Neurorechten: Wat doet Nederland ermee?' *Nederlands Juristenblad* , no. 22, 2021, p. 1793.

[278] See Chapter 5.

[279] European Court of Human Rights Public Relations Unit, 'The European Convention on Human Right – A Living Instrument', *Council of Europe*, 2021, https://www.echr.coe.int/Documents/Convention_Instrument_ENG.pdf (accessed 1 July 2022) in S. Ligthart, T. Kooijmans and G. Meynen. 'Neurorechten: Wat doet Nederland ermee?' *Nederlands Juristenblad* , no. 22, 2021, p. 1793.

> What gives the Convention its strength and makes it extremely modern is the way the Court interprets it: dynamically, in the light of present-day conditions. By its case-law the Court has extended the rights set out in the Convention, such that its provisions apply today to situations that were totally unforeseeable and unimaginable at the time it was first adopted, including issues related to new technologies, bioethics or the environment. The Convention also applies to societal or sensitive questions relating, for example, to terrorism or migration.[280]

This approach thus suggests that we should view the Convention in the light of current social and technological developments. Lighthart et al. note that this has already been the case with respect to the scope of Article 8 ECHR.[281] The scope of this article has been adjusted over the years to the developments surrounding GPS, camera surveillance and DNA.[282] The same authors cite the example of the right to be forgotten on the Internet.[283] In theory, this path could also be followed with regard to neuro-technological developments.

Thirdly, as noted by Lighthart et al. 'this approach does not affect the level of protection of already recognised rights, such as Article 9 ECHR'.[284] The same authors state that 'by placing the legal protection of neurotechnology primarily within Articles 8 and 10 ECHR, there is no need to stretch the scope of Article 9 ECHR and to relativize the absolute protection level of the *forum internum'*.[285] However, they conclude that the combination of Articles 3, 8, 10 and 9 ECHR could lead to a refined assessment framework with regard to the standardisation of neurotechniques.[286]

In my opinion, these are strong arguments for position 3, especially with the addition of Lighthart et al. by focusing on the relationship of not only Articles 3, 8 and 10, but also Article 9 ECHR. With regard to the latter article, my analysis in the previous Chapter leads me to the conclusion that Article 9 ECHR is flexible enough, in the light of contemporary social and especially technological developments, to also protect mental privacy via the first core element of the right to freedom of thought within the *forum internum*: the right not to reveal thoughts.

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[280] European Court of Human Rights Public Relations Unit, 'The European Convention on Human Right – A Living Instrument', *Council of Europe*, 2021, https://www.echr.coe.int/Documents/Convention_Instrument_ENG.pdf (accessed 1 July 2022).
[281] S. Ligthart, T. Kooijmans and G. Meynen. 'Neurorechten: Wat doet Nederland ermee?' *Nederlands Juristenblad* , no. 22, 2021, p. 1793.
[282] Ligthart and Kooijmans, 2021, p. 1793.
[283] Ligthart and Kooijmans, 2021, p. 1793.
[284] Ligthart and Kooijmans, 2021, p. 1793.
[285] Ligthart and Kooijmans, 2021, p. 1793.
[286] Ligthart and Kooijmans, 2021, p. 1793.

In my opinion, the current human rights system is therefore flexible enough and well equipped to adapt to 21st century neuro-technological developments and, as already emphasised in 1978 by the European Court of Human Rights in *Tyrer v. United Kindom*, 'The Convention is a living instrument which … must be interpreted in the light of present-day conditions''.[287] And as noted by Lighthart and Bublitz, this is the daily practice of the law.

[287] *Tyrer v United Kindom* App no 5856/72 (ECHR, 25 April 1978).

Conclusion

This study aimed to answer the question: *'To what extent does the right to freedom of thought in the European context protect against the potential risks to privacy posed by neurotechnology, and more specifically by brain-computer interfaces?*' To this end, a legal doctrinal study was carried out. The reason for this study was the current international debate in the field of neurotechnology and (new) human rights. Within this debate, it is suggested, among other things, that we need a new human right to mental privacy.

The results on the meaning and scope of the right to freedom of thought in relation to mental privacy showed that the right to freedom of thought in a European context is flexible enough to protect mental privacy. This fits within the "living instincts doctrine". Interpreting the law in the light of present-day conditions is daily practice in the world of law.

Part of the aim of this thesis was to determine whether or not new human rights are needed as a result of rapid neuro-technological developments. On the basis of the current research, it can be said that, at least as far as the proposed right to mental privacy is concerned, this is not necessary. However, the fact that no new human right to mental privacy is needed does not mean that we are completely in the clear. More in-depth research into the use of BCIs and specific law and regulation in this area are, in my opinion, badly needed.

Nevertheless, this research has shown that the effects of the use of BCI are very far-reaching. As I said in the Introduction to this thesis, we are entering the era of neurotechnology. Man and machine are slowly (or perhaps not so slowly) becoming one. It is therefore crucial that we all start thinking about what kind of relationship we want with technology in the future, before it is too late and the choice is no longer ours.

Lastly, a glance into the future. Further research is needed to determine the causes of/effects of/relationship between BCIs and AI. As well as the causes of/effects of/relationship between BCIs and BBIs. In this study, the combination of BCIs and AI has been underexplored. However, I have briefly mentioned that the developments of BCIs are converging and accelerating due to the advancement of AI. There are already voices claiming that AI is creating

certain forms of “consciousness”. What this means for the combination of BCIs and AI only time will tell.

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